Service Handbook

HP 9000 Series 300 Computers
Models 345/375

HP Part Number 98574-90039

HEWLETT PACKARD

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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.

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Product Information 1

Introduction

Information in this handbook refers to the HP 9000 Series 300 Model 345 and 375 computers. These computers are product numbers HP 98578A and HP 98574A, 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 345/375 Computers 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 *HP 9000 Workstations Configuration Guide* (5954-8593) for supported hardware/software products and combinations thereof.

2 Product Information

System Features

Computers

Table 1-1. Computer Features

Product/Option Number	Description

Model 345 (HP 98578A)	Model 345 system processing unit featuring:
	    MC68030 CPU, 50 MHz.
	    MC68882 Floating Point Co-CPU, 50 MHz.
	    8 Mbytes RAM Standard, Maximum 16 Mbytes.
	    4 Mbytes RAM Standard on Model 345MH.

Model 375 (HP 98574B)	Model 375 system processing unit featuring:
	    MC68030 CPU, 50 MHz.
	    MC68882 Floating Point Co-CPU, 50 MHz.
	    8 Mbytes RAM Standard, Maximum 32 Mbytes.
	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, either BNC or
	    15-pin Connector.
	High-speed IEEE 488 Disc Interface.
	    (Model 375).
	Optional ANSI X3.131-1986 Small Computer Systems Interface (SCSI)
	Two channel DMA Controller.
	HP-IB, HP-HIL, and RS-232 adapter cables.
	HP 98242B 2-slot DIO backplane.

Memory Boards	Optional Model 345 Memory:
	    HP 98229A 2 Mbyte RAM Product
	Optional Model 375 Memory:
	    HP 98229A 2 Mbyte RAM Product
	    HP 98229B 4 Mbyte RAM Product

Bus Expanders for Model 375

Table 1-2. Expander Features

Product/Option 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.

XXXX 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

Note

Technical information listed below should not be interpreted as specifications. Official specifications are listed in the *HP 9000 Series 300 Hardware Technical Data and Pricing Sheet.*

Electrical

Line voltage/Frequency	48-66 Hz
	48-66 Hz
Fuse	8AF 250V
Backplane Power Available	
Model 375 Computer	Total Power Available from motherboard:
	+5 V dc
	+12 V dc
	−12 V dc
	Each system slot:
	+5 V dc
	+12 V dc
	−12 V dc
Line transient spike immunity (1 nsec rise, 800 nsec duration)	1 KV dc
Power Consumption	250 Watts maximum
Current Requirements	120 V ac
	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 (32 - 131°F)
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

Regulatory Requirements

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

Physical

Dimensions

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

Model 345 System Board

CPU

Type	Motorola MC68030
Clock Frequency	50 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

Floating-point
Co-processor

Type	Motorola MC68882
Clock Frequency	50 Mhz

Model 375 System Board

CPU

Type	Motorola MC68030
Clock Frequency	50 MHz

Floating-point
Co-processor

Type	Motorola MC68882
Clock Frequency	50 MHz

Cache Memory

Type	Write through, instruction, data (external to MC68030 caches)
RAM	64 Kbytes, 16K words of 32-bit entries
Cycle time	60 nsec
Partitioning	Four 32-bit words each; 4K partitions

Memory

Memory Boards

Type	Byte parity error-checking or error checking and correcting
System bus width	32 bits address; 32 bits data
Bandwidth	23 Mbyte/sec read; 14.8 Mbyte/sec write
Average cycle time	180 nsec

Memory Sizes

Model 345 Standard RAM	0 Mbytes on system board
Model 345 Maximum RAM	16 Mbytes (8 boards of 2 Mbytes each)
Model 375 Standard RAM	8 Mbytes
Model 375 Maximum RAM	32 Mbytes (8 boards of 4 Mbytes each)

DIO-II I/O Bus

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

Interfaces

Parallel Interface

Type	IEEE 488
Data Rate	370 Kbyte/sec
Number of 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

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

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 375 Computer

Shipping Weight	15.9 kg (35 pounds)
Container Dimensions	Width - 502 mm (19.75 inches)
	Length - 559 mm (22.0 inches)
	Depth - 267 mm (10.5 inches
	Cube - 0.07 m^3 (2.65 feet^3)

Models 345 Computer

Shipping Weight	9.1 kg (20 pounds)
Container Dimensions	Width - 533 mm (21 inches)
	Length - 584 mm (23 inches)
	Depth - 292 mm (11.5 inches
	Cube - 0.085 m^3 (3.21 feet^3)

HP-HIL and Video Accessories

Listed below are HP-HIL and video accessories compatible with these workstations.

Table 1-3. HP-HIL Devices

Product Number	Product Name/Description
46021A	ITF keyboard
46060A	2-button Mouse
46083A	HP-HIL Knob
46084A	ID Module
46085A	Control Dial Module
46086A	32-button Control Box
46087A	ANSI A/ISO A4-size digitizer
46088A	ANSI A/ISO A3-size digitizer
46089A	4-button cursor for 46087A and 46088A
46094A	Quadrature port
46095A	3-button mouse for 46094A
98203C	Large Keyboard with Knob

Table 1-4. Video Accessories

Product Number	Product Name/Description
HP 98287A	HP 98700A Interface
HP 98542A	Medium Resolution Monochrome Video Board
HP 98543A	Medium Resolution Color Video Board
HP 98544B	High Resolution Monochrome Video Board
HP 98547A	6-plane High-performance Color Video Board
HP 98548A	High Resolution Color Video Board
HP 98549A	Low Cost Color Video Board
HP 98550A	High Resolution Color Video Board

Standard Tools

Model 375 Tools

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

Table 1-5. Model 375 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

Model 345 Tools

The following tools are needed to service the Model 345 computer:

Table 1-6. Model 345 Standard Tools

Part/Product Number	Description
	#1 screwdriver, 4-inch (100 mm) blade.
8720-0001	3/16-inch nutdriver
8720-1220	5.5mm nutdriver
	9/32-inch nutdriver
	5/8-inch deep socket
	9/16-inch deep socket

Computer/System Tests

Table 1-7. Series 200/300 Test Tools

Part No.	Description
09800-12300	eight $3\frac{1}{2}$-inch disks
09800-12500	eight $5\frac{1}{4}$-inch disks

The disk versions consist of the manual and these disks:

    Series 200 Computer Tests Disk Rev. 1.1
    Series 300 Computer Tests Disk Rev. 3.2
    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

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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

Regulatory Requirements

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

Physical

Dimensions
(Model 375 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 375 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 345/375 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 on the Model 375 computer.

Model 375 Computer Configuration

Default RS-232 Configuration

Your Model 375 computer comes with its RS-232 interface configured as follows:

- **Computer shipped with a keyboard**; its RS-232 interface has been set to *local* mode. The computer will display normal information when used with a keyboard and monitor.

- **Computer shipped without a keyboard**; its RS-232 interface has been set to *remote* mode. The computer will display normal information when used with a terminal. If you connect one of your existing keyboards and monitors to a computer configured with RS-232 set to remote, then turn it on, the only displayed information will be:

  ```
  Remote at 9
  ```

Instructions for changing the RS-232 mode are explained in the next section.

Changing RS-232 Mode

You can change your computer's default RS-232 mode from 'remote' to 'local' or from 'local' to 'remote' by using your new computer with a keyboard and monitor or with a terminal. The next two sections explain how to do this.

- Computer Shipped Without Keyboard

  When you use your computer shipped without a keyboard with a terminal, you should see normal operation.

  If you are using a computer that was shipped without a keyboard and connect an existing monitor and keyboard, you'll see only this display when you turn it on:

```
Remote at 9
```

Figure 2-1. RS-232 Remote Mode Power-Up Display

A few seconds later, you should hear two beeps indicating the keyboard has been recognized and can make inputs. When you hear the two beeps, type:

L Return

to temporarily change the RS-232 configuration to local mode.

Your monitor's power-up display should look something like this:

```
Copyright 1989,
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BOOTROM Rev. D
Bit-Mapped Video
MC68030 Processor
MC68882 Coprocessor
Configuration EEPROM
HP-HIL.Keyboard
HP-IB
DMA-CO
RAM 4194080 Bytes
HP98644 (RS-232) at 9
HP98265 (SCSI S 32) at 14
HP98625 (HS HP-IB) at 15
HP98643 (LAN) at 21 080009AAAAAA
HP PARALLEL at 23



System Search Mode
RESET to Power-up
```

Figure 2-2. RS-232 Local Mode Power-Up Display

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To make the RS-232 local mode a default setting, you must enter Configuration Mode, then make the interface configurations permanent. Refer to chapter 3 in this manual, or the *Boot ROM Configure Mode Users Guide* to enter Configuration Mode and make the changes permanent.

- Computer Shipped With Keyboard

When you use your computer shipped with a keyboard and a monitor, it should operate normally with a keyboard and monitor.

If you are using a computer that was shipped with a keyboard and monitor, but initially connect a terminal instead, your terminal's screen will be blank. You must first connect the monitor and keyboard, then turn on the computer and go into Configure Mode.

Refer to chapter 3 in this manual, or the *Boot ROM Configure Mode Users Guide* to use Configuration Mode.

Change the RS-232's setting to remote, then save the new configuration. If you do not make the new configuration permanent, the computer's RS-232 mode will still be in local mode when you power-up the computer again.

You may now connect a terminal to the RS-232 port and use it normally.

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.

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Configuration **3**

Bundled Systems

Refer to the current Series 300 Hardware Price List to determine what HP products are bundled into Model 345 and 375 computer systems.

Supported Configurations

Refer to the *HP 9000 Workstation Configuration Guide (5954-8593)* for the current hardware and software products that are supported.

RAM Configuration

Model 345 and 375 RAM is completely auto-configuring.

The following RAM boards are supported in the computer system:

- HP 98229A 2 Mbyte RAM Board.
- HP 98229B 4 Mbyte RAM Board (Model 375 only).

Standard RAM configurations are:

- **Model 345** -- 8 MBytes; four pairs of HP 98229A 2 Mbyte boards.
- **Model 375** -- 8 Mbytes; two HP 4 Mbyte RAM boards.

  Options convert the standard RAM to larger amounts.

Model 375 Board Installation Precautions

| CAUTION |

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

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.

System Board LAN Jumper

Selection of the LAN, either ThinLAN to the BNC connector, or AUI to the 9-pin connector, place the LAN jumper on one of two rows of LAN pins as shown in Figure 3-1.
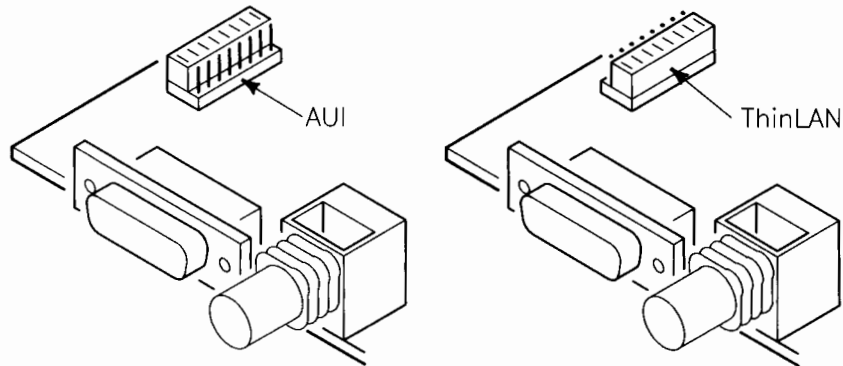
Figure 3-1. System Board LAN Jumper

To use the ThinLAN BNC connector, place the jumper on the two outside rows of pins. For the AUI LAN connector, place the jumper on the two inside rows of pins.

System Board Human Interfaces

Human interface configurations are controlled by the Boot ROM's Configuration Mode.

Entering Configuration Mode

When you turn the computer on and see the display show the memory size in RAM (RAM 4194080 Bytes), type **C Return**.

Your display shows the Configuration Mode menu in the upper right-hand corner:

```
  Configurable Interfaces
Keys Interface  Select Code
---- ---------- -----------
  1  HP-IB              7
  2  RS-232             9
  3  SCSI              14
  4  HS HP-IB          15
  5  LAN               21
  6  HP PARALLEL       23

  N  store New values
  D  store Default values
     (then cycle SPU power)
  A  Abort without changes
----------------------------
Type [key] RETURN ?
```

If an error message appears in the mode line at the bottom, for example:

```
Configure Mode Failed
RESET to Power-UP, SPACE to clear input                    ? C
```

or the Configuration EEPROM Failed error message appears at power up, a hardware problem with the Boot ROM or its memory probably exists. Refer to the following table for possible error messages you may see when entering Configuration Mode.

Error Message	Meaning and What To Do
(no message)	Configure Mode could not start. Error messages can not be displayed. Hardware failure.
Configure Mode Failed	Configure Mode started but something failed.
EEPROM has bad information	Configuration Mode started, menu may have appeared, but something failed.
Too much data to save	Re-configure computer with fewer interfaces.
EEPROM Load section missing	Could not load new configuration data. Hardware failure.
EEPROM Defaults section missing	Default settings could not be found. Hardware failure.

Configuration Menu

The Configuration Menu's user actions are explained below:

- Keys - the keyboard's number keys representing the built-in interface you want to configure. Letter keys N, D, and A are control keys. You may select one or more keyboard configurable interfaces in any order.

- Interface - built-in interfaces listed in the display's left column that do not have configuration switches are listed by their name.

- Select Code - lists select code for interfaces that can have one. The built-in standard-speed HP-IB interface has a select code, but it cannot be changed. When you turn ON the SPU, each interface's default select code is listed.

Below the menu, the prompt line:

```
Type [key] RETURN ?
```

means:

- ? - waiting for keyboard input.

- `Type [key] RETURN` - type the key for the interface you want to configure, then type **Return**.

Example Interface Menu

You may select one or more keyboard configurable interfaces in any order. For each interface, you're able to go to its Interface Menu. An example Interface Menu for the RS-232 Interface is:

```
   RS-232
Key Feature          Value
-------------------------
 1  Select Code        9
 2  Interrupt Level    5
 3  Remote/Local       L
 4  Fast/Normal        N
 5  Modem Enable       Y

 X  to eXit menu
----------------------------
Type [key] RETURN ?
```

Three columns have this information for you to use:

- `Key` - the keyboard number keys represent the interface function you want to configure. Type **X Return** to exit and return to the Configuration Menu.

- `Feature` - Lists the interface's function. The menu control features are at the bottom.

- `Value` - Lists state or value of that interface function.

Note that all Interface Menus are not the same. Each has its own functions available for configuration.

Below the menu, the prompt line:

```
Type [key] RETURN ?
```

means:

- ? - waiting for keyboard input.

- `Type [key] RETURN` - type the key for the interface you want to configure, then type **Return**.

- You may just type **Return** exit the Interface Menu and return to the Configuration Menu.

When you select an interface's function, the prompt line changes. An example is the RS-232's Select Code. After you have selected the RS-232 interface to configure, and you want to change its select code you would type **1 Return**. The RS-232 Menu's prompt would change to:

```
 1  Select Code        9
 used select codes are  :
 14 15 21 23
Type 0.. 31 except used RETURN ?
```

Note the select code function line appears like it does in the main part of the RS-232 Menu. The current select code appears at the right. Select codes already used in your SPU are listed in the line:

```
 used select codes are  :
 14 15 21 23
```

The bottom prompt line:

```
Type 0.. 31 except used RETURN ?
```

tells you to type in a select code number between 0 and 31 except for those codes already used. In this case, codes 14, 15, 21, and 23 are already used by other interfaces.

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

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Power Supply Specifications

Voltage	Tolerance
+5 V dc	4.89 to 5.25 V dc
+12 V	11.86 to 12.72 V dc
−12 V	−11.86 to −12.72 V dc

Model 375 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

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:	ooSS SSSS Where SS SSSS Indicates State of Power-up
Required Device Missing or DTACK Failure:	o●DD DDDD Where DD DDDD Indicates Device
Failing Device:	●oDD DDDD Where DD DDDD Indicates Device
Special Codes (Special Case Highest Priority Codes):	●●●● ●●●● LEDs Never Accessed (or Unused Code) o●●● ●●●● LEDs Failed to DTACK oooo ooo● Timer on processor board has failed or is missing.

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

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Table 4-2. Boot ROM LED Error Codes

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 ●●●o	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.
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.
o●oo oooo	Failure: I/O circuit at select code 0. Each successive LED pattern represents an I/O failure at select codes 2 through 30.
o●o● ●●●●	Failure: I/O circuit at select code 31.

Remote Computer Analysis

The Model 345/375 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 ●oo●, 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

Two RAM boards are required for each block of memory/addresses. For each group of sixteen addresses, starting at the top, they are split between RAM boards as follows:

- The first four and third four addresses are on the lower-numbered connector's RAM board.

- The second four and fourth four addresses are on the higher-numbered connector's RAM board.

In the following table, the least significant hex digit of sixteen sequential memory addresses and their corresponding memory board in a pair of memory boards for both a Model 345 and 375.

RAM LSD versus RAM Connector Number

RAM Address LSD	Board Number of RAM Board Pair
F, E, D, C, 7, 6, 5, and 4	Lower
B, A, 9, 8, 3, 2, 1, and 0	Upper

In the following table, each computer's memory address blocks can be compared to the RAM connectors, or boards they correspond to. After you have determined the RAM connector pair for the address block, refer to the previous table to find out what board or connector number has the failed memory address.

RAM Connector Pair versus Address Block

Model 345/375 2 Mbyte Blocks HP 98229A RAM	Upper - Lower Address Range	Model 375 4 Mbyte Blocks HP 98229B RAM
Connector Pairs RAM 0 - 1 RAM 2 - 3 RAM 4 - 5 RAM 6 - 7	FFFFFFFF - FFC00000 FFBFFFFF - FF800000 FF7FFFFF - FF400000 FF3FFFFF - FF000000 FEFFFFFF - FE800000 FE7FFFFF - FE000000	**Connector Pairs** RAM 0 - 1 RAM 0 - 1 RAM 2 - 3 RAM 2 - 3 RAM 4 - 5 RAM 6 - 7

In this example, you'll find out how to determine what board needs to be replaced from a memory failure message.

This memory failure message appears during Boot ROM self-tests:

`MEMORY FAILED AT FFA25B9A`

Here's the steps you should take to determine the failed RAM board:

1. Find the Upper - Lower address range in the above table for the failed address.

   Address FFA25B9A is between FFBFFFFF and FF800000.

   a. If the computer is a Model 345, or a Model 375 with HP 98229A RAM boards, the failure is in either RAM 2 or RAM 3.

   b. If the computer is a Model 375, the failure is in either RAM 0 or RAM 1.

2. Look at the RAM LSD versus RAM Connector Number Table and determine which connector, or RAM board has the failure.

   Address FFA25B9A has an 'A' as its LSD, so the upper board, or connector number has the failure.

   a. If the computer is a Model 345, or a Model 375 with HP 98229A RAM boards, the failure is in RAM 3.

   b. If the computer is a Model 375, the failure is in RAM 1.

Boot ROM Self-Tests

Table 4-3. 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 o●oo	Top 16 Kbytes of RAM missing or not found by CPU.
oooo o●o●	Searching for user-supplied Extension ROM.
oooo o●●o	Start executing Extension ROM instructions.
oooo o●●●	Starting Test Vector list.
oooo ●ooo	Resetting all interfaces.
oooo ●oo●	Searching for alpha video circuits.
oooo ●o●o	Testing RAM for I/O on-board test code.
oooo ●o●●	I/O on-board test code running.
oooo ●●oo	Internal BMD checksum.
oooo ●●o●	DIO-II console testing.
oooo ●●●o	Failed Boot ROM checksum.
oooo ●●●●	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● o●oo	Failure: OS tried to start loading at too high of an address.
ooo● o●o●	Failure: Not enough RAM to load OS.

Memory Failures

If the computer has a memory failure during Boot ROM or other memory tests, a memory failure message like one of these:

```
RAM GONE ABOVE FFFFC000
```

```
RAM FAILED ABOVE FFFFC000
```

```
MEMORY FAILED AT HHHHHHHH
```

```
DATA PARITY ERROR AT HHHHHHHH
```

```
PARITY BIT ERROR AT HHHHHHHH
```

will appear.

Note that HHHHHHHH is the address where the failure occurred.

Computer Tests

<div style="text-align: right;">**5**</div>

Test Tools

Package Contents

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

Media	Part Number
eight 3½-inch disks	09800-12300

The disk version consist of the manual and these disks:

> Series 200 Computer Tests Disk Rev. 1.1
> Series 300 Computer Tests Disk Rev. 3.2
> 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

Using Test Tools on Early Model 375 Computers

If an early Model 375 has an HP 98577A VMEbus Expander attached and Series 300 Test Tools are run, an error will occur. The error message is of the form:

(addr) ... UNALIGNED TRANSFER......

and may occur more than once.

The error is superfluous and should be disregarded. Note also that this error does not mask a real error. The error indicates that a failure occurred during an unaligned transfer, which is correct since the hardware does not support unaligned transfers.

A Service Note regarding this problem is being prepared.

Adjustments　　　　　　　　6

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

42   Adjustments

Peripherals 7

Supported Peripherals List

Due to constant changes of supported peripherals, this information is published separately in the *HP 9000 Workstation Configuration Guide* (part number 5954-8593).

The Series 300 Hardware Technical Data Sheet and Hardware Pricing List also have supported peripheral information.

44   Peripherals

Parts Lists

8

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:

> Support Materials Organization
> Hewlett-Packard Company
> 8050 Foothills Boulevard
> Roseville, California 95678 USA
>
> Telephone: (916) 786-8000

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.

Model 375 Part Number Lists

The parts listed in this section apply to the Model 375 computer. Various interfaces, accessories and HP-HIL devices are also listed.

Model 375 Computer Electrical Parts

Table 8-1. Model 375 Electrical Parts

Ref. No.	New Part Number	Exchange Part Number	Description
1	98574-63510	98574-69510	System board
1a	98574-63512	98574-69512	Emulator board
1b	98574-63531		HS HP-IB Ribbon Cable Assy.
1b	98574-61602		SCSI Ribbon Cable
1c	98574-61604		HP Parallel Ribbon Cable
2a	98229-63530	98229-69530	2 Mbyte add-on RAM board
2b	98229-63521	98229-69521	4 Mbyte add-on RAM board
2c	5041-2423		RAM board guide
3a	98542-66570	98542-69570	Med-res mono video board
3b	98543-66570	98543-69570	Med-res color video board
3c	98544-66570	98544-69570	Hi-res mono video board
3d	98545-66570	98545-69570	Hi-res color video board
3e	98547-66570	98547-69570	Hi-res color video board
3f	98548-66570	98548-69570	Hi-res mono video board
3g	98550-66572	98550-69572	Hi-res color video board
3h	98556-66572	98556-69572	Graphics accelerator board
4	0950-1760		Power supply
5	98562-66501		Backplane/Motherboard
6	5180-1303		Small fan
7	5180-0410		Large fan
8	98562-66506		2-slot DIO backplane
9	98561-61601		DIO Bus cable (short)
10	98561-61602		DIO Bus cable (long)
11	98562-66508		DIO Adaptor
12	5180-0407		LED cable assembly
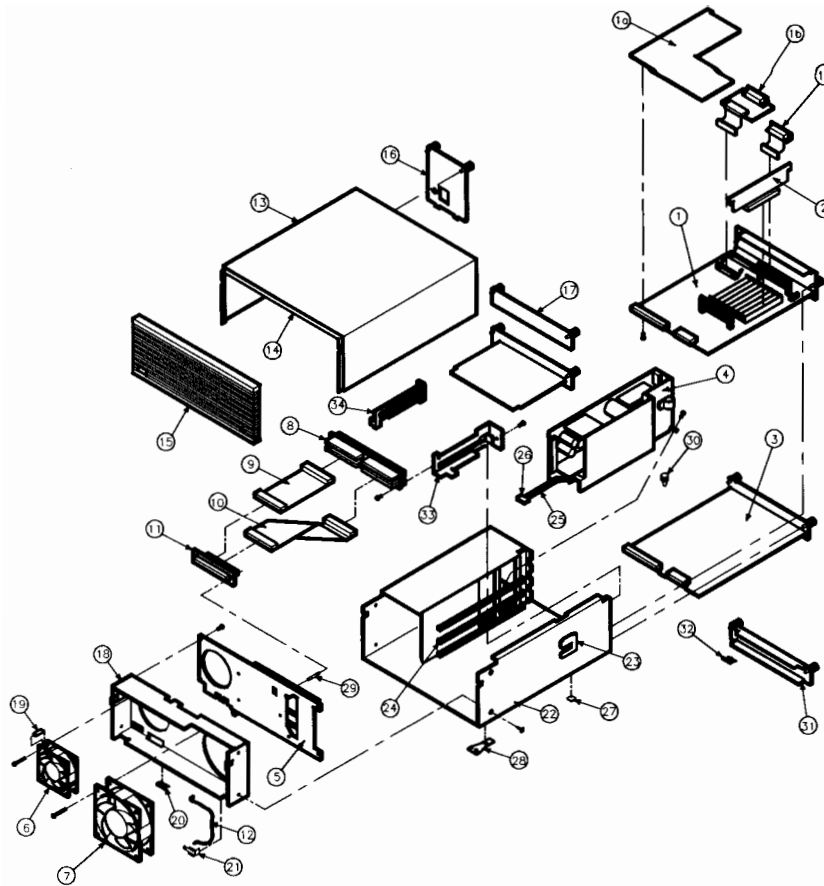
Figure 8-1. Model 375 Computer Exploded View

Table 8-2. Model 375 Computer Case Parts

Ref.	Part Number	Description
12	09817-47700	Light pipe
13	5001-9009	Top cover
14	5041-2420	Top cover insulator
15	5041-2413	Front panel
16	5001-3700	Power supply cover
16a	5001-9098	RF Insulator
17	98561-04102	DIO cover plate
18	5001-9011	Fan plate
19	0380-0012	Round spacer, 0.875-in. long
20	8160-0389	Double RFI finger
21	5001-9001	LED bracket
22	5001-3696	Chassis
23	5001-3694	Card guide bracket
24	0403-0379	PC board guide
25	5041-2412	Power switch shaft
26	5041-1203	ON-OFF pushbutton
27	0403-0427	Mounting foot bumper
28	09121-48303	Molded foot
29	0380-1901	Support post
30	0380-1655	Snap-in spacer
31	98561-04107	Cover plate
32	5180-0409	Spring Clip
33		Right DIO Card Guide
34		Left DIO Card Guide
	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

Table 8-3. Model 375 Miscellaneous Electrical Parts

Part Number	Description
1250-0781	BNC coax adaptor
98561-61604	RS-232 cable
2110-0342	Main fuse, 8AF, 250 Volt
1420-0314	Battery

External Cables

Table 8-4. External Cables

Part Number	Description
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
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)

Model 375 Labels

Part Number	Description
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
7121-4859	Fuse Rating Label
98562-84005	Battery Warning Label
7121-5102	Information label
7120-7500	Made in USA label
9320-5673	Blank ID# label

Static-Free Bags

Table 8-6. Static-Free Bags

Part Number	Description
9222-0980	9-inch by 15-inch cushioned pouch, for system boards

Model 345 Parts List

Electrical Parts

Table 8-7. Model 345 Electrical Parts List

Ref. No.	New Part Number	Exchange Part Number	Description
1	98578-63510	98578-69510	System board
1a	98574-63512	98574-69512	Emulator board
2	98229-63530	98229-69530	2 Mbyte RAM board
3a	98544-66571	98544-69571	345M Video board
3b	98548-66570	98548-69570	345MH Video board
3c	98549-66571	98549-69571	345C+ Video board
3d	98550-66572	98550-69572	345CH Video board
3e	98720-66582	98720-69582	345SRX LGB board
4	98578-66501		Backplane
5	98574-61604		HP Parallel Ribbon Cable
6a	98574-61602		SCSI Ribbon Cable
6b	98574-63531		HS HP-IB Ribbon Cable Assy.
7	0950-1985		Power Supply
7a	2110-0010		Fuse, 5 A
8	5001-9042		Power supply plate
9			Power supply plate screw
10a	5001-9048		Panel-rear standard
10b	5001-9047		Panel-rear LGB

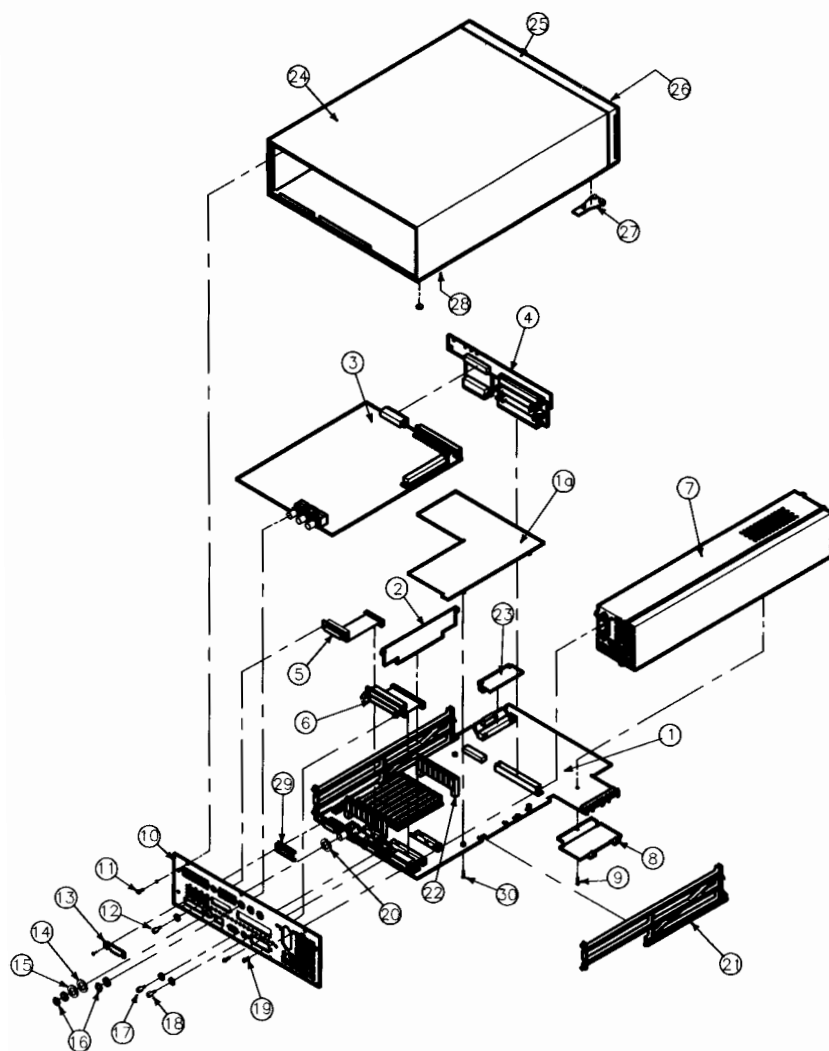**Figure 8-2. Model 345 Computer Exploded View**

Table 8-8. Model 345 Mechanical Parts List

Ref. No.	Part Number	Description
11	0515-1851	Screw-machine
12	1251-7812	HP Parallel jackscrew
13a	1251-0220	LAN Clip (Kit)
13b	1251-0220	LAN Screw (Kit)
14	0160-6777	Capacitor-washer
15	3050-0604	Washer-flat
16a	2940-0256	Nut-hex (RGB/LAN)
16b	2190-0054	Washer-lock (RGB/LAN)
17	0380-0643	Jackscrew-HPIB
17a	1251-7812	Jackscrew-RS232
17b	2190-0409	Washer-Lock (RS-232)
18a	2190-0407	Washer-lock (HP-IB)
19	0515-0219	Flathead screw (LGB)
20	3050-1291	Washer-shoulder
21	98571-44701	Board support
22	5041-2423	RAM card guide
23	98578-66505	SCSI Terminator
24	5001-9033	Case
25	35751-40001	Cover-front
26	98571-84003	Front panel label
27	09121-48303	Foot-molded
28	98571-84001	Voltage/current label
29	5001-9032	LAN RFI Bezel

Table 8-9. Model 345 Miscellaneous Mechanical Parts

Part Number	Description
2190-0016	RCA video lock washer
2950-0001	RCA video hex nut
6960-0002	Plug-hole (RGB)
6960-0145	Plug-hole (Mono)
5001-9039	Clip-RFI spring

Diagrams

EXPANDER (Model 375 only)

VIDEO/GRAPHICS BOARD — To Monitor

POWER SUPPLY
+5
+12
−12

EMULATOR BOARD

LARGE FAN
+12

SMALL FAN (Model 375 only)
+5
−12

SYSTEM BOARD
HS HP−IB/SCSI
HP−IB
RS−232
HP PARALLEL
HP−HIL
AUDIO

KEYBOARD

HP−HIL DEVICES

RAM

LED
+12
−12

OPTIONAL DIO−1 SLOT (Model 375 Only)
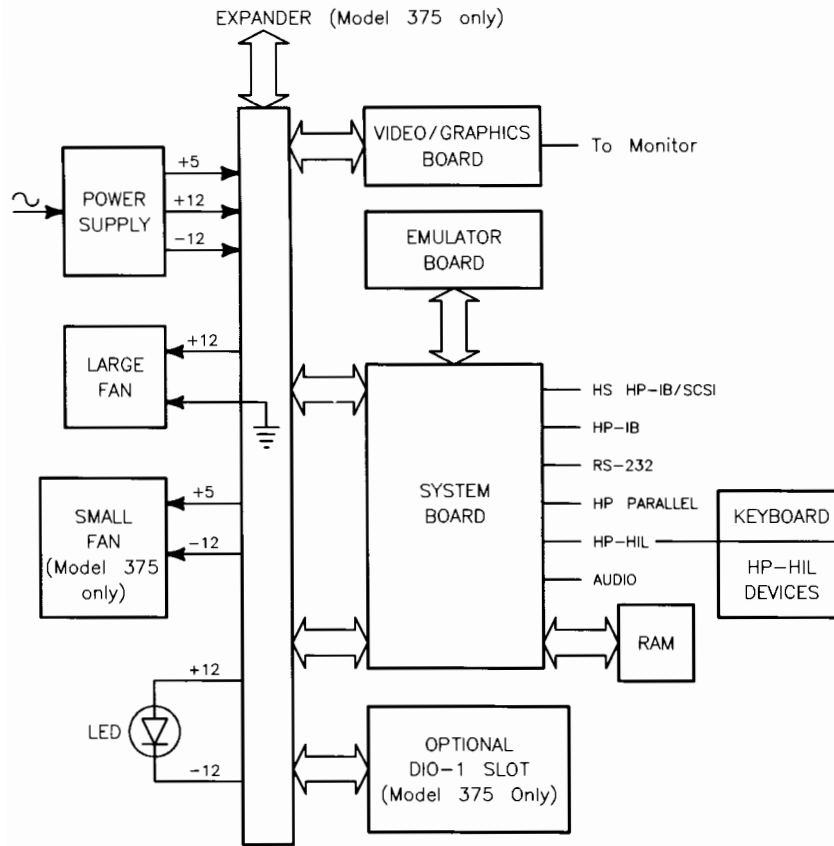
Figure 9-1. Model 345/375 Computer Block Diagram
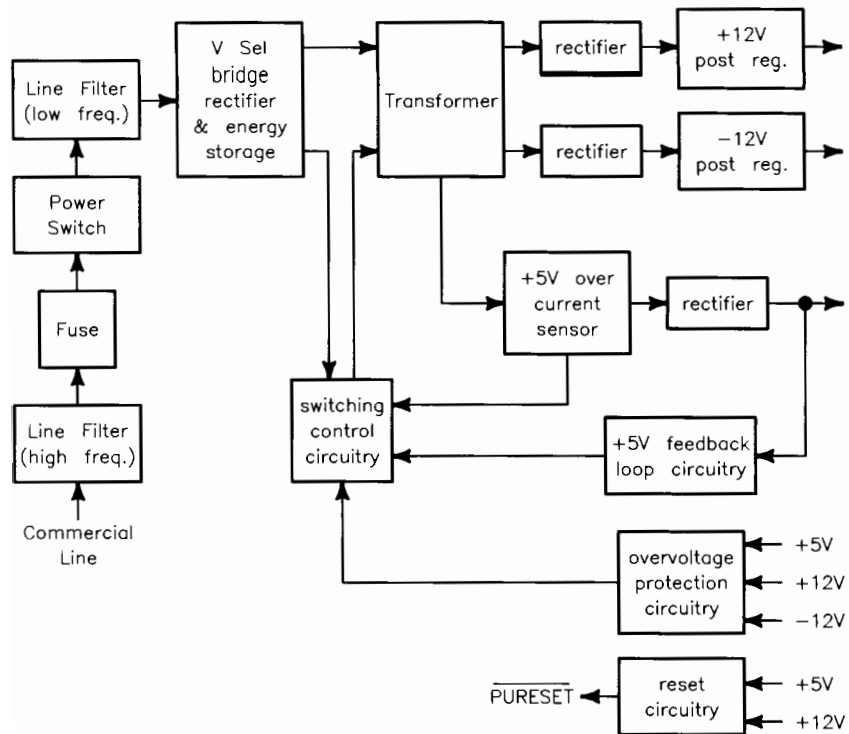
Figure 9-2. Model 375 Computer Power Supply Block Diagram
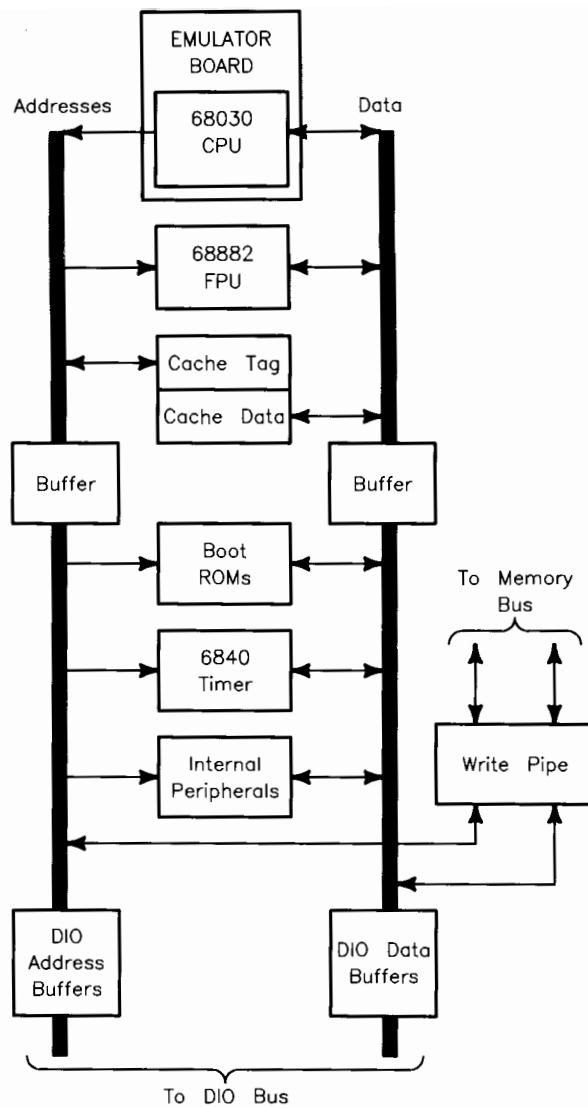
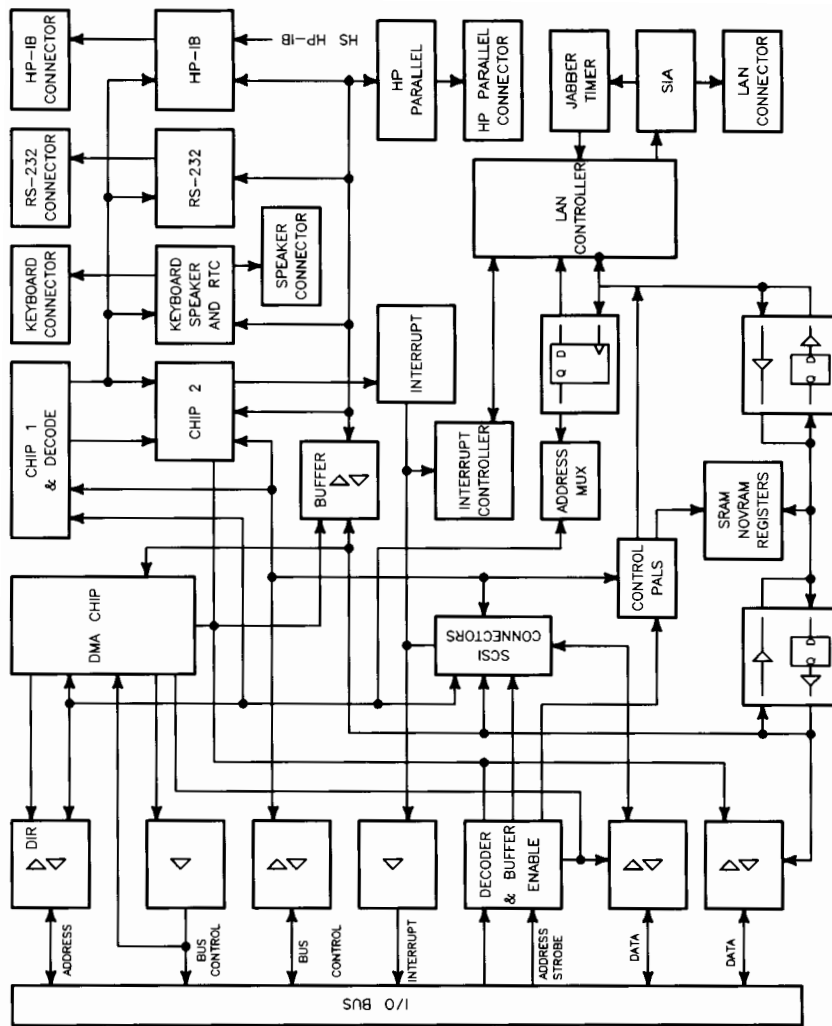**Figure 9-3. Model 345/375 System Board CPU Block Diagram**

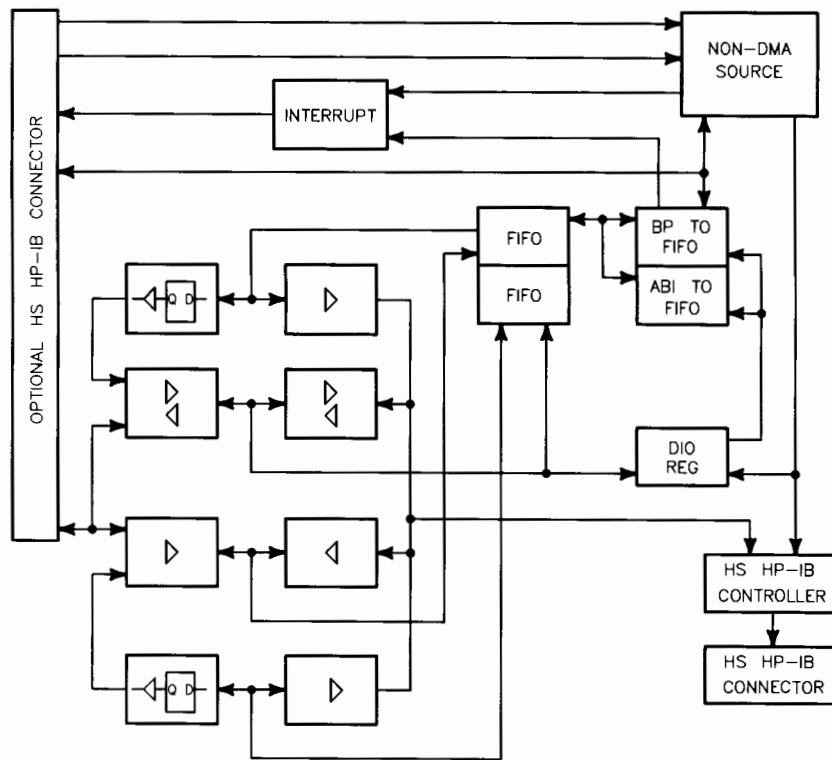Figure 9-4. Model 345/375 System Board Interface Block Diagram
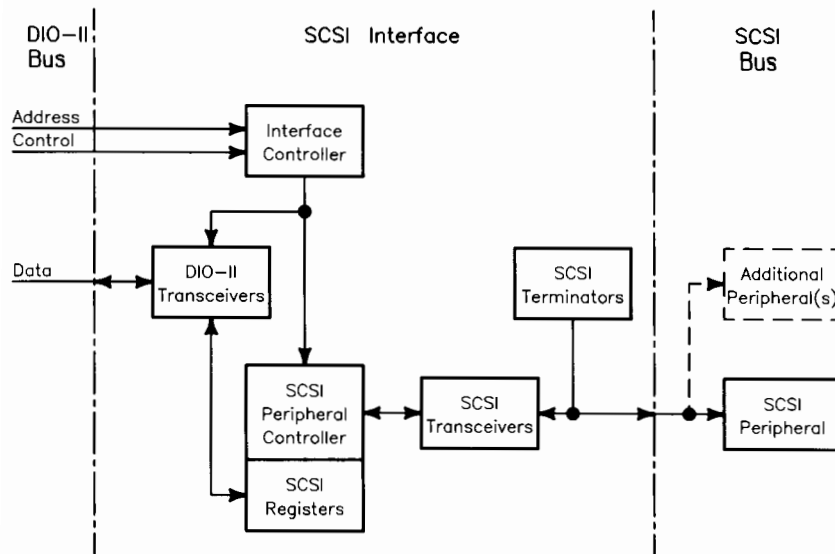
Figure 9-5. High-Speed HP-IB Block Diagram
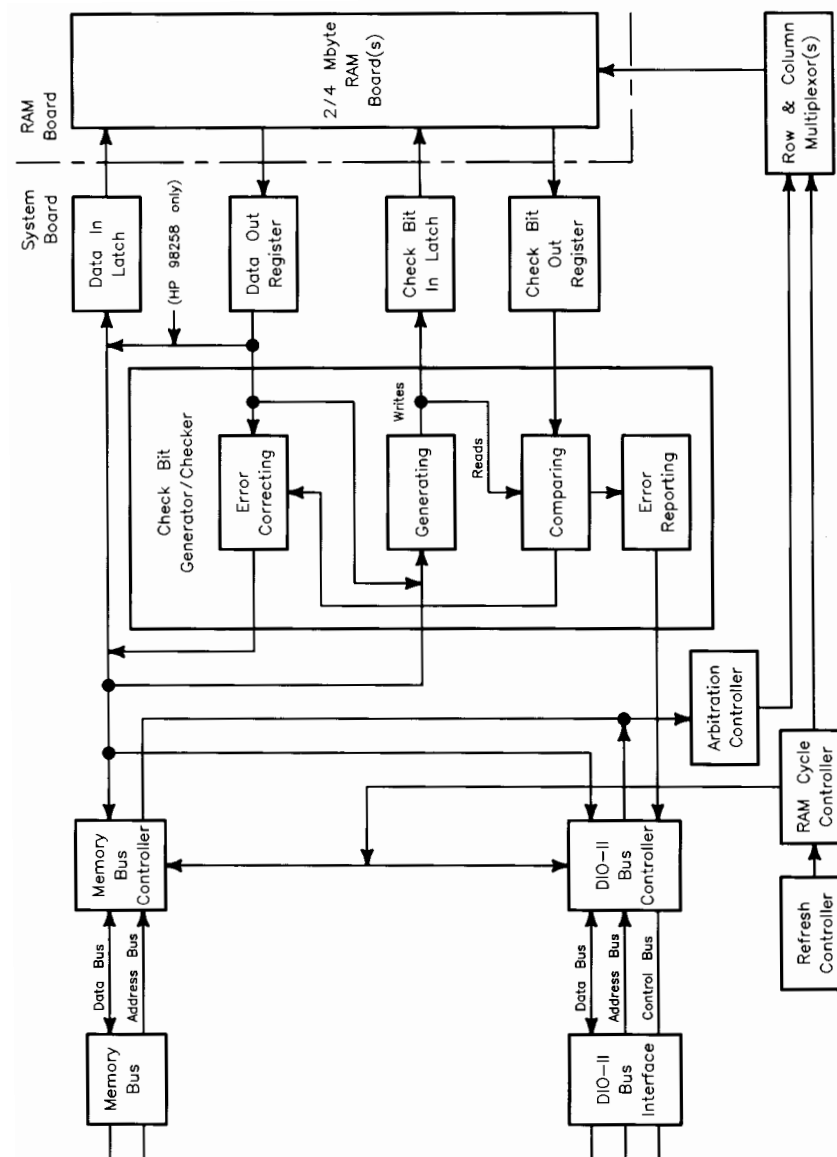
Figure 9-6. SCSI Interface Block Diagram

Figure 9-7. RAM Product Block Diagram

64 Diagrams

References 10

Related Hardware Documentation

Starting on the next page are lists of related hardware documentation.

Hardware Support Documentation

Table 10-1. Hardware Support Documentation

Printed Pages Part Number	Manual Title
98574-90600	Model 345/375 Boot ROM Configuration Mode Users Manual
09000-90041	HP 9000 Series 200/300/500 Site Preparation Manual
09800-90001	HP 9000 Series 200/300 Test Tools Manual
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
98568-90600	HP 98568A Eight-Slot Bus Expander Installation Note
98568-90604	HP 98568A and HP 98570A Bus Expander Installation Note
98577-90000	HP 98577A VMEbus Expander Familiarization Guide
98577-90005	HP 98577A VMEbus Expander Accessory Development Guide
98562-90011	DIO-II Accessory Development Guide
98603-90000	HP 98603B BASIC 5.1 ROM Board Familiarization Guide

Installation Manuals/Notes

Table 10-2. Installation Manuals/Notes

Printed Pages Part Number	Manual Title
98560-90656	Model 345M and 345MH Installation Picture Guide
98560-90655	Model 345C and 345CH Installation Picture Guide
98560-90657	Model 345SRX Installation Picture Guide
98560-90660	Model 375M and 375MH Installation Picture Guide
98560-90659	Model 375C and 375CH Installation Picture Guide
98560-90658	Model 375SRX Installation Picture Guide
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
98248-90603	HP 98248B Floating Point Accelerator Installation Note
98262-90601	HP 98262A High-Speed Disc Add-On Board Installation Note
98229-90600	HP 98229A Add-On RAM Installation Note
98229-90601	HP 98229B Add-On RAM Installation Note
98578-90601	HP Parallel Interface Option
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
98603-90603	HP 98603B BASIC 5.1 ROM Board Installation Note
5954-8593	HP 9000 Workstations Configuration Guide
98244-90600	HP 98244C Upgrade (Model 3x0-to-375) Installation Note

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Service Notes

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Notes