

Service Handbook

**HP 9000 Series 300 Computers
Models 360/370**

HP Part Number 98579-90039



**HEWLETT
PACKARD**

Hewlett-Packard Company

3404 East Harmony Road, Fort Collins, Colorado 80525

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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.

June 1988...Edition 1

Notices

Radio Frequency Interference Statements

FCC Statement

**Federal Communications Commission
Radio Frequency Interference Statement
(U.S.A. Only)**

The Federal Communications Commission (in Subpart J of Part 15, Docket 20780) has specified that the following notice be brought to the attention of the users of this product.

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. 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.

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Safety Considerations

WARNINGS, CAUTIONS, and Notes

Warnings, cautions and notes are used throughout this document to alert the user to conditions of importance. They are used as follows:

- **WARNINGS** contain information which, if not observed, could result in injury to personnel or loss of life.
- **CAUTIONS** contain information which, if not observed, could result in damage to or destruction of equipment.
- **Notes** contain information that will assist you in accomplishing the job.

Examples:

WARNING

The power supply presents a hazard to personnel. Extreme care must be taken when connecting voltmeter probes to the test points. De-energize the product by turning it off and removing its power cord before connecting or removing test probes.

CAUTION

The printed circuit assemblies in this product are susceptible to damage by electro-static discharge. Extreme care must be taken when handling printed circuit assemblies. Use an Anti-static Workstation while handling printed circuit assemblies.

Note

Hewlett-Packard supports repair of this product only to the assembly level. The fault is diagnosed to the assembly that is causing the problem. That assembly is then replaced with a new or rebuilt one.

Information Locator

Finding Service Information

On the next page is a Service Information Locator. It shows where to find a variety of subjects dealing with servicing these products. To use this table, first find the type of information you need to reference in the left-hand column. Next, move to the right in that row to a referenced chapter number. Last, move up the column with the information's referenced chapter to the top. Across the top are manual titles and part numbers that have the information documented.

Chapter identifiers in the Locator use the following codes:

Chapter Number: Numbers, such as 2. Inclusive chapters, such as 4-6.

Appendices: Letters, such as A for Appendix A.

Entire Manual: All

Varies: * (Check Table of Contents or Index.)

In some cases, two or more references will be shown for a given information type. You should check all references to be sure you get the specific information you need.

For example, suppose you need to find out what the Repair Philosophy is for the HP 98570A Bus Expander. Locating "Repair Philosophy" in the left-hand column, and moving to the right in that row, you'll notice that this information is in "Chapter 1" of a manual. At the top of this column is the manual's abbreviated title. Chapter 7 in this manual lists manual titles and part numbers for service information.

Service Information Locator

Manuals identified in this locator are abbreviated by their initials:

SIM	Service Information Manual
IRM	Installation Reference Manual
SHB	Service Handbook
PIN	Product Installation Note
CRM	Configuration Reference Manual
TDS	Technical Data Sheet/Price List
TTM	Series 300 Test Tools Manual
ADG	Accessory Development Guide
SPM	Site Preparation Manual

Service Information Locator

Service Information	SIM	SHB	CRM	TTM	SPM	IRM	PIN	TDS	ADG
Assembly replacement	2								
Block diagrams	1, 2	9							
Booting Operating Systems	4								
Computer tests	1, 5	2		1, 2, 3					
Configurations	1	3				All		All	
CS/80 tests	1, 5	5		4					
Electrical requirements	1	1			3, A			*	
Environmental requirements	1	2			4, A			*	
Functional descriptions	3								All
HP-HIL device tests				2, 3					
Installation	2	2	All		All	All	All		
I/O Bus architecture	1, 3								All
Monitors	1	3	All		A	1		*	
People who can help									

Service Information Locator (cont.) .

Service Information	SIM	SHB	CRM	TTM	SPM	IRM	PIN	TDS	ADG
Options/Accessories	1, 3	3	All			All	All	*	All
Ordering spare parts	6	8							
Part numbers	6	8	All						
Peripherals	1	3	All					*	
Preventive maintenance		2							
Product information	1	1	All		All	All	All	All	
Product numbers	1	1, 3	All		A			All	
Reference material	7	10	*			All		All	All
Self-tests	4, 5	5		1, 2					
Service notes	1	11							
Site preparation		2			All				
System Functional Tests	1, 5	5		1, 3					
Systems	1	3	All			All		*	
Troubleshooting	5	4		All					
Turn-on	3, 4	4, 5				2			

Table of Contents

Chapter 1: Product Information

Introduction	1
Hewlett-Packard Support	1
Repair Philosophy	1
System Features	3
Computers	3
Expanders	4
Serial Numbers	4
Technical Information	5
Electrical	5
Environmental	6
Electromagnetic Interference	6
Regulatory Requirements	6
Physical	6
Shipping Information	6
Model 360 Processor Board	7
Model 370 Processor Board	8
Memory	8
DIO-II I/O Bus	8
System Interface Board	9
Standard Tools	10
Computer/System Tests	10

Chapter 2: Environmental/Installation/PM

Environmental	11
Environmental Specifications	11
Electromagnetic Interference	11
Regulatory Requirements	11
Physical	12
Shipping Information	12
Installation	13
Mounting	13
Cabling	13
Preventive Maintenance	14

Chapter 3: Configuration

Bundled Systems 15
Supported Configurations 15
Board Installation Precautions 16
RAM Configuration 17
 RAM Configuration Examples 18
System Interface Board 19
 HP-IB and RS-232 Switches 19
 LAN Switches 20
 High-Speed HP-IB Add-On Switches 21
 HP-HIL Accessories 23

Chapter 4: Troubleshooting

Initial Troubleshooting Flowchart 25
Dead Unit Troubleshooting Flowchart 26
Live Unit Troubleshooting Flowchart 27
Power Supply Specifications 28
 Voltage Indicators 28
 General Failure Indications 29
 Boot ROM Error Codes 30
Remote Computer Analysis 31
 Locating Defective RAM Boards 31
Boot ROM Self-Tests 32

Chapter 5: Computer Tests

Test Tools 35
 Package Contents 35

Chapter 6: Adjustments

Chapter 7: Peripherals

Supported Peripherals List 39

Chapter 8: Parts Lists

Replacement Parts Information 41
 Introduction 41
 Cooperative Support Program 42
 Exchange Parts 42
Part Number Lists 43
 Static-Free Bags 43
 Labels 43
 Computer Electrical Parts 44

Computer Case Parts	46
Expander Case Parts Diagram	48
HP 98570A and 98568A Opt. 132 Expander	49
Printed Circuit Boards	50
Miscellaneous Electrical Parts	51
External Cables	51
HP-HIL Devices	52
Chapter 9: Diagrams	
Model 360/370 Computer	53
Computer Block Diagram	53
Power Supply	54
Power Distribution	55
Model 360 Processor Board	56
Model 370 Processor Board	57
RAM Boards	58
System Interface Board	59
Video Boards	60
Chapter 10: References	
Related Hardware Documentation	61
Hardware Support Documentation	61
Installation Manuals/Notes	63
Chapter 11: Service Notes	65

Product Information

Introduction

Information in this handbook refers to the HP 9000 Series 300 Model 360 and 370 computers. These computers are product numbers HP 98579A and HP 98579B, respectively.

Where applicable, the information also applies to the HP 98568A Opt. 132 and HP 98570A Direct-Connect System/DIO Slot Expanders.

Hewlett-Packard Support

Support services and policies mentioned in this section are subject to change. Please consult your local Hewlett-Packard Sales and Service Office for the current support policies.

Repair Philosophy

Field Repair Philosophy for the Model 360/370 Computers and the HP 98568A Opt. 132 and 98570A Expanders is assembly, or board level. This means that when a failure occurs, the problem is diagnosed to the assembly having the failed part. That assembly is then replaced. Replacement assemblies are available through local HP Sales and Service Offices.

Some assemblies may be exchanged for rebuilt ones. Other assemblies are only available as new ones. Refer to Chapter 6, or the Service Handbook, Chapter 8, for information on replacement parts.

Schematics

In support of the repair philosophy, this manual contains information to the assembly level. Schematics are not available for these products.

Supported Configurations

Only computer systems with Hewlett-Packard approved parts, accessories, peripherals, operating systems and application programs are supported by Hewlett-Packard. Any computer system with other than HP approved hardware or software connected or installed must have the non-HP approved hardware and software removed by the customer before On-Site or Service Center repair is accomplished.

Refer to the Series 300 Configuration Reference Manual (98561-90020) for supported hardware/software products and combinations thereof.

System Features

Computers

Table 1-1. Computer Features

Product Number	Description
Model 360 (HP 98579A)	Model 360 system processing unit featuring: MC68030 CPU, 25 MHz MC68882 Floating Point Co-CPU, 25 MHz 4 Mbytes of Processor On-Board RAM 4 Mbytes RAM Standard, Maximum 16 Mbytes
Model 370 (HP 98579B)	Model 370 system processing unit featuring: MC68030 CPU, 33 MHz MC68882 Floating Point Co-CPU, 33 MHz 8 Mbytes RAM Standard, Maximum 48 Mbytes 32-bit High-Speed System Bus
Common Features	4 Gbytes Virtual Memory address space 32-bit DIO-II I/O Bus IEEE-488 HP-IB Interface RS-232C Serial Interface IEEE 802.3/Ethernet LAN Interface with ThinMAU and "T" Connector or thickLAN and 15-pin connector High-speed IEEE 488 Disc Interface (optional on Model 360) or optional SCSI Interface Two channel DMA Controller HP-IB, HP-HIL, and RS-232 adapter cables.

Expanders

Table 1-2. Expander Features

Product Number	Description
Direct-Connect I/O Expanders	HP 98568A Opt. 132, 8 DIO Card Slots HP 98570A 2 DIO-II System Board Slots 4 DIO Card Slots
Backplane Upgrades	HP 98242A 4-slot DIO backplane. Can be added to 98579B or to 98570A. HP 98242B 2-slot DIO backplane. Can be added to 98579B or to 98570A. HP 98570A Opt. 004 provides 2 DIO slots and 3 system slots.

Serial Numbers

Serial No.

2623 A 01234

Location: Behind the power supply access cover on the inside bottom of the chassis.

Description:

5-digit unique identifying number.

Country of Origin Code.

Product Code, decoded as:

First 2 digits + 60 = Last 2 digits of year product was introduced or significantly changed.

Last 2 digits = number of week in year product was introduced or significantly changed.

Technical Information

Electrical

Line voltage/Frequency	120 V ac @ 48-66 Hz 240 V ac @ 48-66 Hz
Fuse	8AF 250V
Backplane Power Available	Total Power Available from motherboard: 95 Watts @ +5 V dc 40 Watts @ +12 V dc 12 Watts @ -12 V dc
Computers and, Expanders	Each system slot: 23 Watts @ +5 V dc 10 Watts @ +12 V dc 3 Watts @ -12 V dc
	DIO backplane, all slots combined 23 Watts @ +5 V dc 10 Watts @ +12 V dc 3 Watts @ -12 V dc
Line transient spike immunity (1 nsec rise, 800 nsec duration)	1 KV dc
Power Consumption	250 Watts maximum
Current Requirements	5.0 A @ 120 V ac 3.0 A @ 240 V ac
Maximum Heat Dissipation	853 BTU/hr 250 Kcal/hr
Battery Back-up	Real-Time Clock on System Interface Board

Environmental

Operating temperature	0 - 55° C
Operating humidity	5 - 95% relative
Operating altitude	4 572 metres (15 000 feet)

Electromagnetic Interference

Standards met	FCC Class A VCCI Class 2 VDE Class B, VDE 1046/84
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Regulatory Requirements

Standards met	UL 478, 5th Edition CSA 154M-1983 IEC 380, 3rd Edition; 435, 2nd Edition
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Physical

Dimensions (Computer or Expander)

Height	130 mm (5.12 inches)
Width	325 mm (12.8 inches)
Length	376 mm (14.8 inches)
Weight	11.8 kg (26 pounds) maximum
Vibration Standard	Meets Class B requirements

Shipping Information

The shipping container for each computer includes the Localization Kit, which includes power cords, fuse, keyboard cable, HP-HIL cable, Installation Reference, and Installation Picture Card.

Models 360 or 370 Computer

Shipping Weight	15.9 kg (35 pounds)
Container Dimensions	Width - 502 mm (19.75 inches) Length - 559 mm (22 inches) Depth - 267 mm (10.5 inches) Cube - 0.07 m ³ (2.65 feet ³)

HP 98568A Opt. 132 or 98570A Expander

Shipping Weight	12 kg (26.4 pounds)
Container Dimensions	Width - 502 mm (19.75 inches) Length - 502 mm (19.75 inches) Depth - 241 mm (9.5 inches) Cube - 0.06 m ³ (2.03 feet ³)

Model 360 Processor Board

CPU

Type	Motorola MC68030
Clock Frequency	25 MHz
Internal Architecture	32-bit data and address registers
Address range	4 Gbytes virtual mapped to 4 Gbytes physical
Data bus	32-bit synchronous to: 4 Mbytes On-board RAM

Co-processors

Floating point	
Type	Motorola MC68882
Clock Frequency	25 MHz

On-Board memory

Size	4 Mbytes
Type	Byte parity error-checking
Average cycle time	300 nsec

Model 370 Processor Board

CPU	MC68030 at 33 MHz
Floating Point Co-CPU	MC68882 at 33 MHz
Page size	4 Kbytes/page
Cache Memory	
Type	Write through, instruction, data (external to MC68030 instruction cache)
RAM	16 Kbytes, 8K words of 32-bit entries
Cycle time	120 nsec
Partitioning	Four 32-bit words each; 22 partitions

Memory

Memory Boards

Type	Byte parity error checking or error checking and correcting (Model 370 only)
System bus width	32 bits address; 32 bits data
Bandwidth	22.2 Mbyte/sec read; 14.3 Mbyte/sec write
Average cycle time	180 nsec

Memory Sizes

360 Standard RAM	4 Mbytes on processor board
360 Maximum RAM	16 Mbytes (4 Mbytes on processor plus one 4, 8 or 12 Mbyte RAM add-on board)
370 Standard RAM	8 Mbytes: 4 Mbyte controller board plus 4 Mbyte add-on board
370 Maximum RAM	48 Mbytes (3 boards of 16 Mbytes each)

DIO-II I/O Bus

Width	32 bits address; 32 bits data
Bus bandwidth	6 Mb/sec

System Interface Board

LAN Interface

Media	ThinLAN coax cable (RG 58U) or 15-pin ThickLAN
Protocols	IEEE 802.3, Ethernet
Data Rate	10 Mbits /sec

Disc Interface

Type	IEEE 488
Data Rate	1 Mbyte/sec
Connected drives	8 per interface supported. (Additional disc interfaces are available as optional accessories)

Parallel Interface

Type	IEEE 488
Data Rate	370 Kbyte/sec
Connected devices	15 per interface devices supported

Serial Interface

Type	RS-232C standard
Connector	DB9 with cable; adapter to DB25

Small Computer Systems Interface

Type	ANSI X3.131-1986
Data Rate	1.5 Mbytes/second (asynchronous)
Number of connected devices	7 (not counting the SPU)

Battery-backed Real-Time Clock

Resolution	10 milliseconds
Accuracy	±5 seconds/day
Battery type	Lithium; 1 year expected life

Keyboard requirements

HP 46021A (ITF) with HP-HIL interface, 107-key low profile with numeric keypad, 8 special-function keys

HP 98203C with HP-HIL interface, 106-key with rotary control knob, including 10 special-function keys.

Standard Tools

The following tools are needed to service the computer and expander:

Table 1-9. Standard Tools

Part/Product Number	Description
(various)	General electronic tools
9300-0933	Anti-static workstation
(various)	#1 Pozidriv Screwdriver
(various)	#2 Pozidriv Screwdriver
HP 3476B	Digital Multimeter

Computer/System Tests

Table 1-10. Series 200/300 Test Tools

Part No.	Description
09800-12700	one 1/4-inch tape
09800-12300	eight 3 1/2-inch disks
09800-12500	eight 5 1/4-inch disks

The tape version consists of one tape and the manual.

The disk versions consist of the manual and these disks:

Series 200 Computer Tests Disk Rev. 1.1

Series 300 Computer Tests Disk Rev. 2.0

Series 200/300 System Functional Tests Disks:

SFT0 Disk Rev. 1.2

SFT1 Disk Rev. 1.2

SFT2 Disk Rev. 1.2

SFT3 Disk Rev. 1.2

SFT4 Disk Rev. 1.2

CS/80 Exerciser Disk Rev. 3.1

Environmental/Installation/PM **2**

Environmental

Environmental Specifications

Operating temperature	0 - 55° C
Operating humidity	5 - 95% relative
Operating altitude	4 572 metres (15 000 feet)
Maximum Heat Dissipation	853 Btu/hr 250 Kcal/hr

Electromagnetic Interference

Standards met	FCC Class A VCCI Class 2 VDE Class B, VDE 1046/84
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Regulatory Requirements

Standards met	UL 478, 5th Edition CSA 154M-1983 IEC 380, 3rd Edition; 435, 2nd Edition
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Physical

Dimensions (Computer or Expander)

Height	130 mm (5.12 inches)
Width	325 mm (12.8 inches)
Length	376 mm (14.8 inches)
Weight	11.8 kg (26 pounds) maximum
Vibration Standard	Meets Class B requirements

Shipping Information

The shipping container for each computer includes the Localization Kit, which includes power cords, fuse, keyboard cable, HP-HIL cable, Installation Reference, and Installation Picture Card.

Models 360 or 370 Computer

Shipping Weight	15.9 kg (35 pounds)
Container Dimensions	Width - 502 mm (19.75 inches) Length - 559 mm (22 inches) Depth - 267 mm (10.5 inches) Cube - 0.07 m ³ (2.65 feet ³)

HP 98568A Opt. 132 or 98570A Expander

Shipping Weight	12 kg (26.4 pounds)
Container Dimensions	Width - 502 mm (19.75 inches) Length - 502 mm (19.75 inches) Depth - 241 mm (9.5 inches) Cube - 0.06 m ³ (2.03 feet ³)

Installation

Model 360/370 computers are customer-installable, unless a non-customer-installable peripheral is included in the order. The HP 98570A and 98568A Opt. 132 expander is likewise customer-installable.

Mounting

Tabouret or mini-rack, or unmounted (desktop).

Cabling

Table 2-1. Interface and Video Cables

Cable Type	Product Number, Description
Standard HP-IB	HP 10833D, 0,5 metre HP 10833A, 1 metre HP 10833B, 2 metre HP 10833C, 4 metre
High-Speed HP-IB	98562-61600 (connects to high-speed disc add-on.)
9-Pin RS-232C	HP 92221M DTE to DCE HP 92221P DTE to DTE HP 92222F female to female gender converter HP 92222W custom wiring kit
RGB Video	HP 98290A 3-metre, 3-wire for color monitors
Standard Video	5061-6533, 3-metre, 1-wire for monochrome monitors
Audio	8120-4704, 3-metre
98265-61601	Add-on SCSI card cable
1252-2297	SCSI terminator
5061-6565	SCSI test connector
8120-4998	1-metre SCSI peripheral interface cable (both ends standard)
8120-5158	0.5-metre SCSI peripheral interface cable (both ends standard)
8120-5159	2-metre SCSI peripheral interface cable (both ends standard)
8120-5160	1-metre SCSI extender cable (one end male, one end female)

Preventive Maintenance

The real-time clock contains a lithium battery which should be replaced once a year. The real-time clock is located on the system interface board.

Although the battery is available from Hewlett-Packard, it usually can be obtained locally. It is a 3V, 160 mAh battery.

Make	Part Number
Panasonic	BR2325

WARNING

Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

When changing the battery, remember that the real-time clock will reset to its default state, and it is necessary to set it to the current time. Note also that the battery retainer clip is a conductor, and merely lifting it up without changing the battery will still cause the real-time clock to reset.

Configuration

Bundled Systems

Refer to the current Model 360/370 Hardware Price List to determine what HP products are bundled into Model 360 and 370 computer systems.

Supported Configurations

Refer to the *Series 300 Configuration Reference Manual (98562-90020)* for the current hardware and software products that are supported.

Board Installation Precautions

CAUTION

Two-board assemblies must not be installed in the top slot directly under the top cover.

CAUTION

Do not use excessive force to seat boards in the system slot connectors.

If excessive force seems to be needed to install a board, remove the board, and inspect the system slot connector for bent pins. Straighten any pins that appear to be bent.

Remove the top cover and all boards above the one that is difficult to seat.

Re-insert the board in the system slot connectors and adjust the position of the board's connector to mate correctly with the slot connector. Carefully seat the board in the connector. Reinstall the other boards the same way and the top cover.

RAM Configuration

Model 360 RAM is completely auto-configuring.

Each Model 370 RAM assembly must be configured for the total RAM it contains:

- 4 Mbyte RAM controller board without add-ons must be set to 4 Mbyte block boundaries.
- 4 Mbyte RAM controller board with 4 Mbyte add-on must be set to 8 Mbyte block boundaries.
- 4 Mbyte RAM controller board with 12 Mbyte add-on must be set to 16 Mbyte block boundaries.

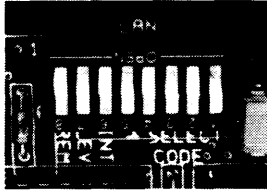
Maximum RAM is:

- Model 360 is 16 Mbytes, or one 12 Mbyte RAM controller board with the processor.
- Model 370 is 48 Mbytes, or three 16 Mbyte 2-board assemblies.

System Interface Board

HP-IB and RS-232 Switches

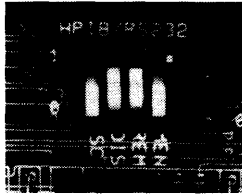
Table 3-3. HP-IB and RS-232 Configuration Switches



Switch Label	Function/How It's Used
MEN	Modem Enable 1 = Modem lines enabled (Shipped setting) 0 = Modem lines disabled
REM	Remote Terminal Enable 1 = Remote Mode 0 = Local Mode (Shipped setting)
DIS	RS-232 Disable 0 = Enabled(Shipped setting) 1 = Disabled
SC	Internal HP-IB System Controller 1 = System Controller (Shipped setting) 0 = Not System Controller

LAN Switches

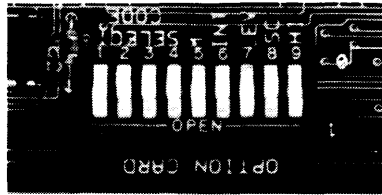
Table 3-4. LAN Configuration Switches



Switch Label	Function/How It's Used
SELECT (1 - 5)	Select Code: 1 (L) is LSB, 5 (M) is MSB. (Shipped with 10100, SC-20)
INT (6) LEV (7)	Interrupt Level: LEV (7) is MSB 7 6 - - 0 0 = Level 3 0 1 = Level 4 1 0 = Level 5 (Shipped setting) 1 1 = Level 6
REM (8)	Local/Remote 0 = Local (Shipped setting) 1 = Remote

High-Speed HP-IB Add-On Switches

Table 3-5. High-Speed HP-IB Add-On Configuration Switches



Switch Label	Function/How It's Used
$\overline{\text{SELECT}}$ (1 - 5)	Select Code: 1 (L) is LSB, 5 (M) is MSB Shipped with SC-14
INT (6) LEV (7)	Interrupt Level: LEV (7) is MSB 7 6 -- 0 0 = Level 3 0 1 = Level 4 (Shipped setting) 1 0 = Level 5 1 1 = Level 6
SC (8)	System Controller 1 = System Controller (Shipped setting) 0 = Not System Controller
HI (9)	Low/High Speed 0 = Low Speed 1 = High Speed (Shipped setting)

HP-HIL Accessories

HP-HIL devices are limited to a total of 1 A of current and seven addresses per computer.

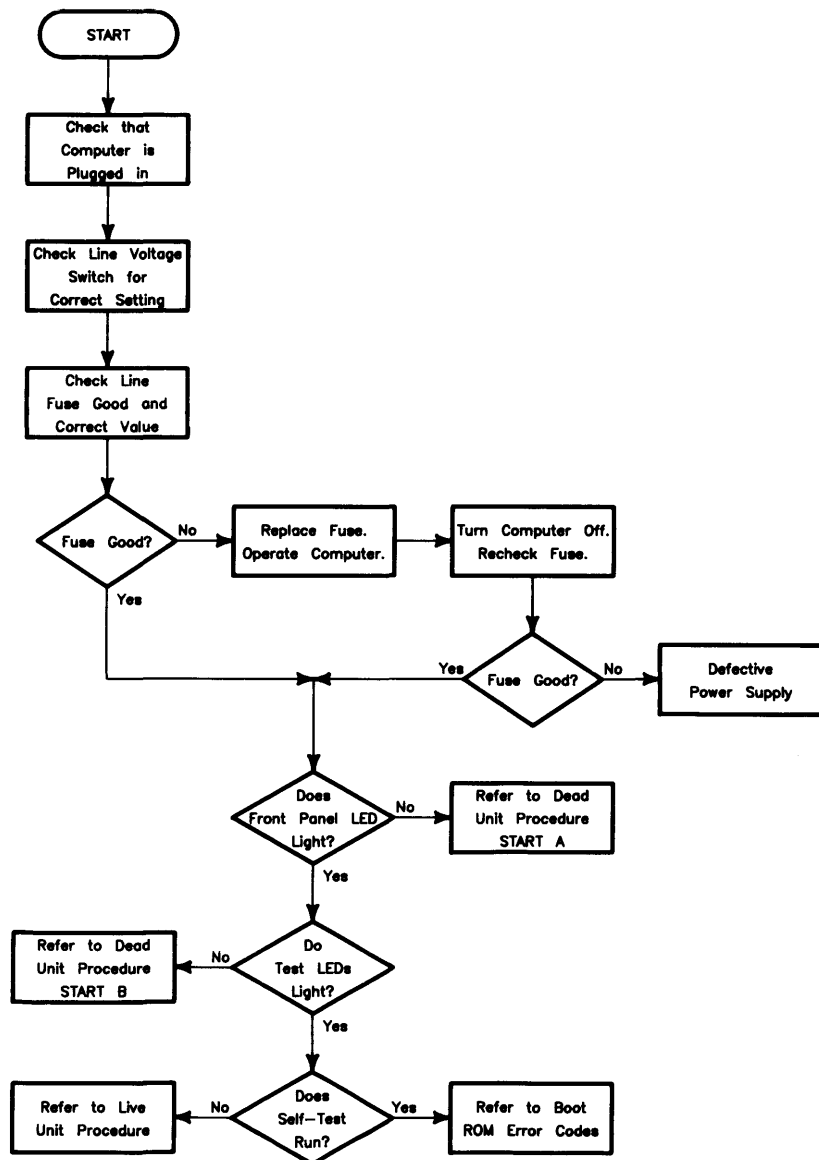
Table 3-7. HP-HIL Devices and Current/Power Requirements

Product Number	Device Name	mA	Watts
HP 35723A	Touchscreen Bezel	250	3.0
HP 46021A	ITF Keyboard	100	1.2
HP 46021A	ITF Keyboard	145	1.74
HP 46060A	HP Mouse	200	2.4
HP 46080A	Extension Module	25	0.3
HP 46081A	3 Metre Ext.	25	0.3
HP 46082A/B	15/30 Metre Extension ¹	50	0.6
HP 46083A	Rotary Control Knob	110	1.32
HP 46084A	ID Module	60	0.72
HP 46085A	Control Dials	370	4.2
HP 46086A	Button Box	80	0.96
HP 46087A ²	"A"-Size Digitizer ²	200	2.4
HP 46088A ²	"B"-Size Digitizer ²	200	2.4
HP 46094A	Quadrature Port Device ³	80	1.2
HP 46095A	Three-Button Mouse	80	0.96
HP 92916A	Barcode Reader	100	1.2

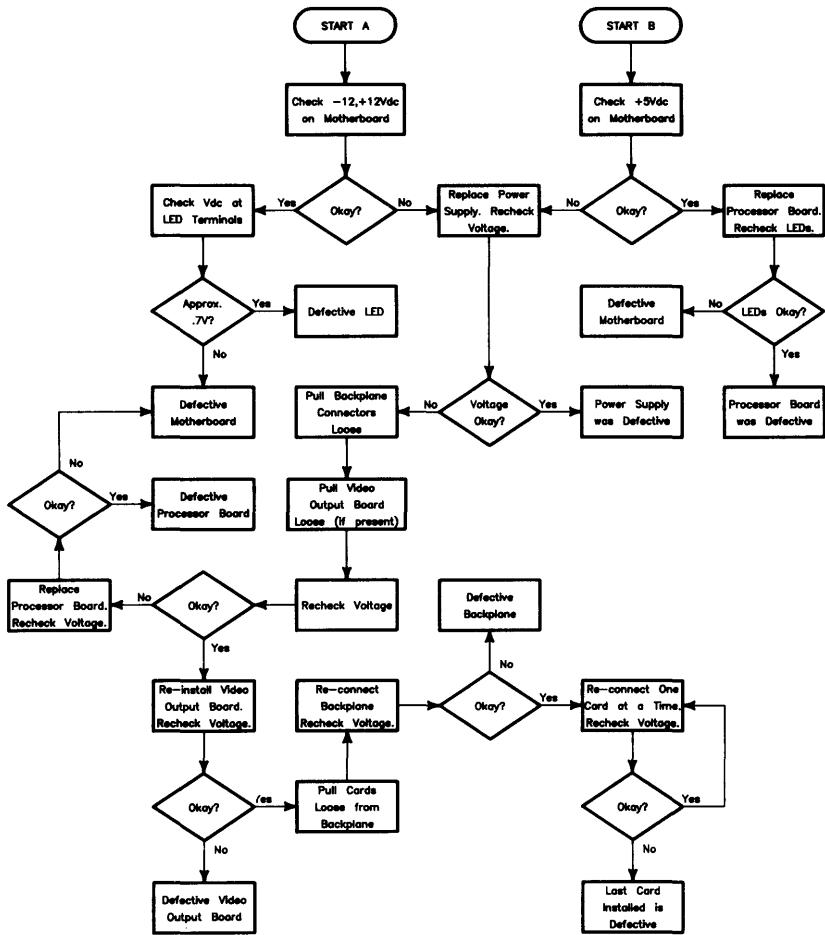
- Notes:
- ¹ Extension cables have two boxes, each draws 25 mA.
 - ² Includes HP 46089A 4-Button Cursor.
 - ³ Port devices require 80 mA; devices attached cannot exceed 120 mA.

Troubleshooting

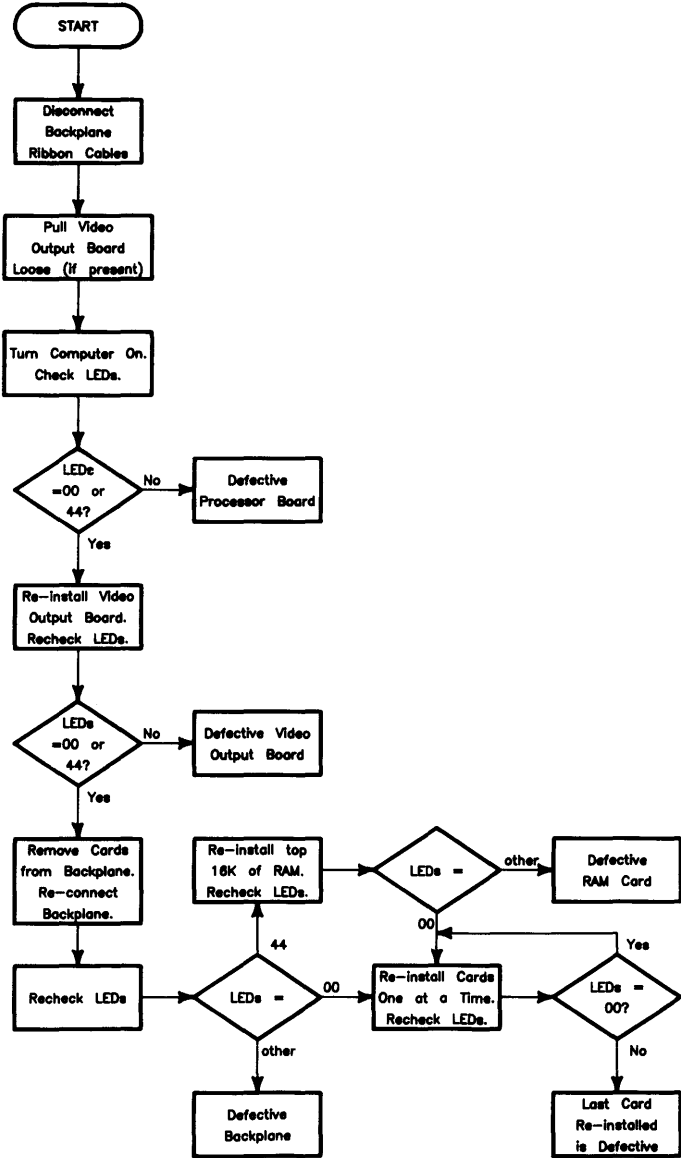
Initial Troubleshooting Flowchart



Dead Unit Troubleshooting Flowchart



Live Unit Troubleshooting Flowchart



Power Supply Specifications

Voltage	Tolerance	Maximum Current
+5 V dc	4.89 to 5.25 V dc	20 A
+12 V	11.86 to 12.72 V dc	3.6 A
-12 V	-11.86 to -12.72 V dc	1.1 A

Voltage Indicators

Voltage	Visual Indication	Physical Indication
-12 V dc	Front Panel "ON" LED Lit	Small Fan Running
+5 V	Self-test LED lit at turn-on.	Small Fan Running
+12 V dc	Front Panel "ON" LED Lit	Large Fan Running

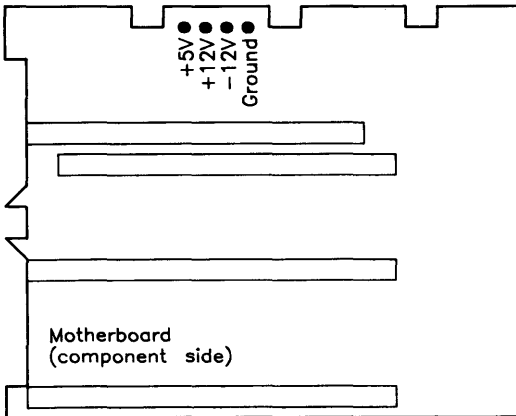


Figure 4-1. Power Supply Test Points

General Failure Indications

Table 4-1. Self-Test LED General Failure Indications

Upper 2 Bits Fail Indicator	LED Code and Failure Description
State Indication Only:	○○SS SSSS Where SS SSSS Indicates State of Power-up
Required Device Missing or DTACK Failure:	○●DD DDDD Where DD DDDD Indicates Device
Failing Device:	●○DD DDDD Where DD DDDD Indicates Device
Special Codes (Special Case Highest Priority Codes):	●●●● ●●●● LEDs Never Accessed (or Unused Code)
	○●●● ●●●● LEDs Failed to DTACK
	○○○○ ○○○● Timer on processor board has failed or is missing.

Lower 2 Bits State or Device Codes	LED Code and Failure Description
Miscellaneous (Highest Priority):	XX○○ FFFF Where FFFF indicates Failure (Xs are don't-care bits)
Internal Peripheral Failure (Medium Priority):	XX○● PPPP Where PPPP is Peripheral Number
I/O Card Failure (Lowest Priority):	XX●S SSSS Where S SSSS is Select Code

Boot ROM Error Codes

**Table 4-2a. Boot ROM LED Error Codes
(In numerical order)**

LEDs	Explanation
oooo oooo	No failure
oooo ooo●	Failed CPU register test.
oooo oo●●	Failure in top 16 Kbytes of RAM.
oooo o●oo	Top 16 Kbytes of RAM missing or not found by CPU.
oooo ●●oo	Failed Boot ROM checksum.
ooo● ooo●	Failure: Not enough RAM.
ooo● oo●o	Failure: ROM system.
ooo● oo●●	Failure: Boot error.
ooo● o●oo	Failure: OS tried to start loading at too high of an address.
ooo● o●●o	Failure: Not enough RAM to load OS.

**Table 4-2b. Boot ROM LED Error Codes for Interfaces
(In numerical order)**

LEDs	Explanation
oo●o oooo	Failure: 4 ms timer.
oo●o oo●o	Failure: Processor board keyboard circuit.
oo●o oo●●	Failure: External keyboard circuit.
oo●o o●oo	Failure: Internal HP-IB circuit
oo●o ●ooo	Failure: DMA circuit.
oo●o ●●oo	Failure - one of these high-res video circuits: Font ROM is bad. Font ROM is not usable. Could not find US ASCII character set.
oo●o ●●●o	Failure: Video board bit map circuit.
oo●o oooo	Failure: I/O circuit at select code 0. Each successive LED pattern represents an I/O failure at select codes 2 through 30.
oo●o ●●●o	Failure: I/O circuit at select code 31.

Remote Computer Analysis

The Model 360/370 computers provide for remote analysis of problems by means of the beeper. To test the computer remotely, follow this procedure:

1. Establish a telephone connection with someone at the location of the computer.
2. Have them hold the receiver near the speaker output of the computer. The speaker is located in most monitors, or in the speaker module.
3. Now have them turn the computer on.
4. The computer will go through its self-test and report problems as a series of beeps. These beeps correlate with the above error codes.
5. A high beep indicates a one and a low beep indicates a zero.

For example, suppose that on power-up a computer emits three low beeps, a high beep, two low beeps and a high beep. This will be of the form `ooo●ooo`, where `o` represents a low beep, `●` represents a high beep and `x` represents an unbeeped high or low. Referring to the table of Boot ROM Error Codes shows a RAM Failure as the probable cause.

Locating Defective RAM Boards

Remember that RAM is on the Model 360 processor board in addition to the Mbyte RAM assemblies.

A RAM failure message may be decoded to determine which RAM block caused the failure. For example, in the message

```
Memory Failed at FFB3A900  
W:F58A8C2C,R:F78A8C2C
```

the failure occurred at memory address FFB3A900. To correlate this with a RAM board, take the first three hex digits of the address and translate them into binary. Then find a board whose address switches are set to the first ten bits of the top address in that 4 Mbyte address block.

In the above example, FFB is 1111 1111 10(01) in binary. A RAM board with switches set to 1111 1111 10 has its top address as FFBFFFFFF. FFB3A900 is below FFBFFFFFF and above FF7FFFFFF (next 4 Mbyte RAM block down). Therefore, the switches on the defective RAM board would be set to 1111 1111 10.

Boot ROM Self-Tests

Table 4-3a. LED State Codes In Numerical Order

LEDs	Explanation
oooo oooo	No failure
oooo ooo●	Failed CPU register test.
oooo oo●o	Testing top 16 Kbytes of RAM.
oooo oo●●	Failure in top 16 Kbytes of RAM.
oooo oo●o	Top 16 Kbytes of RAM missing or not found by CPU.
oooo oo●●	Searching for user-supplied Extension ROM.
oooo oo●●	Start executing Extension ROM instructions.
oooo oo●●●	Starting Test Vector list.
oooo oo●oo	Resetting all interfaces.
oooo oo●o●	Searching for alpha video circuits.
oooo oo●o●	Testing RAM for I/O on-board test code.
oooo oo●o●●	I/O on-board test code running.
oooo oo●o●o	Internal BMD checksum.
oooo oo●o●●	DIO-II console testing.
oooo oo●o●●●	Failed Boot ROM checksum.
oooo oo●o●●●	Pre-loading RAM for main test.
ooo● oooo	RAM Testing
ooo● ooo●	Failure: Not enough RAM.
ooo● oo●o	Failure: ROM system.
ooo● oo●●	Failure: Boot error.
ooo● oo●o●	Failure: OS tried to start loading at too high of an address.
ooo● oo●o●●	Failure: Not enough RAM to load OS.

Table 4-3b. LED State Codes for Interfaces In Numerical Order

LEDs	Explanation
○○●○ ○○○○	Failure: 4 ms timer.
○○●○ ○●●○	Failure: Processor board keyboard circuit.
○○●○ ○●●●	Failure: External keyboard circuit.
○○●○ ○●○○	Failure: Internal HP-IB circuit
○○●○ ●○○○	Failure: DMA circuit.
○○●○ ●●○○	Failure - one of these high-res video circuits: Font ROM is bad.
	Font ROM is not usable.
	Could not find US ASCII character set.
○○●○ ●●●○	Failure: Video board bit map circuit.
○○●○ ○○○○	Failure: I/O circuit at select code 0.
	Each successive LED pattern represents an I/O failure at select codes 2 through 30.
○○●○ ●●●●	Failure: I/O circuit at select code 31.

Computer Tests

Test Tools

Package Contents

The combined Series 200/300 Test Tools software package is provided on these media:

Media	Part Number
one 1/4-inch tape	09800-12700
eight 3 1/2-inch disks	09800-12300

The tape version consists of one tape and the manual.

The disk versions consist of the manual and these disks:

Series 200 Computer Tests Disk Rev. 1.1

Series 300 Computer Tests Disk Rev. 2.2

Series 200/300 System Functional Tests Disks:

SFT0 Disk Rev. 1.2

SFT1 Disk Rev. 1.2

SFT2 Disk Rev. 1.2

SFT3 Disk Rev. 1.2

SFT4 Disk Rev. 1.2

CS/80 Exerciser Disk Rev. 3.1

Adjustments

6

There are no adjustments in the computer. For adjustments to the monitor, refer to the monitor's Service Manual or Handbook.

Peripherals

Supported Peripherals List

Due to constant changes of supported peripherals, this information is published separately in the *Series 300 Configuration Reference Manual* (part number 98561-90020).

The Model 360/370 Hardware Technical Data Sheet and Hardware Pricing List also have supported peripheral information.

Parts Lists

Replacement Parts Information

Introduction

Field replaceable parts are listed in this chapter for the computers and expanders. Components, such as ICs, are not available for field repair.

Parts are available direct from:

Corporate Parts Center
333 Logue Avenue
Mountain View, California 94042 USA
Telephone: (415) 968-9200

Parts may be ordered through your local HP Sales and Service Office. To help get parts as soon as possible, please write the address and telephone number of your local HP Office in the spaces below.

Name: _____

Address: _____

City, State ZIP: _____

Telephone: _____

Cooperative Support Program

HP's Cooperative Support Program is available for customers that can provide technical assistance, manual updates, and other helpful information for hardware support. Your local HP Sales and Service Office can provide the information for this support service.

Exchange Parts

Exchange parts are available for some items at a reduced cost. When an exchange part is ordered, your account will be charged for a new part. Customers have 15 days to return the failed part to receive credit for the difference between a new and exchange part.

Please return failed exchange parts to your local HP Sales and Service Office as soon as possible. Place them in anti-static bags (see Parts List for part numbers) and package them securely in a sturdy container. It's a good idea to save the containers and static-free bags you receive parts in and use them to ship parts in.

Part Number Lists

The parts listed in this section apply to both Models 360/370 computers and the HP 98568A Opt. 132 and HP 98570A expander, unless noted otherwise. Various interfaces, accessories and HP-HIL devices are also listed.

Static-Free Bags

Part No.	Description	Notes
9222-0978	9-inch by 10-inch cushioned pouch, for DIO cards	
9222-0980	9-inch by 15-inch cushioned pouch, for system boards	

Labels

Part No.	Description	Notes
98562-84002	Identification Label	
5958-4325	UL Info Label	
7120-3428	CSA Label	
7121-4858	Service Warning Label	
7121-4733	Serial Label	
7124-2083	Voltage warning label	
98570-84002	FCC Label, Expander	
7121-4859	Fuse Rating Label	
98562-84005	Battery Warning Label	
5955-8036	Computer compliance label	
5955-8037	Peripheral compliance label	
9320-5673	Blank ID# label	

Computer Electrical Parts

Miscellaneous Electrical Parts

Part No.	Description	Notes
1250-0781	BNC coax adaptor	
5180-0410	Large fan	
5180-1303	Small fan	
5180-0407	LED cable assembly	
98561-61601	DIO Bus cable (short)	
98561-61602	DIO Bus cable (long)	
98561-61604	RS-232 cable	
98562-61600	Fast HP-IB cable	

Printed Circuit Boards

Exchange Part No.	New Part No.	Description	Notes
	0950-1760	Power supply (without switch shaft)	
	98561-66500	DIO-II backplane	
98579-69510	98579-66510	Model 360 Processor board	
98579-69515	98579-66515	Model 370 Processor board	
98267-69520	98267-66520	4 Mbyte add-on RAM board	
98267-69521	98267-66521	8 Mbyte add-on RAM board	
98267-69522	98267-66522	12 Mbyte add-on RAM board	
98562-69533	98562-66533	System interface board (with BNC thin-LAN connector)	
98562-69534	98562-66534	System interface board (with 15-pin thick-LAN connector)	
98562-69531	98562-66531	High-speed HP-IB add-on card	
98265-69501	98265-66501	Small Computer System Interface add-on card	
	98562-66501	Motherboard	
	98562-66502	2-connector system bus	
	98562-66503	3-connector system bus	
	98562-66506	2-slot DIO backplane	
98542-69570	98542-66570	Med-res monochrome video board	
98543-69570	98543-66570	Med-res color video board	
98544-69570	98544-66570	Hi-res monochrome video board	
98545-69570	98545-66570	Hi-res color video board	
98546-69571	98546-66571	Display compatibility video card	
98547-69570	98547-66570	Hi-res color video board	
98204-69577	98204-66577	Display compatibility graphics card	
98548-69570	98548-66570	Hi-res monochrome video board	
98550-69572	98550-66572	Hi-res color video board	

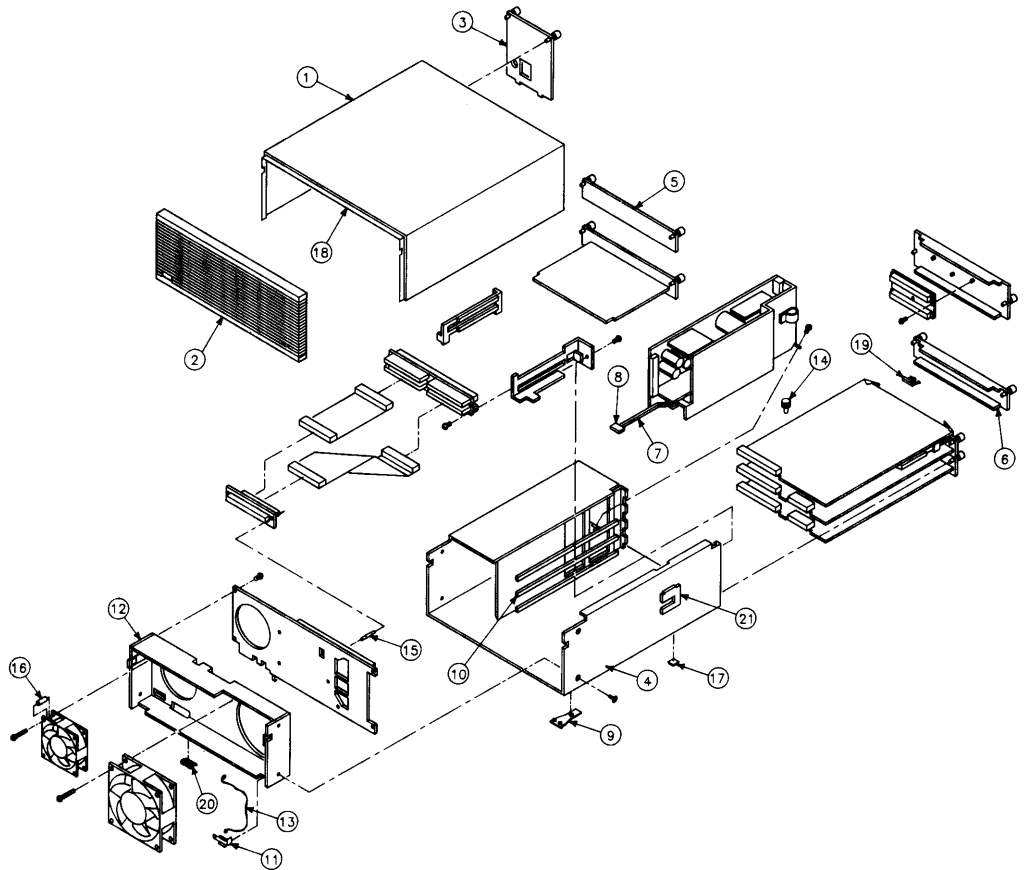


Figure 9-1 Model 260/270 Computer Case Parts

Computer Case Parts List

Ref.	Part No.	Description	Notes
1	5001-9009	Top cover	
2	5041-2413	Front panel	
3	5001-3700	Power supply cover	
4	5001-3696	Chassis	
5	98561-04102	2-slot cover plate	
6	98561-04107	Cover plate	
7	5041-2412	Power switch shaft	
8	5041-1203	ON-OFF pushbutton	
9	09121-48303	Moulded foot	
10	0403-0379	PC board guide	
11	5001-9001	LED bracket	
12	5001-9011	Fan plate	
13	09817-47700	Light pipe	
14	0380-1655	Snap-in spacer	
15	0380-1901	Support post	
16	0380-0012	Round spacer, 0.875-in. long	
17	0403-0427	Mounting foot bumper	
18	5041-2420	Top cover insulator	
19	5180-0409	Spring clip	
20	8160-0389	Double RFI finger	
21	5001-3694	Card guide bracket	
	0515-0219	Screw M3 × 6, flat head	
	0515-0389	Screw M3.3 × 8, pan head, ext. lock washer	
	0515-0536	Screw M3 × 0.5, machine	
	0515-0990	Screw M3 × 3.5, pan head, ext. lock washer	
	0515-1146	Screw M3 × 6, pan head patch	

Expander Case Parts Diagram

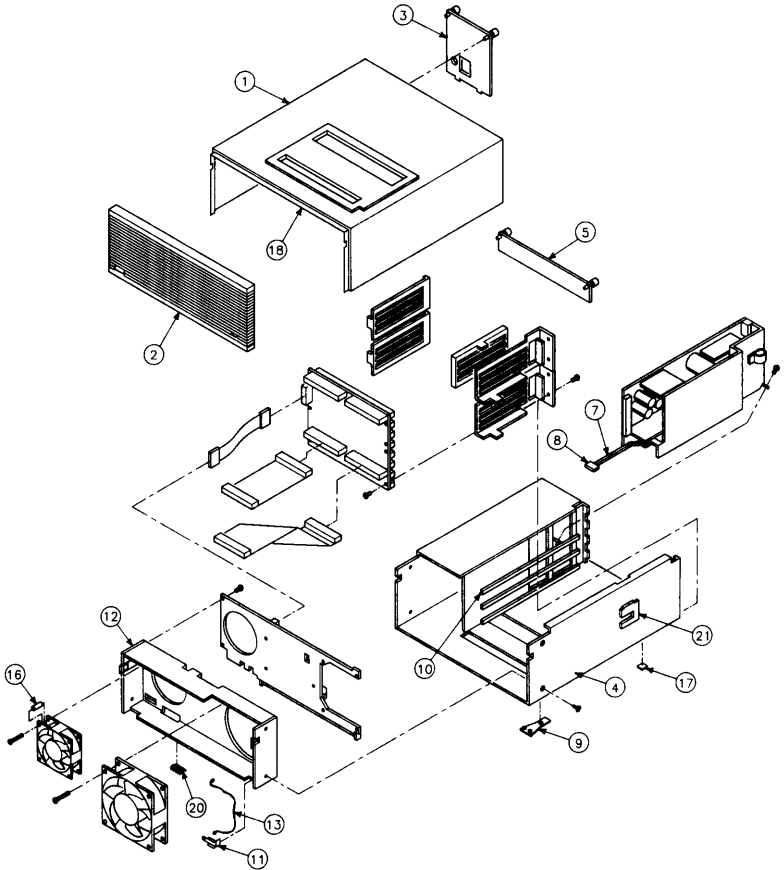


Figure 8-2. Expander Case Parts Diagram

HP 98570A and 98568A Opt. 132 Expander Expander Case Parts List

Ref.	Part No.	Description	Notes
1	5001-9015	Top cover (with cable slots)	
2	5041-2413	Front panel	
3	5001-3700	Power supply cover	
4	5001-9014	Chassis	
5	98561-04102	2-slot cover plate	
6	5001-9016	System slot cover plate	
7	5041-2410	Power switch shaft	
8	5041-1203	ON-OFF pushbutton	
9	09121-48303	Moulded foot	
10	0403-0397	PC board guide	
11	5001-9001	LED bracket	
12	5001-9011	Fan plate	
13	09817-47700	Light pipe	
14	0380-1655	Snap-in spacer	
15	0380-1901	Support post	
16	0380-0012	Round spacer, 0.875-in. long	
17	0403-0427	Mounting foot bumper	
18	5041-2420	Top cover insulator	
19	5180-0409	Spring clip	
20	8160-0389	Double RFI finger	

Expander Case Parts List (cont'd)

Ref.	Part No.	Description	Notes
21	5001-3694	Card guide bracket	
	5041-2414	Ganged card guide	
	5041-2418	Pin cover	
	5041-2419	Channel-lock	
	98561-04107	Cover plate	
	0515-0219	Screw M3 × 6, flat head	
	0515-1146	Screw M3.5 × 8, pan head, ext. lock washer	
	0515-0898	Screw M4 × 7, 6mm long	
	0515-0913	Screw M4 × 7, 10mm long	
	0515-0990	Screw M3 × 3.5, pan head, ext. lock washer	

Printed Circuit Boards

Part No.	Description	Notes
0950-1760	Power supply (without switch shaft)	
98570-66501	HP 98570 Standard motherboard	
98562-66508	Adaptor Board/Cable	
98561-66501	4-slot DIO Backplane	
98568-66500	HP 98668 Opt. 132 8-slot backplane	

Miscellaneous Electrical Parts

Part No.	Description	Notes
5180-0410	Large fan	
5180-1303	Small fan	
5180-0407	LED cable assembly	
98561-61601	DIO Bus cable (short)	
98561-61602	DIO Bus cable (long)	

External Cables

Part No.	Description	Notes
8120-3616	Color Cable Audio Cable, RCA-RCA	
09920-61602	Interface Cable	
8120-4483	Video Cable Adaptor, RCA-BNC Color Cable, High-resolution Cable, 4963-E-24	
5061-6533	Video Cable, RCA-RCA Audio Cable, RCA-earphone	
98562-61600	Add-on HP-IB card cable	
98265-61601	Add-on SCSI card cable	
1252-2297	SCSI terminator	
5061-6565	SCSI test connector	
8120-4998	1-metre SCSI peripheral interface cable (both ends standard)	
8120-5158	0.5-metre SCSI peripheral interface cable (both ends standard)	
8120-5159	2-metre SCSI peripheral interface cable (both ends standard)	
8120-5160	1-metre SCSI extender cable (one end male, one end female)	

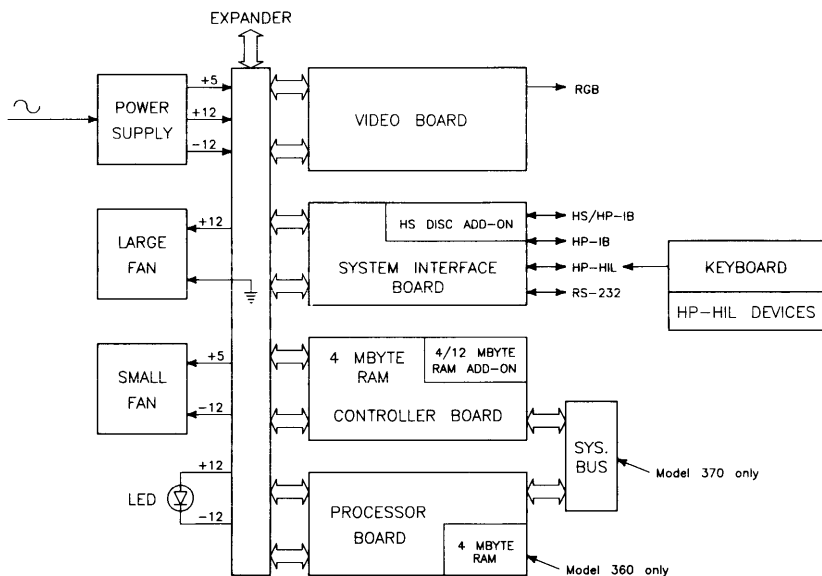
HP-HIL Devices

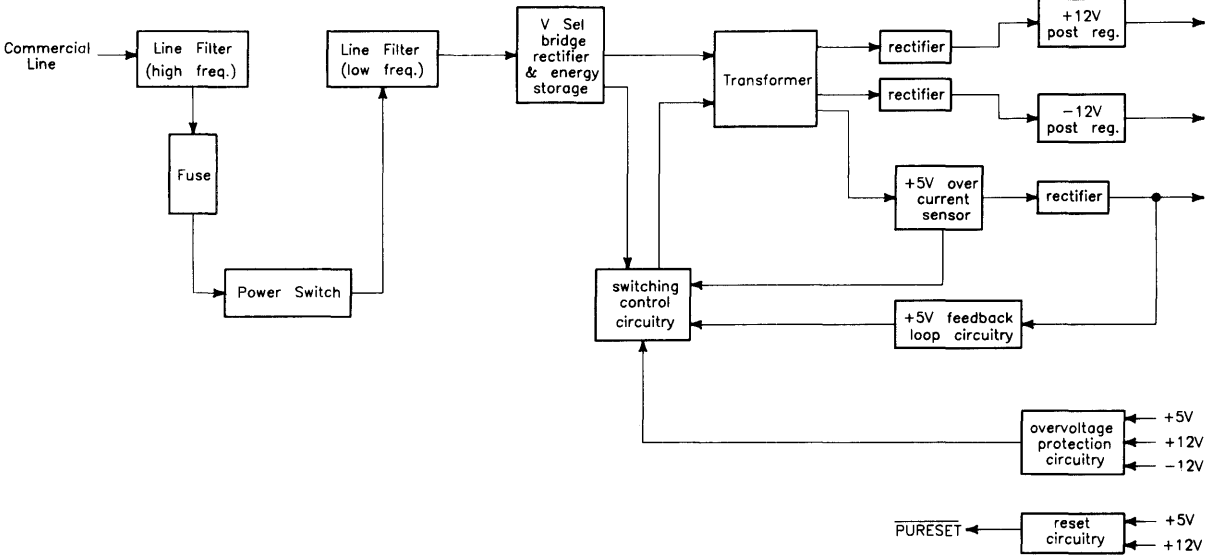
Exchange Part No.	New Part No.	Description	Notes
35723-69003	35723-66003	Touchscreen PC board	
	46021-60201	ASCII Keyboard	
	46020-60001	Keyboard Cable	
	46080-61601	Video Cable, 3-conductor	
	46081-61601	2.4-metre extension cable	
	46082-61601	Short audio cable	
	46082-61602	30-metre audio extension cable	
	46082-61603	30-metre video cable	
	46082-61604	15-metre remote cable	
	46082-61605	15-metre video cable	
	46083-61601	Short audio cable	
	46083-67901	Switch cap assembly	
	HP 46085A	Control dials	
	46085-85000	Overlay	
	0403-0430	Moulded foot	
	QEDS-7099	RPG Pot assembly	
	5041-2416	RPG knob	
	HP 46084A	ID module	
	HP 46086A	Button box	
	HP 46087A	"A" size digitizer	
	HP 46088A	"B" size digitizer	
	HP 46094A	Quadrature port device	
	HP 46095A	3-button mouse	
	HP 46060A	HP Mouse	
	HP 92916A	Bar code reader	

Diagrams

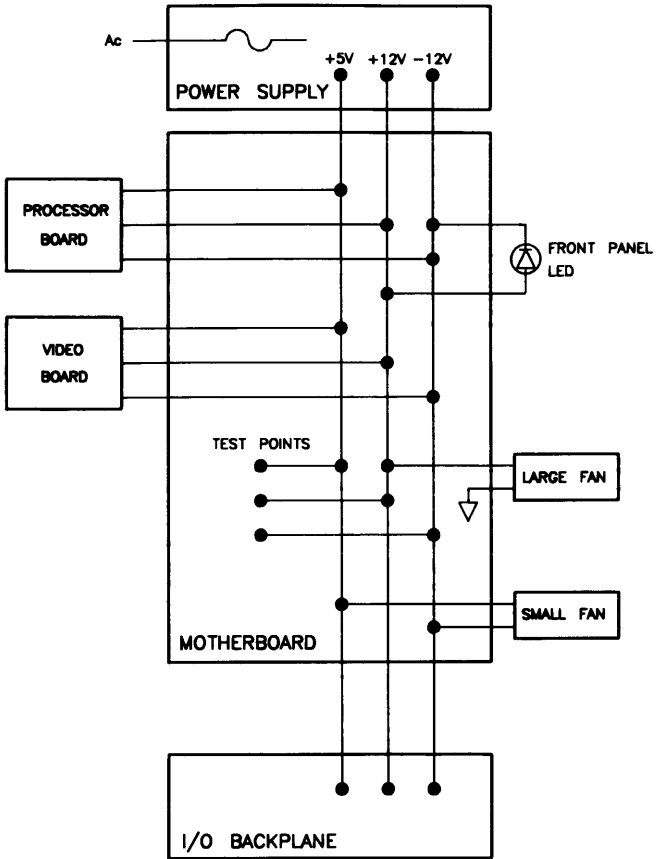
Model 360/370 Computer

Computer Block Diagram

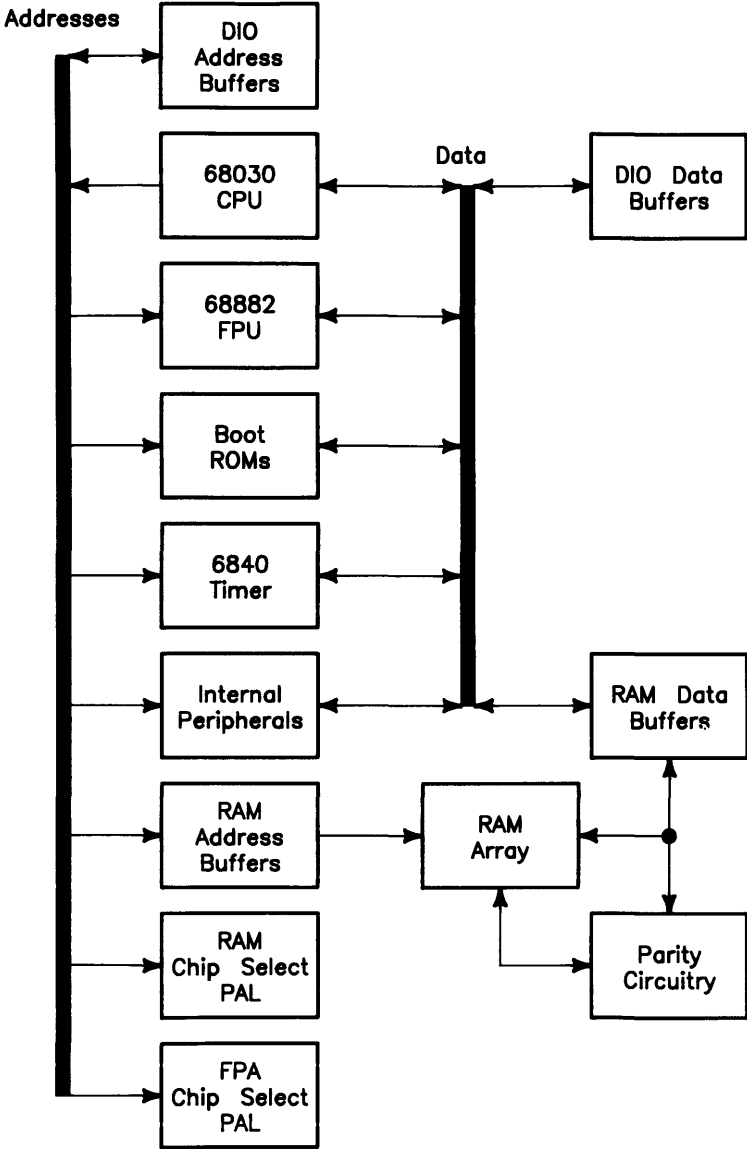




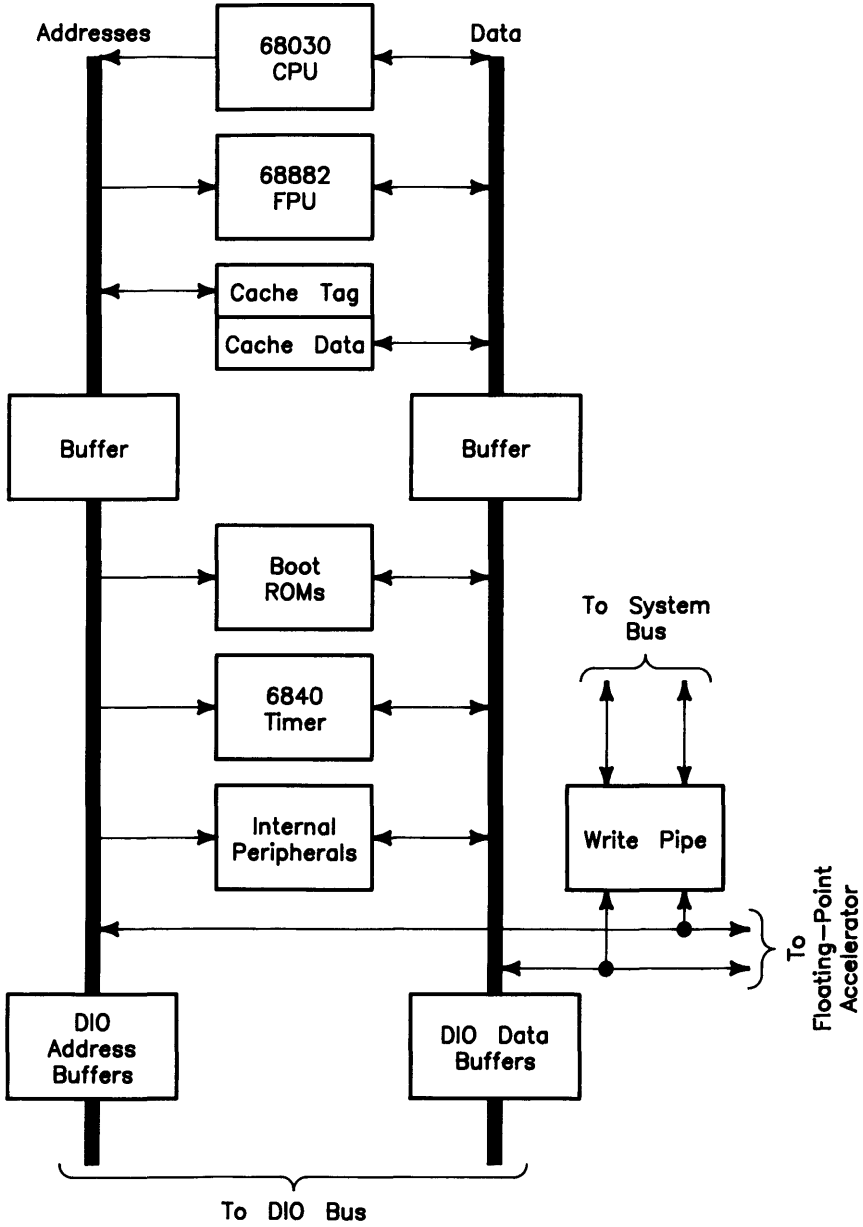
Power Distribution

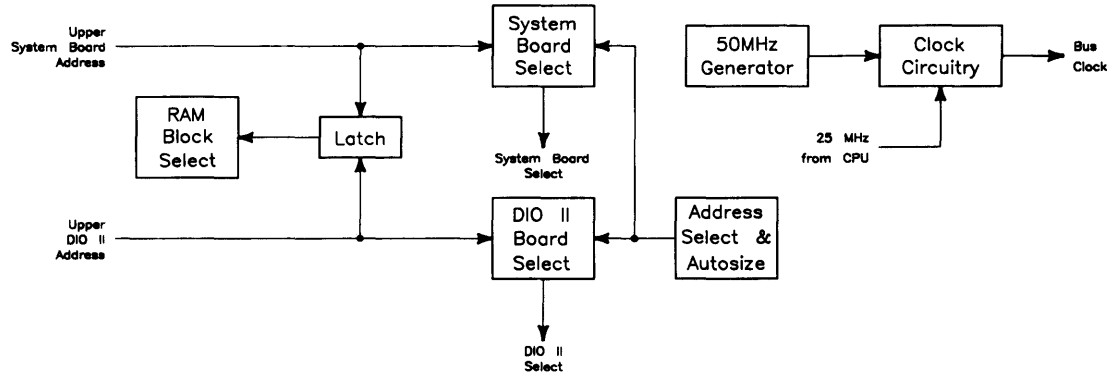
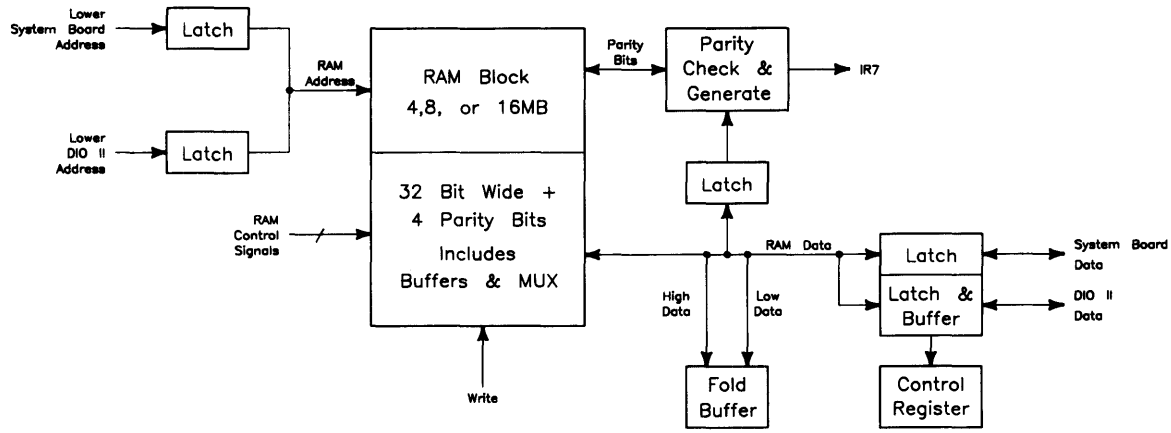


Model 360 Processor Board

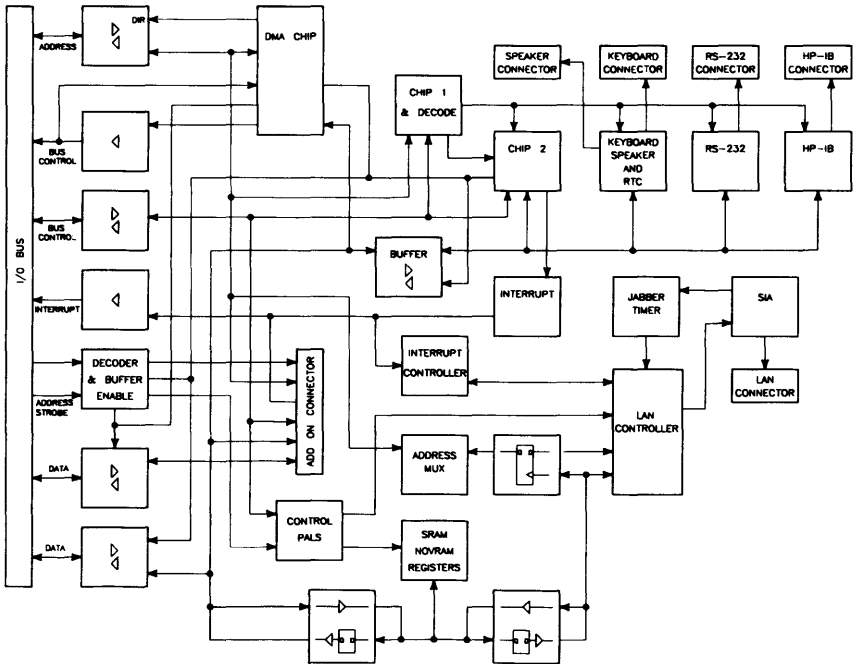
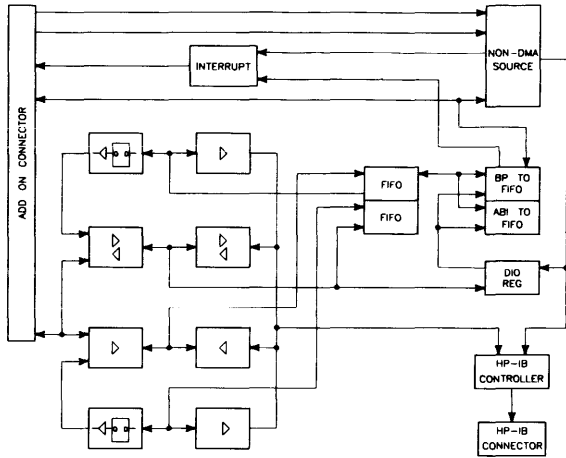


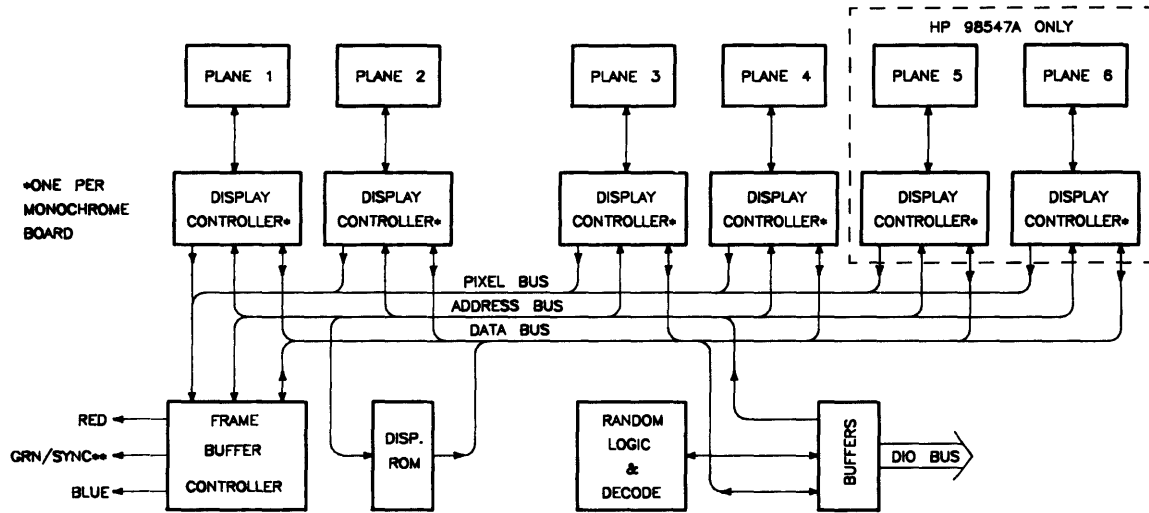
Model 370 Processor Board





System Interface Board





••ONE PER MONOCHROME BOARD

••COMPOSITE VIDEO ON MONOCHROME BOARDS. RED/BLUE/GREEN ONLY ON COLOR BOARDS.

Related Hardware Documentation

Hardware Support Documentation

Table 10-1a. Hardware Support Documentation

Printed Pages Part Number	Manual Title
09000-90041	HP 9000 Series 200/300/500 Site Preparation Manual
09800-90001	HP 9000 Series 200/300 Test Tools Manual
98248-90001	HP 98248B Floating-Point Accelerator Familiarization Guide
98248-90020	HP 98248 Floating-Point Accelerator Reference
98264-90000	HP 98258A/B/C and HP 98264A/B RAM Board Familiarization Guide
98265-90000	HP 98265A SCSI Interface Card Familiarization Guide
98265-90010	SCSI Technical Reference
98547-90600	HP 98547A Video Board Hardware Notice
98548-90000	HP 98548A Color Video Board Familiarization Guide
98549-90000	HP 98549A Graphics Interface Familiarization Guide
98549-90800	HP 98549A Graphics Interface Familiarization Guide Update
98550-90000	HP 98550A Graphics Interface Familiarization Guide
98550-90800	HP 98550A Graphics Interface Familiarization Guide Update
98556-90000	HP 98556A 2D Integer Based Graphics Accelerator Familiarization Guide
98556-90039	HP 98556A 2D Integer Based Graphics Accelerator CE Handbook

Table 10-1b. Hardware Support Documentation (cont'd)

98577-90000	HP 98577A VMEbus Expander Familiarization Guide
98577-90005	HP 98577A VMEbus Expander Accessory Development Guide
98561-90020	Series 300 Configuration Reference Manual
98562-90011	DIO-II Accessory Development Guide
98579-90030	HP 9000 Series 300 Model 360/370 Service Information Manual
98579-90039	HP 9000 Series 300 Model 360/370 Service Handbook
98603-90000	HP 98603B BASIC 5.1 ROM Board Familiarization Guide

Installation Manuals/Notes

Table 10-2a. Installation Manuals/Notes

Printed Pages Part Number	Manual Title
5958-4342	HP 98542/3/4/5A Video Board Installation Note
5958-4343	HP 98569A Rack-Mount Kit Installation Note
5958-4344	HP 98567A Rack-Mount Kit Installation Note
5958-4351	HP 98567B Rack-Mount Kit Installation Note
98242-90601	HP 98242A/B 2-Slot DIO Backplane Installation Note
98247-90600	HP 98247A Model 330-to-360 Upgrade Installation Note
98247-90601	HP 98247B Model 330/350/360-to-370 Upgrade Installation Note
98247-90602	HP 98247A System Interface Board Installation Note
98248-90603	HP 98248B Floating Point Accelerator Installation Note
98262-90601	HP 98262A High-Speed Disc Add-On Board Installation Note
98267-90600	HP 98267A/B/C RAM Board Installation Note
98265-90601	HP 98265A SCSI Interface Card Installation Note
98546-90600	HP 98546A Display Compatibility Interface Installation Note
98548-90601	HP 98548A Color Interface Installation Note
98549-90602	HP 98549A Color Video Board Installation Note
98550-90603	HP 98550A Color Video Board Installation Note
98556-90601	HP 98556A Integer Based Graphics Accelerator Installation Note
98560-90623	HP 98562B/98587B/98586B Installation Note
98568-90600	HP 98568A Eight-Slot Bus Expander Installation Note
98603-90603	HP 98603B BASIC 5.1 ROM Board Installation Note

Table 10-2b. Installation Manuals/Notes (cont'd)

Printed Pages Part Number	Manual Title
98622-90000	HP 98622A GPIO Installation Manual
98623-90000	HP 98623A BCD Installation Note
98624-90000	HP 98624A HP-IB Installation Note
98625-90000	HP 98625A/B Disc Interface Installation Manual
98626-90000	HP 98626A RS-232 Installation Manual
98627-90000	HP 98627A Color Video Interface Installation Manual
98628-90001	HP 98628/98691 Datacomm Installation Manual
98630-90000	HP 98630A Breadboard Installation Manual

Table 10-3. Document Binders

Binder Part Number	Description
9282-1077	1-inch, 3-ring, 8.5 by 11-inch page size, 300 pages
9282-1078	1.5-inch, 3-ring, 8.5 by 11-inch page size, 350 pages
9282-1079	2-inch, 3-ring, 8.5 by 11-inch page size, 600 pages
9282-1080	2.5-inch, 3-ring, 8.5 by 11-inch page size, 750 pages
9282-1081	1-inch, 3-ring, 7 by 8.5-inch page size, 300 pages
9282-1082	1.25-inch, 3-ring, 7 by 8.5-inch page size, 450 pages
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