

# **Model 340 Workstation's SPU Service Handbook**

**HP 9000 Series 300 Computers  
Model 340**

HP Part Number 98571-90039



**Hewlett-Packard Company**

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# Printing History

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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.

October 1988...Edition 1

December 1988...Edition 2. (Several part numbers changed and this edition includes the new part numbers.)



## Manufacturer's Declaration (Germany Only)

### Herstellerbescheinigung

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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:

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### **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.

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### **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.

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### **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.

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# Service Information Locator

On the next page is a Service Information Locator. First, find the information to reference in the left-hand column. Next, move to the right to a chapter number. Last, move up to the abbreviated manual title that has 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.)

Manuals identified in this locator are abbreviated by their initials:

Initials	Manual Title	Part Number
<b>SIM</b>	Model 340 Workstation's SPU Service Information Manual	98571-90030
<b>SHB</b>	Model 340 Workstation's SPU Service Handbook	98571-90039
<b>TTM</b>	Series 200/300 Test Tools Manual	09800-90011
<b>SPM</b>	HP 9000 Site Preparation Manual	09000-90041
<b>PIN</b>	Product Installation Note	
<b>TDS</b>	Series 300 Technical Data Sheet/Price List	

## Video/Graphics Boards Information

These boards have service information located in other manuals identified in the following table.

Model	Part Number	Title
340SRX	98720-90030	HP 98720A Graphics Display Station Hardware Support Document
340CH	98550-90000	HP 98550A Graphics Interface Familiarization Guide
	98556-90000	HP 98556A 2D Graphics Interface Familiarization Guide
340C+	98549-90000	HP 98549A Graphics Interface Familiarization Guide
340MH	98548-90000	HP 98548A Familiarization Guide
340M	98562-90030	Model 330/350 Service Information Manual

## Service Information Locator

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Booting Operating Systems	4					
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## Service Information Locator (cont.)

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Ordering spare parts	6	8				
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Product numbers	1	1, 3		A		All
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# Product Information

## Introduction

Information in this handbook refers to the SPUs for the HP 9000 Series 300 Model 340 Workstation's SPU.

## Features

**Table 1-1a. Model 340 Workstation Features**

Workstation	Product	Name/Description
Model 340SRX	98573C	<p>3D Color Workstation; includes:</p> <p>SPU with LGB Interface, DIO-1 Slot and 4 Mbytes RAM.</p> <p>HP 98720A 3D Display Controller with 8 planes of frame buffer memory.</p> <p>HP 98789A 16-inch High-Res Color Monitor.</p> <p>Opt. 719: Substitute HP 98752A 19-inch High-Res Color Monitor.</p>
Model 340CH	98564G	<p>2D Color Workstation; includes:</p> <p>SPU with High-Res Color Graphics (1280 by 1024) and 4 Mbytes RAM.</p> <p>HP 98789A 16-inch High-Res Color Monitor.</p> <p>Opt. 556: Add 2D Integer-Based Graphics Accelerator.</p> <p>Opt. 719: Substitute HP 98752A 19-inch High-Res Color Monitor.</p>

**Table 1-1b. Model 340 Workstation Features**

<b>Workstation</b>	<b>Product</b>	<b>Name/Description</b>
Model 340C+	98564C	Color Workstation; includes:  SPU with High-Res Color Graphics (1024 by 768) and 4 Mbytes RAM.  HP 98785A 16-inch High-Res Color Monitor.  Opt. 719: Substitute HP 98751A 19-inch High-Res Color Monitor.
Model 340MH	98563G	Monochrome Workstation; includes:  SPU with High-Res Monochrome Graphics (1280 by 1024) and 4 Mbytes RAM.  HP 98788A 19-inch High-Res Monochrome Monitor.
Model 340M	98563E	Monochrome Workstation; includes:  SPU with High-Res Monochrome Graphics (1024 by 768) and 4 Mbytes RAM.  HP 98786A 17-inch High-Res Monochrome Monitor.

## Interfaces

Optional interfaces are available that provide additional capability in addition to those on the processor board:

- Option 006 - One DIO-I slot. Also available separately as an HP 98013A DIO-I Slot Upgrade. It's standard with the Model 340SRX and supplied with Options 010 and 011.
- Option 010 - High-Speed HP-IB Interface. Standard with the Model 340SRX.
- Option 011 - Small Computer Systems Interface (SCSI).
- Opt. 015 - AUI LAN (requires external media attachment unit).
- Opt. 017 - ThinLAN with built-in ThinMAU and BNC "T" connector.

Note that Options 010 and 011 cannot be installed together because each occupies the same slot in the SPU.

## Keyboard

Standard keyboard is the Integrated Terminal Format (ITF) HP 46021A Keyboard. It connects to the HP-IIIIL connector through the rear panel.

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# Operating Systems

## HP-UX

Series 300 HP-UX, Revision 6.2 or later, is supported on Model 340 Workstations.

## BASIC 5.2

Supported as a service tool only, the HP 98613D Series 300 BASIC 5.2 operating system may be used to test the workstation. BASIC does not have drivers for the LGB interface used in Model 340SRX workstations.

## HP-HIL Accessories

Listed below are HP-HIL accessories compatible with the Model 340 Workstations. For a complete list, consult the *HP 9000 Series 300 Hardware Technical Data and Price List*.

**Table 1-2. HP-HIL Devices**

<b>Product Number</b>	<b>Product Name/Description</b>
HP 35723A	Touchscreen Bezel
HP 46021A	ITF Keyboard
HP 46060A	HP Mouse
HP 46080A	Extension Module
HP 46081A	3 Metre Ext.
HP 46082A/B	15/30 Metre Extension
HP 46083A	Rotary Control Knob
HP 46084A	ID Module
HP 46085A	Control Dials
HP 46086A	Button Box
HP 46087A	"A"-Size Digitizer
HP 46088A	"B"-Size Digitizer
HP 46089A	4-Button Cursor for Digitizer
HP 46094A	Quadrature Port Device
HP 46095A	Three-Button Mouse
HP 92916A	Barcode Reader

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# **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 this SPU 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 workstations with Hewlett-Packard approved parts, accessories, peripherals, operating systems and application programs are supported by Hewlett-Packard. Any workstation 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 repair is accomplished.

## **HP Repair Services**

There are many hardware support options available, from utilizing customer's maintenance groups to buying full support from the local HP Sales Office. Please contact your local Hewlett-Packard Sales and Service Office for complete information.

Hewlett-Packard provides on-site repair services for Model 340 Workstation SPU's.

More information is available in the *HP 9000 Series 300 Pricing Information Sheet* Contact your local HP Sales and Service for complete information on these services. Each is briefly described below.

## **Repair by Customers**

In addition, customers may obtain service training courses and spare parts to do their own repair. Contact your nearest HP Sales and Service Office for information concerning service training, special tools and test equipment, and spare parts.

## **Operating Systems Support**

### **HP-UX Installation Services**

A set of modular services that provide expert installation of hardware, operating system, and selected HP DesignCenter applications is available. They allow users to make productive use of their system in the shortest possible time. Services include:

- Interconnection of system hardware.
- Formatting discs.
- Loading and configuration of the HP-UX Operating System.
- Loading applications.
- Verification of system operation.
- Review of the system for its System Administrator.

Refer to the *HP 9000 Series 300 HP-UX Installation Services Technical Data (5954-9695)* for details and complete information.

## **Primary Support**

There are numerous operating system support options:

- Account Management Support (AMS) provides a local SE, on-site assistance, one Response Center caller and one alternate for telephone assistance, and a Software Materials Subscription.
- Response Center Support (RCS) provides one Response Center caller and one alternate for telephone assistance, and Software Materials Subscription.
- Software Materials Subscription (SMS) provides software and manual updates, Software Status Bulletins, and HP communicator magazine. Updates to ROM-based systems are not provided.

## **Support For An Additional System**

The following options support an additional system:

- Additional System Coverage extends AMS or RCS coverage on the operating system to one additional system under the same system manager. All support is delivered through the central system.
- Extended Materials Support extends SMS by providing the right to make one copy of all central system materials for use on one additional system.
- Additional Response Center Caller provides one additional caller and one alternate for access to the HP Response Center.
- Manual Update Service (MUS) provides one copy of updates to software reference manuals.
- Software Notification Service (SNS) provides issues of the HP Communicator and Software Status Bulletin.

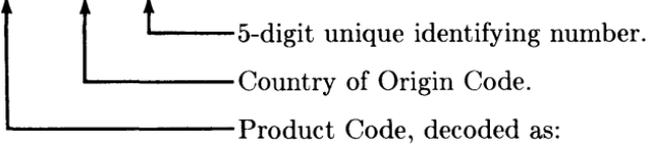
## Serial Numbers

**Serial No.**

**Location:** On the outside of the rear panel.

**XXXX A 01234**

**Description:**



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.

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## Standard Tools

The following tools are needed to service the SPU:

- T-10 Torx® screwdriver, 4-inch (100mm) blade
- Pozidriv® #1 screwdriver, 4-inch (100mm) blade
- One each of these nutdrivers:
  - 3/16-inch (8720-0001)
  - 5.5mm (8720-1220)
  - 9/32-inch
- 5/8-inch open-end wrench
- 9/16-inch open-end wrench

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<b>CAUTION</b>
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A static-free Workstation (9300-0794) should be used as a work surface. Anti-static bags should be used to store assemblies in.

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## Technical Information

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### 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*.

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### Electrical

Line voltage/frequency	115 V ac @ 48-66 Hz 230 V ac @ 48-66 Hz
Line transient spike immunity (1 nsec rise, 800 nsec duration)	1 KV dc
Power Consumption	155 Watts maximum
Current Requirements	2.6 A @ 115 V ac 1.5 A @ 230 V ac
Maximum Heat Dissipation	570 BTU/hr 167 Kcal/hr

### Environmental

Operating temperature	0 - 55° C (32 - 104° F)
Operating humidity	5 - 80% relative
Operating altitude	4 572 metres (15 000 feet)

## **Electromagnetic Interference**

Standards met	FCC Class A VCCI Class 1 VDE Class B, VDE 1046/84
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## **Regulatory Requirements**

Standards met	UL 478, 5th Edition CSA 220-M1986 IEC 380, 2nd Edition; 435, 2nd Edition
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## **Physical**

Dimensions	
Height	104mm (4.1 inches)
Width	325mm (12.8 inches)
Length	444mm (17.5 inches)
Weight	4.55kg (10 pounds) maximum

## Processor Board

### CPU

Type	Motorola MC68030
Clock Frequency	16.67 MHz
Internal Architecture	32-bit data and address registers
Address range	4 Gbytes virtual mapped to 4 Gbytes physical
Data bus	32-bit synchronous

### Floating point Coprocessor

Type	Motorola MC68882
Clock Frequency	16.67 MHz

### MMU

Type	Motorola MC68852
Clock Frequency	16.67 MHz

### LAN Interface

Media	LAN coax cable (RG 58U)
Protocols	IEEE 802.3, Ethernet
Data Rate	10 Mbits /sec

### Parallel Interface

Type	HP-IB (IEEE 488)
Data Rate	350 Kbyte/sec
Number of connected devices	15 per interface devices supported

## Processor Board (cont.)

### Serial Interface

Type RS-232C standard

### Capacitor-backed Real-Time Clock

Resolution 10 milliseconds

Accuracy  $\pm 5$  seconds/day

Clock life 24 hours

### DMA

Input Clock 10 MHz

Channels 2

Channel Priority Programmable, high or low, each channel

Channel Arbitration Round-robin

Bus Arbitration DIO daisy chain

Transfer Types 8-bit (byte)  
16-bit (word)  
32-bit (long word)

Max Transfers 4G transfers per arming

Bus Bandwidth Use Limits Programmable: 100%, 50%, 25%, 12.5%

Min Cycle Time 300 ns

Max Theoretical Transfer 13.3 Mbytes/sec

### Rate

Typical Burst Transfer Rate 2.8 Mbytes/sec

Interrupt levels Programmable: 7, 6, 5, 4, 3

Address range FFFFFFFF - 00000000

## Memory

Amount	4, 8, or 16 Mbytes
Type	Byte parity error-checking
Average cycle time	300 nsec

## I/O Bus

Width	32 bits address; 16 bits data
Bus bandwidth	6 Mb/sec

## Shipping Information

The shipping container for each SPU includes the Localization Kit, which includes power cords, keyboard cable, HP-HIL cable, Safety and Regulatory Information, and Installation Picture Card.

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

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## **Preventive Maintenance**

There is no preventive maintenance requirement for the Model 340 Workstation's SPU.

# Configuration

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## Bundled Systems

Refer to the current *HP 9000 Series 300 Price List* to determine what HP products are bundled into this workstation.

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## Supported Configurations

Refer to the *Series 300 Configuration Reference Manual (98561-90020)* for the current hardware and software products that are supported.

### DIO-I Accessory Cards Supported

When the HP 98013A DIO Slot Upgrade is installed, only the DIO-I accessory cards listed below are supported:

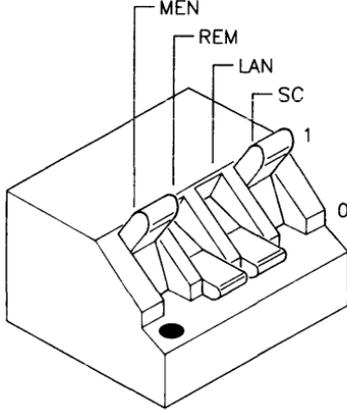
- HP 36593A HP-UX Gateway/SNA Interface
- HP 50955A 3278 Emulator
- HP 50962A SRM Interface
- HP 98255A EPROM Board
- HP 98259A Bubble Memory Card
- HP 98286A DOS Coprocessor
- HP 98622A 16-Bit GPIO
- HP 98623A BCD Interface
- HP 98624A HP-IB Interface
- HP 98625B High-Speed HP-IB Interface
- HP 98626A 50-Pin RS-232C Interface
- HP 98628A Datacomm Interface
- HP 98630A Breadboard Interface Card

## **DIO-I Accessory Cards Supported (cont.)**

- HP 98633A 6944A Multi-Programmer Interface
- HP 98640A 7-Channel A/D Interface
- HP 98641A RJE 2780/3780 Interface
- HP 98642A 4-Port RS-232 MUX Interface
- HP 98643A LAN Interface
- HP 98644A RS-232C Interface
- HP 98646A VMEbus Interface
- HP 98647A PC-IB Interface
- HP 98658A SCSI Interface
- HP 98691A Programmable Datacomm Interface
- HP 98725A Local Graphics Bus Interface

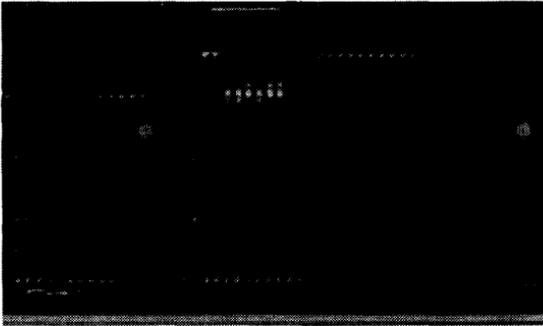
# SPU Configuration Switches

Table 3-1. SPU I/O Interface 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)
LAN	Local/Remote 0 = Local Mode (Shipped setting) 1 = Remote Mode
SC	Internal HP-IB System Controller 1 = System Controller (Shipped setting) 0 = Not System Controller

**Table 3-2. Model 340SRX SPU LGB Address Select Switch Settings**



Switch Label	Function/How It's Used
CS	Must be set to 01011. Sets display controller control space (CTL_BASE) to starting address 560000 <sub>16</sub> .
FB	Must be set to 0. Sets frame buffer starting address to 200000 <sub>16</sub> .

# HP-HIL Accessories

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

**Table 3-2. HP-HIL Devices and Current/Power Requirements**

Product Number	Device Name	mA	Watts
HP 35723A	Touchscreen Bezel		
HP 46021A	ITF Keyboard	100	1.2
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 <sup>1</sup>	50	0.6
HP 46083A	Rotary Control Knob	110	1.32
HP 46084A	ID Module	60	0.72
HP 46085A	Control Dials	350	4.2
HP 46086A	Button Box	80	0.96
HP 46087A <sup>2</sup>	"A"-Size Digitizer <sup>2</sup>	200	2.4
HP 46088A <sup>2</sup>	"B"-Size Digitizer <sup>2</sup>	200	2.4
HP 46089A	4-Button Cursor for Digitizer	(n/a)	(n/a)
HP 46094A	Quadrature Port Device <sup>3</sup>	80	1.2
HP 46095A	Three-Button Mouse	80	0.96
HP 92916A	Barcode Reader	100	1.2

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



# Troubleshooting

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## Analytic Troubleshooting

Troubleshooting SPUs is the process of getting answers to these five questions:

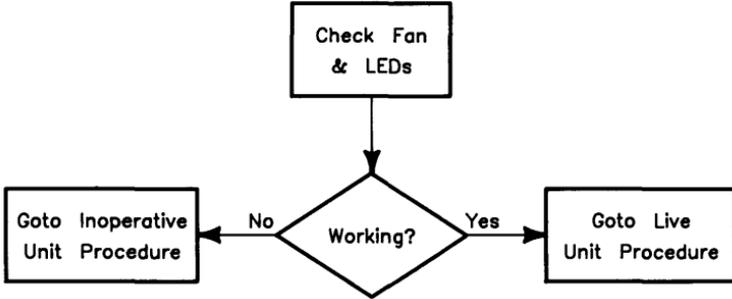
- What exactly is wrong, or what are the bad symptoms?
- Where are the bad symptoms appearing?
- When do the bad symptoms occur?
- How bad is the problem or to what extent does it occur?
- What actually caused the problem in the first place?

Getting the answers to these questions usually makes the troubleshooting process much more effective and less costly. When a failure in a workstation occurs, remember these questions and get the answers to each of them.

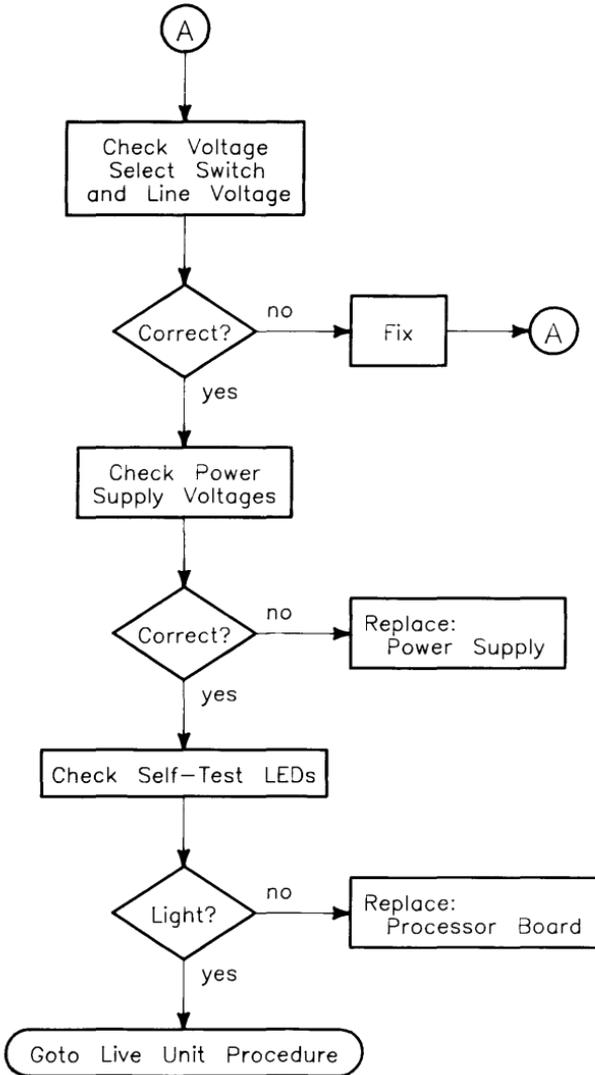
After you have all answers possible, decide what's the most probable cause of the problem. Sometimes you'll arrive at several choices for a cause. For each choice, qualify it against the answers to the questions above. The most probable cause is the one that logically justifies the correct answers to these questions.

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# Initial Troubleshooting Flowchart

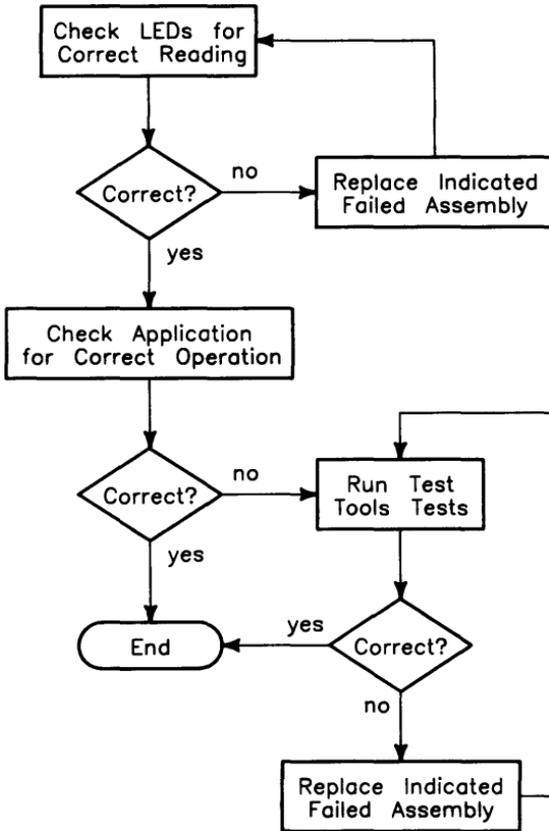


# Dead Unit Troubleshooting Flowchart



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# Live Unit Troubleshooting Flowchart



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## Power Supply Technical Information

Make sure that the SPU is properly grounded. It requires a three-wire power cable and the power supply retaining/grounding screw must be installed. Also, make sure that the power supply access door is properly installed.

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

### Voltage Indicators

Voltage	Indication
-12 V dc	(none)
+5 V	Self-test LED lit at turn-on.
+12 V dc	Fan Running

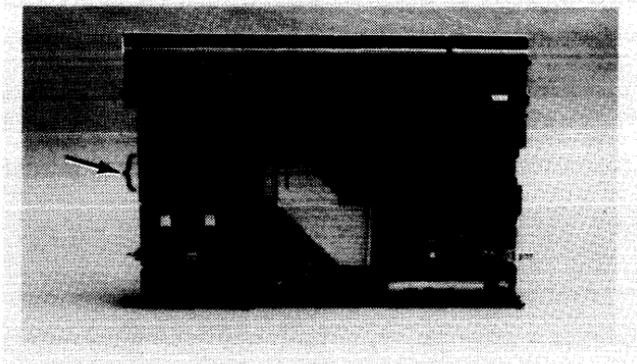


Figure 4-1. Power Supply Test Points

# General Failure Indications

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

Failure Indications via Upper Two LEDs	LED Pattern General Description of Failure
<p><b>State Indication Only</b></p> <p>Required Device Missing or DTACK Failure</p> <p>Failing Device</p> <p>Special Codes (Special Case Highest Priority Codes)</p>	<p>ooss ssss, Where ss ssss Indicates State of Power-up</p> <p>o•dd dddd, where dd dddd Indicates Device</p> <p>•odd dddd, where dd dddd Indicates Device</p> <p>•••• •••• LEDs Never Accessed (or Unused Code)</p> <p>o••• •••• LEDs Failed to DTACK</p> <p>oooo o••• Timer on processor board has failed or is missing.</p>

State or Device Codes Via Lower 6 LEDs	LED Pattern General Description of Failure
<p>Miscellaneous (Highest Priority)</p> <p>Internal Peripheral Failure (Medium Priority)</p> <p>I/O Failure (Lowest Priority)</p>	<p>xxoo ffff Where ffff indicates Failure (xs are don't-care bits)</p> <p>xxo• pppp Where pppp is Peripheral Number</p> <p>xx•s ssss Where s ssss is Select Code</p>

# Boot ROM Error Codes

Table 4-2. Boot ROM LED Error Codes

LEDs	Probable Cause	Replace or Do
○○○○ ○○○○	No Failure Detected	
○○○○ ●●●●	CPU Timer Missing	Processor Board
○●●○ ○●●○	Top RAM Failed	Check RAM Configuration
○●●● ●●●●	LEDs failed to acknowledge	Processor Board
●○○○ ○○○○	CPU Failed	Processor Board
●○○○ ○●●●	Boot ROM Failed Checksum	Processor Board
●○○○ ○●●○	Top RAM Failed	RAM 1 board
●○○○ ●○○●	RAM Failure	RAM Board Processor Board
●○○○ ●○○○	Insufficient RAM	RAM Board
●○○● ○●●○	Keyboard Controller Failed	Processor Board
●○○● ○●○○	HP-IB Failed	Processor Board
●○○● ●○○○	DMA Failed	Processor Board
●○○● ●●○○	Bit Map Font Failed	Video Board (Except Model 340X) Check Graphics Station (340SRX)
●○○● ●●●●	Bit Map Failed	Video Board (Except 340SRX) Check Graphics Station (340SRX)
●○xx xxxx	I/O at xx xxxx Failed	I/O at Select Code xx xxxx.
●●●● ●●●●	LEDs Never Accessed	Check -12 V dc. If okay, replace Processor Board. Otherwise, replace Power Supply.

---

## RAM Troubleshooting

Table 4-3 lists each RAM board/slot's address range. When a RAM failure address is given, use this table to identify the failed RAM board.

**Table 4-3. RAM Board/Slot Number and Address Block**

RAM Board Connector/Label	Top Address	Bottom Address
RAM 1/FFF	FFFFFFF	FFC00000
RAM 2/FFB	FFBFFFFFF	FF800000
RAM 3/FF7	FF7FFFFFF	FF400000
RAM 4/FF3	FF3FFFFFF	FF000000

---

## Remote SPU Analysis

The SPU and monitor allows remote analysis of problems by means of the beeper. To test the SPU remotely, follow this procedure:

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

For example, suppose that on power-up an SPU emits three low beeps, a high beep, two low beeps and a high beep. This will be of the form  $\circ\circ\circ\bullet\circ\circ\bullet$ , where  $\circ$  represents a low beep,  $\bullet$  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.

# Boot ROM State Codes

Table 4-4. LED State Codes In Numerical Order

LEDs	Test Activity
oooo oooo	No failure
oooo ooo●	LED ripple (all on, then off in sequence from MSB)
oooo oo●o	Resetting I/O
oooo oo●●	Checksumming Boot ROM (or LED ripple)
oooo o●oo	Testing top RAM (or maybe the Boot ROM checksum failed)
oooo o●●o	Searching for boot extension ROMs
oooo o●●●	Starting test vector list (or LED ripple)
oooo ●ooo	Preloading RAM
oooo ●o●o	Testing RAM
oooo ●●●o	LED ripple
ooo● oo●o	Testing keyboard circuit (or an interrupt line is stuck)
ooo● oo●●	Testing processor HP-IB
ooo● ●ooo	Testing DMA
ooo● ●●●o	Checksumming ID/INIT ROM
oo●x xxxx	Testing I/O at select code x xxxx



# SPU Tests

## Diagnostic Programs

Three types of diagnostic programs are available to test the Model 340 Workstation's SPU and are overviewed in Table 5-1:

**Table 5-1. Diagnostic Programs Overview**

Diagnostic Program	Media	Part Number	Diagnostics Available
HP-UX ce.utilities	Tape Disc	Series 300 HP-UX Rev. 6.2	CRT Adjustments Floating-Point Coprocessor Tests Display Controller Tests System Functional Tests CS/80 Exercisers (VMEbus Expander and Error Checking Correcting RAM Tests are available but not supported on Model 340 Workstations.)
Series 200/300 Test Tools	3.5-in. Disc 5.25-in. Disc	09800-12300 09800-12500	Computer Tests System Functional Tests CS/80 Exercisers
Series 300 System Support Tape Rev. 2.1	Tape	98561-10835	(same as HP-UX ce.utilities) Computer Tests System Functional Tests CS/80 Exercisers (VMEbus Expander and Error Checking Correcting RAM Tests are available but not supported on Model 340 Workstations.)

### HP-UX Diagnostics

In the HP-UX Rev. 6.2 operating system Programming Environment, a series of diagnostics called *CE.utilities* provide extensive testing of the workstation.

## Series 200/300 Test Tools

Series 200/300 Test Tools do not have tests for the Model 340SRX SPU local graphics bus interface or the HP 98720A Display Controller. Test Tools may be used to test the Model 340SRXes high-speed HP-IB circuits, other functional areas of the SPU with a printer as the output device.

These tests do not utilize the local graphics bus interface; therefore, no video can be generated to feed the monitor. Instructions in the Test Tools Manual show you how to use a printer as a logging device for status and error messages. All input is done without a monitor and you need to be careful.

LGB circuits are only tested with the CE.utilities for the HP 98720 Display Controller on the HP-UX operating system.

Series 200/300 Test Tools provide the following test capabilities when combined with the SPU's Boot ROM self-test:

- Computer Tests.
- System Functional Tests.
- CS/80 Disc Drive Tests.

These tests are also included in HP-UX CE.utilities and the System Support Tape tests.

The combined Series 200/300 Test Tools software package is provided on both 3.5-inch and 5.25-inch discs as listed in Table 5-2.

**Table 5-2. Series 200/300 Test Tools Package Contents**

<b>Part Description</b>	<b>3.5-in. Disc Part Number</b>	<b>5.25-in. Disc Part Number</b>
Series 200/300 Test Tools, complete package consisting of:	09800-12300	09800-12500
Series 200/300 Test Tools Manual	09800-90001	09800-90001
Series 200 Computer Tests Disc Rev. 1.0	09800-10336	09800-10536
Series 300 Computer Tests Disc Rev. 3.0	98561-10334	n/a
Series 200/300 System Functional Tests Discs:		
SFT0 Disc Rev. 1.2	09800-11334	09800-11534
SFT1 Disc Rev. 1.2	09800-11335	09800-11535
SFT2 Disc Rev. 1.2	09800-11336	09800-11536
SFT3 Disc Rev. 1.2	09800-11337	09800-11537
SFT4 Disc Rev. 1.2	09800-11338	09800-11538
CS/80 Exerciser Disc Rev. 3.1	09800-11304	09800-11600

### **Series 300 System Support Tape**

Both the Series 200/300 Test Tools and Series 300 HP-UX CE.utilities tests are combined in this tape. Their use is explained in the Series 300 System Support Tape Users Manual (98561-90035).



---

# Model 340SRX LGB Diagnostics

HP-UX operating systems, Revision 6.2 and later are supported on the Model 340SRX Workstation.

Included in the HP-UX operating system is the *CE.utilities* diagnostics. These diagnostics provide a convenient way to troubleshoot the Model 340SRX Workstation. This section instructs you how to access the diagnostics and use them to determine what part of the workstation has failed.

The diagnostics test each HP 98720A assembly and display messages indicating the assembly's pass/fail status. Information as to which assembly is the most likely candidate for replacement is also displayed.

## Terms and Conventions

Before starting, review the terms and conventions used:

- Text appearing in computer font must be entered **literally**. For instance, the instruction `su root` is to be typed in literally.
- Text appearing in *italics* means for you to substitute the desired information. For instance, *pathname* means to put in the pathname of the desired file at that point. Unless the desired information is obvious, italicized items are defined immediately following their use.
- Words appearing in a keycap form mean to press the key with that word on it. For instance, `[Return]` means to press the Return key.
- Keys in separate keycaps mean to press the keys individually in sequence. For instance, the instruction

”Press `[Stop]` `[E]` `[Y]`”

means to press and release the Stop key, press and release the E key, then press and release the Y key.

- Keys in joined keycaps mean to press the first key and hold it down while typing the next key, as you would to press the Shift key and the A key to obtain a capital A. For instance, the instruction

Press **CTRL-D**

means to press and hold down the CTRL key and type the D key. Then release them both.

- A key in the form **f** refers to one of the softkeys at the top of the keyboard.

Many of the terms and conventions here relate to the hardware used in the HP 98720A Display Controller. Refer to the GDC service documentation for information.

## Accessing the Diagnostics

After the HP-UX operating system is installed in the workstation, follow these steps to access the ce.utilities:

1. Log in as root. Type:

root **Return**

When `password:` appears, ask the user to type:

*password* **Return**.

2. After the prompt appears, type:

cd /usr/CE.utilities/98720 **Return**

## Running the Diagnostics

1. To run the diagnostics, type:

```
./START 
```

2. This message will appear:

```
***Welcome to the 98720A series test code! ***
```

```
Creating Device Files
```

```
Device Files Created
```

```
Do you want to change which tests are run?
```

```
You must be able to use
```

```
'vi' editor to do this!!! [default is no]
```

If this is the first time the HP 98720A test has been run, the device file information will be displayed. Afterwards, those two lines will not appear.

Answering “yes” to this question will put you into the “vi” editor and display the “test\_disable” file in the /usr/CE.utilities/98720/ucode directory. A listing of the test\_disable file is shown in Table 5-5.

Press   to answer yes.

Press  to answer no.

3. Then this is displayed:

```
To what address are the switches
```

```
on the LGB interface card set?
```

```
Hit $<$return$>$ for more information. [0 to 31, no default]
```

Pressing  will cause this to be displayed:

```
Enter a number from 0 to 31.
```

```
If the 98720A is the system console the number will be
```

```
0 to 15 (try 11). If not it will be 16 to 31 (try 31).
```

```
To what address are the switches
```

```
on the LGB Interface Card set?
```

```
Hit $<$return$>$ for more information [0 to 31, no default]
```

Answer by typing:

11

as the HP 98720A is the system console in a Model 340SRX Workstation. The five control space switches on the SPU's LGB\HP-IB board must be set to 01011<sub>2</sub> which is the binary equivalent of address 11<sub>10</sub>.

4. Then this is displayed:

Do you have a transform Engine (98721A)? [default is yes]

If the HP 98720A does not have a Transform Engine Board, press .

5. Next question is:

Do you have a Rev D or Rev E ACE chip?

Hit  for more information. [D or E, no default]

Pressing  will cause this to be displayed:

If your 98720A is serial number 2624A00214 or greater you most likely have a REV E ACE chip. If when running these diagnostics the 'ACE CHIP TEST' fails it could be due to picking the wrong Rev ACE here.

Do you have a Rev D or a Rev E ACE chip?

Hit  for more information. [D or E, no default]

Model 340SRX Workstation SPU's have the Rev. E ACE chip.

Press .

6. Next question is:

How many Frame Buffer Boards are present [0-4]

If you enter a number greater than 4 you get this message:

That is an illegal choice. The number should be from 0 to 4.

For example, if you have an four plane system you should enter '0',

8 planes - enter '1'

16 planes - enter '2'

24 planes - enter '3'

32 planes - enter '4'

How many Frame Buffer Boards are present? [0-4]

Answer by pressing the number key for the number of frame buffer boards your GDC contains and `Return`.

Note: A wrong answer here will cause errors when the tests are run.

---

### Note

To stop the tests while they're running, press `Break`. Pressing the `Break` key won't have any effect until the current test is finished. This can take up to 4 minutes depending on the test that is running when `Break` is pressed.

---

7. At this point, the system will echo back the configuration it believes you have by the way the questions were answered. Also any tests that have been disabled will be echoed back at this time. (See the section labeled "Test\_Disable File Contents" to learn how to disable or enable tests. The "Real Time Measurements" and the System Exerciser" tests are not used.)

```
*****  
* Renaissance TAF/STRIFE Test *  
*****
```

```
Assumed Configuration:  
Overlay Planes Present  
Frame Buffer board 3 Present  
Frame Buffer Board 2 Present  
Frame Buffer Board 1 Present  
Frame Buffer Board 0 Present  
Transform Board Present  
Scan Board Present
```

```
Control Space Device File:  
'ucode/crtmap11'  
Frame Buffer Device File:  
'ucode/fbuf0'
```

```
Disabled Test: 'Real Time Measurements'  
Disabled Test: 'System Exercise'
```

8. If the system aborts, or the diagnostic is not run, you need to create the pseudo device files. Here's how it's done:

- a. Type: `cd ucode` and press `[Return]`.
- b. Type: `./make_crtmap` and press `[Return]`.

This creates the pseudo device files `crtmap0` through `crtmap31` and `fbuf0` and `fbuf1` files. Listing the `ucode` directory should show these files.

9. Next question is:

```
Store results in a Data Base? (y or n)
[default is y]
```

This will create a file called `RTEST_mmdhmm` where the results of all testing will be stored. Abbreviations mean month-day-hour-minute. An example of the displayed filename is:

```
RTEST_03280930
```

which means March 28 at 9:30 AM.

10. Then:

```
Store extra diagnostics? (y or n)
[Default is n]
```

Typing `y` `[Return]` causes the frame buffer tests to be output to a local printer by the `frame_dump` program.

11. The final question is:

```
Halt on first error? (y or n)
[Default is No]
```

This allows repeated tests to be logged to the data base. Once the tests begin, press `[Return]` to advance through the monitor patterns.

12. At this time, the diagnostics tests will begin executing. It takes approximately 20 minutes to run through one pass if all tests in the `test_disable` file are enabled.

```
*** Welcome to the 98720A series test code! ***
```

```
Do you want to change which tests are run?
You must be able to use
the 'vi' editor to do this!!! [default is no]
```

```
To what address are the switches
on the LGB interface Card set?
Hit [$<Return>] for more information [0 to 31, no default]
```

If you press , this message is displayed:

Enter a number from 0 to 31.

If the 98720A is the system console the number will be 0 to 15 (try 11). If not, it will be 16 to 31 (try 31).

To what address are the switches  
on the LGB interface Card set?

Hit <return> for more information [0 to 31, no default]

Do you have a Transform Board (98721A)? [default is yes]

Do you have a Rev D or a Rev E ACE chip?

Hit <return> for more information. [D or E, no default]

If you pressed  you get this message:

If your 98720A is serial number 2624A00214 or greater you most likely have a REV E ACE chip. If when running these diagnostics the 'ACE CHIP TEST' fails it could be due to picking the wrong Rev ACE here.

Do you have a Rev D or a Rev E ACE chip?

Hit <return> for more information. [D or E, no default]

How many Frame Buffer Boards are present [0-4]

13. These messages and response indicators appear:

Store Results in Data Base? (Y/N)  
[Default is Yes]

Data Base File Name:  
'RTEST\_11140644'

Store Extra Diagnostics? (Y/N)  
[Default is No]

Halt on First Error? (Y/N)  
[Default is No]

14. When the tests are run, this is displayed:

```
*****  
* Renaissance Taf/Strife Test 1 *  
*****
```

Test: 'Monitor Test'

The following patterns will be displayed:

```
White Raster.  
Red Raster.  
Green Raster.  
Blue Raster.  
Convergence Grid.  
Fine Convergence Grid.  
Color Bars.
```

Hit `<return>` to advance through patterns  
This will only be necessary the first pass

Hit `<return>` now to start

When `Return` is pressed, each enabled test in the `Test_disable` file is performed in sequence. After each test is completed, a status message is displayed indicating its pass/fail/skip condition. For example:

```
Test: 'Refresh Bus Test' (pass) means it passed.  
Test: 'Refresh Bus Test' (FAIL) means it failed.  
Test: 'Refresh Bus Test' (SKIP) means it wasn't enabled.
```

Test pattern colors will vary depending on the number of frame buffers in the display controller.

\* Non System Call In Test Interrupted \*

\* A = Abort Now \*

\* Q = Quit After Current Test Loop \*

\* C = Continue \*

\* M = Add Memo to Data Base \*

\* Make selection From Menu Above. \$>\$m

\* ENTER M (MEMO). Terminate With Blank Line \*

This is a test.

\* CONTINUE \*

...or when

\* Make Selection From Menu Above. \$>\$c

\* CONTINUED \*

...or when

\* Make Selection From Menu Above. \$>\$q

\* QUIT FLAG SET \*

...or when

\* Make Selection From Menu Above. \$>\$a

\* ABORTED \*

# (superuser prompt)

## Test disable File Contents

The `test_disable` file (Table 5-5) contains a listing of all the tests that the `CE.utilities/98720` will accomplish on the HP 98720A, except for the **LGB/DIO Interface Card** test. In the Model 340SRX Workstation's SPU, its LGB circuits are tested by the **LGB/DIO Interface Card** test.

All enabled tests have a # symbol in front of the test name. To disable a test, remove the # symbol. Before modifying the file, make a copy of the file in case the list you are using gets lost.

If the GDC doesn't have an HP 98721A Transform Engine installed, these tests in the `test_disable` file will not be run:

## Table 5-5. Test\_disable File Contents

```
#Dither Test
#Transparency Test
#Xform! I.D.
#Xform! Random Cntrl Store
#Xform! IEEE Control Store
#Cntrl Store Walking Bit
#Xform! Sequencer
#Xform! ALU
#Xform! Pointer Ram
#Xform! Data Ram
#Xform! Command Data Write
#Xform! Floating Point
#DC Ram over LGB
#DC Ram via ucode!
#Ace Chip Register
#Ace Chip
#Xform! Spin Test
```

**Table 5-6. Test\_disable File Listing**

```
#All tests are enabled to be run initially except the last two.
#To DISABLE a test remove the '#' sign in front of it.
#To ENABLE a test place a '#' sign in front of it.
#
#If you mess up this file the testcode doesn't work properly
#you can restore this file by copying 'td_backup' to 'test_disable'
#in the 'ucode' directory.
#
#Allegro Monitor Test
#Refresh Bus Test
#Z Buffer Test
#Repeat pattern Test
#Dither Test
#Transparency Test
#LGB/DIO Interface Card
#Xform! I.D.
#Xform! Random Cntrl Store
#Xform! IEEE Control Store
#Cntrl Store Walking Bit
#Xform! Sequencer
#Xform! ALU
#Xform! Pointer Ram
#Xform! Data Ram
#Xform! Command Data Write
#Xform! Floating Point
#DC Ram over LGB
#DC Ram via ucode!
#Ace Chip Register
#Ace Chip
#Color Map
#F.B. Control Shadow Ram
#Frame Buf Ram via ucode!
#Frame Buffer Write Enable
#Frame Buffer Folded/Full
#Fast Window Move
#Slow Window Move
#Xform! Spin Test
#
# The Following Tests Are Not Finished And Should Normally Be Disabled,
# I.e., they should have no '#' in front of them!
Real Time Measurements
System Exercise
#
#
#
```

# Adjustments

There are no adjustments in the SPU. For adjustments to other products in the workstation, refer to the product'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 (98561-90020)*.

The *HP 9000 Series 300 Technical Data Sheet and Hardware Pricing List* also has supported peripheral information.

---

## Parts Lists

Parts listed in this section apply to only the Model 340 Workstation's SPU.

**Table 8-1. Electrical Parts List**

<b>Ref. No.</b>	<b>New Part Number</b>	<b>Exchange Part Number</b>	<b>Description</b>
1	98571-66551		Power Supply
	2110-0010		Fuse, 5 A
2	98571-66510	98571-69510	Processor board
3	98268-66520	98268-69520	RAM board
4a	98571-66530		ThinLAN board
4b	98571-66534		AUI LAN board
5	98571-66501		SPU backplane
6a	98544-66572	98544-69571	340M Video board
6b	98548-66571	98548-69570	340MH Video board
6c	98549-66572	98549-69571	340C+ Video board
6d	98550-66573	98550-69572	340CH Video board
6e	98720-66582	98720-69582	340SRX LGB board
6f	98556-66570	98556-69570	Graphics accelerator board
	98658-66501	98658-69501	SCSI interface card
	98625-66502	98625-69502	HS HP-IB interface card
7	98571-66506		DIO-I backplane
8	98561-61601		Cable-DIO short
9	98561-61602		Cable-DIO long

# Parts Lists

---

## Parts Information

### Introduction

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

Parts are available direct from:

Support Materials Operation  
3625 Cincinnati Avenue  
Rocklin, California 95677-1297 USA

Telephone: (916) 768-8000

# Parts Lists

Parts listed in this section apply to only the Model 340 Workstation's SPU.

**Table 8-1. Electrical Parts List**

Ref. No.	New Part Number	Exchange Part Number	Description
1	0950-1958		Power Supply
	2110-0010		Fuse, 5 A
2	98571-63510	98571-69510	Processor board
3	98268-63520	98268-69520	RAM board
4a	98571-63530		ThinLAN board
4b	98571-66534		AUI LAN board
5	98571-63501		SPU backplane
6a	98544-66571	98544-69571	340M Video board
6b	98548-66570	98548-69570	340MH Video board
6c	98549-66571	98549-69571	340C+ Video board
6d	98550-66572	98550-69572	340CH Video board
6e	98720-66582	98720-69582	340SRX LGB board
6f	98556-66570	98556-69570	Graphics accelerator board
	98658-66501	98658-69501	SCSI interface card
	98625-66502	98625-69502	HS HP-IB interface card
7	98571-66506		DIO-I backplane
8	98561-61601		Cable-DIO short
9	98561-61602		Cable-DIO long
	1252-2297		Terminator SCSI Single Ended
	98700-61603		RGB Video cable
	98700-61600		LGB I/O cable

**Table 8-2a. Mechanical Parts List**

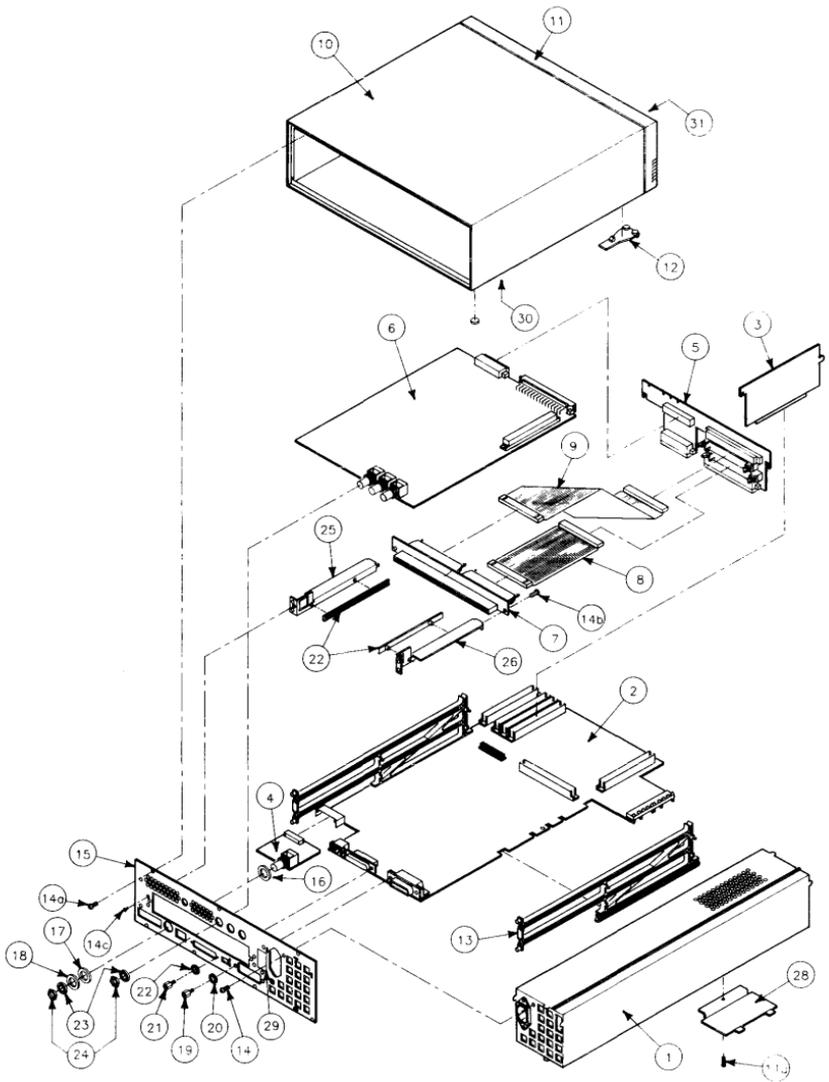
<b>Ref. No.</b>	<b>Part Number</b>	<b>Description</b>
10	5001-9033	Case
11	35751-40001	Cover-front
12	09121-48303	Foot-molded
13	98571-44701	Board support
14a	0515-1851	Screw-machine
14b	0515-0372	Screw-machine
14c	0515-0219	Flathead screw (DIO/LGB)
15a	5001-9038	Panel-rear w/o DIO slot
15b	5001-9036	Panel-rear LGB
15c	5001-9037	Panel-rear DIO slot
16	3050-1291	Washer-shoulder
17	0160-6777	Capacitor-washer
18	3050-0604	Washer-flat
19	0380-0643	Jackscrew-HPIB
20	2190-0409	Washer-Lock (RS-232)
21	1251-7812	Jackscrew-RS232
22	2190-0407	Washer-lock (HP-IB)
23	2190-0054	Washer-lock (RGB/LAN)
24	2940-0256	Nut-hex (RGB/LAN)
25	5001-9040	Bracket-DIO left

**Table 8-2b. Mechanical Parts List (cont.)**

<b>Ref. No.</b>	<b>Part Number</b>	<b>Description</b>
26	5001-9041	Bracket-DIO right
27	0403-0268	DIO-I card guide
28	5001-9042	Power supply plate
29	98571-84001	Voltage/current label
30	98571-84002	Regulatory label
31	98571-84003	Front panel label

**Table 8-3. Miscellaneous Mechanical Parts**

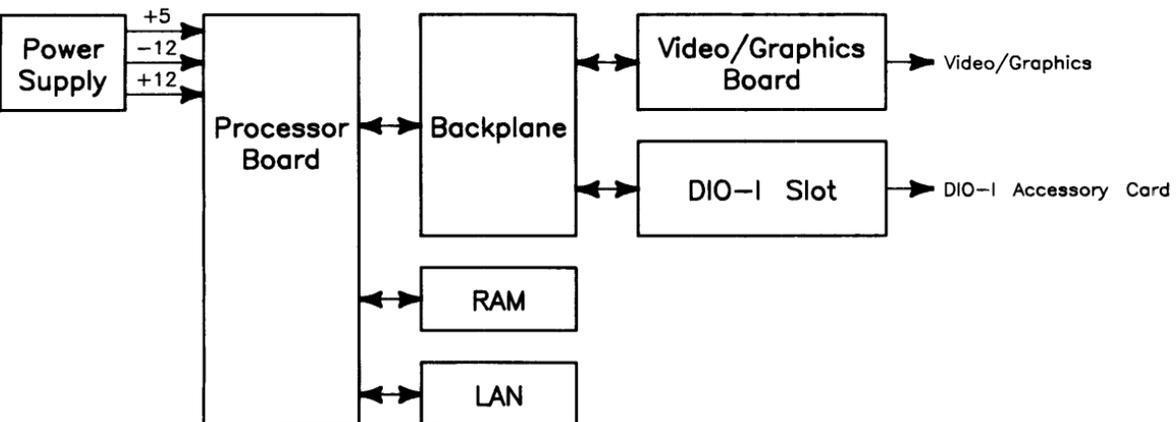
<b>Part Number</b>	<b>Description</b>
2190-0016	RCA video lock washer
2950-0001	RCA video hex nut
6960-0084	Plug-hole (LAN)
6960-0002	Plug-hole (RGB)
6960-0145	Plug-hole (Mono)
5001-9039	DIO-I Card Clip-RFI spring
5180-0409	DIO-I Cover Plate Clip-RFI spring
5001-9016	DIO-I Slot Cover Plate



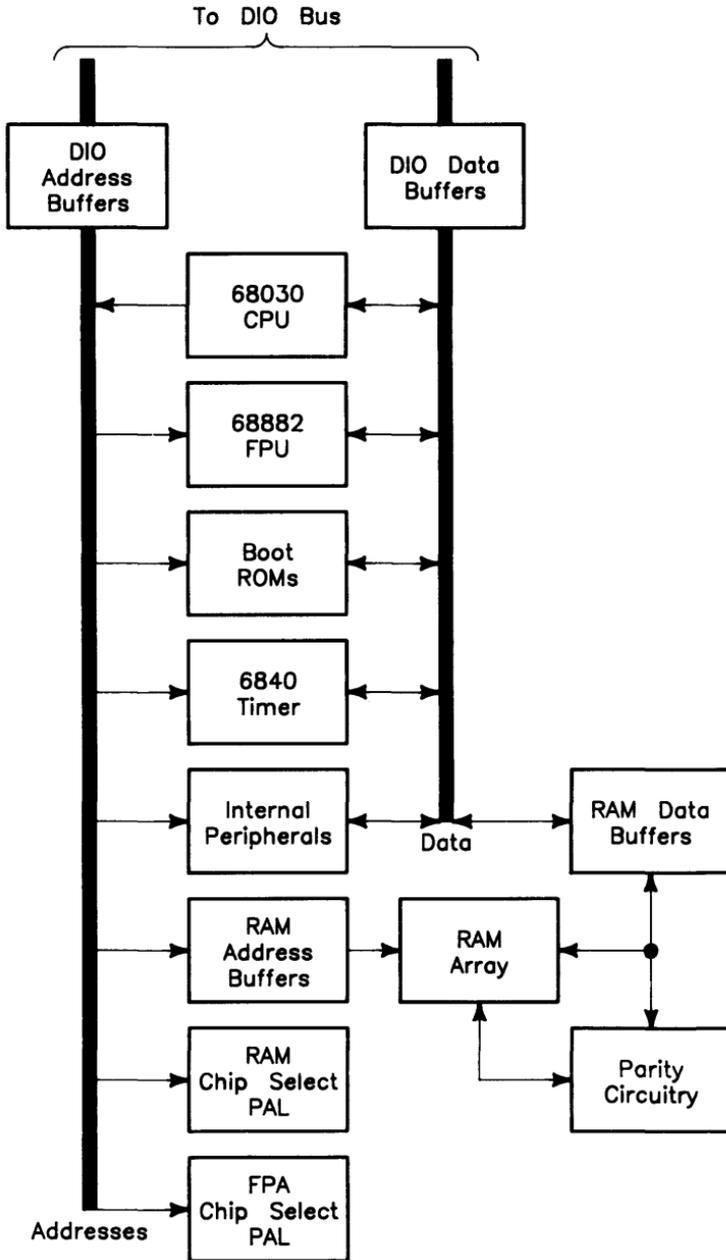
**Figure 8-1. SPU Exploded View**



## Model 340 SPU Block Diagram

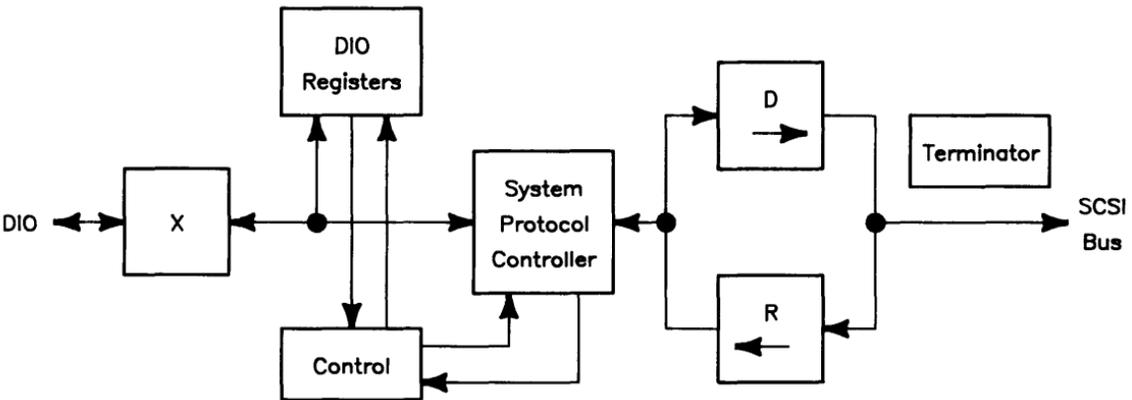


# Processor/RAM/LAN Boards

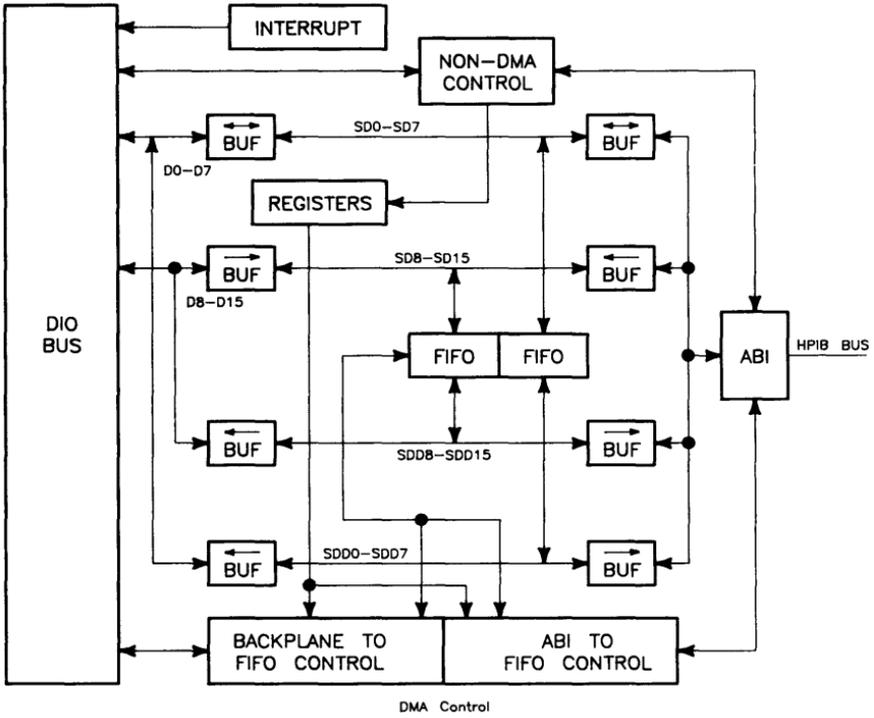


# Optional DIO Cards

## SCSI Circuit



# High-Speed HP-IB Circuit



## Related Hardware Documentation

**Table 10-1. Hardware Support Documentation**

Printed Pages Part Number	Manual Title
09000-90041	HP 9000 Series 200/300/500 Site Preparation Manual
98561-90020	Series 300 Configuration Reference Manual
98561-90035	Series 300 System Support Tape Users Manual
09800-90001	HP 9000 Series 200/300 Test Tools Manual
98571-90030	HP 9000 Series 300 Model 340 Workstation's SPU Service Information Manual
98571-90039	HP 9000 Series 300 Model 340 Workstation's SPU Service Handbook

**Table 10-2. Video/Graphics Boards Service Information**

Workstation Model	Part Number	Title
Model 340SRX	98720-90030	HP 98720A Graphics Display Station Hardware Support Document
Model 340CH	98550-90000	HP 98550A Graphics Interface Familiarization Guide
	98556-90000	HP 98556A 2D Graphics Interface Familiariza- tion Guide
Model 340C+	98549-90000	HP 98549A Graphics Interface Familiarization Guide
Model 340MH	98548-90000	HP 98548A Familiarization Guide
Model 340M	98562-90030	Model 330/350 Service Information Manual

**Table 10-3. Document Binders**

<b>Binder Part Number</b>	<b>Ring Dia., Ring, Page Size</b>	<b>Maximum Pages</b>
9282-1077	1-inch, 3-ring, 8.5 by 11-inch	300
9282-1078	1.5-inch, 3-ring, 8.5 by 11-inch	350
9282-1079	2-inch, 3-ring, 8.5 by 11-inch	600
9282-1080	2.5-inch, 3-ring, 8.5 by 11-inch	750
9282-1081	1-inch, 3-ring, 7 by 8.5-inch	300
9282-1082	1.25-inch, 3-ring, 7 by 8.5-inch	450
9282-1080	1.5-inch, 3-ring, 7 by 8.5-inch	600

**Table 10-3. Installation Manuals/Guides/Notes**

<b>Printed Pages Part Number</b>	<b>Manual Title</b>
98563-90603	Model 340M Workstation Installation Guide
98563-90602	Model 340MH Workstation Installation Guide
98564-90605	Models 340C+ and 340CH Workstation Installation Guide
98573-90602	Model 340SRX Workstation Installation Guide
98561-90000	HP 9000 Series 300 Installation Reference
98013-90601	HP 98013A DIO Slot Upgrade Installation Note
98237-90601	HP 98235A and 98237A LAN Upgrade Installation Note
98268-90601	HP 98268A 4 Mbyte RAM Upgrade Installation Note
98561-90027	HP 9000 Series 300 Peripheral Installation Guide





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# Notes





**HP Part Number  
98571-90039**

Microfiche No. 98571-99039  
Requires Binder No. 9282-0683  
Printed in U.S.A. E1088



**98571-90039**  
For Internal Use Only