Service Handbook

HP 9000 Series 300 Computers
Model 319C+

HP Part Number 98564-90039

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

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

Service Information	SIM	SHB	CRM	TTM	SPM	IRM	PIN	TDS
Assembly replacement	2							
Block diagrams	1, 2	9						
Booting Operating Systems	4							
Computer tests	1, 5	2		1, 2, 3				
Configurations	1	3				All		All
CS/80 tests	1, 5	5		4				
Electrical requirements	1	1			3, A			*
Environmental requirements	1	2			4, A			*
Functional descriptions	3							
HP-HIL device tests				2, 3				
Installation	2	2	All		All	All	All	
I/O Bus architecture	1, 3							
Monitors	1	3	All		A	1		*
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						
Part numbers	6	8	All					
Peripherals	1	3	All					*
Preventive maintenance		2						
Product information	1	1	All		All	All	All	All
Product numbers	1	1, 3	All		A			All
Reference material	7	10	*			All		All
Self-tests	4, 5	5		1, 2				
Service notes	1	11						
Site preparation		2			All			
System Functional Tests	1, 5	5		1, 3				
Systems	1	3	All			All		*
Troubleshooting	5	4		All				
Turn-on	3, 4	4, 5				2		

Table of Contents

Chapter 1: Product Information

Introduction 1
Features 1
Hewlett-Packard Support 3
Repair Philosophy 3
HP Repair Services 4
Repair by Customers 5
Operating Systems Support 5
Serial Numbers 7
Technical Data 8
Physical 8
Processor Board 8
I/O Bus 9
Video-SCSI/HP-IB Board 10
Shipping Information 10
HP-HIL Accessories 11
Monitors 12
System Software 12
Standard Tools 13
SPU/System Tests 14

Chapter 2: Technical Information/Installation/PM

Technical Information 15
Electrical 15
Environmental 16
Electromagnetic Interference 16
Regulatory Requirements 16
Physical 16
Shipping Information 17
HP-HIL and Video Accessories 17
Preventive Maintenance 19

Chapter 3: Configuration
Bundled Systems 21
Supported Configurations 21
SPU Configuration Switches 22
HP-HIL Accessories 23

Chapter 4: Troubleshooting
Analytic Troubleshooting 25
Initial Troubleshooting Flowchart 26
Dead Unit Troubleshooting Flowchart 27
Live Unit Troubleshooting Flowchart 28
Power Supply Technical Information 29
Voltage Indicators 29
General Failure Indications 30
Boot ROM Error Codes 31
Remote SPU Analysis 32
Boot ROM State Codes 33

Chapter 5: SPU Tests
Test Tools 35
Package Contents 35

Chapter 6: Adjustments

Chapter 7: Peripherals
Supported Peripherals List 39

Chapter 8: Parts Lists
Parts Information 41
Introduction 41
Exchange Parts 42
Part Number Lists 42
Static-Free Bags 42
SPU Electrical Parts 42
HP-HIL Devices 44
SPU Case Parts 45
SPU Parts List 46

Chapter 9: Diagrams
SPU Block Diagram 49
Power Supply 50
Processor/Add-On RAM Board 51
Video-HS HP-IB/SCSI Board 52
Video Circuit 52
SCSI Circuit 53
High-Speed HP-IB Circuit 54

Chapter 10: Reference
Hardware Support Documentation 55

Chapter 11: Service Notes
Notes 58

Product Information 1

Introduction

Information in this handbook refers to the HP 9000 Series 300 Model 319c+ Workstation's SPU.

Features

Table 1-1. Model 319C+ Workstation Features

Product Number	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 ThinMAU 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 1-2. Model 319C+ Workstation Options

Product Number	Description
Options Available	
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. 305	Add HP 50952B Opt. 022 NS-ARPA on 0.25-inch Tape
Opt. 306	Add HP 50952B Opt. 045 NS-ARPA on 3.25-inch Disc
Opt. 751	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, 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 repair services for Model 319C+ Workstation SPU's in four ways:

- Priority On-Site Service
- Next Day On-Site Service
- Standard System Maintenance 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.

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.

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, exluding 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.

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

- Corrective and Preventive Maintenance.
- Engineering improvements.
- Site environmental survey.

HP will utilize a customer-owned diagnostic modem used with the HP Support Link to test equipment covered the contract.

Scheduled On-Site Service

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

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:

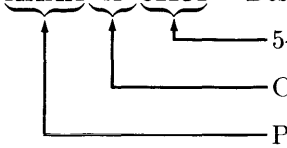
- Additional System Coverage extends AMS or RCS coverage on the operating system to one additional system under the same system manager. All support is delivered through the central system.
- Extended Materials Support extends SMS by providing the right to make one copy of all central system materials 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.
XXXX A 01234

Location: On the outside of the rear panel.

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 Data

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

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 $feet^3$)

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 98551A and 98785A High-Resolution Monochrome Monitor is supported with Model 319C+ 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 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

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
98561-10334	Series 300 Computer Tests Disc Rev. 2.0
	Series 200/300 System Functional Tests Discs:
09800-00334	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

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

Regulatory Requirements

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

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 $feet^3$)

HP-HIL and Video Accessories

Table 2-1 lists HP-HIL and video accessories compatible with the Model 319C+ Workstations. For a complete list, consult the *HP 9000 Series 300 Model 319C+ Workstation's Hardware Price List.*

Table 2-1. HP-HIL Devices

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

Preventive Maintenance

There is no preventive maintenance requirement for the Model 318M Workstation's SPU.

Configuration 3

Bundled Systems

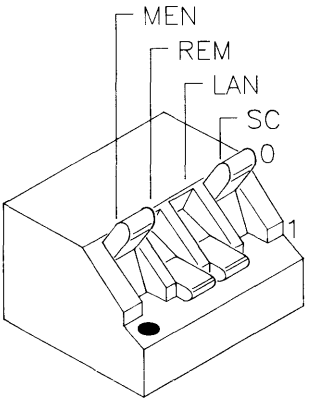
Refer to the current *HP 9000 Series 300 Price List* to determine what HP products are bundled into this systems.

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 3-1. 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

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 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 Reader	100	1.2

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

Troubleshooting 4

Analytic Troubleshooting

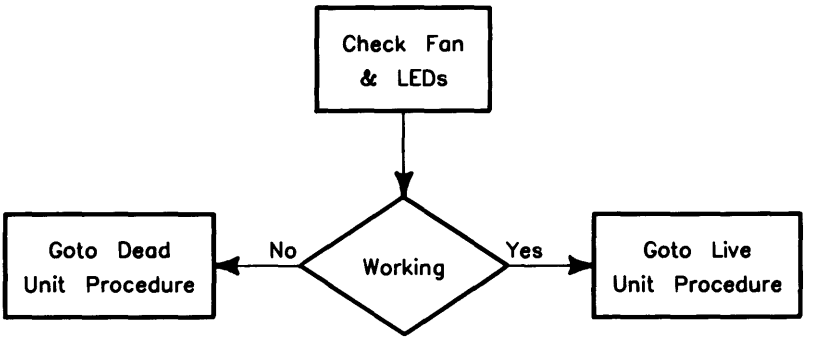
Troubleshooting SPUs is the process of getting answers to these five questions:

- 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?

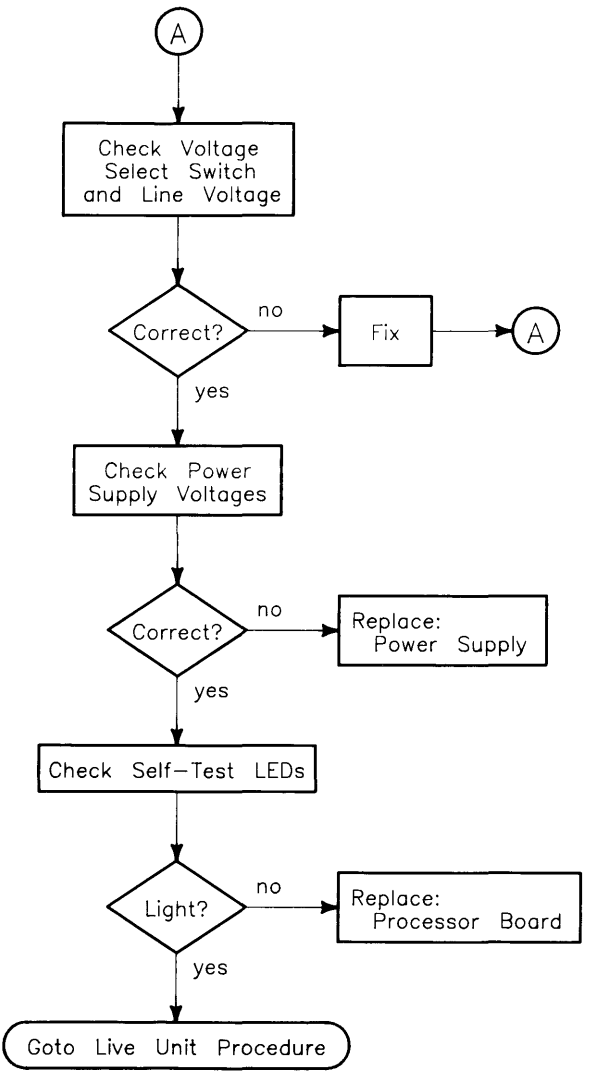
Getting the answers to these questions usually makes the troubleshooting process much more effective and less costly. When a failure in a workstation occurs, remember these questions and get the answers to each of them.

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.

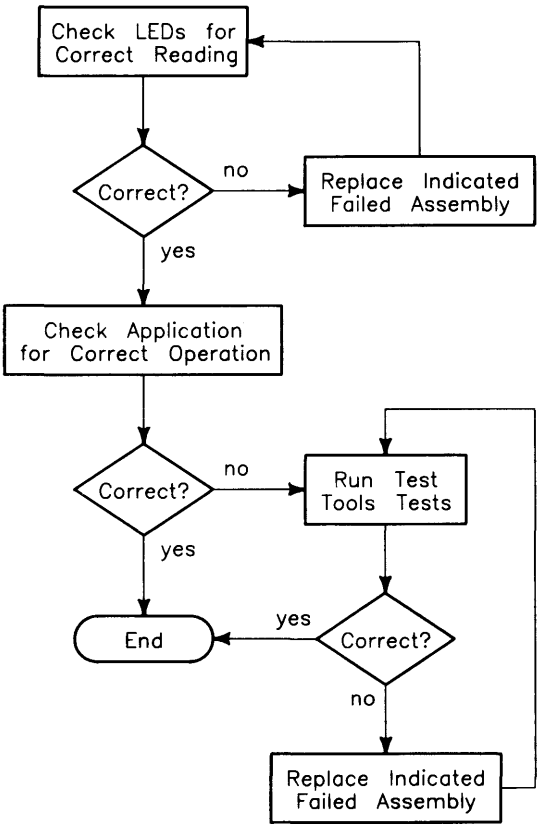
Initial Troubleshooting Flowchart



Dead 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

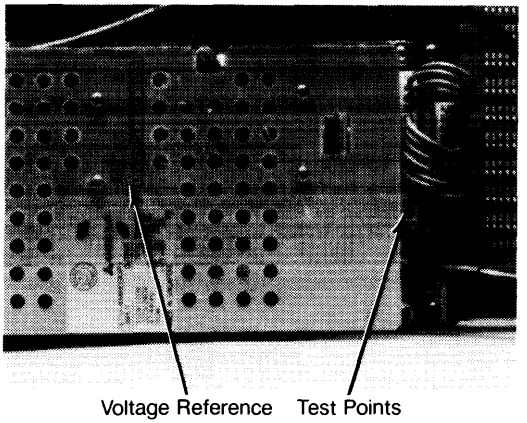


Figure 4-1. Power Supply Test Points

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

State or Device Codes Via Lower 6 LEDs	**LED Pattern General Description of Failure**
Miscellaneous (Highest Priority)	xx○○ ffff Where ffff indicates Failure (xs are don't-care bits)
Internal Peripheral Failure (Medium Priority)	xx○● pppp Where pppp is Peripheral Number
I/O Failure (Lowest Priority)	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
○○○○ ○○○○	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	Processor Board.
●○○○ ●○○●	RAM Failure	Add-On RAM Board. Processor Board.
●○○○ ●○●○	Insufficient RAM	Processor Board.
●○●● ○○●○	Keyboard Controller Failed	Processor Board.
●○○● ○●○○	HP-IB Failed	Processor Board.
●○○● ●○○○	DMA Failed	Processor Board.
●○○● ●●○○	Bit Map Font Failed	Video Board.
●○○● ●●○●	Bit Map Failed	Video Board
●○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.

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 •oo•, where o represents a low beep, • represents a high beep and x represents an unbeeped high or low. Referring to the table of Boot ROM Error Codes shows a RAM Failure as the probable cause.

Boot ROM State Codes

Table 4-3. LED State Codes In Numerical Order

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

SPU Tests 5

Test Tools

Package Contents

The combined Series 200/300Test 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

Discs in the 3.5-inch disc package are listed below.

Part Number	Contents
09800-90001	Series 200/300 Test Tools Manual
09800-10336	Series 200 Computer Tests Disc Rev. 1.1
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

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 7

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
98564-61602	Power distribution cable	
98564-62701	Line filter	
09125-68500	Fan	

Printed Circuit Boards

Exchange Part No.	New Part No.	Description	Notes
	0950-1894	Power supply	
98564-69508	98564-66508	Processor board w/4 Mbyte	
98564-69509	98564-66509	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	

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

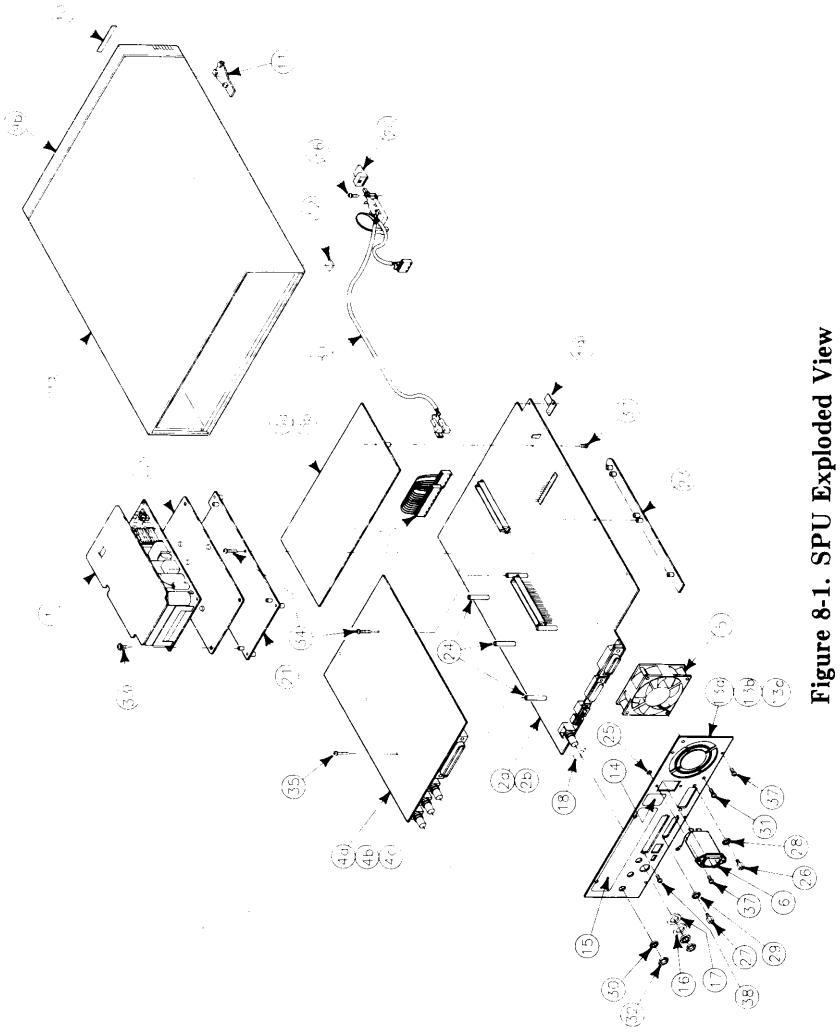


Figure 8-1. SPU Exploded View

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
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
14	98564-84002	Label, 120/240 volt
15	98564-84001	Label, model/serial

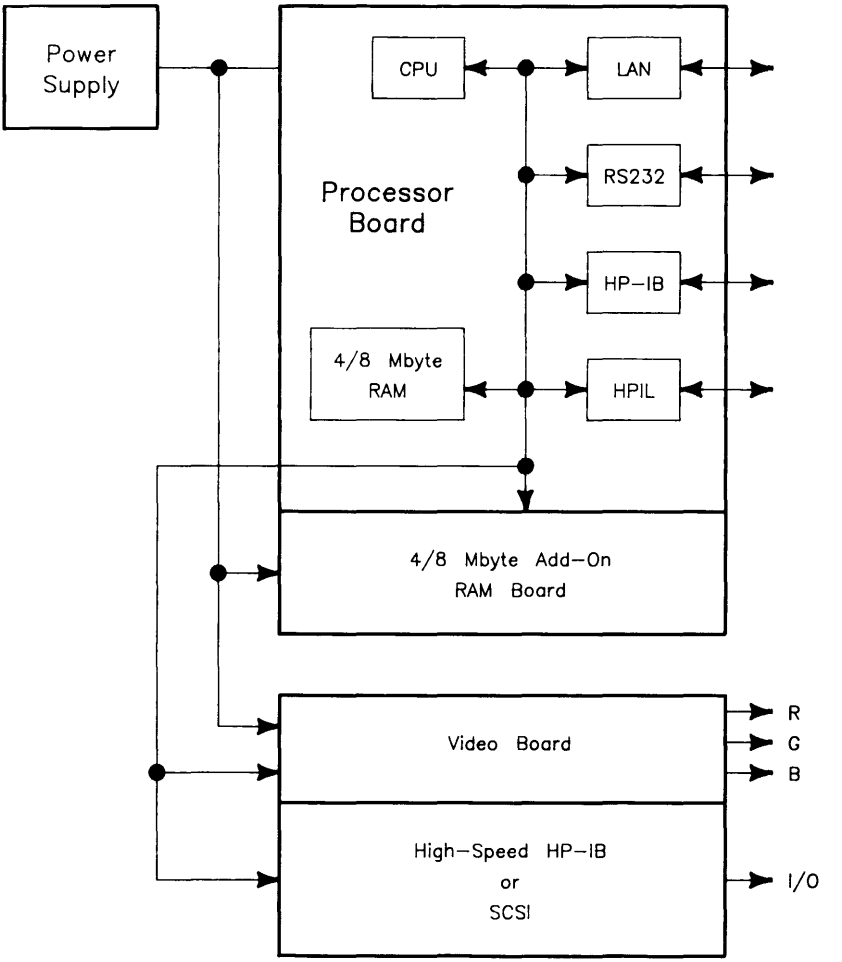
Parts identified by an asterisk (*) are required when either the case or front panel need replaced. The front panel cannot be removed from the case.

SPU Parts List (cont.)

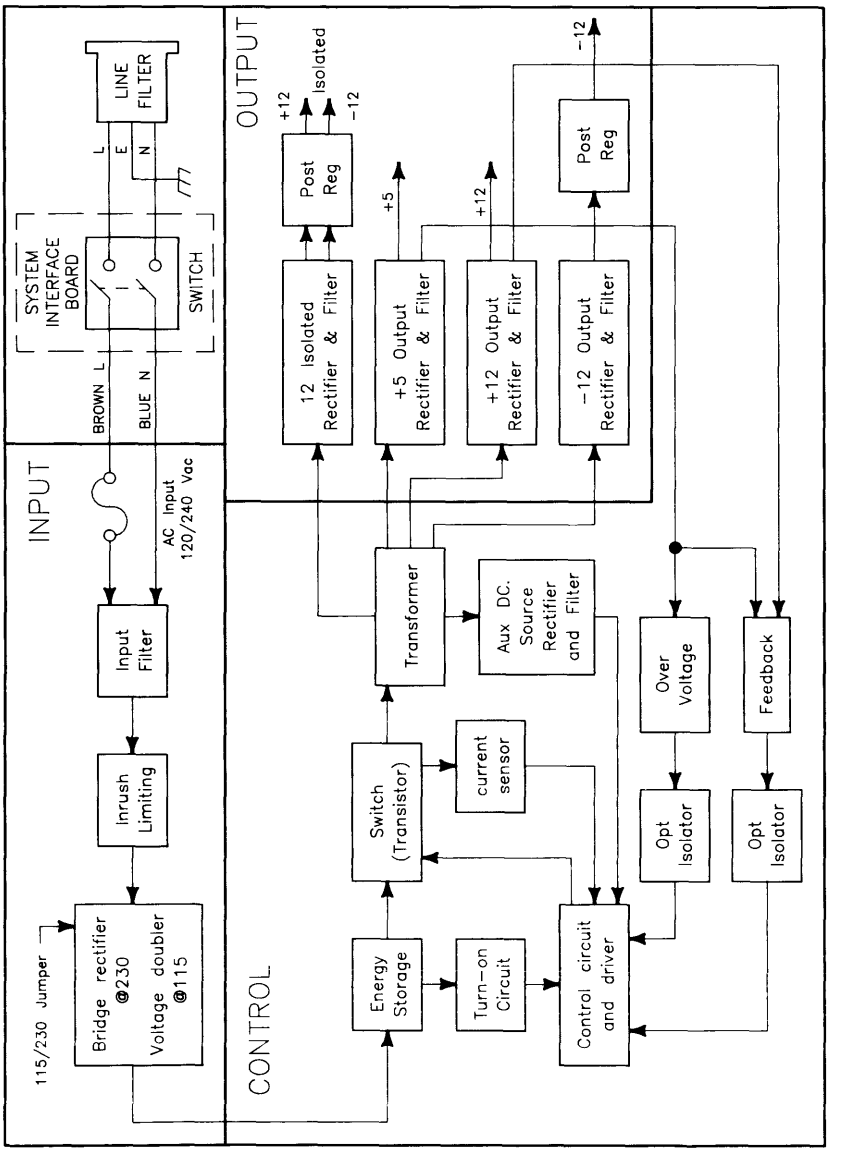
Ref.	Part Number	Description
16	3050-0604	Flat washer
17	0160-6777	Capacitor/washer
18	3050-1291	Shoulder washer
19	5001-9030	Tongue bracket
20	5041-2424	ON/OFF keycap
21	5001-9028	Power supply plate
22	5041-2426	Power supply insulator
23	5041-2423	Rail
24	0380-1947	Spacer, 33 mm
25	0505-0082	Hex nut
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

Diagrams 9

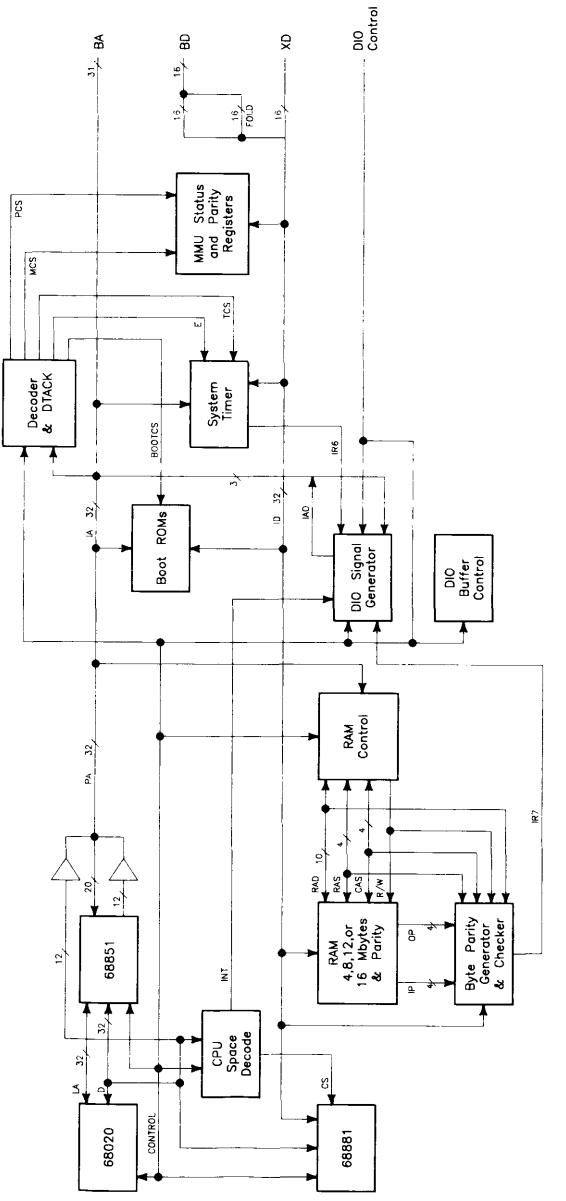
SPU Block Diagram



Power Supply

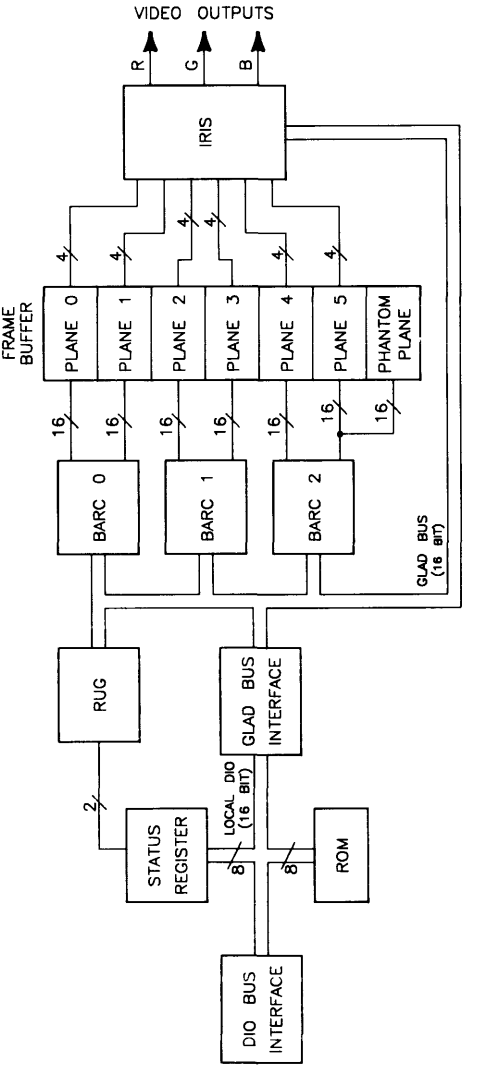


Processor/Add-On RAM Board

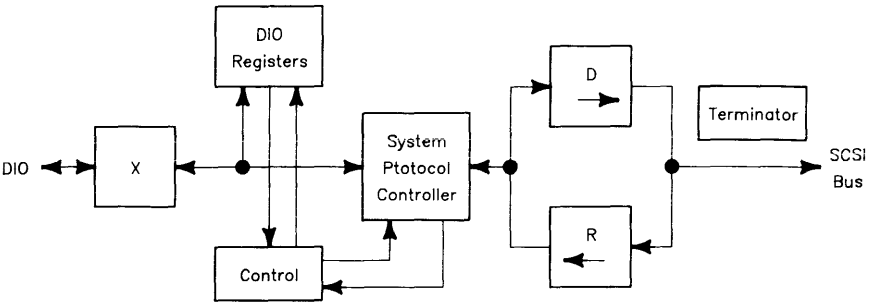


Video-HS HP-IB/SCSI Board

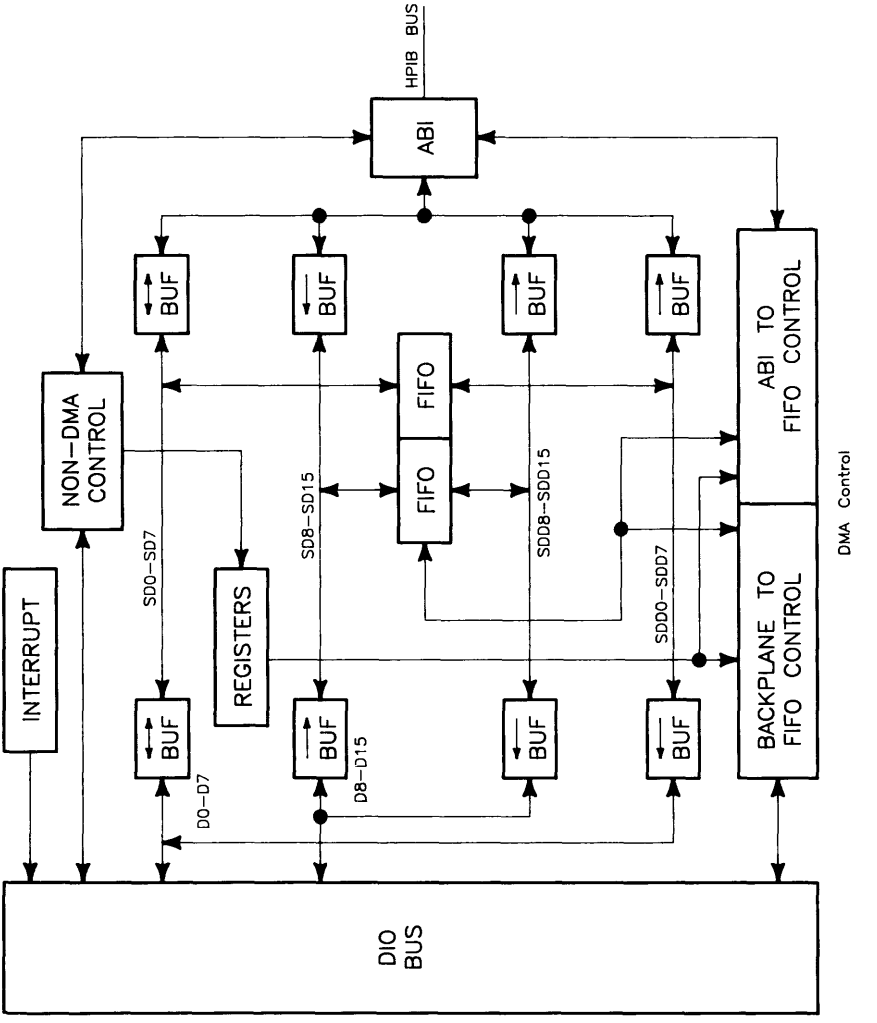
Video Circuit



SCSI Circuit



High-Speed HP-IB Circuit



Reference 10

Hardware Support Documentation

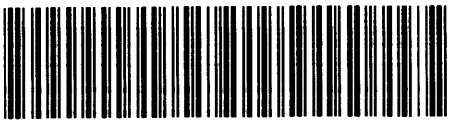
Part Number	Manual Title
09000-90041	HP 9000 Series 200/300/500 Site Preparation Manual
98561-90020	Series 300 Configuration Reference Manual
98562-90005	HP 9000 Series 200/300 Test Tools Manual
98564-90030	HP 9000 Series 300 Model 319C+ Workstation's SPU Service Information Manual
98564-90039	HP 9000 Series 300 Model 319C+ Workstation's SPU Service Handbook
98564-90099	HP 9000 Series 300 Model 319C+Workstation's SPU Self-Paced Hardware Training Guide

Service Notes 11

Notes

HP Part Number
98564-90039

Microfiche No. 98564-99039
Requires Binder No. 9282-0683
Printed in U.S.A. 11/87



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