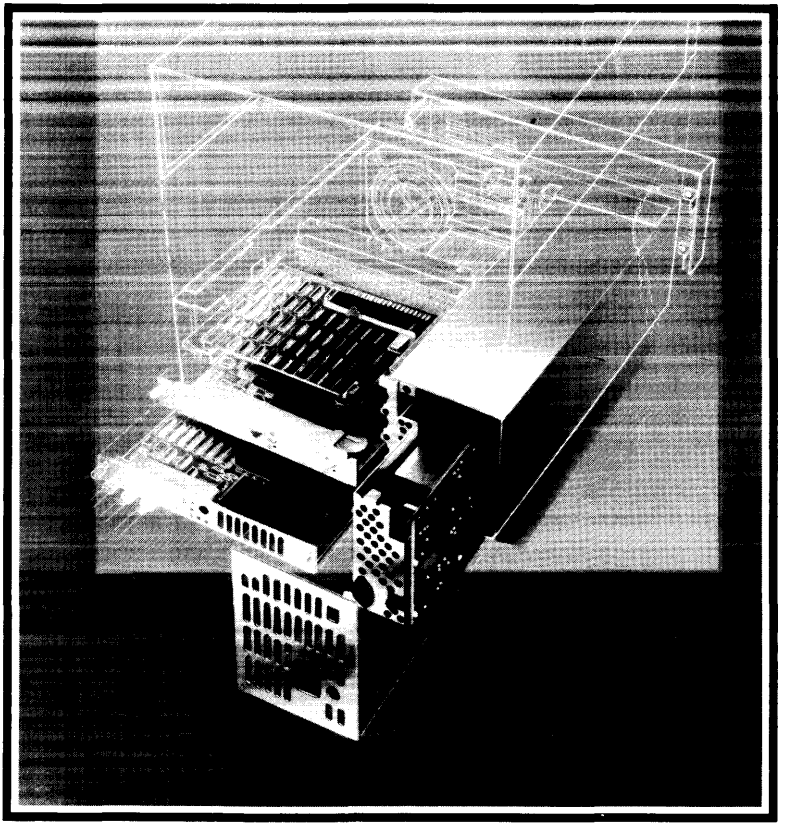
HP 9000 Series 300 Computers

HEWLETT PACKARD

98561A/B Service Handbook



98561A/B Service Handbook

for HP 9000 Series 300 Computers

HP Part Number 98561-90039

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

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.

May 1985...Edition 1
March 1986...Edition 2
May 1986...Update

NOTICE

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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.

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Physical

Height:	130 mm (5.12 inches)
Width:	325 mm (12.80 inches)
Depth:	376 mm (14.80 inches)
Weight:	
Computer:	10.57 Kg (23.25 lbs)
Expander:	10.18 Kg (22.4 lbs)
Shipping Weight:	
Computer:	15.91 Kg (35 lbs)
Expander:	12.00 Kg (26.41 lbs)

Power Requirements

Operating voltage:	85 to 129 Vac, 187 to 250 Vac switch-selectable	
Operating frequency:	48 to 66 Hz	
Power consumption:	250 W (maximum)	
	HP 98561A Computer	HP 98568A Expander
Backplane power*:	31 W @ +5 V 19.2 W @ +12 V 6 W @ -12 V	62 W @ +5 V 38.4 W @ +12 V 12 W @ -12 V

*Any card designed for installation in this backplane must meet DIO guidelines. DIO guidelines may be found in the *Accessory Development Guide*, part number 09800-90010.

Product Configuration

Product Number	Description
HP 98561A	MC68010 processor Low-resolution monochrome video output 1M bytes RAM HP-IB, HP-HIL, RS-232 and audio interfaces Battery-backed real-time clock 4-slot card cage for interfaces and memory HP 46020A Keyboard
Option 002	Delete 512K bytes RAM
Option 003	Delete video controller
Option 004	Delete 4-slot card cage
HP 98561B	MC68020 processor 4-slot card cage for interfaces and memory HP-IB, HP-HIL, RS-232 and audio interfaces Battery-backed real-time clock HP 98257A RAM card (1M byte) HP 46020A Keyboard

Product Information 1

Information in this manual refers to the HP 9000 HP 98561A and HP 98561B computers. Where applicable, the information also applies to the HP 98568A eight-slot backplane expander.

Processors

HP 98561A

Type:	Motorola 68010
Clock frequency:	10 MHz
Internal architecture:	32-bit data and address registers
Address range:	16M bytes (7.5M bytes user RAM)
RAM data bus:	16-bit asynchronous
Instruction types:	57
Major data types:	5
Addressing modes:	14
Interrupt levels:	6 maskable and 1 non-maskable

HP 98561B

Type:	Motorola 68020
Clock frequency:	16.6 MHz
Internal architecture:	32-bit data and address registers
Address range:	4G bytes (7.5M bytes user RAM)
RAM data bus:	16-bit asynchronous
Cache data bus:	32-bit
Instruction types:	100
Major data types:	7
Addressing modes:	18
Interrupt levels:	6 maskable and 1 non-maskable
Floating-point Co-proc.	12.5 MHz Motorola 68881

Clock and Timers

Real-time clock	
Resolution:	10 msec
Accuracy:	50 ppm (4.3 sec/day)
Power-on reset:	Midnight, January 1, 1900
Timers	
Delay interrupt:	10 msecs to 1.94 days
Cycled interrupt:	10 msecs to 1.94 days
Match interrupt:	Match on time of day, 0.00 to 84600.00 seconds (23.5 hours)
Time of day and date:	10 msec, battery-backed

Beepers

Range (nominal):	81.375 Hz to 5208 Hz
Duration:	0.01 to 2.55 sec

Beeper hardware supports three tone generators with attenuators and white noise source.

Features

- HP standard industrial package
- Optional backplane with four option card slots (two for external interface cards)
- Optional direct-connect I/O expander with eight option card slots (four for external interface cards)
- HP-UX 5.0, Pascal 3.1 and BASIC 4.0 language systems
- Supports external 12-inch medium-resolution, monochrome or color display, and 17-inch monochrome and 19-inch color high-resolution displays
- HP-HIL accessory support

Accessory Power Requirements

Product Number	Product Description	+5V	+12V	-12V	Total
HP 13264A	Data Link Pod	0.2W	1.9W	0.3W	2.4W
HP 13265A	Modem	0.5W	0.5W	0.5W	1.5W
HP 13266A	Current Loop Pod	1.0W	1.0W	1.0W	3.0W
HP 98028A	Res. Mgmt. MUX	2.2W	6.4W		8.6W
HP 98204B	Video w/o Graph.	7.5W			7.5W
HP 98204B	Video w/Graphics	15.0W			15.0W
HP 98253A	EPROM Prog.	5.7W			5.7W
HP 98254A	64K byte RAM	3.0W			3.0W
HP 98255A	EPROM Card	2.8W			2.8W
HP 98256A	256K byte RAM	4.1W (2.7W standby)			4.1W
HP 98257A	1M byte RAM	4.0W (4.0W standby)			6.0W
HP 98259A	128K byte Bubble	2.4W	2.9W		5.3W
HP 98620B	DMA Controller	6.0W			6.0W
HP 98622A	GPIO Interface	3.8W			3.8W
HP 98623A	BCD Interface	2.5W			2.5W
HP 98624A	HP-IB Interface	2.4W			2.4W
HP 98625B	Disc Interface	3.0W	0.1W		3.1W
HP 98626A	RS-232 Interface	2.0W	0.6W	0.6W	3.2W
HP 98627A	Color Interface	5.5W			5.5W
HP 98628A	Datacomm Interf.	3.6W	0.5W	0.7W	4.8W
HP 98629A	Resource Mgmt. w/o HP 98028A MUX	3.7W	0.5W	0.5W	4.7W
HP 98629A	Resource Mgmt. w/HP 98028A MUX	5.9W	6.9W	0.5W	13.3W
HP 98630A	Breadboard Card	1.3W			1.3W
HP 98635A	Floating-Point	4.2W			4.2W
HP 98640A	A-D Card	2.6W	0.7W	0.2W	3.5W
HP 98644A	Serial Card	2.0W	0.3W	0.1W	2.4W
HP 98691A	Progr. Datacomm	6.4W	2.0W	1.3W	9.7W
HP 98695A	IBM 3270 Coax	7.2W			7.2W
HP 98642A	RS-232 Multiplexer	5.7W	0.8W	0.1W	6.6W

All of the above figures are quoted in **Watts**.

HP-HIL Accessories

HP-HIL Device Requirements

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

Product Number	Description	Current (ma)	Power (W)	Addresses
HP 46021A	Keyboard	100	1.2	1
HP 46060A	Mouse	200	2.4	1
HP 46080A	Extension Module	25	0.3	0
HP 46081A	Extension/Audio	25	0.3	0
HP 46082A	15-metre Audio/Video Ext.	50	0.6	0
HP 46082B	30-metre Audio/Video Ext.	50	0.6	0
HP 46083A	Rotary Control Knob Module	110	1.32	1
HP 46084A	ID Module	60	0.72	1
HP 46085A	Control Dial Box	320	4.0	3
HP 46086A	Function Box	80	1.0	1
HP 46087A	"A"-Size Digitizer	200	2.4	1
HP 46088A	"B"-Size Digitizer	200	2.4	1
HP 46089A	Four-Button Cursor	0	0.0	0
HP 46094A	Quadrature Port	125	1.5	1
HP 46095A	Three-button Mouse	0	0.0	0
HP 35723A	Touchscreen	250	3.0	1

Language Systems

BASIC

Product Number	Description	Memory Requirements
HP 98613B	BASIC 4.0	768K bytes
HP 98603A	ROM BASIC 4.0	none

Pascal

Product Number	Description	Memory Requirements
HP 98615C	Pascal 3.1	512K bytes

Video Boards

HP 98542A	Monochrome bit-mapped
HP 98543A	Color bit-mapped
HP 98544A	High-resolution monochrome bit-mapped
HP 98545A	High-resolution color bit-mapped (replaced by HP 98547A)
HP 98546A	Display Compatibility Interface for Series 200 compatibility
HP 98547A	High-resolution color bit-mapped (replaces HP 98545A)

Display Monitors

HP 35731A/B	Monochrome display (use HP 98542A)
HP 35741A/B	Color display(use HP 98543A)
HP 98781A/B/C	High-resolution monochrome display (use HP 98544A)
HP 98782A/B/C	High-resolution color display (use HP 98545A)

Enhancements

HP 98242A	Four-slot I/O backplane
HP 98567A	Display monitor 19-inch rack-mount kit
HP 98568A	Eight-slot I/O expander
HP 98569A	19-inch rack-mount kit
HP 98243A	68020 processor board and HP-IB/HP-HIL/RS-232/audio/battery-backed real-time clock interface

Backplane Accessories and Interface Cards

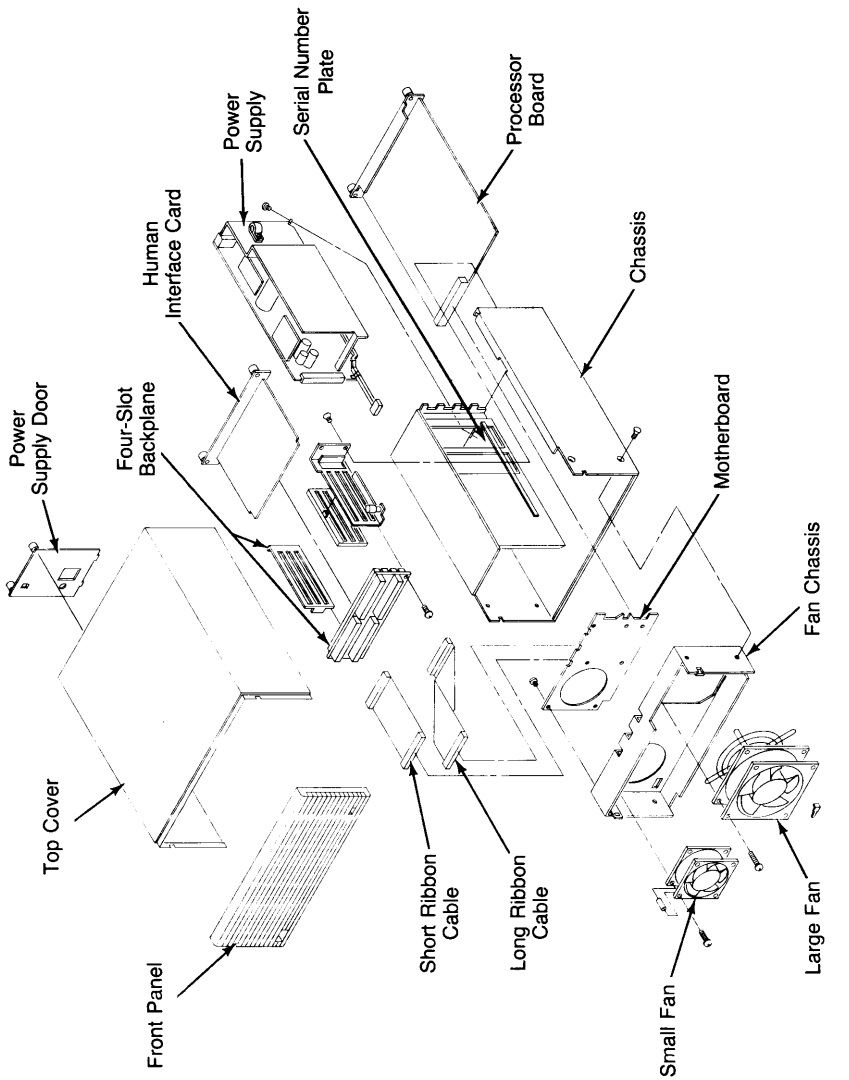
Product No.	Description
HP 98256A	256K byte RAM Card
HP 98257A	1M byte RAM Card
HP 98620B	2-channel DMA Controller (only one DMA controller can be used per mainframe)
HP 98622A	16-bit GPIO Interface
(Opt. 001)	4.6 m (15 feet) unterminated cable
(Opt. 002)	0.8 m (2.5 feet) terminated cable for HP 9885M Flexible Disc Drive
(Opt. 003)	4.6 m (15 feet) terminated cable for HP 6940A/B Multiprogrammer
(Opt. 004)	2.5 m (8.3 feet) terminated cable for HP 9866A/B Thermal Printer
HP 98623A	BCD Interface
(Opt. 001)	4.6 m (15 feet) unterminated cable
HP 98624A	HP-IB Interface
HP 10833A	1 m (3.3 feet) HP-IB cable
HP 10833B	2 m (6.6 feet) HP-IB cable
HP 10833C	4 m (13.2 feet) HP-IB cable
HP 10833D	0.5 m (1.6 feet) HP-IB cable
HP 98625A	Disc Interface (Pascal and SRM only)
HP 98626A	Serial Interface
(Opt. 001)	4.9 m (16 feet) RS-232 cable with DTE connector (male)
(Opt. 002)	4.9 m (16 feet) RS-232 cable with DCE connector (female)
HP 13265A	300 Baud Modem
HP 13266A	Current Loop Interface
HP 98627A	Color Video Interface (includes cables)
HP 98628A	Datacomm Interface (BASIC and Pascal only. Always order with one personality option and one or more cable options)
	Personality Options
(Opt. 100)	Async and Data Link ROM
	Cable Options
(Opt. 001)	4.9 m (16 feet) RS-232-C DTE (male) cable with test connector
(Opt. 002)	4.9 m (16 feet) RS-232-C DCE (female) cable with test connector
(Opt. 003)	4.9 m (16 feet) RS-449/423 DTE (male) cable with test connector
(Opt. 099)	No cable (for use with 1326X adapters)
HP 13264A	Data Link Adaptor
HP 13265A	300 Baud Modem
HP 13266A	Current Loop Interface
HP 98629A	Resource Management Interface
(Opt. 001)	10 m terminated cable
(Opt. 002)	25 m terminated cable
(Opt. 003)	60 m terminated cable
(Opt. 004)	60 m unterminated cable
HP 98691A	Programmable Datacomm Interface with 4K RAM
(Opt. 001)	4.9 m (16 feet) RS-232-C DTE (male) cable with test connector
(Opt. 002)	4.9 m (16 feet) RS-232-C DCE (female) cable with test connector
(Opt. 003)	4.9 m (16 feet) RS-449/423 DTE (male) cable with test connector
(Opt. 099)	No cable
HP 98630A	Breadboard Card
(Opt. 001)	Backplane Extender Card
HP 98255A	EPROM Card
HP 98253A	EPROM Development Kit (2 cards)
HP 98259A	128K Byte Magnetic Bubble Memory Card
HP 98635A	Floating-point Math Card

Tools List

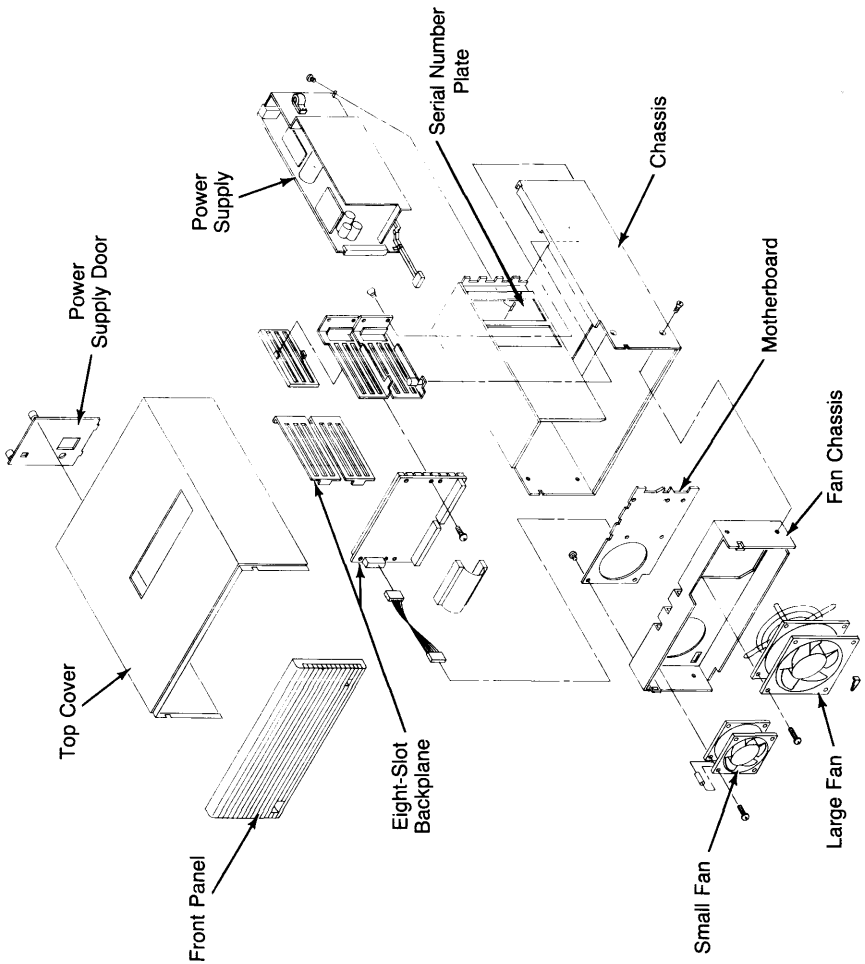
The following tools are needed to service HP 98561A/B computers and the HP 98568A expander:

Part Number	Description
	Standard CE Tool Kit
9300-0933	Anti-static workstation
3476B	Multimeter

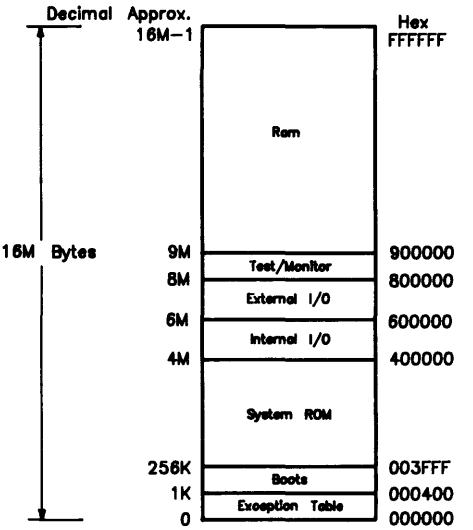
Computer Exploded View



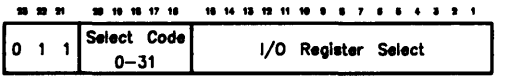
Expander Exploded View



Address Information

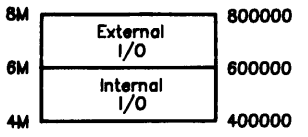


Series 300 Memory Map



Standard Select Codes

Internal		External		
0	Not Used	8	HPIB	20 Data Comm
1		9	RS232	.
2	KYBD & CLK	10		.
3	Graphics	11	BCD	.
4		12	GPIO	
5		13		
6	BR–mapped graphics	14	Disc Intrfc.	
7	HPIB	.		
		.		31



Memory––Mapped I/O

External Address Format

Environmental/Installation/PM 2

Environmental Range

Operating Temperature:	0°C to 55°C (32°F to 131°F)
Humidity:	5% to 95% R.H. non-condensing, 40°C (104°F) maximum wet-bulb temperature
Storage Temperature:	−40°C to 75°C (−40°F to 197°F)
Maximum Altitude:	4600 metres (15 000 feet)
EMI:	Conducted and radiated interference meets VDE Level A standards.
	Conducted and radiated interference also meets FCC class A standards, although some individual Series 300 products may meet FCC class B standards. Check the FCC label on the rear panel.
Line Transient Spike Immunity:	1 kV (1 nsec. rise, 800 nsec. duration)
Additional Regulatory Compliance:	UL, CSA, IEC

These specifications apply to HP 98561A/B computers and the HP 98568A expander, but not necessarily to any peripheral (including display monitors).

Installation

The Model HP 98561A and HP 98561B computers are customer-installable, unless a non-customer-installable peripheral is included in the order. The Model HP 98568A expander is likewise customer-installable.

Mounting

Tabouret or mini-rack, or unmounted (desktop).

Cabling

Standard HP-IB, HP-HIL.

RS-232-C:

25-pin on HP 98561A
9-pin on HP 98561B

9-pin:

HP 92221M DTE to DCE
HP 92221P DTE to DTE
HP 92222F female to female gender converter
HP 92222W custom wiring kit

Setting Processor Board Switches

HP 98561A processor boards contain communications functions with switch-selected attributes. This section tells how to set the switches for desired operation. HP 98561B processor boards do not contain any switches.

RS-232 Control Line Defeat:

0 Control lines defeated

1 Control lines enabled (default)

This function enables or defeats the DCD, CTS, DSR and RI control lines.

RS-232 Keyboard:

0 Local keyboard (default)

1 Remote keyboard

Display Disable:

0 On-board video enabled (default)

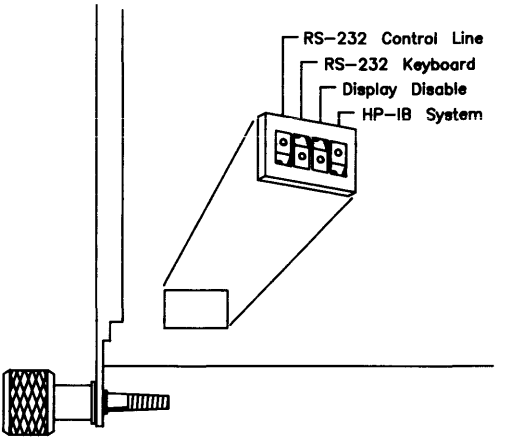
1 On-board video disabled

HP-IB System Controller:

0 Computer is not system controller (HP-IB address 20)

1 Computer is system controller (HP-IB address 21) (default)

Processor Board Switch Chart



Setting Human Interface Card Switches

The 98561-66530 human interface card contains communications functions with switch-selected attributes. This section tells how to set the switches for desired operation.

RS-232 Control Line Defeat:

0 Control lines defeated

1 Control lines enabled (default)

This function enables or defeats the DCD, CTS, DSR and RI control lines.

RS-232 Keyboard:

0 Local keyboard (default)

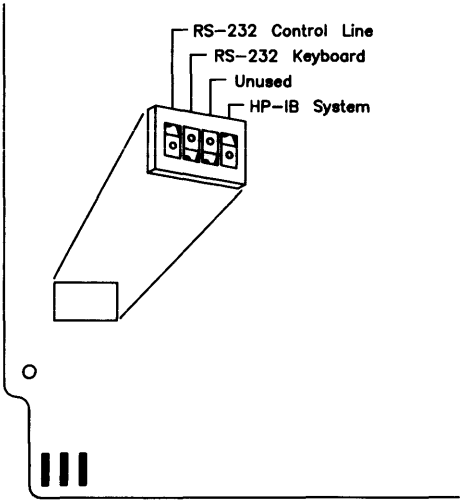
1 Remote keyboard

HP-IB System Controller:

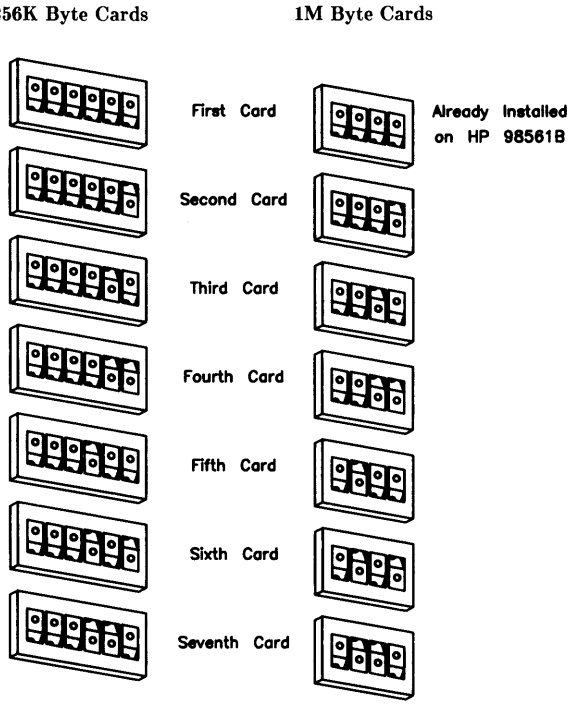
0 Computer is not system controller (HP-IB address 20)

1 Computer is system controller (HP-IB address 21) (default)

Human Interface Card Switch Chart



Setting the RAM Starting Address



Preventive Maintenance

The real-time clock contains a lithium battery which should be replaced once a year. The real-time clock is located according to this chart:

Model	Option	Location	
HP 98561A	000	98561-66512	Processor Board
	002	98561-66511	Processor Board
	003	98561-66513	Processor Board
HP 98561B	All	98561-66530	Human Interface Card

Although the battery is available from Hewlett-Packard, it is usually can be obtained locally. It is a 3V, 160mAH battery from these manufacturers:

Manufacturer	Part Number
Panasonic	BR2325

WARNING

Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

When changing the battery, remember that the real-time clock will reset to its default state, and it is necessary to set it to the current time. Note also that the battery retainer clip is a conductor, and merely lifting it up without changing the battery will still cause the real-time clock to reset.

Notes

Configuration 3

System Products

Here's a description of the systems which customers will order. A drawing of each system follows.

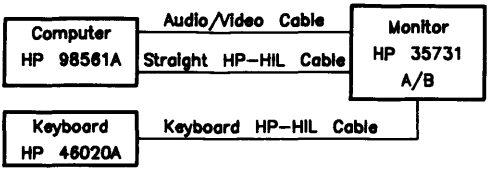
Component	HP 98580A	HP 98581A	HP 98582A	HP 98583A
Computer	HP 98561A	HP 98561A Option 003	HP 98561B	HP 98561B
RAM	none	none	1M HP 98257A	1M HP 98257A
Monitor	Monochrome HP 35731A/B/C	Color HP 35741A/B/C	Hi-res mono HP 98781A/B/C	Hi-res color HP 98782A/B/C
Video Output	Monochrome on processor	Color HP 98543A	Hi-res mono HP 98544A	Hi-res color HP 98547A
DIO Slots	3	4	2	8 HP 98568A
Extras	ROM BASIC HP 98613B	none	none	Speaker Module HP 46081A disc interf. HP 98625B DMA card HP 98620B
Options				
002:	Delete 512K bytes RAM 98561-66511			
008:	Add compatibility interface HP 98546A	Add compatibility Interface HP 98546A		

HP 98561X Products

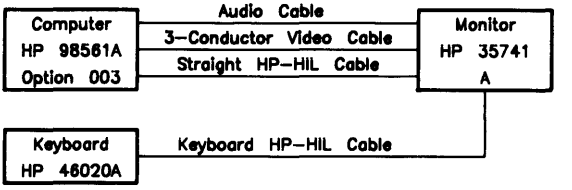
Here's a description of the boxes Manufacturing will build:

Component	HP 98561A	HP 98561A Option 002	HP 98561A Option 003	HP 98561B
SPU	MC68010 98561-66512	MC68010 98561-66511	MC68010 98561-66513	MC68020 98561-66519
RAM				
Internal	1M byte	512K byte	1M byte	none
External	none	none	none	1M byte HP 98257A
Video Output	on SPU	on SPU	none	none
Interfaces	on SPU	on SPU	on SPU	on Human Int. Cd. 98561-66530
Keyboard	HP-HIL HP 46020A	HP-HIL HP 46020A	HP-HIL HP 46020A	HP-HIL HP 46020A
DIO Slots	4	4	4	2
Option 004:	Delete backplane 98561-60001	Delete backplane 98561-60001	Delete backplane 98561-60001	none

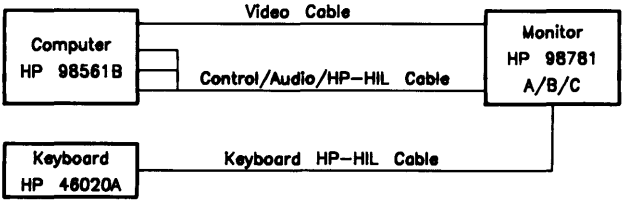
HP 98580A Configuration



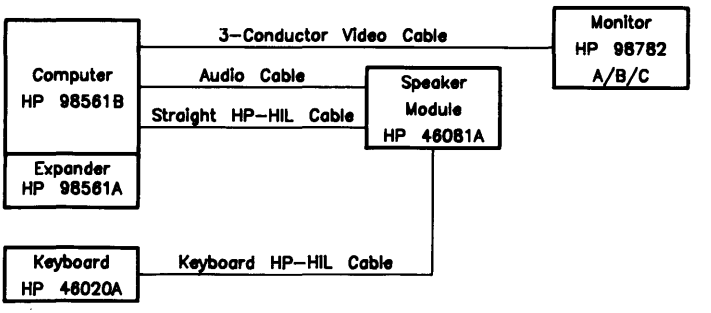
HP 98581A Configuration



HP 98582A Configuration



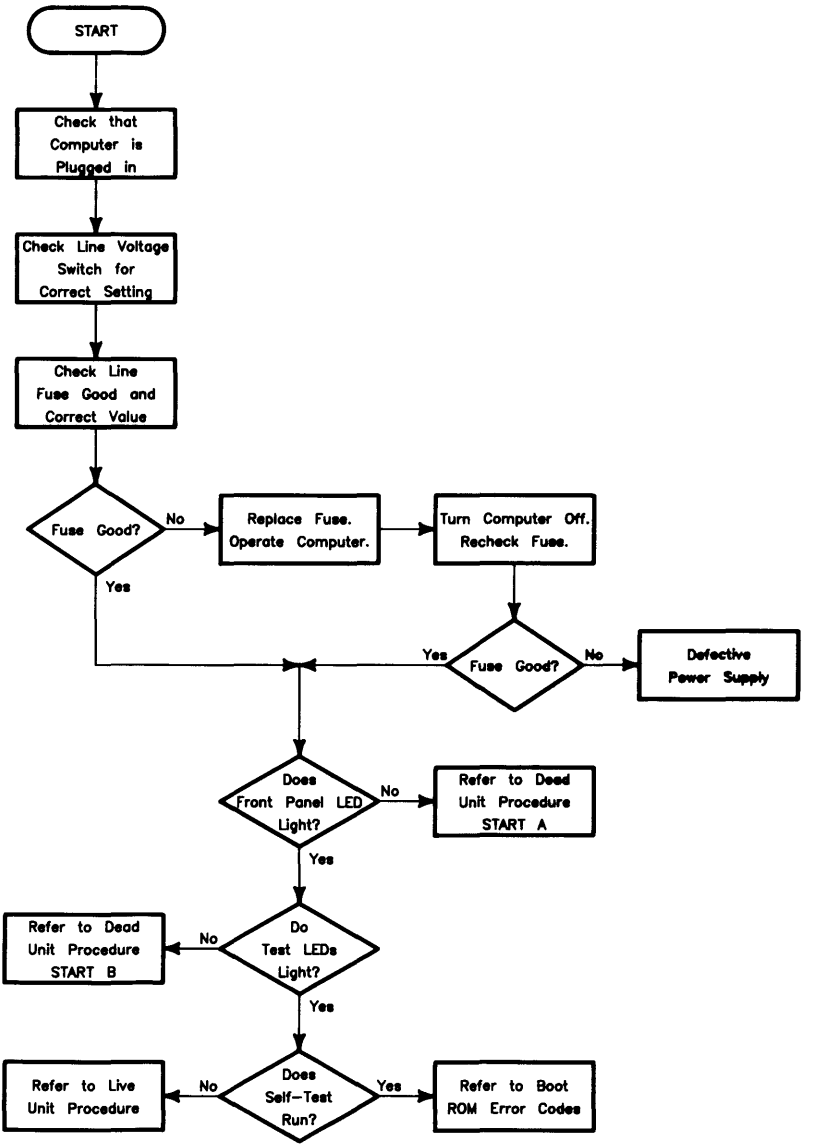
HP 98583A Configuration



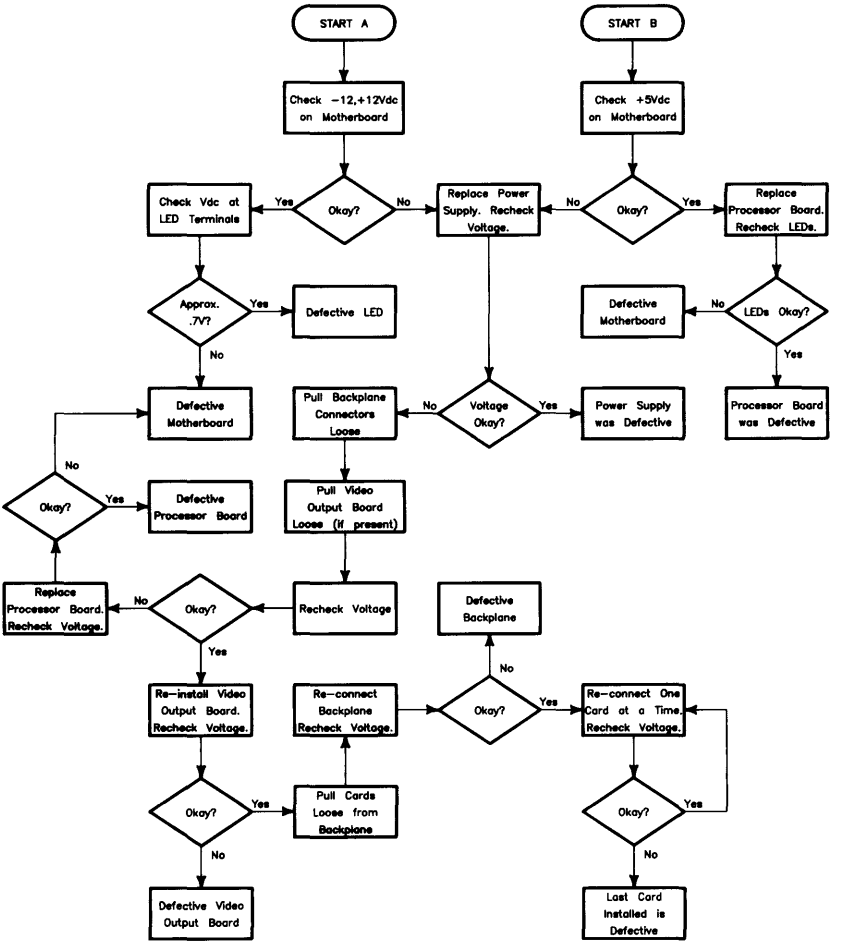
Notes

Troubleshooting 4

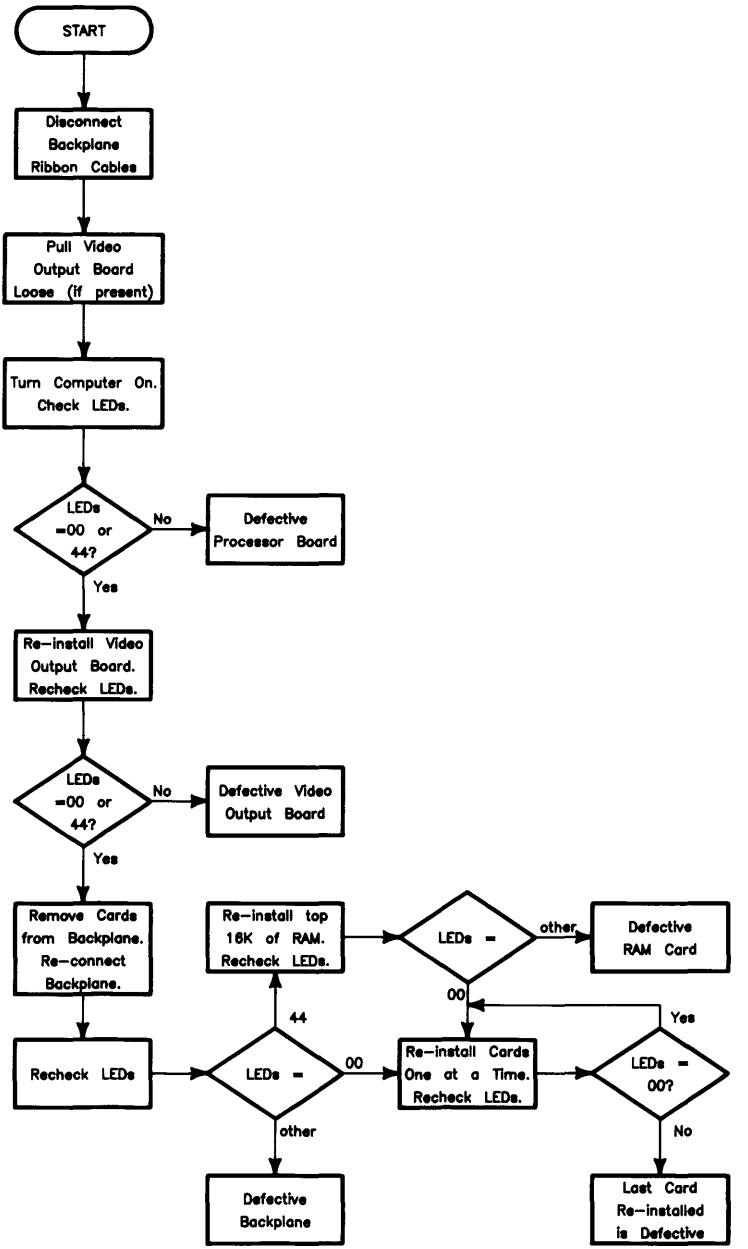
Initial Troubleshooting Flowchart



Dead Unit Troubleshooting Flowchart



Live Unit Troubleshooting Flowchart



Power Supply Specifications

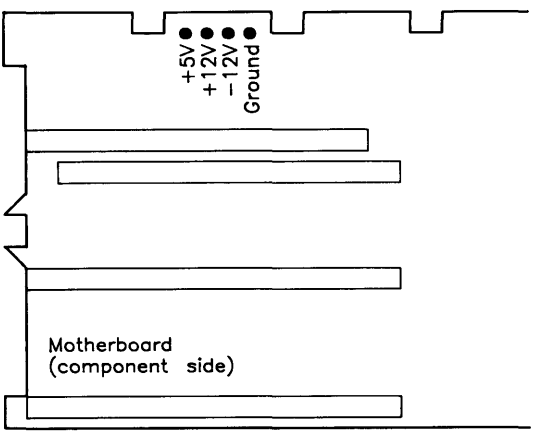
Make sure that the computer is properly grounded. It requires a three-wire power cable and the power supply retaining/grounding screw must be installed. Also, make sure that the power supply access door is properly installed.

Voltage	Voltage Tolerance and Ripple	Maximum Current
-12 V	-11.86 to -12.72 V	1.1 A
+5 V	4.89 to 5.25 V	20 A
+12 V	11.86 to 12.72 V	3.6 A

Power Supply Test Points

Voltage	Test Point to Ground	Visual Indication	Other Indication
-12 V	Motherboard -12 V pin	Front Panel LED Lit	Small Fan Running
+5 V	Motherboard +5 V pin	Processor Board Test LEDs Lit at power-up	Small Fan Running
+12 V	Motherboard +12 V pin	Front Panel LED Lit	Large Fan Running

Power Supply Test Points



Diagnostics 5

Boot ROM Self Test Sequence

Test	LED display	Hex equivalent
CPU test[1]	●●●● ●●●●	FF
Top 16K RAM test[2]	○○○○ ○●○○	04
CPU timer test [3]	○○○○ ○●○●	05
Alpha display controller test (if present)	○○○● ●●●○	1E
Bit-mapped display controller test	○○○● ●●○●	1D
Local keyboard test	○○○● ○○●○	12
or Accessory keyboard test [4]	○○○● ○○●●	13
Boot ROM checksum test	○○○○ ○○●●	03
Graphics display controller test	○○○● ●●●●	1F
Internal HP-IB test	○○○● ○●○○	14
DMA test	○○○● ●○○○	18
I/O card test	○○●X XXXX	20 to 3F
ROM checksum test	○○○○ ●●○●	0D
RAM test	○○○○ ●○○●	09

[1] Self test stops here and displays ●○○○ ○○○● (81 hexadecimal) on the LEDs if the CPU fails its test.
[2] Self test stops here and displays ○●○○ ○●○○ (44 hexadecimal) or ●○○○ ○●○○ (84) on the LEDs unless functional RAM is present in the top 16K bytes of RAM space.
[3] Self test stops here and displays ○○○○ ○●○● (05 hexadecimal) on the LEDs if the CPU board timer fails its test.
[4] If more than one accessory keyboards are present, only the one with the lowest select code will be checked.

Boot ROM Error Codes

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
○○○○ ○○○○	00	No Failure Detected	
○○○○ ○●○●	05	CPU Timer Failed	Replace CPU Board
○●○○ ○●○○	44	Top RAM Missing	Check RAM Addressing
○●●● ●●●●	7F	LEDs failed to DTACK	Replace Processor Board
●○○○ ○○○●	81	CPU Failed	Replace Processor Board
●○○○ ○○●●	83	Boot ROM Failed Checksum	Replace Processor Board
●○○○ ○●○○	84	Top RAM Failed	Check RAM Addressing Replace Processor Board
●○○○ ●○○●	89	RAM Failure	Check RAM Addressing Replace Processor Board
●○○○ ●○●○	8A	Insufficient RAM	Check RAM Addressing Replace Processor Board
●○○○ ●●○●	8D	ROM Operating System Failed Checksum	Replace Processor Board Replace I/0 Connectorboard
●○○● ○○●○	92	Local Keyboard Controller Failed	Replace Processor Board (except 98561-66519 Processor Board, replace Human Interface Card)
●○○● ○○●●	93	Accessory Keyboard Controller Failed	Replace Accessory Keyboard Controller
●○○● ○●○○	94	HP-IB Failed	Replace Processor Board (except 98561-66519 Processor Board, replace Human Interface Card)
●○○● ●○○○	98	DMA Card Failed	Replace DMA Card Replace Processor Board
●○○● ●●○○	9C	Bit Map Font Failed	Replace Video Board
●○○● ●●○●	9D	Bit Map Failed	Replace Video Board

Boot ROM Error Codes (Cont'd)

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
•ooo •••o	9E	Alpha Display Controller Failed	Replace Video Board
•ooo ••••	9F	Graphics on Alpha/Graphics Controller Failed	Replace Video Board
•oXX XXXX	90 to BF	I/O Card at XXXXX Failed	Replace I/O Card at Select Code XXXXX Replace Processor Board Replace I/O Backplane
•••• ••••	FF	LEDs Never Accessed	Check -12 V. If okay, replace Processor Board. Otherwise, replace Power Supply.

Remote System Analysis

The Model HP 98561A/B computers provide for remote system analysis of problems by means of the beeper. To diagnose the computer remotely, follow this procedure:

1. Establish a telephone connection with someone at the location of the computer.
2. Have them hold the receiver near the speaker output of the computer. The speaker is located in 35731, 35741 and 98781 monitors, or in the speaker module.
3. Now have them turn the computer on.
4. The computer 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 computer emits three low beeps, a high beep, two low beeps and a high beep. This will be of the form:

Xooo •oo• (09 or 89 hexadecimal)

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 leads us to RAM Failure as the probable cause.

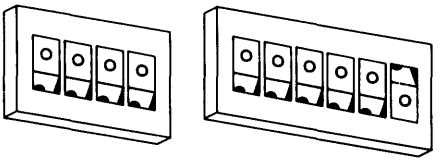
Locating a Defective RAM Card

The RAM failure message may be decoded to determine which RAM card caused the failure. For example, in the message

```
Memory Failed at FB53A9
W:F58A8C2C,R:F78A8C2C
```

the failure occured at memory address FB53A9. To correlate this with a RAM card, take the first two letters or digits of the address and translate them into binary. Then find a card whose address switches are set to the first four or six bits of that address.

For instance, in the above example, FB is •••• •••• in binary. Therefore, the switches on the defective board would be:



if a 1M byte card, or if a 256K byte card.

If you are unable to find a memory card with the appropriate switch setting, the failure is in RAM located on the processor board.

Adjustments 6

There are no adjustments in the computer. For adjustments to the monitor, refer to the Service Manual for the monitor.

Notes

Peripherals 7

Supported Peripherals List

Due to constant change of the list of supported peripherals, this information is published separately. The *Series 300 Configuration Reference Manual* (part number 98561-90020) has this information.

Notes

Replacement Parts 8

The parts listed in this chapter apply to both the HP 98561A/B computer and the HP 98568A eight-slot expander, unless noted otherwise.

Assemblies

HP 98561A/B Assemblies

Check Digit	HP Part Number	98561A Option 000	002	003	98561B	Description	Repair Status
5	98561-66511		1			Processor Board	Exchange
6	98561-66512	1				Processor Board	Exchange
7	98561-66513			1		Processor Board	Exchange
3	98561-66519				1	Processor Board	Exchange
6	0950-1760	1	1	1	1	Power Supply	Exchange
6	98561-60001	1	1	1	1	Four-slot Backplane	Non-exchange
3	09826-66524					256K Byte Memory Card	Exchange
1	98257-66524				1	1M Byte Memory Card	Exchange
8	98561-66530				1	Human Interface Card	Exchange
3	98542-66570					B/W Vid. Bd.	Exchange
4	98543-66570					Medium-res Color Vid. Bd.	Exchange
5	98544-66570					High-res B/W Vid. Bd.	Exchange
8	98547-66570					High-res Color Vid. Bd.	Exchange
7	98546-66570					Disp. Comp. Interface	Exchange
1	98204-66577					Graphics Card	Exchange
3	98561-66501	1	1	1	1	Motherboard	Non-exchange

HP 98568A Assemblies

Check Digit	HP Part Number	Total Quantity	Description	Repair Status
9	98568-66500	1	Eight-slot Backplane	Non-exchange
0	98568-66501	1	Motherboard	Non-exchange
6	0950-1760	1	Power Supply	Exchange

Exchange Part Numbers of HP 98561A/B and HP 98568A Exchange Assemblies

Miscellaneous Parts

Check Digit	HP Part Number	Total Quantity	Description
0	2110-0342	1	Line Fuse (6ANB)
7	7101-0591		I/O Cover Plate
2	98561-04104		Large Cover Plate, HP 98561
9	98561-04101		Cover Plate, Silk-screened for '19 bd.
8	5001-9001	1	LED Bracket
0	5041-1203	1	On/Off Pushbutton
5	5041-2412	1	On/Off Switch Shaft
2	1420-0314	1	Battery, Lithium
4	1420-1353	1	Clip, Battery Retainer
7	98546-84001		Softkey Overlay (for HP 98546A)
8	98546-84002		Numeric Pad Overlay (for HP 98546A)
6	09817-47700	1	Light Pipe

Check Digit	Exchange Part Number	Description
1	98561-69511	Processor Board
2	98561-69512	Processor Board
3	98561-69513	Processor Board
9	98561-69519	Processor Board
1	98561-69553	Power Supply → 0950-1760
9	09826-69524	256K Byte Memory Card
7	98257-69524	1M Byte Memory Card
4	98561-69530	Human Interface Card
9	98542-69570	Medium-res B/W Video Board
0	98543-69570	Medium-res Color Video Board
1	98544-69570	High-res B/W Video Board
4	98547-69570	High-res Color Video Board
3	98546-69570	Compatibility Video Card
6	98204-69577	Graphics Card

Case Parts

Check Digit	HP Part Number	Total Quantity	Description
7	5001-3698	1	Top Cover, HP 98561
8	5001-3699	1	Top Cover, HP 98568
2	5001-3693	1	Fan Chassis
6	5041-2413	1	Front Panel
5	5180-1303	1	Fan, Small
1	5180-0410	1	Fan, Large
4	3160-0481	1	Fan Grill
5	5001-3696	1	Chassis, HP 98561
6	5001-3697	1	Chassis, HP 98568
9	09817-41200	1	Power Supply Guide
0	09817-41201	2	I/O Card Guide
2	0403-0379	2	PC Board Guide, HP 98561
6	09121-48303	2	Front Foot
1	0403-0427	2	Rear Foot
9	0380-1655	1	Snap-in Spacer
2	5001-3700	1	Power Supply Door

Internal Cable Assemblies

Check Digit	HP Part Number	Total Quantity	Description
8	5180-0407	1	LED Cable
4	5180-1302	1	Fan Cable
1	98568-61601	2	Computer-to-expander cable
0	98568-61600	1	Dc Cable, HP 98568A
5	98561-61601	1	Short Ribbon Cable, HP 98561A/B
4	98561-61602	1	Long Ribbon Cable, HP 98561A/B

External Cable Assemblies

The assemblies listed in this section apply to the HP 98561A/B computer only.

Check Digit	HP Part Number	Description	Where Used
1	46020-60001	HP-HIL Keyboard Cable, 3.0 m	46020/46021A
3	46080-61601	HP-HIL Cable, 2.4 m	HIL
6	46083-61601	HP-HIL Cable, 0.5 m	HIL
3	09920-61602	Intf. Cable, aud/vid, 3.0 m	98544A
4	8120-3616	Color Cable, BNC-BNC, 1.5 m (3 needed)	98543A
1	5061-6533	Video Cable, RCA-BNC, 2.4 m	98546A
5	1252-1112	Adapter, RCA-earphone	98544/98547
2	98561-61603	Dual Cable, RCA-RCA, 2.4 m	98542/98561A
3	98561-61604	RS-232 Cable, DTE-DCE, 9-pin to 25-pin	98561A
6	8120-4703	Jumper Cable, BNC-RCA, .75 m	98546
7	8120-4704	Audio Cable, RCA-RCA, 2.4 m	98543/98546
6	8120-4712	Jumper Cable, BNC-BNC, .75 m	98546
7	98700-61603	Video Cable, BNC-BNC, 3.0 m	98547

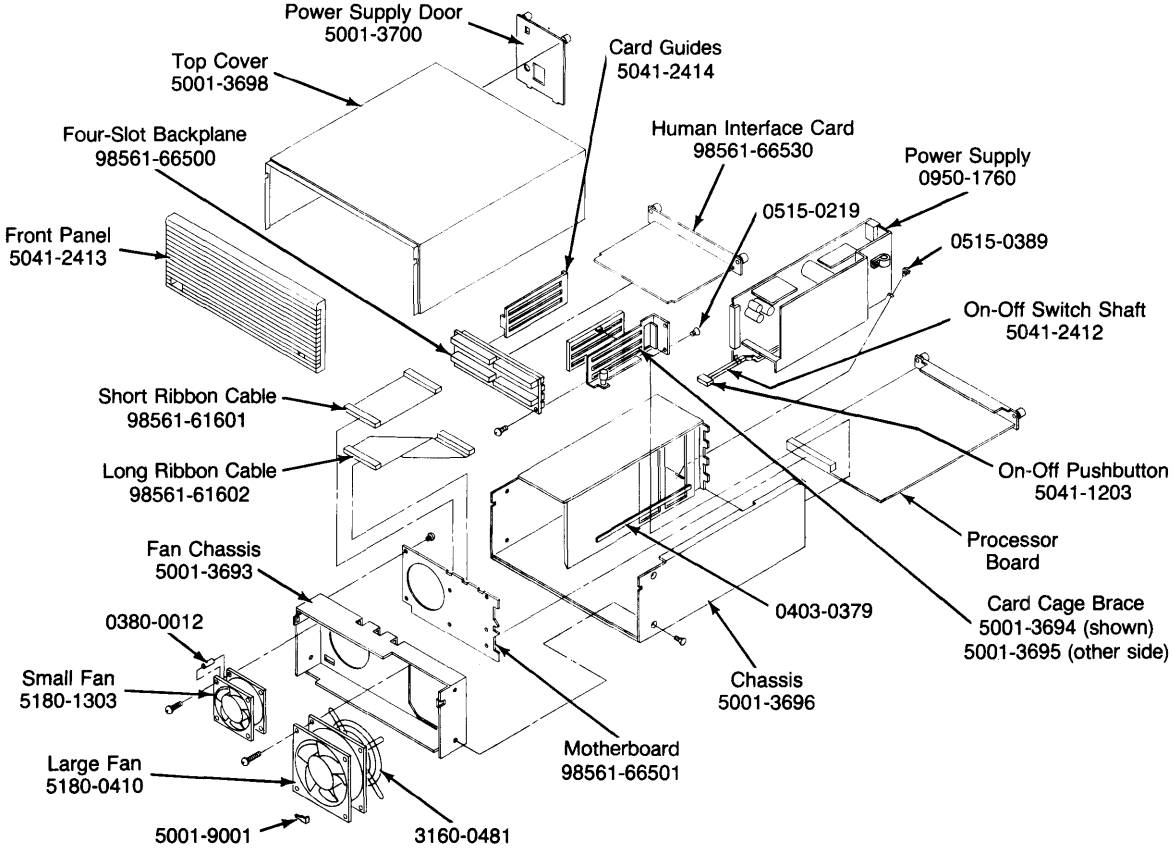
Labels

Check Digit	HP Part Number	Total Quantity	Description
7	98561-84002	1	Identification Label, HP 98561
4	98568-84002	1	Identification Label, HP 98568
6	5958-4325	1	UL Info Label
5	7120-3428	1	CSA Label
9	7121-4858	1	Service Warning Label
9	7121-4733	1	Serial Label
8	7121-4857	2	Danger Label
0	7121-4859	1	Fuse Rating Label
0	98561-84005	1	Battery Warning Label

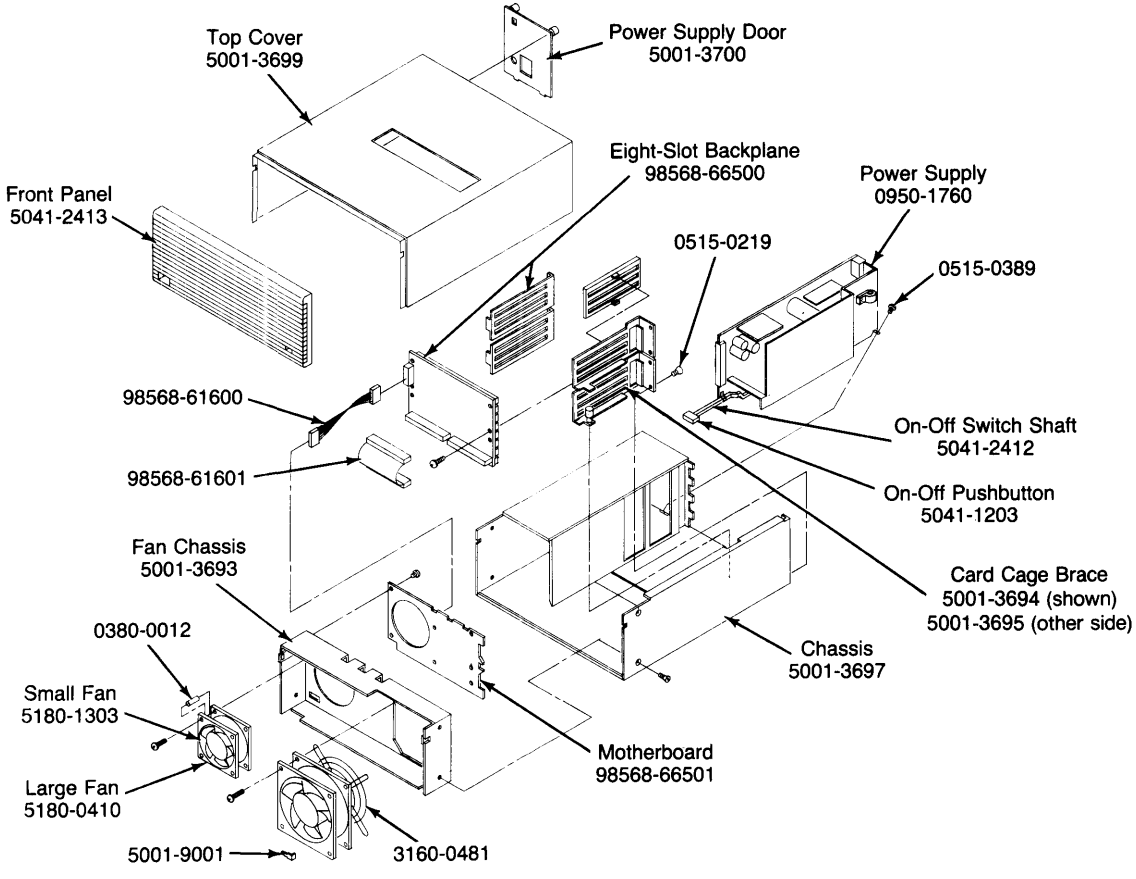
Screws

Check Digit	HP Part Number	Total Quantity	Description
6	0515-0219	8	M3X0.5 Flathead Screw
0	0515-1146	7	M3X6 Panhead Screw

Computer Exploded View



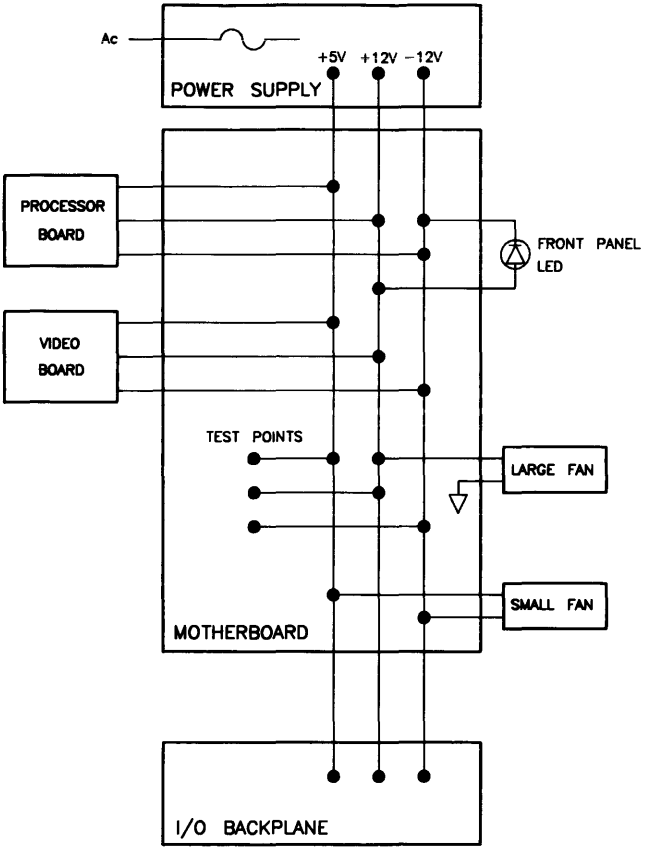
Expander Exploded View



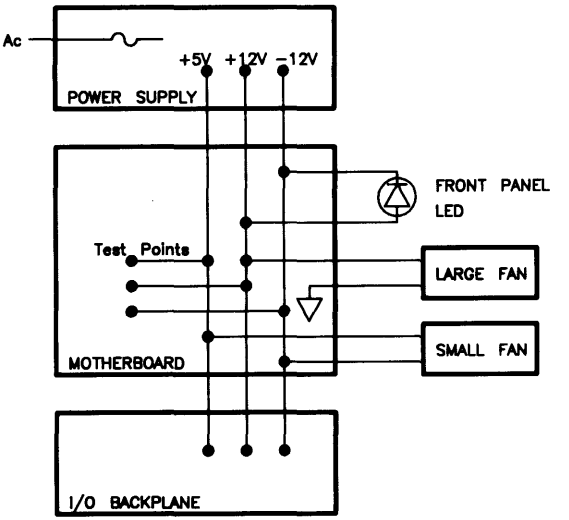
Diagrams

9

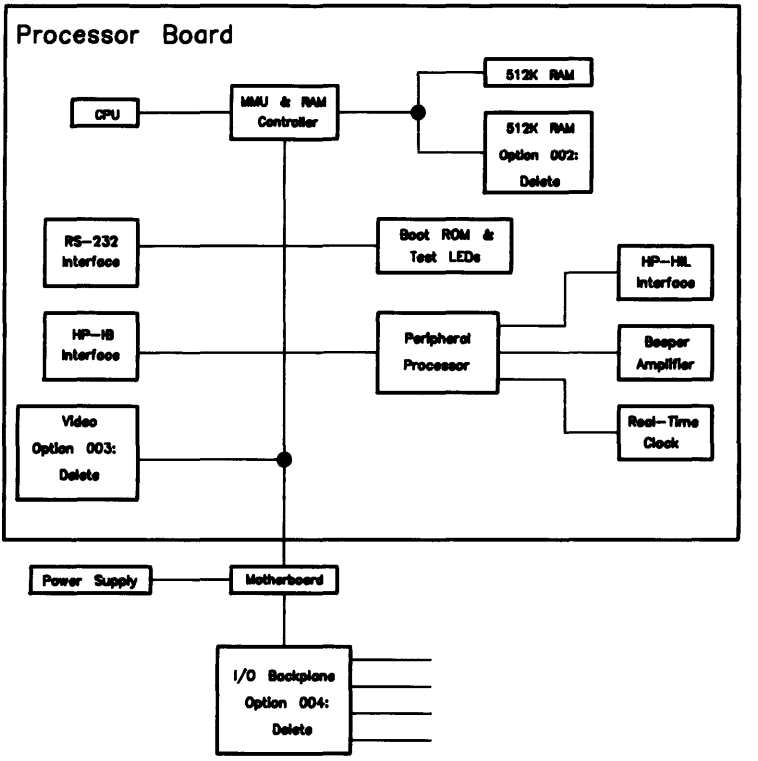
Computer Power Distribution Diagram



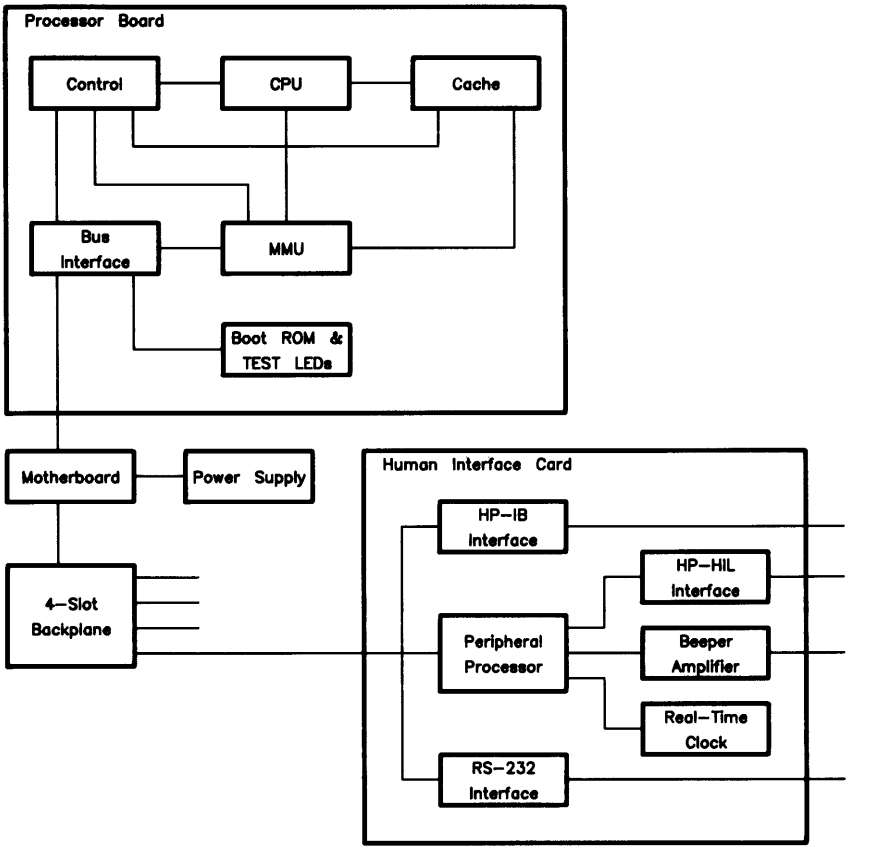
Expander Power Distribution Diagram



HP 98561A Block Diagram



HP 98561B Block Diagram



Reference 10

Related Documentation

BASIC

Manual Part Number	Description
98613-90090	CSUB Preparation Manual
98613-87904	BASIC Manual Kit contains one each of the following manuals:
98613-90091	Utilities Library Manual
98613-90092	Loader Utility Manual
98613-90011	BASIC Programming Techniques
98613-90021	BASIC Interfacing Techniques
98613-90031	BASIC Graphics Techniques
98613-90041	BASIC User's Guide
98613-90051	BASIC Language Reference
98613-90061	BASIC Condensed Reference
98613-90071	BASIC Documentation Guide and Master Index
98613-90082	Software/Manual Catalog

Pascal

Manual Part Number	Description
98615-87903	Pascal Manual Kit contains one each of the following manuals:
09826-90072	Pascal Textbook (Wiley)
09826-90073	MC68000 User's Manual
98615-90022	Pascal 3.1 Workstation System
98615-90031	Pascal 3.1 Procedure Library
98615-90036	Pascal 3.1 Graphics Techniques
98615-90041	Pascal 3.1 User's Guide
98615-90051	HP Pascal 3.1 Language Reference for Series 200 Computers
98615-90016	Pascal 3.1 Documentation Guide and Master Index
98615-90606	MC68020 User's Guide
98615-90607	MC68881 User's Guide

Service Documentation

Manual Part Number	Description
98561-90000	Installation Reference
98560-90601	HP 98580A Installation Card
98560-90602	HP 98581A Installation Card
98560-90603	HP 98582A Installation Card
98560-90604	HP 98583A Installation Card
5958-4342	Upgrade Video Board Installation Note
98546-90600	HP 98546A Display Compatibility Interface Installation Note
98242-90600	HP 98242A Four-slot Backplane Installation Note
98243-90600	HP 98243A Upgrade Processor Installation Note
98568-90600	HP 98568A Eight-slot Expander Installation Note
5958-4343	HP 98569A Rack-mount Kit Installation Note
5958-4344	HP 98567A Monitor Rack-mount Kit Installation Note
98561-90030	Service Information Manual
98561-90039	Service Handbook

Miscellaneous

Manual Part Number	Description
98257-90000	HP 98256A/HP 98257A RAM Card Installation Note
98620-90001	HP 98620B DMA Card Installation Note
98622-90000	HP 98622A GPIO Installation Manual
98623-90000	HP 98623A BCD Installation Note
98624-90000	HP 98624A HP-IB Installation Note
98625-90000	HP 98625A Disc Interface Installation Manual
98626-90000	HP 98626A RS-232 Installation Manual
98627-90000	HP 98627A Color Video Interface Installation Manual
98628-90001	HP 98628/98691 Datacomm Installation Manual
98630-90001	HP 98630A Breadboard Installation Manual
98635-90001	HP 98635A Floating-Point Math Card Installation Note

Boot ROM Self Test Sequence

Test	LED display	Hex equivalent
CPU test[1]	●●●● ●●●●	FF
Top 16K RAM test[2]	○○○○ ○●○○	04
CPU timer test [3]	○○○○ ○●○●	05
Alpha display controller test (if present)	○○○● ●●●○	1E
Bit-mapped display controller test	○○○● ●●○●	1D
Local keyboard test	○○○● ○○●○	12
or Accessory keyboard test [4]	○○○● ○○●●	13
Boot ROM checksum test	○○○○ ○○●●	03
Graphics display controller test	○○○● ●●●●	1F
Internal HP-IB test	○○○● ○●○○	14
DMA test	○○○● ●○○○	18
I/O card test	○○●X XXXX	20 to 3F
ROM checksum test	○○○○ ●●○●	0D
RAM test	○○○○ ●○○●	09

[1] Self test stops here and displays ●○○○ ○○○● (81 hexadecimal) on the LEDs if the CPU fails its test.
[2] Self test stops here and displays ○●○○ ○●○○ (44 hexadecimal) or ●○○○ ○●○○ (84) on the LEDs unless functional RAM is present in the top 16K bytes of RAM space.
[3] Self test stops here and displays ○○○○ ○●○● (05 hexadecimal) on the LEDs if the CPU board timer fails its test.
[4] If more than one accessory keyboards are present, only the one with the lowest select code will be checked.

Boot ROM Error Codes

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
○○○○ ○○○○	00	No Failure Detected	
○○○○ ○●○●	05	CPU Timer Failed	Replace CPU Board
○●○○ ○●○○	44	Top RAM Missing	Check RAM Addressing
○●●● ●●●●	7F	LEDs failed to DTACK	Replace Processor Board
●○○○ ○○○●	81	CPU Failed	Replace Processor Board
●○○○ ○○●●	83	Boot ROM Failed Checksum	Replace Processor Board
●○○○ ○●○○	84	Top RAM Failed	Check RAM Addressing Replace Processor Board
●○○○ ●○○●	89	RAM Failure	Check RAM Addressing Replace Processor Board
●○○○ ●○●○	8A	Insufficient RAM	Check RAM Addressing Replace Processor Board
●○○○ ●●○●	8D	ROM Operating System Failed Checksum	Replace Processor Board Replace I/0 Connectorboard
●○○● ○○●○	92	Local Keyboard Controller Failed	Replace Processor Board (except 98561-66519 Processor Board, replace Human Interface Card)
●○○● ○○●●	93	Accessory Keyboard Controller Failed	Replace Accessory Keyboard Controller
●○○● ○●○○	94	HP-IB Failed	Replace Processor Board (except 98561-66519 Processor Board, replace Human Interface Card)
●○○● ●○○○	98	DMA Card Failed	Replace DMA Card Replace Processor Board
●○○● ●●○○	9C	Bit Map Font Failed	Replace Video Card
●○○● ●●○●	9D	Bit Map Failed	Replace Video Card

Boot ROM Error Codes (Cont'd)

LEDs	Hexadecimal Equivalent	Probable Failure	What to Do
●○○○ ●●●○	9E	Alpha Display Controller Failed	Replace Video Card
●○○○ ●●●●	9F	Graphics on Alpha/Graphics Controller Failed	Replace Video Card
●○XX XXXX	90 to BF	I/O Card at XXXXX Failed	Replace I/O Card at Select Code XXXXX Replace Processor Board Replace I/O Backplane
●●●● ●●●●	FF	LEDs Never Accessed	Check -12 V. If okay, replace Processor Board. Otherwise, replace Power Supply.

Notes

Service Notes 11

HP Part Number
98561-90039
Microfiche No. 98561-99039
Required Binder No. 9282-0683
Printed in U.S.A. 3/86

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