

Technical Reference And Troubleshooting Guide

HP Workstation x2100



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1 System Overview

This chapter provides detailed system specifications for the HP Workstation x2100:

- Introduces the system's internal and external features
- Lists the system's specifications and characteristic data
- Provides a summary of the available documentation

Workstation Description

The HP Workstation x2100 is based on the ATX form factor. The following table provides an overview of the system.

Feature	Description
<i>System Board</i>	Dimensions: 12 in. X 9.6 in. in an Extended-ATX (E-ATX) package
<i>Processor</i>	Intel Pentium 4 processor Socket 423
<i>Cache Memory (integrated in processor package)</i>	<ul style="list-style-type: none"> Level 1: 16KB code, 16KB data Level 2: 256KB
<i>Internal Processor Clock Speed</i>	1.7GHz, 1.9GHz, 2.2 GHz and higher speeds with a quad-pumped 100MHz Front Side Bus
<i>Chipset</i>	Intel I850 chipset, including Memory Controller Hub (MCH) Host Bridge, Input/Output Controller Hub (ICH) for I/O subsystem
<i>Super I/O Chip</i>	NS 87364
<i>Basic I/O System (BIOS)</i>	Based on Phoenix core, including: <ul style="list-style-type: none"> 4 megabits of flash memory Support for PCI 2.2 specification Support for RIMM memory modules
<i>Firmware - BIOS</i>	Flash EEPROM: Intel's firmware hub concept
<i>HP MaxiLife Utility</i>	Hardware-monitoring utility that monitors system components via the SMBus and an LCD status panel
<i>Operating System</i>	All models come preloaded with a Windows OS.
<i>Main Memory</i>	<p>Two pairs of RIMM sockets, supporting two or four PC800 RDRAM memory modules</p> <p>Each pair of memory sockets must contain identical memory modules (identical in size, speed, and type). That is, sockets A1 and B1 must contain identical modules, and sockets A2 and B2 must contain identical modules (or continuity modules).</p> <p>If only two RDRAM modules are installed, use the sockets marked A1 and B1. The other two sockets (A2 and B2) must contain continuity modules.</p> <p>Models are supplied with non-ECC RDRAM modules.</p> <p>Both ECC and non-ECC modules are available.</p> <p>The HP PC Accessories Web site, at www.hp.com/desktops/products/accessories, lists up-to-date memory upgrades.</p>

Feature	Description
<i>Mass Storage</i>	<p>Seven shelves, supporting:</p> <ul style="list-style-type: none"> • Two front-access, third-height 3 1/2-inch drives (one for the floppy disk drive and one free) (1-inch height) • Three front-access, half-height, 5 1/4-inch drives (1-inch height); you can use an adapter tray (available as an accessory) to install two 3 1/2-inch hard disk drives in one of the 5 1/4-inch shelves. • Two internal 3 1/2-inch hard disk drives (1-inch height)
<i>SCSI Controller</i>	Adaptec Ultra 160 SCSI PCI card (optional).
<i>IDE Controller</i>	All models include an integrated Ultra ATA-100 controller that supports as many as four IDE devices.
<i>Graphics Controllers</i>	<ul style="list-style-type: none"> • nVIDIA Quadro2 MXR with TwinView or nVIDIA Quadro Pro nVIDIA Quadro2 Ex ATI FireGL 8800 • Matrox Millennium G450-Dual monitor AGP graphics controller with 16MB SGRAM graphics memory (maximum configuration) • ATI FireGL2 or GL4 3D Graphics Card
<i>Accessory Card Slots</i>	<p>One AGP Pro Universal 4X 32-bit slot supporting:</p> <ul style="list-style-type: none"> • 1.5V AGP cards (£25W) • 1.5V AGP Pro Cards (£50W) <p>The system doesn't support high-power (i.e., greater than 50W) AGP Pro and 3.3V AGP cards.</p> <p>Five 32-bit 33MHz Peripheral Component Interconnect (PCI) slots, supporting all bridges and multifunction PCI devices. All five PCI slots comply with PCI Specification 2.2.</p> <ul style="list-style-type: none"> • PCI slot 5 contains a LAN interface board. • PCI slot 4 is for a SCSI interface board (some models only).
<i>LAN Card</i>	Lan is now integrated onto the system board. All x2100 models come with an HP 10/100BT PCI Ethernet Adapter LAN card supporting Wake-On LAN 9WOL) and PCI Specification 2.2.
<i>Optical Drives</i>	Models include one or two of the following IDE drives: CD-ROM, CD-RW, or DVD-ROM.
<i>Audio</i>	CrystalClear CS4299 Audio Codec 97 version 2.1 is integrated on the system board.

Feature	Description
<i>System Board Connectors</i>	<ul style="list-style-type: none"> • One flexible disk drive connector • Two ATA-100 IDE connectors (for as many as four IDE devices) • One CD-IN audio connector • Internal speaker connector • WOL connector • Battery socket • Status panel connector • Main power supply connector and ATX 12V power connector • Auxiliary power connector (MT models only) • Main chassis fan connector • Processor fan connector • PCI card fan connector • Chassis intrusion connector • Thermal sensor connector
<i>Rear Connectors (color coded)</i>	<ul style="list-style-type: none"> • Keyboard/Mouse <ul style="list-style-type: none"> — HP enhanced keyboard with mini-DIN connector — HP enhanced scrolling mouse with mini-DIN connector • 25-pin parallel <ul style="list-style-type: none"> — Mode: Centronics or bidirectional modes (ECP/EPP) — Parallel port: 1 (378h, IRQ 7), 2 (278h, IRQ 5), or Off • 9-pin serial (two, buffered) <ul style="list-style-type: none"> — Standard: Two UART 16550 buffered serial ports (both RS-232-C). — Serial Ports A and B: 2F8h (IRQ 3), 2E8h (IRQ 3), 3F8h (IRQ 4), 3E8h (IRQ 4), or Off <p>(if one port uses 2xxh, the other port must use 3xxh).</p> • Dual USB connectors • Audio <ul style="list-style-type: none"> — LINE IN jack (3.5mm) — LINE OUT jack (3.5mm) — MIC IN jack (3.5mm)

Internal And External Components

Figure 1-1 and Figure 1-2 show the front and rear views of the HP Workstation x2100.

Figure 1-1 Front and Side Views

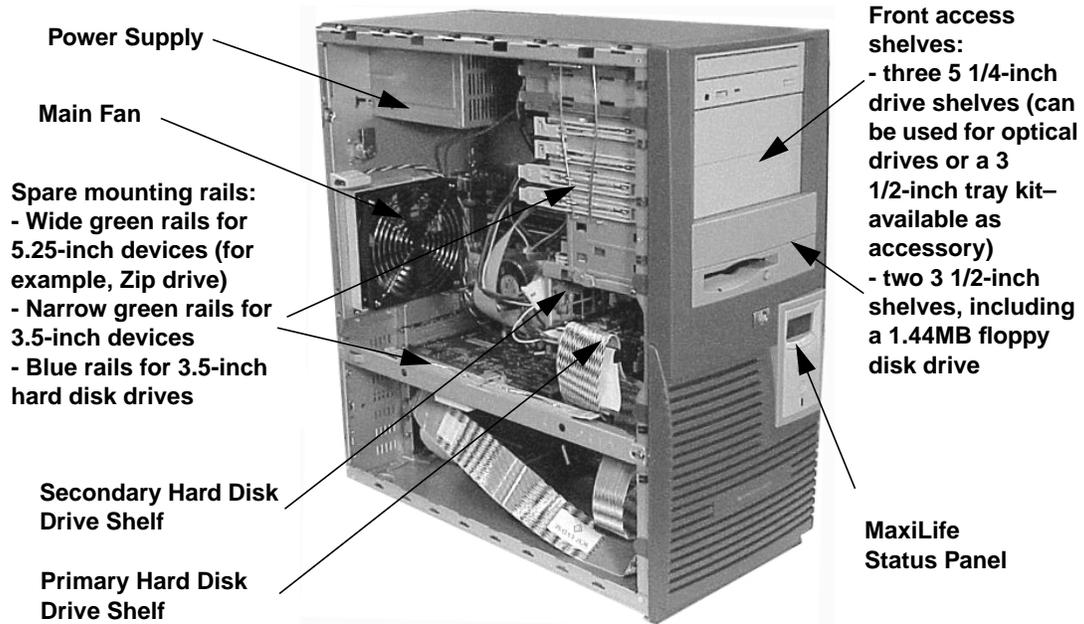
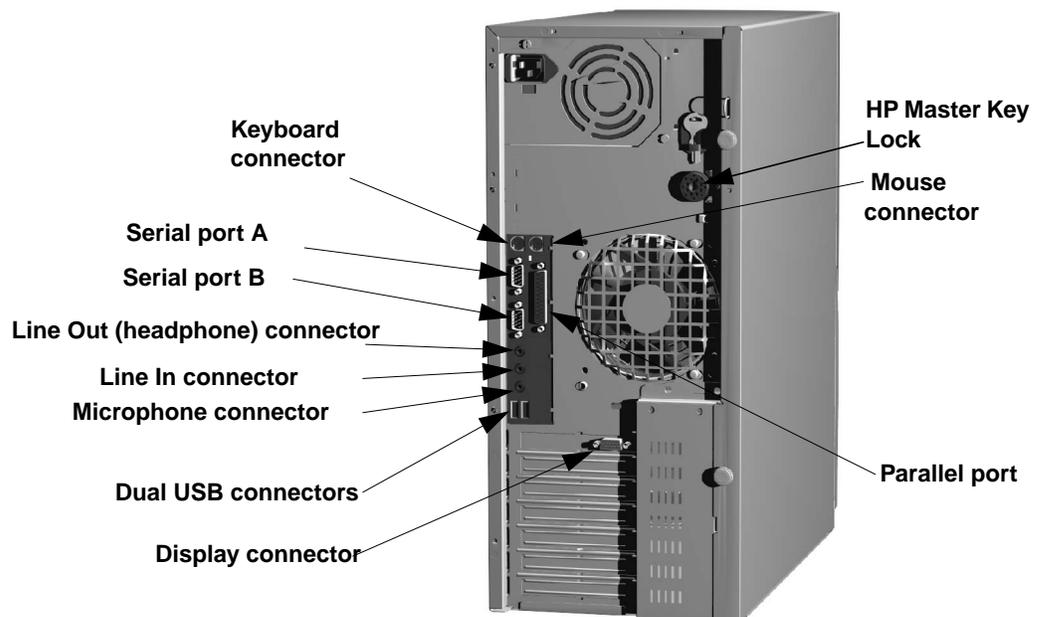


Figure 1-2 Rear View



Internal Features

The core architecture of the HP Workstation x2100 consists of:

- Memory Controller Hub (MCH)
- Input/Output Controller Hub (ICH)
- Host bus

The HP Workstation x2100 supports a Pentium 4 processor. For information about this processor, see page 58.

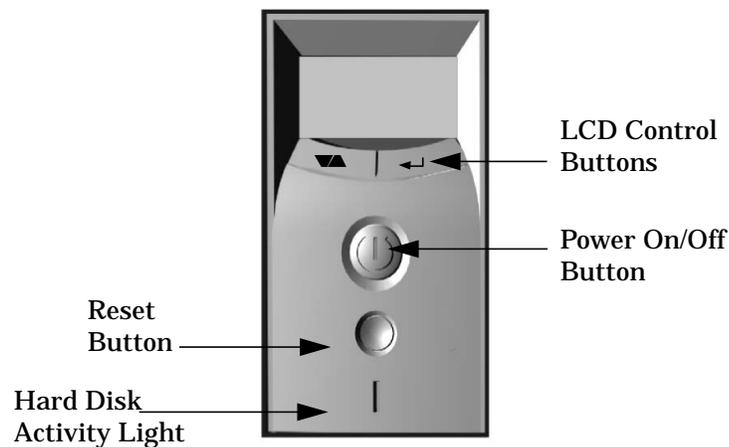
For information about...	Refer to...
System board components	Chapter 2
HP BIOS routines	Chapter 3
Tests and error messages including Power On Self Test (POST) routines	Chapter 4
Graphics, network and SCSI devices, and mass storage devices	Chapter 5
Accessories Installation and Parts Replacement	Chapter 6
Use or configuration problems	Chapter 7
Troubleshooting and Recovery	Chapter 7
Contacting support	Chapter 7

Front Panel

The HP Workstation x2100's front panel has the following features:

- Liquid Crystal Display (LCD). For information about LCD error messages and available menus, see page 77.
- On/Off LED. The LED displays four states:
 - Blank: Indicates that the computer is turned off.
 - Green: Indicates that the computer is turned on and running correctly.
 - Red (fixed or flashing): Indicates a preboot or a POST error that is preventing the system from booting.
 - Amber: Displayed during system reset, system lock.
- Hard disk drive activity LED. Activated during POST and during hard disk drive access.

Figure 1-3 Front Panel



Specifications And Characteristics

Physical Characteristics

System Processing Unit	
Weight: (Standard configuration as shipped, excluding keyboard and display)	14.4 kilograms (31.68 pounds)
Dimensions	47.0cm max. (D) X 21.0cm (W) X 49.0cm (H) (18.50 inches X 8.26 inches X 19.29 inches)
Footprint	0.09 square meters (1.06 square feet)

Electrical Specifications

Parameter	Total Rating		Peak (15 secs.)	Maximum per PCI Slots 32-bit 33MHz	Maximum for AGP Slot ^a		
					Standard Connector	Extension	Total
Input voltage (Switch select)	100-127 V VAC	200-250 V VAC	—	—	—	—	—
Input current (max)	5.5 A	2.5 A	—	—	—	—	—
Input frequency	50 to 60 Hz		—	—	—	—	—
Available power	492 W		—	100W for PCI slots and AGP Pro slot			
Max current at +12 V	15 A		15 A	0.5 A	1 A	4.2 A	5.2 A
Max current at -12 V	0.8 A		—	0.1 A	—	—	—
Max current at +3.3V	28 A		—	7.6 A	6 A	7.6 A	13.6 A
Vddq ^b	—		—	—	2 A		
Max current at +5V	30 A		—	5 A	2 A		
Max current at -5V	0.0 A		—	—	—	—	—
Max current at +5V stdby combined with 3.3V stdby	2 A		—	1.875 A total on 3.3V stdby			

- The system can draw a maximum of 50W from the AGP Pro slot. The standard part of the AGP Pro connector supplies 25W (max.), plus 25W from the connector extension (25W + 25W = 50W). For information about the AGP Pro Universal slot, see page 33.
- Only for I/O buffers.

If an overload triggers the power supply's overload protection, all power is immediately cut. To reset the power supply unit:

1. Disconnect the power cord.
2. Determine what caused the overload, and fix the problem.
3. Reconnect the power cord, and reboot the workstation.

If an overload occurs twice, then there is an undetected short circuit somewhere.

When you use the front panel's power button to turn off the workstation, power consumption falls below the low power consumption (refer to the table on page 21), but doesn't reach zero. This on/off feature extends the power supply's lifetime. To reach zero power consumption in "off" mode, either unplug the workstation or use a power block with a switch.

Power Consumption And Cooling

The power consumption and acoustics listed in the following table are valid for a standard configuration as shipped (one processor, 256MB of memory, 492 W power supply, one hard disk drive, graphics card, LAN card).

All information in this section is based on primary power consumptions.

Power consumption (approximate values)	<i>230V/50Hz and 115V/60Hz</i>	
<ul style="list-style-type: none"> • Typical operating mode • Suspend mode (Windows 2000 models only) 	70W <4W	- 238.8Btu/h ^a - 13.6Btu/h

a. 1W = 3.4121Btu/h

Additional Component		
<ul style="list-style-type: none"> • Processor • SCSI hard disk drive with I/O access • SCSI hard disk without I/O access (idle) • PCI card 	50W 23W 16W 10W to 36W	- 170.6Btu/h - 78.4Btu/h - 54.5Btu/h - 64.1Btu/h to 122.8Btu/h

Environmental Specifications

Environmental Specifications (System Processing Unit with Hard Disk)		
Operating Temperature	+10 °C to +35 °C (+40 °F to +95 °F).	
Storage Temperature	-40 °C to +70°C (-40 °F to +158 °F).	
Over-Temperature Shutdown	+50°C (+122°F)	
Operating Humidity	15% to 80% (relative). ^a	
Storage Humidity	8% to 85% (relative). ¹	
Acoustic noise emission (as defined in ISO 7779):	<i>Sound Power</i>	<i>Sound Pressure</i>
	LwA <= 40.5dB	LpA <= 25.7dB
	LwA <= 41.4dB	LpA <= 26.5dB
	LwA <= 43.2dB	LpA <= 30.0dB
Operating Altitude	10,000ft (3100m) max	
Storage Altitude	15,000ft (4600m) max	

a. noncondensing conditions.

Operating temperature and humidity ranges may vary depending on the installed mass storage devices. High humidity levels can cause improper disk operation. Low humidity levels can aggravate static electricity problems and cause excessive wear of the disk surface.

Power Saving And Ergonometry

Depending on the operating system, the following power-management types are available:

- No sleeping state: Windows NT 4.0 (Full On and Off).
- ACPI: Windows 2000 or XP (Full On, Standby, Hibernate, Off).

		Windows 2000/XP	Windows NT 4.0
A P M	<i>Full On</i>	Not Supported by Windows 2000	Supported
	<i>Suspend</i>		Not Supported by Windows NT 4.0
	<i>Off</i>		Supported
A C P I	<i>Standby (S1 or S3)</i>	Supported (implemented as S3, Suspend to RAM)	APM only Operating System
	<i>Hibernate (S4)</i>	Supported	
	<i>Off (S5)</i>	Supported	

Power Saving And Ergonometry For APM Systems

	Full On	Suspend ^a	Off
Processor	Normal speed	Halted	Halted
Display	On	Blanked, <5W (typ)	Blanked, <5W (typ)
Hard disk drive	Normal speed	Halted	Halted
Power consumption	Supports up to 320W	<40W (230V, 50Hz) <21W (115V, 60Hz)	(plugged in but turned off) <5W (average)
Resume events		Keyboard, network (RWU), modem, USB	Power button or RPO
Resume delay		A few seconds	Boot delay

a. Not supported by Windows NT 4.0.

Power Saving Modes And Resume Events For ACPI Systems

	Full On (S0)	Suspend (S1)	Suspend to RAM (S3)	Suspend to Disk (S4)	Off (S5)
Processor	Normal speed	Halted	Off	Off	Off
Display	On	Blanked	Off	Off	Off

	Full On (S0)	Suspend (S1)	Suspend to RAM (S3)	Suspend to Disk (S4)	Off (S5)
Hard Disk Drive	Normal speed	Halted	Off	Off	Off
Active Power Planes	VCC VCCAux	VCC VCCAux	Memory VCCAux	VCCAux	VCCAux
Power Consumption	Supports up to 492W	<40W	<10W	<10W	<10W
Resume Events		Power button, LAN, Modem, USB, Scheduler	Power button, LAN, Modem, Scheduler	Power button, LAN, Modem, Scheduler	Power button
Resume Delay		Instantaneous	Instantaneous	BIOS boot delay	Regular boot delay

Soft Power Down

When you shut down the operating system, the environment is cleared, and the computer is powered off. The Soft Power Down utility is available with Windows NT.

Documentation

The following table lists the documentation available for the HP Workstation x2100. Only selected publications are in hard-copy format. Most are available as PDF files from the HP Web site.

Title	Available at HP Web site	Hard-copy?
<i>HP Workstation x2100 Getting Started Guide</i>	PDF file	A8030-90001
<i>HP Workstation x21000 Technical Reference And Troubleshooting Guide</i>	PDF file	No

Access HP World Wide Web Site

Additional online support documentation, BIOS upgrades, and drivers are available from HP's Web site at <http://www.hp.com/go/workstationsupport>.

After accessing the site, select **HP Workstation x2100**.

Where To Find The Information

The table below summarizes information provided in the HP Workstation x2100 documentation set.

	Getting Started Guide	Technical Reference/Troubleshooting Guide^a	Service Handbook
Introducing the Workstation			
<i>Product features</i>	Minimal	Key features.	Exploded view. Parts list.
<i>Product model numbers</i>			Product range.
<i>Environmental</i>	Setting up the PC. Working in Comfort.	Complete listing.	
<i>Safety warnings</i>	Safety.	Electrical, multimedia, safety, unpacking, removing, and replacing cover.	
<i>Finding on-line information</i>	HP Web sites.	HP Web sites.	
<i>Technical information</i>	Basic details.	Advanced.	
<i>Formal documents</i>	Certificate of Conformity. Software License agreement.		
Using the Workstation			
<i>Connecting devices and turning on</i>	Rear panel connectors, starting and stopping.		
<i>BIOS</i>	Basic details.	Advanced.	
<i>Fields and their options within Setup</i>	Basic details. Viewing Setup screen, using passwords	Complete list.	
<i>Manageability</i>	Power management, Software and drivers.		
Upgrading the Workstation			
<i>Opening the PC</i>		Full description.	
<i>Supported accessories</i>		Full description	Full PN details

	Getting Started Guide	Technical Reference/Troubleshooting Guide^a	Service Handbook
<i>Installing accessories</i>		Processor(s), memory, accessory boards, mass storage devices., fans, power supply, system board, battery	
<i>Configuring devices</i>		Installing devices.	
<i>System board</i>		Installing and removing, connectors and switch settings. Chip-set details.	Jumpers, switches and connectors.
Repairing the Workstation			
<i>Troubleshooting</i>	Basic.	Advanced. MaxiLife, hardware diagnoses and suggested solutions.	Service notes.
<i>Power-On Self-Test routines (POST)</i>		Error codes, messages, EMU and suggestions for corrective action. Order of tests.	
<i>Diagnostic utility</i>	e-DiagTools, CD-ROM recovery.	HP e-DiagTools, CD-ROM recovery Technical Details.	
Peripheral Devices			
<i>Audio Accessories</i>		Refer to online version of <i>Audio User's Guide</i> for information about setting up and configuring audio accessories.	
<i>LAN Accessories</i>		Refer to online version (preloaded on hard disk) of <i>LAN Administrator's Guide</i> for information on setting up and configuring LAN cards and systems.	

a. For address, "Access HP World Wide Web Site" on page 25.

2 **System Board**

System Board Description

This chapter describes the components of the system board including:

- Memory Controller Hub (MCH)
- Input/Output Controller Hub (ICH2)
- FirmWare Hub (FWH)
- System Bus

Figure 2-1 shows the HP Workstation x2100 system board in detail.

Figure 2-1 **HP Workstation x2100 System Board**

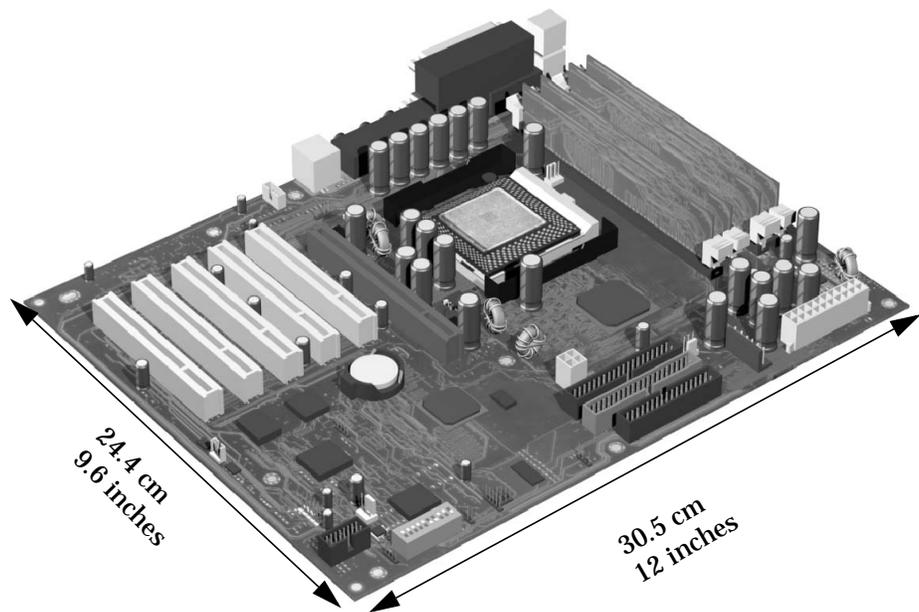
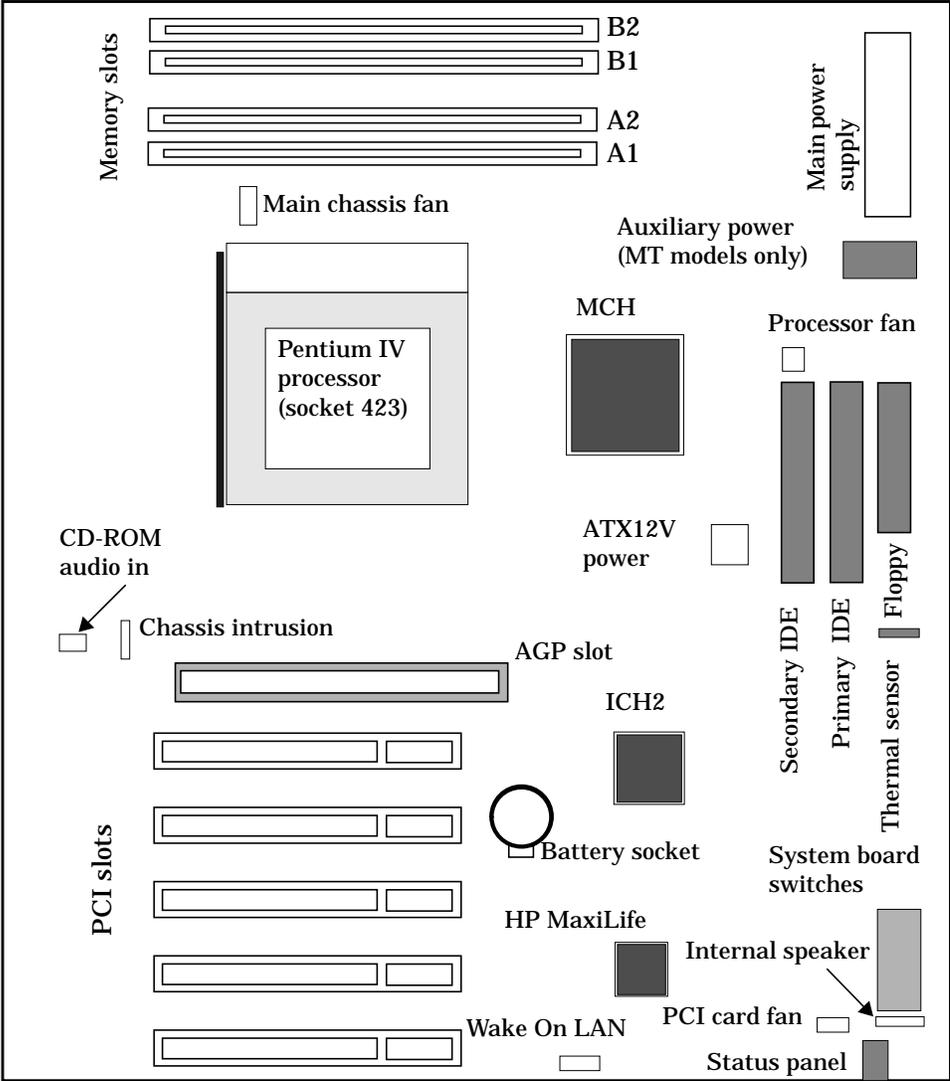
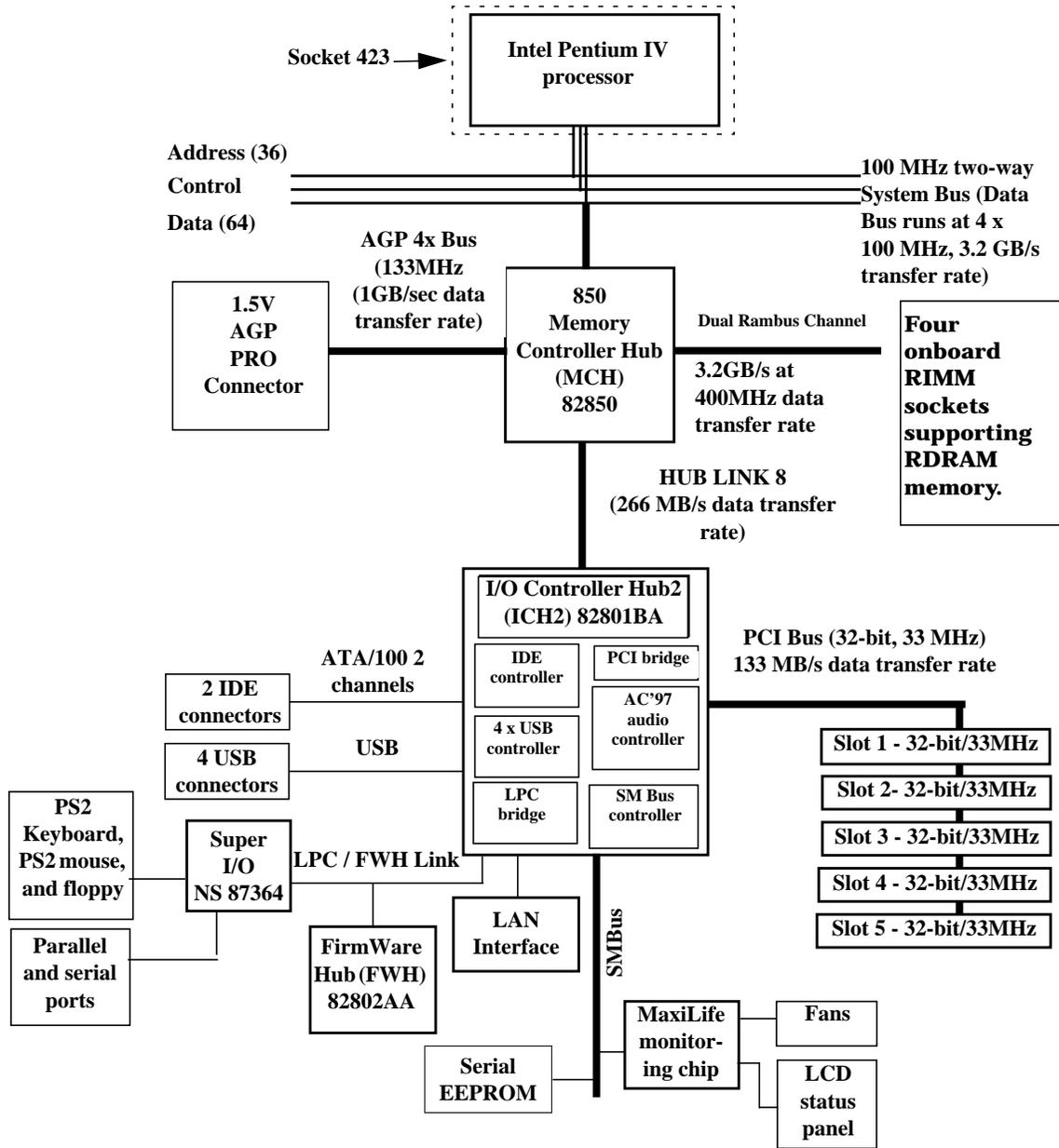


Figure 2-2 shows where the different chips and connectors reside on the system board.

Figure 2-2 System Board Chips and Connectors



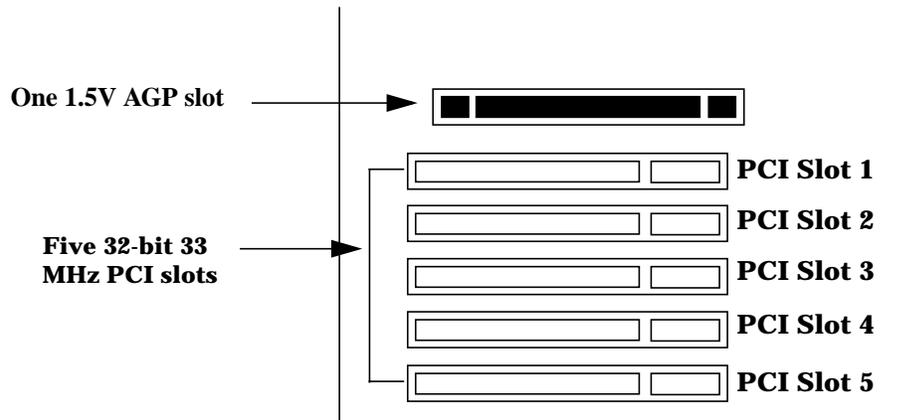
Architectural View



Accessory Board Slots

Figure 2-3 shows the position of the accessory board slots on the system board.

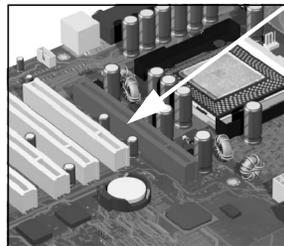
Figure 2-3 Accessory Board Slots



Accelerated Graphics Port Slot

The HP Workstation x2100 has one Accelerated Graphics Port (AGP) graphics slot.

Figure 2-4 AGP Slot



The AGP Pro 1.5V slot provides graphics performance for high-end graphics cards, combining AGP 4X bandwidth (data transfer rates as fast as 1056MB/sec) with the ability to accept high-end graphics cards drawing up to that draw as much as 110W of power.

To accommodate AGP Pro cards, the AGP PRO slot connector is wider than the standard AGP 4X connector. To meet the increased power requirements of AGP Pro graphics cards, additional pins are present at both ends of the connector.

An AGP Pro card may draw power either from the existing part of the AGP Pro connector, the extended part, or a combination of the two. In all cases, the maximum power that an AGP Pro card may draw is limited to 110W in the workstation models. Power on the existing part of the connector is delivered on 5.0V and 3.3V rails. Power on the extension is delivered on the 12V and 3.3V rails.

You can use either standard AGP graphics cards or AGP Pro graphics cards that draw less than 50W of power. (Below 25W, you can use a standard AGP connector.) Power is provided through 3.3V, 5V, or 12V power rails.

NOTE AGP Pro graphics cards that draw more than 50W and AGP 3.3V graphics cards cannot be used in the workstation's AGP slot.

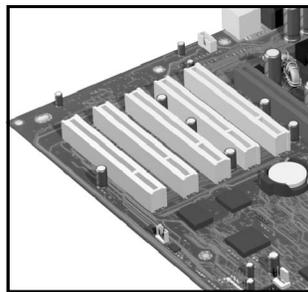
The AGP Pro 1.5V slot is backward compatible with both AGP 1x and 2.x modes (using 1.5V signalling) and AGP 4x mode (where 1.5V signalling is necessary).

For information about the AGP interface and bus, see page 41.

Peripheral Component Interconnect Slots

The system board contains five 32-bit, 33MHz Component Interconnect (PCI) connectors.

Figure 2-5 PCI Slots



The PCI slots accept 3.3V and 5V PCI 32-bit 33MHz cards, and Universal PCI cards (which are 3.3V or 5V compatible). Refer to the table on page 34 for the different PCI board installations.

The maximum supported power consumption per slot is 25W, either from the 5V or the 3.3V supply. The power consumption must comply with the electrical specifications of the PCI 2.2 specification. Total power consumption for the PCI slots must not exceed 60W.

The power consumption of each PCI board is automatically reported to the system through the two presence-detect pins on each PCI slot. These pins code the following cases:

- No accessory board in the PCI slot
- 7W maximum PCI board in the PCI slot
- 15W maximum PCI board in the PCI slot
- 25 maximum PCI board in the PCI slot

The following table shows the various PCI board installations for the different PCI slots:

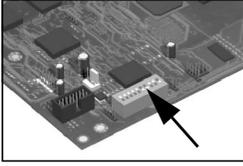
PCI Slot	PCI Card					
	3.3V and 5V		Universal (3.3V or 5V compatible)			
	32-bit/ 33MHz	64-bit/ 33MHz	32-bit/ 33MHz or 66MHz		64-bit/ 33MHz or 66MHz	
Slots 1, 2, 3, 4, and 5 5V, 32-bit/33MHz	yes	yes ^a	yes	yes	yes	yes ^b

a. You can install a 64-bit card in a 32-bit slot. However, this card will only operate in 32-bit mode.

- b. You can install a 66Mhz card in a 33MHz slot. However, this card will only operate in 33MHz mode.

The system board and BIOS support the PCI 2.2 specification. This specification supports PCI-to-PCI bridges and multifunction PCI devices, and each of the five PCI slots have master capabilities.

The PCI slots are connected to the ICH2 PCI 32-bit 33MHz bus.



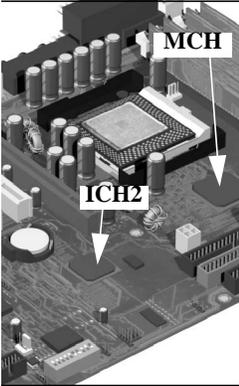
System Board Switches

There Are 10 System Board Switches Used For Configuration. You Should Not Modify The Settings Of Reserved Switches 1 - 5; Modification Of These Switches Can Lead To System Failure.

Switch	Default Position	Use
1-4	OFF	Reserved. Do <i>not</i> change default settings.
5	ON	Reserved. Do <i>not</i> change default setting.
6	ON	Enables keyboard power-on. OFF disables this option.
7	OFF	Enables normal modes. ON enables the BIOS recovery mode at next boot.
8	OFF	Retains CMOS memory. ON clears CMOS memory at next boot.
9	OFF	Enables User and System Administrator passwords. ON clears the passwords at next boot.
10	OFF	Chassis type OFF = desktop, ON= minitower

System Chipset

The Intel I850 chipset is a high-integration chipset designed for graphics/multimedia PC platforms and is comprised of the following:



- The 82850 MCH is a bridge between the:
 - System bus
 - Dual Rambus bus (main memory)
 - AGP 4x (graphic) bus
 - Hub link 8-bit

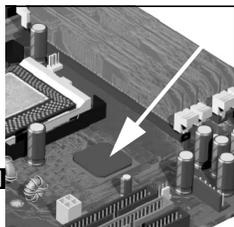
For detailed information about the MCH chip feature, see page 38.

- The 82801BA ICH2 is a bridge between the 32-bit, 33MHz PCI bus and the SMBus. Additionally, the ICH2 supports the:
 - integrated IDE controller (Ultra ATA/100)
 - enhanced DMA controller
 - USB controller
 - interrupt controller
 - Low Pin Count (LPC) interface
 - FWH interface
 - Integrated LAN
 - ACPI Power Management Logic
 - AC'97 2.1 Compliant Link
 - Alert-On-LAN (AOL) and Real Time Clock (RTC)
 - CMOS

For detailed information about the ICH2, see page 44.

- The 82802AB FWH stores system BIOS and SCSI BIOS (i.e., the nonvolatile memory component). In addition, the FWH contains an Intel Random Number Generator (RNG). The RNG provides random numbers to enable fundamental security building blocks for stronger encryption, digital signing, and security protocols for the workstation. For detailed information about the FWH, see page 56.

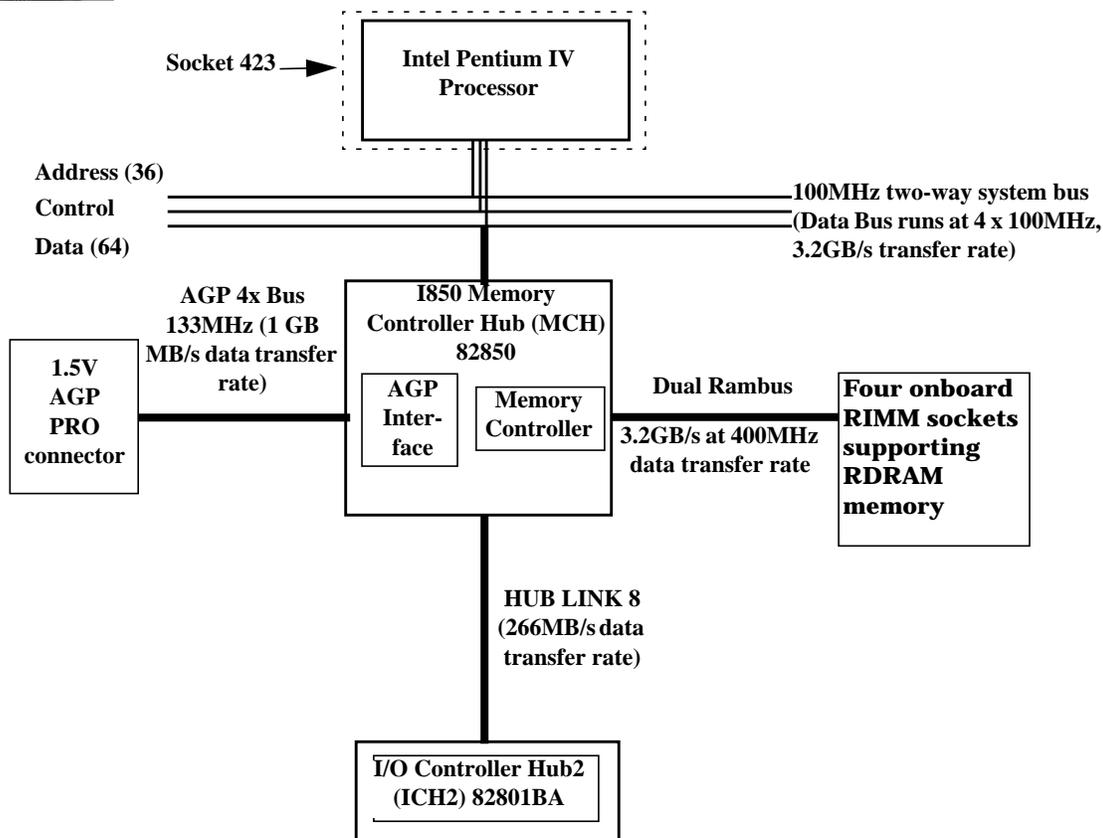
Memory Controller Hub (82850)



The MCH host bridge/controller is contained in a 615-pin Organic Land Grid Array (OLGA) package and is the bridge between the system bus, Dual Rambus bus (main memory), AGP 4x (graphic), and Hub Link 8-bit.

Figure 2-6 shows an example of the system block diagram using the MCH.

System Block Diagram using MCH



The following table shows the features that the MCH host bridge/controller offers.

Feature	Feature
<ul style="list-style-type: none"> • Processor/system bus: <ul style="list-style-type: none"> — Supports Pentium IV processor at 100MHz system bus frequency (400MHz data bus) — Provides an eight-deep In-Order Queue that supports as many as eight outstanding transaction requests on the system bus — Desktop optimized AGTL+ bus driver technology with integrated AGTL + termination resistors — Support for 32-bit system bus address 	<ul style="list-style-type: none"> • Accelerated Graphics Port (AGP) interface: <ul style="list-style-type: none"> — Single 1.5V AGP Pro connector — AGP 2.0 compliant, including AGP 4x data transfers and 2x/4x Fast Write protocol — AGP 1.5V connector support with 1.5V signalling only — AGP PIPE# or SBA initiated accesses to DRAM is not snooped — AGP FRAME initiated accesses to DRAM are snooped (snooper identifies that data is coherent in cache memory) — Hierarchical PCI configuration mechanism — Delayed transaction support for AGP-to-DRAM reads that cannot be serviced immediately
<ul style="list-style-type: none"> • Memory Controller <p><i>Direct Rambus:</i></p> <ul style="list-style-type: none"> • Dual Direct Rambus Channels operating in lock-step (both channels must be populated with a memory module). Supporting 300MHz or 400MHz • RDRAM 128Mbit and 256Mbit devices • Minimum upgrade increment of 32MB using 128Mbit DRAM technology 	<ul style="list-style-type: none"> • As many as 64 Direct Rambus devices • Dual-channel maximum memory array size is: <ul style="list-style-type: none"> — 1GB using 128Mbit DRAM technology — 2GB using 256Mbit DRAM technology • As many as eight simultaneous open pages: <ul style="list-style-type: none"> — 1KB page size support for 128Mbit and 256Mbit RDRAM devices — 2KB page size support for 256Mbit RDRAM devices
<ul style="list-style-type: none"> • Hub Link 8-bit interface to ICH2: <ul style="list-style-type: none"> — High-speed interconnect between the MCH and ICH2 (266MB/sec) 	

Feature	Feature
<ul style="list-style-type: none"> • Power management: <ul style="list-style-type: none"> — SMRAM space remapping to A0000h - BFFFFh (128KB). — Extended SMRAM space above 256MB, additional 128KB, 256KB, 512KB, 1MB TSEG from top of memory, cacheable (cacheability controlled by processor) — ACPI 1.0 compliant power management — APM 1.2 compliant power management 	<ul style="list-style-type: none"> • Arbitration: <ul style="list-style-type: none"> — Distributed arbitration model for concurrency support — Concurrent operations of system, hub interface, AGP, and memory buses supported through a dedicated arbitration and data-buffering logic
<ul style="list-style-type: none"> • 615 OLGA MCH package 	<ul style="list-style-type: none"> • I/O device support: <ul style="list-style-type: none"> — I/O Controller Hub (ICH2)

MCH Overview

The MCH provides the processor interface, memory interface, AGP interface and hub interface in an Intel 850 chipset platform. The MCH supports two channels of Direct RDRAM operating in lock-step. It also supports 4x AGP data transfers and 2x/4x AGP fast writes. The primary host interface enhancements include:

- Source synchronous double pumped address
- Source synchronous quad pumped data
- System bus interrupt delivery

The MCH supports a 64B cache line size. One processor is supported at a system bus frequency of 100 MHz (400 MHz Data Bus). It supports 32-bit host addresses, letting the processor address the entire 4GB space of the MCH's memory address space. The MCH also provides an eight-deep In-Order Queue that supports as many as eight outstanding pipelined address requests on the host bus.

Host-initiated I/O signals are subtractively decoded to the hub interface. Host-initiated memory cycles are positively decoded to AGP or RDRAM and are again subtractively decoded to the hub interface.

AGP semantic memory accesses initiated from AGP to DRAM are not snooped on the host bus. Memory accesses initiated from AGP using PCI semantics and accesses from the hub interface to DRAM are snooped on the system bus. Memory access whose addresses lie within the AGP aperture are translated using the AGP address translation table, regardless of the originating interface.

Accelerated Graphics Port (AGP) Bus Interface

A controller for the AGP Pro 1.5V slot is integrated in the MCH. The AGP interface supports 1x/2x/4x AGP signaling and 2x/4x fast writes. AGP semantic cycles to the DRAM are not snooped on the host bus. PCI semantic cycles to DRAM are snooped on the host bus. The MCH supports PIPE# or SBA{7.0} AGP address mechanisms, but not both simultaneously. Either the PIPE# or the SBA{7.0} mechanism must be selected during system initialization. Both upstream and downstream addressing is limited to

32-bit for AGP and AGP/PCI transactions. The MCH contains a 32-deep AGP Requests queue. High priority accesses are supported. All accesses from the AGP interface that fall within the graphic aperture address range pass through an address translation mechanism with a fully associative 20 entry TLB. Accesses between AGP and the hub interface are limited to memory writes originating from the hub interface for the AGP bus.

The AGP interface is clocked from a dedicated 66 MHz clock (661N). The AGP-to-host/core interface is asynchronous. The AGP buffers operate only in 1.5V mode. They are not 3.3V safe.

Hub Interface

The 8-bit hub interface connects the MCH to the ICH2. Most communications between the MCH and the ICH2 occur over this interface. The hub interface runs at 66 MHz/266 MB/s.

The hub interface's supported traffic types include: hub interface-to-AGP memory writes, hub interface-to-DRAM, processor-to-hub interface, messaging (MSI interrupt messages, power management state change, MI, SCI, and SERR error indication). It is assumed that the hub interface is always connected to an ICH2.

RDRAM Interface

The MCH directly supports two channels of Direct RDRAM memory operating in lock-step using RSL technology. These channels run at 300 MHz and 400MHz and support 128 Mb and 256 Mb technology RDRAM Direct devices. These 128 Mb and 256 Mb RDRAMs use page sizes of 1 Kb, while 256 Mb devices may also be configured to use 2 Kb pages. A maximum of 64 RDRAM devices are supported on the paired channels without external logic (128Mbit technology implies 1GB maximum in 32MB increments, whereas 256Mbit technology implies 2GB maximum in 64MB increments).

The MCH also provides optional ECC error checking for RDRAM data integrity. During DRAM writes, ECC is generated on a QWord (64-bit) basis. During DRAM reads, and the read of the data that underlies partial writes, the MCH supports detection of single-bit and multiple-bit errors, and will correct single-bit errors when correction is enabled.

RDRAM Thermal Management

The relatively high power dissipation needs of RDRAM necessitate a MCH mechanism capable of putting a number of memory devices into a power-saving mode to keep an inadequately cooled system from overheating. RDRAM devices may be in one of three power-management states: active, standby or "nap." The MCH implements the RDRAM nap mode.

Two queues are used in the MCH to control power consumption: the A queue contains references to device pairs that are currently in the active mode while the B queue contains references to devices that are in the standby mode. This means that all devices that are in neither queue are in standby or napping. The A queue can hold from 1 to 8 device pairs, while the B queue can be configured to contain between 1 and 16 device pairs. This allows power consumption to be tuned.

The MCH also implements a mode in which all devices are turned on and it is assumed that the system will provide adequate cooling. This means that all devices that are in neither queue A or B are in standby mode. One fail-safe mechanism is supported that

protects the RDRAM devices from thermal overload. This mechanism polls the thermal indicator bits in the RDRAM devices themselves. When the mechanism is activated, the MCH immediately exits the “all devices on” mode and reverts to whatever queue mode has been programmed by system software.

Dual Rambus Bus

The Dual Rambus bus is comprised of 16 x 2 bits of data information, and eight bits of Error Correcting Code (ECC). The bus is connected to the RIMM memory slots and to the MCH chip so that the system supports two Dual Rambus channels (A and B).

Both channels run at 300MHz or 400MHz, supporting as many as 32 Rambus devices per channel. The maximum available data bandwidth is 3.2GB/s at 400MHz.

The configuration of both primary rambus channels must be symmetrical. The memory configuration on channel A must be identical to the memory configuration on channel B. This means that you must install the memory in identical pairs.

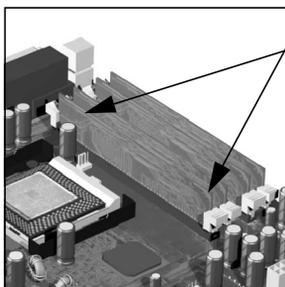
RIMM Memory Slots

The HP Workstation x2100 has four RIMM memory sockets for installing two or four RDRAM memory modules:

- RIMM A1
- RIMM A2
- RIMM B1
- RIMM B2

Figure 2-7

RIMM Memory Slots



Each pair of memory sockets must contain identical memory modules (identical in size, speed, and type). That is, sockets **A1** and **B1** must contain identical modules, and sockets **A2** and **B2** must contain identical modules (or continuity modules).

If you install only two RDRAM modules, use the sockets marked **A1** and **B1**. The other two sockets (**A2** and **B2**) must contain continuity modules.

Each RIMM socket is connected to the SMBus.

Read/Write Buffers

The MCH defines a data-buffering scheme to support the required level of concurrent operations and provide adequate sustained bandwidth between the DRAM subsystem and all other system interfaces (CPU, AGP, and PCI).

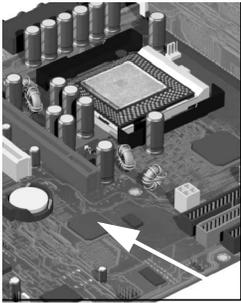
System Clocking

The MCH has the following clock input pins:

- Differential BCLK0/BCLK1 for the host interface
- 66 MHz clock input for the AGP and hub interface
- Differential CTM/CTM# and CFM/CFM# for each of the two RAC's.

Clock synthesizer chip(s) are responsible for generating the system host clocks, AGP and hub interface clocks, PCI clocks and RDRAM clocks. The MCH provides two pairs of feedback signals to the Direct Rambus Clock Generator (DRCG) chips to keep the host and RDRAM clocks aligned. The host speed is 100 MHz. The RDRAM speed is 300 MHz or 400 MHz. The MCH does not require any relationship between the BCLK host clock and the 66 MHz clock generated for AGP and hub interfaces; they are totally asynchronous from each other. The AGP and hub interfaces run at a constant 66 MHz base frequency. The hub interface runs at 4x. AGP transfers may be 1x/2x/4x.

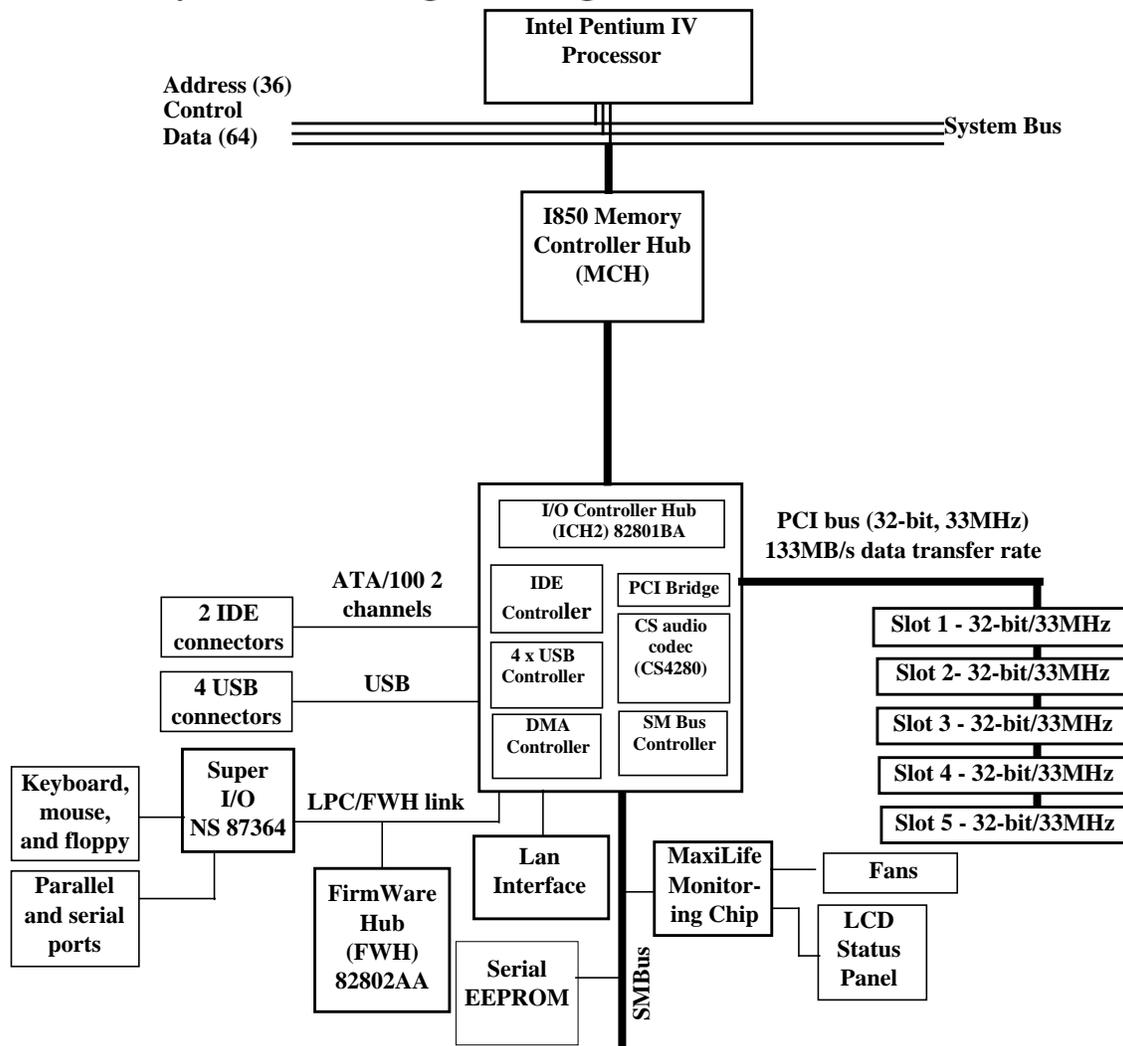
Input/output Controller Hub 2 (82801BA)



The ICH2 is encapsulated in a 360-pin Enhanced Ball Grid Array (EBGA) package and resides on the system board just underneath the AGP connector. It provides the interface between the PCI bridge (PCI 2.2 compliant with support for 32-bit 33MHz PCI operations), PCI-to-Low Pin Count (LPC) bridge, IDE controller, USB controller, SMBus controller, and Audio Codec'97 controller.

You'll find more detail about the ICH2 functions and capabilities later in this section. Figure 2-8 shows an example of the system block diagram using the ICH2.

Figure 2-8 System Block Diagram Using ICH2



The following table shows the available ICH2 features, and the following sections discuss them.

Feature	Feature
<ul style="list-style-type: none"> • Multifunction PCI bus interface: <ul style="list-style-type: none"> — PCI at 32-bit 33MHz — PCI 2.2 specification — 133MB/sec data transfer rate — Master PCI device support for as many as five devices 	<ul style="list-style-type: none"> • Enhanced DMA controller: <ul style="list-style-type: none"> — Two 82C37 DMA controllers — PCI DMA with two PC/PCI channels in pairs — LPC DMA — DMA collection buffer to provide Type-F DMA performance for all DMA channels
<ul style="list-style-type: none"> • USB, supporting: <ul style="list-style-type: none"> — USB 1.1 compliant — UHCI implementation with four USB ports for serial transfers at 1.2 or 1.5Mbit/sec — Wake-up from sleeping states — Legacy keyboard/mouse software 	<ul style="list-style-type: none"> • Interrupt Controller: <ul style="list-style-type: none"> — Two cascaded 82C59 controllers — Integrated I/O APIC capability — 15 interrupt support in 8259 mode, 24 supported in I/O APIC mode — Serial interrupt protocol
<ul style="list-style-type: none"> • Power Management Logic: <ul style="list-style-type: none"> — ACPI 1.0 compliant — Support for APM-based legacy power management for non-ACPI implementations — ACPI defined power states (S1, S3, S4, S5) — ACPI power management timer — SMI generation — All registers readable/restorable for proper resume from 0V suspend states — PCI PME# 	<ul style="list-style-type: none"> • Integrated IDE controller: <ul style="list-style-type: none"> — Independent timing of as many as four drives — Ultra ATA/100 mode (100MB/sec) — Ultra ATA/66 mode (66MB/sec) — Ultra ATA/33 mode (33MB/sec) — PIO mode four transfers as fast as 14MB/sec — Separate IDE connections for primary and secondary cables — Integrated 16 x 32-bit buffer for IDE PCI burst transfers — Write ping-pong buffer for faster write performances
<ul style="list-style-type: none"> • Real-time clock, supporting: <ul style="list-style-type: none"> — 256-byte battery-backed CMOS RAM — Hardware implementation to indicate century rollover 	<ul style="list-style-type: none"> • System TCO reduction circuits: <ul style="list-style-type: none"> — Timers to generate SMI# and reset upon — Timers to detect improper processor reset — Integrated processor frequency strap logic
<ul style="list-style-type: none"> • Timers based on 82C54: <ul style="list-style-type: none"> — System timer, refresh request, speaker tone output 	<ul style="list-style-type: none"> • SMBus <ul style="list-style-type: none"> — Host interface allows processor to communicate via SMBus — Compatible with two-wire I2C bus
<ul style="list-style-type: none"> • System timer, refresh request, speaker tone output 	<ul style="list-style-type: none"> • GPIO: <ul style="list-style-type: none"> — TTL, Open-Drain, Inversion

Feature	Feature
<ul style="list-style-type: none"> FWH interface 	<ul style="list-style-type: none"> 3.3V operation with 5V tolerant buffers for IDE and PCI signals
<ul style="list-style-type: none"> 241 BGA package 	<ul style="list-style-type: none"> Alert-On-LAN (AOL) support

ICH2 Features

ICH2 Architecture

The ICH2 interface architecture ensures that the I/O subsystems, both PCI and the integrated I/O features (for example, IDE, AC'97, and USB), receive adequate bandwidths.

By placing the I/O bridge directly on the ICH2 interface, and no longer on the PCI bus, the ICH2 architecture ensures that the I/O functions obtain the bandwidth necessary for peak performance.

ICH2 PCI Bus Interface

The ICH2 PCI provides the interface to a PCI bus interface operating at 33MHz. This interface implementation is compliant with PCI 2.2 specification, supporting as many as five external PCI masters in addition to the ICH2 requests. The PCI bus can reach a data transfer rate of 133MB/sec. The maximum PCI burst transfer can be between 256 bytes and 4KB. It also supports advanced snooping for PCI master bursting, and provides a prefetch mechanism dedicated for IDE read.

For a list of ICH2 interrupts, see the table on page 60.

SMBus Controller

The System Management (SM) bus is a two-wire serial bus that runs at a maximum of 100kHz. The SMBus host interface allows the processor to communicate with SMBus slaves and an SMBus slave interface that allows external masters to activate power-management events. The bus connects to sensor devices that monitor some of the hardware functions of the system board, both during system boot and run-time.

For a description of the devices on the SMBus, see page 49. For information about the MaxiLife ASIC, see page 51.

Low Pin Count Interface

The ICH2 implements the LPC interface 1.0 specification.

Enhanced USB Controller

The USB controller provides enhanced support for the Universal Host Controller Interface (UHCI). This includes support that allows legacy software to use a USB-based keyboard and mouse. The USB supports four stacked connectors on the back panel. These ports are built into the ICH2, as standard USB ports.

The ICH2 is USB 1.1 compliant.

USB works only if you've enabled the USB interface within the HP Setup program. Currently, only Microsoft Windows 95 SR2.1, Windows 98, and Windows 2000 provide USB support.

AC'97 Controller

The AC'97 controller is a single-chip CS4299 audio controller that provides full audio features for the HP Workstation x2100.

For information about the CS4299 audio solution, see page 48.

IDE Controller

The IDE controller is implemented as part of the ICH2 chip and has PCI-Master capability. Two independent ATA/100 IDE channels are provided with two connectors per channel. You can connect two IDE devices (one master and one slave) per channel. To guarantee data transfer integrity, you must use Ultra-ATA cables for Ultra-ATA modes (Ultra-ATA/33, Ultra-ATA/66, and Ultra-ATA/100).

The PIO IDE transfers as fast as 14MB/sec, and the system supports Bus Master IDE transfer rates of as fast as 66MB/sec. The IDE controller integrates 16 x 32-bit buffers for optimal transfers.

You can mix a fast and a slow device (for example, a hard disk and a CD-ROM) on the same channel without affecting the performance of the faster device. The BIOS automatically determines the fastest configuration that each device supports.

DMA Controller

The seven-channel DMA controller incorporates the functionality of two 82C37 DMA controllers. Channels zero to three are for 8-bit count-by-byte transfers, whereas channels five to seven are for 16-bit count-by-word transfers. (For allocated DMA channel allocations, see the table on page 74.) You can program any two of the seven DMA channels to support fast Type-F transfers.

The ICH2 DMA controller supports the LPC DMA. The LPC interface supports Single, Demand, Verify, and Incremental modes. Channels zero to three are 8-bit, whereas channels five to seven are 16-bit. Channel four is reserved as a generic bus master request.

Interrupt Controller

The interrupt controller is equivalent in function to the two 82C59 interrupt controllers. The two interrupt controllers are cascaded so that 14 external and 2 internal interrupts are possible. In addition, the ICH2 supports a serial interrupt scheme and also implements the I/O APIC controller. The table on page 60 shows how the master and slave controllers are connected.

Timer/Counter Block

The timer/counter block contains three counters that are equivalent in function to those found in one 82C54 programmable interval counter/timer. These three counters provide the system timer function and speaker tone. The 14.318MHz oscillator input provides the clock source for these three counters.

Advanced Programmable Interrupt Controller

You can use the APIC, which is incorporated in the ICH2, in either single-processor or multiprocessor systems, whereas the standard interrupt controller supports only single-processor systems.

Real Time Clock

The RTC is 146818A-compatible, with 256 bytes of CMOS. The RTC performs two key functions:

- Keeps track of the time
- Stores system data

The RTC operates on a 32.768KHz crystal and a separate 3V lithium battery that provides up to seven years of protection for an unplugged system. The RTC also supports two lockable memory ranges. By setting bits in the configuration space, you can lock two 8-byte ranges to read and write accesses. This procedure prevents unauthorized reading of passwords or other security information. Another feature is a date alarm that allows for a schedule wake-up event as much as 30 days in advance.

Enhanced Power Management

The ICH2's power-management functions include enhanced clock control, local and global monitoring support for 14 individual devices, and various low-power (suspend) states. A hardware-based thermal management circuit permits software-independent entry points for low-power states.

The ICH2 includes full support for the Advanced Configuration and Power Interface (ACPI) specifications.

Crystal CS4299 Integrated PCI Audio

Based on the earlier crystal audio controller, the CS4299 extends these features to include, among many other enhancements, PC'98 and PC'99 compliancy for multimedia desktops that require high-quality audio.

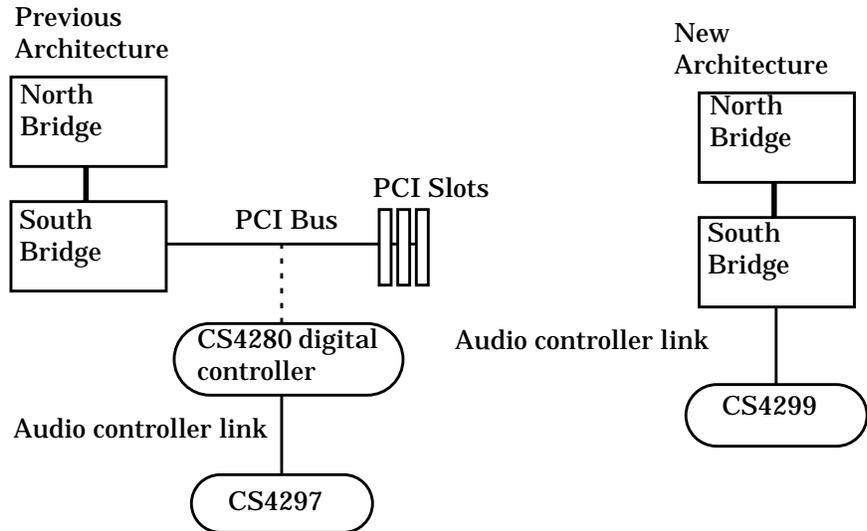
Features of the CS4299 include:

- AC'97 2.1 compatibility
- Industry-leading mixed-signal technology
- 20-bit stereo digital-to-analog converter and 18-bit analog-to-digital converter
- High-quality pseudo-differential CD input
- Mono microphone input
- Analog line-level stereo inputs for LINE IN
- Stereo line-level output
- Compliance with Microsoft's PC'98 and PC'99 audio performance requirements

The CS4299 introduces a new architecture that is different from the one used with the CS4280-CS4297 pair.

Figure 2-9

CS4280-CS4297 and CS4299 Architecture



Devices On The SMBus

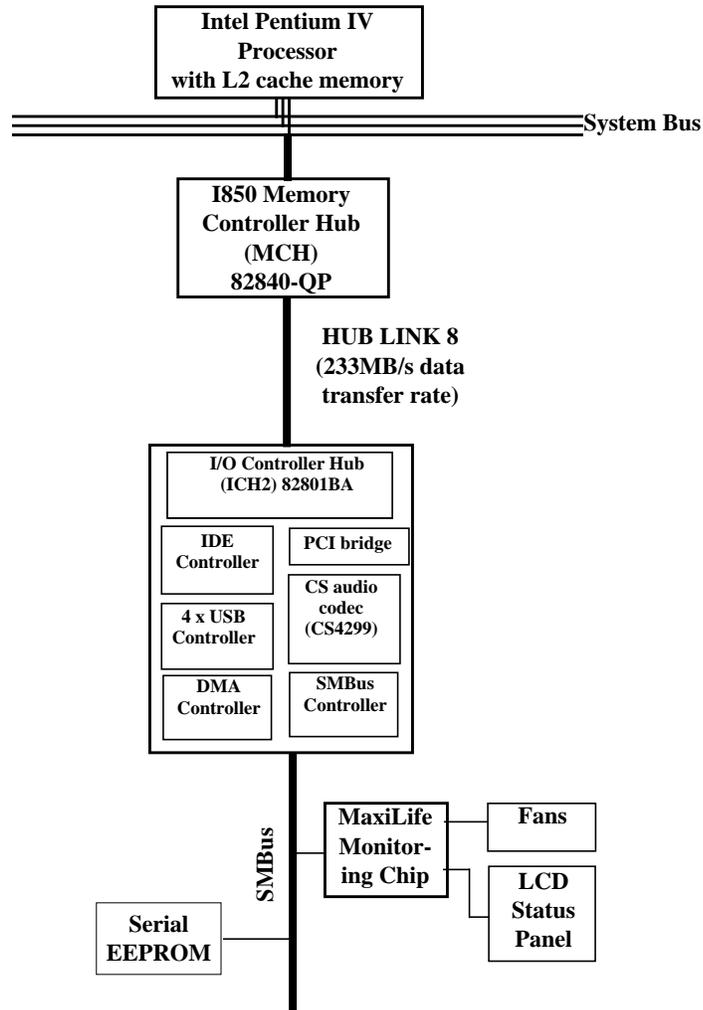
The SMBus is a subset of the I2C bus. It is a two-wired serial bus that runs at a maximum speed of 100KHz. The SMBus monitors some of the system board's hardware functions (for example, voltage levels, temperature, fan speed, memory presence, and type), both at system boot and during normal run-time. The SMBus controller, located in the ICH2, controls the SMBus.

The following devices are connected to the SMBus:

- LCD status panel
- One serial EEPROM MaxiLife (also includes backup values of CMOS settings)
- PCI slot 5 ready for Alert-On LAN (AOL) from a hardware level
- ICH2 SMBus master controller 100KHz maximum
- MaxiLife for hardware management, bus master controller
- One LM75 thermal sensor on the system board
- One ADM1024 hardware-monitoring sensor

- RIMM serial EEPROM

Figure 2-10 **Devices on the SMBus**



ICH2 SMBus Master Controller

The ICH2 provides a processor-to-SMBus controller. All access performed to the SMBus occurs through the ICH2 SMBus interface. Typically, the processor has access to all the devices connected to the SMBus.

RIMM Sockets

Each RIMM socket is connected to the SMBus. The 168-pin RIMM modules include a 256-byte I2C serial EEPROM. The first 128 bytes contain general information, including the DRAM chips' manufacturer's name, RIMM speed rating, RIMM type, and so on. You can use the second 128 bytes of the serial EEPROM to store data online.

AS98127F

The AS98127 chip is a hardware-monitoring sensor dedicated to the processor temperature. This chip uses the thermal diodes integrated into each processor cartridge and makes the temperature information available through the SMBus. It also monitors processor power supply voltages.

Serial EEPROM

This is the nonvolatile memory that holds the default values for the CMOS memory (in the event of battery failure). When you install a new system board, the serial EEPROM will have a blank serial number field. The BIOS automatically detects this, and the system prompts you for the serial number printed on the identification label on the back of the workstation.

The computer uses 16KB of serial EEPROM implemented within two chips. Serial EEPROM is ROM in which the application of appropriate electrical signals can return one byte at a time to its unprogrammed state. In effect, you can make serial EEPROM behave like very slow, nonvolatile RAM. It is used for storing the tattoo string, the serial number, and the parameter settings for the Setup program as well as MaxiLife firmware.

LM75 Temperature Sensor

The LM75 temperature sensor and alarm reside on the system board. The sensor measures the temperature in various areas of the system board. The system uses this information to regulate fans.

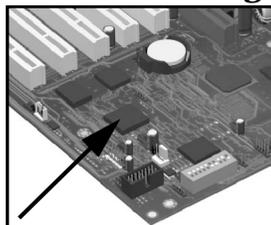
HP MaxiLife Hardware-monitoring Chip

MaxiLife is a hardware-monitoring chip on the system board. Its functions include:

- On/off and reset control
- Status panel management (lock button, LEDs)
- Hardware monitoring (temperature and voltage)
- Early diagnostics (CPU, memory, PLLs, boot start)
- Run-time diagnostics (CPU errors)
- Fan speed regulation
- Other miscellaneous functions (such as special OK/FAIL symbols based on a smiling face)

Figure 2-11

HP MaxiLife Hardware-Monitoring Chip



The integrated microprocessor includes the following:

- Synopsys cell based on Dallas “8052” equivalent
- 2KB boot ROM
- 256 bytes of data RAM
- I2C cell
- Analog-to-Digital (ADC) with five entries
- Additional glue logic for interrupt control, fan regulation, and a status panel control

MaxiLife downloads its code in 96 milliseconds from an I2C serial EEPROM. The total firmware (MaxiLife 8051-code, running in RAM) size is 14KB. As it exceeds the 2KB program RAM space, a paging mechanism swaps code as necessary, based on a 512-byte buffer. The first 2KB pages of firmware code is crucial because it controls the initial power on/reset to boot the system. This initial page is checked with a null-checksum test and the presence of MaxiLife markers (located just below the 2KB limit).

MaxiLife is not accessible in I/O space or memory space of the system platform, but only through the SMBus (which is a subset of the I2C bus), via the ICH2. Its I2C cell may operate either in slave or master mode, switched by firmware, or automatically in the event of Arbitration loss.

As a monitoring chip, MaxiLife reports critical errors at start-up, and is therefore powered by Vstandby (3.3V) power. For MaxiLife to work, the workstation must be connected to a grounded outlet. This enables the workstation’s hardware-monitoring chip to be active, even if the system has been powered off.

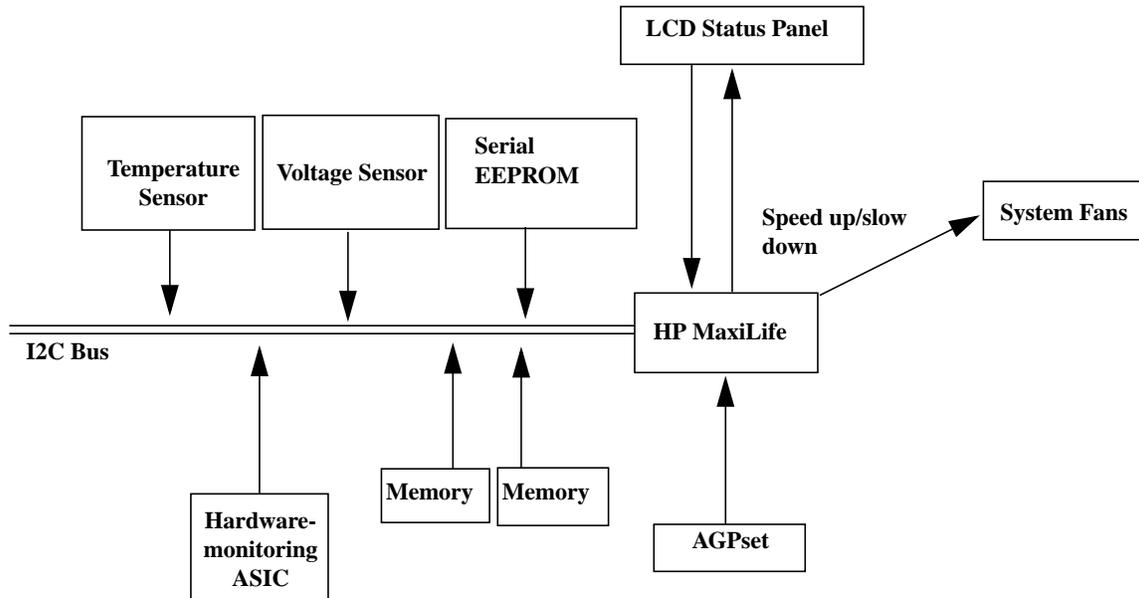
Test Sequence And Error Messages

For detailed information about the different test sequences and error messages, see “MaxiLife Test Sequence And Error Messages” on page 78.

MaxiLife Architecture

The MaxiLife chip continuously monitors temperature and voltage sensors located in critical regions on the system board. This chip receives data about the various system components via a dedicated I2C bus, which is a reliable communications bus to control the integrated circuit boards.

Figure 2-12 MaxiLife Architecture



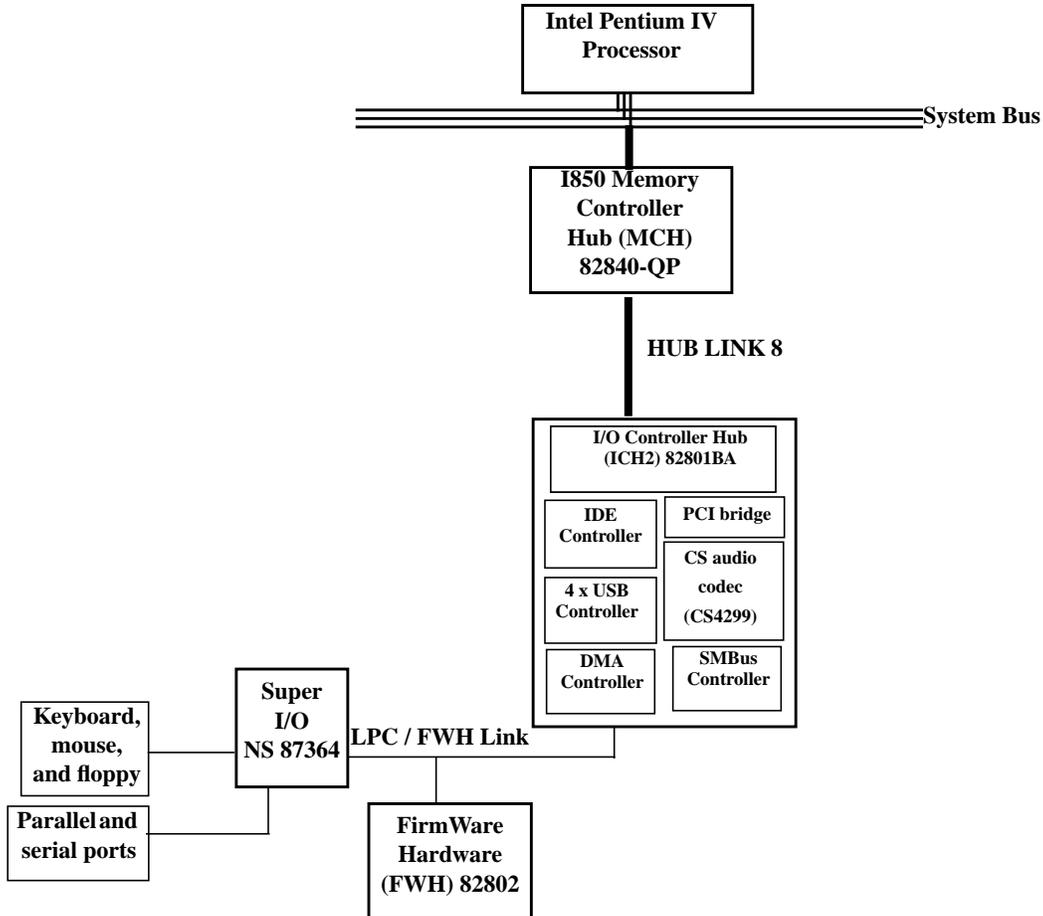
NOTE

MaxiLife is powered by VSTBY. Therefore, MaxiLife is functional as soon as the power cord is plugged in.

Devices On The LPC Bus

Figure 2-13 illustrates the devices connected to the LPC bus.

Figure 2-13 Devices on the LPC Bus



The Super I/O Controller

The Super I/O chip (NS 87364) provides control for two FDD devices, two serial ports, one bidirectional multimode parallel port, and a keyboard and mouse controller.

Device	Index	Data
Super I/O	2Eh	2Fh

Serial/Parallel Communications Ports

The 9-pin serial ports (whose pin layouts are depicted on page 114) support RS-232-C and are buffered by 16550A UARTs, with 16-byte FIFOs. You can program them as COM1, COM2, COM3, COM4, or you can disable them.

The 25-pin parallel port (also depicted on page 115) is Centronics compatible, supporting IEEE 1284. You can program the port as LPT1, LPT2, or you can disable it. It can operate in the following modes:

- Standard mode (PC/XT, PC/AT, and PS/2 compatible).
- Bidirectional mode (PC/XT, PC/AT, and PS/2 compatible).
- Enhanced mode (enhanced parallel port, EPP, compatible).
- High-speed mode (MS/HP extended capabilities port, ECP, compatible).

FDC

The integrated floppy disk controller (FDC) supports any combination of two of the following: tape drives, 3.5-inch flexible disk drives, 5.25-inch flexible disk drives. It is software- and register-compatible with the 82077AA, and IBM-compatible. It has an A and B drive-swapping capability and a non-burst DMA option.

Keyboard And Mouse Controller

The computer has an 8042-based keyboard and mouse controller. See page 113 for connector pin layouts.

FirmWare Hub (82802AB)

The FWH (also known as flash memory) is connected to the LPC bus. It contains 4Mbit (512KB) of flash memory.

The hardware features of the FWH include:

- Random Number Generator (RNG)
- Five General Purpose Inputs (GPI)
- Register-based block locking
- Hardware-based locking

An integrated combination of logic features and nonvolatile memory:

- Enables better protection for the storage and update of system code and data.
- Adds flexibility through additional GPIs.
- Allows for quicker introduction of security/manageability features.

The following table outlines the available FWH features

Feature	Feature
<ul style="list-style-type: none"> • Platform compatibility: <ul style="list-style-type: none"> — Enables security-enhanced platform infrastructure — Part of the Intel I840 chipset 	<ul style="list-style-type: none"> • Two configurable interfaces: <ul style="list-style-type: none"> — FWH interface for system operation — Address/Address Multiplexed (A/A Mux) interface
<ul style="list-style-type: none"> • FWH interface mode: <ul style="list-style-type: none"> — Five signal communication interface supporting x8 reads and writes — Register-based read and write protection for each code/data storage blocks — Five additional GPIs for system design and flexibility — A hardware RNG — Integrated Command User Interface (CUI) for requesting access to locking, programming, and erasing options. Also handles requests for data residing in status, ID, and block lock registers. — Operates with 33MHz PCI clock and 3.3V I/O 	<ul style="list-style-type: none"> • 4Mbits of flash memory for system code/data nonvolatile storage: <ul style="list-style-type: none"> — Symmetrically blocked, 64KB memory sections — Automated byte program and block erase through an integrated Write State Machine (WSM)
<ul style="list-style-type: none"> • A/A Mux Interface/Mode, supporting: <ul style="list-style-type: none"> — 11-pin multiplexed address and 8-pin data I/O interface — Fast on-board or out-of-system programming 	<ul style="list-style-type: none"> • Power supply specifications: <ul style="list-style-type: none"> — Vcc: 3.3V +/- 0.3V — Vpp: 3.3V and 12V for fast programming, 80ns

Feature	Feature
<ul style="list-style-type: none"> • Industry standard packages: <ul style="list-style-type: none"> — 40L TSOP or 32L PLCC 	<ul style="list-style-type: none"> • Case temperature operating range

The FWH includes two hardware interfaces:

- FWH interface
- A/A Mux interface

The Interface Configuration (IC) pin on the FWH provides the control between these interfaces. You must select the interface mode prior to power-up or before return from reset (RST# or INIT# low to high transition).

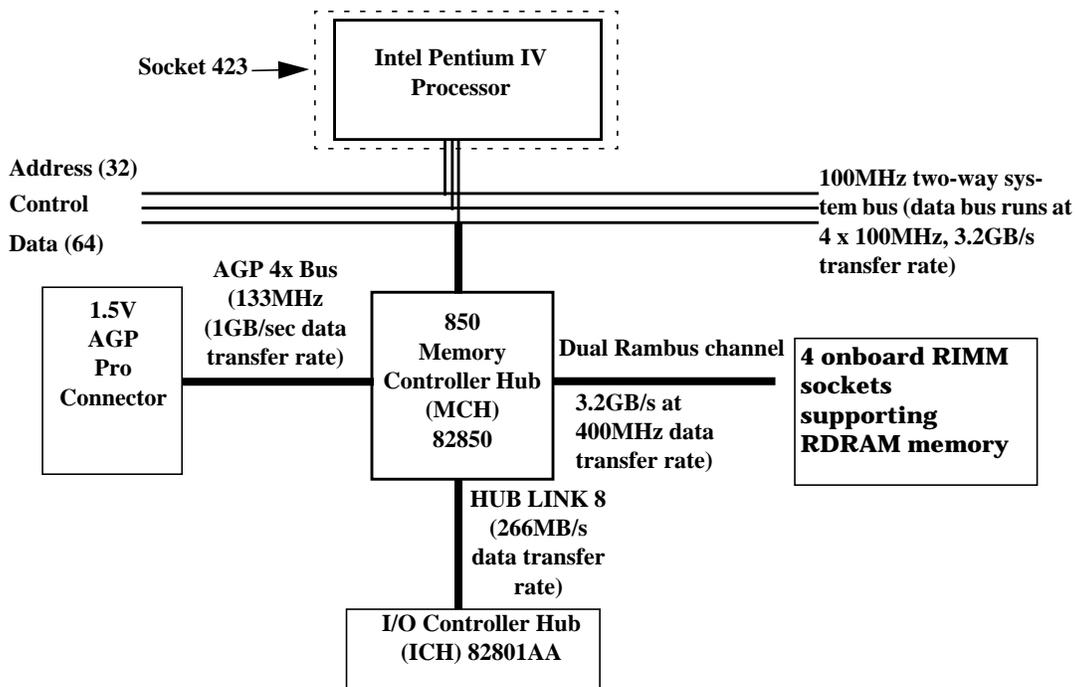
The FWH interface works with the ICH2 during system operation, while the A/A Mux interface is designed as a programming interface for component preprogramming.

An internal CUI serves as the control center between the FWH and A/A Mux interfaces, and internal operation of the nonvolatile memory. A valid command sequence written to the CUI initiates device automation. An internal WSM automatically executes the algorithms and timings necessary for block erase and program operations.

System Bus

The system bus of the Pentium IV processor is implemented in the Gunning Transceiver Logic (GTL)+ technology. This technology features open-drain signal drivers that are pulled up through resistors at bus extremities to the operating voltage of the processor core. These resistors also act as bus terminators and are integrated in the processor and in the 82850 MCH.

Figure 2-14 The System Bus



The supported operating frequency of the GTL+ bus for the Pentium IV is 100MHz. The width of the data bus is 64 bits, whereas the width of the address is 32 bits. Data bus transfers occur at four times the system bus, at 400MHz. Along with the operating frequencies, the processor voltage is set automatically.

The control signals of the system bus allow the implementation of a “split -transaction” bus protocol. This allows the Pentium IV processor to send its request (for example, for the contents of a given memory address) and release the bus, rather than waiting for the result. Therefore, processor can accept another request. The MCH, as the target device, then requests the bus again when it is ready to respond, and sends the requested data packet. As many as four transactions can be outstanding at any given time.

Intel Pentium IV Processor

The Pentium IV processor has several features that enhance performance:

- Data bus frequency of 400MHz

- Dual independent bus architecture, which combines a dedicated 64-bit Level 2 cache bus (supporting 256KB), plus a 64-bit system bus that enables multiple simultaneous transactions
- MMX2 technology, which gives higher performance for media communications, and 3D applications
- Dynamic execution to speed up software performance
- Internet Streaming SIMD Extensions 2 (SSE2) for enhanced floating point and 3D application performance
- Uses multiple low-power states, such as AutoHALT, Stop-Grant, Sleep, and Deep Sleep to conserve power during idle times

The Pentium IV processor is packaged in a pin grid array (PGA) that fits into a PGA423 socket (423-pin Zero Insertion Force—ZIF—socket).

Processor Clock

The 100MHz system bus clock is provided by a PLL. The processor core clock is derived from the system bus by applying a ratio. This ratio is fixed in the processor. The processor then applies this ratio to the system bus clock to generate its CPU core frequency.

Bus Frequencies

The system board contains a 14.318MHz crystal oscillator. This frequency is multiplied to 133MHz by a phase-locked loop. An internal clock multiplier within the processor further scales this number.

The bus frequency and the processor voltage are set automatically.

Voltage Regulation Module (VRM)

One VRM is integrated on the system board, complying with VRM specification 9.0. The system supports high-current and low-voltage processors.

The processor requires a dedicated power voltage to supply the CPU core and Level 2 cache. The processor codes through Voltage Identification (VID) pins with a required voltage level of 1.30V to 2.05V. The VID set is decoded by the VRM on the system board that in return supplies the required power voltage to the processor. Note, however, that voltage may vary from one processor model to another.

Cache Memory

The Pentium IV integrates the following cache memories on the same die as the processor cache:

- A trace instruction and Level 1 data cache. The trace cache is 4-way set associative.
- A 256KB Level 2 cache. The Level 2 cache is 8-way associative.

Intel sets the amount of cache memory at the time of manufacture. You can't change the value.

Assigned Device Interrupts

I/o Controller Hub Interrupts

Device	Reference Name	REQ/GNT	ID	IDSEL AD[xx]	Chip-set Interrupt Connection			
					INTA	INTB	INTC	INTD
AC'97 audio controller	CS4280	4 (ICH2)	5	21	—	A	—	—
USB controller	—	—	—	—	A	—	—	—
AGP slot	J34	—	0	16	A	B	—	—
PCI 32-bit slot #1	J37	1 (ICH2)	6	22	C	D	A	B
PCI 32-bit slot #2	J38	0 (ICH2)	8	24	A	B	C	D
PCI 32-bit slot #5 (LAN card)	J42	5 (ICH2)	11	27	B	C	D	A

PCI 64-bit Hub Interrupts

Device	Reference Name	REQ/GNT	ID	IDSEL AD[xx]	Interrupt Requests (IRQ)										
					0	1	2	3	4	5	6	7	8		
Ultra-Wide SCSI U160 controller	AIC-7892	2 (P64H)	9	25	—	—	—	—	—	—	—	—	—	—	A
PCI 32-bit slot #3	J39	1 (P64H)	4	20	—	—	—	—	A	B	C	D	—	—	—
PCI 32-bit slot #4	J40	0 (P64H)	7	23	A	B	C	D	—	—	—	—	—	—	—

Interrupt Controllers

The system has an interrupt controller that is equivalent in function to that of two 82C59 interrupt controllers. The following table shows how the interrupts are connected to the APIC controller. The IRQs are numbered sequentially, starting with the master controller, and followed by the slave (both of 82C59 type).

Although you can use the Setup program to change some of the settings, the following address map isn't completely BIOS dependent but is determined partly by the operating system. Note that some of the interrupts are allocated dynamically.

Interrupt Source	APIC Controller		Interrupt Signalling on	
	of device	Input	(PIC mode) ^a	(APIC modes)
INTA - PCI slot 3 (32/33)	P64H	IRQ0	BT_INT	APIC bus
INTB - PCI slot 3 (32/33)	P64H	IRQ1	BT_INT	APIC bus
INTC - PCI slot 3 (32/33)	P64H	IRQ2	BT_INT	APIC bus
INTD - PCI slot 3 (32/33)	P64H	IRQ3	BT_INT	APIC bus
INTA - PCI slot 4 (32/33)	P64H	IRQ4	BT_INT	APIC bus
INTB - PCI slot 4 (32/33)	P64H	IRQ5	BT_INT	APIC bus
INTC - PCI slot 4 (32/33)	P64H	IRQ6	BT_INT	APIC bus
INTD - PCI slot 4 (32/33)	P64H	IRQ7	BT_INT	APIC bus
INTA - onboard SCSI controller	P64H	IRQ8	BT_INT	APIC bus
AGP - INTA, PCI Slot 1 - INTC, PCI Slot 2 - INTA, PCI Slot 5 - INTB	ICH2	INTA	INT	APIC bus
PCI Audio - INTA, AGP - INTB, PCI Slot 1 - INTD, PCI Slot 2 - INTB, PCI Slot 5 - INTC	ICH2	INTB	INT	APIC bus
BT_INT, PCI Slot 1 - INTA, PCI Slot 2 - INTC, PCI Slot 5 - INTD	ICH2	INTC	INT	APIC bus
USB - INTA, PCI Slot 1 - INTB, PCI Slot 2 - INTD, PCI Slot 5 - INTA	ICH2	INTD	INT	APIC bus
Device on Primary IDE Channel	ICH2	IRQ14	INT	APIC bus
Device on Secondary IDE Channel	ICH2	IRQ15	INT	APIC bus
Serial Interrupt from Super I/O	ICH2	SERIRQ	INT	APIC bus

a. In PIC mode, the interrupts signaled to the P64H are chained as INTC to the ICH2.

Three major interrupt modes are available:

- **PIC mode:** This mode uses only legacy interrupt controllers, so only one processor can be supported. Because this system has dual-processor capability, Windows NT doesn't choose this mode as the default. However, during Windows NT installation, you can select this mode.
- **Virtual wire mode:** This mode is implemented with APIC controllers in the ICH2 and P64H and used during boot time. The virtual wire mode allows the transition to the symmetric I/O mode. In the virtual wire mode, only one processor executes instructions.
- **Symmetric I/O mode:** This mode is implemented with APIC controllers in the ICH2 and P64H and allows for multiple processor operations.

NOTE

In PIC mode and virtual wire mode, PCI interrupts are routed to the INT line. In symmetric I/O mode, PCI interrupts are routed to the I/O APIC controllers and forwarded over an APIC bus to the processors.

PCI IRQ Lines

PCI devices generate IRQs using up to four PCI IRQ lines (INTA#, INTB#, INTC#, and INTD#).

PCI interrupts can be shared; several devices can use the same interrupt. However, optimal system performance is reached when minimizing the sharing of interrupts. Refer to page 60 for a table of the PCI device interrupts.

3 **System BIOS**

Overview

This chapter summarizes the HP Workstation x2100's Setup program and BIOS. Chapter 4, "Tests And Error Messages," describes the POST routines.

The BIOS is based on the core Phoenix BIOS, which includes 4Mbits of flash memory, support for PCI Specification 2.2, suspend to RAM, and RIMM or DIMM memory modules.

The BIOS includes a boot ROM for the 3COM 3C905C and HP LAN cards.

The system ROM contains the Power-On Self-Test (POST) routines and the BIOS: the system BIOS, video BIOS, and low-option ROM. This chapter (and Chapter 4) gives an overview of the following:

- Menu-driven Setup with context-sensitive help.
- The address space, with details of the interrupts used.
- POST routines, which are a sequence of tests the computer performs to ensure that the system is functioning correctly. See Chapter 4 for information.

The system BIOS is identified by the version number IY.WM, where:

- IY is a two-letter code indicating that it is for the x2100.
- W is a one-digit code indicating the HP entity.
- JG.W1.01US is the major BIOS version.

An example of a released version would look similar to the following: JG.W1.01US.

See page 70 for the procedure for updating the system ROM firmware.

Using The HP Setup program

To run the Setup program, press **F2** while the initial HP logo displays, immediately after restarting the workstation.

Alternatively, press **Esc** to view the summary configuration screen. By default, this screen displays for 15 seconds, but pressing any key stops this delay.

The band at the top of the Setup screen offers the following menus: Main, Advanced, Security, Boot, Power, and Exit. Use the left and right arrow keys to select these menus.

The following screens are examples of a BIOS configuration.

Main Screen

The Main Screen shows a list of fields. To change a value press **F7** or **F8**.

PhoenixBIOS Setup Utility						
Main	Advanced	Security	Boot	Power	Exit	Item-Specific Help
BIOS Version:		IC.11.02				
PnP OS		[No]				
Reset Configuration Data:		[No]				
System Time:		[14:42:33]				
System Date:		[02/08/2000]				
Key Click:		[Disabled]				
Keyboard auto-repeat rate speed: Delay before auto-repeat:		[21.8 per Second] [0.50 Second]				
Numlock at Power-on:		[On]				
F1 Help	↑	↓	Select Item	F7/F8 Change Values	F9 Setup Defaults	Previous Values
ESC Exit	←	→	Select Menu	Enter Select > Submenu	F10 Values	

Advanced Screen

The Advanced Screen doesn't have the same structure as the Main Screen and Power Screen. Instead of presenting a list of fields, it offers a list of submenus.

Advanced users use the Advanced Screen to carry out special system configurations.

Main	Advanced	Security	Boot	Power	Exit	Item-Specific Help
>> Processors, Memory, and Cache >> Floppy Disk Drives >> IDE Devices >> Integrated USB Interface >> Integrated I/O Ports >> Integrated Audio Device >> AGP Configuration (Video) >> PCI Device, slot #1 >> PCI Device, slot #2 >> PCI Device, slot #3 >> PCI Device, slot #4 >> PCI Device, slot #5 >> Integrated LAN						

Processors, Memory And Cache

Advanced		Item-Specific Help
Processors, Memory, and Cache		
Processor Type	Pentium (R) 4	
CPU Speed	1500MHz	
Microcode update version	[F24/4]	
Memory Caching	[Enabled]	
Memory Error Checking ^a	[ECC]	

a. Only if the system detects ECC modules.

Floppy Disk Drives

Advanced		Item-Specific Help
Floppy Disk Drives		
Floppy Disk Controller	[Enabled]	
Floppy Disk Drive A	[1.44, 3 "]	
Floppy Disk Drive B	[Not installed]	

IDE Devices

Advanced		Item-Specific Help
IDE Devices		
>> IDE Primary Master Device	[None]	
>> IDE Primary Slave Device	[None]	
>> IDE Secondary Master Device	[None]	
>> IDE Secondary Slave Device	[None]	
>> Large Disk Access Method	[NT/DOS]	
>> Integrated IDE Controller	[Both Enabled]	

IDE Primary Master Device

Advanced		Item-Specific Help
IDE Primary Master Device (HD 2564)		
Type		
Multisector transfer		
LBA Mode Control		
32 bit I/O		
Transfer Mode		
ULTRA DMA Mode		

Integrated USB Interface

Advanced		
Integrated USB Interface		Item-Specific Help
USB Controller	[Auto]	
Legacy Keyboard Emulation	[Disabled]	

Integrated I/O Ports

Advanced		
Integrated I/O Ports		Item-Specific Help
Parallel Port	[Auto]	
Parallel Port Mode	[ECP]	
Serial Port A	[Auto]	
Serial Port B	[Auto]	

Integrated Audio Device

Advanced		
Integrated Audio Device		Item-Specific Help
Integrated Audio	[Enabled]	

AGP Configuration (Video)

Advanced		
AGP Configuration (Video)		Item-Specific Help
Graphic Aperture	[64MB]	

PCI Device, Slot #1

Advanced		
PCI Device, Slot 1 ^a		Item-Specific Help
Option ROM Scan	[Auto]	
Bus Master	[Disabled]	
Bus Latency Timer	[0040h]	

a. PCI Slot #x have the same options as above. PCI Device, Slot 1 is only an example.

Integrated LAN

Advanced		
Integrated LAN		Item-Specific Help
Integrated Network:	[Enabled]	
Option ROM Scan	[Enabled]	
Bus Master	[Disabled]	
Bus Latency Timer	[0020h]	

Security Screen

Submenus let you change the characteristics and values of the:

- systems administrator password
- user password
- power-on password
- boot device security
- hardware protection

Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
	Administrator Password	Clear			
	Set Administrator Password	[Enter]			
	Clear Both Passwords	[Enter]			
	User Password	Clear			
	Set User Password	[Enter]			
	Power-on Password	[Disabled]			
	Start from Floppy	[Enabled]			
	Start from CD-ROM	[Enabled]			
	Start from HDD	[Enabled]			
>>	Hardware Protection				

Hardware Protection

Security		
Hardware Protection		Item-Specific Help
Write on Floppy Disks	[Unlocked]	
Secured Setup Configuration	[No]	
Hard Disk Boot Sector	[Unlocked]	

Boot Screen

This screen lets you select the order of the devices in which you want the BIOS to attempt to boot the operating system:

- Hard disk drives
- Removable devices

The operating system assigns drive letters to these devices in the order that you specify. During POST, if the BIOS unsuccessfully boots from one device, it attempts to boot from the next device on the Boot Device Priority list until it finds an operating system.

Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
Quickboot Mode [Enabled]					
Display Option ROM Messages [Enabled]					
>	Boot Device Priority				

Power Screen

This screen lets you set the Standby Delay and Suspend Delay modes. Standby mode slows down the processor, whereas Suspend mode saves energy. These options are available only with Windows 95 RTM. For other operating systems (for example, Windows 95 SR 2.5, Windows 98, and Windows 2000), use the control panel for similar options.

Modem Ring enables or disables the system's ability to return to full speed after an Interrupt Request (IRQ) is generated. Network Interface enables or disables the system's ability to return to full speed after the network interface receives a specific command.

Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
Standby Delay [Disabled]					
Suspend Delay [Disabled]					
Suspend Wakeup					
Modem Ring [Enabled]					
Network Interface [Enabled]					

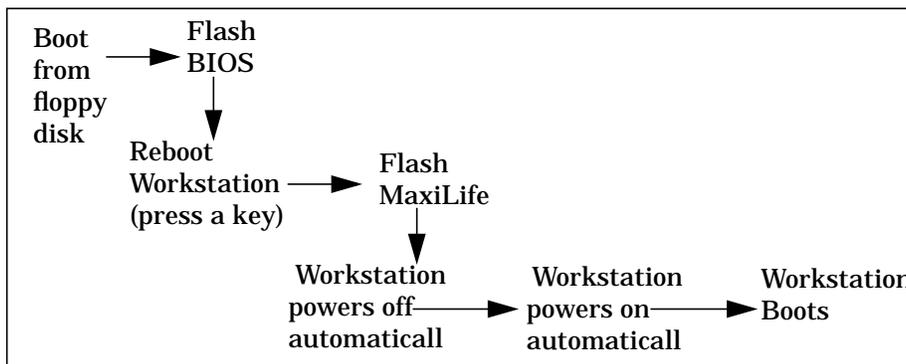
Updating The System BIOS

You can download the latest system BIOS (standard flash operation) from HP's Web site at www.hp.com/go/workstationsupport. After accessing the site, select **HP x2100 Workstation**.

Instructions for updating the BIOS accompany the downloaded BIOS files and a BIOS flash utility (flash.txt).

The BIOS update not only flashes the BIOS but also updates MaxiLife. Figure 3-1 shows how the system BIOS flash operates.

Figure 3-1 System BIOS Flash Process



CAUTION

Don't turn off the computer until the system BIOS update procedure has completed, successfully or not; otherwise, irrecoverable damage to the ROM might occur.

Restoring BIOS Default Settings

BIOS and configuration issues may cause suspected hardware errors. If the BIOS settings are wrong, perform the following steps to restore the BIOS to its default setting:

1. To access the Setup program, press **F2** while the initial HP logo displays immediately after restarting the workstation.
2. Press **F9** to load the default settings from the Setup program.
3. In the main menu, set the Reset Configuration Data to **Yes**.

Take note of the system setup before you make any modifications to the BIOS.

If You Forget The Administrator Password

1. Turn off the workstation, disconnect the power cord and all cables, then remove the cover.
2. Set switch 9 on the system board switch block to **ON**.
3. Replace the power cord, and restart the workstation.
4. When the Passwords have been cleared message appears, turn off the workstation.

5. Remove the power cord, and reset switch **9** back to **OFF**.
6. Replace the workstation's cover, turn on the workstation, and let it complete its startup routine.
7. After POST completes, press **F2** when prompted to use the Setup program.
8. Set the administrator and new user passwords.
9. To save the new password and exit Setup, press **Esc** or select **Exit Menu**.

Clearing The CMOS

1. Turn off the workstation, disconnect the power cord and all cables, then remove the cover.
2. Set the system board switch **8** to **ON**.
3. Replace the cover, and reconnect the power cord and video cable.
4. Reboot the workstation. A message similar to the following will appear:

```
“Configuration has been cleared, set switch Clear to the ON position before rebooting.”
```
5. Turn off the workstation, disconnect the power cord and video cable, and remove the cover.
6. Set the system board switch **8** to **OFF**.
7. Replace the cover, and reconnect the power cord and data cables.
8. Turn on the workstation. Press **F2** to run Setup, then press **F9**. The system automatically downloads and saves the CMOS default values.
9. To save the configuration and exit Setup, press **Esc** .

Recovering The BIOS (Crisis Mode)

If the BIOS is corrupted and you can't use the standard flash, use the BIOS Recovery Mode (exceptional BIOS recovery operation) to restore the BIOS.

1. Obtain a bootable DOS floppy disk.
2. Copy the BIOS files onto the floppy disk. For information about how to download the system BIOS, see page 70.
3. Create (or edit) the autoexec.bat file, which should contain the following line of text:

```
“phlash /c /mode=3 /s IY.W1.XX.FUL”
```


(Rename the BIOS filename with the filename on the floppy disk.)
4. Turn off the workstation, disconnect the power cord, and remove the cover.
5. Set switch **7** to **ON**.
6. Insert the floppy disk into the floppy disk drive.
7. Reconnect the power cord, and turn on the workstation.
8. The workstation boots from the floppy disk, then flashes the BIOS. During the flash process, the screen remains blank. When you hear one long beep, the recovery process is finished.

9. Turn off the workstation. Remove the floppy disk from the drive. Remove the power cord.
10. Set switch 7 back to **OFF**.
11. Replace the cover, reconnect the power cord, then reboot the workstation.

BIOS Addresses

This section provides a summary of the main features of the HP system BIOS. This is software that provides an interface between the computer hardware and the operating system. For the procedure to update the system ROM firmware, see page 70.

System Memory Map

Reserved memory that accessory boards use must reside in the area from C8000h to EFFFFh.

0000 0000 - 0000 03FF	Real-mode IDT
0000 0400 - 0000 04FF	BIOS data area
0000 0500 - 0009 FC00	Used by operating system
0009 FC00 - 0009 FFFF	Extended BIOS data area
000A_0000 - 000B_FFFF	Video RAM or SMRAM (not visible unless in SMM)
000C 0000 - 000C 7FFF	Video ROM (VGA ROM)
000C 8000 - 000F FFFF	Adapter ROM, RAM, memory-mapped registers, BIOS
000E 0000-000F FFFF	128KB BIOS (Flash/Shadow)
0001 0000-000F FFFF	Memory (1MB to 16MB)
0010 0000-001F FFFF	Memory (16MB to 32MB)
0020 0000-003F FFFF	Memory (32MB to 64MB)
0040 0000-007F FFFF	Memory (64MB to 128MB)
0080 0000-7FFF FFFF	Memory (128MB to 2GB)
FECO 0000	I/O APIC
FEE0 0000	Local APIC (each CPU)
FFF8 0000-FFFF FFFF	512KB BIOS (Flash)

HP I/O Port Map (I/O Addresses Used By The System, if configured)

You access peripheral devices, accessory devices, and system controllers through the system I/O space, which isn't located in system memory space. The 64KB of addressable I/O space comprises 8-bit and 16-bit registers (called I/O ports) located in the various

system components. When you install an accessory board, ensure that the selected I/O address space is in the free area of the space reserved for accessory boards (100h to 3FFh).

Default Values for I/O Address Ports	Function
0000 - 0CF7	DMA controller 1
0020 - 0021	Master interrupt controller (8259)
002E - 002F	Super I/O
0040 - 0043	Timer 1
0060, 0064	Keyboard controller (reset, slow A20)
0061	Port B (speaker, NMI status, and control)
0070	Bit 7: NMI mask register
0070 - 0071	RTC and CMOS
0080	Manufacturing port (POST card)
0081 - 0083, 008F	DMA low page register
0092	PS/2 reset and Fast A20
00A0 - 00A1	Slave interrupt controller
00C0 - 00DF	DMA controller 2
00F0 - 00FF	Coprocessor error
0170 - 0177	Free (IDE secondary channel)
01F0 - 01F7	IDE primary channel
0278 - 027F	LPT 2
02E8 - 02EF	Serial port 4 (COM4)
02F8 - 02FF	Serial port 2 (COM2)
0372 - 0377	Free (IDE secondary channel, secondary floppy disk drive)
0378 - 037F	LPT1
03B0 - 03DF	VGA
03E8 - 03EF	COM3
03F0 - 03F5	Floppy disk drive controller
03F6	IDE primary channel
03F7	Floppy disk drive controller
03F8 - 03FF	COM1
04D0 - 04D1	Interrupt edge/level control
0778 - 077F	LPT1 ECP
0CF8 - 0CFF	PCI configuration space
C000 -	Power management I/O space and ACPI registers
C100 - C10F	SMBus I/O space

DMA Channel Controllers

The system permits only I/O-to-memory and memory-to-I/O transfers. The hardware configuration doesn't allow I/O-to-I/O or memory-to-memory transfers.

The system controller supports seven DMA channels, each with a page register that extends the channel's addressing range to 16MB.

The following table shows how the system allocates DMA channels.

DMA controller	
Channel	Function
DMA 0	Free
DMA 1	Free if not used for parallel port in Setup
DMA 2	Floppy disk drive controller
DMA 3	Free if not used for parallel port in Setup
DMA 4	Used to cascade DMA channels 0-3
DMA 5	Free
DMA 6	Free
DMA 7	Free

Interrupt Controllers

The system's interrupt controller is equivalent in function to two 82C59 interrupt controllers. The following table shows how the interrupts are connected to the APIC controller. The IRQs are numbered sequentially, starting with the master controller and followed by the slave (both of 82C59 type).

I/O APIC Input	IRQ	IRQ Description
INTIN0	ICH	
INTIN1	IRQ1	Super I/O keyboard controller
INTIN2	IRQ0	ICH system timer
INTIN3	IRQ3	Super I/O - Used by serial port if enabled
INTIN4	IRQ4	Super I/O - Used by serial port if enabled
INTIN5	IRQ5	Free if not used for parallel port or audio
INTIN6	IRQ6	Super I/O - floppy disk controller
INTIN7	IRQ7	Super I/O - LPT1
INTIN8	IRQ8	ICH - RTC
INTIN9	IRQ9	Available for PCI devices
INTIN10	IRQ10	Available for PCI devices
INTIN11	IRQ11	Available for PCI devices
INTIN12	IRQ12	Super I/O - mouse
INTIN13	IRQ13	Coprocessor
INTIN14	IRQ14	ICH - Integrated IDE Controller (primary)
INTIN15	IRQ15	ICH - Integrated IDE Controller (secondary)
INTIN16	PCINTA	
INTIN17	PCINTB	

I/O APIC Input	IRQ	IRQ Description
INTIN18	PCINTC	
INTIN19	PCINTD	
INTIN20	TFPC IRQ	
INTIN21	SCI IRQ	
INTIN22	not connected	
INTIN23	ICH SMI (not used)	

Three major interrupt modes are available:

- **PIC mode:** This mode uses only legacy interrupt controllers, so the system can support only one processor. You can select this mode when you install Windows NT.
- **Virtual wire mode:** This mode, which is implemented using the 82C59 interrupt and the I/O APIC controller, is used during boot time. The virtual wire mode allows the transition to the symmetric I/O mode. In the virtual wire mode, only one processor executes operations.
- **Symmetric I/O mode:** This mode is implemented using the I/O APIC controller and allows for multiple processor operations.

NOTE

In PIC mode and virtual wire mode, PCI interrupts are routed to the INT line. In symmetric I/O mode, PCI interrupts are routed to the I/O APIC controllers and forwarded over an APIC bus to the processors.

PCI IRQ Lines

PCI devices generate IRQs using up to four PCI IRQ lines (INTA#, INTB#, INTC#, and INTD#).

PCI interrupts can be shared; several devices can use the same interrupt. However, optimal system performance is reached when minimizing the sharing of interrupts. Refer to page 60 for a table of the PCI device interrupts.

4 Tests And Error Messages

This chapter describes:

- MaxiLife firmware test sequences and error messages
- Preboot diagnostics error codes
- Power-On Self-Test (POST) routines, which the computer's ROM BIOS contains
- Error messages and suggestions for corrective action

MaxiLife Test Sequence And Error Messages

When you turn on the workstation, the system initiates the normal startup sequence, which consists of the following steps:

- Basic preboot diagnostics
- BIOS launch
- POST phase
- Operating system boot phase

If the system detects any errors during the startup sequence, MaxiLife won't necessarily freeze the system. However, some critical hardware errors are fatal to the system and prevent the system from starting. (For example, CPU socket and power supply malfunctions can prevent the system from working.)

The system detects non-crucial errors both during preboot diagnostics and POST, in which the BIOS boot process returns an error code. The system detects some errors only during POST sequence; these errors produce the same process.

Finally, while the workstation is working, the system can report fan and temperature controls. (For example, the system can report a fan error if a fan cable is disconnected.) This type of error disappears as soon as you fix the problem (for example, reconnect the fan cable).

The next sections describe the different diagnostics.

Basic Pre-boot Diagnostics

The first diagnostic, called basic preboot diagnostics, runs to check the presence of the processors or terminators, power supply, hardware monitoring, and thermal sensors. If you have a power cord connected to the workstation, the basic preboot diagnostics are activated.

The preboot diagnostic tests run in order of priority, according to their importance to computer functions.

On the HP Workstation x2100, the first detected error displays a message on the LCD status panel. If an error occurs, one of the following screens displays.

Figure 4-1 Possible Error Messages

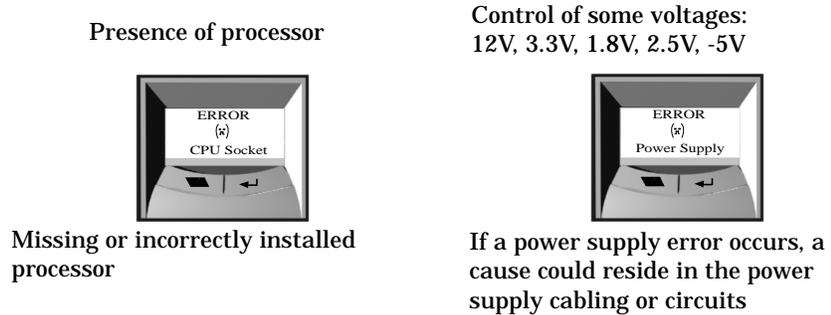
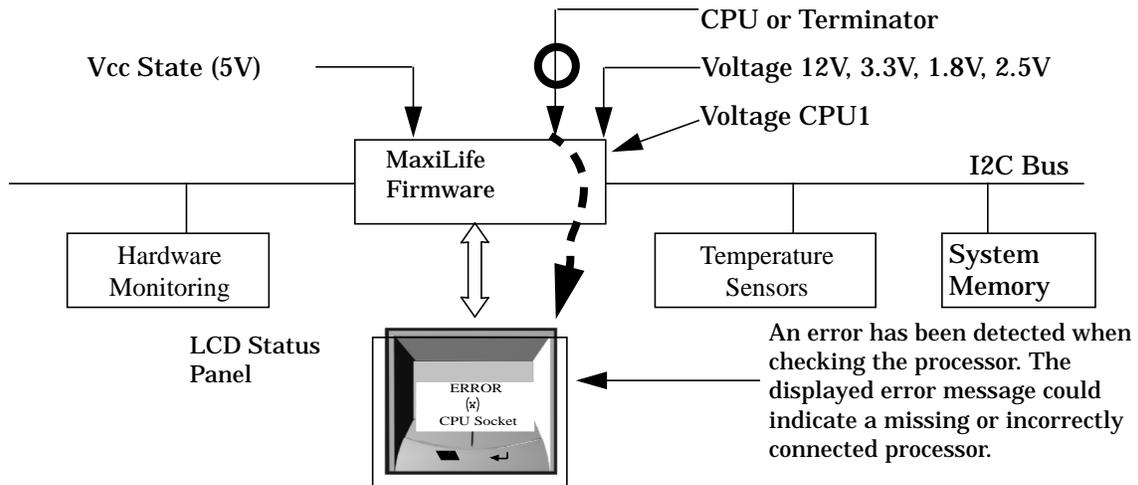


Figure 4-2 shows how the preboot diagnostics work when an error occurs.

Figure 4-2 Preboot Diagnostics Error



The following table shows the test sequence carried out, the type of error message, and the action to take.

Table 4-1

Test	Error Code	Beep Codes	Action to Take
Presence a processor	CPU socket	1	Check that the processor and correctly installed
Control of some voltages: 12V, 3.3V, 1.8V, 2.5V	Power supply	2	Check the power supply cable and connectors, and processor
Check the hardware monitoring	No HW monitoring		System board problem
Check thermal sensor	Therm. sensor 90		System board problem
Check thermal sensor	Therm. sensor 92		System board problem

Pre-boot Diagnostics Error Codes

When a failure occurs prior to the operating system loading, the workstation beeps three times, then begins a series of beeps. These beeps identify the part that needs troubleshooting or replacement.

Number of beeps	Problem
1	Absent or incorrectly connected processor
2	Power supply is in protected mode
3	Memory modules not present, incompatible, or not functioning
4	Video controller failure
5	PnP/PCI initialization failure
6	Corrupted BIOS; you need to activate crisis-recovery procedure
7	System board failure

POST Sequence And POST Error

In this phase, MaxiLife waits for any error messages that the BIOS may issue. If such an error occurs, an error code appears on the monitor screen.

On the HP Workstation x2100, a screen similar to Figure 4-3 displays. The error code that appears on the LCD status panel is the same as the one that appears on the monitor screen. If the POST issues several error codes, only the last one is visible on the LCD status panel.

Figure 4-3 POST Sequence and POST Error



Figure 4-4 and Figure 4-5 show the different BIOS-generated errors.

Figure 4-4 BIOS-generated Errors

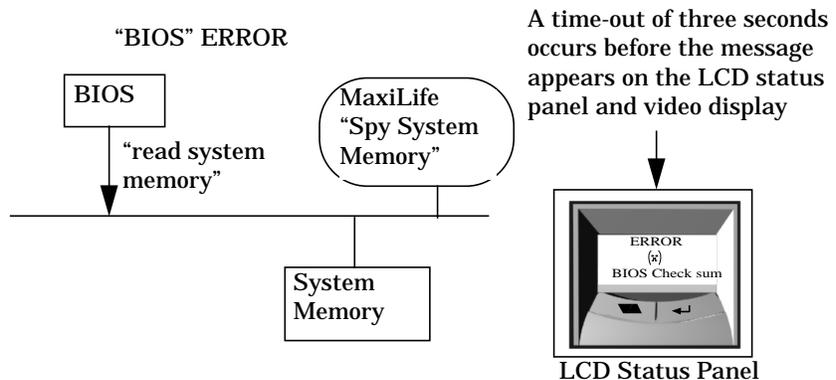


Figure 4-5 BIOS-generated Errors

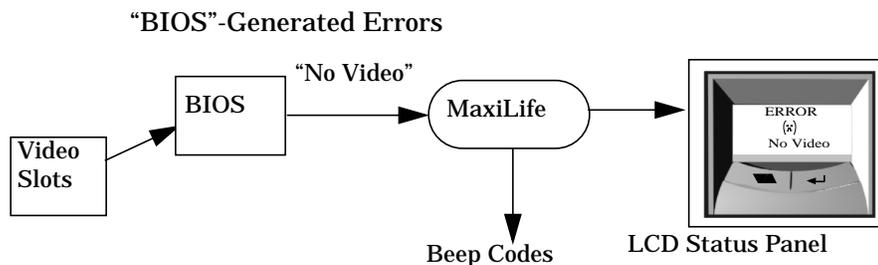


Table 4-2

Test	Error Code	Beep Codes	Action to Take
Incompatible memory modules	Mem miscompare	3	Check that the memory modules are of the same speed and type

Table 4-2 (Continued)

Test	Error Code	Beep Codes	Action to Take
Presence of continuity modules in the RIMM sockets	RIMM continuity	3	Check that the RDRAM continuity modules are installed
Compatibility speed rating of installed RDRAM modules	RIMM speed	3	Check that the installed RDRAM modules have the same speed ratings
Compatibility of installed RDRAM modules	RIMM devices	3	The 32-device limit per RDRAM has been exceeded
Presence of memory modules	No RIMM	3	Check that the memory modules are correctly installed
Availability of video controller is checked by the BIOS. If an error is detected, and it isn't a fatal error, the BIOS continues its execution normally.	No video	4	Check that the video controller is correctly installed Note: No error is detected if a monitor isn't connected to an installed video controller. This isn't a fatal error, and the BIOS continues its normal execution.

Operating System Boot Phase

If no error message appears at this stage of the system startup, the operating system launches. The LCD status panel displays the system platform and a smiling icon.

Run-time Errors

During the normal usage of the workstation (and at boot), MaxiLife continually monitors vital system parameters. These include: temperature errors, fan malfunctions, power voltage drops and CPU problems.

Table 4-3

Test	Error Code	Action to Take
During normal usage, HP MaxiLife continually checks vital system parameters. If an error occurs, a message appears on the LCD panel.	System FAN	System or chassis fan, fan cable
	PCI FAN	PCI fan, fan cable
	CPU 1 FAN	CPU fan, fan cable
	CPU Throttle	Processor frequency has been lowered to prevent over temp errors
	CPU Shutdown	Processor has undergone an internal error (IERR) or the processor temperature has risen too quickly for CPU Throttle to be effective.
	PCI temperature	Ambient or PCI temperature > 64°C
	Disk temperature	Disk temperature > 58°C, or sensor unplugged
	PSU 12 V error	Power supply unit failed. Try the following: <ul style="list-style-type: none"> • Replace the power supply unit with a known working one • If the problem persists, replace the system board
	Power CPU error	
	PSU 3V3 error	
	PSU 2V5 error	
	PSU 1V8 error	
PSU -5V error		

Main Menu

The main menu appears when you press any of the LCD buttons. (You can access the MaxiLife LCD status panel even when the workstation is powered off.) The main menu consists of three submenus:

- System Info
- Boot Steps
- Boot Report

system info

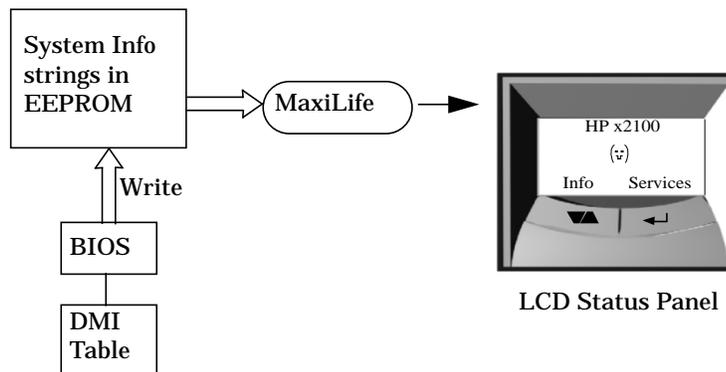
Obtains information from the BIOS and the system's serial EEPROM. This information includes:

- Product name
- BIOS version
- Serial number
- Speed of processor
- Size of memory for each socket

Figure 4-6 shows how the System Info obtains its information.

Figure 4-6

System Information



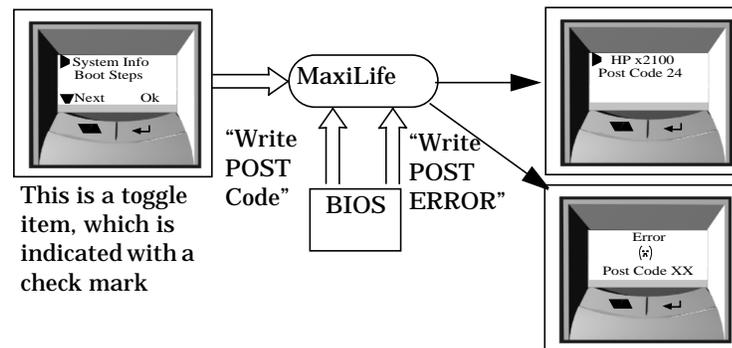
Boot Steps

Shows the POST codes during system startup. The BIOS provides the POST code, which appears on the LCD panel as soon as it is available. If the system stops during startup, the last successful boot-step POST code appears on the LCD. When you select Boot Steps, the POST step appears on the LCD status panel during the subsequent boot processes.

To ensure that MaxiLife is ready to display the first POST codes as soon as possible, the preboot diagnostics aren't executed when the system is booted with the Boot Steps option selected. Figure 4-7 shows how Boot Steps obtains its information from the BIOS, then displays a POST error if necessary.

Figure 4-7

Boot Steps



Boot Report

Runs a set of diagnostics that assess the system's components. Results of the tests appear on the LCD status panel, one after another, when you press the LCD buttons.

Components are tested in sequence when you press the **Next** button. When all components have been checked, a diagnostic screen appears. Depending on the result of the diagnostics, the screen could indicate either **Diagnostics Done OK** or **FAIL**.

At the end of the test, you can exit the diagnostic mode by pressing the LCD button.

For more information about MaxiLife, refer to Chapter 7 "troubleshooting your hp workstation x2100."

Order In Which POSTs Occur

The POST executes each time the system is powered on or a reset is performed. The POST process verifies the basic functionality of the system components and initializes certain system parameters.

The POST starts by displaying a graphic screen of the HP PC Workstation's logo when you restart the system. If you want to view the POST details, press **Esc** to access the HP Summary Screen.

If the POST detects an error, the screen switches to text mode and a detailed error message appears on a View System Errors screen. On this screen, the error message utility (EMU) not only displays the error diagnosis but suggests corrective action. (Refer to page 93 for a brief summary.)

On the HP Workstation x2100, the LCD status panel displays either a message, a POST code number (refer to Table 4-4), or an EMU code.

Devices such as memory and newly installed hard disks are configured automatically. You don't need to confirm the change.

During the POST, the system copies BIOS and other ROM data into high-speed shadow RAM. The shadow RAM is addressed at the same physical location as the original ROM in a manner that is completely transparent to applications. Therefore, shadow RAM appears to behave as very fast ROM. This technique provides faster access to the system BIOS firmware.

Table 4-4 lists the POST checkpoint codes and their associated beeps. See page 81 for more details about preboot diagnostics error codes.

Table 4-4 POST Checkpoint Codes

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
02h	Verify real mode		
03h	Disable Non-Maskable Interrupt (NMI)		
04h	Get CPU type		
06h	Initialize system hardware		
08h	Initialize chipset with initial POST values		
09h	Set IN POST flag	POST Start	
0Ah	Initialize CPU registers	CPU Regist. Init	
0Bh	Enable CPU cache		
0Ch	Initialize caches to initial POST values		
0Eh	Initialize I/O component	I/O Init.	
0Fh	Initialize the local bus IDE	IDE Init.	
10h	Initialize power management		

Table 4-4 POST Checkpoint Codes (Continued)

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
11h	Load alternate registers with initial POST values		
12h	Restore CPU control word during warm boot		
13h	Initialize PCI bus mastering devices	PCI Mast. Init.	
14h	Initialize keyboard controller		
16h	BIOS ROM checksum	BIOS Check sum	
17h	Initialize cache before memory autosize		
18h	8254 timer initialization		
1Ah	8237 DMA controller initialization		
1Ch	Reset programmable interrupt controller		
20h	Test DRAM refresh	RAM Refresh Test	
22h	Test 8742 keyboard controller	Keyb. Ctrl. Test	
24h	Set ES segment register to 4GB		
26h	Enable A20 line		
28h	Autosize DRAM	Memory Detection	3
29h	Initialize POST memory manager		
2Ah	Clear 512KB base RAM		
2Ch	RAM failure on address line ^a	RAM Add. Failure	
2Eh	RAM failure on data bits xxxx1 of low byte of memory bus	RAM Data Low	
2Fh	Enable cache before system BIOS shadow		
30h	RAM failure on data bits xxxx1 of high byte of memory bus	RAM Data High	
32h	Test CPU bus-clock frequency		
33h	Initialize POST dispatch manager		
36h	Warm start shut down		
38h	Shadow system BIOS ROM	Shadow BIOS ROM	
3Ah	Autosize cache		
3Ch	Advanced configuration of chipset registers		
3Dh	Load alternate registers with CMOS values		
42h	Initialize interrupt vectors		
45h	POST device initialization		

Table 4-4 POST Checkpoint Codes (Continued)

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
46h	Check ROM copyright notice		
48h	Check video configuration against CMOS		
49h	Initialize PCI bus and devices	PCI Detection	5
4Ah	Initialize all video adapters in system	Video Detection	4
4Bh	Display QuietBoot screen (optional)		
4Ch	Shadow video BIOS ROM		
4Eh	Display BIOS copyright notice		
50h	Display CPU type and speed		
51h	Initialize EISA board		
52h	Test keyboard	Keyboard Test	
54h	Set key click if enabled		
56h	Enable keyboard		
58h	Test for unexpected interrupts	Unexpect. STOP	
59h	Initialize POST display service		
5Ah	Display prompt press F2 to enter Setup		
5Bh	Disable CPU cache		
5Ch	Test RAM between 512KB and 640KB	Base Memory Test	
60h	Test extended memory	Ext. Memory Data	
62h	Test extended memory address lines	Ext. Memory Add.	
64h	Jump to UserPatch1		
66h	Configure advanced cache registers		
67h	Initialize multiprocessor APIC		
68h	Enable external and CPU caches		
69h	Setup System Management Mode (SMM) area		
6Ah	Display external Level 2 cache size		
6Ch	Display shadow-area message		
6Eh	Display possible high address for UMB recovery		
70h	Display error messages		
72h	Check for configuration errors		

Table 4-4 POST Checkpoint Codes (Continued)

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
76h	Check for keyboard errors	Keyboard Test	
7Ch	Set up hardware interrupt vectors		
7Eh	Initialize coprocessor if present		
80h	Disable onboard super I/O ports and IRQs		
81h	Late POST device initialization		
82h	Detect and install external RS 232 ports		
83h	Configure non-MCD IDE controllers		
84h	Detect and install external parallel ports		
85h	Initialize PC-compatible PnP ISA devices		
86h	Re-initialize onboard I/O ports		
87h	Configure system board configurable devices (optional)		
88h	Initialize BIOS data area		
89h	Enable Non-Maskable Interrupts (NMIs)		
8Ah	Initialize extended BIOS data area		
8Bh	Test and initialize PS/2	Mouse PS2 Test	
8Ch	Initialize floppy controller		
8Fh	Determine number of ATA drives (optional)		
90h	Initialize hard disk controllers	Disc Ctrl. Init.	
91h	Initialize local-bus hard disk controllers	Disc Bus Init.	
92h	Jump to UsersPatch2	Maxilife Test	
93h	Build MPTABLE for multiprocessor boards		
95h	Install CD-ROM for boot	CDROM Ctr. Init.	
96h	Clear huge ES segment register		
97h	Fix multiprocessor table		
98h	Search for option ROMs	Opt. Rom Detect.	
99h	Check for SMART drive		
9Ah	Shadow option ROMs		
9Ch	Set up power management		
9Dh	Initialize security engine (optional)		
9Eh	Enable hardware interrupts		

Table 4-4 POST Checkpoint Codes (Continued)

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
9Fh	Determine number of ATA and SCSI drives	Check ATA / SCSI	
A0h	Set time of day		
A2h	Check key lock		
A4h	Initialize typematic rate		
A8h	Erase F2 prompt		
AAh	Scan for F2 key stroke		
ACh	Enter SETUP	BIOS SETUP	
A Eh	Clear Boot flag		
B0h	Check for errors	...Checking...	
B2h	POST done - prepare to boot operating system		
B5H	Terminate QuietBoot (optional)		
B6h	Check password (optional)	Check Password	
B7h	ACPI tables initialized	ACPI Init.	
B8h	Clear global descriptor table		
B9h	Prepare boot	Prepare Boot...	
BAh	Initialize DMI parameters	DMI Tables Init.	
BBh	Initialize PnP Option ROMs	PNP Opt. ROM Init	
BCh	Clear parity checkers		
BDh	Display MultiBoot menu		
BEh	Clear screen (optional)		
BFh	Check virus and backup reminders		
C0h	Try to boot with INT 19		
C1h	Initialize POST Error Manager (PEM)		
C2h	Initialize error logging		
C3h	Initialize error display function		
C4h	Initialize system error handling		
C5h	PnPnd dual CMOS (optional)		
C6h	Initialize notebook docking (optional)		
C7h	Initialize notebook docking late		
C8h	Force check (optional)		

Table 4-4 POST Checkpoint Codes (Continued)

Checkpoint Code	POST Routine Description	MaxiLife LCD Display Message	Beep Codes
C9h	Extended checksum (optional)		
D2h	Unknown Interrupt		
<i>The following are for boot block in Flash ROM</i>			
E0h	Initialize the chipset		
E1h	Initialize the bridge		
E2h	Initialize the CPU		
E3h	Initialize system timer		
E4h	Initialize system I/O		
E5h	Check force recovery boot		
E6h	Checksum BIOS ROM		
E7h	Go to BIOS		
E8h	Set huge segment		
E9h	Initialize multiprocessor		
EAh	Initialize OEM special code		
EBh	Initialize PIC and DMA		
ECh	Initialize memory type		
EDh	Initialize memory size		
EEh	Shadow boot block		
EFh	System memory test		
F0h	Initialize interrupt vectors		
F1h	Initialize run time clock		
F2h	Initialize video		
F3h	Initialize system management mode		
F4h	Output one beep before boot		
F5h	Boot to mini DOS		
F6h	Clear huge segment		
F7h	Boot to full DOS		

- a. If the BIOS detects error 2C, 2E, or 30 (base 512KB RAM error), it displays an additional word-bitmap (xxxx) indicating the address line or bits that failed. For example:

2C 0002 means line 1 (bit one set) has failed.

2E 1020 means data bits 12 and 5 (bits 12 and 5 set) have failed in the lower 16 bits.

The BIOS also sends the bitmap to the port-80 LED display. It first displays the checkpoint code, followed by a delay, the high-order byte, another delay, then the low-order byte of the error. It repeats this sequence continuously.

Error Message Summary

In the event an error generates in POST during the boot process, the Error Setup Manager gives access to one or more detected errors. Each EMU error displays as a four-digit code with an associated text message on the monitor screen and/or the MaxiLife LCD panel.

You can get further details by pressing **Enter**. A detailed description of the reason for the failure and how to solve the problem displays. The following examples give the different types of error categories.

<i>Category #1:</i>	If the error is only a warning (such as, key stuck), the POST should prompt:
WARNING ^a	
00100	Keyboard Error

- a. After a time-out period of five seconds without any intervention, the system resumes to boot.

<i>Category #2:</i>	If the error is serious, the POST should prompt:
00xx	The BIOS has detected a serious problem that prevents your PC from booting
Press Enter to view more information about error messages.	

Code #	Cause/Symptom	Short message (US)
0000h	Any POST error that isn't listed below	System error
0010h	CMOS Checksum error (if no serial EEPROM)	Incorrect CMOS Checksum
0011h	Date and time (CMOS backed up from SE2P)	Date and time lost
0012h	PC configuration lost (both SE2P and CMOS lost)	Incorrect PC configuration
0020h	Any POST error regarding an AT option ROM	Option ROM error
0040h	Serial number corrupted (bad checksum or null #)	Invalid PC serial number
0041	Product flag not initialized or bad	Invalid internal product type
0060h	RPO initialization failure	Remote power on error
0100h	Keyboard stuck key	Keyboard error
0101h	Keyboard self-test failure	Keyboard error
0102h	Keyboard controller I/O access failure	Keyboard error
0103h	Keyboard not connected	Keyboard error
0300h	Floppy A: self-test failure	Flexible disk drive A error
0301h	Floppy B: self-test failure	Flexible disk drive B error

Code #	Cause/Symptom	Short message (US)
0310h	Floppy A: not detected (but configured in CMOS)	Flexible disk drive error
0311h	Floppy B: not detected (but configured in CMOS)	Flexible disk drive error
0306h	General failure on floppy controller	Flexible disk drive error
0400h	CD-ROM test failure	CD-ROM error
0401h	CD-ROM not detected (but configured in CMOS)	CD-ROM error
0500h	General failure on HDD onboard primary ctrl	IDE device error
0501h	General failure on HDD onboard secondary ctrl	IDE device error
0510h	HDD # 0 self-test error	IDE device # 0 error
0520h	HDD # 0 not detected (but configured in CMOS)	IDE device # 0 error
0521h	HDD # 1 not detected (but configured in CMOS)	IDE device # 1 error
0522h	HDD # 2 not detected (but configured in CMOS)	IDE device # 2 error
0523h	HDD # 3 not detected (but configured in CMOS)	IDE device # 3 error
0530h	Found a drive on slave connector only (primary)	IDE device error
0531h	Found a drive on slave connector only (secondary)	IDE device error
0600h	Found less video memory than configured in CMOS	Video memory error
0700h	Found less DRAM memory than at previous boot	System memory error
0711h	Defective SIMM (module 1, bank 1)	System memory error
0800h	Found lower cache size than configured	System cache error
0801h	Cache self-test failure	System cache error
0A00h	Plug and Play (PnP) video auto-setting failure (DDC hang)	DDC video error

The following table summarizes the most significant problems that can be reported.

Message	Explanation or Suggestions for Corrective Action
Operating system not found	<ul style="list-style-type: none"> • Check whether the disk, HDD, FDD, or CD-ROM drive is connected. • If it is connected, check that it is detected by POST. • Check that your boot device is enabled on the Setup Security menu. • If the problem persists, check that the boot device contains the operating system.
Missing operating system	If you have configured HDD user parameters, check that they are correct. Otherwise, use HDD type "Auto" parameters.

Message	Explanation or Suggestions for Corrective Action
Resource allocation conflict -PCI device 0079 on system board	Clear CMOS.
Video PnP interrupted or failed; re-enable in Setup and try again	You may have powered your computer off/on too quickly and the computer turned off video PnP as a protection.
System CMOS checksum bad - run Setup	CMOS contents have changed between two power-on sessions. Run Setup for configuration.
No message, system “hangs”	Check that the main memory modules are correctly set in their sockets.
Other	An error message may display and the computer may hang for 20 seconds, then beep. The POST is probably checking for a mass storage device, which it can't find, and the computer is in time-out mode. After time-out, run Setup to check the configuration.

5 **Hardware Components**

This chapter describes:

- Graphics cards and PCI cards
- Mass storage devices
- Connectors and sockets
- The rear panel

Graphics Cards

HP Workstation x2100 models provide installation and factory support for certain Matrox, nVIDIA and ATI graphics cards. HP-supported drivers for these cards can be found on the <http://www.hp.com/go/workstationsupport> web page. For all other product information (specifications, features, etc.), visit the individual manufacturer's web page:

- Matrox Millennium G450 (for HP-supported drivers, see <http://www.hp.com/go/workstationsupport>; for product information, see <http://www.matrox.com/mga/home.htm>)
- nVIDIA Quadro2 MXR and Quadro Pro (for HP-supported drivers, see <http://www.hp.com/go/workstationsupport>; for product information, see <http://www.nvidia.com/Products.nsf>)
- nVIDIA Quadro2 Ex (for HP-supported drivers, see <http://www.hp.com/go/workstationsupport>; for product information, see <http://www.nvidia.com/Products.nsf>)
- ATI FireGL2 and FireGL4 (for HP-supported drivers, see <http://www.hp.com/go/workstationsupport>; for product information, see <http://www.ati.com>)
- ATI FireGL 8800 (for HP-supported drivers, see <http://www.hp.com/go/workstationsupport>; for product information, see <http://www.ati.com>)

Selecting A Monitor For Your Workstation

The table below provides a list of display resolutions and frequencies for the graphics cards supported by your workstation. Using these resolutions and frequencies you will be able to select the appropriate monitor for your graphics card. Note that frequencies of 85Hz and higher provide ergonomic flicker-free viewing.

If the monitor you select is DDC-2B or DDC-2B+ compliant, the graphics card will automatically limit itself to those resolutions and frequencies supported by that monitor. In this case, you do not need to use Table 5-1 to select your monitor.

Table 5-1 Graphics Cards, Resolutions and Display Frequencies

Graphics Card	Display Resolution ^a	Vertical Frequencies (Hz) ^b
Matrox G450	640x480	60, 70, 72, 75, 85, 100, 120, 160, 200
	800x600	60, 70, 72, 75, 85, 100, 120, 160, 200
	1024x768	60, 70, 72, 75, 85, 100, 120, 160
	1280x1024	60, 70, 72, 75, 85, 100, 120
	1600x1200	60, 70, 72, 75, 85, 100
	1920x1200	60, 70, 72, 75, 85, 100
	2048x1536	60, 70, 72, 75, 85

Table 5-1 Graphics Cards, Resolutions and Display Frequencies (Continued)

Graphics Card	Display Resolution^a	Vertical Frequencies (Hz)^b
nVidia Quadro2 EX	640x480	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	800x600	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	1024x768	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	1280x1024	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170
	1600x1200	60, 70, 72, 75, 85, 100, 120
	1920x1200	60, 70, 72, 75, 85, 100
	2048x1536	60, 70, 72, 75
nVidia Quadro2 Pro	640x480	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	800x600	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	1024x768	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170, 200, 240
	1280x1024	60, 70, 72, 75, 85, 100, 120, 140, 144, 150, 170
	1600x1200	60, 70, 72, 75, 85, 100, 120
	1920x1200	60, 70, 72, 75, 85, 100
	2048x1536	60, 70, 72, 75
ATI Fire GL2	640x480	60, 75, 85, 100
	800x600	60, 75, 85, 100
	1024x768	60, 75, 85, 100
	1280x1024	60, 75, 85, 100
	1600x1200	60, 75, 85
	1920x1200	60, 75, 76
ATI Fire GL4	640x480	60, 75, 85, 100, 120 ^c
	800x600	60, 75, 85, 100, 120 ^c
	1024x768	60, 75, 85, 100, 120 ^c
	1280x1024	60, 75, 85, 100, 120 ^c
	1600x1200	60, 75, 85
	1920x1200	60, 75, 76
	2048x1536	60

- a. 1 Only common resolutions are listed. Other intermediate resolutions are possible.
- b. The 120Hz frequency is supported only in Stereo mode.
- c. The maximum frequency may not be available at all color depths.

PCI Cards

HP 10/100 TX PCI LAN Interface

The 10/100 TX LAN Interface is a 32-bit PCI 2.2 card that supports 10Mbps per second (10Base-T) and 100Mbps per second (100 TX) transfer speeds, and both half and full duplex operation.

HP 10/100 TX PCI LAN Interface Features

Feature	Description
RJ45 connector	Connection to Ethernet 10/100 TX autonegotiation
BootROM	Protocols: <ul style="list-style-type: none">• PxE 2.0• On-board socket support up to 128Kb
Remote Power On (RPO)	Full remote power on using Magic Packet for Microsoft Windows NT 4.0 in APM mode.
Remote Wake Up (RWU)	Enable and Wake Up from Suspend state using Magic Packet and Pattern Matching for Microsoft Win2000 in ACPI mode. This feature enables a host computer to remotely (over the network) power on computers and wake computers up from energy-saving sleep mode. To enable these features, use the Setup program to configure the BIOS.
Power Management	<ul style="list-style-type: none">• OnNow 1.0• Advanced Power Management 1.2• PCI Power Management 1.1• WfM 2.0 compliant, ACPI
Manageability	<ul style="list-style-type: none">• Desktop Management Interface (DMI) 2.0 dynamic driver• DMI 2.0 SNMP mapper• PXE 2.0 Flashable BootROM (optional on socket)
Diagnostic	<ul style="list-style-type: none">• Mac address DOS report tool• User Diag for DOS

HP 10/100 TX PCI LAN Interface LED Descriptions

Table 5-2

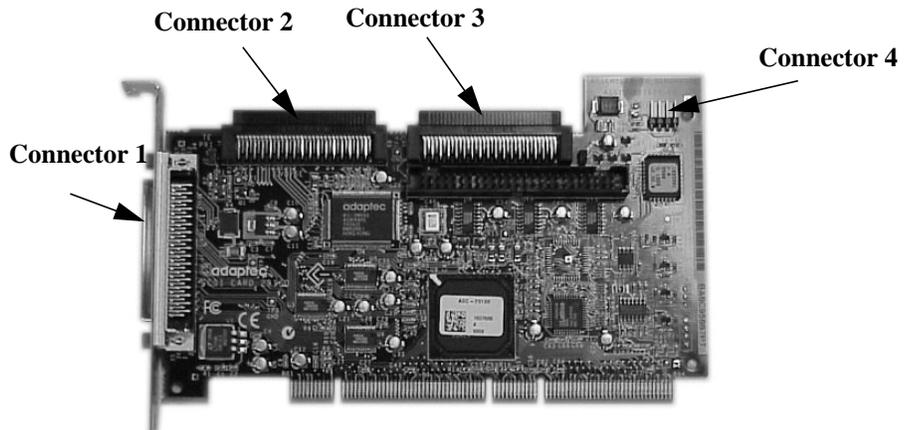
LED	Description	Flashing	Steady	Off
<i>10 LNK</i>	Link integrity	Reversed polarity	Good 10Base-T connection between NIC and hub	No connection between NIC and hub
<i>100 LNK</i>	Link integrity	Reversed polarity	Good 100 TX connection between NIC and hub	No connection between NIC and hub
<i>ACT</i>	Yellow: Port traffic for either speed	Network traffic present	Heavy network traffic	No traffic

SCSI Adapter Cards

Adaptec 29160 SCSI PCI Adapter Card. Your workstation has an Ultra 160/m SCSI card. The Adaptec SCSI card has a system bus rate of 533MB/sec, a SCSI data transfer rate of 160MB/sec, and the capability to support as many as 15 peripheral devices.

The Adaptec SCSI card can connect to Low-Voltage Differential (LVD) SCSI devices (for example, Ultra2 and Ultra 160/m) and Single-Ended (SE) SCSI devices (for example, Ultra SCSI, Fast SCSI, SCSI-1). Examples of SE devices include DAT drives, scanners, and older hard disk drives.

Figure 5-1 Adaptec SCSI Card



The following is a description of connectors 1 through 4.

- Connector 1: 68-pin external connector for LVD SCSI devices
- Connector 2: 68-pin internal connector for LVD SCSI devices
- Connector 3: 68-pin internal connector for wide SE SCSI devices
- Connector 4: 50-pin internal connector for narrow SE SCSI devices

Although SE SCSI devices work when you attach them to connector 1 or 2, it limits all devices to SE mode. For example, this limitation would result in the Ultra 160/m hard disk drive performance being limited from 160MB/sec to 40MB/sec. Therefore, you should connect only LVD SCSI devices to connectors 1 and 2.

For information about how to connect internal and external SCSI devices, please read Chapter 6 “Installing and Replacing Hardware Parts.”

SCSI Cable Information

You should use your external SCSI connector to connect LVD SCSI devices to your workstation. This section provides you with SCSI cable information that is important for the correct operation of your external SCSI device.

NOTE The total length of the external SCSI cable shouldn't exceed 10 meters (approximately 32.81 feet) and at least eight inches of cable must separate each device.

Contact your dealer to order shielded HP SCSI cables to connect external SCSI accessories.

CAUTION LVD SCSI is very sensitive to noise; therefore, all cables on the SCSI bus must be exceptionally high-quality cables. The following table shows examples of such cables.

Please make sure that any external hard disk enclosures are rated for LVD SCSI use.

Table 5-3

Cable Number	Cable Length	Description
C2978A	0.5m	68-pin HDTS ^a to 68-pin HDTS
C2979A	1.5m	
C2911B	1.0m	
C2924B	2.5m	
C2361A	1.0m	68-pin VHDCI ^b to 68-pin HDTS
C2362A	2.5m	
C2363A	10.0m	
C2365A	5.0m	

a. High Density Thumbscrew (HDTS)

b. Very High Density Cabled Interconnect (VHDCI)

Additional SCSI Card Features.

The following table describes features of the Adaptec SCSI card.

Table 5-4

Feature	Description
Double Transition Clocking	<p>Changes the digital protocol to use both edges of the SCSI request/acknowledge signal clock. Allows designers to use Ultra2 cables. The signal in an Ultra2 SCSI runs a 40MHz, whereas data runs at only 20MHz or 80MB/sec on a 16-bit wide bus.</p> <p>Using both edges of the same signal at 40MHz, you can increase the data rate to 40MB/sec or 160MB/sec on a 16-bit wide bus.</p>
Cyclical Redundancy Check	<p>Provides extra data protection for marginal cables that are connected to external devices. The Ultra3 SCSI cyclical redundancy check detects all:</p> <ul style="list-style-type: none">• Single-bit errors• Double-bit errors• Odd number of errors• Burst errors up to 32-bits long
Domain Validation	<p>Tests networks, cables, backplanes, terminators, and hard disk drives to ensure that the environment is operating at required specification. If reliability is at risk, the transfer speed is lowered.</p>

PYRO 1394/Firewire Host Controller Card

The PYRO card is Plug and Play, fully IEEE 1394 compliant and provides 3 ports (2 external and 1 internal) at 400 Mbps. The IEEE 1394 standard is supported on Windows 2000 but not on Windows NT 4.0.

For HP-supported drivers for the PYRO card, see the <http://www.hp.com/go/workstationsupport> web page. For additional product information on the PYRO card, see <http://www.adstech.com>.

Mass Storage Devices

You can find information about available accessories at www.hp.com/pcaccessories

Flexible Disk Drives

The front-access shelf has a 3.5-inch, 1.44MB flexible disk drive.

Hard Disk Drives

Tables 5-1, 5-2 and 5-3 list the 5.25-inch (1-inch high) hard disk drives (which are subject to change) that may be supplied with the HP Workstation x2100 (type and quantity depends on model) on internal shelves, connected to the SCSI or IDE controller.

Table 5-5 Quantum/Maxtor SCSI Hard Disk Drives

FEATURE	Quantum Atlas 10K II (10 krpm)	Quantum Atlas 10K II (10 krpm)	Maxtor Atlas 10K III (10 krpm)
Capacity	18.4 GB	36.7 GB	73.4 GB
Interface	Ultra160 SCSI	Ultra160 SCSI	Ultra160 SCSI
Ext. peak transfer rate	160 MB/sec	160 MB/sec	160 MB/sec
Average seek time (read)	4.7 ms	4.7 ms	<5.0 ms
Internal data rate (MB/sec)	280 MB/sec to 478 MB/sec	280 to 478 MB/sec.	NA
Number of discs/heads	3/6	5/10	4/8
Buffer size	8 MB	8 MB	8 MB

Table 5-6 Seagate SCSI Hard Disk Drives

FEATURE	Seagate (Cheetah 73LP - ST373405) (10 krpm)
Capacity	73 GB
Interface	Ultra/2/3 SCSI
Ext. peak transfer rate	160 MB/sec
Average seek time (read)	5.3 msec w/ controller overhead)
Internal data rate (MB/sec)	399-671 MB/sec (variable with zone)
Number of discs/heads	?/8
Buffer size	4096 KB

Table 5-7 IBM SCSI Hard Disk Drives

FEATURE	IBM Ultrastar 36LZX (DDYS-T18350)	IBM Ultrastar 36LZX (DDYS-T36950)
Capacity	18.35 GB	36.7 GB
Interface	Ultra160 SCSI	Ultra160 SCSI
Ext. peak transfer rate	160MB/sec	160MB/sec
Average seek time (read)	4.9 msec typical	4.9 msec typical
Internal data rate (MB/sec)	280 MB/sec min. to 452 MB/sec max.	280 MB/sec min. to 452 MB/sec max.
Number of discs/heads	3/6	6/12
Buffer size	4096 KB	4096 KB

Optical Drives

IDE CD-ROM Drive

Some models¹ have a 48x IDE CD-ROM drive in a 5.25-inch front-access shelf ATAPI, supporting ATAPI commands and with audio playback capability. It can play any standard audio CDs and CD-ROMs, conforming to optical and mechanical standards as specified in the Red, Yellow, Green, and Orange Book.

Some of the 48X IDE CD-ROM features include:

- Application disk type (confirmed by Red, Yellow, Green, Orange Book)
- CD-ROM data disk (Mode 1 and Mode 2)
- Photo-CD Multisession
- Audio CD
- Mixed-mode CD-ROM (data and audio)
- CD-ROM XA, CD-I, CD-Extra, CD-R, CD-RW

	Description
Data capacity	650MB
Data transfer rate	Sustained transfer rate (1X=150 KB/sec) Outsider: 7,200KB/sec Burst transfer rate: PIO mode 4 - 16.6 MB/sec maximum Single Word DMA Mode 2 - 8.3 MB/sec maximum Multi Word DMA Mode 2 - 16.6 MB/sec maximum
Buffer memory size	128KB
Access time	Average stroke (1 / 3) 110ms Full stroke 180ms
Rotational speed	2,048 bytes (Mode 1) 2,336 bytes (Mode 2)

1. See the HP Workstation x2100 Service Handbook to determine which models are installed with the 48X IDE CD-ROM drive.

	Description
Interface	ATAPI
Power requirements	5V, 1.2A 12V, 0.8A

IDE DVD-ROM Drive

Some models¹ have a DVD-ROM drive, which can play any standard audio CDs and CD-ROMs, conforming to optical and mechanical standards as specified in the Red, Yellow, Orange, and Green Books.

	Description
Data capacity	650MB
Data transfer rate	Sustained transfer rate (1X=150KB/sec); Outside: 7,200KB/sec Burst transfer rate: PIO mode 4 - 16.6MB/sec maximum Single Word DMA Mode 2 - 8.3MB/sec maximum Multi Word DMA Mode 2 - 16.6MB/sec maximum
Buffer memory size	128KB
Access time	Average stroke (1 / 3) 110ms Full stroke 180ms
Rotational speed	2,048 bytes (Mode 1) 2,336 bytes (Mode 2)
Interface	ATAPI
Power requirements	5V, 1.2A 12V, 0.8A

IDE CD-Writer Plus Drive

Some models² have a CD-RW drive in a 5.25-inch front-access shelf ATAPI, supporting ATAPI commands and with audio playback capability. The drive can play any standard audio CDs and CD-ROMs, and can record both write-once (CD-R) and CD-RW optical media. It conforms to optical and mechanical standards as specified in the Red, Yellow, Orange, and Green Books.

	Description
Data capacity	650MB or up to 74 minutes of audio per disc 547MB in CD-UDF data format
Performance	Typical: 110ms (random, 1/3 access including latency) Maximum: 130ms (random, 1/3 access including latency) Data transfer rate: Read: Up to 32X (1X=150KB/sec) Write: 12X (CD-R); 8X (CD-RW)
Burst transfer rate	16.67MB/sec

1. Refer to the HP Workstation x2100 Service Handbook to determine which models are installed with the DVD-ROM drive.
2. Refer to the HP Workstation x2100 Service Handbook to determine which models are installed with the HP CD-RW drive.

	Description
Spin-up time	3.2 seconds (disk high speed to stop)
Spin-down time	2.5 seconds (disk high speed to stop)
Corrected error rate	ECC On (max. 32X): 1 block/1012 bits ECC Off (max. 32X): 1 block/109 bits
Data Buffer Capacity	2MB
Write methods	<ul style="list-style-type: none">- Track at once- Session at once- Disc at once- Variable packet writing- Fixed packet writing- Multisession
Format and EEC standard	Red, Yellow, Orange, Green books
MTBF	120,000 POH
Interface	E-IDE and ATAPI

Connectors And Sockets

IDE Drive Connectors

IDE Connectors			
Pin	Signal	Pin	Signal
1	Reset#	2	Ground
3	HD7	4	HD8
5	HD6	6	HD9
7	HD5	8	HD10
9	HD4	10	HD11
11	HD3	12	HD12
13	HD2	14	HD13
15	HD1	16	HD14
17	HD0	18	HD15
19	Ground 7	20	orientation key
21	DMARQ	22	Ground 2
23	DIOW#	24	Ground 3
25	DIOR#	26	Ground 4
27	IORDY	28	CSEL
29	DMACK#	30	Ground 5
31	INTRQ	32	IOCS16#
33	DA1	34	PDIAG#
35	DA0	36	DA2
37	CS1FX#	38	CS3FX#
39	DASP#	40	Ground 6

Flexible Disk Drive Data Connector			
Pin	Signal	Pin	Signal
1	Ground	2	LDENSEL#
3	Ground	4	Microfloppy
5	Ground	6	EDENSEL
7	Ground	8	INDX#
9	Ground	10	MTEN1#
11	Ground	12	DRSEL0#
13	Ground	14	DRSEL1#
15	Ground	16	DTEN0#
17	Ground	18	DIR#
19	Ground	20	STP#
21	Ground	22	WRDATA#
23	Ground	24	WREN#
25	Ground	26	TRK0#
27	Ground	28	WRPRDT#
29	Ground	30	RDDATA#
31	Ground	32	HDSSEL1#
33	Ground	34	DSKCHG#

Battery Pinouts

Battery Connections	
Pin	Signal
1	GROUND
2	VBAT1
3	VBAT2

Battery Connections	
Pin	Signal
1	VBAT1
2	GROUND

Additional SCSI LED Connector

Additional SCSI LED Connector (4-pin)	
Pin	Signal
1	Not used
2	LED out
3	LED out
4	Not used

Power Supply Connector (20-pin) And Aux Power Connector

Power Supply Connector for System Board (20-pin)			
Pin	Signal	Pin	Signal
11	3V3_MAINSENSE	1	3V3_2
12	12V_NEG	2	3V3_3
13	GROUND_1	3	GROUND2
14	_PSON	4	5V_1
15	GROUND3	5	GROUND4
16	GROUND5	6	5V_2
17	GROUND6	7	GROUND7
18	5V_NEG	8	PW0K
19	5V_3	9	5VSB
20	5V_4	10	12V

Aux. Power Connector	
Pin	Signal
1	GROUND1
2	GROUND2
3	GROUND3
4	3V3_1
5	3V3_2
6	5V

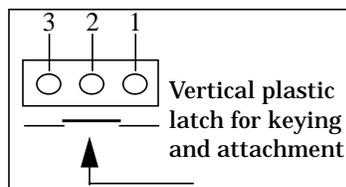
Wake On LAN Connector

Wake On LAN (WOL)	
Pin	Signal
1	5V STDBY
2	Ground
3	LAN_WAKE

Rear Fan Connector

Fan Connector	
Pin	Signal
1	Ground
2	12V Power
3	Sense

PCI Fan Connector (MT only)



Fan Connector	
Pin	Signal
1	Sense
2	+12V power (or less, depending on desired fan speed)
3	Ground

internal audio connectors

CD AUDIO Connector		
Pin	Signal	I/O
1	Analog Ground	-
2	CD Left Channel	IN

AUX Connector		
Pin	Signal	I/O
1	Analog Ground	-
2	AUX Left Channel	IN

CD AUDIO Connector		
Pin	Signal	I/O
3	Analog Ground	-
4	CD Right Channel	IN

AUX Connector		
Pin	Signal	I/O
3	Analog Ground	-
4	AUX Right Channel	IN

Internal Speaker	
Pin	Signal
1	SPK1
2	Tst1
3	Tst2
4	SPK2

Status Panel And Intrusion

Status Panel			
Pin	Signal	Pin	Signal
1	B1_LCD1	2	B1_LCD2
3	Ground	4	PWR_LED_A
5	HDD_LED_K	6	BACKLIGHT
7	ON_OFF	8	RED-LED_A
9	GROUND2	10	HDD_LED_A
11	_RESET	12	SDA
13	VSTDBY_3V	14	SCL

Intrusion	
Pin	Signal
4	CLOSE
3	COMMON
1	OPEN

Hard Disk Drive Temperature

HDD Temperature	
Pin	Signal
1	3V3
2	SENSE
4	Ground

VGA DB15 Connector

VGA DB Connector Pins		
Pin	Standard VGA	DDC2B
1	Analog RED	Analog RED
2	Analog GREEN	Analog GREEN
3	Analog BLUE	Analog BLUE
4	Monitor ID2	Monitor ID2
5	n/c	DDC return
6	Analog RED return	Analog RED
7	Analog GREEN return	Analog GREEN
8	Analog BLUE return	Analog BLUE
9	n/c	VCC supply (optional)
10	Digital ground	Digital ground
11	Monitor ID 0	Monitor ID 0
12	Monitor ID 1	Data:SDA
13	HSYNC	HSYNC
14	VSYNC	VSYNC
15	n/c	Clock:SCL

LCD Panel

LCD Panel			
Pin	Signal	Pin	Signal
1	SCL_5V	2	VSTDBY 5V
3	SDA_5V	4	BT_LCD 1
5	not connected	6	BT_LCD 2
7	RX_BB	8	TX_BB
9	Ground	10	Ground

Figure 5-2 S-Video Connector

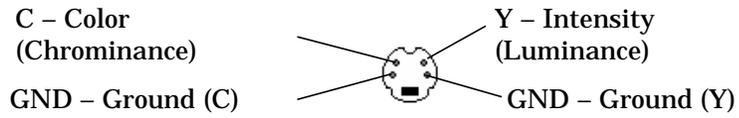
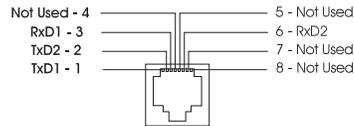
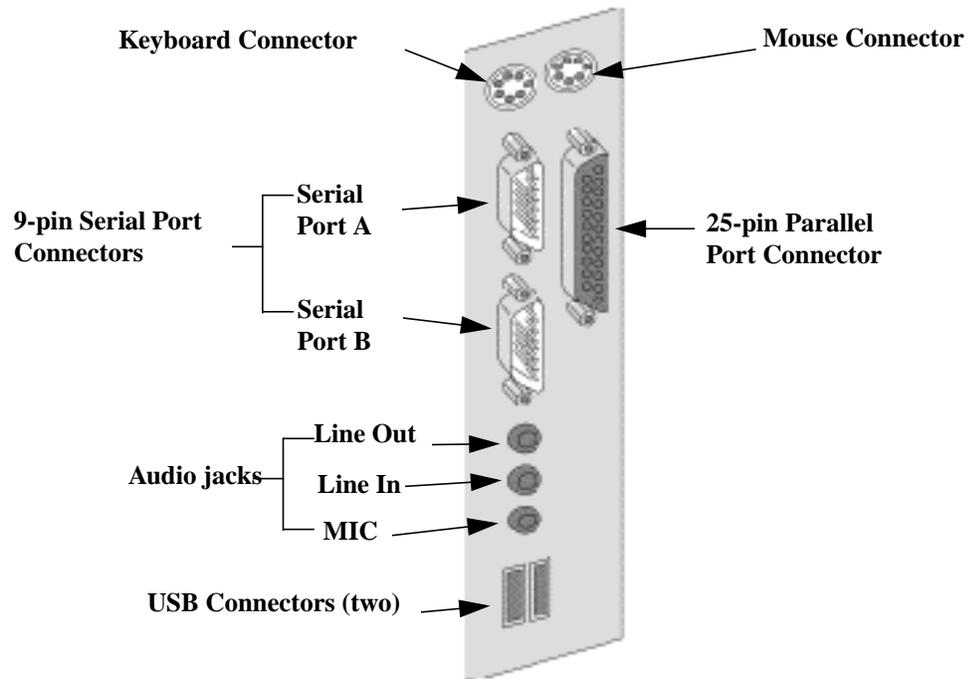


Figure 5-3 Ethernet UTP Connector

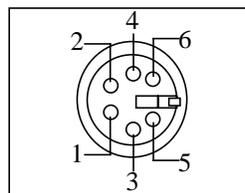


Rear Panel Connectors

Figure 5-4 Rear Panel Socket Pin Layouts



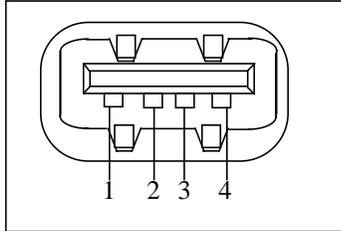
Keyboard And Mouse Connectors



Keyboard and Mouse Connectors			
Pin	Signal	Pin	Signal
1	Data	2	Not Used
3	Ground	4	+5V dc
5	Clock	6	Not Used

USB Stacked Connector

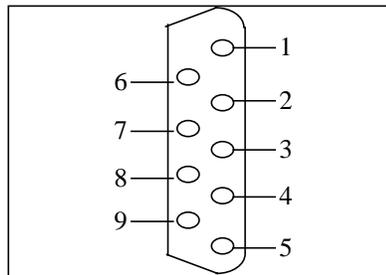
The USB graphic and pinout table for a USB connector. However, the information is also valid for a USB stacked connector.



USB Connector	
Pin	Signal
1	VBus
2	D-
3	D+
4	GND
Shell	Shield

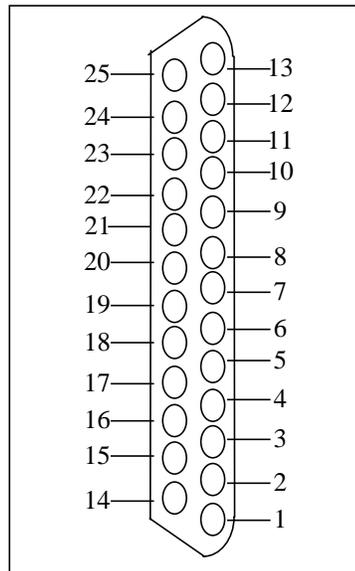
Serial Port Connectors

This pinout information is valid for both the Serial Port A and Serial Port B connectors.



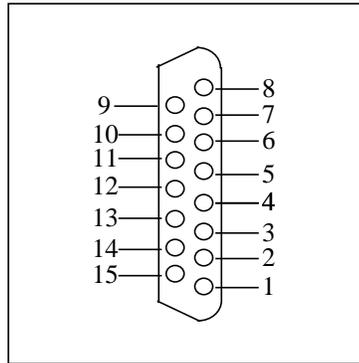
9-pin Serial Port Connector			
Pin	Signal	Pin	Signal
		1	(DCD) CF
6	(DSR) CC	2	(RD) BB
7	(RTS) CA	3	(TD) BA
8	(CTS) CB	4	(DTR) CD
9	(R) CE	5	(GND) AB

25-pin Parallel Connector



25-pin Parallel Connector			
Pin	Signal	Pin	Signal
		13	SLCT
25	Ground	12	PE
24	Ground	11	BUSY
23	Ground	10	ACK
22	Ground	9	D7
21	Ground	8	D6
20	Ground	7	D5
19	Ground	6	D4
18	Ground	5	D3
17	SLIN	4	D2
16	INIT	3	D1
15	ERROR	2	DO
14	AUTO-FD	1	Strobe

MIDI/Joystick Connector



MIDI/Joystick Connector			
Pin	Signal	Pin	Signal
		8	+5 V
9	+5 V	7	A-2
10	B-1	6	A-Y
11	B-X	5	Ground
12	MIDI-OUT	4	Ground
13	B-Y	3	A-X
14	B-2	2	A-1
15	MIDI-IN	1	+5 V

External Audio Jacks

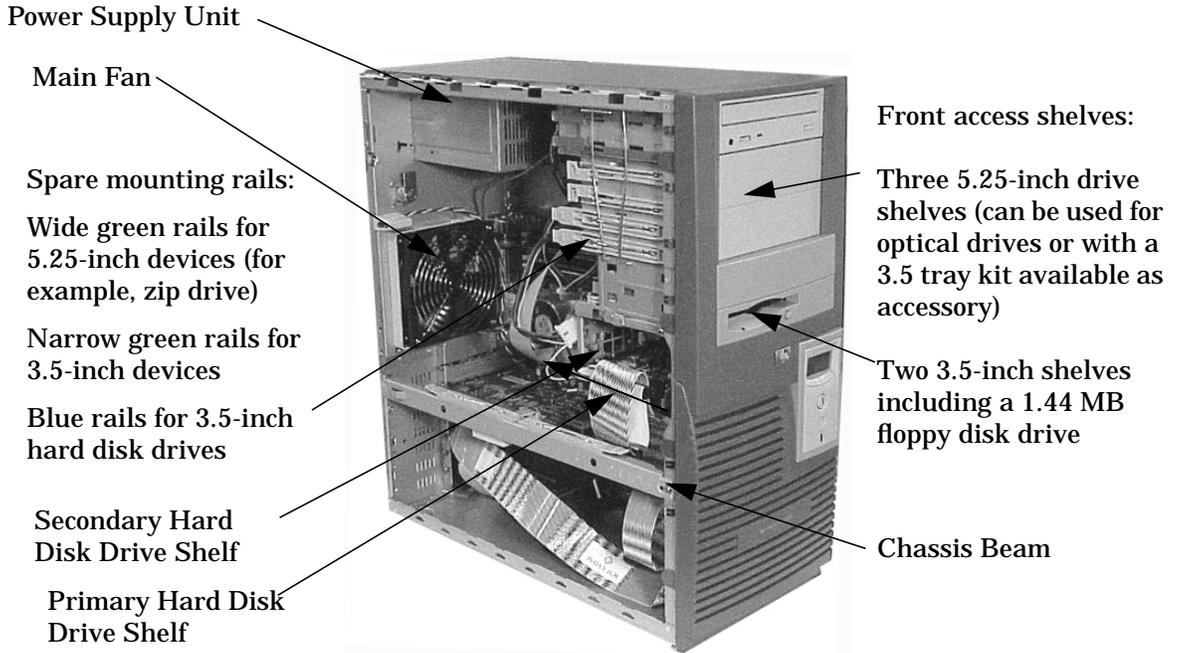
The Line In jack, Line Out jack, and Mic In jack on the rear panel are standard connectors.

6 **Installing Or Replacing Parts And Accessories**

Overview

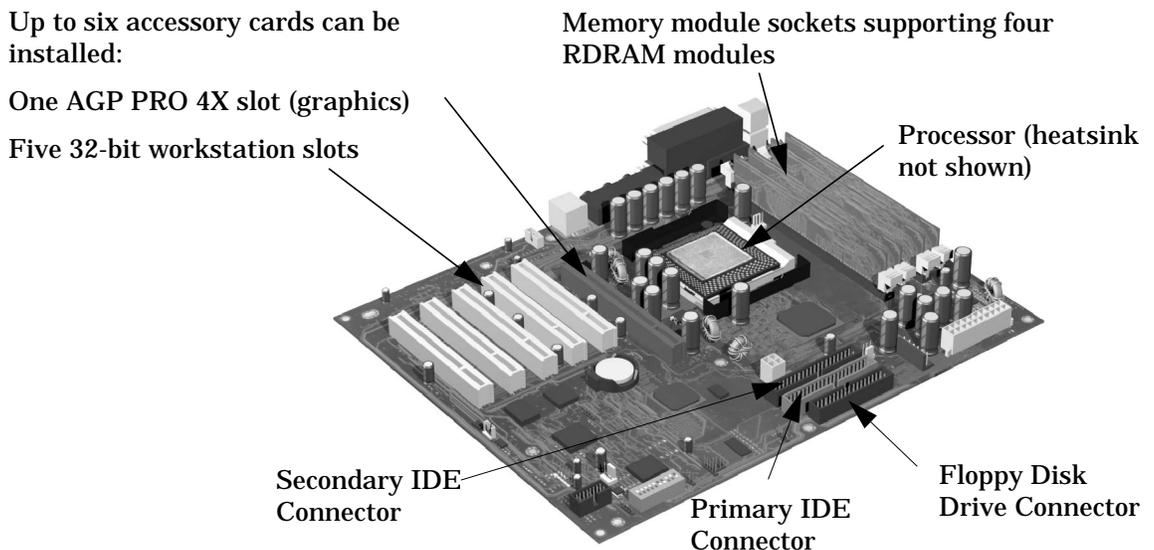
This chapter provides information about installing accessories and replacing hardware parts in your HP Workstation x2100.

Figure 6-1 Workstation



Contact your dealer for an up-to-date list of supported devices or check the HP web site: www.hp.com/go/workstationsupport.

Figure 6-2 HP Workstation x2100 System Board



Removing And Replacing The Cover And Front Bezel

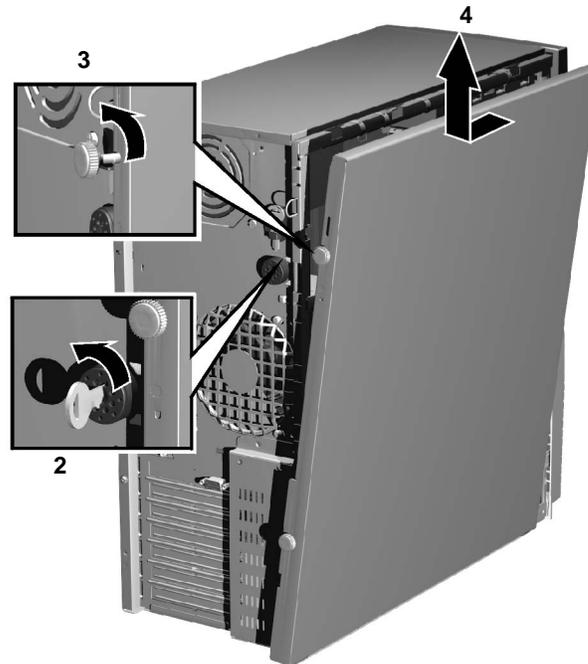
WARNING

For your safety, never remove the workstation cover without first disconnecting the power cord from the power outlet and removing any connection to a telecommunications network. If a Power Protection Device is fitted to your workstation, you must shut down your computer using its on/off switch, then remove its power cord before removing the workstation's cover. Remove the Power Protection Device cables before any servicing operation. Always replace the cover before switching the workstation on again.

Removing The Cover

1. Switch off the display and computer. Disconnect all power cables and any LAN or telecommunications cables.
2. If necessary, unlock the cover at the back of the workstation.
3. Unscrew the two thumb screws located at the back of the workstation.
4. Standing at the back of the workstation, slide the cover towards you, tilt it open, then lift it off. See Figure 6-3.

Figure 6-3 Removing the Cover



WARNING

Parts inside the computer may be hot, wait for them to cool before touching them.

Removing The Front Bezel

The front bezel is divided into two sections:

- The upper bezel gives access to three 5.25-inch shelves and two 3.5-inch shelves.
- The lower bezel gives access to the control panel. To access the lower bezel, you must first remove the upper bezel.

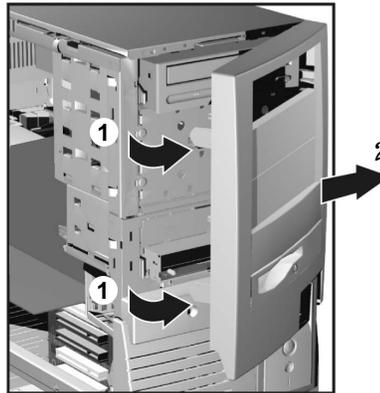
NOTE

Take care when removing the upper and lower bezels. They are not on a hinge — do not force them open.

To remove the upper and lower bezels:

1. Unclip the two clips located on the left-hand side of the bezel.
2. Open the bezel slightly, and then gently push it outwards. See Figure 6-4.

Figure 6-4 Removing the Bezels



Replacing The Cover And Front Bezel

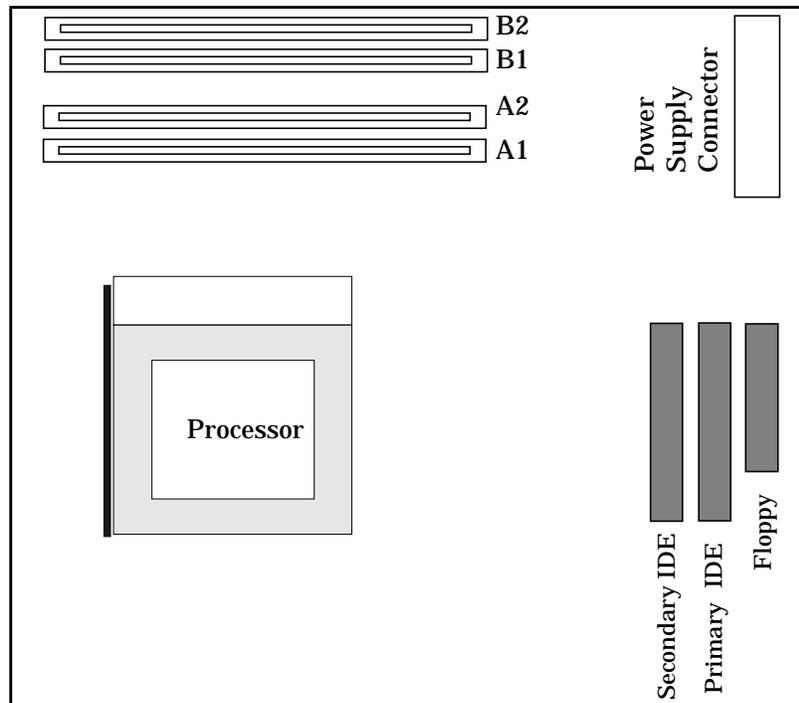
1. Ensure that all internal cables are properly connected and safely routed.
2. If you have removed both sections of the front bezel, first replace the lower bezel. Ensure that the bezel is correctly oriented, align the two plastic tabs with their slots on the right-hand side of the chassis, and then close the bezel. After closing the bezel, confirm that the tabs on the left side are fully seated flat against the chassis.
3. Standing at the back of the workstation, lower the cover onto the chassis (aligning the guide rail on the bottom inside edge of the cover with the bottom edge of the workstation chassis).
4. Shut the cover ensuring that the guides on the top of the cover slide into the rails at the top of the chassis.
5. Slide the cover forward, then tighten the two thumbscrews.
6. If required, lock the cover using the key provided. Reconnect all the power and telecommunications cables.

Removing, Replacing And Upgrading Memory

Your HP Workstation x2100 has two pairs of memory sockets for installing two or four RAMBUS Direct RAM (RDRAM) memory modules.

Each pair of memory sockets must contain identical memory modules (identical in size, speed and type). That is, sockets **A1** and **B1** must contain identical modules, and sockets **A2** and **B2** must contain identical modules (or continuity modules).

Figure 6-5 Memory Sockets



If only two RDRAM modules are installed, use the sockets marked **A1** and **B1**. The other two sockets (**A2** and **B2**) must contain continuity modules.

Use only HP memory modules designed for your workstation model. For other accessories for your workstation, refer to www.hp.com/workstations/products/winnt/accessories.html.

Removing And Replacing A Memory Module

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).

To ease installation, place the workstation on its side with the system board facing upwards.

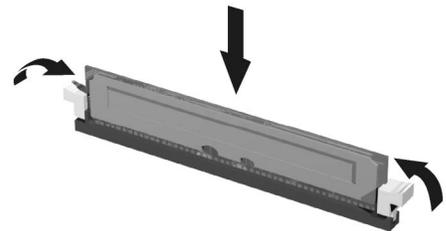
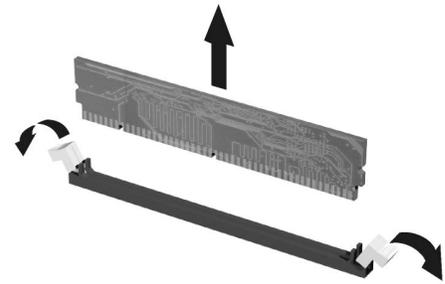
3. If you are installing additional memory modules, you will need to remove the continuity modules. Open the two retaining clips and remove the continuity module from the socket.

If you are replacing an existing memory module, open the two retaining clips and remove the existing memory module the socket.

Always store any removed memory or continuity module in a safe place for future use.

4. Install your new memory modules, ensuring that the two notches on the bottom edge of each memory module are aligned with those of the socket. With the two retaining clips open, press the memory module fully into the socket until the retaining clips click into position. You can also close the retaining clips by hand to ensure that the module is correctly inserted.

5. Replace the workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.
6. Check the Summary Screen to verify the new configuration.



Installing Or Replacing An Accessory Card

Your HP Workstation x2100 has five 32-bit 33 MHz PCI (PCI 2.2) accessory card slots and one AGP Pro slot on the system board.

x2100 models support the following AGP graphics cards:

- 1.5v AGP graphics cards ($\leq 25w$)
- 1.5v AGP Pro graphics cards ($\leq 50w$)

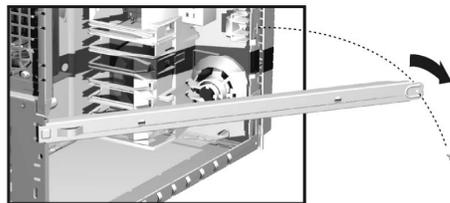
The x2100 does not support high power ($>50w$) AGP Pro and AGP 3.3 graphics cards.

To install or replace an accessory card, complete the following steps:

CAUTION

Static electricity can damage electronic components. Turn OFF all equipment before installing the accessory. Don't let your clothes touch the accessory. To equalize the static electricity, rest the accessory anti-static bag on top of the workstation while you are removing the accessory from the bag. Handle the accessory as little as possible and with care.

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).



3. If you are removing an existing AGP graphics card, you must remove the chassis beam and the universal AGP retainer clip to gain access to the AGP PRO slot.

a. To remove the chassis beam: Remove the screw that holds the beam to the chassis and rotate the beam away from the chassis (see above).

4. If you are installing a new accessory card, unscrew and remove the slot panel. Store it in a safe place. If the slot cover is tight, loosen the screws on the adjacent slots. If you are replacing an existing accessory card, remove any cables connected to the accessory card. Remove the screw that holds the old card in place and carefully pull it out.

NOTE

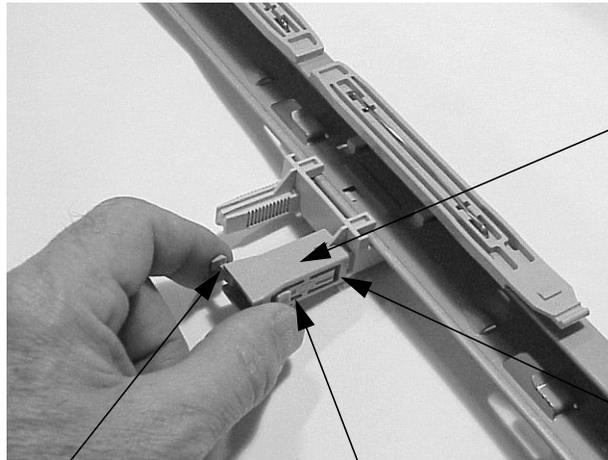
Some cards may have preferred locations and special installation instructions detailed in their manuals.

5. Aligning the new card carefully, slide it into position, then press it firmly into the slot and tighten the retaining screw.
6. If you are installing an AGP graphics card, you must adjust the universal AGP retainer clip before re-installing the chassis beam. This clip firmly holds your card in place during transit and normal operation.

- a. Make sure the green retainer clip is installed on the post as shown in Figure 6-6. To move or adjust the clip, squeeze the locks on each side of the clip and slide it in or out. Before installing the beam, adjust the clip to be as close to the beam as possible.

Figure 6-6 Retainer Clip on the Chassis Beam Assembly

The retainer clip keeps the graphics board seated on the system board when the chassis beam assembly is installed.



Clip inserted on post and adjusted to be as close to beam as possible. After beam is installed, adjust clip to push snugly against graphics card edge.

Retainer clip slot

Squeeze locks to adjust

Retainer clip

- b. Hook the chassis beam assembly to the left side of the chassis and replace the screw that holds the chassis beam assembly to the chassis.
 - c. Adjust the retainer clip by using your index fingers to squeeze the locks and slide the retainer clip against the AGP graphics card making sure the card edge is firmly in the retainer clip slot. The retainer clip should push snugly against the graphics card edge.
7. If you are installing or replacing a SCSI card, reconnect the disk activity LED connector to the system board (refer to for the location of the system board connectors).
 8. Install any other accessories before replacing the cover (refer to page 119). Reconnect all cables and power cords.

Mass Storage And Optical Device Overview

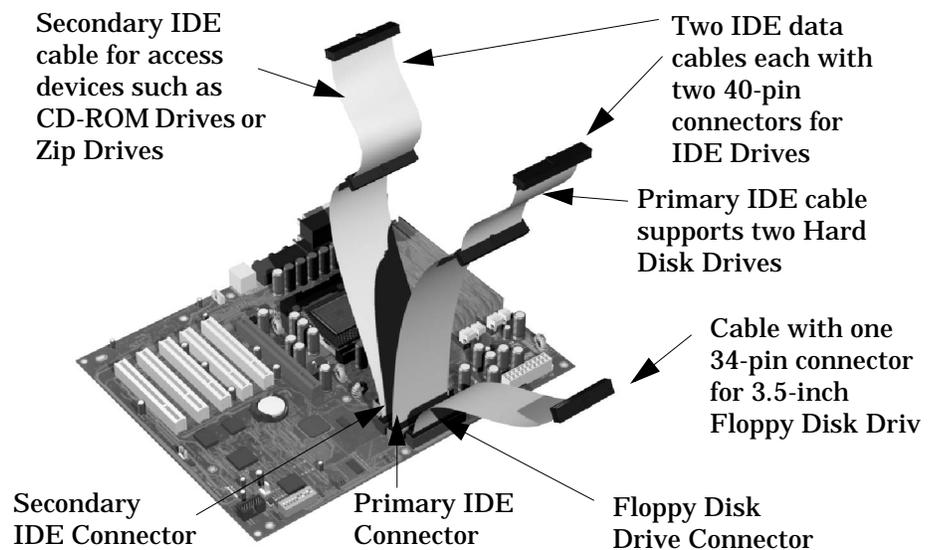
The workstation has an integrated Ultra ATA-100 controller that supports up to four IDE devices. Removable media IDE devices, such as CD-ROM drives, DVD drives, tape drives and Zip drives, require front access. In addition to the floppy disk drive, your workstation can support another 3.5-inch device plus three front-access 5.25-inch devices. Note that one front-access shelf may already have a CD-ROM drive installed in it.

You can physically install up to two hard disk drives in the x2100 chassis. The internal hard disk shelves support up to two 15 Krpm drives.

Identifying Cables And Connectors (All Models)

If you add an IDE Zip drive, hard disk drive, DVD drive, CD-ROM drive, CD-RW drive, or tape drive, you need to connect it to power and data cables. The data cables and connectors provided are shown in Fig. 1-5.

Figure 6-7 Data Cables and Connectors



Installing IDE Drives

NOTE Before installing an IDE Hard disk, refer to the drive's installation guide to check jumper settings or if there is a special installation procedure to follow.

There are three or four data cables inside your workstation. Two of these are for IDE devices.

- The ATA IDE cable supports two IDE devices. This cable is connected to the Primary IDE connector on the system board. The bootable hard disk drive is connected to this cable via the MASTER connector. A second hard disk drive could be installed by using the SLAVE connector.

- A second IDE drive cable supports two IDE devices. If you install a CD-ROM drive, a DVD drive or a Zip drive, connect it to this cable.
- The third cable has one connector for a floppy drive.
- SCSI models have an additional cable and connectors. For more information, refer to “Installing SCSI Drives” on page 127.

The following table explains which data connectors you should use when you install additional devices.

Examples of multiple IDE drive combinations		
Configuration	Connections to data cables	
1 Hard disk drive 1 CD-ROM drive	Bootable hard disk drive: CD-ROM drive:	Master connector, Primary IDE Cable Master connector, Secondary IDE Cable
1 Hard disk drive	Bootable hard disk drive:	Master connector, Primary IDE Cable
2 Hard disk drives	Bootable hard disk drive: Second hard disk drive:	Master connector, Primary IDE Cable Slave connector, Primary IDE Cable
2 Hard disk drives 1 CD-ROM drive	Bootable hard disk drive: Second hard disk drive: CD-ROM drive:	Master connector, Primary IDE Cable Slave connector, Primary IDE Cable Master connector, Secondary IDE Cable
1 Hard disk drive 1 CD-ROM drive 1 Zip drive	Bootable hard disk drive: CD-ROM drive: Zip drive:	Master connector, Primary IDE Cable Master connector, Secondary Cable Slave connector, Secondary IDE Cable
2 Hard disk drives 1 CD-ROM drive 1 Zip drive	Bootable hard disk drive: Second hard disk drive: CD-ROM drive: Zip drive:	Master connector, Primary IDE Cable Slave connector, Primary IDE Cable Master connector, Secondary IDE Cable Slave connector, Secondary IDE Cable

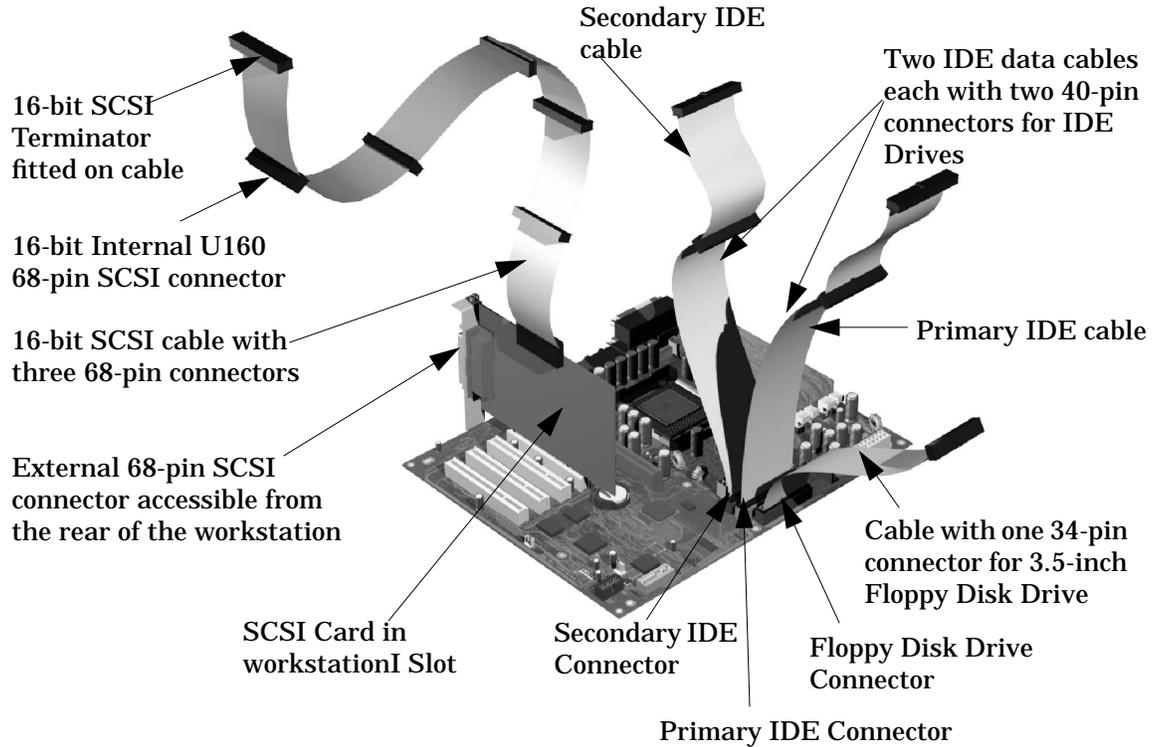
Verifying Your IDE Drive

1. Switch on the computer.
2. To verify the configuration of your hard disk drive, press **F2** to enter Setup when the HP logo appears. Once in Setup, select the **Advanced** menu, then the **IDE Devices** submenu. In the **Primary Master** item, check that the details for the device have been correctly detected by the Setup program.
3. Press **F3** to save and exit Setup.
4. Refer to the operating system documentation for information on partitioning and formatting a drive.
5. If an IDE drive is removed, switch on the computer. The system BIOS will detect that the device is missing. Press **F4** to confirm that you want to remove the device. The system configuration will be updated automatically.

Installing SCSI Drives

Models with a SCSI card can be connected to up to five internal SCSI devices. Figure 6-8 shows both SCSI and IDE cables.

Figure 6-8 Cables and Connectors (SCSI Models)



NOTE

The total length of the external SCSI cables should not exceed 3 meters (approximately 10 feet).

Setting SCSI IDs

There are several SCSI Hard Disk Drives that may be installed in your system. For each of these drives, you must assign an unused SCSI ID. SCSI IDs range from 0 to 15 for wide 16-bit SCSI.

Table 6-1 SCSI ID Settings

SCSI ID	Used By
0	First SCSI hard drive
1	Optional second SCSI hard drive
2 - 6	Unused
7	SCSI controller
8 - 15	Unused

To set the SCSI ID:

1. Assign an unused SCSI ID. See Table 6-1:
 - If you are *adding* a SCSI hard drive to your system, consider setting the new hard drive SCSI ID to 1. However, if you have other SCSI devices connected externally, or have changed the SCSI ID of the currently installed hard drive, remember that this SCSI ID must be unique.
 - If you are *replacing* a SCSI hard drive, you can use the SCSI ID number of the current hard drive for the replacement hard drive.
 - SCSI IDs are set by jumpering pins on the disk drive

Which Pins To Jumper

First, compare your drive to the photos in Figure 6-9, Figure 6-10, Figure 6-11 or Figure 6-12 to determine which drive is installed in your system. Your drive will be type A, B, C or D. Then use Table 6-2 for the proper pins to jumper on your drive.

Using the jumpers provided, set the SCSI ID on the jumper block located on the bottom of the hard disk drive. Do not use the 12-pin jumper block next to the power connector.

NOTE Jumpers must be installed vertically. If jumpers are installed horizontally across adjacent pins, there is no effect. However, this is a good way to store unused jumpers.

Figure 6-9 Drive Style A

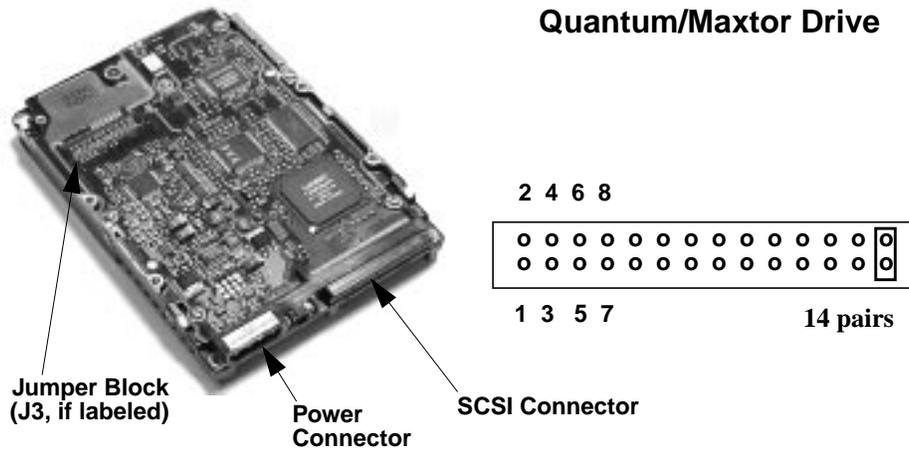


Figure 6-10 Drive Style B

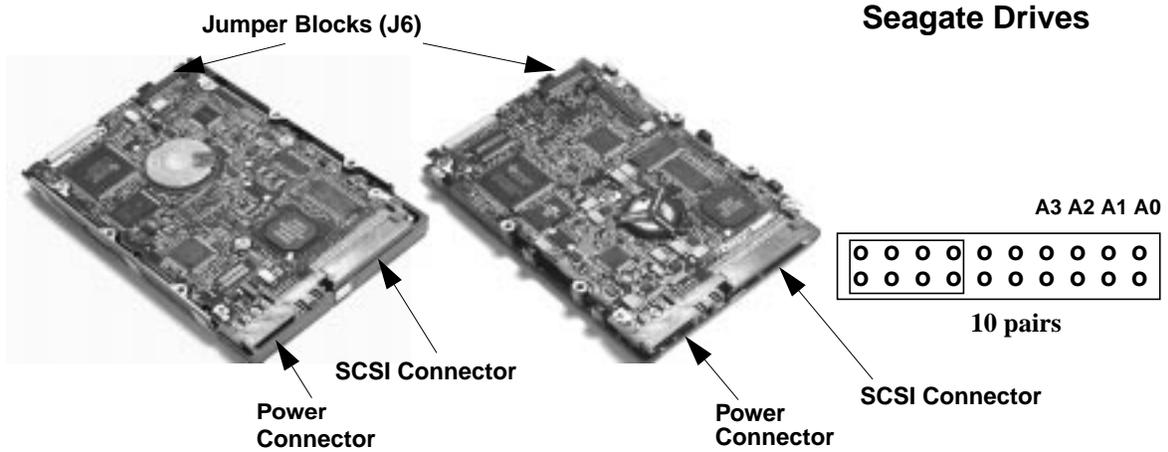


Figure 6-11 Drive Style C

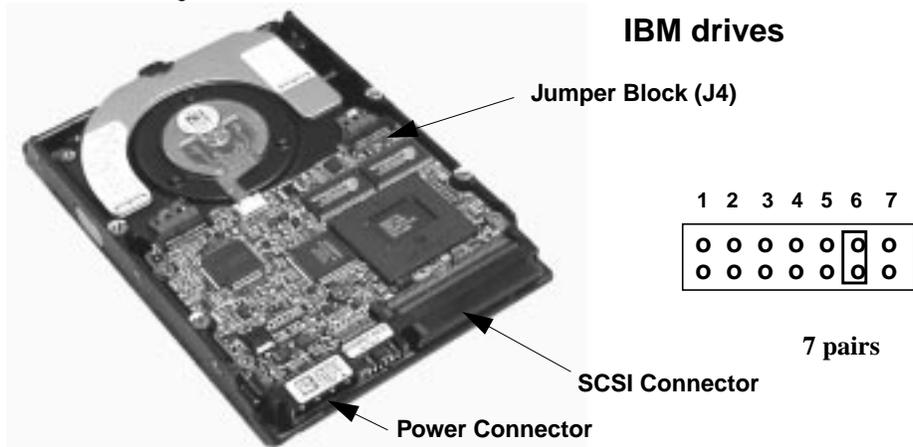


Figure 6-12 Drive Style D

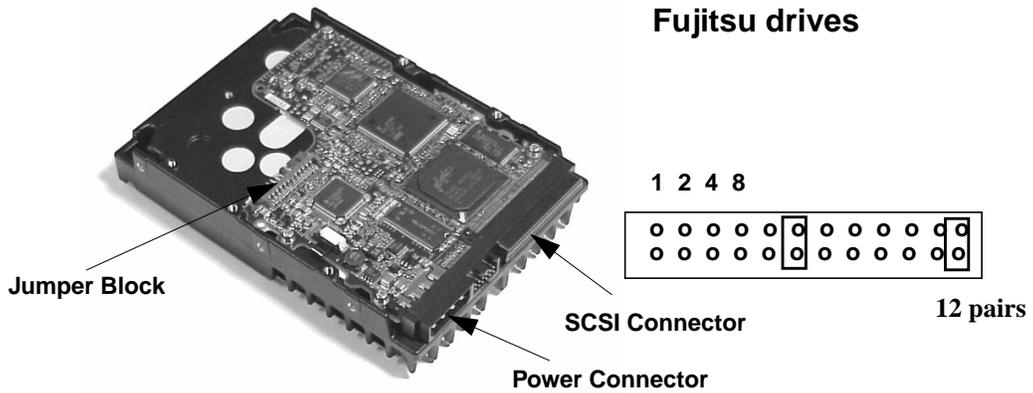


Table 6-2 Pins to Jumper

Drive Style/SCSI ID	Pins to Jumper (n)			
	1/2	3/4	5/6	7/8
(Quantum/Maxtor) A				
(Seagate) B	A3	A2	A1	A0
(IBM) C	1	2	3	4
(Fujitsu) D	1	2	4	8
SCSI ID = 0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 2	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 3	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 4	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 6	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Table 6-2 Pins to Jumper (Continued)

Drive Style/SCSI ID	Pins to Jumper (n)			
SCSI ID = 7	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 10	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 11	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 12	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 13	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SCSI ID = 14	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
SCSI ID = 15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Verifying Your SCSI Drive

1. Switch on the computer.
2. To enter the SCSI Configuration Utility press **Ctrl-C** when prompted during the workstation's start-up routine.
3. Verify or modify the configuration of your new SCSI hard disk drive.
For more information on configuring a SCSI hard disk drive, refer to the SCSI User's Guide.
4. When configuration is complete, exit the SCSI Configuration Utility and re-boot the computer to save any changes.

Number of SCSI Hard Disks	Standard HP SCSI Configuration (SCSI ID numbers)
1	ID0
2	ID0, ID1
3	ID0, ID1, ID2
4	ID0, ID1, ID2, ID3

additional guide rails

Extra guide rails are supplied for the installation of additional mass storage devices. These are inside the workstation, three pairs attached on the side of the front access bays and one pair on the chassis beam. Depending on the device to be installed, dedicated guide rails are required and are easily recognized by their distinct shape, markings and color.

The following table indicates the device, location, and required rails.

Device to be Installed	Location	Required Rails
3.5-inch device (2nd hard disk drive)	3.5-inch internal shelf	Blue left and right rails (L or R indicated on the rail)
5.25-inch device (CD-ROM, DVD, etc.)	5.25-inch front access bay	Wide green rails (L or R not indicated on the rail)
3.5-inch device (zip drive or second floppy disk drive)	3.5-inch front access bay	Narrow green rails (L or R indicated on the rail)

Removing And Replacing A Hard Disk Drive

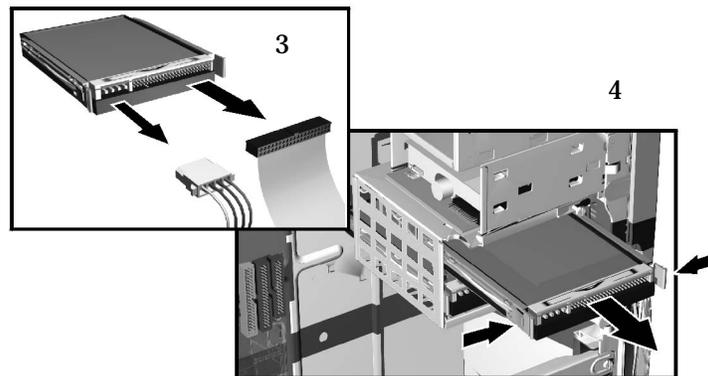
CAUTION

Handle the hard disk drive with care. Avoid shocks and violent movements which can cause damage to the hard disk drive's internal components. A drop of one-quarter inch can damage it. Make sure you back up your files before you install a hard disk drive. Refer to your operating system documentation for information on how to do this.

Removing The Old Drive

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. Disconnect the data and power cables from the hard disk drive.
4. Remove the drive. To do this, press the two front clips inward and, pushing from the rear, slide out the drive. See Figure 6-13.

Figure 6-13 Disconnecting and Removing the Drive



5. Remove the two blue guide rails by gently prying them off the hard disk drive. These guide rails will be required for the new disk drive.

NOTE

Configure the new hard disk drive with the same jumper settings as the old one.

Installing The New Drive

1. Add the blue guide rails to the new hard disk drive. Insert the guide rail labeled "L" on the left-hand side (cable connectors facing towards you and positioned at the bottom), and the guide rail "R" on the right-hand side of the hard disk drive.
2. The hard disk drive can only be inserted one way. Ensure that the data and cable connectors are facing you and positioned at the top. The boot IDE drive is normally located in the lower drive shelf. If you are adding a secondary IDE drive, move the

boot drive to the upper shelf and install the secondary drive in the lower shelf. This will insure the cables are positioned correctly. This procedure is not necessary if the drive is a SCSI drive.

3. Align the guide rails on both sides of the drive with the internal shelf guides and then slide the drive in until it clicks into position.

NOTE

Avoid trapping or disconnecting the hard disk drive bay thermal sensor cable. If this cable becomes disconnected, reconnect it to the system board connector marked **THERMAL_SENSOR** (positioned near the IDE and Floppy data cable connectors).

4. Connect the power cable and the data cable to the new hard disk drive. *The connectors are shaped to go in one way only.* If you are not sure which connector to use, refer to “Mass Storage And Optical Device Overview” on page 125.
5. Replace the workstation’s cover (refer to page 119). Reconnect all the power and telecommunications cables.
6. Turn to page 138 to complete the installation.

Installing A Second Hard Disk Drive In An Internal Shelf

The internal hard disk shelves, located just under the floppy drive, can support two 3.5-inch devices.

To install a second hard disk drive:

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. If the boot IDE hard disk drive is installed in the lower shelf, disconnect the data and power cables. Move the boot drive to the upper shelf and install the secondary drive in the now empty lower shelf. This is not necessary if the drive is a SCSI drive.
4. Attach the blue rails (found on the CD cage) to the new hard disk drive. Insert the guide rail labeled "L" on the left-hand side (cable connectors facing towards you and positioned at the bottom), and the guide rail "R" on the right-hand side of the hard disk drive.
5. You can insert the second hard disk drive only one way. Make sure the data and cable connectors are facing you and positioned at the top.
6. Align the guide rails on both sides of the drive with the internal shelf guides and then slide the drive into the bottom shelf until it clicks into position.

NOTE

Avoid trapping or disconnecting the hard disk drive bay thermal sensor cable. If this cable becomes disconnected, reconnect it to the system board connector labeled **THERMAL_SENSOR** (positioned near the IDE and Floppy data cable connectors).

7. Connect the power and data cables to the second hard disk drive. Reconnect the power cables and the data cable to the boot hard disk drive.
8. Replace the workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables. Turn to page 138 to complete the installation.

Installing A Device In A Front Access Bay

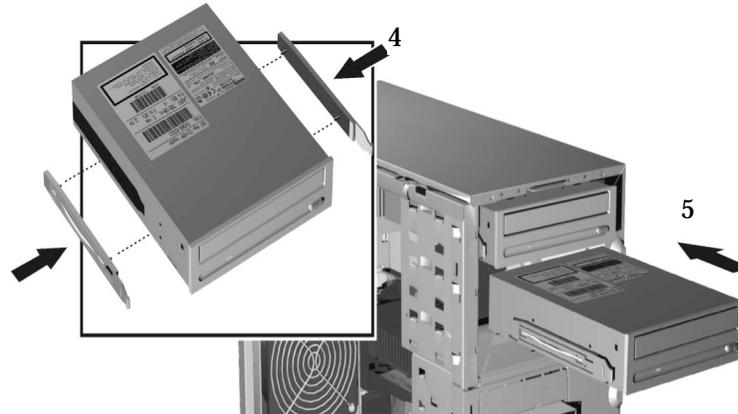
1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover and front upper bezel (refer to page 138 for instructions).
3. Depending on the device to be installed, either:
 - a. Remove the snap-in 5.25-inch metal filler plate.
Through the round filler plate opening located on the left-hand side of the filler plate, use your index finger to pull the plate from the workstation chassis.
 - b. For 3.5-inch installations, use a flat blade screwdriver to break off the 3.5-inch metal filler plate from the workstation chassis; first from one side then the other.

CAUTION

Be very careful not to hurt your fingers when you remove the filler plates.

4. Align the guide rails on both sides of the drive with the internal shelf guides and then slide the drive in until it clicks into position. See Figure 6-11.

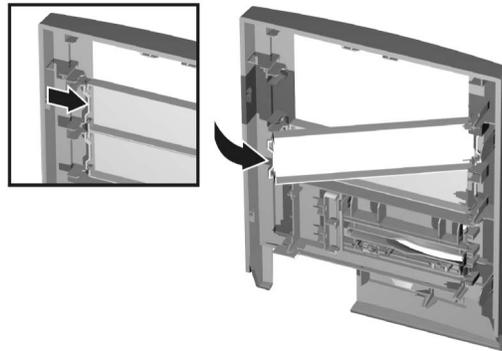
Figure 6-14 Attaching the Rails and Installing the Drive



5. Connect the power and data cables to the installed device. The connectors are shaped to go in one way only. If you are not sure which connector to use, refer to "Mass Storage And Optical Device Overview" on page 125.

6. To allow front access to the device, remove the plastic filler from the upper bezel by unclipping it on one side and pivoting it out. Store the plate in a safe place.

Figure 6-15 Removing the Plastic Filler



7. Replace the front upper bezel and workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.
8. Turn to page 138 to complete the installation.

Completing Mass Storage Device Installation

IDE Drive

1. Switch on the computer.
2. To verify the configuration of your hard disk drive, press **F2** to enter Setup when the HP logo appears. Once in Setup, select the **Advanced** menu, then the **IDE Devices** submenu. In the **Primary Master** item, check that the details for the device have been correctly detected by the Setup program.
3. Press **F3** to save and exit Setup. Refer to the operating system documentation for information on partitioning and formatting a drive.
4. If an IDE drive is removed, switch on the computer. The system BIOS will detect that the device is missing. Press **F4** to confirm that you want to remove the device. The system configuration will be updated automatically.

SCSI Drive On SCSI Models

1. Switch on the computer. To enter the SCSI Configuration Utility press **Ctrl-C** when prompted during the workstation's start-up routine.
2. Verify or modify the configuration of your new SCSI hard disk drive. For more information on configuring a SCSI hard disk drive, refer to the SCSI User's Guide.
3. When configuration is complete, exit the SCSI Configuration Utility and re-boot the computer to save any changes.

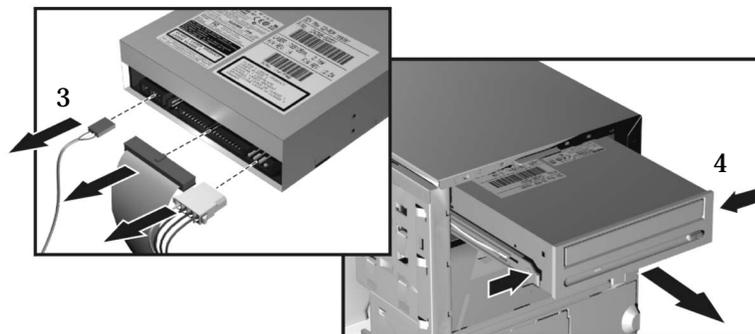
Number of SCSI Hard Disks	Standard HP SCSI Configuration (SCSI ID numbers)
1	ID0
2	ID0, ID1
3	ID0, ID1, ID2
4	ID0, ID1, ID2, ID3

Replacing The CD-ROM Drive (or DVD-drive)

Removing The Old Drive

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover and front upper bezel (refer to page 119 for instructions).
3. Disconnect the power and data cables from the old drive.
4. Remove the drive. To do this, press the two front clips inward and, pushing from the rear, slide out the drive. See Figure 6-13.
5. Remove the two green guide rails by gently prying them off the drive. These guide rails will be required for the new drive.

Figure 6-16 Removing the Old Drive



iNstalling The New Drive

1. Add the guide rails to the new drive. The guide rails are inserted in the two holes located at the bottom of the drive. There is no specific side to which these guides must be installed.
2. Align the guide rails on both sides of the drive with the internal shelf guides, then slide the drive in until it clicks into position.
3. Connect the power cable and the data cable to the rear of the new drive. *The connectors are shaped to go in one way only.* If you are not sure which connector to use, refer to “Mass Storage And Optical Device Overview” on page 125.
4. Replace the front upper bezel and workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.
5. Turn to page 138 to complete the installation.

completing the installation

1. Switch on the computer and press F2 when the HP logo appears.

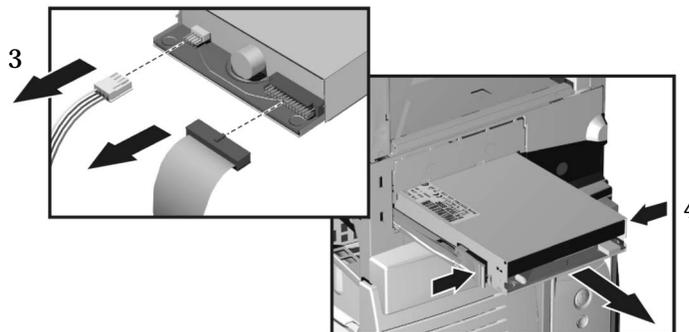
2. In the *Setup* program, select the **Advanced** menu, then the **IDE Devices** submenu. Check that the CD-ROM drive has been detected on the IDE channel.
3. Press **F3** to save and exit the program.

Replacing The Floppy Disk Drive

Removing The Floppy Disk Drive

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover and front upper bezel (refer to page 119 for these instructions).
3. Disconnect the power and data cables from the old drive.
4. Remove the drive. To do this, press the two front clips inward and, pushing from the rear, slide out the drive.
5. Remove the two green guide rails by gently prying them off the drive. These guide rails will be required for the new drive.

Figure 6-17 Removing the Floppy Disk Drive



Installing The Floppy Disk Drive

1. Add the green guide rails to the new drive. Insert the guide rail labeled "L" on the left-hand side (cable connectors facing towards you and positioned at the top), and the guide rail "R" on the right-hand side of the hard disk drive.
2. Align the guide rails on both sides of the drive with the internal shelf guides, then slide the drive in until it clicks into position.
3. Connect the power and data cables to the new drive and any installed drives. *The connectors are shaped to go in one way only.*
4. Replace the front bezel and workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.

completing the installation

1. Switch on the computer and press **F2** when the HP logo appears.
2. In the *Setup* program, select the **Advanced** menu, then the **Floppy Disk Drives** submenu, and check that the drive has been detected.
3. Press **F3** to save and exit the program.

Replacing The Power Supply Unit

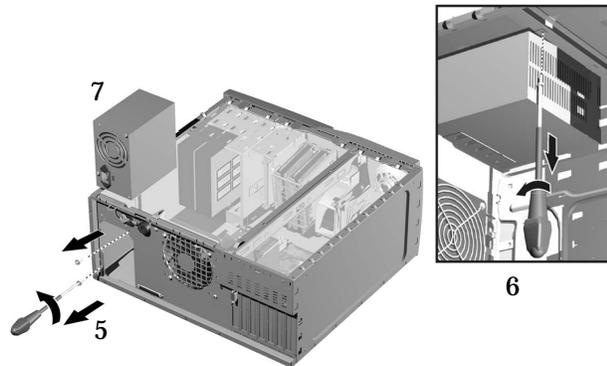
WARNING

Hewlett-Packard does not support power supply upgrades. This information is provided to help you replace a defective power supply unit. For your safety, only replace with a power supply unit provided by HP support services.

Removing The Power Supply Unit

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. Remove *all* internal power supply connectors.
4. Place your workstation on its side with the system board facing upwards.
5. Remove the two screws located on the rear of the chassis that secure the power supply unit in position.
6. Remove the screw located inside the workstation at the top of the power supply unit.
7. Push the supply unit forward until it is clear of the guide rail. Slightly tilt it towards the system board, then remove it from the chassis.

Figure 6-18 Removing the Power Supply Unit



Installing The Power Supply Unit

1. Insert the new power supply unit.
2. Secure it in position using the three screws you previously removed.
3. Reconnect *all* internal power supply connectors.
4. Return the workstation to its upright position.
5. Replace the workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.

Replacing The Processor

Removing The Existing Processor

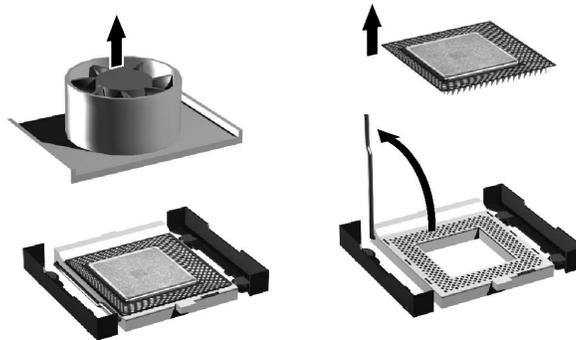
1. Turn on the workstation for 3 to 5 minutes to warm up the heatsink and processor. This will make the separation of the heatsink and the processor easier. Do not leave the workstation on longer than 3 to 5 minutes as the heatsink may become too hot to touch. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. Place the workstation on its side for better access.
4. Remove the heatsink power connector from the system board.

CAUTION

If the Turbo-Fan (located in the center of the heatsink) has not been working, the heatsink may be hot enough to cause burns. Wait until the heatsink has cooled a little before removing.

5. Remove the four heatsink screws then lift off the heatsink. The small amount of heat created during the 3 to 5 minute warm-up should aid in separating the heatsink from the processor.

Figure 6-19 Removing the Processor



6. Open the Zero Insertion Force (ZIF) lever, located at the side of the processor socket, until it is in the vertical position (depending on the socket design, the handle may need to go past vertical), then carefully lift out the processor. To avoid bending the processor pins, keep the processor perfectly flat when removing it. See Figure 6-16.
7. Store the processor in an anti-static bag (for example, the one provided with the replacement processor).

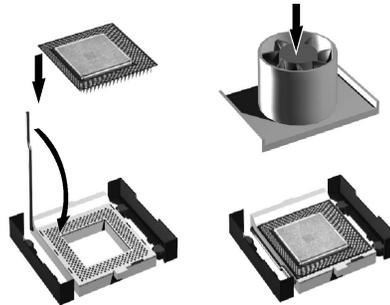
Installing The New Processor

1. If your heatsink has a thermal interface material attached to it, skip this step. When reusing the processor and/or turbocooler heatsink with attached thermal interface material, discard the old thermal interface material. You do not need to scrape off any thermal material that adheres to the processor turbocooler heatsink.

CAUTION

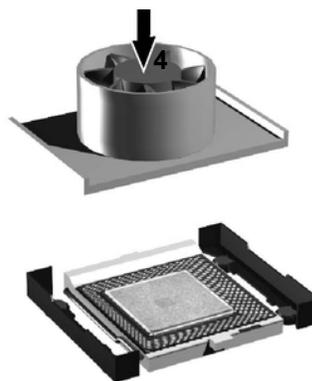
There must be a thermal interface material between the processor and heatsink.

Figure 6-20 Inserting the Processor



2. Ensure that the ZIF socket lever on the system board is in the UP (open) position.
3. Orient the process by matching the notches on the processor to the notches on the ZIF pocket.
4. Carefully lower the new processor into place. When the processor is fully inserted. Close the ZIF lever.
5. Skip this step if your heatsink has an attached thermal interface material. If the original processor needs a thermal interface, center it on the processor chip.
6. Attach the heatsink onto the processor. Screw in the four screws, to attach the heatsink.

Figure 6-21 Attaching the Heatsink



7. Connect the heatsink power connector to the system board.
8. Replace the workstation's cover (refer to page 119 for instructions). Reconnect all the power and telecommunications cables.

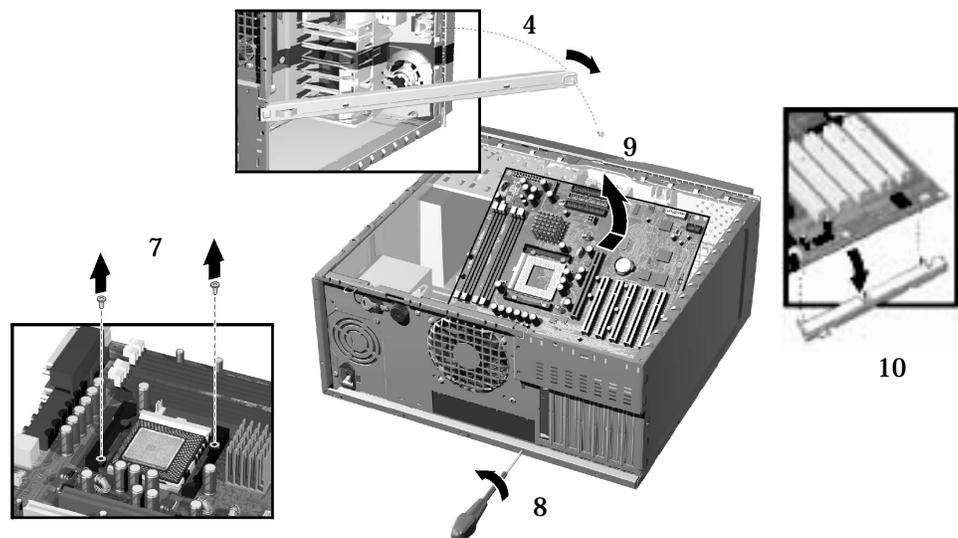
When the workstation is started, you should check that the processor has been correctly identified.

Replacing The System Board

Removing The System Board

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. To ease installation, place your workstation on its side with the system board facing upwards.
4. Remove the workstation chassis beam.

Figure 6-22 Removing the System Board



5. Disconnect any cables attached to the system board.
6. Remove the main memory, processor, heatsink and any accessory cards from the old system board (described in this chapter).
7. Remove the two screws located next to the processor socket.
8. Remove the external screw located on the rear of the workstation near the AGP slot.
9. Remove the system board, being careful not to damage the workstation's rear panel connectors.
10. Unclip the retaining metal bracket from under the system board. This bracket must be re-installed on the new system board.

installing the new system board

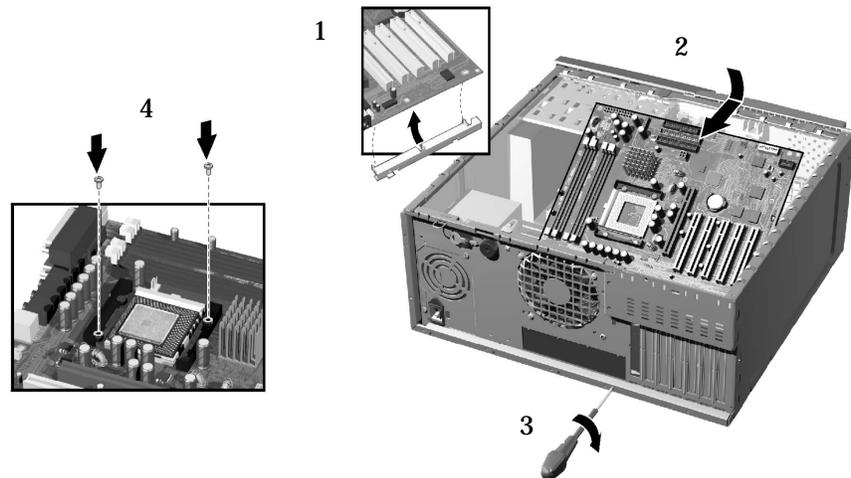
1. Clip the retaining metal bracket onto the new system board.
2. Aligning the rear connectors with their corresponding sockets, insert the system board and lower it onto the guide pins. Ensure that all hooks are correctly positioned. Check that the rear connectors are correctly aligned in their sockets.

CAUTION

When inserting the system board, be careful not to damage or bend the metal fingers on the rear connector EMI shield. If the shield is damaged it can be very difficult to install the system board correctly.

3. Replace the rear screw to secure the system board in place.
4. Replace the two screws located next to the processor socket.

Figure 6-23 Installing the New System Board



5. Reconnect any cables you disconnected earlier from the system board. Note that there are three power connectors on the system board – you must connect all of them. To find out the positions of system board connectors, refer to page 152 or to the label located on the inside of the cover.
6. Replace the main memory, processor, heatsink and any accessory cards in the new system board (described in this chapter). When reinstalling the heatsink, remember to replace the thermal interface.
7. Check system board switch 10 to ensure it is correctly set. Also, check that switch 5 is set to ON. Refer to page 147 for more information about system board switches.
8. Replace the chassis beam and secure it in place with the retaining screw. Make sure the Universal AGP Clip is properly adjusted.
9. Return the workstation to its upright position.
10. Replace the Workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.
11. After installing the system board, you need to update your BIOS.

NOTE

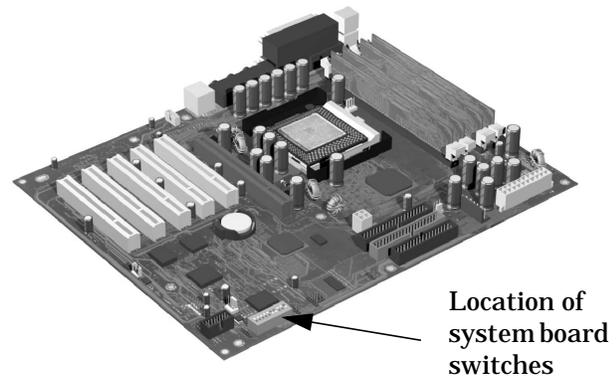
The latest BIOS for your Workstation and instructions on updating the BIOS are available from: www.hp.com/go/workstationsupport.

Setting System Board Switches

There are ten system board switches used for configuration, numbered from 1 to 10. Of these a certain number are reserved and should not be modified, otherwise it could lead to a system failure.

Switch	Default Position	To Configure:
1-4	OFF	Reserved. Do Not change Default Settings
5	ON	Reserved. Do Not change Default Setting
6	ON	Enables keyboard power-on. OFF disables this option.
7	OFF	Enables normal modes. ON enables the BIOS recovery mode at next boot.
8	OFF	Retains CMOS memory. ON clears CMOS memory at next boot.
9	OFF	Enables User and System Administrator passwords. ON clears the passwords at next boot.
10	ON	Selects the chassis type. ON = minitower

Figure 6-24 System Board Switches

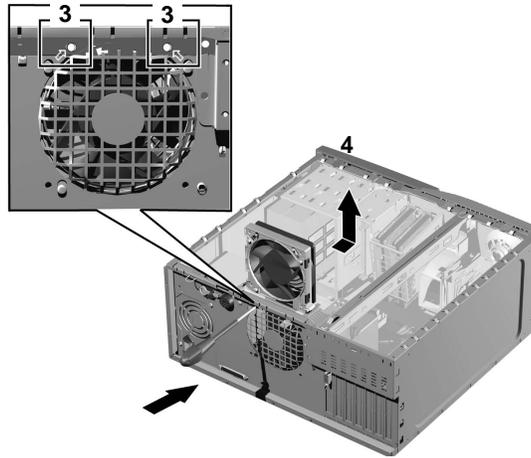


Replacing The System Fan

Removing The Fan

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover (refer to page 119 for instructions).
3. Holding the fan with one hand, use a screwdriver to gently push the retaining clips in the direction shown by the arrows on the chassis, then slide the fan up and out of the chassis.

Figure 6-25 Removing the Fan



4. Disconnect the fan connector from the **CHASSIS_FAN** socket on the system board.

Replacing The Rear Fan

NOTE

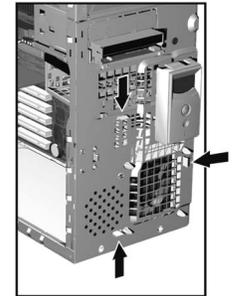
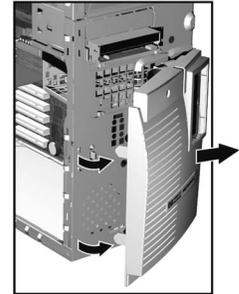
Ensure that all cables are clear of the fan and will not easily come into contact with the fan during normal use or following transportation.

1. The fan unit can only be installed in one way. The distance between the two retaining clips is shorter at the top than the bottom. Align the fan clips with their corresponding holes.
2. Gently push the fan downwards until it clicks into place.
3. Connect the fan connector to the **CHASSIS_FAN** socket on the system board.
4. Replace the workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.

Replacing The Fan And Speaker Assembly

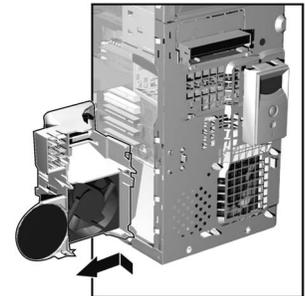
Removing The Fan And Speaker Assembly

1. Switch off the display and workstation. Disconnect all power cables and any LAN or telecommunications cables.
2. Remove the workstation's cover and front upper and lower bezels. Refer to page 119 for these instructions.
3. Disconnect the cables from their connectors located on the system board.
4. For ease of installation, place the workstation on its side with the system board facing upwards.
5. Remove the workstation chassis beam.
6. Remove the screw from the front of the chassis.
7. Unclip the three clips on the front of the chassis.
8. Slide the fan and speaker assembly towards the rear of the workstation until it is clear of the chassis, then remove it from the workstation.



Replacing The Fan And Speaker Assembly

1. Place the fan and speaker assembly behind the internal shelves (the speaker should be near the bottom edge of the chassis and facing towards the front of the workstation). Ensure all cables are clear of the assembly, then carefully move the fan and speaker assembly towards the front of the chassis.
2. Align the clips and guide pins with their appropriate sockets and slide the assembly forward to secure it into place.
3. Connect the fan and speaker cables to their connectors located on the system board.
4. Replace the screw on the front of the chassis.
5. Replace the chassis beam and secure it in place with the retaining screw. Make sure the Universal AGP Clip is properly adjusted.
6. Return the workstation to its upright position.
7. Replace the front upper and lower bezels and workstation's cover (refer to page 119). Reconnect all the power and telecommunications cables.



Replacing The Battery

WARNING

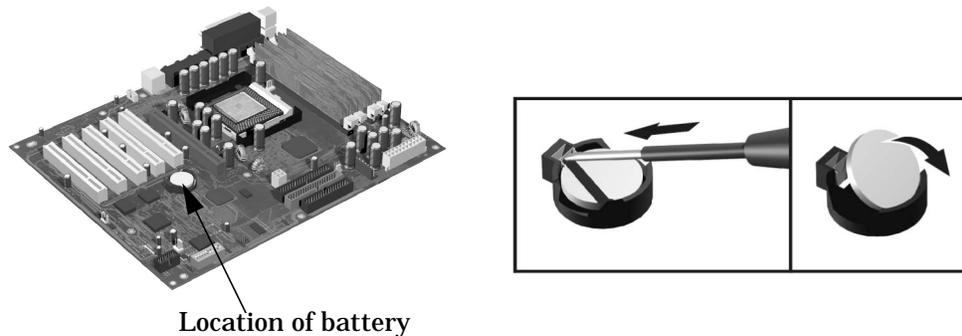
There is a danger of explosion if the battery is incorrectly installed. For your safety, never attempt to recharge, disassemble, or burn the old battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. The battery is a lithium battery which does not contain heavy metals. Nevertheless, in order to protect the environment, do not dispose of batteries in household waste. Please return used batteries to the shop from which you bought them, or to the dealer from whom you purchased your workstation, or to HP, so that they can be either recycled or disposed of in an environmentally sound way. Returned batteries will be accepted free of charge.

If your workstation repeatedly loses its configuration settings you should consider changing the battery. Replace it with a CR2032 coin type manganese/lithium battery, available from most workstation stores.

To change the battery:

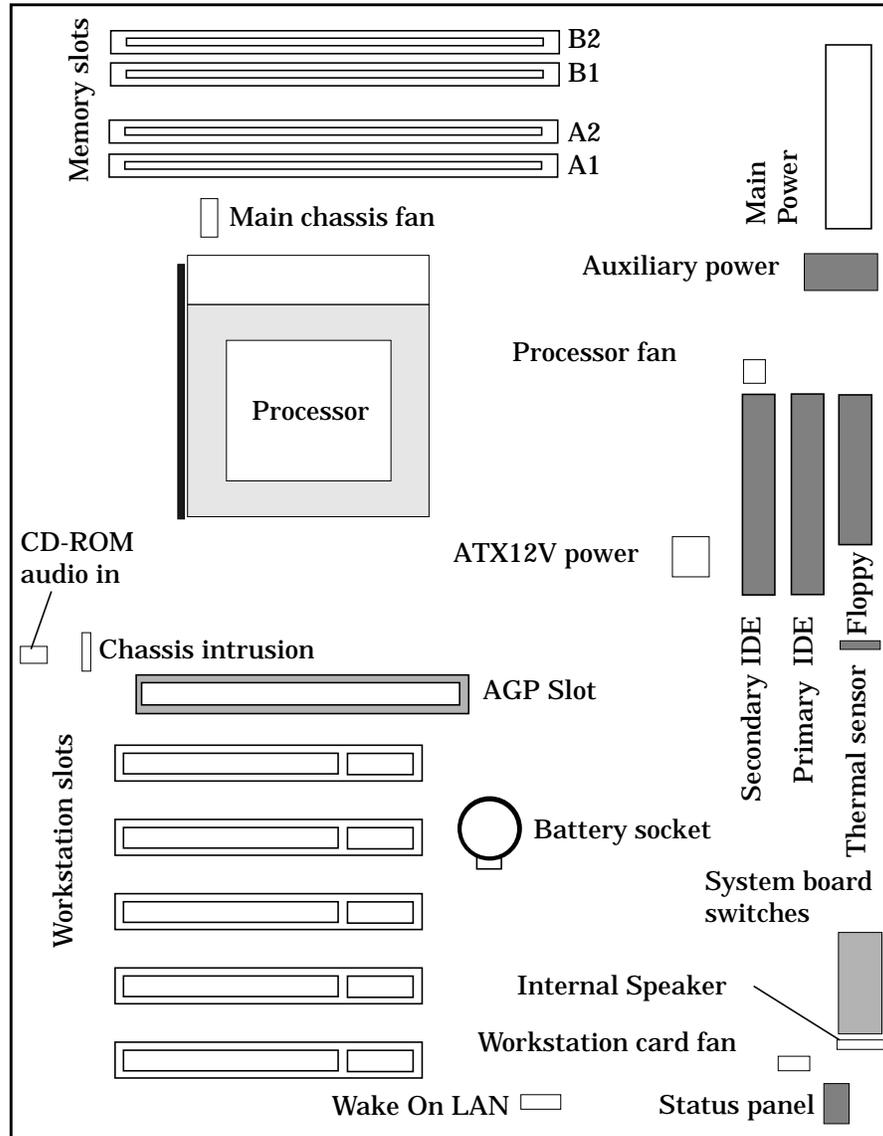
1. Disconnect the workstation's power supply cord and any connection to a telecommunications network.
2. Remove the workstation's cover (refer to page 119).
3. Remove the old battery by sliding it from under the retaining clip(s).

Figure 6-26 Replacing the Battery



4. Place the new battery in the battery holder and ensure that it is properly seated. Ensure that the clip holds the battery firmly in place.
5. Replace the workstation's cover (refer to page 119). Reconnect all cables and power cords.
6. Run the Setup program to reconfigure the workstation.

System Board Connectors



7

Troubleshooting Your Workstation

The following table outlines common problems that are explained in this chapter.

	Symptom: when the power button is pressed, the Workstation...	Type of problem	Refer to page
Case 1	Shows no sign of activity at all: <ul style="list-style-type: none"> • Monitor is blank. • No hard disk drive or fan noise. • MaxiLife status panel does not light up. 	Workstation may not be correctly connected to the power supply.	page 156
Case 2	Appears to boot, but monitor remains blank: <ul style="list-style-type: none"> • Hard disk drive and fan can be heard. • Status LED is GREEN. • MaxiLife status panel displays <code>system booting</code>. 	Monitor may be badly connected or not switched on.	page 158
Case 3	Does not boot: <ul style="list-style-type: none"> • Monitor remains blank. • Status LED is RED. • Beep code emitted. • MaxiLife status panel displays an error message with a sad face (☹). 	HP MaxiLife has detected a hardware configuration error. A component may be improperly connected inside the workstation.	page 160
Case 4	Starts to boot and there is activity on the monitor: <ul style="list-style-type: none"> • Boot process fails with an error message. • Status LED is RED. • MaxiLife status panel displays a sad face (☹) and a POST error message. 	Configuration error has been detected by the POST (Power-On Self Test).	page 164
Case 5	Starts to boot and there is initially some activity on the monitor, but then: <ul style="list-style-type: none"> • Screen becomes blank, or • Image is corrupt. 	Video card may be improperly installed or incorrectly configured. Hard disk drive failure or not accessible.	page 166

Symptom	Type of Problem	Refer To
Workstation starts to boot, but a POST (Power-On Self-Test) error message is displayed on the screen.	• CMOS test error.	page 168
	• Keyboard or mouse are not working correctly.	page 168
	• Floppy disk drive LED does not appear.	page 169
	• Hard disk drive, DVD, CD-RW or CD-ROM drive are not accessible.	page 169
	• Serial or Parallel ports are incorrectly configured. • Devices are not cabled correctly. • Device drivers missing or incorrectly installed.	page 171
An error message appears on the MaxiLife LCD during runtime.		page 171
You cannot turn off the workstation.		page 172

You have forgotten your password.	<ul style="list-style-type: none"> • Can't start the workstation 	page 173
Your workstation has a software problem.	<ul style="list-style-type: none"> • Software application will not run. • Date and time are wrong. 	page 174
Your workstation repeatedly loses its configuration settings.		page 174
You have problems using the Euro symbol.		page 175

Helpful Information	Refer To
Troubleshooting Pre-Boot Checks With HP MaxiLife Hardware	page 160
EMU (Error Message Utility) Description	page 164
Beep Code Table	page 161
If You Have Forgotten Your BIOS Password	page 173
Troubleshooting BIOS Problems: <ul style="list-style-type: none"> • Updating the BIOS. • Restoring BIOS Default Settings. • Clearing the CMOS. • Recovering the BIOS (Crisis Mode). 	page 176 page 176 page 176 page 177
System Board Switches	page 178
Using the HP Setup Program	page 179
Troubleshooting Hardware With HP e-DiagTools	page 182



Case 1: No Activity At All

When the power button is pressed, the workstation appears to boot (sound from the hard disk drive and fan, and status LED is red), but the monitor is blank.

- Monitor is blank.
- No hard disk drive or fan noise.
- MaxiLife status panel does not light up or display any messages.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Symptom...	Check that...	How...
Workstation does not start – the status LED indicator is not illuminated.	You can access the MaxiLife status panel.	Press one of the LCD control buttons to activate MaxiLife. If it comes to life, the power cord is connected. If it doesn't, follow the troubleshooting steps below.
	The power cord is correctly connected.	Connect the power cord to a grounded power outlet and the workstation.
	The power outlet is working.	Plug a light into the grounded power outlet and check that it comes on.
	The voltage switch is correctly set (located on the rear of the workstation).	<ol style="list-style-type: none"> 1. Disconnect the power cord. 2. Select the correct setting. 3. Reconnect the power cord. 4. Start the workstation.
<i>If the workstation still does not start:</i>		
	None of the internal devices are causing the problem.	<ol style="list-style-type: none"> 1. Remove internal power connectors from all internal devices (except for the system board). 2. Reconnect the power cord. 3. Reconnect the power connectors one by one to the internal devices to see if a device is defective. 4. If a device is found to be defective, contact HP Support or your authorized dealer.

Symptom...	Check that...	How...
	There is not a problem with the power supply unit.	<ol style="list-style-type: none"> 1. Replace the power supply unit with a known working power supply from the same model workstation. 2. If the workstation starts, contact HP Support or your authorized dealer. The power supply unit might need replacing.
<i>If the problem persists, contact HP Support or your authorized dealer</i>		



Case 2: Monitor Is Blank, MaxiLife Is OK

When the power button is pressed, the workstation appears to boot (sound from the hard disk drive and fan, and status LED is green), but the monitor is blank.

- Hard disk drive and fan can be heard.
- Status LED is GREEN.
- MaxiLife status panel displays *system booting*.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Symptom...	Check that...	How...
Power indicator light and hard disk activity light work but the screen remains blank.	The display is switched ON (LED is on).	Refer to the monitor manual for an explanation of the LEDs.
	The monitor's power cord is correctly connected.	Ensure the power cord is plugged into a grounded power outlet and into the monitor.
	The monitor's power outlet is working.	Plug a light into the grounded power outlet and check that it comes on.
:		
	The monitor's brightness and contrast settings are correct.	Refer to the monitor manual if necessary.
	The monitor itself is not faulty.	<ol style="list-style-type: none"> 1. Replace the monitor by a known working monitor from the same model of workstation. 2. If the monitor starts, contact HP Support or your authorized dealer. The monitor may need to be replaced.
	The video cable pins are not damaged.	<ol style="list-style-type: none"> 1. Switch off and unplug the monitor. 2. Disconnect the video cable and straighten any bent pins. 3. Reconnect the video cable. 4. Switch on the monitor and see if it works.
You may need to update the Basic Input Output System (BIOS).		The BIOS may be corrupt. Refer to page 177 for instructions on how to recover the BIOS.

Symptom...	Check that...	How...
<i>Dual monitor or multi-monitor configuration problem</i>		
	If you have a dual monitor video card installed, but only one monitor, check that it is connected to Output 1.	The outputs are labelled on the video card.
	If you have two or more video cards installed, but only one monitor, check that the monitor is connected to the correct output.	Plug the monitor in the video output on the AGP video card.
Only one monitor is being displayed by Windows.	The driver is correctly configured for multi-monitor operations.	<ol style="list-style-type: none"> 1. Connect the top connector on the video card, labelled 1, to the first monitor. 2. Connect second connector, labelled 2, to the second monitor. 3. Turn on both monitors before booting the workstation.
One monitor is blank.	Multi-monitor configuration and resolution have been correctly defined.	<ol style="list-style-type: none"> 1. Access Display Properties through Start, Settings, Control Panel. 2. Select the multi-monitor option and configure for the required number of monitors and resolution. <p><i>NOTE:</i> For the Matrox G4xx dual monitor graphics card, the multi-monitor setting is only available if both monitors are connected to the workstation and switched on before the workstation is switched on.</p>

NOTE If the monitor goes blank or becomes corrupted during startup, refer to “Case 5: Screen Goes Blank Or Corrupt Image” on page 166.



Case 3: Boot Fails, Monitor Is Blank, MaxiLife Displays Error Message

When the power button is pressed, the hard disk drive or fan can be heard, but the workstation does not boot. The monitor remains blank and the status LED is red.

- Monitor remains blank.
- Status LED is RED.
- Beep code is emitted.
- MaxiLife status panel displays an error message with a sad face (☹).

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Pre-boot Diagnostics

When your workstation starts up, the BIOS performs a series of pre-boot checks followed by the Power-on Self Test (POST) to test your hardware configuration for any problems. If a problem is detected during the POST, an error is displayed on your workstation's monitor.

If, however, a pre-boot test fails, it will emit an audio signal. An error message is also displayed on the MaxiLife LCD.

The Pre-Boot Diagnostics emits an audio sequence with two kinds of sounds. The first is an unusual series of tones that indicate an anomaly has been detected. This series of sounds also contains an electronic signal that can be sent through a telephone line to an authorized helpdesk or HP Support, if necessary. This signal cannot be interpreted by the human ear. However, it can be decoded by helpdesk equipment to extract the workstation model and serial number.

The second type of sound is a series of long beeps that indicate a particular error. If you hear a series of beeps, you should count them as this will help you detect the cause of the problem.

If your workstation unable to display a POST error message (for example, when you graphics controller has failed), an error message is displayed on the MaxiLife LCD.

Pre-boot Test Errors

The following table shows the type of error messages that can occur during the pre-boot checks.

Beep Code	MaxiLife Message	Cause...	Check that...
1 beep	CPU Socket	Processor absent, not correctly connected or ZIP socket not closed	<ul style="list-style-type: none"> Check processor correctly connected and ZIP socket closed. Processor socket 2 contains a terminator if it is unused.
2 beeps	—	Power supply is in protected mode	<ul style="list-style-type: none"> Power cables inside the workstation are correctly connected.
3 beeps	Contin Module	No continuity modules in unused sockets	<ul style="list-style-type: none"> If unused, memory sockets A2 and B2 must contain RDRAM continuity modules.
	No RIMM	No RDRAM memory modules installed	<ul style="list-style-type: none"> Memory modules are installed (two identical RDRAM modules in sockets A1 and B1).
	RIMM Speed	The RDRAM modules have incompatible speed ratings	<ul style="list-style-type: none"> All installed memory modules have identical speed rating.
	Mem Miscompare	Incompatible RDRAM memory module pairs installed.	<ul style="list-style-type: none"> Sockets A1 and B1 contain identical RDRAM memory modules (identical speed, size and type). Sockets A2 and B2 contain identical RDRAM memory modules (identical speed, size and type), or RDRAM continuity modules.
	Memory Error	No memory, bad memory modules, incompatible memory module	<ul style="list-style-type: none"> Memory modules are correctly seated in sockets. If unused, memory sockets A2 and B2 must contain RDRAM continuity modules.
4 beeps	No Video	Graphics card problem	<ul style="list-style-type: none"> Video card installed. Video card seated correctly in the AGP connector.
5 beeps	PCI Detect	PnP/PCI initialization problem	<ul style="list-style-type: none"> PCI cards are correctly inserted in their slots. You can try removing a PCI card to see if it is causing the problem.
6 beeps	—	Corrupted BIOS.	<ul style="list-style-type: none"> You need to activate crisis recovery procedure (refer to page 177).
7 beeps	—	Defective system board	

If You Miss The Beep Code

If you miss the beep code, turn off the workstation by pressing the on/off power button for five seconds or more, then listen for the signal again.

Post Test Errors

Following the pre-boot checks, the POST (Power-On Self Test) sequence is initiated. It should be noted that in some cases, a Beep and Post Error can occur at the same time.

The following table shows the type of error messages that can be displayed on the MaxiLife status panel, and the action to take.

The Boot Step option must be selected for these messages to be displayed by MaxiLife.

MaxiLife Error Message	Action to Take
P.O.S.T. Start	Change system board
CPU Regist. Init	Change system board
I/O Init.	Change system board
IDE Init.	Change system board
PCI Mast. Init.	Change system board
BIOS Check sum	Change system board
RAM Refresh Test	Change system board
Keyb. Ctrl. Test	Keyboard missing. If this is not the case, change system board.
Memory Detection	Check memory then system board
RAM Add. Failure	Check memory then system board
RAM Data Low	Check memory then system board
RAM DATA High	Check memory then system board
Shadow Bios Rom	Flash BIOS again then check system board
PCI Detection	Check PCI cards. If this does not work, change system board.
Video Detection	Check AGP card then system board
Keyboard Test	Keyboard missing or change keyboard
Unexpect. STOP	Change system board
Base Memory Test	Check memory then system board
Ext. Memory Data	Check memory then system board
Ext. Memory Add	Check memory then system board
Mouse PS2 Test	Change mouse. If this does not work, change system board.
Disc Ctrl. Init.	Check SCSI card (if installed). If this does not work, change system board.
Disc Bus Init.	Check SCSI card (if installed). If this does not work, change system board.
MaxiLife Test	Change system board. If this does not work, change control panel.
CDROM Ctr. Init.	Check CD-ROM. If this does not work, change system board.
Opt. Rom Detect.	Change system board.

Case 3: Boot Fails, Monitor Is Blank, MaxiLife Displays Error Message

MaxiLife Error Message	Action to Take
Check ATA / SCSI	Check SCSI card (if installed). If this does not work, change system board.
Bios SETUP	No action necessary. This message is displayed when the user enters the BIOS Setup program.
...Checking...	Change system board
ACPI Init.	Change system board
Check Password	This message is displayed when the user needs to enter a password.
Prepare Boot	Change system board
Dmi Tables Init.	Change system board
PNP Opt. ROM Ini	Change system board



Case 4: Boot Process Fails, Error Message Appears

When the power button is pressed, the workstation starts to boot and there is activity on the monitor, but the boot process then fails with an error message. Status LED is red. A configuration error has been detected.

- Boot process fails with an error message.
- Status LED is RED.
- MaxiLife status panel displays (⚠) and a POST error message.

NOTE

Before removing the cover, switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Error Message Utility (EMU)

In the event of an error generated in POST (Power-On-Self-Test) during the boot process, there are two beeps, then the Error Setup Manager gives access to one or more detected errors. Each EMU error is displayed as a 4-digit code with an associated text message on the monitor screen and the MaxiLife LCD panel.

For a list of POST errors displayed by MaxiLife and the recommended solutions, refer to “Post Test Errors” on page 162.

NOTE

If the monitor is not available, a short error message is also displayed on the MaxiLife LCD panel.

Further details can be accessed by pressing **Enter**. A detailed description of the reason for the failure and how to solve the problem is displayed.

The following examples give the different types of error categories.

<i>Category #1:</i>	If the error is only a warning (for example, key stuck), the POST should prompt:
WARNING^a 00100	Keyboard Error

- a. After a timeout period of five seconds without any intervention, the system resumes to boot

<i>Category #2:</i>	If the error is serious, the POST should prompt:
00xx	The BIOS has detected a serious problem that prevents your workstation from booting
Press <Enter> to view more information about error	

Case 5: Screen Goes Blank Or Corrupt Image

When the power button is pressed, the workstation starts to boot and there is initially some activity on the monitor, but then the screen goes blank or the image is corrupt.

- Screen becomes blank, or
- Image is corrupt.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Symptom....	Check that...	How...
Workstation boots correctly, but when the operating system starts loading, the screen goes blank or image is corrupt.	The monitor supports the resolution and selected refresh rate. This type of problem can occur if the workstation is configured using one monitor, then swapped with another one.	<ol style="list-style-type: none"> 1. Reboot the workstation in VGA mode. Then, access Display Properties through Start, Settings, Control Panel. 2. Change the display resolution and refresh values to settings that can be handled by your monitor.
<i>If the screen is still blank or corrupt</i>		
	The video card is correctly inserted in the socket on the system board.	<ol style="list-style-type: none"> 1. Follow the instructions indicated in the above Note about removing the cover and switching off the workstation. 2. Remove the AGP card, then carefully re-insert it into the socket. 3. Replace the cover and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.
	Hard disk drive is correctly configured and cables are connected.	Refer to page 169 for further help, if required.
	Hard disk drive is accessible.	Refer to page 182 for instructions about troubleshooting using HP e-DiagTools.
<i>If the screen is still blank or corrupt</i>		
	The video driver is not corrupted or incorrectly installed.	Install the latest driver for the video card. This can be downloaded from the Workstation Support web site: www.hp.com/go/workstationsupport , then HP Workstation x2100.

Use Or Configuration Problems

If your workstation boots normally, but you are having problems using or configuring your workstation.

Symptom	Type of Problem	Refer To
Workstation starts to boot, but a POST (Power-On Self-Test) error message is displayed on the screen.	<ul style="list-style-type: none"> CMOS test error. 	page 168
	<ul style="list-style-type: none"> Keyboard or mouse are not working correctly. 	page 168
	<ul style="list-style-type: none"> Floppy disk drive LED does not appear. 	page 169
	<ul style="list-style-type: none"> Hard disk drive, DVD, CD-RW or CD-ROM drive are not accessible. 	page 169
	<ul style="list-style-type: none"> Serial or Parallel ports are incorrectly configured. Devices are not cabled correctly. Device drivers missing or incorrectly installed. 	page 171
An error message appears on the MaxiLife LCD during runtime.		page 171
You cannot turn off the workstation.		page 172
You have forgotten your password.	<ul style="list-style-type: none"> Can't start the workstation 	page 173
Your workstation has a software problem.	<ul style="list-style-type: none"> Software application will not run. Date and time are wrong. 	page 174
Your workstation repeatedly loses its configuration settings.		page 174
You have problems using the Euro symbol.		page 175

Helpful Information	Refer To
If You Have Forgotten Your BIOS Password	page 173
Troubleshooting BIOS Problems: <ul style="list-style-type: none"> Updating the BIOS Restoring the BIOS Default Settings Clearing the CMOS Recovering the BIOS (Crisis Mode) 	page 176 page 176 page 176 page 177
System Board Switches	page 178
Using the HP Setup Program	page 179
Troubleshooting Drives With a Problem:	

• Hard Disk Drive	page 180
• CD-ROM, DVD or CD-RW Drives	page 180
Troubleshooting Hardware With HP e-DiagTools	page 182
Recovering Hard Disk Drive Contents	page 186

CMOS Test Error

Symptom: POST displays CMOS test error. CMOS is a chip that keeps a record of installed components when the workstation is turned off.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Check that...	How...
The internal battery is working.	<ol style="list-style-type: none"> 1. Set the workstation to the correct time (refer to the operating system manual). 2. Switch off and <i>unplug</i> the workstation for an hour. 3. Restart the workstation and check the time is correct. 4. If the time is incorrect, replace the battery by a new one. Refer to Chapter 6, Installing and Replacing Hardware Parts.
Clear the CMOS	Refer to page 176 for instructions.
You have the latest BIOS version.	If you need to update, download the latest BIOS version from the HP Workstations Support website: www.hp.com/go/workstationsupport
The system board is working.	Replace the system board by a known working board from the same model of workstation.
<i>If the problem persists, contact HP Support or your authorized dealer</i>	

Keyboard Test Error

Symptom: POST displays a keyboard test error.

Check that...	How...
The keyboard and mouse cables are correctly connected.	Plug the cables into the correct connectors on the back of the workstation. These connectors are easily identified by their color coded icon.
The keyboard is clean and no keys are stuck down. The mouse is clean.	<ul style="list-style-type: none"> • Check all keys are at the same height, and none are stuck (keyboard). • Clean the mouse ball and sensors.
The keyboard/mouse are working	Replace the keyboard/mouse by known working units.
<i>If the workstation boots but you still have a problem...</i>	

You may need to update the Basic Input Output System (BIOS).	Create a bootable floppy to update the BIOS. Refer to page 176.
<i>If the keyboard/mouse still does not work...</i>	
Check that...	How...
The system board is working.	There is a possible problem with the system board. Contact HP Support or your authorized dealer.
<i>If the problem persists, contact HP Support or your authorized dealer.</i>	

Floppy Disk Drive Test Error

Symptom: Power-On-Self-Test displays floppy disk drive test error.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Check that...	How...
The drive is correctly configured in the Setup program.	<ol style="list-style-type: none"> 1. When the message Press F2 to Enter Setup appears, press the F2 key. 2. Check the floppy disk configuration in Advanced > Floppy Setup > Security.
Restore the default settings in the Setup program.	<ol style="list-style-type: none"> 1. When the message Press F2 to Enter Setup appears, press the F2 key. 2. Press the F9 key to restore the default settings.
The drive cables are correctly connected.	Floppy disk drive power and data cables are correctly connected (refer to Chapter 6).
The drive cable is working.	Replace the floppy disk drive cable by a known working cable from the same model of workstation.
The floppy disk is working.	<ol style="list-style-type: none"> 1. Ensure your formatted diskette is inserted correctly. 2. Clean the floppy disk drive using a diskette cleaning kit. 3. Insert a known working floppy disk and see if it works.
<i>If the drive still does not work...</i>	
Check that...	If not...
The system board is working.	There is a possible problem with the system board. Contact HP Support or your authorized dealer.
<i>If the problem persists, contact HP Support or your authorized dealer.</i>	

hard disk, DVD, CD-RW or CD-ROM test error

Symptom: Power-On-Self-Test displays hard disk, DVD or CD-ROM drive test error.

NOTE Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation, reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Check that...	How...
The drive is correctly configured in the Setup program. Refer to page 179.	<ol style="list-style-type: none"> 1. Switch the workstation OFF then ON. 2. When the message Press F2 to Enter Setup appears, press the F2 key. 3. Check the drive is enabled and the correct type is selected.
Restore the default settings in the Setup program.	<ol style="list-style-type: none"> 1. When the message Press F2 to Enter Setup appears, press the F2 key. 2. Press the F9 key to restore the default settings.
The drive cables are correctly connected.	<ol style="list-style-type: none"> 1. Check the drive cables are correctly connected (refer to Chapter 6). 2. Close the workstation, switch it on, check if it works.
The drive cable is working.	<ol style="list-style-type: none"> 1. Replace the drive cable by a known working cable from the same model of workstation. 2. Close the workstation, switch it on, check if it works.
<i>If the drive still does not work, run e-DiagTools to perform one of the hardware diagnostics tests. Refer to page 182.</i>	
Check that...	How...
The drive is working with HP e-DiagTools.	<ol style="list-style-type: none"> 1. Replace the drive by a known working drive from the same model of workstation. 2. Close the workstation, switch it on, check if it works.
You may need to update the Basic Input Output System (BIOS).	Create a bootable floppy to update the BIOS. Refer to page 176.
Check that...	How...
The system board is working.	<ol style="list-style-type: none"> 1. Replace the system board by a known working board from the same model of workstation. 2. Close the workstation, reconnect the power cord and check that the workstation and drive work. 3. If the drive works, contact HP Support or your authorized dealer for further troubleshooting information.
You receive a S.M.A.R.T. alert during the Power-On-Self-Test.	Recommended action: Carry out an immediate data backup, then contact HP Support or your authorized dealer for a replacement hard drive. Refer to page 180.
<i>If there is a hard disk drive crash, refer to Chapter , "Recovering Hard Disk Drive Contents (Windows only)," on page 186.</i>	
<i>If the problem persists, contact HP Support or your authorized dealer.</i>	

Serial Or Parallel Port Test Error

Symptom: POST displays a port test error.

NOTE

Before removing the cover, always switch off the display and workstation. Disconnect the power cord and any accessory cables. When checks have been completed, close the workstation and reconnect the power cord and accessory cables. Verify that the workstation boots correctly.

Check that...	How...
The port is correctly configured in the Setup program.	<ol style="list-style-type: none"> 1. Switch the workstation OFF then ON. 2. When the message Press F2 to Enter Setup appears, press the F2 key. 3. Check the port is enabled and the correct setting is selected under Integrated I/O Ports in the Advanced menu.
Restore the default settings in the Setup program.	<ol style="list-style-type: none"> 1. When the message Press F2 to Enter Setup appears, press the F2 key. 2. Press the F9 key to restore the default settings.
All connected devices are correctly connected and switched on.	<ol style="list-style-type: none"> 1. Plug the cables into the correct connectors on the workstation rear panel. 2. Switch on the workstation and the external devices.
The correct device drivers are installed.	Refer to the device documentation.
<i>If the workstation still has a problem...</i>	
You may need to update the Basic Input Output System (BIOS).	Create a bootable floppy to update the BIOS. Refer to page 176.
Check that...	How...
The system board is working.	<ol style="list-style-type: none"> 1. Replace the system board by a known working board from the same model of workstation. 2. Close the workstation, reconnect the power cord and check that the workstation works. 3. If the port works, contact HP Support or your authorized dealer for further troubleshooting information.
<i>If the problem persists, contact HP Support or your authorized dealer.</i>	

Error Message Appears On The MaxiLife LCD During Runtime

During normal usage (and at boot) of the workstation, MaxiLife continually monitors vital system parameters. These include: temperature, fan malfunctions, power voltage drops, system board PLL problems and CPU problems.

MaxiLife Error Message	Explanation	Action to Take
Power or Power Supply Errors Messages		

MaxiLife Error Message	Explanation	Action to Take
PSU 12 V error	12V PSU is out of range 10,8V – 13,2V	Check power supply unit.
Power CPU error	CPU power is out of range 1V – 3V	Change system board.
PSU 3V3 error	3.3V PSU is out of range 3,15V – 3,45V	Check power supply unit.
2V5 mainboard	2V5 on main board is out of range 2,25V – 2,75V	Change system board.
1V8 mainboard	1V8 on main board is out of range 1,6V – 2,1V	Change system board.
PSU -5V error	-5V on main board out of range 4,5V – 5,5V	Check power supply unit.
Temperature Error Messages		
Processor Temp	Processor temperature exceeds 80°C	Check airflow access to the heatsink. Check processor.
CPU Shutdown	thermal or internal processor failure	Check processor.
PCI Temperature	Ambient or PCI temperature exceeds 64°C	Check airflow access to the PCI area.
Disk Temperature	Disk temperature exceeds 58°C or sensor unplugged	Check airflow access to the disk area. Check sensor is plugged in.
CPU Throttle	Processor on thermal protection – frequency is halved.	Check airflow access to the heatsink. Check processor.
Fan Error Messages		
System FAN	—	Check if system fan has stopped or is unplugged.
PCI FAN	—	Check if PCI fan has stopped or is unplugged.
CPU FAN	—	Check if CPU fan has stopped or is unplugged.

You Cannot Turn Off Your Workstation

Symptom...	Check that...	How...
Workstation does <i>not</i> make a buzzing or beeping sound when you press the power button, but you are still unable to turn it off.	You have saved all data and exited all programs.	<ol style="list-style-type: none"> 1. Save all data and exit all programs (if you can). 2. Press the power button and keep it pressed for 5 seconds. The workstation will turn off. 3. Remove the power cord.

You Have Forgotten Your Password

NOTE

Use these instructions if the passwords were set with the *Setup* program.

Symptom...	Solution...
<p>You have forgotten the User password.</p>	<ol style="list-style-type: none"> 1. Switch off the workstation. 2. Restart the workstation. If you are prompted for a password, enter the Administrator password. 3. When Press F2 to Enter Setup appears, press the F2 key. 4. Enter the Administrator Password to access the <i>Setup</i> program. 5. Go to the Security menu. 6. Go to the Set User Password field and set a new User Password. This will replace the old password which you had forgotten. 7. Press Esc or select Exit Menu to save the new Password and exit Setup.
<p>You have forgotten the Administrator password.</p>	<ol style="list-style-type: none"> 1. Switch off the workstation and remove the power cord. 2. Remove the workstation's cover. 3. Set switch 9 on the system board switch block to the ON position. 4. Replace the power cord and restart the workstation. 5. When the message Passwords have been cleared appears on screen, switch off the workstation. 6. Remove the power cord and reset switch 9 back to the OFF position. 7. Replace the workstation's cover. 8. Switch on the workstation and allow it to complete its startup routine. 9. After the Power-On-Self-Test has completed, press F2 when prompted to use the Setup program. 10. Set the Administrator and new User Passwords. 11. Press Esc or select Exit Menu to save the new Password and exit Setup.

Your Workstation Has A Software Problem

Symptom...	Solution...
Green power indicator light is illuminated, but some software won't run.	<ul style="list-style-type: none">• Refer to the application software documentation and/or the operating system documentation for guidance.• If the software is running but not functioning properly, try to save any unsaved data, then close down the application and re-launch it. If it still does not work, restart the workstation and then try launching the software again.• Reinstall the software.• If the problem continues, contact the software manufacturer's support services.
Date and time are wrong.	<p>The date and time may be incorrect because the time has changed due to Daylight Savings Time.</p> <p>To change the date and time, use your operating system utilities or the Setup program. If necessary, install a new battery (refer to Chapter 2).</p>
<i>If there still is a software problem...</i>	
	Run HP e-DiagTools to check the hardware configuration. Refer to page 182.

Workstation Clock Does Not Keep Time Correctly

If your workstation repeatedly loses its configuration settings you should consider changing the battery. Replace it with a CR2032 coin type manganese/lithium battery, available from most Computer stores.

WARNING

There is a danger of explosion if the battery is incorrectly installed. For your safety, never attempt to recharge, disassemble, or burn the old battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. The battery is a lithium battery which does not contain heavy metals. Nevertheless, in order to protect the environment, do not dispose of batteries in household waste. Please return used batteries to the shop from which you bought them, to the dealer from whom you purchased your workstation, or to HP, so that they can be either recycled or disposed of in an environmentally sound way. Returned batteries will be accepted free of charge.

To change the battery:

1. Disconnect the workstation's power supply cord and any connection to a telecommunications network.
2. Remove the workstation's cover.
3. Remove the old battery by sliding it from under the retaining clip.
4. Place the new battery in the battery holder and ensure that it is properly seated. Ensure that the clip holds the battery firmly in place.
5. Replace the cover. Reconnect all cables and power cords.

6. Run the *Setup* program, accessed by pressing F2 at startup, to reconfigure the workstation.

You Have Problems Using The Euro Symbol

If your keyboard has a Euro symbol key, it can only be used with operating systems and applications that support this feature.

- Only the latest operating systems provide integrated support for the Euro symbol (in certain languages only).
- Not all applications support the Euro symbol.
- Not all fonts contain the Euro character.

For Windows NT Users

Windows NT 4.0 does not provide integrated support. For more information on how to enable support of the Euro symbol, refer to Microsoft's web site at:

www.microsoft.com/windows/euro.asp

Configuring Your Keyboard

To configure your keyboard, go to **Settings > Control Panel** in the **Start** menu. Double-click on **Keyboard** and select the **Language or Input Locales** tab in the **Keyboard Properties** window. Click on **Add** and select the country that corresponds to your keyboard, and click **OK**. Click **OK** to exit the **Control Panel**.

Troubleshooting BIOS Problems

The BIOS is a set of program routines that gives the workstation its fundamental operational characteristics. Many problems with your workstation can be solved by updating (flashing) the BIOS (Basic Input Output System).

NOTE

It is recommended that before you make any modifications to the BIOS you take note of the system setup.

Updating The BIOS

The latest system BIOS (standard flash operation) for your workstation can be downloaded from HP's Support Web site at: www.hp.com/go/workstationsupport. Instructions on updating the BIOS are supplied with the downloaded BIOS files and a BIOS flash utility.

Restoring BIOS Default Settings

Suspected hardware errors may be caused by BIOS and configuration issues. If the BIOS settings are suspected to be wrong, do the following steps to restore the BIOS to its default setting:

1. Press **F2** while the initial HP logo is displayed immediately after restarting the workstation to access the *Setup* program.
2. Press **F9** to load the default settings from the *Setup* program.
3. Set the "Reset Configuration Data" to Yes in the Main menu.
It is recommended that before you make any modifications to the BIOS you take note of the system setup.

Clearing The CMOS

1. Turn off the workstation, disconnect the power cord and data cables, then remove the cover.
2. Set the system board switch 8 to the ON position to clear the CMOS memory.
3. Replace the cover, and only reconnect the power cord.
4. Reboot the workstation. A message similar to the following will be displayed:

```
"Configuration has been cleared, set switch Clear to the ON position before rebooting."
```
1. Turn off the workstation, disconnect the power cord, and remove the cover.
2. Set the system board switch 8 to the OFF position to retain the configuration.
3. Replace the cover, and reconnect the power cord and data cables.
4. Switch on the workstation. Run the *Setup* program by pressing **F2**. Then press **F9**, the CMOS default values will be automatically downloaded and saved.
5. Press **Esc** to save the configuration and exit from the *Setup* program.

Recovering The BIOS (crisis mode)

If for some reason the BIOS is corrupted and the standard flash cannot be used, use the BIOS Recovery Mode (exceptional BIOS recovery operation) to restore the BIOS. To do this:

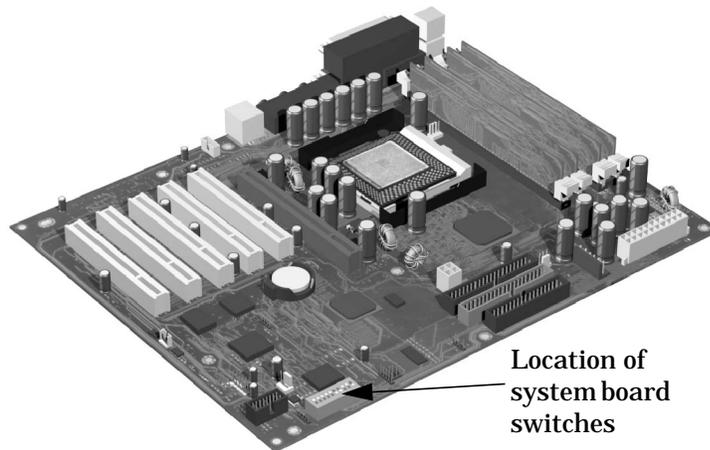
1. Obtain a bootable DOS floppy disk.
2. Copy the BIOS files on to the floppy disk.
3. Create (or edit) the file, AUTOEXEC.BAT
This should contain a single line of text:
`"phlash /c /mode=3 /s IX.W1.XX.FUL"`
4. Rename the BIOS filename with the one on the floppy disk.
5. Shut down the workstation.
6. Power off the workstation and remove the power cord.
7. Remove the cover.
8. Set switch 7 to the ON position.
9. Insert the floppy disk into the floppy disk drive.
10. Reconnect the power cord and switch on the workstation.
11. The workstation boots from the floppy disk, then flashes the BIOS. However, it should be noted, that during the flash process, the screen remains blank.
12. The recovery process is finished when there is one long beep.
13. Power off the workstation. Remove the floppy disk from the drive. Remove the power cord.
14. Set switch 7 back to the OFF position.
15. Replace the cover, reconnect the power cord, then reboot the workstation.

System Board Switches

There are ten system board switches used for configuration, numbered from 1 to 10. A certain number of these are reserved (switches 1, 2, 3, 4, 5) and should not be modified, otherwise it could lead to a system failure.

Switch	Default Position	Function:
1-4	OFF	Reserved. Do not change default settings.
5	ON	Reserved. Do not change default settings.
6	ON	Enables keyboard power-on using the space bar. OFF disables this option.
7	OFF	Enables normal modes. ON enables the BIOS recovery mode at next boot.
8	OFF	Retains CMOS memory. ON clears CMOS memory at next boot.
9	OFF	Enables User and System Administrator passwords. ON clears the passwords at next boot.
10	ON	Selects the chassis type. ON = minitower

Figure 7-1 System Board Switches



Using The HP Setup Program

The Setup program allows you to view and change the configuration of your workstation, such as the passwords and boot device order. Follow these instructions to check the configuration.

First, Turn On Or Restart Your Workstation

If your workstation is off, turn on the display and then the workstation.

If the workstation is already turned on, save your data, exit all programs and restart your workstation. For Windows operating systems, use the **Shut Down > Restart your computer** command in the **Start** menu. This command will automatically exit the operating system and restart the workstation.

To Go To The Setup Program

To go into the *Setup* program, press **F2** while the HP logo appears on your display.

More Troubleshooting For Drives

This section provides more information on how to solve problems with your drives or accessory boards.

WARNING

Be sure to disconnect the power cord and any telecommunication cables from your computer before you remove the cover to check the cable connections or jumper settings.

To avoid electric shock and harm to your eyes by laser light, do not open the CD-ROM drive enclosure. The CD-ROM drive should be serviced by service personnel only. Refer to the label on the CD-ROM for power requirements and wavelength. This workstation is a class 1 laser product. Do not attempt to make any adjustment to the laser unit.

If The Hard Disk Has A Problem

1. If you receive a S.M.A.R.T. alert during Power-On-Self-Test, there could be a potential problem with the hard disk drive. Carry out an immediate data backup, then contact HP Support.
2. Check that the disk power and data cables are correctly connected (refer to Chapter 6 for information about cables and connectors).
3. Check that booting from the hard drive has not been disabled in the **Boot** menu of the *Setup* program, accessed by pressing **F2** at startup.
4. Check that the hard disk drive has been detected (refer to the **Hard Disk Drives** submenu in the **Boot** menu in the *Setup* program, accessed by pressing **F2** at startup).
5. Run ScanDisk and Disk Defragmenter to see if they detect a problem with the hard disk drive. To access these utilities, select **Programs > Accessories > System Tools** from the **Start** menu.
6. Run IDE or SCSI tests from the **Advanced System Test** option from HP e-DiagTools (described on page 182).

If The Hard Disk Activity Light Does Not Work

If the hard disk activity light does not flicker when the workstation is accessing the hard disk drive:

1. Check that the control panel connector is firmly attached to the system board.
2. Check that the disk power and data cables are correctly connected.

CD-ROM, DVD or CD-RW Drive Does Not Work

1. Check that a CD (or DVD) is inserted in the drive.
2. Check that all cables (data, power and audio) have been properly connected both to the drive and to the system board.

3. Verify that the drive has been detected in the *Setup* program, accessed by pressing **F2** at startup). You should see a drive declared in the **IDE Secondary Master** or **IDE Secondary Slave** field.
4. If you intend to boot on CD-ROM, place **CD-ROM** before **HDD** in *Setup* (refer to the **Boot Device Priority** submenu in the Boot menu group of the HP *Setup* program).

CD-ROM, DVD or CD-RW Drive Is Idle

If the drive does not appear to be working, try accessing the disk by clicking on the drive icon or drive letter assigned to the drive by your operating system.

DVD drive doesn't play DVD video

1. Check that the DVD disk you are trying to play and your DVD drive have the same regional code setting.

NOTE

Your DVD drive's regional code setting is set by the first DVD disk you insert in the drive.

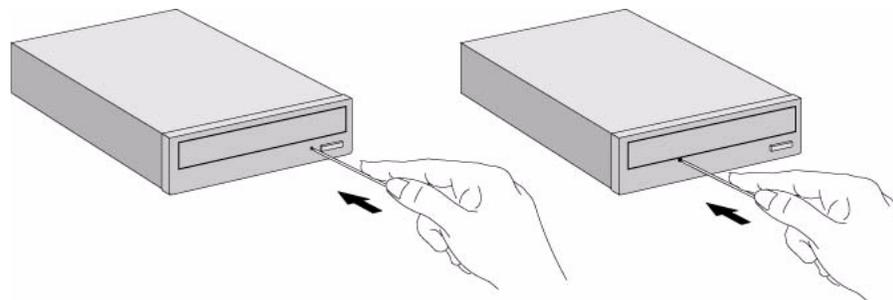
2. Ensure you have a software MPEG decoder installed on your system.

CD-ROM, DVD or CD-RW Door Does Not Open

If you have difficulty removing a disk from the drive (during a power failure for example), you can use the manual eject button.:

1. With a thin, solid rod, such as the end of a paper clip, push the CD-ROM drive's manual eject button. Figure 7-2 shows the two possible positions of the manual eject button.

Figure 7-2 CD-ROM Eject Button



2. The CD-ROM drive door will be released, opening slightly. Carefully pull it open fully and retrieve the CD.
3. To close the CD-ROM drive door, push it gently closed without forcing it. The CD-ROM drive door may not close completely until it is fully functional (for example, when the power comes back on).

HP e-DiagTools Hardware Diagnostics

The first step in solving a problem with a workstation is *diagnosis*.

HP's e-DiagTools helps you diagnose hardware-related problems on a HP computer. It is a series of tools designed to help you to:

- Distinguish between software and hardware problems
- Verify the correct functioning of a HP computer
- Diagnose hardware-related problems
- Provide precise information to support providers so that they can solve any problem quickly and effectively.

e-DiagTools is not a repair tool.

Overview Of e-DiagTools

e-DiagTools has three main components:

- The Pre-Boot Diagnostics, which emit a buzzing sound followed by an audible set of beeps that helps diagnose a problem when the computer cannot boot. Refer to "Pre-boot Diagnostics" on page 160.
- The e-DiagTools core tests, which provide hardware detection, basic and advanced system tests, and the possibility to generate a Support Ticket with a complete record of the test results and the PC's configuration.
- A set of functions to forward the Support Ticket to your authorized support provider via e-mail, and to retrieve and flash the latest BIOS version for your computer.

HP e-DiagTools is supplied on the following media:

- The Utility Partition pre-installed on your hard disk (recommended). This does not apply to FastRaid models.
- The HP Recovery CD-ROM that was supplied with your workstation.
- The HP DiagTools CD-ROM.

NOTE

Only the Utility Partition version of e-DiagTools supports the full range of e-features. When you run e-DiagTools from a CD-ROM you will not be able to send the Support Ticket via e-mail or to update the BIOS.

If you are running e-DiagTools from a CD-ROM, the option to start from the CD-ROM is enabled and the CD-ROM is configured to be the first device to boot from. After running e-DiagTools, restore the original Setup values.

Alternatively, you can set the boot device priority by pressing the F8 key when the logo screen is displayed after restarting your computer.

running e-DiagTools from the utility partition on your hard disk

This section does not apply to FastRaid models. For FastRaid models, run e-DiagTools from the CD-ROM (refer to page 183).

To run e-DiagTools from the Utility Partition on your computer's hard disk drive, follow this procedure:

1. Quit all applications, shut down the operating system, and restart your computer.
2. After the initial splash screen with the logo, a message is displayed:
Press <F10> to enter HP Utility Partition...
or any other key to proceed
3. Press **F10**. A menu appears.

NOTE

If this does not work, it probably means that the Utility Partition has been disabled. Try running e-DiagTools from a CD-ROM instead. Alternatively, you can recreate the Utility Partition and restore your operating system. For more information, refer to the following Web address:
www.hp.com/desktops/diagtools

4. Select the option to run e-DiagTools. Depending on your BIOS configuration, you may have to reboot the workstation. Changes are made automatically and are restored to the original values when you exit e-DiagTools.

NOTE

You cannot move from one option to another. Once you have selected an option, you have to exit, reboot your system and run e-DiagTools.

Running e-DiagTools From A CD-ROM

NOTE

Only the Utility Partition version of e-DiagTools supports the full range of e-features. When you run e-DiagTools from a CD-ROM you will not be able to send the Support Ticket via e-mail or to update the BIOS.

Prerequisites

Before you run e-DiagTools from a CD-ROM, ensure that the following are correctly configured in the computer's BIOS Setup program:

- No operating system is specified, which means that:
 - if the Main or Advanced menu has an item Plug and Play OS, set it to No
 - if the Main or Advanced menu has an item to select the operating system, set it to Other.
- All Hardware Protection items in the Security menu are set to Enabled or Unlocked.
- If you are running e-DiagTools from a CD-ROM, the option to start from the CD-ROM is enabled and the CD-ROM is configured to be the first device to boot from.

Alternatively, you can set the boot device priority by pressing **F8** when the logo screen is displayed after restarting your computer.

After running e-DiagTools, restore the original Setup values.

Running e-DiagTools From The Recovery CD

To run e-DiagTools from the CD-ROM:

1. Insert the HP CD-ROM in your CD-ROM drive. Shut down the operating system and restart your computer.
2. Ensure that the option to start from the CD-ROM drive is enabled, and that the CD-ROM is configured to be the first device to boot from.
3. e-DiagTools will start automatically, or, depending on the HP CD-ROM used, a menu appears. In this last case, select the option to run the hardware diagnostics.

e-DiagTools starts, and a welcome screen displays.

Running e-DiagTools From The Drivers And HP DiagTools CD-ROM

To run e-DiagTools from the HP DiagTools CD-ROM, follow this procedure:

1. Insert the HP DiagTools CD-ROM in your CD-ROM drive. Shut down the operating system and restart your computer.
2. Ensure that the option to start from the CD-ROM drive is enabled and that the CD-ROM is configured to be the first device to boot from.
3. The programs on the CD-ROM will automatically determine the appropriate version of e-DiagTools to run.

e-DiagTools starts, and a welcome screen displays.

HP e-DiagTools Hardware Tests

The following hardware tests can be performed from HP e-DiagTools:

- *Hardware Detection.* Automatically detects the complete hardware configuration of the system (including workstation model and version, processor type, cache memory, BIOS version, total main memory, IDE or SCSI device list, video adapter, audio card, keyboard, and USB controller) and determines the appropriate tests to be performed.
- *Basic System Tests.* Automatically (no user input required) verifies the correct operation of different hardware components of the workstation. If a warning message is displayed, you should use the Advanced System Tests to investigate the error. You can also produce a Support Ticket containing a record of the system's configuration and test results.
- *Advanced System Tests.* Independently tests a selected hardware component of the workstation. Because of this, the tests are more thorough than what is performed in the Basic System Tests. It should also be noted, the Advanced System Tests can only be performed after the Basic System Tests have been completed. Each test is selected through the on-line screen menu and can be repeated any number of times.

For example, if there is doubt with a hard disk drive, select the hard disk drive test, then one of the proposed options. If a test fails, you can produce support ticket.

for more information

For more information about using HP e-DiagTools, consult the e-DiagTools *User's Guide*, available in PDF format on HP's web site www.hp.com/desktops/diagtools

On this web site you can also:

- [Download e-DiagTools](#)
- [Order the HP DiagTools CD-ROM](#)
- [Get information about e-DiagTools, such as Frequently Asked Questions.](#)

Recovering Hard Disk Drive Contents (Windows only)

Overview

The HP Recovery CDs enables you to restore your computer to its original factory configuration and reinstall drivers or other factory-supplied software components. The drivers and software utilities, including documentation and navigational aids, help you to recover the pre-loaded software. There are two CD-ROMs:

- HP Workstation Recovery CD-ROM
- HP Workstations Drivers and Diagnostics

What Functions Are Available?

The HP Recovery CD provides the following function:

- Install Windows 2000 or Windows XP:
To recover your HP workstation to its original state as provided by HP.

CAUTION

Using the HP Recovery CD will permanently erase the current contents of your hard disk. You should always backup your data and personal files before using the CD-ROM.

General Instructions

1. Back up any data on your hard disk drive that you want to keep.
2. Ensure you have a CD drive installed on your workstation.
3. Verify that the HP Workstation Recovery CD-ROM and the HP Workstations Drivers and Diagnostics CD-ROM match your HP workstation.
4. Revert the system to its original hardware configuration by removing any accessories that were not factory installed (for example, a SCSI device).
5. HP recommends that you upgrade your HP workstation with the latest available BIOS version. Refer to the Web for the latest BIOS at:

<http://www.hp.com/go/workstationsupport>

6. In the BIOS setup program, ensure that all passwords have been cleared and booting from the CD-ROM is enabled. To enter BIOS setup, restart your workstation, and press F2 when prompted.
7. Check the Web for the latest drivers at:

<http://www.hp.com/go/workstationsupport>

Recovery Process

The following scenarios are reasons for using the recovery process described in this section:

- You suspect the operating system, files and drivers are corrupt, but the hard disk and hardware are working properly.
- You installing a new hard disk, or you suspect the partitions are corrupt.

Here is the recovery process:

1. Insert the Recovery CD into the CD drive and restart the system.
2. Press **F8** when the HP logo appears during startup to boot from your CD drive.
3. Select Atapi CD-ROM drive and Enter
4. In the DOS menu that appears, select: Install Windows 2000 or Install Windows XP.
5. CAUTION: The recovery process will destroy all current files on your hard disk. Please make sure that you have performed a backup of your important data before you continue.
6. The recovery process prompts you to press **Y** to continue or **N** to cancel the operation.
7. Insert the HP Workstations Drivers and Diagnostics CD-ROM when prompted.
8. Wait until a message indicates that the operation has been successfully completed. Remove the HP Workstations Drivers and Diagnostics CD-ROM from the CD-ROM drive.
9. Restart your system.

Recovering Preloaded Drivers

You can use the HP Workstations Drivers and Diagnostics CD-ROM to reinstall individual drivers that were delivered with the workstation. To do this, insert the CD-ROM into the CD-ROM drive. Automatically an HTML file is displayed. Using your web browser, navigate through the CD-ROM to find the appropriate driver(s). Then install them by executing the corresponding installation program directly from the CD-ROM.

Changing The Hard Disk

If the hard disk is corrupted and you can no longer use it, you should replace it with a new hard disk drive. Refer to the chapter “removing and replacing hardware parts” for information about installing hard disk drives.

Other Sources Of Information

Online Support For Troubleshooting

HP's support web site provides extensive support material that can help you troubleshoot problems on your Workstation:

- Documentation for your Workstation (described below)
- BIOS updates (including the upgrade utility and instructions)
- The latest drivers and software utilities

For HP's support web site, connect to: www.hp.com/go/workstationsupport.

Documentation Set Overview

HP's web site allows you to download documentation for your Workstation free of charge. The documents provided are in Adobe Acrobat (PDF) format and are available from HP's web site at:

www.hp.com/go/workstationsupport.

The available documents include:

- *HP Workstation x2100 Getting Started Guide* — describes how to set up your Workstation for the first time and contains basic troubleshooting information.
- *HP Workstation 2000 Technical Reference and Troubleshooting Guide* — this manual. Technical information on system components, such as system board, chipset and BIOS; troubleshooting and parts replacement information. Provides information on replacement parts, including HP part numbers.

You will also find complete information on available service and support at the HP World Wide Web site. To see the full set of services available, go to:

www.hp.com/go/workstationsupport.

Hewlett-Packard Support And Information Services

collecting information before contacting hp support

You can learn more about HP service and support from the support Web site:www.hp.com/go/workstationsupport

Before you contact HP Support, write down some of the information mentioned below. This will help HP Support deal with your problem quickly and efficiently.

Table 7-1 Collecting Information for Support

Information needed	Details	Your information
<i>General information</i>		
Workstation model number	Located on the label on the right side of your Workstation.	
Workstation serial number	Located on the label on the right side of your Workstation.	
Memory: number of Mbytes installed	The total amount of memory installed is displayed in the <i>Setup</i> program main menu, accessed by pressing F2 during start-up. You can also use the HP MaxiLife System Info feature to get this information.	
Is the memory HP supplied or from another source?	There may be some compatibility problems with non-HP memory modules. HP supports and recommends only HP supplied memory modules.	
<i>Details of the problem</i>		
Frequency of problem	How often has the problem occurred?	
Normal functionality	How long has the Workstation been running normally?	
Recent changes to the Workstation	Have there been any recent changes made to the Workstation?	
<i>Hardware Configuration</i>		
Which BIOS version is used?	The BIOS version is displayed in the <i>Setup</i> program main menu, accessed by pressing F2 during start-up. You can also use the HP MaxiLife System Info feature to get this information.	
Any BIOS parameter changes?	Did the problem occur after changes were made to the BIOS using the <i>Setup</i> program?	
A list of slots and interrupts used by additional cards (for example, LAN, sound and SCSI)	This is to check for interrupt conflicts. You can find IRQs by running e-DiagTools.	

Table 7-1 Collecting Information for Support (Continued)

Information needed	Details	Your information
<i>Operating System</i>		
Original operating system?	Are you using the original operating system software that came preloaded on your Workstation?	
If not, what is the operating system version?	Select Settings > Control Panel from the Start menu, then click on the System icon. The operating system version is displayed under System .	
Any operating system-generated error messages?	Write down exact text of error message.	
Any errors during boot (Power-On Self Test)?	This test checks all installed components. Any POST errors will be displayed on your monitor screen or signalled by beep codes.	

A **x2100 Service Information**

This appendix contains an overview of system accessories, an exploded view of the workstation components and a components parts list.

Parts and Part Numbers

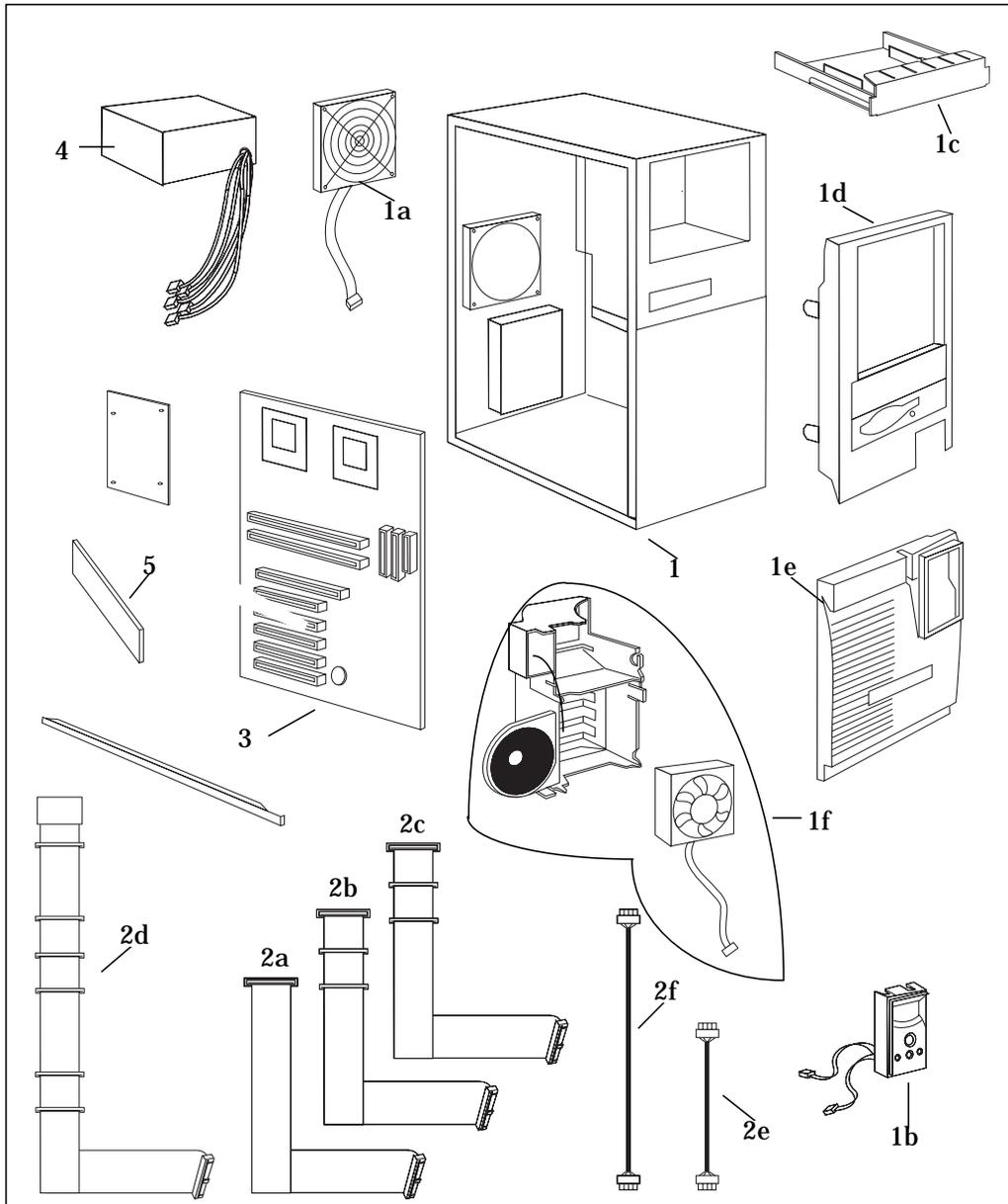


Table A-1Parts List

Item	Description	Replacement Part Number	Exchange Part Number
1	Chassis assembly:	A7218-62001	—
1a	Main fan assembly 120mm	A1280-68509	—
1b	LCD MaxiLife status panel	5064-9162	—
1c	5.25-inch to 3.5-inch HDD adapter tray	5002-6267	—
1d	Upper bezel assembly	A7218-62002	—
1e	Lower bezel assembly	A7818-62004	—
1f	Card guide assembly (includes fan & speaker)	5065-2573	—
	Support kit, including: Qty.		—
	• bumper feet 4		
	• cover screws 2		
	• anti-intrusion switch 1		
	• HDD thermal sensor 1		
	• system board bracket and screw 1		
	• 5 1/2-inch filler panel, 3 1/4-inch floppy panel, 3 1/4-inch cover filler, spare I/O panel 1		
	Not shown in graphic:		
	Left door (cover) assembly	A1280-62402	—
	Universal AGP retainer clip	A7185-41001	—
	Cover lock assembly	5064-2645	—
2	Cables:		
2a	FDD IDE cable	5184-1516	—
2b	HDD IDE cable	5184-1503	—
2c	CD-ROM IDE cable	5184-3874	—
2d	SCSI cable, 5 point, U160	5184-3869	—
2e	SCSI LED cable for U160 SCSI card	5184-3868	—
2f	CD-ROM audio cable	5182-1857	—
3	System board	See system board parts list	
4	Power supply unit, 492W PFC	0950-3978	—
5	RDRAM Continuity Module	D8660-63001	—
Available Parts that are not shown in the graphic			
	Floppy disk drive (1.44)	D2035-60293	—
	Adaptec 29160 SCSI card	--	A1280-69502
	Standard hard disk drives		
	20 GB IDE 72k rpm Viper	P6078-60101	
	40 GB IDE 72k rpm Viper	P6080-60101	
	80 GB IDE 72K rpm Viper	P6082-60101	
	Memory:		
	2x65MB ECC RDRAM, PC800	D9518-63010	D9518-69510
	2x128 MB ECC RDRAM, PC800	D9519-63010	D9519-69010
	2x256 MB ECC RDRAM, PC800	D9520-63010	D9520-63010
	2x512 MB ECC RDRAM, PC800	D2143-63001	D2143-69001

Table A-1Parts List (Continued)

Item	Description	Replacement Part Number	Exchange Part Number
	Optical drives:		
	DVD-ROM 16X/40X IDE drive	P4388-60006	P4388-69006
	CD ROM 48X	D4389-60051	—
	CD-RW 16X/10X/40X Drive	P4398-60181	P4398-69181
	Graphics cards & cables:		
	nVidia Quadro2-EX	A7806-60510	A7806-69510
	nVidia Quadro2 Pro	A6065-66510	A6065-69510
	nVidia Quadro2 MXR	A6064-60001	A6064-69001
	FireGL 2	A6076-66510	A6076-69510
	FireGL 4	A7226-60001	A7226-69001
	G450 16MB dual head	5065-4272	P2062-69501
	Input Devices:		
	Enhanced mouse with scroll/zoom wheel	C4736-60101	—
	Power cord	8120-xxxx	—
	Keyboards:		
	US English keyboard	C4739-60101	
	Canadian French keyboard	C4744-60102	
	German keyboard	C4739-60103	
	Spanish keyboard	C4739-60104	
	French keyboard	C4739-60105	
	Latin Spanish keyboard	C4744-60208	
	Swiss keyboard	C4739-60111	
	Swedish keyboard	C4739-60112	
	UK English keyboard	C4739-60113	
	Italian keyboard	C4739-60117	
	Korean keyboard	C4739-60121	
	Taiwanese keyboard	C4739-60123	
	Japanese keyboard	C4739-60124	
	Thai keyboard	C4739-60132	
	Euro English keyboard	C4739-60142	
	CR2032 battery (3V)	1420-0356	—

Table A-2 System Board

Description	Replacement Part No.	Exchange Part No.
System board: x2100 system board	A7218-66510	A7218-69510
Processors (Socket): Intel Pentium 4, 1.4 GHz	P2136-63001	P2136-69001
Intel Pentium 4, 1.5 GHz	P2137-63001	P2137-69001
Intel Pentium 4, 1.7 GHz	A7225-60001	A7225-69001
Pentium 4 active heatsink	P2136-63101	—
Heatsink retainer clip	1205-1290	—
Thermal interface tape	A6068-40009	—
Main memory modules 2 x 64 MB kit, PC800 ECC RDRAM	5065-0497	D9518-69001
2 x 128 MB kit, PC800 ECC RDRAM	5065-0496	D9519-69001
2 x 256 MB kit, PC800 ECC RDRAM	5065-0495	D9520-69001
2 x 512 MB kit, PC800 ECC RDRAM	P2143-63001	P2143-69001

Table A-3 Manuals and Documentation

Description	Part Number	Comments
Getting Started Guide English Japanese	A8030-90001 A8030-90007	Paper document only
Technical Reference Manual		Electronic file only
Online documentation (electronic files) can be downloaded from: http://www.hp.com/go/workstationsupport		

Table A-4 Recovery CDs

Recovery CDs		—
English US (ABA kit)	A7218-95001	
German (ABD kit)	A7218-95002	
French (ABF kit)	A7218-95003	
Japanese (ABJ kit)	A7218-95004	
English UK (ABU kit)	A7218-95005	
English Europe (ABB kit)	A7218-95006	
Taiwanese (ABO kit)	A7218-95007	
Korean (AB1 kit)	A7218-95008	
Chinese (AB2 kit)	A7218-95009	
Canadian French (ABC kit)	A7218-95010	
Spain Spanish (ABE kit)	A7218-95011	
Latin Amer. Spanish (ABM kit)	A7218-95012	
Swiss German (ABP kit)	A7218-95013	
Swiss French (ABQ kit)	A7218-95014	
Swiss (ABS kit)	A7218-95015	
Finnish (ABX kit)	A7218-95016	
Italian (ABZ kit)	A7218-95017	
Thailand/Eng. (AKL kit)	A7218-95018	
Training CD	A7218-93000	—

