

Model 319C+/319SRX

Workstation's SPU

Service Handbook

HP 9000 Series 300 Computers

HP Part Number 98564-90039



**HEWLETT
PACKARD**

Hewlett-Packard Company

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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.

November 1987...Edition 1

April 1988...Edition 2

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Notices

Radio Frequency Interference Statements

FCC Statement

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

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

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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WARNINGS, CAUTIONS, and Notes

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

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



Examples:

WARNING

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

CAUTION

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

Note

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

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:

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

Service Information Locator

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Assembly replacement	2							
Block diagrams	1, 2	9						
Booting Operating Systems	4							
Computer tests	1, 5	2		1, 2, 3				
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CS/80 tests	1, 5	5		4				
Electrical requirements	1	1			3, A			*
Environmental requirements	1	2			4, A			*
Functional descriptions	3							
HP-HIL device tests				2, 3				
Installation	2	2	All		All	All	All	
I/O Bus architecture	1, 3							
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People who can help					1			

Service Information Locator (cont.)

Service Information	SIM	SHB	CRM	TTM	SPM	IRM	PIN	TDS
Options/Accessories	1, 3	3	All			All	All	*
Ordering spare parts	6	8						
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Peripherals	1	3	All					*
Preventive maintenance		2						
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Product Information

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Introduction

Information in this handbook refers to the SPU's for the HP 9000 Series 300 Model 319C+ and Model 319SRX Workstations.

Features

Table 1-1a. Model 319C+ Workstation Features

Product	Description
System Processing Unit	MC68020 CPU at 16.67 MHz MC68881 Floating Point Co-CPU, 16.67 MHz MC68851 Memory Management Unit, 16.67 MHz 4, 8, 12, or 16 Mbytes of RAM
SPU Interfaces	IEEE-488 HP-IB Interface RS-232C Serial Interface IEEE 802.3/Ethernet LAN Interface with Thin-MAU Two channel DMA Controller RGB High-Res Color Video Output HP-HIL Optional Small Computer Systems Interface (SCSI) Optional High-Speed HP-IB
Monitor	HP 98785A High-Resolution Color, 1024 by 768 resolution.
Keyboard	HP 46021A (HP-HIL)
Operating Systems	HP-UX and NS/ARPA on 3.5-inch disc or 0.25-inch tape.

Table 1-1b. Model 319SRX Workstation Features

Product	Description
System Processing Unit	MC68020 CPU at 16.67 MHz MC68881 Floating Point Co-CPU, 16.67 MHz 4 Mbytes of parity-checking RAM expandable to 16 Mbytes
SPU Interfaces	HP-IB Interface (IEEE-488) with 2-channel DMA controller (one 1-metre HP-IB cable included) RS-232C Serial Interface with DB25 connector IEEE 802.3/Ethernet LAN Interface with ThinMAU and BNC "T" connector HP-HIL Interface with cable Local Graphics Bus Interface Link (2-metre LGB cable included) High-Speed HP-IB Interface
HIL Devices	HP 46021A Keyboard HP 46081A Extension Module
Display Controller	HP 98720A 3D Display Controller, including: HP 98721A Transform Engine HP 98722A Frame Buffer, 8-Plane Total (expandable to 32-planes)
Monitor	HP 98789A 16-inch High-Resolution Color, 1280 by 1024 resolution.
Operating System	HP-UX Rev. 6.2, License to Use AXE; PE; NS-ARPA, NFS Services/300
Options	016: Add one 8-plane frame buffer board to HP 98720A 024: Add two 8-plane frame buffer boards to HP 98720A 032: Add three 8-plane frame buffer boards to HP 98720A 060: Add HP 46060A 2-Button Mouse 084: Add HP 46084A HP-HIL ID Module 108: Add 4 Mbytes RAM for 8 Mbytes total 112: Add 8 Mbytes RAM for 16 Mbytes total 116: Add 12 Mbytes RAM for 16 Mbytes total 719: Substitute HP 98752 19-inch Monitor

Table 1-2. Model 319C+ Workstation Options

Product	Description
Opt. 010	Add High-Speed HP-IB Interface
Opt. 011	Add SCSI Interface (Available early 1988)
Opt. 022	HP-UX on 0.25-inch Tape
Opt. 045	HP-UX on 3.5-inch Disc
Opt. 060	Add HP 46060A Mouse
Opt. 084	Add HP 46084A ID Module
Opt. 108	8 Mbytes of RAM (Replace 4 Mbyte RAM with 8 Mbyte RAM)
Opt. 112	12 Mbytes of RAM (Replace 4 Mbyte RAM with 12 Mbyte RAM)
Opt. 116	16 Mbytes (Replace 4 Mbyte RAM with 16 Mbyte RAM)
Opt. 719	Replace HP 98785A 16-inch Monitor with HP 98751A 19-inch Monitor

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 in the Model 319C+ Service Information Manual, or Chapter 8 in this manual 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 repair services for Model 319C+ and 319SRX Workstation SPU's in five ways:

- Standard System Maintenance Service
- Basic System Maintenance Service
- Priority On-Site Service
- Next Day On-Site Service
- Scheduled On-Site Service

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.

Standard System Maintenance Service

HP will travel to a customer's site and provide all labor, parts, and materials deemed necessary to keep systems in good operating condition. Included are:

- Four-hour coverage, zones 1, 2, and 3.
- Work to completion or until parts are not available.
- Hours of coverage are 8:00 AM to 9:00 PM.

Basic System Maintenance Service

Hewlett-Packard will travel to the customer's site and provide all labor, parts, and materials necessary to maintain the hardware products covered. Parts replaced are new, or their equivalent. Included are:

- Next day coverage, zones 1, 2, and 3.
- Work to completion or until parts are not available.
- Hours of coverage are 8:00 AM to 5:00 PM.



Priority On-Site Service

If the workstation applications call for a high level of availability, Priority On-Site Service offers a four-hour coverage. This service is especially valuable if the customer does not stock spare equipment at his site. Included are:

- Four-hour coverage, zones 1, 2, and 3.
- Hours of coverage are 8:00 AM to 5:00 PM.

Next Day On-Site Service

For Next Day On-Site Service, an HP Customer Engineer goes to the customers site on the next day (Monday through Friday, excluding HP Holidays) after the service call, troubleshoots, and repairs the hardware to the assembly level. The defective assembly is replaced with a new or rebuilt assembly. This service is available through a service contract or a time-and-materials basis. Included are:

- Next day coverage, zones 1, 2, and 3.
- Hours of coverage are 8:00 AM to 5:00 PM.

Scheduled On-Site Service

Provides the lowest on-site support costs for a minimum of twenty-five HP workstation products. HP will make visits to a single central site which the customer specifies. Included are:

- Weekly visits, zones 1, 2, and 3.
- Hours of coverage are 8:00 AM to 5:00 PM.

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:

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



Physical

Dimensions

Height 104 mm (4.1 inches)

Width 325 mm (12.8 inches)

Length 444 mm (17.5 inches)

Weight 4.55 kg (10 pounds) maximum

Vibration Standard Meets Class B requirements

Processor Board

CPU

Type Motorola MC68020

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 to:
4 or 8 Mbytes On-board RAM and
4 or 8 Mbytes Add-On RAM

Floating point Coprocessor

Type Motorola MC68881

Clock Frequency 16.67 Mhz

MMU

Type Motorola MC68851

Clock Frequency 16.67 Mhz

LAN Interface

Media	ThinLAN 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

Serial Interface

Type	RS-232C standard
------	------------------

Capacitor-backed Real-Time Clock

Resolution	10 milliseconds
Accuracy	± 5 seconds/day
Clock life	24 hours

Memory

Size	4 Mbytes or 8 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

Video-SCSI/HP-IB Board

Video Interface

High-Resolution Color

Local Graphics Bus

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

9.1 kg (20 pounds)

Container Dimensions

Width - 533 mm (21 inches)

Length - 584 mm (23 inches)

Depth - 292 mm (11.5 inches)

Cube - 0.085 m³ (3.21 feet³)

HP-HIL Accessories

Table 1-3. HP-HIL Devices

Product Number	Product Name/Description
35723A	Touchscreen Bezel
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

Monitors

The HP 98751A and 98785A High-Resolution Color Monitors are supported with Model 319C+ Workstations.

HP 98789A and 98752A High-Resolution Color Monitors are supported with Model 319SRX Workstations.

System Software

Table 1-4. HP-UX Operating System

Product Number	Description
HP 98515A	HP-UX 5.5 AXE (Single-user)
HP 98595A	HP-UX 5.5 AXE (Multi-user)
HP 98517A	HP-UX 5.2 Pgm. Env. (Single-user)
HP 98597A	HP-UX 5.2 Pgm. Env. (Multi-user)
HP 98518A	HP-UX 5.2 FORTRAN 77 Compiler (Single-user)
HP 98598A	HP-UX 5.2 FORTRAN 77 Compiler (Multi-user)
HP 97055A	HP-UX 5.2 Ada Compiler (Multi-user)
HP 97066A	HP-UX 5.2 Technical BASIC
HP 98678A	Development Env. for Common LISP
HP 98679A	Execution License for Common LISP
HP 50952B	NS-ARPA Services/300 Ntwk. Software
HP 79232U	PROLOG
HP 98674A	Starbase Display List
HP 36590A	HP-UX SNA 3270 for Series 300
HP 36591A	HP-UX Gateway/SNA 3270 for each Series 300

Table 1-5. BASIC Language Systems for Model 319C+ Service Use Only

Product Number	Description
HP 98613D	RAM BASIC 5.1 Language System

Standard Tools

The following tools are needed to service the SPU:

Table 1-6. Standard Tools

Part/Product Number	Description
9300-0933	Anti-static workstation T-10 Torx® screwdriver
8720-0001	3/16-inch nutdriver
8720-1219	5mm nutdriver 9/32-inch nutdriver
8720-0007	1/2-inch nutdriver 5/8-inch open-end wrench
HP 3476B	Digital Multimeter



SPU/System Tests

These diagnostic tools will test all functions of the SPU except the LGB circuits on the LGB/HP-IB board in the Model 319SRX Workstation's SPU. Refer to Table 1-9 for diagnostics for the LGB circuit diagnostics.

Table 1-7. Series 200/300 Test Tools

Part No.	Description
09800-12300	Series 200/300 Test Tools, eight 3.5-inch discs

Table 1-8. Series 200/300 Test Tools 3.5-inch Discs

Part No.	Contents
09800-90001	Series 200/300 Test Tools Manual
09800-10336	Series 200 Computer Tests Disc Rev. 1.1
09800-10334	Series 300 Computer Tests Disc Rev. 2.0
	Series 200/300 System Functional Tests Discs:
09800-11334	SFT0 Disc Rev. 1.2
09800-11335	SFT1 Disc Rev. 1.2
09800-11336	SFT2 Disc Rev. 1.2
09800-11337	SFT3 Disc Rev. 1.2
09800-11338	SFT4 Disc Rev. 1.2
09800-1130	CS/80 Exerciser Disc Rev. 3.1

Table 1-9. Model 319SRX Workstation's LGB Diagnostics

Part No.	Description
HP-UX 6.2	CE.utilities 98720

Technical Information/ Installation/PM

2

Technical Information

Note

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

Electrical

Line voltage/frequency	120 V ac @ 48-66 Hz 240 V ac @ 48-66 Hz
Line transient spike immunity (1 nsec rise, 800 nsec duration)	1 KV dc
Power Consumption	110 Watts maximum
Current Requirements	1.9 A @ 120 V ac 1.0 A @ 240 V ac
Maximum Heat Dissipation	380 BTU/hr 112 Kcal/hr
Capacitor Back-up	Real-Time Clock on Processor Board

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	104 mm (4.1 inches)
Width	325 mm (12.8 inches)
Length	444 mm (17.5 inches)
Weight	4.55 kg (10 pounds) maximum
Vibration Standard	Meets Class B requirements

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	9.1 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)



Preventive Maintenance

There is no preventive maintenance requirement for the Model 319C+ and 319SRX Workstation's SPU.

Configuration

Bundled Systems

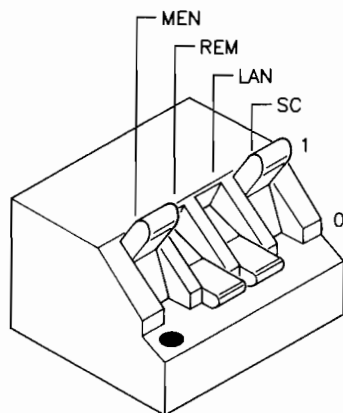
Refer to the current *HP 9000 Series 300 Price List* to determine what HP products are bundled into this systems.

Supported Configurations

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

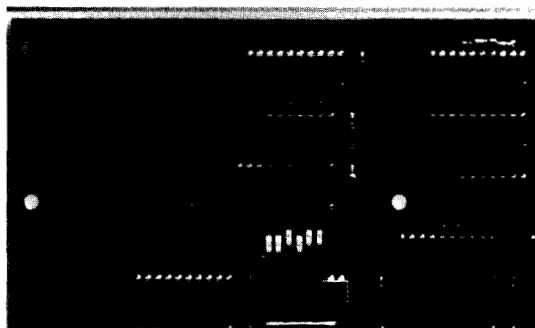
SPU Configuration Switches

Table 3-1a. 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 3-1b. Model 319SRX 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 ₁₆ .
FB	Must be set to 0. Sets frame buffer starting address to 200000 ₁₆ .



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 ¹	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 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 Reade	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

Analytic Troubleshooting

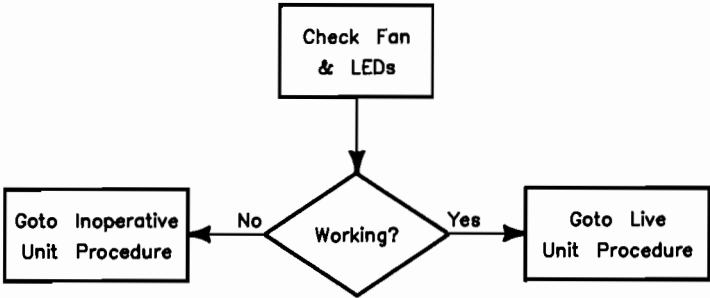
Troubleshooting SPUs is the process of getting answers to these five questions:

- 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?

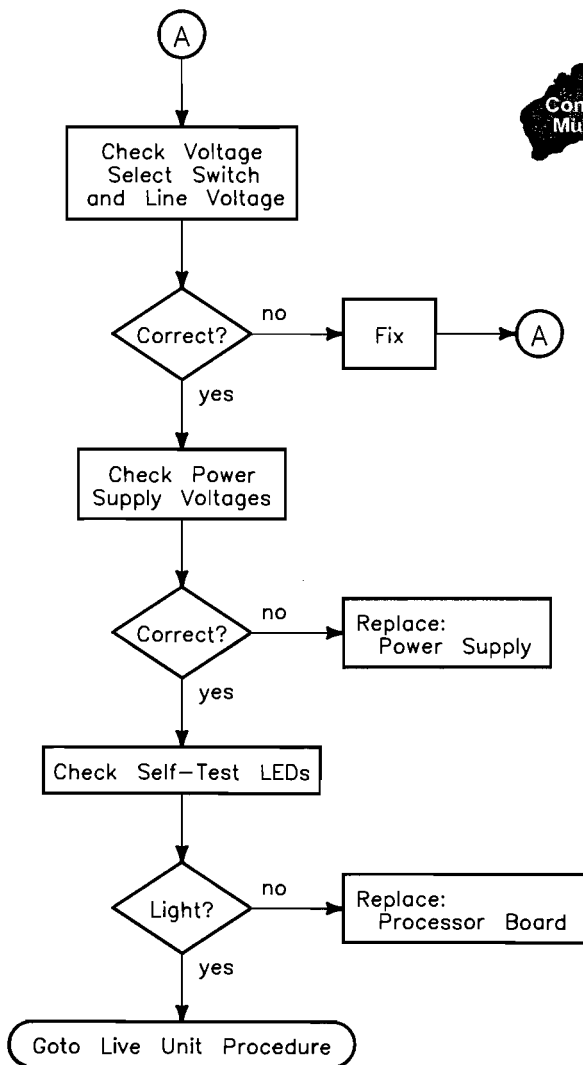
Getting the answers to these questions usually makes the troubleshooting process much more effective and less costly. When a failure in a workstation occurs, remember these questions and get the answers to each of them.

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.

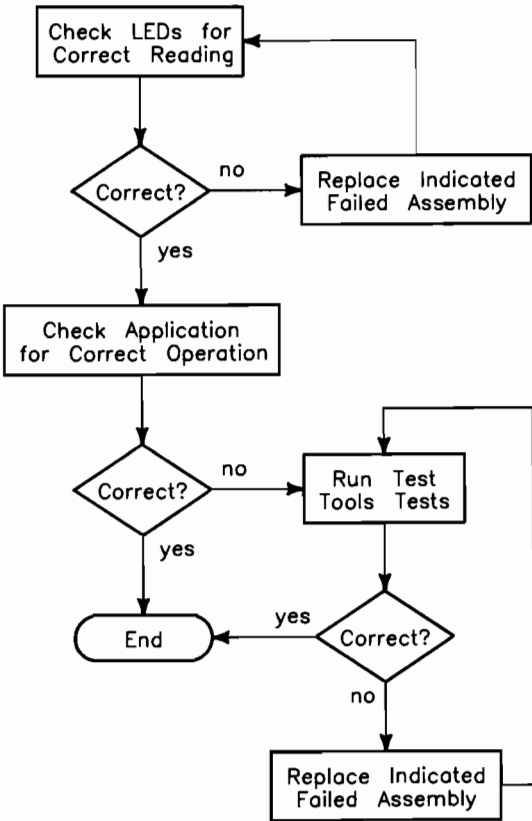
Initial Troubleshooting Flowchart



Inoperative Unit Troubleshooting Flowchart



Live Unit Troubleshooting Flowchart



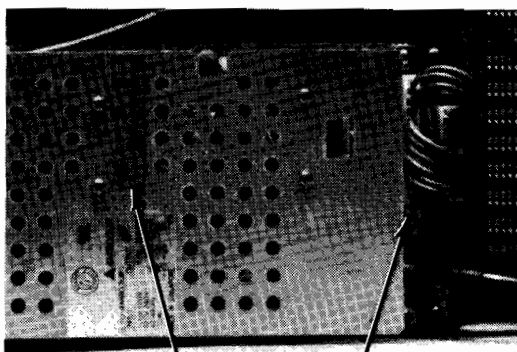
Power Supply Technical Information

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



Voltage Reference Test Points

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
State Indication Only Required Device Missing or DTACK Failure Failing Device Special Codes (Special Case Highest Priority Codes)	00ss ssss, Where ss ssss Indicates State of Power-up 0•dd dddd, where dd dddd Indicates Device •0dd dddd, where dd dddd Indicates Device •••• •••• LEDs Never Accessed (or Unused Code) 0••• •••• LEDs Failed to DTACK 0000 0•0• Timer on processor board has failed or is missing.

State or Device Codes Via Lower 6 LEDs	LED Pattern General Description of Failure
Miscellaneous (Highest Priority) Internal Peripheral Failure (Medium Priority) I/O Failure (Lowest Priority)	xx00 ffff Where ffff indicates Failure (xs are don't-care bits) xx0• pppp Where pppp is Peripheral Number xx•s ssss Where s ssss is Select Code

Boot ROM Error Codes

Table 4-2. Boot ROM LED Error Codes

LEDs	Probable Cause	Replace or Do
oooo oooo	No Failure Detected	
oooo oooo	CPU Timer Missing	Processor Board
oooo oooo	Top RAM Failed	Check RAM Configuration.
oooo oooo	LEDs failed to acknowledge	Processor Board
oooo oooo	CPU Failed	Processor Board
oooo oooo	Boot ROM Failed Checksum	Processor Board
oooo	Top RAM Failed	Processor Board.
oooo oooo	RAM Failure	Add-On RAM Board. Processor Board.
oooo oooo	Insufficient RAM	Processor Board.
oooo oooo	Keyboard Controller Failed	Processor Board.
oooo oooo	HP-IB Failed	Processor Board.
oooo oooo	DMA Failed	Processor Board.
oooo oooo	Bit Map Font Failed	Video Board (319C+). Check Graphics Station (319SRX)
oooo oooo	Bit Map Font Failed	Video Board (319C+). Check Graphics Station (319SRX)
oxxx xxxx	I/O at xx xxxx Failed	I/O at Select Code xx xxxx.
oooo oooo	LEDs Never Accessed	Check -12 V dc. If okay, replace replace Power Supply.

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

Boot ROM State Codes

Table 4-3. LED State Codes In Numerical Order

LEDs	Test Activity
0000 0000	No failure
0000 0001	LED ripple (all on, then off in sequence from MSB)
0000 0010	Resetting I/O
0000 0011	Checksumming Boot ROM (or LED ripple)
0000 0100	Testing top RAM (or maybe the Boot ROM checksum failed)
0000 0101	Searching for boot extension ROMs
0000 0110	Starting test vector list (or LED ripple)
0000 0111	Preloading RAM
0000 1000	Testing RAM
0000 1001	LED ripple
0001 0000	Testing keyboard circuit (or an interrupt line is stuck)
0001 0001	Testing processor HP-IB
0001 0010	Testing DMA
0001 0011	Checksumming ID/INIT ROM
000x xxxx	Testing I/O at select code x xxxx



SPU Tests

Series 200/300 Test Tools

Series 200/300 Test Tools do not have tests for the Model 319SRX SPU local graphics bus interface or the HP 98720A Display Controller. Test Tools may be used to test the Model 319SRXes 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 98720 on the HP-UX operating system.

Package Contents

The combined Series 200/300 Test Tools software package is provided on both 3.5-inch discs and 0.25-inch tape as shown below:

Part Number	Description
09800-12300	Series 200/300 Test Tools, eight 3.5-inch discs
98561-10835	Series 200/300 Test Tools, one 0.25-inch tape

Discs in the 3.5-inch disc package are listed in Table 5-1.



Table 5-1. Series 200/300 Test Tools 3.5-inch Disc Package Contents

Part Number	Contents
09800-90001	Series 200/300 Test Tools Manual
98561-10334	Series 300 Computer Tests Disc Rev. 2.0
	Series 200/300 System Functional Tests Discs:
09800-11334	SFT0 Disc Rev. 1.2
09800-11335	SFT1 Disc Rev. 1.2
09800-11336	SFT2 Disc Rev. 1.2
09800-11337	SFT3 Disc Rev. 1.2
09800-11338	SFT4 Disc Rev. 1.2
09800-11304	CS/80 Exerciser Disc Rev. 3.1

Model 319SRX LGB Diagnostics

HP-UX operating systems, Revision 6.2 and later are supported on the Model 319SRX Workstation.

Included in the HP-UX operating system is the *CE.utilities* diagnostics. These diagnostics provide a convenient way to troubleshoot the Model 319SRX 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 assemblies 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 of the diagnostics, type:

`./START` `Return`

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 3-1.

Press `Y` `Return` to answer yes.

Press `Return` 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 `Return` 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 319SRX Workstation. The five control space switches on the SPU's LGB\HP-IB board must be set to 01011₂ which is the binary equivalent of address 11₁₀.

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

Model 319SRX 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_mdddhmm` 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 *
* C = Continue           *
* M = Add Memo to Data   *
```

* 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 5-2) 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 319SRX 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:

```
#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 5-2. 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

6

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

8

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:

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

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

Name: _____

Address: _____

City, State ZIP: _____

Telephone: _____

Exchange Parts

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

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

Part Number Lists

The parts listed in this section apply to only the SPU used in the Model 319C+ Workstation, unless noted otherwise. Various accessories and HP-HIL devices are also listed.

Static-Free Bags

Part No.	Description	Notes
9222-0980	9-inch by 15-inch cushioned pouch.	

SPU Electrical Parts

Miscellaneous Electrical Parts

Part No.	Description	Notes
98564-61604	Power distribution cable	
98564-62701	Line filter	
98573-61600	HP-IB connector/cable	
09125-68500	Fan	

Printed Circuit Boards

Exchange Part No.	New Part No.	Description	Notes
	0950-1894	Power supply	
98564-69510	98564-66510	Processor board w/4 Mbyte	
98564-69511	98564-66511	Processor board w/8 Mbyte	
98564-69520	98564-66520	Add-on RAM board, 4 Mbyte	
98564-69521	98564-66521	Add-on RAM board, 8 Mbyte	
98564-69570	98564-66570	Video board	
98564-69571	98564-66571	Video board w/SCSI	
98564-69572	98564-66572	Video board w/HS HP-IB	
98573-69580	98573-66580	LGB/HS HP-IB board	

HP-HIL Devices

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

SPU Case Parts

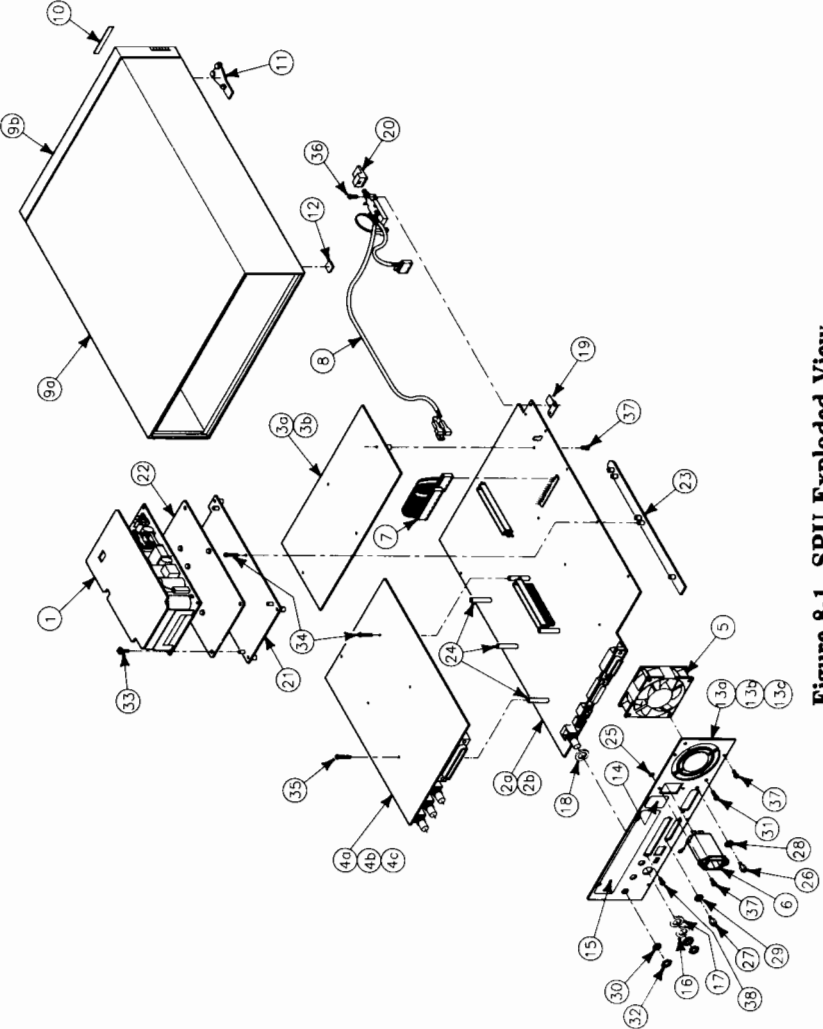


Figure 8-1. SPU Exploded View

SPU Parts List

Ref.	Part Number	Description
1	98564-67002	Power Supply
2a	98564-66510	Processor board/4 Mb
2b	98564-66511	Processor board/8 Mb
3a	98564-66520	4 Mb Add-On RAM board
3b	98564-66521	8 Mb Add-On RAM board
4a	98564-66570	Video board
4b	98564-66571	Video-SCSI board
4c	98564-66572	Video-HS HP-IB board
4d	98573-66580	LGB/HP-IB board
5	5180-1336	Fan
6	98564-62701	Line filter
7	98564-61602	Power distribution cable
8	98564-61602	ON/OFF cable
9a	5001-9025	* Case
9b	35751-40001	* Front Panel
10	98561-84002	* Label, name
11	09121-48303	Molded foot
12	0403-0427	* Bumper
13a	5001-9027	Rear panel (standard)
13b	5001-9026	Rear panel for SCSI
13c	5001-9029	Rear panel for HS HP-IB
13d	98573-60200	Rear panel for LGB/HP-IB
14	98564-84002	Label, 120/240 volt
15a	98564-84001	Label, model/serial (319C+)
15b	98573-84001	Label, model/serial (319SRX)

Parts identified by an asterisk (*) are required when either the case or front panel need replaced. The front panel cannot be removed from the case.

SPU Parts List (cont.)

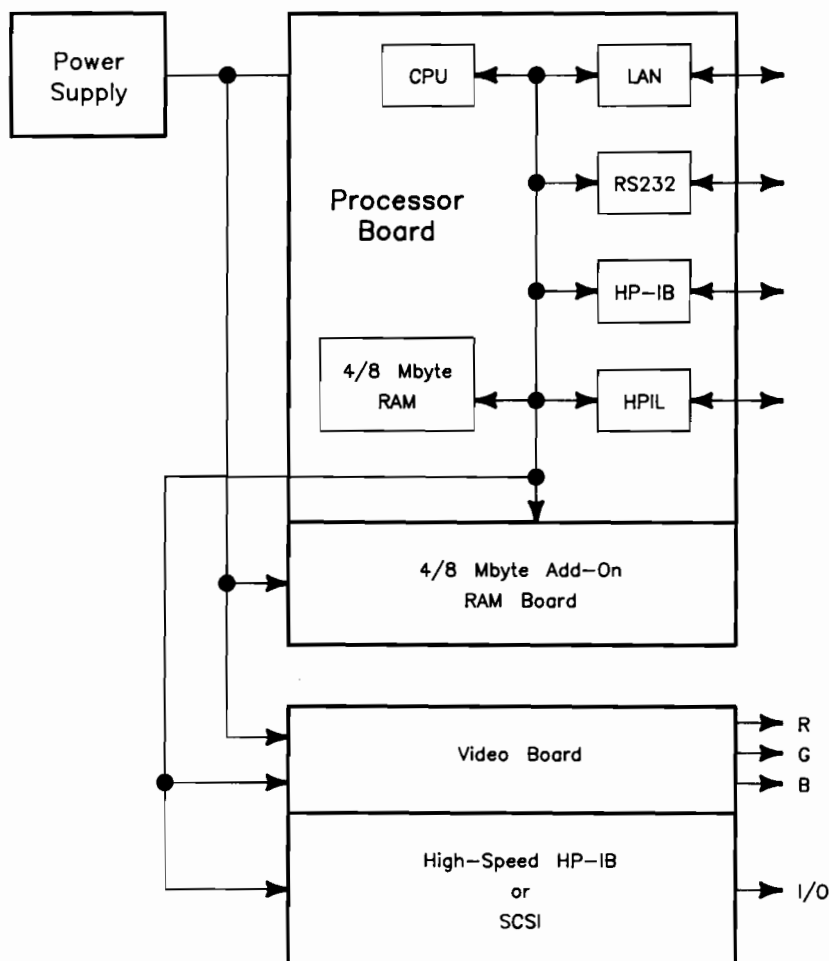
Ref.	Part Number	Description
16	3050-0604	Flat washer
17	0160-6777	Capacitor/washer
18	3050-1291	Shoulder washer
19	5001-9030	Tongue bracket
20	5041-2424	ON/OFF keycap
21	5001-9028	Power supply plate
22	5041-2426	Power supply insulator
23	5041-2423	Rail
24	0380-1947	Spacer, 33 mm
25	0505-0082	Hex nut
26	0380-0643	HP-IB jack screw
27	1251-7812	RS-232 jack screw
28	2190-0407	Lock washer, internal tooth
29	2190-0054	Lock washer, internal tooth
30	2190-0409	Lock washer, internal tooth
31	0624-0525	10-24 self-tapping screw
32	2940-0256	Double hex nut
33	0515-1919	Screw/washer assembly
34	0624-0706	Torx screw, 0.94-in. long
35	0624-0707	Torx screw, 1.75-in. long
36	0515-1851	Screw, M3 by 6 mm
37	0515-0372	Torx screw, M3
38	2200-0104	Flat-head screw
39	98573-61600	HP-IB cable/connector



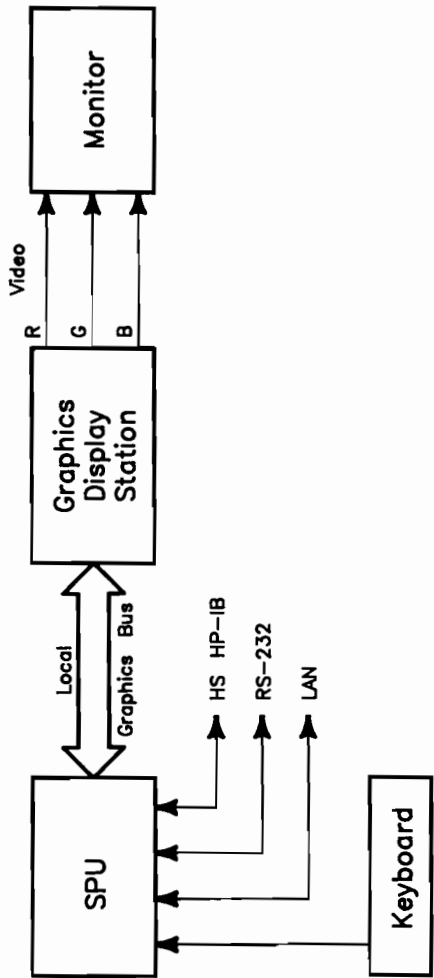
Diagrams

9

Model 319C+ SPU Block Diagram



Model 319SRX SPU Block Diagram



Power Supply

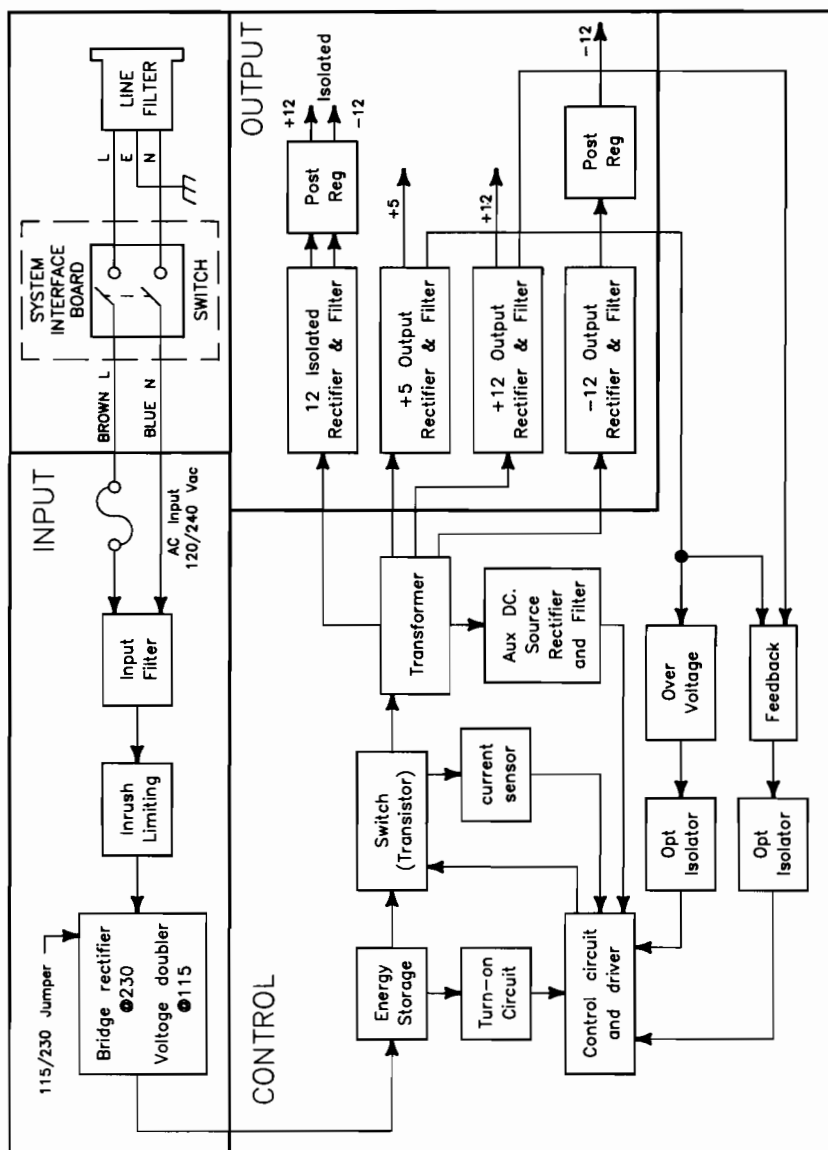
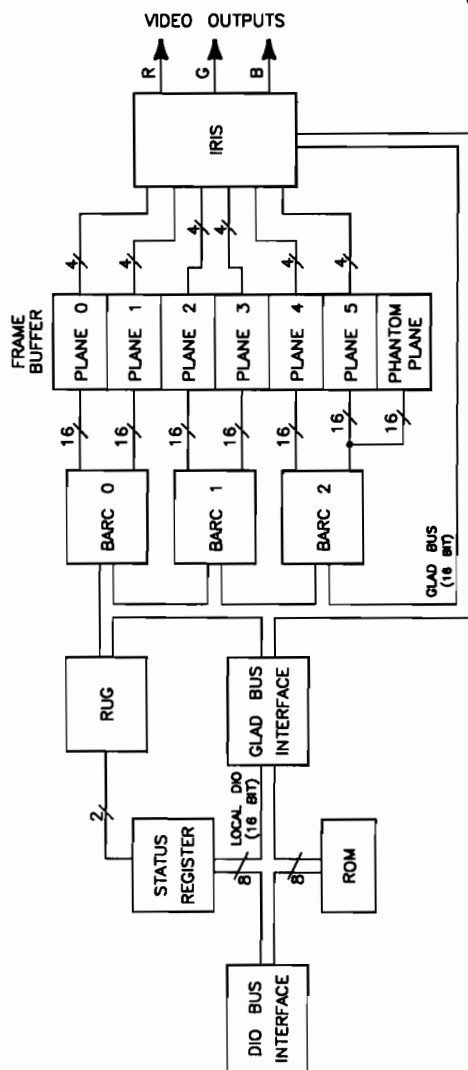


Figure 1

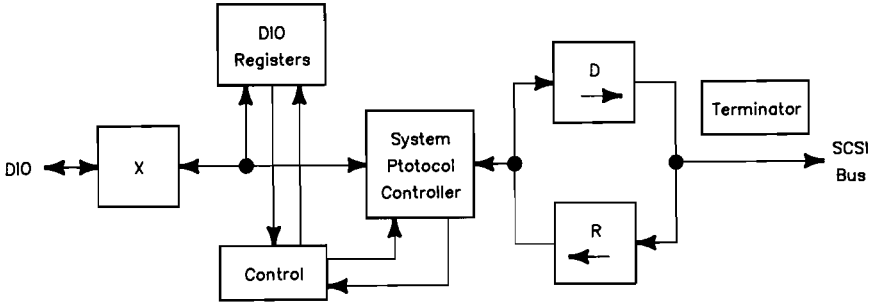


Video-HS HP-IB/SCSI Board

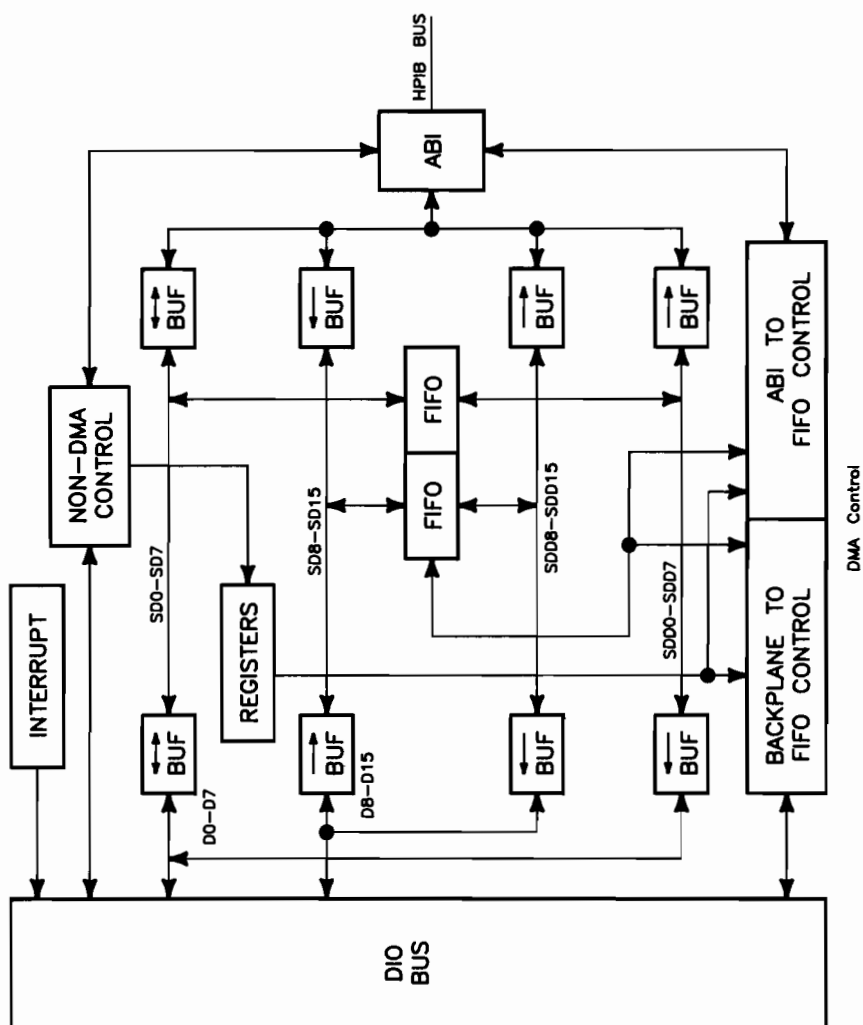
Video Circuit



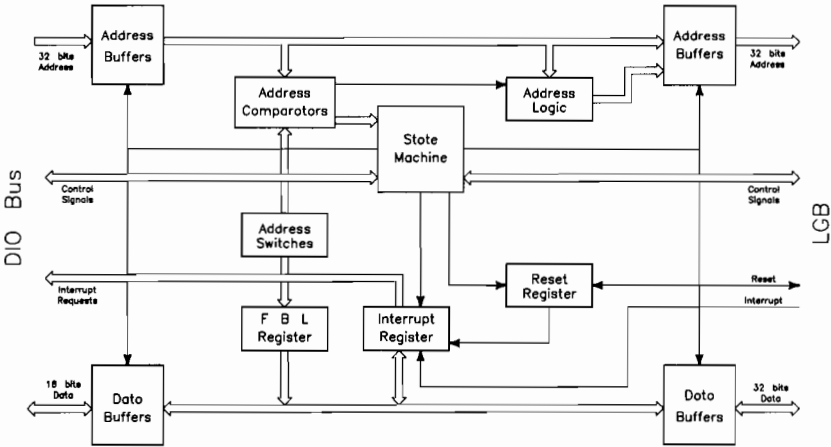
SCSI Circuit



High-Speed HP-IB Circuit



Local Graphics Bus Interface Circuit



Local Graphics Bus Connector Pinout

Pin No.	Line Function	Pin No.	Line Function	Pin No.	Line Function	Pin No.	Line Function
1	SPO	19	Ground	37	Ground	55	GAD20
2	HIL-I	20	GAD21	38	HIL-O	56	Ground
3	Ground	21	GAD23	39	Ground	57	GAD22
4	Ground	22	Ground	40	GAD0	58	GAD24
5	GAD1	23	GAD25	41	GAD2	59	Ground
6	GAD3	24	GAD27	42	Ground	60	GAD26
7	Ground	25	Ground	43	GAD4	61	GAD28
8	GAD5	26	GAD29	44	GAD6	62	Ground
9	GAD7	27	GAD31	45	Ground	63	GAD30
10	Ground	28	Ground	46	GAD8	64	<u>GDS0</u>
11	GAD9	29	<u>GDS1</u>	47	GAD10	65	Ground
12	GAD11	30	<u>GDS3</u>	48	Ground	66	<u>GDS2</u>
13	Ground	31	Ground	49	GAD12	67	<u>GDTACK</u>
14	GAD13	32	<u>GAS</u>	50	GAD14	68	Ground
15	GAD15	33	<u>GR/W</u>	51	Ground	69	<u>GINT_H</u>
16	Ground	34	Ground	52	GAD16	70	<u>GBR</u>
17	GAD17	35	<u>GRESET</u>	53	GAD18	71	Ground
18	GAD19	36	<u>GBCACK</u>	54	Ground	72	<u>GBG</u>



Hardware Support Documentation

Part Number	Manual Title
09000-90041	HP 9000 Series 200/300/500 Site Preparation Manual
98561-90020	Series 300 Configuration Reference Manual
09800-90001	HP 9000 Series 200/300 Test Tools Manual
98564-90000	HP 9000 Series 300 Model 319SRX Workstation's SPU Familiarization Guide
98564-90030	HP 9000 Series 300 Model 319C+ Workstation's SPU Service Information Manual
98564-90099	HP 9000 Series 300 Model 319C+ Workstation's SPU Self-Paced Hardware Training Guide



Service Notes

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