Service Handbook

HP 9000 Series 300 Computers
Model 318

HP Part Number 98563-90039

Hewlett-Packard Company
3404 East Harmony Road, Fort Collins, Colorado 80525

NOTICE

The information contained in this document is subject to change without notice.

HEWLETT-PACKARD MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MANUAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Hewlett-Packard shall not be liable for errors contained herein or direct, indirect, special, incidental or consequential damages in connection with the furnishing, performance, or use of this material.

WARRANTY

A copy of the specific warranty terms applicable to your Hewlett-Packard product and replacement parts can be obtained from your local Sales and Service Office.

Notices

Copyright Statement

© Copyright 1987, Hewlett-Packard Company

This document contains proprietary information which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Hewlett-Packard Company. The information contained in this document is subject to change without notice.

Restricted Rights Legend

Use duplication, or disclosure by the Government is subject to restrictions as set forth in paragraph (b)(3)(B) of the Rights in Technical Data and Software clause in DAR 7-104.9(a).

Hewlett-Packard Company

3404 East Harmony Road, Fort Collins, Colorado 80525

RFI Statements

Federal Communications Commission (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.

VCCI Statement

この装置は，第一種情報装置（商工業地域において使用されるべき情報装置）で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（VCCI）基準に適合しております。

従って，住宅地域またはその隣接した地域で使用すると，ラジオ，テレビジョン受信機等に受信障害を与えることがあります。

取扱説明書に従って正しい取り扱いをして下さい。

Manufacturer's Declaration (Germany Only)

Funkentstörung Deutschland
Herstellerbescheinigung

Hiermit wird bescheinigt, daß das Gerät/System HP 9000 Modell 318M (Einstiegsmodell eines monochromatischen Arbeitsplatzrechners) in Übereinstimmung mit den Bestimmungen der Postverfügung 1046/84 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes/Systems angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeräumt.

Printing History

New editions of this manual will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged into the manual by the user. Each updated page will be indicated by a revision date at the bottom of the page. A vertical bar in the margin indicates the changes on each page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

March 1987...Edition 1

Safety Considerations

WARNINGs, CAUTIONs, and Notes

WARNINGS, CAUTIONS and Notes are used in this manual to alert users to important situations. 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.

WARNING

The power supply is hazardous to personnel. Extreme care must be taken when connecting voltmeter probes to the test points. Turn off the unit and remove the power cord before connecting or removing test probes.

CAUTION

Integrated circuits on PC boards are susceptible to damage by electro-static discharge. Extreme care must be taken when handling printed circuit boards. Use an Anti-static Workstation.

Note

Hewlett-Packard supports field repair of these products only to the board or assembly level. Component level information and repair is not within the scope of this manual, nor available.

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
ADG	Accessory Development Guide

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
Hewlett-Packard Support 1
Repair Philosophy 1
Repair Services 2
Hardware Support Services 2
Operating Systems Support 3
SPU Features 4
Serial Numbers 4
Specifications 5
Electrical 5
Environmental 5
Electromagnetic Interference 6
Regulatory Requirements 6
Physical 6
Shipping Information 6
Processor Board 7
DIO-II I/O Bus 8
System Interface Board 8
HP-HIL Accessories 9
Monitors 10
System Software 10
Standard Tools 11
SPU/System Tests 12

Chapter 2
Environmental/Installation/PM
Environmental 13
Environmental Specifications 13
Electromagnetic Interference 13
Regulatory Requirements 13
Physical 14
Shipping Information 14
Installation 15
Cabling 15

Preventive Maintenance 16

Chapter 3
Configuration
Bundled Systems 17
Supported Configurations 17
System Interface Board 18
HP-HIL Accessories 19

Chapter 4
Troubleshooting
Analytic Troubleshooting 21
Initial Troubleshooting Flowchart 22
Dead Unit Troubleshooting Flowchart 23
Live Unit Troubleshooting Flowchart 24
Power Supply Specifications 25
Voltage Indicators 25
General Failure Indications 26
Boot ROM Error Codes 27
Remote SPU Analysis 28
Boot ROM State Codes 29

Chapter 5
SPU Tests
Test Tools 31
Package Contents 31

Chapter 6
Adjustments 33

Chapter 7
Peripherals
Supported Peripherals List 35

Chapter 8
Parts Lists
Replacement Parts Information 37
Introduction 37
Cooperative Support Program 38
Exchange Parts 38
Part Number Lists 38
Static-Free Bags 38

Electrical Parts 39
HP-HIL Devices 40
Case Parts 41

Chapter 9
Diagrams
SPU Block Diagram 43
Power Supply 44
Processor Board 45
System Interface Board 46

Chapter 10
Reference
Hardware Support Documentation 47

Chapter 11
Service Notes
Notes 50

Product Information 1

Introduction

Information in this handbook refers to the HP 9000 Series 300 Model 318M Workstation's SPU.

Hewlett-Packard Support

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

Repair Philosophy

Field Repair Philosophy for the 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 8 in this handbook, or Chapter 6 in the service 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 this product.

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 or Service Center repair is accomplished.

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

Repair Services

Hewlett-Packard provides repair services in two ways:

- On-Site Repair.
- Customer Repair.

On-Site Repair

For On-Site Repair, an HP Customer Engineer goes to the customers site, 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.

Customer Repair

Customers have the option of repairing their own HP computer products. Contact your nearest HP Sales and Service Office for information concerning service training, special tools and test equipment, and spare parts.

Hewlett-Packard offers a Customer Cooperative Support Program to assist customers in maintaining their HP computer products. A variety of technical services and information are available. Your local HP Sales and Service can provide you with information about the Cooperative Support Program.

Hardware Support Services

There are many hardware support options available, from utilizing on-site maintenance groups to buying full support from the local sales office. Please contact your local Hewlett-Packard Sales and Service Office for these services.

Operating Systems Support

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.

SPU Features

Table 1-1. SPU Features

Product Number	Description
Main Chips	MC68020 CPU at 16.67 MHz MC68881 Floating Point Co-CPU, 16.67 MHz MC68851 Memory Management Unit, 16.67 MHz
Memory	4 Mbytes of Processor On-Board RAM
Interfaces	IEEE-488 HP-IB Interface RS-232C Serial Interface IEEE 802.3/Ethernet LAN Interface with ThinMAU Two channel DMA Controller HP-IB, HP-HIL, and RS-232 adapter cables
Operating Systems	AXE and LAN on 3.5-inch disc or 0.25-inch tape.
Options Available	
Opt. 060	2-Button Mouse
Opt. 084	ID Module

Serial Numbers

Serial No.
XXXXA01234

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.

Specifications

Electrical

Line voltage/frequency	115 V ac @ 48-66 Hz 230 V ac @ 48-66 Hz
Fuse	3AF 250V
Line transient spike immunity (1 nsec rise, 800 nsec duration)	1 KVdc
Power Consumption	100 Watts maximum
Current Requirements	2.5 A @ 115 V ac 1.5 A @ 230 V ac
Maximum Heat Dissipation	340 BTU/hr 100 Kcal/hr
Capacitor Back-up	Real-Time Clock on System Interface Board

Environmental

Operating temperature	0 - 40° C
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 154M-1983 IEC 380, 3rd Edition; 435, 2nd Edition

Physical

Dimensions	
Height	100 mm (3.94 inches)
Width	325 mm (12.8 inches)
Length	325 mm (12.8 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, fuse, 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 $feet^3$)

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 Mbytes On-board RAM
Floating point Co-CPU	
Type	Motorola MC68881
Clock Frequency	16.67 Mhz
MMU	
Type	Motorola MC68851
Clock Frequency	16.67 Mhz
Memory	
Size	4 Mbytes
Type	Byte parity error-checking
Average cycle time	300 nsec

DIO-II I/O Bus

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

System Interface Board

Video Output	High-Resolution Monochromatic
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
Connector	DB9 with cable; adapter to DB25
Real-Time Clock	
Back-up	Capacitor
Resolution	10 milliseconds
Accuracy	±5 seconds/day
Clock life	24 hours
Keyboard requirements	HP 46021A (ITF type) with HP-HIL interface, 107-key low profile with numeric keypad, 8 special-function keys

HP-HIL Accessories

Table 1-2. 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

Monitors

The HP 98786A High-Resolution Monochrome Monitor is supported with Model 318M Workstations.

System Software

Table 1-3. HP-UX Operating System

Product Number	Description
HP 98515A	HP-UX 5.2 AXE (Single-user)
HP 98595A	HP-UX 5.2 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 98519A	HP-UX 5.2 Pascal Compiler (Single-user)
HP 98599A	HP-UX 5.2 Pascal Compiler (Multi-user)
HP 97054A	HP-UX 5.2 Ada Compiler (Single-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 1-4. BASIC Language Systems for Service Use Only

Product Number	Description
HP 98613C	RAM BASIC 5.0 Language System

Standard Tools

The following tools are needed to service the SPU:

Table 1-5. Standard Tools

Part/Product Number	Description
9300-0933	Anti-static workstation
8710-0899	#1 Pozidriv screwdriver
8710-0900	#2 Pozidriv screwdriver
8720-0001	3/16-inch nutdriver
8720-1219	5mm nutdriver
	9/32-inch nutdriver
8720-0007	1/2-inch nutdriver
8720-0010	9/16-inch open-end wrench
8730-0001	Flat-tip Medium-duty screwdriver
HP 3476B	Digital Multimeter

SPU/System Tests

Table 1-6. Series 200/300 Test Tools

Part No.	Description
09800-12700	Series 200/300 Test Tools, one 0.25-inch tape
09800-12300	Series 200/300 Test Tools, eight 3.5-inch discs

Table 1-7. 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
98561-11334	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

Environmental/Installation/PM 2

Environmental

Environmental Specifications

Operating temperature	0 - 40° C (32 - 104° F)
Operating humidity	5 - 80% relative
Operating altitude	4 572 metres (15 000 feet)
Maximum Heat Dissipation	340 Btu/hr 100 Kcal/hr

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	100 mm (3.94 inches)
Width	325 mm (12.8 inches)
Length	325 mm (12.8 inches)
Weight	4.54 kg (10 pounds) maximum
Vibration Standard	Meets Class B requirements

Shipping Information

Shipping Weight	kg (pounds)
Container Dimensions	Width - mm (inches) Length - mm (inches) Depth - mm (inches Cube - m^3 ($feet^3$)

Installation

Model 318M Workstation SPUs are customer-installable, unless a non-customer-installable peripheral is included in the order.

Cabling

Table 2-1. Interface and Video Cables

Cable Type	Product Number, Description
Standard HP-IB	HP 10833D, 0.5 metre HP 92220R, 0.5 metre (For use in Tabouret Mini-Rack Mount.) HP 10833A, 1 metre HP 10833B, 2 metre HP 10833C, 4 metre
9-Pin RS-232C	HP 92221M DTE to DCE HP 92221P DTE to DTE HP 92222F female to female gender converter HP 92222W custom wiring kit
Standard Video	5061-6533, 3-metre, 1-wire for monochrome monitors
Audio	8120-4704, 3-metre

CAUTION

When installing the SPU in an HP 92211L Tabouret Mini-Rack, the HP-IB cable must be the HP 92220R 0.3 metre cable. The 90° connector must be attached to the SPU in order to clear the right-hand side of the cabinet.

Preventive Maintenance

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

Configuration 3

Bundled Systems

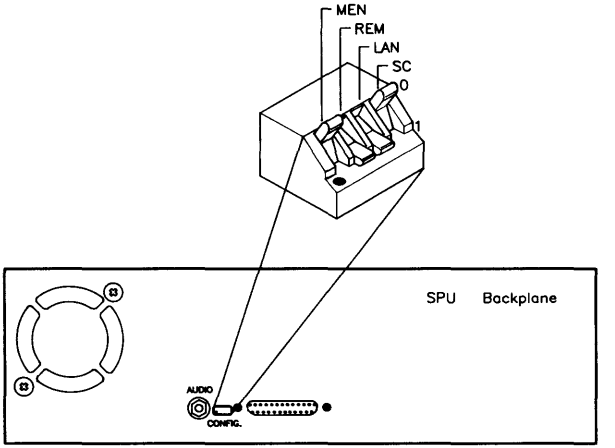
Refer to the current Model 318M Workstation's Hardware Price List to determine what HP products are bundled into this systems.

Supported Configurations

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

System Interface Board

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

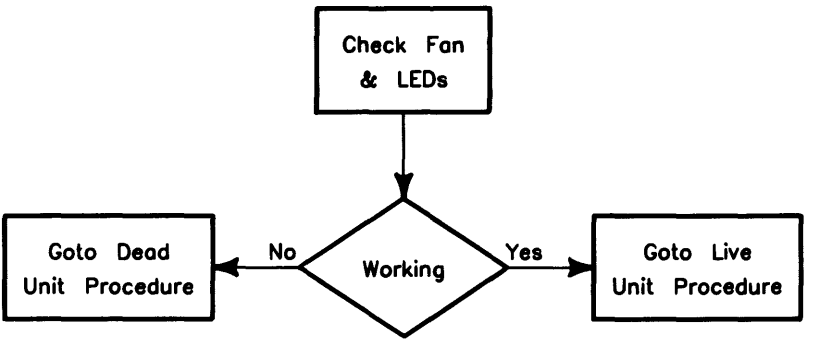
Troubleshooting SPUs is the process of getting answers to these five questions:

- 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?

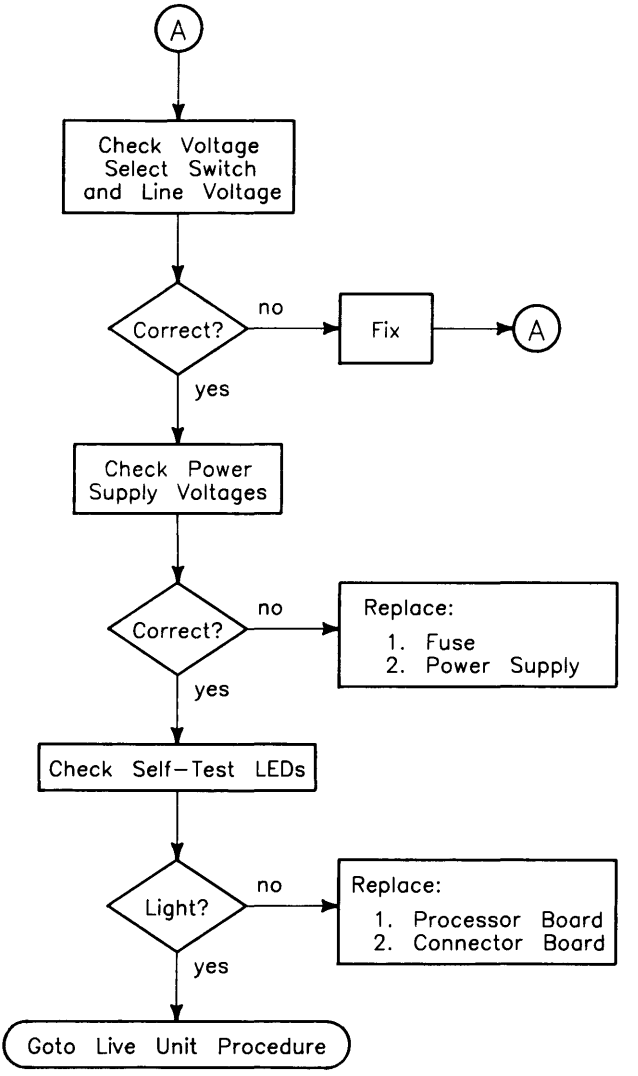
Getting the answers to these questions usually makes the troubleshooting process much more effective and less costly. When a failure in a workstation occurs, remember these questions and get the answers to each of them.

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.

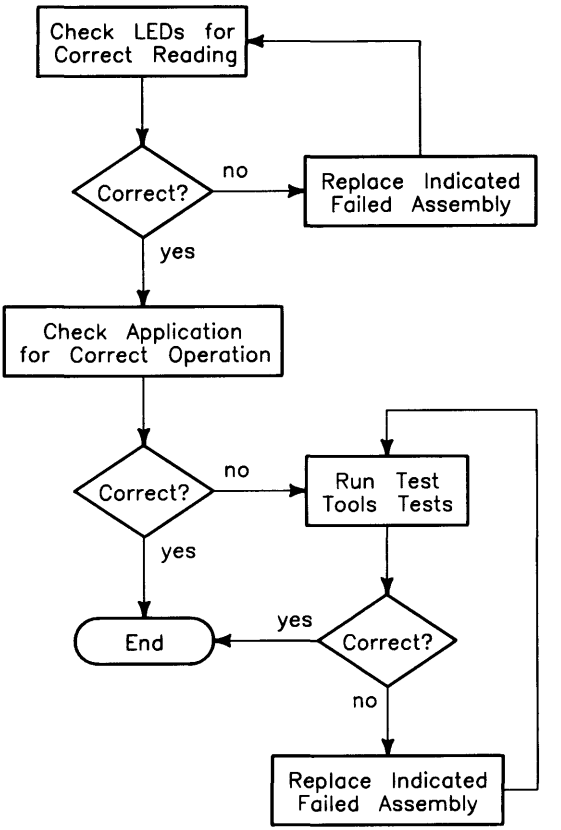
Initial Troubleshooting Flowchart



Dead Unit Troubleshooting Flowchart



Live Unit Troubleshooting Flowchart



Power Supply Specifications

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

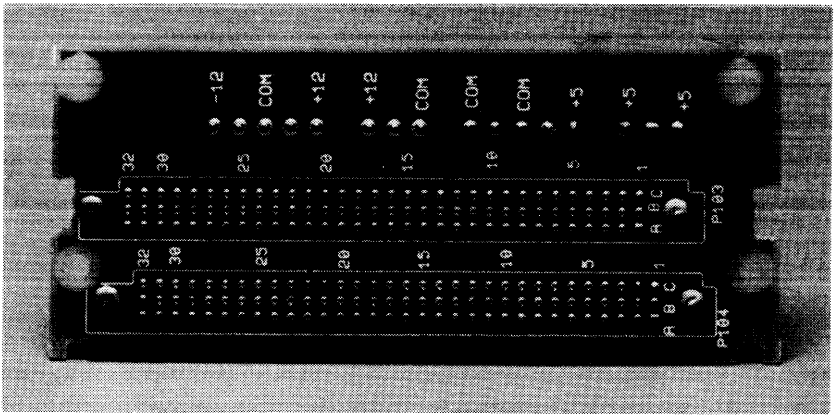


Figure 4-1. Power Supply Test Points

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	Check RAM Configuration. Processor Board.
●○○○ ●○○●	RAM Failure	Check RAM Configuration. Processor Board.
●○○○ ●○●○	Insufficient RAM	Check RAM Configuration. Processor Board.
●○●● ○○●○	Keyboard Controller Failed	System Interface Board.
●○○● ○●○○	HP-IB Failed	System Interface Board.
●○○● ●○○○	DMA Failed	System Interface Board.
●○○● ●●○○	Bit Map Font Failed	System Interface Board.
●○○● ●●○●	Bit Map Failed	System Interface Board
●oxx xxxx	I/O at xx xxxx Failed	I/O at Select Code xx xxxx. System Interface Board.
●●●● ●●●●	LEDs Never Accessed	Check −12 V dc. If okay, replace Processor Board. Otherwise, replace Power Supply.

Remote SPU Analysis

The SPU and monitor provides for 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
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 ●oo●	Testing RAM
oooo ●●●●	LED ripple
ooo● oo●o	Testing keyboard circuit (or an interrupt line is stuck)
ooo● o●●o	Testing internal 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 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
09800-12700	Series 200/300 Test Tools, one 0.25-inch tape
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
98561-11334	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* (part number 98561-90020).

The Model 318M Workstation Hardware Technical Data Sheet and Hardware Pricing List also has supported peripheral information.

Parts Lists 8

Replacement 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: _____

Cooperative Support Program

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

Exchange Parts

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

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

Part Number Lists

The parts listed in this section apply to only the SPU used in the Model 318M 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, for system boards	

Electrical Parts

Miscellaneous Electrical Parts

Part No.	Description	Notes
35751-60009	Voltage selector switch	
98563-61600	Power distribution cable	
98563-62700	Line filter	
5180-1335	Fan	
2110-0003	Fuse	

Printed Circuit Boards

Exchange Part No.	New Part No.	Description	Notes
	98563-67002	Power supply	
98562-69511	98562-66512	Processor board (Exchange board requires new Boot ROMs and part number label from Boot ROM Kit.)	
	98563-67001	Boot ROM Kit	
98563-69530	98563-66530	System interface board	
	98563-66501	Connector board	

External Cables

Part No.	Description	Notes
8120-4483	Video Cable Adaptor, RCA-BNC Cable, 4963-E-24	
5061-6533	Video Cable, RCA-RCA Audio Cable, RCA-earphone	

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	Moulded foot	
	QEDS-7099	RPG Pot assembly	
	5041-2416	RPG knob	
	HP 46084A	ID module	
	HP 46086A	Button box	
	HP 46087A	"A" size digitizer	
	HP 46088A	"B" size digitizer	
	HP 46094A	Quadrature port device	
	HP 46095A	3-button mouse	
	HP 92916A	Bar code reader	

Case Parts

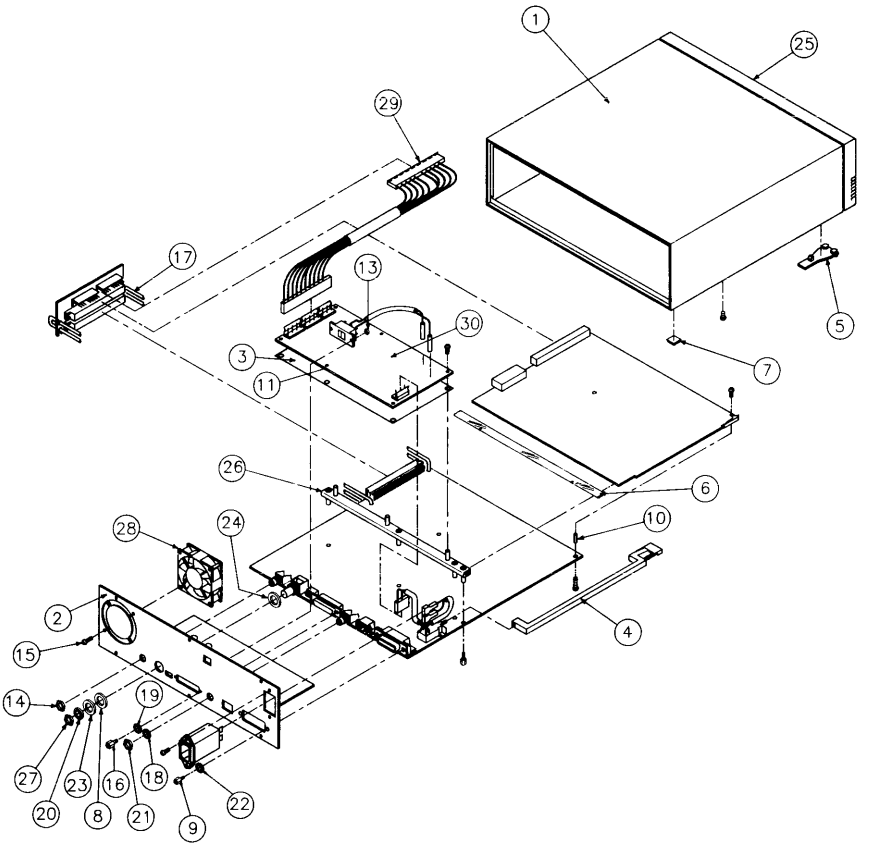


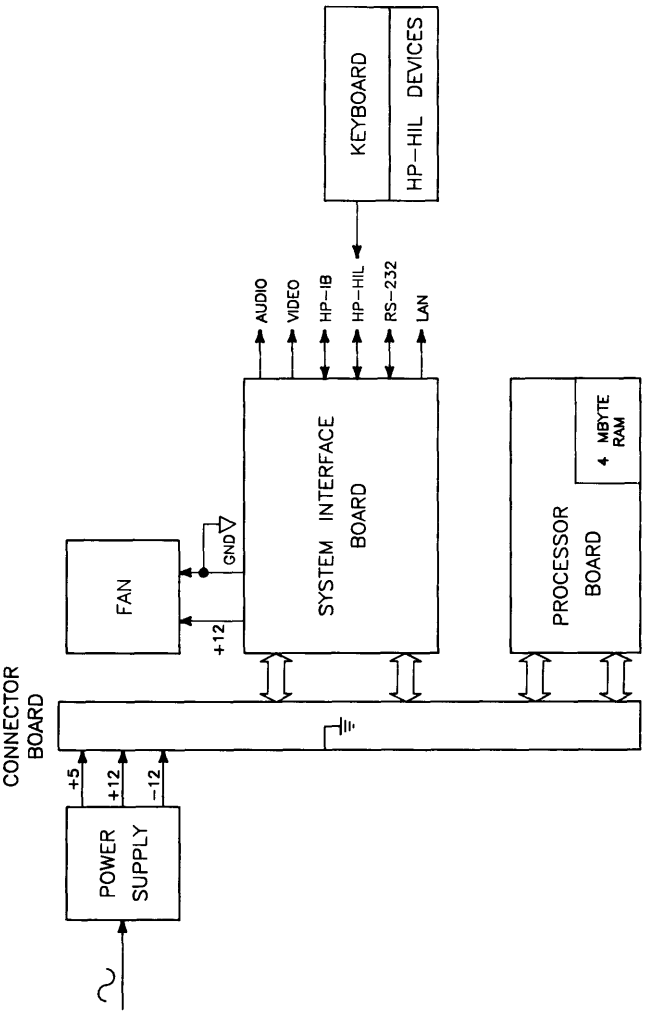
Figure 8-1. SPU Exploded View

SPU Case Parts List

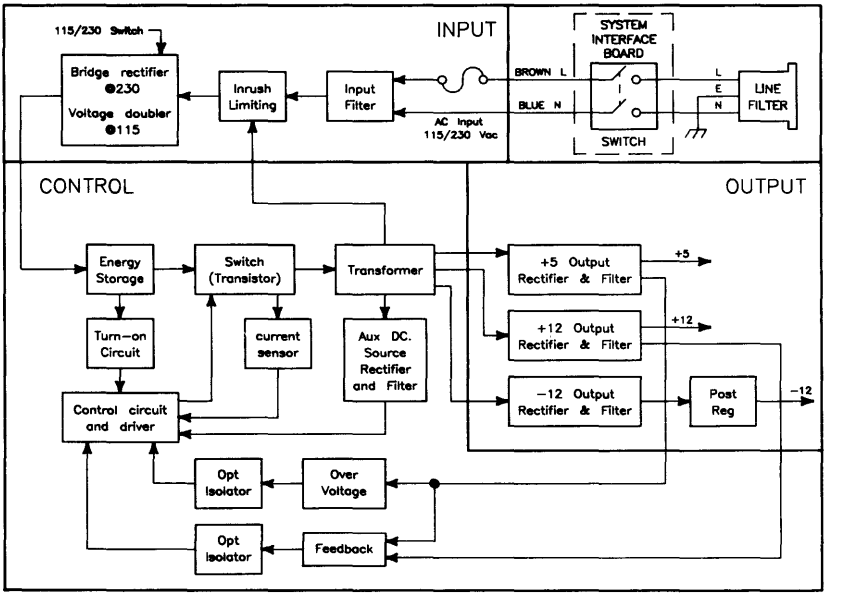
Ref.	Part No.	Description	Notes
1	35751-00001	Case	
2	5001-9021	Rear panel	
3	98563-82401	Power supply insulator	
4	5041-2422	Power switch shaft	
5	09121-48303	Moulded foot	
6	98563-82402	Board insulator	
7	0403-0427	Mounting foot bumper	
8	0610-6777	Capacitor/washer	
9	0380-0643	Standoff, 0.255 in.	
10	0380-1361	Standoff, 10 mm	
11	0403-0199	Bumper	
12	0510-1270	Fastener	
13	0535-0031	Hex nut w/lockwasher	
14	0505-0082	Hex nut	
15	0624-0458	0.5 × 0.375-inch Pan/tap screw	
16	1251-7812	Jack screw	
17	1400-0482	Cable tie	
18	2190-0016	Lock washer, internal tooth	
19	2190-0407	Lock washer, internal tooth	
20	2190-0256	Lock washer, internal tooth	
21	2950-0001	Hex nut, double chamfered	
22	2190-0409	Washer	
23	3050-0604	Washer	
24	3050-1273	Shoulder washer	
25	5001-9022	PC board holder	

Diagrams 9

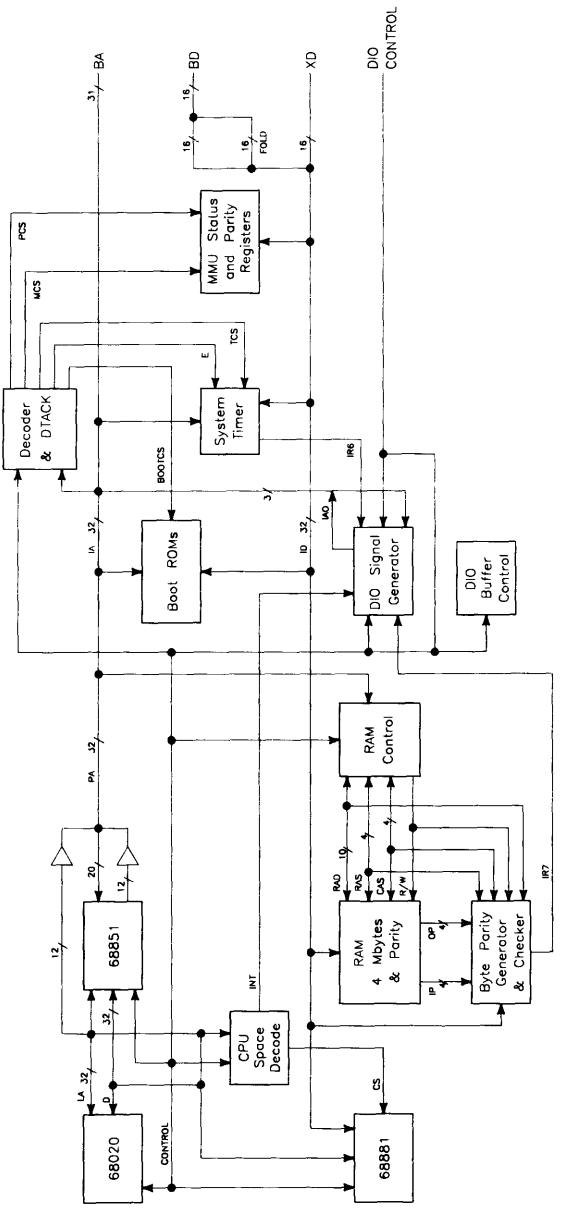
SPU Block Diagram



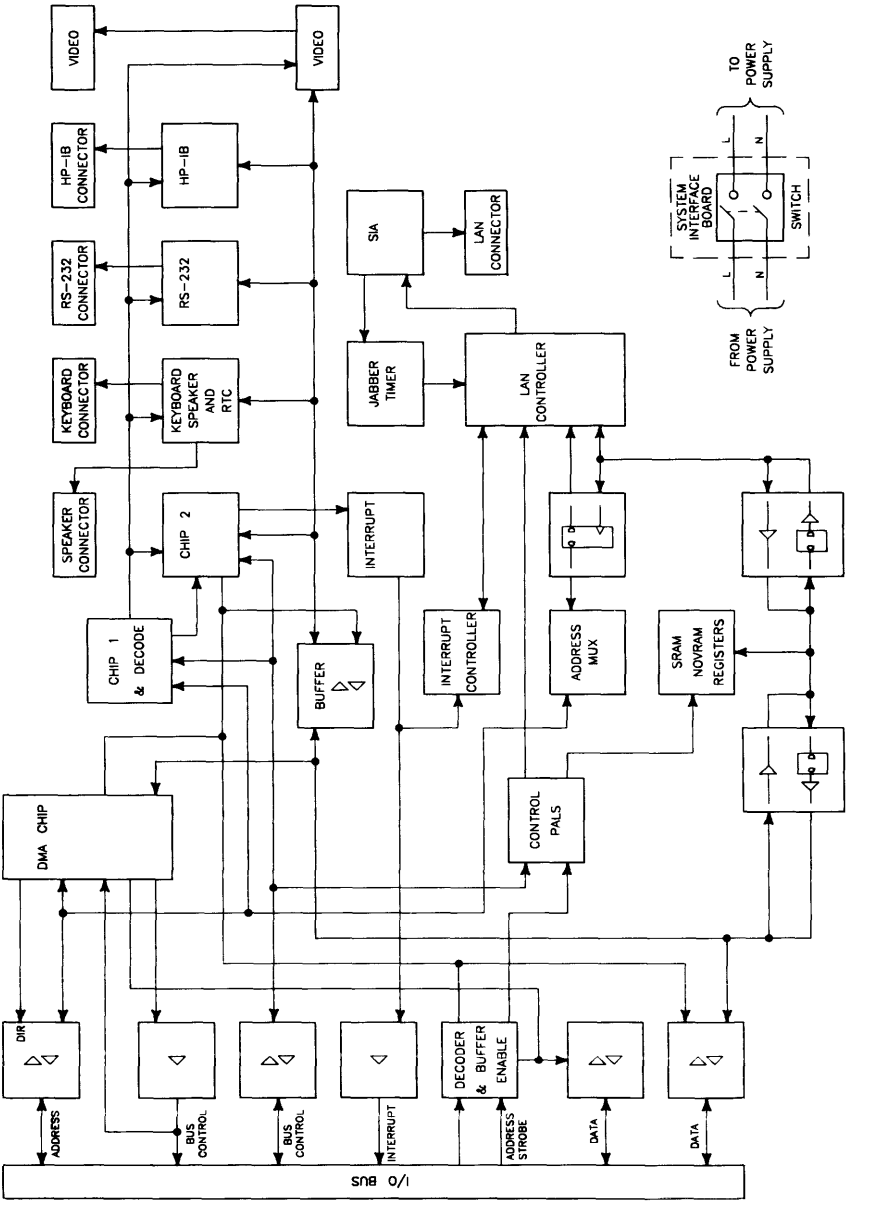
Power Supply



Processor Board



System Interface Board



Reference 10

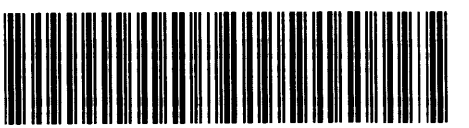
Hardware Support Documentation

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
98563-90030	HP 9000 Series 300 Model 318 Workstation SPU Service Information Manual
98563-90039	HP 9000 Series 300 Model 318 Workstation SPU Service Handbook
98563-90099	HP 9000 Series 300 Model 318 Workstation SPU Self-Paced Hardware Training Guide

Service Notes 11

Notes

HP Part Number
98563-90039
Microfiche No. 98563-99039
Printed in U.S.A. 3/87



For Internal Use Only