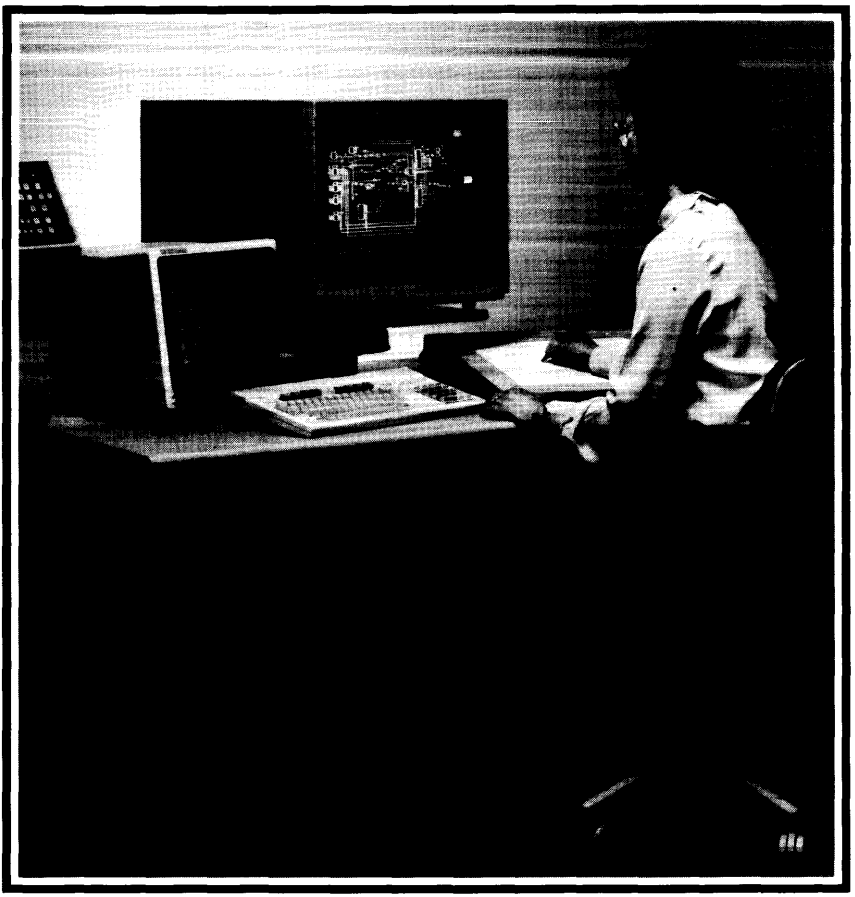
HP 9000 Series 500 Computers

HEWLETT PACKARD

9050 CE Handbook



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9050 CE Handbook
for the HP 9000 Series 500

Manual Reorder No. 09050-90035

Note

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Printing History

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

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

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9050 Product Information

Chapter 1

Product Description

Features

- 32 Bit CPU with 32 bit data paths.
- 12 Slot processor stack.
- Up to three CPU boards.
- Up to 10M bytes of RAM.
- One or two IOP boards.
- Up to four Display Station Buffer cards (DSB).
- Error correcting and self healing memory.
- Compatible with 4.0 and later HP-UX operating system.
- 7 C-I/O Slots with built in medium speed HP-IB. Expandable with second IOP and I/O expander.
- Real time clock.
- Nicad battery for RTC and NVM.
- Variable speed fans for noise reduction.
- LED indicators for self-tests.

Central Processor Unit

- Improved NMOS III CPU.
- Floating point math chips for improved capability.
- Math chips invisible to operating system.
- Can have 3 CPUs.

Memory

- Up to 10 Cards of RAM (either 512K byte or 1M byte cards)
- RAM cards can be any combination in the same stack (1M byte boards must be used in pairs).

I/O Processor

- one or two IOPs can be used.
- Seven channel I/O card slots. (Select codes 0 Through 6.)
- Second IOP can drive an expander with 8 additional I/O cards.

Display Station Buffer (DSB)

- Up to 4 DSB cards.
- Must be in slots 4 thru 7.
- Other stack cards use slots 4 thru 7 when DSBs are absent.

System Components

The system components are listed in the configuration section. Interface card information can be found in the peripherals section.

System Software

A list of the system software is in the reference section.

Tools List

HP Part Number	Description
9300-0794	Antistatic Kit
09855-67004	Power Supply Discharge Tool
8710-0899	#1 Pozidriv Screwdriver
8710-0900	#2 Pozidriv Screwdriver
8730-0001	Flat Blade Screwdriver
8710-0585	IC Extractor
8720-0007	1/2 inch Nut Driver
8720-0005	3/8 inch Nut Driver

Related Documentation

Related Documents are listed in the reference section.

Safety

WARNING

LETHAL VOLTAGES ARE PRESENT INSIDE THE HP 9050. OBSERVE ALL WARNINGS ON THE COMPUTER AND IN THE DOCUMENTATION. SWITCH OFF POWER AND UNPLUG POWER CORD FROM AC OUTLET BEFORE REMOVING ANY ASSEMBLIES.

WARNING

ENSURE THERE IS CONTINUITY BETWEEN GROUND AND METAL CHASSIS AFTER MAKING ANY PRIMARY WIRING CHANGES.

WARNING

DO NOT REMOVE POWER SUPPLY FROM THE COMPUTER WITHOUT DISCHARGING THE POWER SUPPLY CAPACITORS WITH THE POWER SUPPLY DISCHARGE TOOL. IF A TOOL IS NOT AVAILABLE, WAIT 15 MINUTES FOR THE CAPACITORS TO DISCHARGE.

9050 Environmental/Installation/PM

Chapter 2

Environmental

Height	234 mm
Width	325 mm
Length	530 mm
Weight	20 Kg ±5 Kg
Operating Temperature	0 to +55 Degrees C.
Storage Temperature	−40 to +75 Degrees C.
Operating Humidity	5 to 95% RH at 40 Degrees C.
Operating Altitude	4 600 metres (15 000 ft)
Non-operating Altitude	15 300 metres (50 000 ft)

Shock of 30 Gs for a pulse duration of 11 milliseconds.

Heat Output – 2100 BTU/hour

Ac line voltage	110 Vac (90 to 125 Vac)
	220 Vac (198 to 250 Vac)
Line frequency	48 to 66 Hz
Power consumption	580 watts maximum
Power Supply	400 watt switching power supply

Installation

1. Unpack the computer.
2. Using the information in the "Line Voltage and Fusing" subsection of the Installation and Configuration manual, ensure the line voltage, and ground, are correct and within tolerance.
3. Ensure the line voltage switch is set correctly: up for 110 Vac; down for 220 Vac.
4. Ensure the fuse is correct for the voltage being applied to the system you are installing.
5. Remove the shipping spacers in the I/O card cage.
6. Refer to the "Switch Settings" and "Interconnections" sections in the Installation and Configuration manual, then set the switches and install each of the interface driver cards.
7. Install the peripherals. Refer to the installation instructions that are shipped with the peripherals for installation information.
8. Using the information in the self-test subsection of the Installation and Configuration manual, apply power to the computer and ensure that it passes all the self tests.
9. Load the HP-UX Operating System. Refer to the "System Administrator Manual" to load and run the system operating software. Ensure all self-tests are successfully passed.
10. Verify correct system operation by using the System Functional Test in the HP-UX Operating System and ensure that the computer is operating correctly with the systems peripherals.

Preventive Maintenance

There is no regularly scheduled preventive maintenance. Clean the filter screen when required for good air flow.

9050 Configuration

Chapter 3

Configuration

These system configurations are current at the time of manual publication. Due to the frequent change of the system components, it is suggested that you consult the latest edition of the Supported Peripherals Matrix for current information.

Minimum Configuration

- HP 9050.
- System console (terminal and interface).
- Revision 4.0 or later HP-UX on 1/4 inch tape cartridge.
- Mass storage device with tape reader.
- 1.5M byte of RAM.

Minimum Configuration for Troubleshooting

1. Fans must be connected.
2. Any three of the following must be connected for power supply regulation.
   a. One CPU.
   b. One IOP.
   c. Two 512K RAM boards.
   d. SCM board.
   e. 09855-66525 load board (used with 9020/9030/9040).

System Components

9050A – One of the CPU options is required.
- 512K byte RAM.
- One IOP.

Bundled Product

9050 AM – Option 022 and one of the CPU options are required.
- 1 1/2M byte RAM (three 512K byte boards).
- One IOP.
- 27110A/B HP-IB interface.
- 27130A/B 8-Channel MUX.
- Multi-user HP-UX operating system.
- Multi-user Fortran 77.
- Multi-user Pascal.
- Multi-user Graphics/9000 DGL/AGP.
- Multi-user Asynchronous Terminal Emulator.

9050 AT – Option 022 and one of the CPU options are required.
- 1 1/2M byte RAM (three 512K byte boards).
- One IOP.
- 27110A/B HP-IB interface.
- 27128A Asynchronous Serial Interface (with female connector).
- Single user HP-UX operating system.
- Single user Fortran 77.
- Single user HP Pascal.
- Single user Graphics/9000 DGL/AGP.
- Single user Asynchronous Terminal Emulator.

Options

500 One CPU, floating point.

600 Two CPUs, floating point.

700 Three CPUs, floating point.

249 One additional IOP.

246 Additional 2M byte RAM (two 1Megabyte boards).

247 Additional 1/2M byte RAM (one 512K byte board).

248 4M byte RAM (four 1Megabyte boards – Replaces 1/2M byte RAM boards).

022 HP-UX Software on 1/4 inch tape cartridge.

System Software

HP Product No.		
Single-User	**Multi-User**	**Software**
97070A	97080A	HP-UX Operating System
97071A	97081A	FORTRAN 77 Compiler
97072A	97082A	HP Pascal Compiler
97073A	97083A	IMAGE-9000 DBMS
97074A	97084A	HP-UX GRAPHICS DGL
97075A	97085A	HP-UX GRAPHICS AGP
97076A		Asynchronous Terminal Emulator
97077A	97087A	RJE Communications Software
98163A	98183A	HPSPICE Circuit Simulation
2285A		Local Area Network
97086A		Applications Migration Package
50953A/M/R	50954A/M/R	HP 27125 LANIC Software

Stack Accessories

HP Product Number	Description
97043B	CPU
97046A	1 Megabyte RAM
97047A	512K byte RAM
97049A	Second IOP
98288A	Display Station Buffer

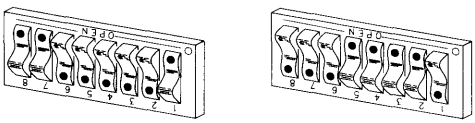
Interface Cards

HP Product Number	Description
Built In	Internal HP-IB Interface
2285A	LAN Local Area Network Interface. Use HP 27110A - HP-IB.
27110A/B	HP-IB Interface
27112A	GPIO General Purpose Interface
27122A	RJE Interface
27123A	SRM Interface
27125A	LANIC Interface
27128A	ASI Asynchronous Serial Interface
27130A/B	Asynchronous 8-Channel Multiplexer
97060A/T	Graphics Processor. Use HP 27112A GPIO Interface Card.
27140A	Modem MUX Interface

Select Codes

Select Code	Usage	Select Code	Usage
0	I/O Slot 0	8	I/O Slot 0
1	I/O Slot 1	9	I/O Slot 1
2	I/O Slot 2	10	I/O Slot 2
3	I/O Slot 3	11	I/O Slot 3
4	I/O Slot 4	12	I/O Slot 4
5	I/O Slot 5	13	I/O Slot 5
6	I/O Slot 6	14	I/O Slot 6
7	System Control Module	15	I/O Slot 7

SCM Switches



Note

"Open" position of the switches on the SCM board is a logic 0. "Open" position of switches on the I/O boards is a logic 1.

Switch 1 (SW1)

S1 thru S5	HP-IB address (LSB = S1, 30 suggested, Do not use 31)
S6	System Controller (Closed = controller, suggested)
S7 & S8	Not used.

Switch 2 (SW2)

S1 & S2	S1	S2	ROM
	Open	Open	8K X 8
	Closed	Open	16K X 8
	Open	Closed	32K X 8
	Closed	Closed	32K X 8

S3 & S4 Future use.

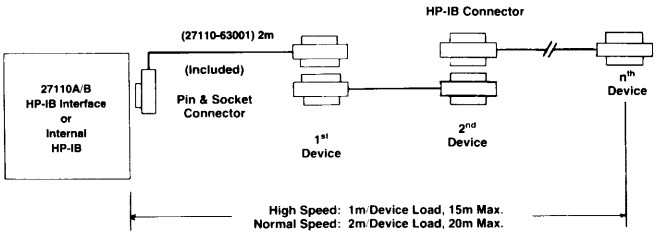
S5 thru S7 Internal HP-IB select code (LSB = S5).

S8 Internal HP-IB Disable (open = disabled)

- HP-IB select code = 0 thru 6.
- I/O slot corresponding to internal HP-IB is empty.

Interface Cables

HP-IB (Internal or HP 27110A/B I/O Interface Card)

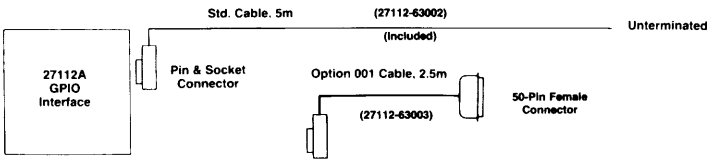


Available HP-IB Cables

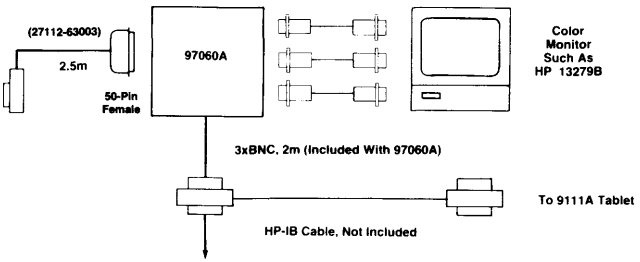
Product Number	Length (in meters)
*92220R	0.3
10833D	0.5
10833A	1.0
*82977A	1.0
10833B	2.0
*82977B	2.0
10833C	4.0
8120-3448	6.0
8120-3449	8.0

* Right Angle Connector

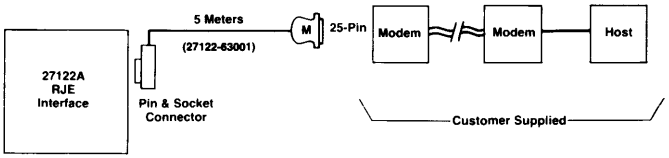
HP 27112A General Purpose Interface (GPIO)



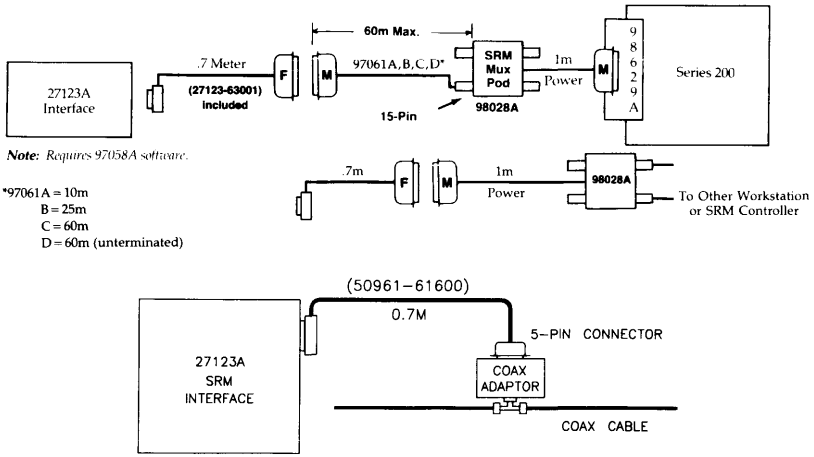
HP 97060A Graphics Processor



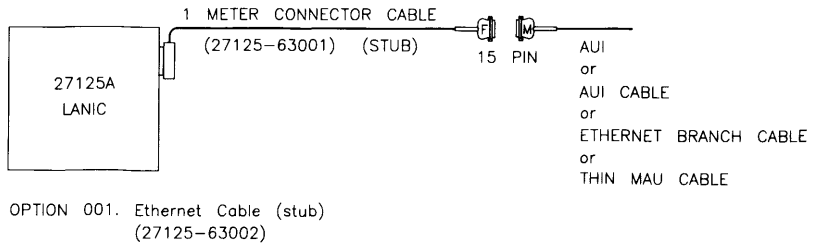
HP 27122A Remote Job Entry (RJE)



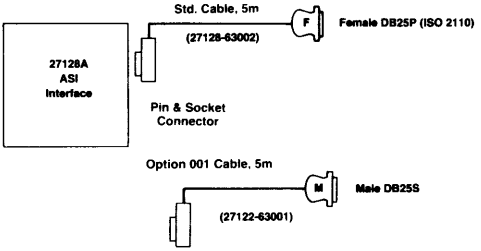
HP 27123A Shared Resource Management (SRM)



HP 27125A LAN Interface Card (LANIC)



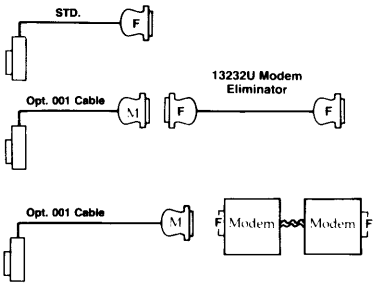
HP 27128A Asynchronous Serial Interface (ASI)



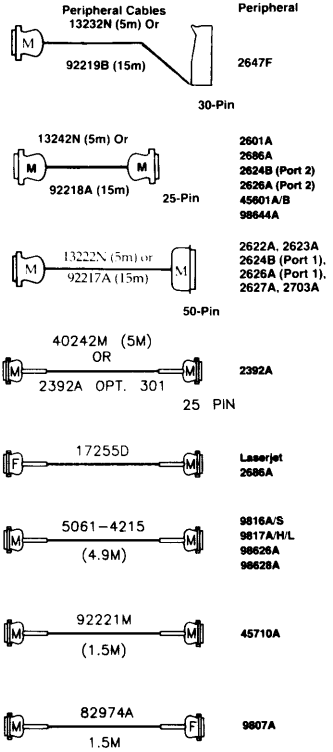
Terminal Cabling

Any of these . . .

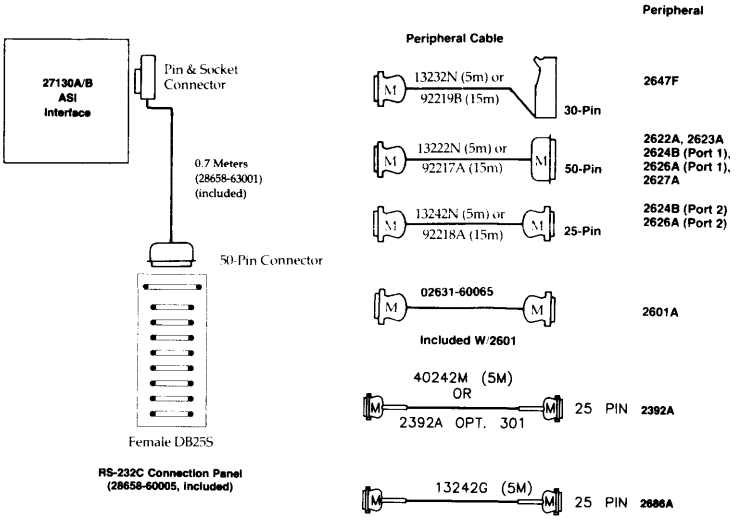
ASI Interface Cables



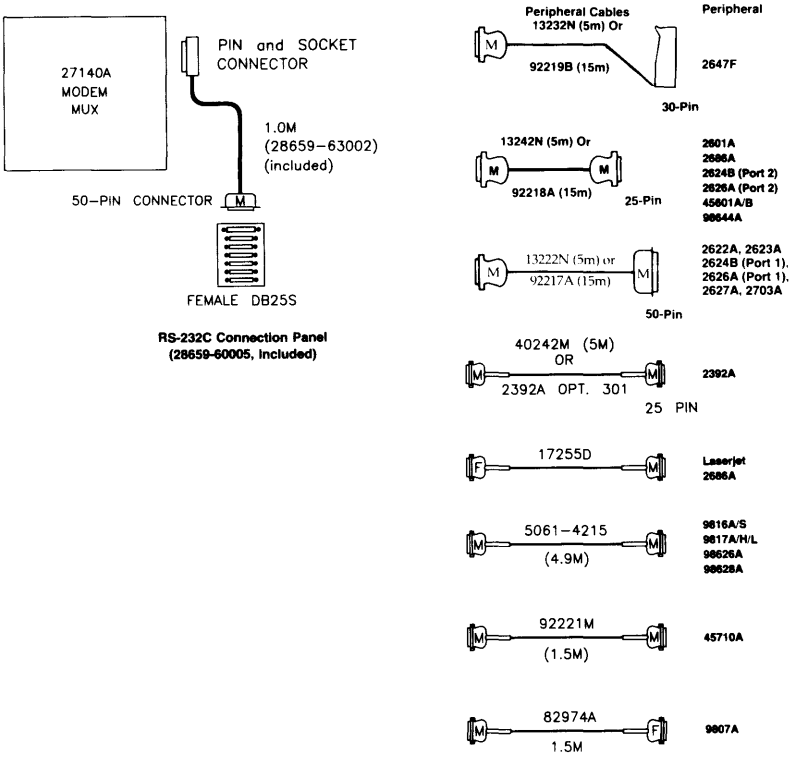
are compatible with any of these.



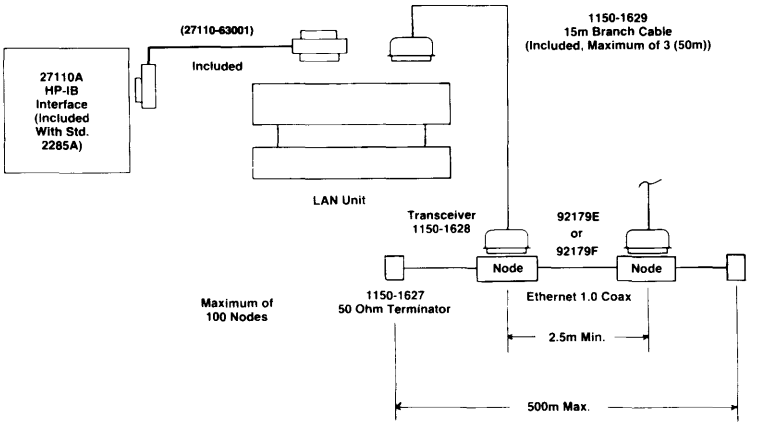
HP 27130A/B Asynchronous 8-Channel Multiplexer



HP 27140A Modem MUX Interface



HP 2285A Local Area Network Interface



9050 Troubleshooting

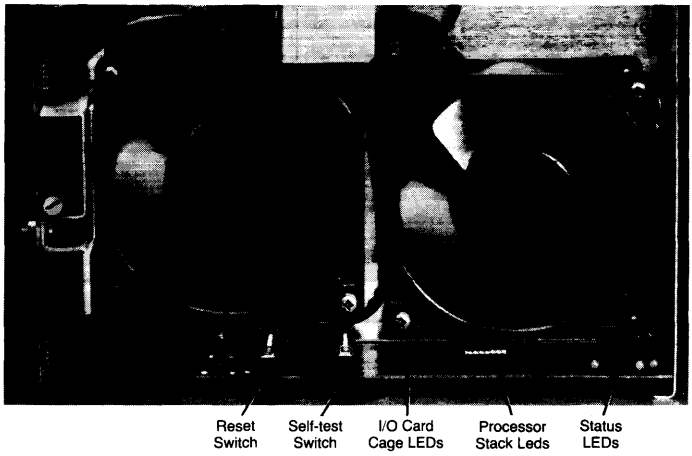
Chapter 4

Procedure

Start.
|
Switch the computer on.
|
Power indication LEDs and fans OK? (OT - OFF,
Power On - ON, IB - ON, Stack PS - OFF.)
YES NO
| Correct overtemperature, power supply, or fans problems.
| Chapter 5.
|
Stack LEDs OK? (On for 1/2 second then all off.)
YES NO
| Replace faulty stack board then retest. Faulty board corresponds to lit LED.
|
Is terminal or printer available as output device?
YES NO
| Use the I/O card LEDs to indicate card failure.
| Use the I/O card cage LEDs to indicate I/O channel failure and I/O error code.
| Error code chart in Chapter 5.
| Troubleshoot and repair the I/O channels.
|
Use the error messages on the output device to determine faults. Error messages are in Chapter 5.
Also available, to support the error messages, is a Normal Operation Sequence chart in Chapter 5.

9050 Diagnostics

Chapter 5



Front Panel LEDs and Switches

Diagnostics Overview

Self-tests run:

- At power on.
- Self-test switch pressed.
- Self-test switch pressed for 3.5 seconds. Press switch again, or cycle power, to terminate the self-test loop.

Board Self-Tests

The board self-tests reside on each stack board and I/O board that has a microprocessor. The tests are initiated before the boot loader is transferred to the RAM, and are not dependent on the loader. The system control module generates the self-test initiation signals.

When a board fails, the sequence stops and the corresponding stack LED is lit. The board before or after the indicated board may be bad disrupting the initiating signal. Some failures will cause several LEDs to turn on. The faulty board is the one corresponding to the lowest numbered lit LED. LEDs that correspond to 1M byte RAM boards will blink while the board is performing its self-test.

If the RAM memory controller is bad, the appropriate LED will light and the self-test will stop.

If an I/O board fails its self-test, an LED on the I/O board will light, and a status signal will be made available for the loader code to respond to during loader self-tests. Some I/O cards do not have self-tests (the GPIO for example).

Boot Loader Self-Tests

The boot loader performs the following checks and operations before transferring control to the operating system.

1. Initializes the I/O cards:
   a. Looks for a device to display system loader messages (starts with Graphics Display).
   b. Checks I/O cards for what is available and where it is located.
   c. Turns on I/O card cage LEDs for 1/2 second.
2. Sends `Loader Rev_` to the output device.
3. Performs loader I/O self tests:
   a. Checks each select code for interface card and status.
   b. Checks I/O cards and internal HP-IB for self-test failure.
   c. Checks SCM.
   d. Checks I/O bus.
   e. Checks real time clock 0.1 second register.
4. Outputs "System Loader Message" for failed I/O card self-tests.
   a. Failure message is sent to the display device and SCM.
   b. Select code channel that failed indicated on I/O card cage LEDs and failure error code is displayed when reset switch is pressed.
   c. No indication on LEDs for failed I/O select code in the I/O expander. Error message is on the display.
   d. This error reporting is for a bad I/O card. Later messages are for peripheral devices.

I/O LED Error Codes.

Error No.	I/O LEDs (1 = on; 0 = off) 7 6 5 4 3 2 1 0	Description
0	0 0 0 0 0 0 0 0	*
1	0 0 0 0 0 0 0 1	*
2	0 0 0 0 0 0 1 0	Operating system not found; will retry
3	0 0 0 0 0 0 1 1	*
4	0 0 0 0 0 1 0 0	Bad operating system file
5	0 0 0 0 0 1 0 1	Not enough usable memory
6	0 0 0 0 0 1 1 0	I/O card or connected device failed self-test
7	0 0 0 0 0 1 1 1	*
8	0 0 0 0 1 0 0 0	*
9	0 0 0 0 1 0 0 1	Media or device not ready
10	0 0 0 0 1 0 1 0	*
11	0 0 0 0 1 0 1 1	Part of operating system not readable
12	0 0 0 0 1 1 0 0	Attempted address or read past end of volume
13	0 0 0 0 1 1 0 1	Controller/unit failed after passing self-test
14	0 0 0 0 1 1 1 0	I/O timeout; device did not respond in time
15	0 0 0 0 1 1 1 1	CS80 error occurred
16	0 0 0 1 0 0 0 0	Tape error occurred
17	0 0 0 1 0 0 0 1	Bad status from HP-IB (I/O Card).
18	0 0 0 1 0 0 1 0	Bad I/O bus
19	0 0 0 1 0 0 1 1	NVM chip failed test
20	0 0 0 1 0 1 0 0	RTC chip not ticking
21	0 0 0 1 0 1 0 1	*
22	0 0 0 1 0 1 1 0	Test card found (not an error)
23	0 0 0 1 0 1 1 1	Test Module did not find SCM
24	0 0 0 1 1 0 0 0	Memory Test in progress (not an error)
25	0 0 0 1 1 0 0 1	Looking for Operating System (not and error)

* These codes are not used.

5. Tests all memory (except the location where the loader code resides).
   a. Displays `Testing Memory`.
   b. Maps salvaged memory back in. Leaves unsalvageable memory mapped out.
   c. Loader message "NOT ENOUGH USABLE MEMORY. . ." indicates NO good memory except that used by loader code.
   d. Configures memory.
6. Sets up interleave configuration of memory if 1M byte RAM is used.
7. Boot loader looks for operating system.
   a. Displays `Looking for System`.
   b. First pass, loader looks for operating system on removable media. Second pass, loader will accept first operating system it sees.
   c. Loader will ignore operating systems that are not ready.
   d. Loader will try again in a few seconds if operating system is not found.

8. Loader loads operating system into RAM.
   a. Operating system must be HP-UX 4.0 or later.
   b. Displays `OS ID# ___`.
   c. After "OS ID" number displayed, any error will cause program to stop and output an error message.
   d. Loader checks OS header for required amount of memory. Loads OS or displays `NOT ENOUGH USABLE MEMORY; TOTAL IS XXXX`.
9. Displays `Load Done`.
   a. Transfers control to operating system.
   b. If pre 4.0 release operating system is used, the computer will stop here. Use an operating system that is 4.0 or higher.

Operating System Self-Tests

1. Loader self-test results are passed to operating system for:
   a. Further evaluation.
   b. Recording the status.
   c. Presentation as warnings and error messages.
2. OS configures system.
   a. Resets I/O bus and runs I/O self-tests again.
   b. Performs another checksum test of operating system.
   c. Assigns I/O device addresses.
3. Record error message information – Operating system records stack self-test information, and any other error messages for display.
4. Initialize I/O outputs
   a. Reinitialize output device for display of OS messages.
   b. Initialize I/O outputs for operational tests of devices. Records self-test results of devices.
5. NVM checksum checked. Operating system clock set to RTC.
6. Operating system drivers look at device set. – If no self-test errors on a device set, the I/O card sets up a default structure. OS records the default structure for use by the computer.
7. Display error messages – OS does not use I/O card cage LEDs.
8. Displays copyright messages
9. Run operation – Operating system has completed self-tests.

System Functional Tests

The System Functional Tests are a part of the HP-UX Operating System. They are found in the `CE.utilities` directory. Information concerning these tests can be found in the Series 500 CE Handbook in the Series 500 HP-UX section (Diagnostics Chapter).

LEDs

Stack LEDs

- Directly controlled by stack boards.
- Lit for 1/2 second at start of Board Self-Tests (if a board occupies the slot).
- LEDs indicate stack board failure during board self-tests.
- LED corresponding to 1M byte RAM boards will blink during self-test.
- More than one LED lit; lowest number that is lit corresponds to the failed self-test.
- One LED lit; indicates failed board.

I/O Card Cage LEDs

- Controlled by loader self-test program via SCM board.
- Loader self-tests turn on LEDs for 1/2 second at start of self-tests.
- Self-tests check I/O status lines for pass or fail. Failure of I/O channel, lights the corresponding LED.
- Reset switch provides an error code for the failed card. Error code gives the same information as message on display device. Reset switch toggles LEDs between failure and I/O error code.

Status LEDs

Internal Bias (IB)

- Turned on when +12 volt internal bias voltage is present (AC applied to main power supply).
- IB on indicates power applied to computer.
- IB on indicates fuse is good.
- IB on indicates the computer is turned on.
- IB on indicates the interlock switch is engaged.

Power On (+5 Volt)

- Driven by +5 volt power supply.
- Indicates main power supply is on.
- Off when power not available to main power supply (IB LED is off).
- Off during overtemperature condition.
- Off during over or under voltage condition (either main power supply or stack power supply).

Self-Test

- Turned on when board self-tests are initiated by SCM.
- Turned off after OS self testing is complete.

Load

- Turned on when boot loader code is loaded into RAM.
- Turned off after operating system is loaded and before control is transferred to the operating system.

Run

- Controlled by SCM.
- Turned on after completion of OS self-tests.

Overtemperature

- Turned on when CPU (slot one), or main power supply is in an overtemperature condition.
- Powered by IB voltage.
- When overtemperature occurs, stack power supply turns off main power supply and turns on LED.
- LED on indicates power available to internal bias (uses IB to power LED).
- LED on indicates main power supply turned off (+ 5 volt LED off).
- LED on indicates stack power supply off (stack PS LED is off).

Stack Power Supply Board LED

Indicates when one of the stack power supply voltages is overvoltage or undervoltage.

LED on the I/O Board

- Turned on when the I/O card fails the self-test.
- Driven by the I/O board and not dependent on the boot loader.

Normal Operation Sequence

Operation	Normal Indication	What Normal Indicates	Probable Failure
Power On	IB LED on.	AC to Main Power Supply	Power On switch. AC power cable. Fuse. 110/220 switch. Interlock switch not engaged. Stack PS to Main PS cable disconnected.
	OT LED off.	Temperature in stack and Main PS is in tolerance.	Temperature Filter screen clogged. Fans.
	Stack PS LED off.	Voltages on stack PS are in tolerance.	Stack PS board. +19 volts or −12 volts to the Stack PS. Short on a Stack PS output.
	Power On LED on.	Main PS and Stack PS voltages are in tolerance.	Main Power Supply. Stack PS. Short on one of the Power Supply outputs.
	Fans operating	Both power supplies operating and in tolerance. Fans and drivers are good.	Main PS. Stack PS. Fans. Fan cables.
Self-Tests (Board).	Self-Test LED on. Stack LEDs on for ½ second then off.	Primary Power On signal is good.	SCM.
		SCM initiated self-test signals.	SCM.
		Motherboard/SCM connections.	SCM/Motherboard connector J4 and J5.
		Stack LEDs and drivers are good.	LED. Stack board. Motherboard.
	Stack board LEDs remain off.	Stack boards are good.	Stack board (LED that's on). Stack board (LED that's lowest in group). SCM clock (1M RAM LED not blinking during test, or all stack boards failed test). CPU (all LEDs on).
	LEDs on I/O card remain off.	I/O cards are good.	I/O card (with LED lit).
Self-Test (Boot Loader)	Load LED on.	Boot loader loading into RAM	SCM board. Motherboard. I/O cable.
		Start of boot loader self-tests.	SCM board. Motherboard.
	I/O card cage LEDs on for ½ second.	I/O card cage LEDs are good.	LEDs. SCM board. Motherboard. IOP Cable.

Normal Operation Sequence (continued)

Operation	Normal Indication	What Normal Indicates	Probable Failure
	"Loader Rev.___" on output device.	Boot loader is running.	No output device. Output device failed its self-test. Output device not powered up.
	No System Loader Error Messages on output device (or I/O card cage LEDs lit).	I/O cards passed self-tests. Internal HP-IB passed self-tests. SCM passed self-test. NVM is good. I/O bus is good. RTC is operating.	I/O cards. SCM board. Motherboard. Output device.
	"Testing Memory" on output device.	Loader memory test is being performed.	
	"Looking for system" on output device.	Boot Loader completed memory test and has configured memory. Boot loader is looking for operating system.	"Not enough usable memory..." indicates "no" usable memory (except that used for loader).
	"OS ID#___" on output device.	Boot Loader found an operating system.	Peripheral, with OS, not ready. No operating system.
	"Load Done" on output device.	Operating system is loaded in RAM and loader transferred control to operating system.	Refer to System Loader Messages. Not enough good RAM. Mass storage device failure. Error in loading OS.
	Load LED off.		
Self-Test (OS).	No Operating System Error messages.	Stack, I/O cards, and peripherals passed OS Self-Tests. OS checksum was checked. I/O devices were assigned addresses.	Boot loader ROM and OS revision level are incompatible or console interface not on select code 0 (OS stops after transfer of control from loader). Refer to Operating System Error Messages.
	Copyright messages displayed.	I/O outputs were initialized. Default structure established.	Failure to find root device. "System halted" error message.
	Self-Test LED off.	Operating System is ready for run operation.	
	Run LED on.		

Power Indication LEDs

This chart shows the LEDs that are lit for various power supply conditions. It also indicates which board is the most likely faulty component.

A "1" in the Fault Location column indicates the Stack PS board.

A "2" in the Fault Location column indicates the Main PS Assembly.

A "3" in the Fault Location column indicates the motherboard, or the rest of the sytem.

An undervoltage condition may require the unplugging of stack and I/O boards in order to determine whether a short is in the power supply or the load. A minimum power supply load must be maintained and the fans must be connected. Any three of the following will maintain the power supply load:

- One CPU.
- One IOP.
- Two 512K RAM boards.
- SCM board.
- 09855-66525 load board (used with 9020/9030/9040).

Power Indication LEDs Chart

Fault	Stack PS LED	OT LED	Power ON LED	IB LED	Fault Location
⟨normal⟩	off	off	on	on	
−2V undervoltage	on	off	off	on	1,3 (short)
−2V overvoltage	on	off	off	on	1,3 (short)
6.7V undervoltage	on	off	off	on	1,3 (short)
6.7V overvoltage	on	off	off	on	1,3 (short)
3.85V undervoltage	on	off	off	on	1,3 (short)
3.85V overvoltage	on	off	off	on	1,3 (short)
Stack overtemp	off	on	off	on	CPU, Fan, or 1
Main supply overtemp	off	on	off	on	Fan, 1, or 2
19V undervoltage	off	off	off	on	1, 2, or 3
19V overvoltage	off	off	off	on	1, 2, or 3
−12V undervoltage	off	off	off	on	1, 2, or 3
5V undervoltage	off	off	off	on	2
Overcurrent	off	off	off	on	1, 2, or 3
+12V undervoltage	off	off	off	on	1, 2, or 3
Line fuse open	off	off	off	off	2
IB fuse open	off	off	off	off	2
Cable disconnected	off	off	off	off	1, 2
Voltage Selector at 110V (220V input)	off	off	off	off	Selector Switch Fuse
Voltage Selector at 220V (110V input)	off	off	off	on	Selector Switch

System Loader Message

Each of the System Loader Messages are explained below. Possible causes for many of the messages are provided. If the message begins with "ERROR:" the system halts after issuing the message. If the message begins with "NOTE:" the message provides information and the computer continues operating.

The computer will attempt to output messages to a Graphics Display Station if one is present. If it can not find a display station, it will output messages to the serial interface at select code 0.

Often the computer attempts to identify the device to which it was "talking" when the message was generated. The trailer "SELECT CODE NN" is appended to the message to indicate which select code (I/O port) of the computer caused the message. Select codes 0 through 7 are on the computer and are controlled by the first I/O processor (IOP). Select codes 8 through 15 are on the I/O Expander and are controlled by the second IOP.

Messages

`Loader XXX` – Informational message identifying the revision of the system loader.

`Testing Memory...` – Informational message that follows the "Loader XXX" message indicating that the loader is performing memory tests and configuring memory. This can take up to 15 seconds.

`Looking for System...` – Informational message that follows the "Testing Memory..." message indicating that the loader is searching for an operating system. This message is usually followed by a single line message identifying the operating system the computer is attempting to load.

`Please mount next volume.` – Informational message. The loader is ready to load another portion of the operating system. Mount the volume containing an unloaded portion of the operating system. Volumes may be mounted in any order without affecting the loading process, but must be loaded in the same device.

`SYSTEM NOT FOUND; WILL RETRY IN XXX` – Unable to find an operating system on any mass storage device. The loader will attempt to find an operating system again in XXX seconds. Possible causes: mass storage device not powered up, no media in mass storage device, wrong disc in disc drive, computer or mass storage device hardware failure, media failure, incompatible loader/system revision numbers, etc.

`BAD SYSTEM FILE: SELECT CODE NN` – Operating system loaded. However, an error has been detected in the operating system code during loading. Possible causes: corrupt system, media failure, mass storage hardware failure, or computer hardware failure.

`NOT ENOUGH USABLE MEMORY; TOTAL IS XXXX` – The amount of usable memory is too small to load the operating system. The total amount of memory required is 98304 bytes plus the amount of memory for the operating system. The total amount of good memory is "XXXX" bytes. Possible causes: corrupt system or hardware (memory) failure.

`BAD CARD OR DEVICE: SELECT CODE NN` – Informational message. A hardware failure has been detected (interface card or mass storage device did not pass the Module Self-Test). The loader continues searching for an operating system.

MEDIA/DEVICE NOT READY: SELECT CODE NN – While loading. The media (Volume) was removed from the device (e.g. a floppy disc was pulled out of a disc drive), the device went offline, or a hardware problem caused the device to become "not ready".

UNRECOVERABLE DATA: SELECT CODE NN – Part of the operating system is not readable. Possible causes: media failure or mass storage device hardware failure.

END OF VOLUME: SELECT CODE NN – Attempt to address or read past the end of a volume. Possible causes: corrupt system, media failure or mass storage device hardware failure.

CTRLR/UNIT FAULT: SELECT CODE NN – Hardware passed initial self-test. However, It failed while being used to load the operating system. Possible causes: computer (interface card) hardware failure or mass storage device hardware failure.

IO TIMEOUT: SELECT CODE NN – Mass storage device failed to respond fast enough while attempting to load from it. Possible cause: computer hardware failure, mass storage device hardware failure, or the media was removed during loading.

CS80 DEVICE: SELECT CODE NN – Indicates a mass storage device hardware failure.

TAPE DEVICE: SELECT CODE NN –Usually indicates a tape device (HP 7971A, HP 7974, HP 7978) hardware failure. Can also indicate a failure on the HP 27110A HP-IB Interface. Tape errors covered are: "Command Rejected", "Interface Busy", "Rewinding", "Tape Runaway", "Data Timing Error", and "Command Parity Error".

HPIB CARD: SELECT CODE NN – Transaction to the indicated HPIB interface card was terminated due to a probable interface card failure.

SCM NOT FOUND. – Indicates a computer hardware failure on the computer's System Control Module.

BAD IO BUS: SELECT CODE NN – Indicates a computer hardware failure on the computers first IOP, or a bad SCM. The IOP does a write/read to the SCM during this test.

BAD NVM: SELECT CODE NN – Indicates that Non-Volatile Memory failed its self-test. Possible cause: SCM failure.

BAD RTC: SELECT CODE NN – Indicates that the built in Real Time Clock is not operating correctly.

Operating System Error Messages

The self-test messages displayed by the operating system consist of:

1. Self-Test Warning and Error Messages.
2. Fatal Error Messages.
3. Software Failure Messages

Warning and Error Messages

`Clock and date not set.` – This message indicates that either the contents of the NVM are not valid at powerup or the clock has not been set since this condition was detected. Possible causes: a bad battery on the SCM board, or computer powered down for more than 2 weeks. The condition does not stop the system operation.

```
Self test error 1: I/O address AA, SS STATUS: XXXXXXXX
```

Where: AA = Select code

SS = Subaddress

XXXXXXXX = Device or card dependent error information (in hexadecimal).

This error message is displayed as a result of the self-test failure of an I/O device. The select code subaddress denote the device, and the device dependent error information indicates the nature of the failure. System operation can continue provided that use of the failed device is not required.

`Self test error 2: CHECKSUM for segment NN` – When the system is powered up, or a system reset is executed, the checksum for every code segment of the operating system is computed and compared to a checksum in the operating system code. When the checksums do not agree for a segment, the segment number is stored. As a result, the segment reported is the last segment for which a checksum error was detected. The operation of the system is not halted, however, further operation is at your own risk.

```
Self test error 3: XXXX NN
```

Where: XXXX = "CPU#", "IOP#", or "MC#_".

NN = The Nth of that type of component (counting from the bottom of the stack).

This error occurs when the system is able to get completely through the board self-test and the loader self-test, but a failed stack component is detected by the operating system. The message indicates the type of component which has failed and its relative position in the stack. Operation of the system can continue, if the failed board is not required.

```
Self test error 4: Memory reduced to: NNNNNNNN Bytes, MCs:<list>
```

Where: NNNNNNNN = number of bytes (in decimal) that are available.

<list> = A list of Memory Controller numbers which had failures. Up to 10 MC numbers are printed in 10 two character fields, with no intervening spaces. For example: "MCs: 1 210" indicates that Memory Controllers 1, 2, and 10 have failed the memory test. Memory boards (and memory controllers) are numbered from 1, starting at the bottom of the RAM.

This number represents all usable RAM in the system including memory used to hold code segments.

`Self test error 5: Fewer finstrates were found than expected.` – This message is displayed when the number of boards recorded in the Non-Volatile Memory (NVM) is greater than the actual number of boards in the stack. If the number of boards in the stack is greater than the number stored in the NVM, the number in the NVM is updated to reflect the larger stack size.

Fatal Error Messages

`System halted due to double bit memory error on MC # NN CCCCCCCC`

Where: NN = MC #

CCCCCCCC = Last healer content for that MC (in hexadecimal).

This message is displayed when a double bit error has been detected by the memory controller hardware. The MC# is in terms of memory controller boards (counting up from the bottom of the stack). This information is also recorded in the NVM.

If more than one MC with a double bit error is found, only the last error is displayed. If no double bit errors are found, but the CPU was interrupted for a double bit error, "No DBE found" replaces NN XXXXXXXXX. DBE information is stored in the NVM.

`SYSTEM_HALTED: Insufficient memory to start system` – This message is displayed when there is insufficient memory for the operating system and user subsystem. Check the stack self-test lights to see if any stack components have failed self-test. Also, check the memory configuration of the computer to see if it is large enough to accomodate the system and options which are being loaded.

`SYSTEM HALTED: Incompatible IOPs` – This message indicates that an illegal combination of IOP boards were found at power up. IOPs of Revision 2.1 or earlier are not compatible with IOPs of Revision 2.2 or later.

System Error Message

`System halted->SYSTEM ERROR:....` – This message is displayed when the operating system software encounters either:

- an unanticipated trap,
- an unrecoverable system software error.

The "trap" is distinguished from the software error by the word "trap:" which is added to the first line of the message.

Before displaying any messages, the currently executing CPU disables its interrupts and causes all other CPUs to stop operating. The message text is multiple lines information dumped from memory and internal registers. The message starts on the top line on the Display and overwrites any other messages on the CRT. If a printer is the output device and the message is more than 25 lines in length, the message continues to print (up to 500 lines).

9050 Adjustments

Chapter 6

There are no field adjustments in the HP 9050 Computer.

9050 Peripherals

Chapter 7

Interface Cards

HP-IB Interface - HP 27110A/B

Features

- IEEE-488-1978 compatible.
- Supports DMA with two modes of performance: High Speed Mode for operation with fixed discs or other high speed peripherals; Standard Mode for instruments and slower peripherals.
- Supports up to 14 device loads.
- Selectable as HP-IB controller or slave.
- Built in hardware self-test.

Configuration

Normal switch settings are as follows (note that up is the open switch position and represents a logic one).

S1-S5: Address 30 (decimal); S1 is least significant bit; Address 31 is illegal and causes a flashing LED on the HP-IB card.

S6: System Controller On; When the switch is up the HP-IB is the system controller for the HP-IB bus.

S7: Normal Speed; Up for normal speed; Also called Data Settling Time Selection switch as it changes the time delay to meet IEEE Standard 488-1978 for high speed devices. An in-line resistor pack must also be moved when changing the speed, if the HP-IB is the system controller.

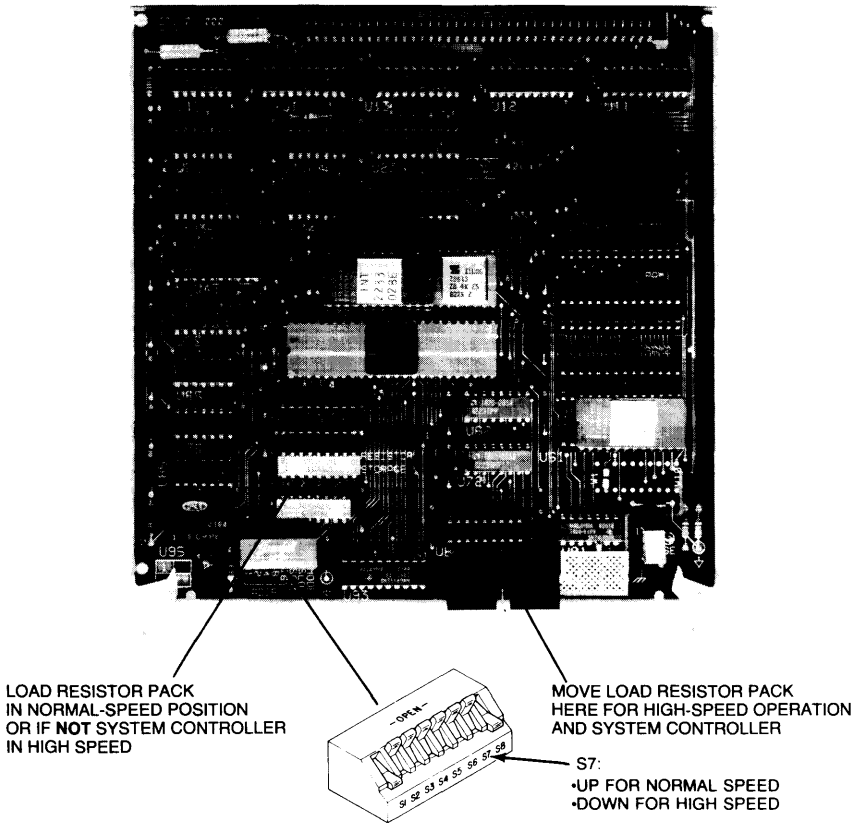
S8: Self Test Mode 1; Down for self test mode 1.

High speed devices can run on a normal speed bus, but run slower than their capacity. Normal speed devices cannot run on a high speed bus. The following are examples of high speed devices:

- Disc drives
- 7971A tape drives
- 2608S 2631B/G printers

Connections

Cabling information is in the configuration section.



HP 27110A/B HP-IB Interface Card

General Purpose Interface (GPIO) - HP 27112A

Features

- Choice of programmable operating modes (clocked or transparent) for ease of use with instrumentation.
- Supports +5 V level on all input and output signals, plus an optional +12 V level on output signals.
- Programmed data detection for either positive true or ground true levels.
- Independent 16 bit input and output buses and storage registers.
- Two control and two status lines.

Configuration

Normal switch settings depend on which peripheral device is connected to the GPIO. The 97060A Graphics Processor requires the following GPIO switch settings. When the switch is up, it is in the open position.

The switches correspond to:

SW1	S1: DIN;	Up - Positive True. Down - Negative True.
	S2: CTS and STS;	Up - Positive True. Down - Negative True.
	S3: PSET;	Up - Positive True. Down - Negative True.
	S4: PDIR;	Up - Positive True. Down - Negative True.
	S5: DOUT;	Up - Positive True. Down - Negative True.
	S6: PEND	Up - Positive True. Down - Negative True.
	S7: PFLAG	Up - Positive True. Busy - High. Ready - Low. Down - Negative True (HP 97060A). Busy - Low. Ready - High.
	S8: PCNTL;	Up - Positive True. Active - High. Idle - Low. Down - Negative True. Active - Low. Idle - High.

SW2 S1: Bidirectional Bus Enable:
Up - Disabled.
Down - Enabled.

S2: Internal Handshake Enable;
Up - Disabled.
Down - Enabled.

S3: Full/Pulse Handshake Enable;
Up - Disabled.
Down - Enabled (HP 97060A).

S4 and S5: Data Input Clock Select;
Both Down - Backplane sync cycle completion.
Both Up - Backplane sync cycle completion.
S4 Up and S5 Down - Busy to ready edge of PFLAG (trail edge)
S4 Down and S5 Up - Ready to busy edge of PFLAG (lead edge)

Ensure that jumpers W1, W2, and W3 are in the correct position.

It may be necessary to increase the delay on the GPIO card. Use the following procedure.

Two one-shots (E15) on the GPIO card generate the write delay and the internal handshake delay. The write delay one-shot provides approximately 100 nsec for the output data to settle. When extra long cables are used, or when the peripheral device requires additional settling time for the data, the delay can be increased by adding a capacitor between pins 1 and 4 of the socket at E16.

The formula for selecting the capacitor value is:

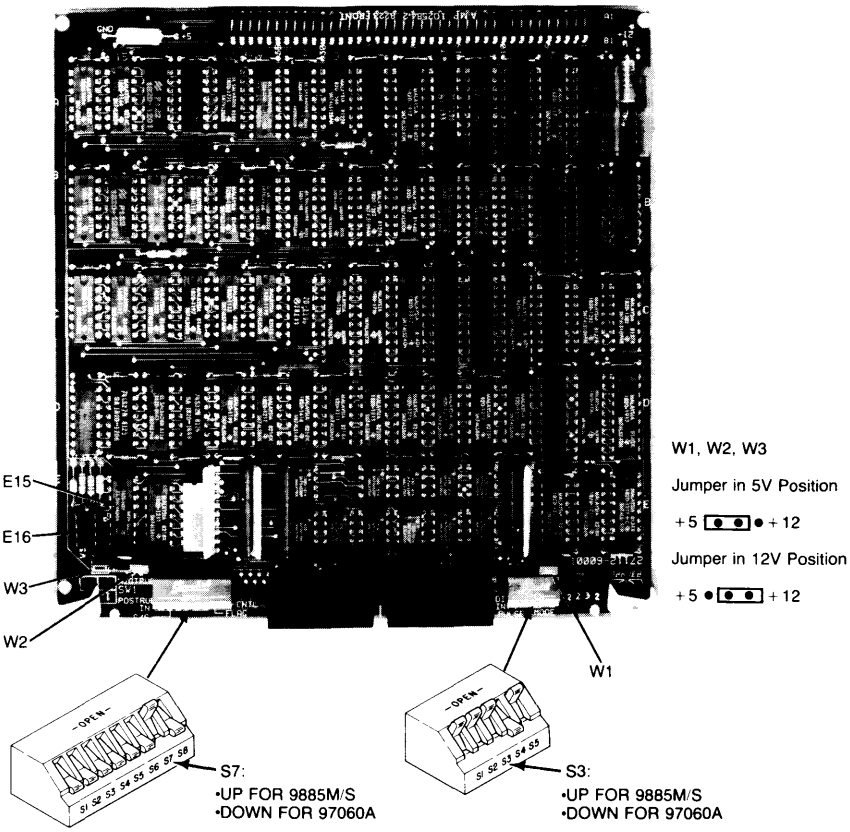
$C = (T-100)/1.5$ Where: C = Added Capacitance (in pf)
T = Total time delay (in nsec)

The internal delay one shot provides a delay of approximately 3 usec between the assertion of PCNTL and the assertion of FLAG. The delay can be increased by adding a capacitor between pins 5 and 8 of the socket at E16.

The formula for selecting the capacitor value is:

$C = (T-3000)/3$ Where: C = Added Capacitance (in pf)
T = Total time delay (in nsec)

Connections
Cabling information is in the configuration section.



HP 27112A General Purpose I/O Interface Card

Remote Job Entry Interface (RJE) - HP 27122A

Features

- 1 200 to 19 200 baud rates.
- Compatible with EIA RS- 232C and CCITT V.24 specifications.
- Supports Bell type 208B, 2096, and 212 data sets or equivalent.
- Supports Siemens MSV2 protocol.
- Works with full or half duplex modems, and supports AUTO ANSWER and ORIGINATE.
- Provides link control functions: line bid, normal and transparent data modes, all responses, and link termination.
- Assures data integrity with CRC error checking.
- EBCDIC character recognition.
- Space compression/truncation.

Configuration

There are no switches to be set on the RJE Card.

Connections

Cabling information is in the configuration section.

Shared Resource Management Interface (SRM) - HP 27123A

Features

- Data transmission rate is 700 Kbits per second.
- Access to the network through rotary polling on an HP 98028A Multiplexer (part of the SRM product).
- All transmissions are broadcast to all connections on the HP 98028A multiplexer.
- Packets can contain up to 512 data bytes.
- Reception of packets is acknowledged.
- Remote file access to create/open/purge a file or directory, read or write bytes, set protection, and catalog.

Configuration

Ensure That the eight switches are set to the binary equivalent of the assigned decimal node address. S1 is the MSB, and S8 is the LSB.

Connections

Cabling information is in the configuration section.

Local Area Network Interface Controller (LANIC) - HP 27125A

Features

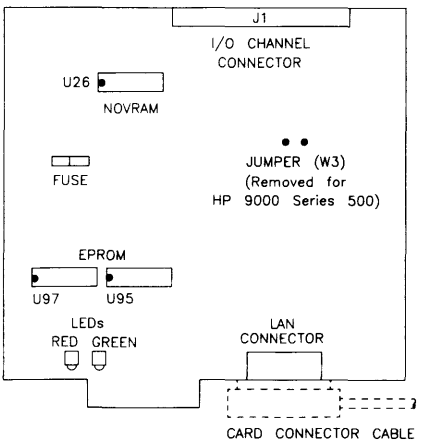
- Implementation of IEEE LAN standards 802.2 type 1 and 802.3.
- Provides LAN connection to HP 9000 Series 500 host computers.
- Operates with baseband networks using Carrier Sense Multiple Access with Collision Detect (CSMA/CD).
- Provides for connection and operation with Ethernet version 1.0.
- 10 Mbps transfer rate.
- 50 metres distance between LANIC and attachment unit.

Configuration

- There are no switches to be set.
- All node hardware must conform to the same standards.
- Remove and throw away jumper W3.
- Record the Link Address – 08 00 09 (plus xx yy zz from the NOVRAM).

Connections

Cabling information is shown in the configuration section.



Asynchronous Serial Interface (ASI) - HP 27128A

Features

- Switch selectable and software programmable baud rate; up to 19 200 bits per second.
- EIA RS-232C, CCITT V.28 compatible.
- Asynchronous transmission in simplex, full duplex, and echoplex mode.
- Programmable format control and built-in framing error, overrun error, and parity checking.
- Break detection, support for X-ON or X-OFF and terminal emulation mode.

Configuration

The normal switch settings are:

S1: Single Text Termination;	Up - Single Text Termination. (Typical) Down - Not Single Text Termination.
S2: Hard wired;	Up - Device directly connected. Down - Device Not Directly Connected. (Modem use)
S3: No Parity;	Up - No Parity. (Typical) Down - Odd Parity.
S4: Bits Per Character;	Up - 8 Bits Per Character. (Typical) Down - 7 Bits Per Character.

S5 to S8: Baud Rate; (See table)

ASI Baud Rate Switches

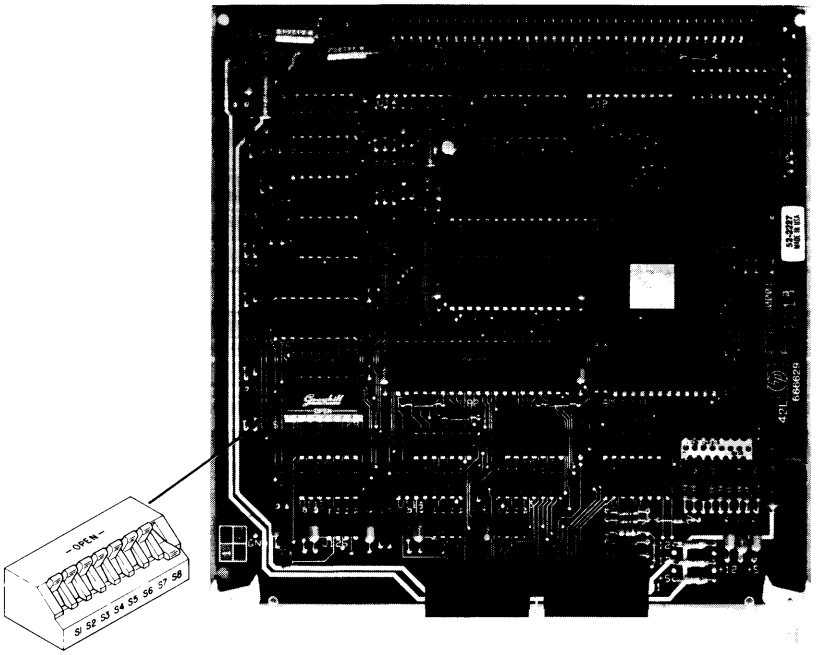
Switches				
S5	**S6**	**S7**	**S8**	**BAUD Rate**
Down	Down	Down	Down	50
Down	Down	Down	Up	75
Down	Down	Up	Down	110
Down	Down	Up	Up	134.5
Down	Up	Down	Down	150
Down	Up	Down	Up	300
Down	Up	Up	Down	600
Down	Up	Up	Up	900
Up	Down	Down	Down	*1200
Up	Down	Down	Up	1800
Up	Down	Up	Down	2400
Up	Down	Up	Up	3600
Up	Up	Down	Down	4800
Up	Up	Down	Up	7200
Up	Up	Up	Down	**9600
Up	Up	Up	Up	19200

* Typical modem

** Typical direct connection application

Connections

Cabling information is in the configuration section.



HP 27128A Asynchronous Serial Interface (ASI) Card

Asynchronous 8-Channel Multiplexer Interface - HP 27130A/B

Features

- CCITT V.28 and EIA RS-232C compatible.
- Supports simplex, echoplex, or full duplex mode (asynchronous transmission only).
- Selection of data transmission attributes can be performed independently on each channel.
- Local intelligence reduces time consumed by the CPU during I/O transactions by offering edit functions, special character recognition, and handshake protocol control.
- Parity, overrun, and framing errors are sensed locally to detect transmission errors.
- X-ON or X-OFF (both directions) and ENQ/ACK (one direction, host sending ENQ) handshaking.

Configuration

There are no switches to be set on the multiplexer card.

Connections

Cabling information is in the configuration section.

Modem MUX Interface - HP 27140A

Features

- Supports up to six EIA RS-232C/CCITT-V.22 compatible devices.
- Consists of interface card, cable, and connection panel.
- Provides control lines and handshaking for asynchronous modems and uucp networking.
- Direct DCE style connection.
- DTE style connection with HP 92219Q cable.

Configuration

There are no switches to set on the HP 27140A card.

Connections

Cabling information is in the configuration section.

Graphics Processor - 97060A

Features

- GPIO interface to the host computer.
- High performance graphics processor; 8 planes of 1024 X 1024 pixels.
- RGB output to color graphics monitor.
- Built in self-test capabilities. Results displayed by the Ready light.
- Compatible with the HP 9111A Data Tablet.

Connections

Cabling information is in the configuration section.

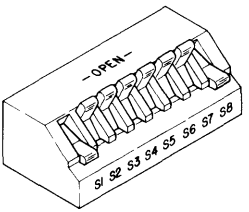
Local Area Network (LAN) - HP 2285A

Features

- HP-IB interface to the host computer.
- Coaxial cable with baseband signaling
- 10 Mbps data signaling rate.
- Minimum separation between nodes is 2.5 metres.
- Nodes can be up to 40 metres from the coaxial cable.
- Masterless protocol, Carrier-Sense Multiple Access with Collision Detection (CSMA/CD).
- Segment coax length of up to 500 metre and up to 100 nodes per segment.
- Supports broadcast and multicast addressing.
- Diagnostics the user can run simultaneously with other network services.

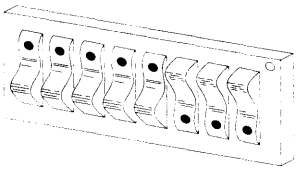
Configuration

The LAN Unit uses an HP-IB interface to connect to the computer. Before you install the HP-IB ensure that the switches on the HP-IB are set to the following position.



HP-IB Switches

The LAN Unit has switches on the back. Ensure that they are set to 0 by putting them in the following position.



LAN Unit Switches

Connections
Cabling information is in the configuration section.

Peripheral

General Configuration

Use the appropriate peripheral manual for information on switch settings.

Select Code 7 is reserved for the SCM.

System console should use select code 0. The operating system expects to find it there.

Terminals
If necessary, change the following fields or switches to have the indicated values.

Local Echo	OFF
Caps Lock	OFF
Xmit Fnctn(A)	NO
Inh Hnd Shk(G)	YES
Inh D2(H)	YES
Baud Rate	9600
Bits/Characters	8
Parity	NONE
Enq Ack	YES
Recv Pace	XON/XOFF
Xmit Pace	XON/XOFF
Line/Block Mode	Line
Return Def	CR
Remote *	ON
Auto LF	OFF
Display Functions	OFF

Disc Drives
Set the HP-IB address switch for the system disc drive to "0".

The suggested select code for the system disc HP-IB interface is 5 (Internal HP-IB or HP 27110).

Supported Peripherals

This list is current as of publication of this manual. Due to the frequent change of this list it is recommended that you contact the HP Sales Representative for current information about this equipment.

Modems

Use 27128A or 27140A Interface.

HP Product Number	Description
37212A	QTD 300/1200 Baud Modem.
92205A/C	Hayes 1200 Baud Modem.

Terminals

Use HP 27128A or HP 27140A Interface.

HP Product Number	Description
2382A	Alphanumeric Terminal.
2392A	Alphanumeric Terminal.
2622A	Alphanumeric Terminal.
2623A	Graphics Terminal. HP 17623A is the Tablet for the HP 2623A Terminal.
2627A	Color Graphics Terminal. HP 17623A is the Tablet for the HP 2627A Terminal.
45610A/B	HP 150 when used as HP 2623 Terminal.
45710A	HP 110 when used as a terminal emulator.
97056A	BASIC Terminal Emulator.
97076A	"Aterm" HP-UX Terminal Emulator.
9807A	Integral PC
98700A	Graphics Display Station
98790A	Series 200 Terminal Emulator.

Mass Storage

Use HP 27110A/B HP-IB.

HP Product Number	Description
7911P/R	28.1M byte Disc Drive with a 67M byte Tape Cartridge.
7912P/R	65.6M byte Disc Drive with a 67M byte Tape Drive.
7914P/R	132.1M byte Disc Drive with Two 67M byte Tape Drive.
7933H	404M byte CS/80 Disc Drive.
7935H	404M byte CS/80 Disc Drive.
7941A	24M byte Disc Drive.
7942A	24M byte Disc Drive.
7945A	55M byte Disc Drive.
7946A	55M byte Disc Drive.
7974A	Tape Drive, 9 track, 1600 cpi.
9122D/S	3 1/2 inch Flexible Disc Drive.
9125S	5 1/4 inch Flexible Disc Drive.
9133D	14.5M byte Winchester Disc Drive and 3 1/2 inch Flexible Disc Drive.
9134D	14.8M byte SS/80 Winchester Disc Drive.
9144A	1/4 inch Cartridge Tape Drive.
9895A	8 Inch Flexible Disc Drive.

Printers

Use HP 27110A/B HP-IB.

HP Product Number	Description
2225A	Thinkjet Dot Matrix Printer, 150 cps.
2563A	Line Printer, 300 lpm. (Shade - 26061A - GPIS for Printer)
2565A	Impact Printer, Dot Matrix, 600 lpm.
2566A	Impact Printer, Dot Matrix, 900 lpm.
2602A	Impact Printer, Daisywheel, 25 cps
2671A/G	Dot Matrix Thermal, 120 cps.
2673A	Intelligent Printer, 120 cps.
2686A	Laser Printer, 6 ppm.
2688A	Laser Printer, 12 ppm.
2932A	Impact Graphics Printer, 200 cps.
2933A	Impact Graphics Printer, 200 cps, with fonts and bar code.
2934A	Impact Graphics Printer, 200 cps, without bar code, with letters.

Plotters

Use HP 27110A/B HP-IB.

HP Product Number	Description
7470A	Pinchroll Plotter, A size, 2 Pen.
7475A	Pinchroll Plotter, B size, 6 Pen.
7550A	Plotter, B size, 8 Pen.
7580A/B	Plotter, D size, 8 Pen.
7585A/B	Plotter, E size, 8 Pen.
7586B	Roll Feed Plotter, E size, 8 Pen.
9872C/T	Plotter, B size, 8 pen.

Miscellaneous

HP Product Number	Description
9111A	Tablet. Use HP 27110A HP-IB.
13279B	Color Monitor, 19 Inch. Uses HP 97062A Color Output Interface.
26075A	HP-IB Switch
27116A	HP-CIO Extender
92211L	Taboret Cabinet Rack
92211R	Design Plus Mobile Mini Rack
97064A	CAD Worktable
97098A	I/O Expander (Needs a Second IOP in the Stack.)
46087A	A size Graphics Digitizer.
46088A	B size Graphics Digitizer.
46089A	4 Button Cursor (for Digitizers).
98028A	SRM Multiplexer.

9050 Replaceable Parts

Chapter 8

Extender Board

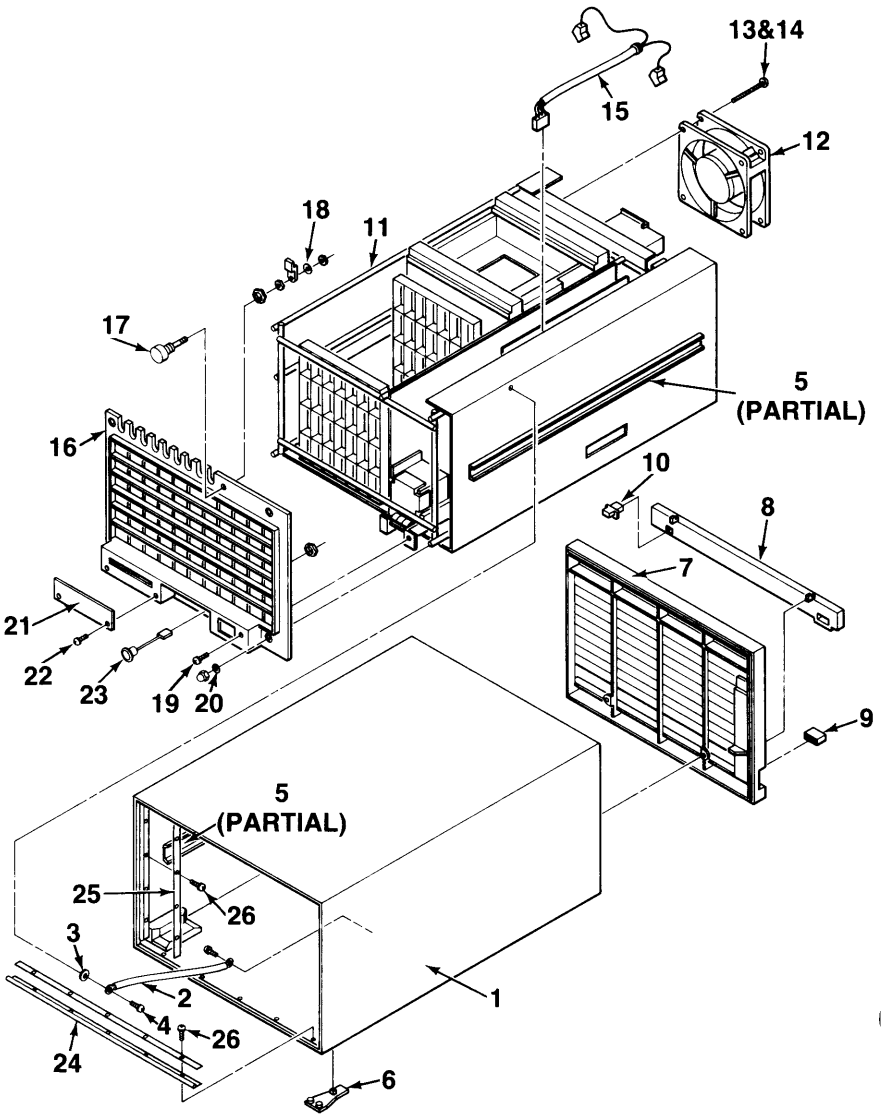
HP-CIO Extender Board	27116A

Documentation

HP 9050 Hardware Support Document	09050-90038
HP 9050 Installation and Configuration Manual	09050-90011
HP 9000 Series 200/500 Site Preparation Manual	09000-90040
HP 9050 CE Handbook	09050-90035

Parts Lists

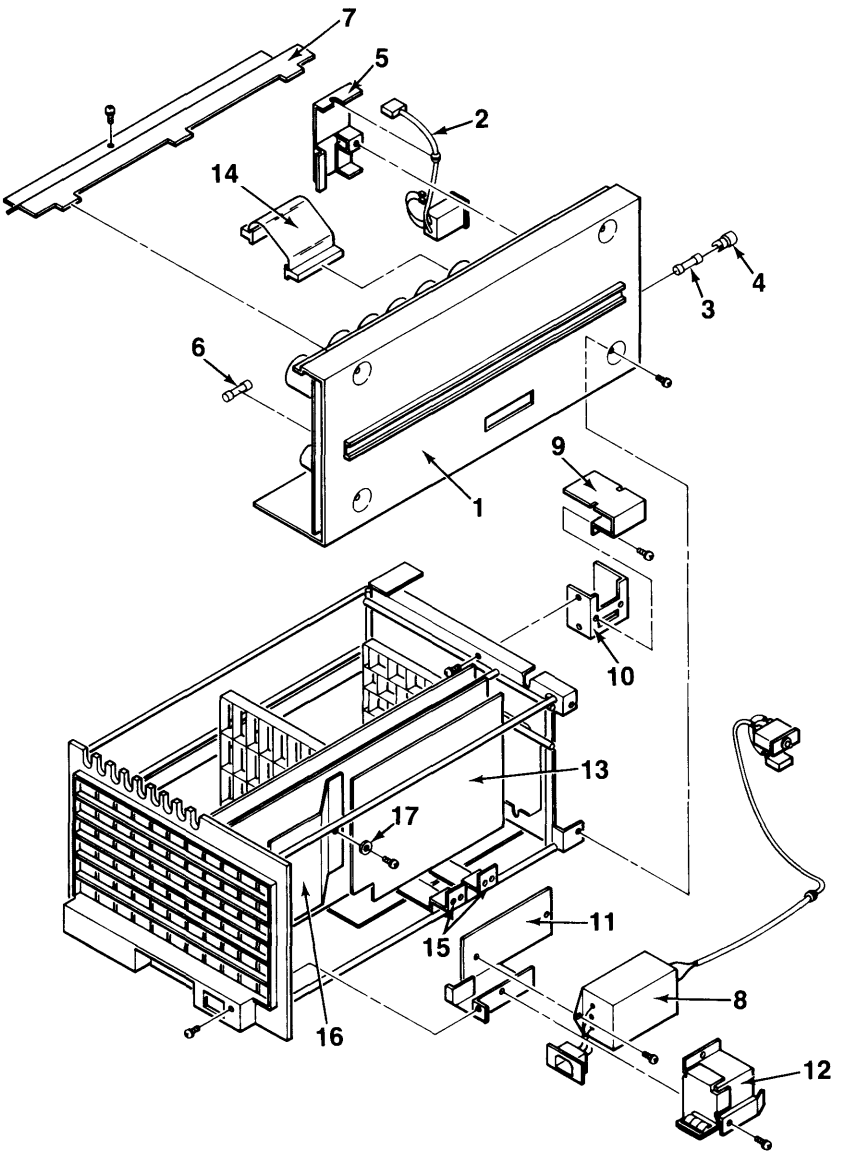
The following parts lists and explodes identify all the replaceable parts for the HP 9050 computer.



Case, Panel, Casting, Frame, and Fans

Case, Panel, Casting, Frame, and Fans

Index No	Part Number	Description	Qty
	Common Hardware		
	0515-0825	Screw/Washer (M4 X 7mm)	42
1	09050-04402	Case Assembly (with feet and slides)	1
2	09050-61608	Ground Cable (Steel)	1
3	0510-0174	Retainer, Screw (Ground Strap)	1
4	0515-0825	Screw/Washer (M4 X 7mm)	1
5	09050-21201	Slide Assembly (2 Pieces)	2
6	09121-48303	Feet	4
7	09050-64301	Front Panel Assembly (with insert)	1
8	09050-40201	Front Panel Insert	1
9	5041-1203	Button, Line (ON, OFF)	1
10	09050-47701	Light Pipe	1
11	09050-00102	Frame	1
12	3160-0458	Fan	2
13	0515-0964	Screw (M4 X 45mm)	4
14	2190-0009	Washer	4
15	09050-61604	Fan Cable Assembly	1
16	09050-04401	Rear Casting	1
17	1390-0720	Latch Assembly (all parts)	1
18	2190-0011	Star Washer (for latch assembly)	1
19	2950-0208	Cap Nut	4
20	2190-0057	Star Washer (for Frame)	4
21	1600-1353	I/O Cover Plate	1
22	0515-0080	Screw, I/O Cover Plate (M3.5)	2
23	09050-61606	Uninterruptable PS (UPS) Cable Assembly	1
24	09050-29501	RFI Gasket (top/bottom)	2
25	09050-29502	RFI Gasket (sides)	2
26	0515-0219	Screw, RFI Gasket (M3X0.5)	18



Power Supplies

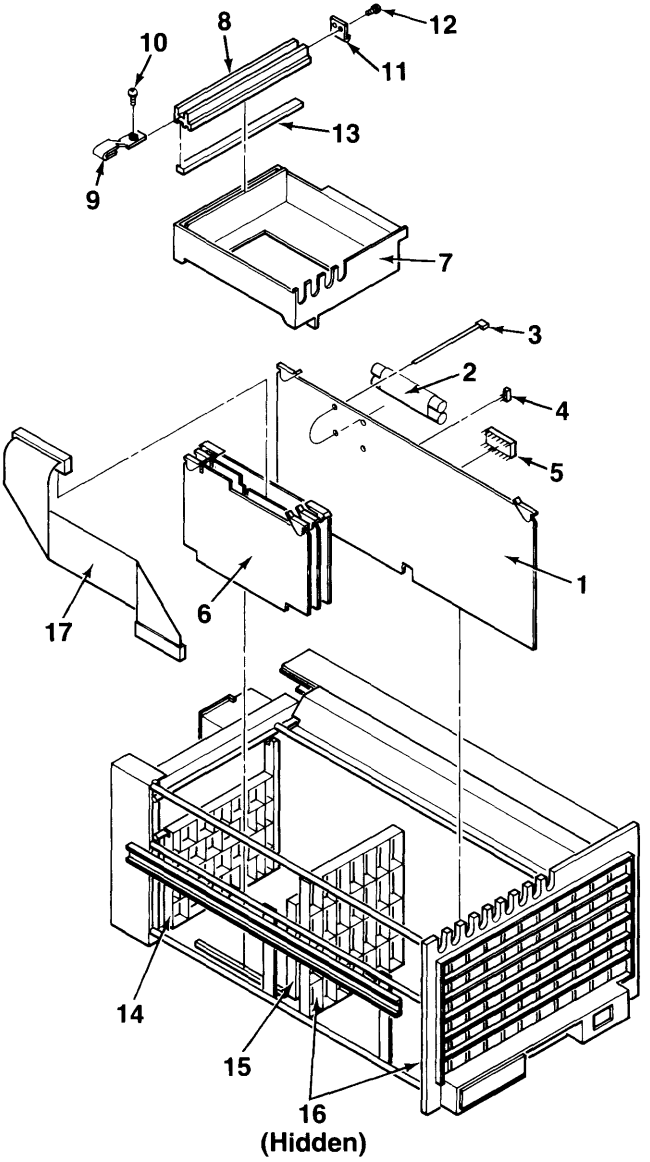
Power Supplies

Index No.	Part Number	Description	Qty
1 *	09050-66587	Main Power Supply (New)	1
*	09050-69587	Main Power Supply (Exchange)	
2	09050-61601	Cable Assembly (ON/OFF Switch)	1
3	2110-0051	Fuse (10A-110V)	1
	2110-0342	Fuse (8A-250V)	1
4	2110-0269	Fuse Cap	1
5	09050-01206	Power Switch Bracket	1
6	2110-0360	IB Fuse (3/4A)	1
7	09050-07902	Stack Power Supply Cover	1
8	09050-67901	Filter/Interlock Cable Assembly	1
9	09050-01204	Interlock Cover	1
10	09050-01205	Interlock Bracket	1
11	09050-01203	AC Receptacle Bracket	1
12	09050-04101	AC Receptacle Cover	1
13	09050-66585	Stack Power Supply Board (New)	1
	09050-69585	Stack Power Supply Board (Exchange)	
14	09050-61603	Stack Power Supply Cable	1
15	09050-07901	Bus Bars	2
16	09050-24101	Air Baffle (Plastic)	1
17	3050-0071	Flat Washer (Air Baffle)	1

Power Cords

8120-1378	United States (110V)
8120-0698	United States (220V)
8120-1369	Australia
8120-1689	Europe
8120-2104	Switzerland
8120-2956	Denmark
8120-4211	South Africa

* Includes items 2 thru 6.



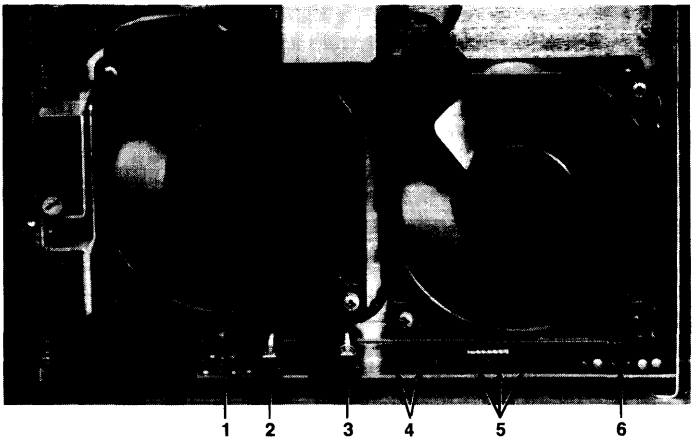
Processor Stack and I/O Card Cage

Processor Stack and I/O Card Cage

Index No.	Part Number	Description	Qty
1 *	09050-66510	System Control Module (New)	1
*	09050-69510	System Control Module (Exchange)	
2	1420-0302	Battery	1
3	1400-0719	Cable Ties	2
4	8159-0005	Jumper, Battery	1
5 **	09050-80000	Loader ROM	1
6		Processor Stack Boards	
	5061-6803	CPU (New)	
	97043-69803	CPU (Exchange)	
	5061-6806	IOP, Rev. 3.1 (New)	
	97044-69806	IOP, Rev. 3.1 (Exchange)	
	5061-6805	512K byte RAM (New)	
	97047-69805	512K byte RAM (Exchange)	
	5061-7704	1M byte RAM (New)	
	97046-69704	1M byte RAM (Exchange)	
	5061-4228	IOP Buffer Assembly (No Exchange)	
	98700-66583	Display Station Buffer (DSB)	
7	09050-44101	Stack Retainer Bucket	1
8	7200-1750	Stack retainer Bar	2
9	09050-01201	Retainer Slider	2
10	0515-0825	Screw (Retainer Slider)	2
11	09050-01202	Retainer Hook	2
12	0515-0635	Screw (Retainer Hook)	4
13	09050-24701	Stack Retainer Cushion	2
14	09050-44703	Stack Card Guide (13 Slot - Short)	1
15	09050-44704	Stack Card Guide (12 Slot - Short)	1
16	09050-44702	I/O Card Guide (12 Slot - Long)	2
17	09050-61605	IOP Cable (First IOP)	1
		Not Shown On Exploded Diagram	
	09050-61607	IOP Cable (Second IOP)	
	09050-40601	Second IOP Shield	
	09050-40602	Second IOP Shield Cover	

* When replacing the SCM board, move the loader ROM to the new board. Use tool 8710-0585.

**When ordering the Loader ROM, the serial number of the computer must be given to the individual taking the order. The serial number is programmed into the replacement ROM.



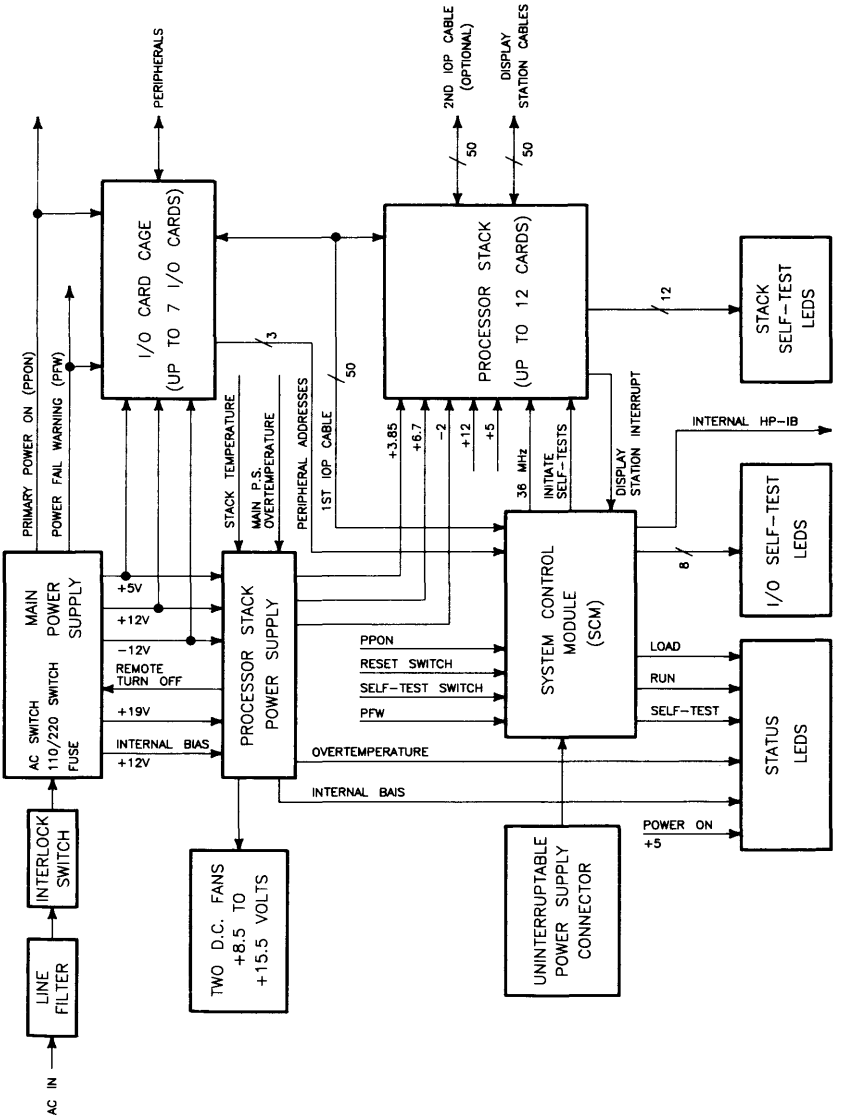
Motherboard

Motherboard

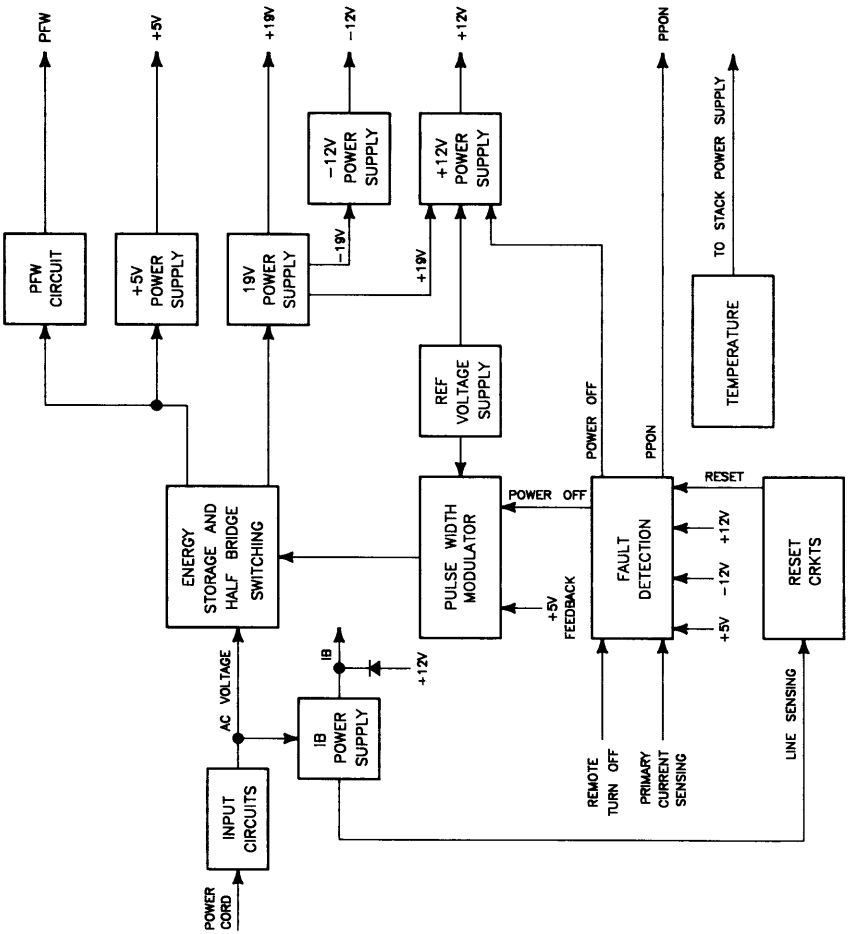
Index No.	Part Number	Description	Qty
1	09050-66500	Motherboard (No Exchange)	1
2	3101-2777	Reset Switch	1
3	3101-2777	Self Test Switch	1
4	1990-1037	I/O Card Cage LEDs	2
5	1990-1037	Stack LEDs	3
6	1990-1036	Status LEDs	1

9050 Diagrams

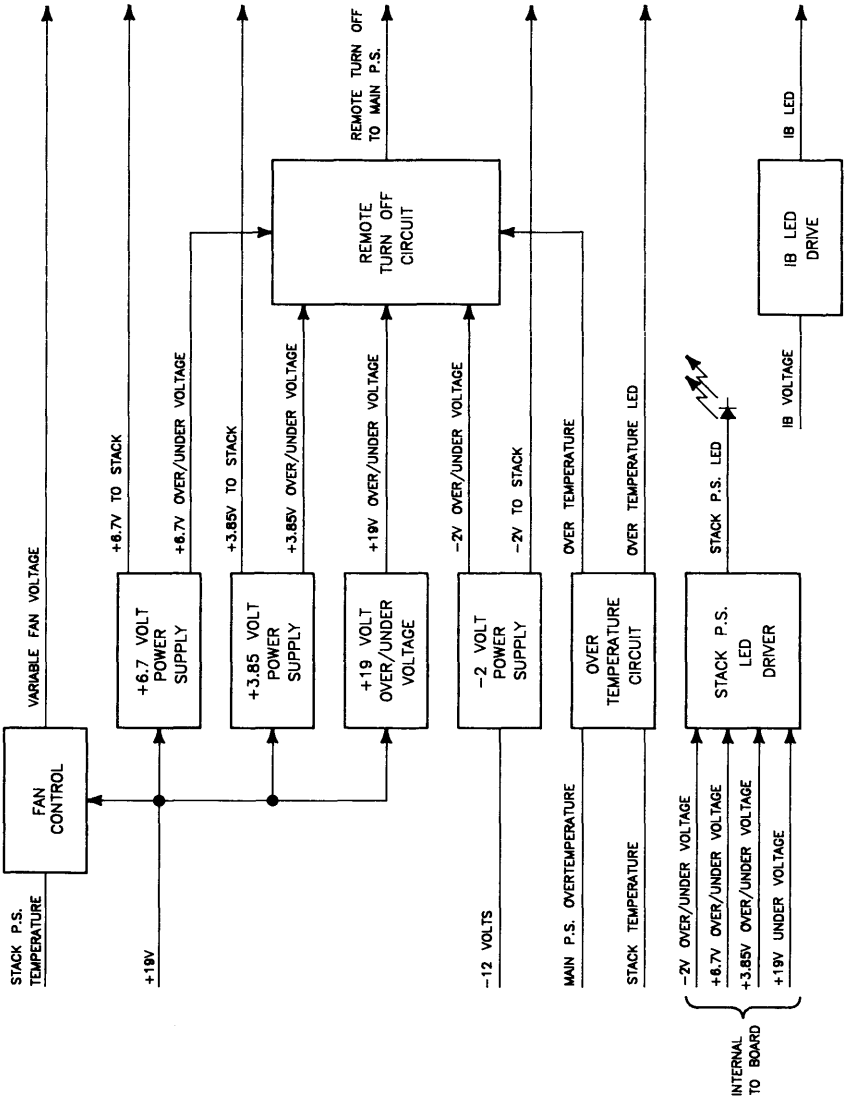
Chapter 9



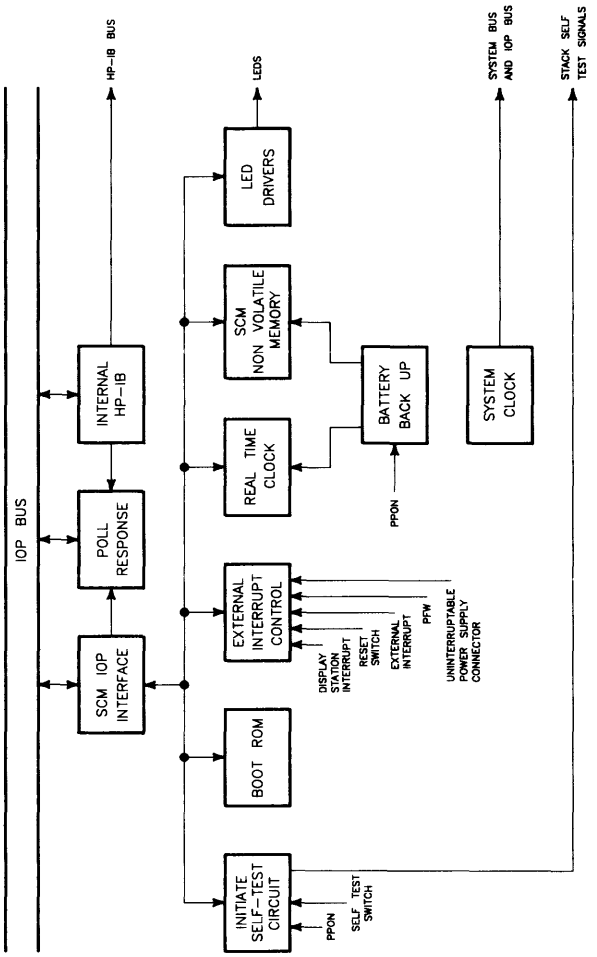
System Block Diagram



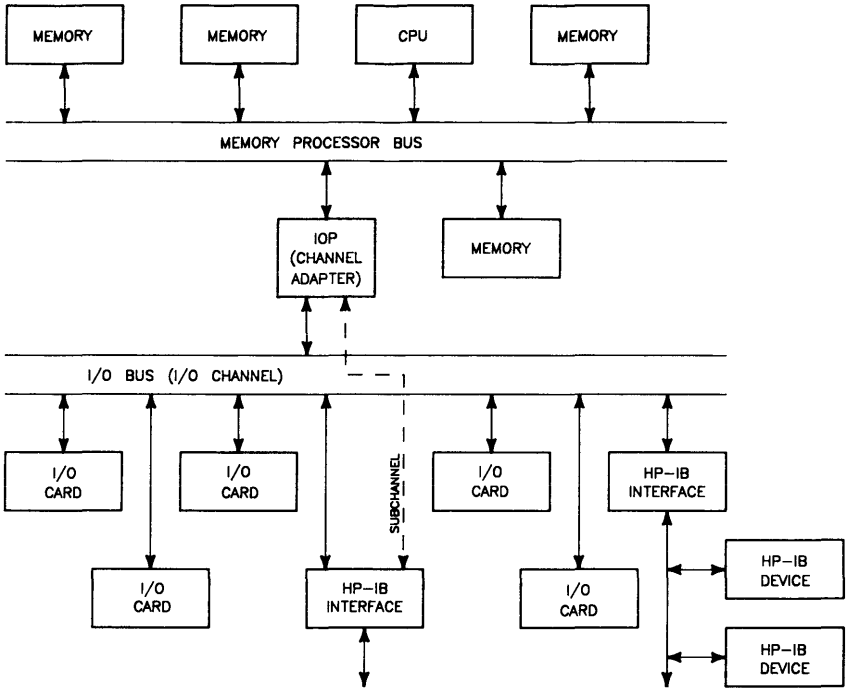
Power Supply Block Diagram



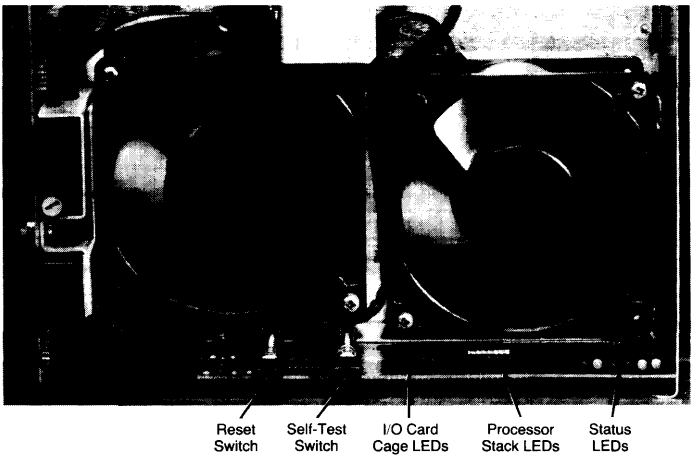
Stack Power Supply Block Diagram



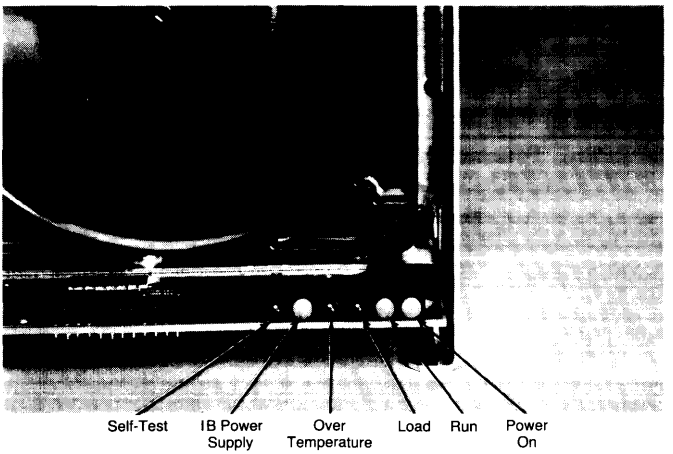
SCM Block Diagram



I/O Channel Interconnections



Front Panel LEDs and Switches



Status LEDs

9050 References

Chapter 10

9050 Service Manuals

HP Part No.	Description
09050-90038	HP 9050 Hardware Support Document
09050-90035	HP 9050 CE Handbook
09050-90011	HP 9050 Installation and Configuration
09000-90040	HP 9000 Series 200/500 Site Preparation Manual

Accessories Manuals

Product	Manual No.	Description
97060A	97060-90030	Graphics Processor Service Manual
97098	97098-90020	I/O Expander Installation and Service Manual
97064A	97064-90000	CAD Table Installation and Service Manual

Interface Manuals

Interface	Description
27132A	Channel I/O Technical Reference Package
27110A/B	HP-IB Interface Installation Manual
27110A/B	HP-IB Interface Technical Reference Manual
27112A	GPIO Interface Installation Manual
27112A	GPIO Technical Reference Manual
27122A	RJE Interface Installation Manual
27122A	RJE Firmware Reference Manual
27123A	SRM Interface Installation Manual
27125A	LANIC Installation Manual
27128A	ASI Installation Manual
27128A	ASI Technical Reference Manual
27130A/B	MUX Installation Manual
27130A/B	MUX Technical Reference Manual
	Programmable Serial Interface Hardware Reference Manual

HP-UX Users Documentation

HP Part No.	Description
09000-90007	HP-UX Reference
97073-90005	IMAGE HP-UX Reference Supplement
98680-90025	Introducing the UNIX System by McGilton & Morgan
97089-90004	HP-UX Concepts and Tutorials (4 Vols.)
97089-90048	HP-UX System Administrator's Manual
97080-90093	Unpacking Instructions for the HP 9000 Series 500 Computers
92836-90005	Stuctured FORTRAN 77 Programming by Pollack
97081-90001	FORTRAN/9000 Reference
92832-90002	Programming in Pascal by Grogono
97082-90001	Pascal/9000 Reference
97089-90000	The C Programming Language by Kernighan & Ritchie
97086-90001	Applications Migration Reference
97086-90002	Applications Migration Users Guide
97059-90000	HP-UX Local Area Network (LAN) Users Guide
97059-90001	HP-UX LAN Node Manager's Guide
97076-90001	HP-UX Asynchronous Communications User's Guide
97077-90000	RJE Synchronous Data Communications User's Guide
97084-90000	DGL Programmer Reference
97084-90001	DGL Supplement for the Series 500
97084-90025	Graphics/9000 Device Handlers Manual
97085-90000	AGP User's Guide
97085-90001	AGP Supplement for the Series 500
97085-90005	AGP Reference
98183-90000	HP SPICE User's Guide
98183-90005	HP SPICE Reference

9050 Service Notes

Chapter 11

Keep your service notes in this section.

09050-90601
Mfg. No. Only