



Technical Reference Guide

HP workstation c8000

Document Part Number: 5969-3188
Second Edition

July 2004

This manual contains an overview of system specifications, instructions for removing and replacing system components, information on configuring your system using the included tools and interfaces, and detailed troubleshooting information.

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WARNING: Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

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Important Safety Warnings



WARNING: *Avoid Electrical Shocks.* To avoid electrical shock, do not open the power supplies. There are no user-serviceable parts inside.

To avoid electrical shock and harm to your eyes by laser light, do not open the DVD laser module. The laser module should be serviced by service personnel only. Do not attempt to make any adjustment to the laser unit. Refer to the label on the DVD for power requirements and wavelength. This product is a class I laser product.



WARNING: *Removing and Replacing the Cover.* For your safety, never remove the system side 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 system, you must shut down your computer using its on/off switch, then remove the power cord before removing the system's side cover. Remove the Power Protection Device cables before any servicing operation. Always replace the side cover before switching the system on again.



WARNING: *Battery Safety Information.* There is a danger of explosion if the battery is incorrectly installed. For your safety, never attempt to recharge, disassemble, or burn an old battery. Replace the battery with the same or equivalent type, as recommended by the manufacturer.

The battery in this system is a lithium battery that does not contain any heavy metals. However, to protect the environment, do not dispose of batteries in household waste. Return used batteries either to the shop from which you bought them, to the dealer from whom you purchased your system, or to HP so that they can either be recycled or disposed of in the correct way. Returned batteries will be accepted free of charge.




WARNING: *Metallic particulates* can be especially harmful around electronic equipment. This type of contamination may enter the data center environment from a variety of sources, including, but not limited to, raised floor tiles, worn air conditioning parts, heating ducts, rotor brushes in vacuum cleaners or printer component wear. Because metallic particulates conduct electricity, they have an increased potential for creating short circuits in electronic equipment. This problem is exaggerated by the increasingly dense circuitry of any electronic equipment.


Over time, very fine whiskers of pure metal can form on electroplated zinc, cadmium, or tin surfaces. If these whiskers are disturbed, they may break off and become airborne, possibly causing failures or operational interruptions. For over 50 years, the electronics industry has been aware of the relatively rare, but possible, threat posed by metallic particulate contamination. During recent years, a growing concern has developed in computer rooms where these conductive contaminants are formed on the bottom of some raised floor tiles.

Although this problem is relatively rare, it may be an issue within your computer room. Since metallic contamination can cause permanent or intermittent failures on your electronic equipment, Hewlett-Packard strongly recommends that your site be evaluated for metallic particulate contamination before installation of electronic equipment.



WARNING: *Avoid Burn Injuries.* Some parts inside the computer will be hot. Turn off and unplug the system, then wait approximately three to five minutes for them to cool down before opening the system access panels or touching internal components.

 **CAUTION:** *Avoid Static Electricity.* Static electricity can damage electronic components. Turn OFF all equipment and disconnect the power cable before installing an accessory card. Don't let your clothes touch any accessory card. To equalize the static electricity when replacing an accessory card, rest the accessory card bag on top of the system unit while you are removing the card from the bag. Handle the card as little as possible and with care.

 **CAUTION:** *Information on Ergonomic Issues.* It is strongly recommended that you read the ergonomics information, available in the "Working In Comfort" section of this manual, before using your system. You can access more extensive ergonomics information at: **www.hp.com/ergo**

NOTE: Recycling Your System. HP has a strong commitment toward the environment. Your HP system has been designed to respect the environment as much as possible. HP can also take back your old system for recycling when it reaches the end of its useful life. HP has a product take-back program in several countries. The collected equipment is sent to an HP recycling facilities in Europe or the U.S.A. As many parts as possible are reused. The remainder is recycled. Special care is taken for batteries and other potential toxic substances, these are reduced into non-harmful components through special chemical processes. If you require more details about the HP product take-back program, contact your local dealer or your nearest HP Sales Office.

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Product Information

This chapter provides an overview of the HP workstation c8000, including:

- System Features, page 1-1
- Physical Characteristics, page 1-4
- Power Specifications, page 1-5
- Front Panel, page 1-7
- Rear Panel, page 1-9

System Features

The HP workstation c8000 is available in several different configurations. To obtain more information for your system, see one of the following:

- Boot Console Handler (BCH) Information menu (page 2-6).
- Features and overview at: <http://www.hp.com/workstations/risc/c8000>
- Supported accessories and components at: <http://partsurfer.hp.com>

Feature	Description
Processor	One or two HP PA-8800 processor modules
Firmware	8 MB flash EEPROM Configured using Boot Console Handler (BCH)
Operating system	HP-UX 11i v1
Main memory	Capacity: <ul style="list-style-type: none"> • Minimum 1 GB (2 x 512 MB) • Supports up to 32 GB (8 x 4 GB) Type: PC2100 ECC registered DDR266 DIMMs Slots: Eight DIMM slots Peak bandwidth: up to 8.5 GB/sec For memory loading order and detailed memory installation instructions, see "Memory Modules" on page 3-10.
Hard drive(s)	May include the following internal drives: <ul style="list-style-type: none"> • Up to two Ultra ATA-133 IDE hard drives • Up to four LVD Ultra 320 SCSI hard drives with 68-pin interface connector plus four-pin standard power connector

Feature	Description
Optical drive(s)	Model with IDE hard drives may include up to two optical drives. Model with SCSI hard drives may include up to three optical drives. The following optical drives are supported: <ul style="list-style-type: none">• 48X CD-RW• 16X DVD-ROM• 4X DVD+RW
SCSI controller	Two-channel Ultra 320 SCSI controller on system board External SCSI connector (option) <ul style="list-style-type: none">• 68-pin standard, high density SCSI connector• Requires cables designated as U320-capable with U320 devices• Supports LVD devices (Ultra320, Ultra 160, Ultra2)• Legacy SE devices• SE, narrow devices with appropriate conversion hardware• Does not support HVD• 80-pin SCA connector not supported
IDE controller	Ultra ATA-133 capable controller supporting two IDE buses and a total of four IDE devices: <ul style="list-style-type: none">• Up to three front-access optical drives, or• Up to two front-access optical drives and two internal hard drives
Graphics controller	1 AGP 8X Pro 110 slot (150 W max power including auxiliary power connector)
Accessory card slots	Seven slots total: <ul style="list-style-type: none">• One AGP 8X Pro 110W 32-bit slot• Two half-length 3.3V 32-bit 33 MHz PCI slots• One full-length 3.3V 64-bit 33 MHz PCI slot• Two full-length 3.3V 64-bit 66 MHz PCI-X slots• One full-length 3.3V 64-bit 133 MHz PCI-X slot
I/O connectors	<ul style="list-style-type: none">• 10/100/1000 LAN connector• Two 9-pin serial connectors:<ul style="list-style-type: none">• UART 16550 buffered• RS-232-C• Five USB 2.0 480 Mb/s connectors:<ul style="list-style-type: none">• Two front-access• Three rear-access

Feature	Description
Input devices	USB keyboard and mouse: <ul style="list-style-type: none">• HP 104/105 key keyboard, available in 13 localized layouts• HP three-button mouse, standard or scroll-wheel
Audio (option)	May include: <ul style="list-style-type: none">• PCI Audio card• Front-access mic and headphone connectors• Line in, line out, microphone in (on audio card)

Physical Characteristics

Characteristic	HP workstation c8000
Weight ¹	
Tower system	Minimum: 22.5 kg (49.5 lb) Maximum: 26.6 kg (58.6 lb)
Rack system	Minimum: 20.5 kg (45.2 lb) Maximum: 24.7 kg (54.4 lb)
Dimensions	
Tower system	Height: 490.2 mm (19.3 in.) Depth: 571.4 mm (22.5 in.) Chassis Width: 203.2 mm (8.0 in.) Pedestal Width: 287.0 mm (11.3 in.)
Rack system	Chassis Height: 203.2 mm (8.0 in.) Front Panel Height: 219.0 mm (8.6 in.) Depth: 568.9 mm (22.4 in.) Chassis Width: 424.2 mm (16.7 in.) Front Panel Width: 482.6 mm (19.0 in.)
Footprint, tower system	0.16 m ² (1.77 sq ft)
Space requirement, rack system	5 units (5U)

1. Excludes keyboard, mouse and display.

Power Specifications

Parameter	Total Rating	PCI Slots	AGP Slots
Input voltage (wide-range)	100 – 127VAC 200 – 240VAC		
Max input current ¹	8.7A at 100VAC 4.4A at 200VAC		
Input frequency	50 – 60 Hz		
Max output power ²	700W	6 slots available at 15W/slot Total of 90W	1 slot available at 110W/slot
Max current at +12V – combined	50A		
Max current at +12V – CPU0	15A		
Max current +12V – CPU1	15A		
I/O 12V	15A		
AGP 12V	15A		
Max current at +3.3V	34A		
Max current at +5V	25A		
Max current at –12V	0.5A		
Max current at +5V – Standby	2A		

1. The worst case/highest current given the lowest input voltage and the maximum input power.

2. Corresponds to the maximum DC power the power supply can provide to the system.

The power supply has Active Power Factor Correction (APFC) that meets EN61000-3-2 over the range of 88-265 VAC rms.

Power Consumption and Cooling

This information is based on primary power consumptions.

Components	Power Consumption	
Workstation: typical configuration ¹	410W	1399 Btu/h
	maximum configuration ²	871W
Processor	130W	443.6 Btu/h
IDE hard disk drive with I/O access	23W	78.4 Btu/h
IDE hard disk without I/O access (idle)	16W	54.5 Btu/h
PCI card	10W to 25W	34.12 Btu/h to 85.30 Btu/h
AGP card	110W maximum (150W possible with optional power dongle)	170.6 Btu/h

1. A typical configuration includes: 1 CPU, 4 GB RAM (4 x 1 GB), 700W power supply, 2 hard drives, 1 medium power AGP, and 1 optical drive.
2. A maximum configuration (fully loaded) includes: 2 CPUs, 32 GB RAM (8 x 4 GB), 700W power supply, 4 hard drives, 1 high end AGP, and 3 optical drives.

Environmental Specifications

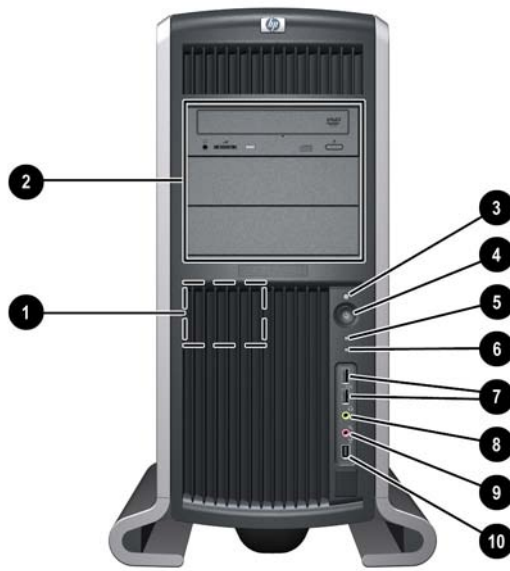
Environmental Specifications (System Processing Unit with Hard Disk)	
Operating temperature	+5° C to +35° C (+41° F to +95° F)
Storage temperature	-20° C to +70° C (-4° F to +158° F)
Over-temperature shutdown	+38° C (+100° F)
Operating humidity	15% to 80% relative (non-condensing)
Storage humidity	8% to 80% relative (non-condensing)
Operating altitude	0 – 3000 m (0 – 10,000 ft.)
Storage altitude (long-term)	0 – 4600 m (0 – 15,000 ft.)

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.

Front Panel

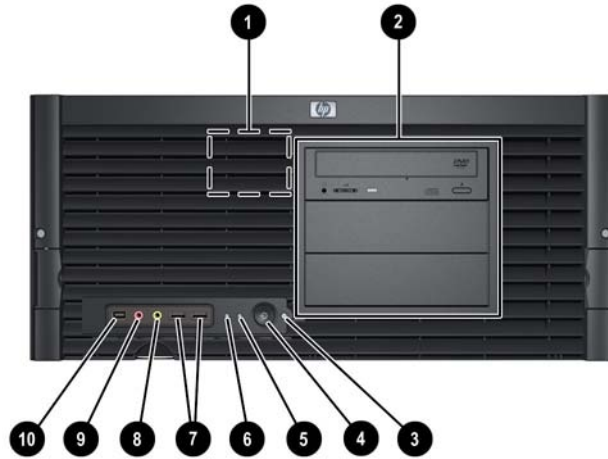
The HP workstation c8000 front panel has the features identified in the following figures.

- A pull-out information card containing the product and serial numbers is on the side of the system.
- For more information about the system LEDs, see “LAN LEDs (Front and Rear Panel)” on page 4-3.



Front panel, tower configuration

❶ System speaker	❹ LAN activity LED
❷ Three optical drive bays	❺ Two USB connectors
❸ System status LED	❻ Headphone (option)
❹ Power button	❼ Microphone (option)
❺ Disk activity LED	❽ IEEE-1394 FireWire (not supported)

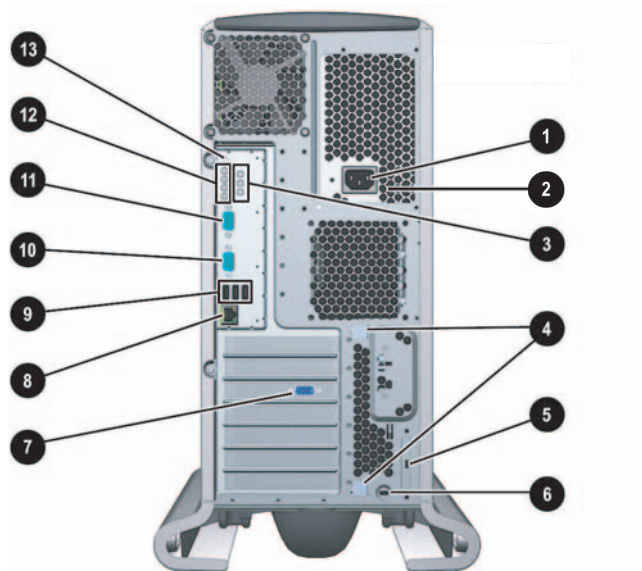


Front panel, rack-mount configuration

❶ System speaker	❹ LAN activity LED
❷ Three optical drive bays	❺ Two USB connectors
❸ System status LED	❻ Headphone (option)
❹ Power button	❼ Microphone (option)
❺ Hard Disk activity LED	❽ IEEE-1394 FireWire (not supported)

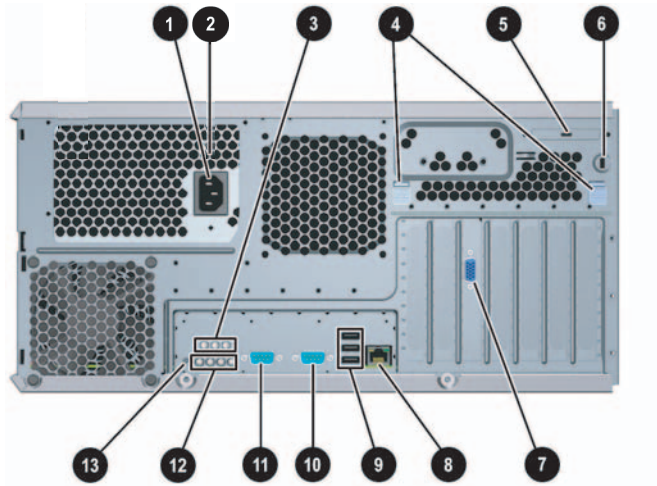
Rear Panel

The HP workstation c8000 rear panel has the following connectors and features:



Rear panel, tower configuration

① Power cord connector	⑧ LAN connector and LEDs
② Built-In Self Test LED (power supply LED behind ventilation holes)	⑨ Three USB connectors
③ On-board diagnostic LEDs	⑩ Serial connector B
④ PCI/AGP retention release	⑪ Serial connector A
⑤ External SCSI connector (option)	⑫ Diagnostic LEDs
⑥ Security cable slot	⑬ Transfer-of-control (TOC) button
⑦ Monitor connector (on graphics card)	



Rear panel, rack-mount configuration

① Power cord connector	⑧ LAN connector and LEDs
② Built-In Self Test LED (power supply LED behind ventilation holes)	⑨ Three USB connectors
③ On-board diagnostic LEDs	⑩ Serial connector B
④ PCI/AGP retention release	⑪ Serial connector A
⑤ External SCSI connector (option)	⑫ Diagnostic LEDs
⑥ Security cable slot	⑬ Transfer-of-control (TOC) button
⑦ Monitor connector (on graphics card)	

System Configuration

You will typically alter the system configuration only if you want to change the boot device or change the console. This chapter covers:

- “Boot Console Handler (BCH)” on page 2-1
- “Firmware Upgrades” on page 2-9

Boot Console Handler (BCH)

You can configure the HP workstation c8000 system with The Boot Console Handler (BCH), the user interface to the system firmware. The BCH:

- Lets the bootstrap code know which path (that is, which device) to boot from.
- Allows you to view and modify a set of specific system parameters.
- If you are satisfied with your system configuration, you do not need to perform any system configuration.

Accessing the BCH

You can access the BCH through either:

- your system’s USB keyboard and graphics monitor by interrupting the normal boot process
- a serial console connection and terminal emulator.

Access via Keyboard and Graphics Monitor

When you boot your system, the boot process pauses and gives you 10 seconds to interrupt the normal boot process. Perform the specified action to access the BCH. When you are finished, reboot your system.

Access via Serial Console Connection

To access the BCH through a serial connection:

1. With the workstation turned off, connect the serial cable provided with your system or a compatible cable to *Serial Port A* on the rear panel of the workstation, and to your remote device.

NOTE: If your system has a plug-in serial card (installed in slot 6), connect to the card’s serial port instead of to Serial Port A.

2. Disconnect all USB keyboards from the system.

3. Configure the terminal emulation software with these settings:
 - Baud rate: 9600
 - Bits: 8
 - Parity: None
 - Stop Bits: 1 (one)
 - Flow Control: XON/XOFF
4. Using the terminal emulation software, connect to the workstation with a direct connection.
5. Turn on the workstation. The system display is redirected to the serial console device.

Paths

All devices in the HP workstation c8000 are represented by *paths* in the BCH. To identify the correct slot or disk drive, use the following tables.

Accessory Card Slots

Slot	Path
1 PCI (33 MHz, 32 bit, half-length)	0/3/5/0
2 PCI (33 MHz, 32 bit, half-length)	0/3/4/0
3 AGP 8X 32 bit	0/4/0/0
4 PCI (33 MHz, 64 bit)	0/3/6/0
5 PCI-X (66 MHz, 64 bit)	0/2/2/0
6 PCI-X (66 MHz, 64 bit)	0/2/3/0
7 PCI-X (133 MHz, 64 bit)	0/0/1/0

IDE Drives

Drive	Path	Hardware Connection
IDE hard drive 1 (or optical drive 3)	0/3/2/0.0.0	IDE 0, master
IDE hard drive 2	0/3/2/0.0.1	IDE 0, slave
IDE optical drive 1	0/3/2/0.1.0	IDE 1, master
IDE optical drive 2	0/3/2/0.1.1	IDE 1, slave

SCSI Drives

Drive	Path
SCSI hard drive on channel A	0/2/1/0.<scsi_ID>
SCSI hard drive on channel B	0/2/1/1.<scsi_ID>

Network

Device	Path
Built-in LAN	0/3/3/0

BCH Commands

The interactive portion of BCH includes the following five main commands, which are available on the Main Menu and all submenus.

Command	Description
B0ot [PRI ALT <path>]	Boot from a specified path
DIsplay	Redisplay the current menu
HElp [<menu> <command>]	Display help for menu or command
RESET	Restart the system
MAin	Return to the Main Menu

Main Menu

The following commands are available in the main menu.

```
--- Main Menu -----
```

Command	Description
-----	-----
B0ot [PRI ALT <path>]	Boot from specified path
PAth [PRI ALT CON KEY] [<path>]	Display or modify a path
SEArch [DIsplay IPL] [<path>]	Search for boot devices
COnfiguration menu	Displays or sets boot values
INformation menu	Displays hardware information
SERvice menu	Displays service commands
DIsplay	Redisplay the current menu
HElp [<menu> <command>]	Display help for menu or command
RESET	Restart the system

Configuration Menu

The following commands are available in the configuration menu.

Main Menu: Enter command or menu > co

--- Configuration Menu -----

Command	Description
AUto [B0ot SEArCh STart] [ON OFF]	Display or set specified flag
BootID [<proc> [<bootid>]]	Display or set Boot Identifier
BootINfo	Display boot-related information
BootTimer [0 - 200]	Seconds allowed for boot attempt
CPUconfig [<proc> [ON OFF]]	Config/Deconfig processor
Default	Set the system to predefined values
FastBoot [ON OFF]	Display or set boot tests execution
LanConfig [<config type>]	Display or set LAN configuration
MONitor [LIST <type>]	Display or set the current monitor type
PAth [PRI ALT CON KEY [<path>]]	Display or change a path
PoWerRestore [ON OFF LAST]	Display or set the Power Restore Policy
ReSTart [ON OFF]	Display or set the System Restart Policy
SEArCh [DIsplay [[IPL] [<path>]]]	Search for boot devices
SECure [ON OFF]	Set/show security mode
Time [c:y:m:d:h:m[:s]]	Read or set the real time clock in GMT
B0ot [PRI ALT <path>]	Boot from specified path
DIsplay	Redisplay the current menu
HElp [<command>]	Display help for specified command
RESET	Restart the system

The configuration **default** command sets the following values:

```

Primary boot path:   scsiA.0 (core SCSI)0
Alternate boot path: lan.0.0.0.0 (core LAN)
Console path:       graph3 (AGP Graphics Slot 3)
Keyboard path:      usb0 (core USB)
Autoboot:           ON
Autosearch:         ON
Autostart:          OFF
BootTimer           0

```

Information Menu

The following commands are available from the information menu:

```
-----
Main Menu: Enter command or menu > in

---- Information Menu -----
```

Command	Description
-----	-----
ALL	Display all system information
BootINfo	Display boot-related information
CAche	Display cache information
ChipRevisions	Display revisions of major VLSI
COprocessor	Display coprocessor information
FRU	Display FRU information
FwrVersion	Display firmware version
* IO	Display I/O interface information
LanAddress	Display Core LAN station address
MEemory	Display memory information
PRocessor	Display processor information
** WARNings	Display selftest warning messages
BOot [PRI ALT <path>]	Boot from specified path
DISplay	Redisplay the current menu
HElp [<command>]	Display help for specified command
RESET	Restart the system
MAin	Return to Main Menu

```
-----
```

* The PCI device information displayed includes Description, Path, VendorID, DeviceID, Slot#, and bus#.

** Any warnings that apply are displayed.

The **Info PR** command displays processor information on the console. For example:

```
-----  
Main Menu: Enter command or menu > in pr  
Model: hp workstation c8000 (model string 9000/785/c8000)  
PROCESSOR INFORMATION  
HVERSION SVERSION Processor  
Processor Speed HVERSION SVERSION CVERSION Processor  
----- Model Op ----- State  
0 1000 MHz 0x088b 0x0491 3.1 Active  
1 1000 MHz 0x088b 0x0491 3.1 Idle  
2 1000 MHz 0x088b 0x0491 3.1 Idle  
3 1000 MHz 0x088b 0x0491 3.1 Idle  
Central Bus Speed (in MHz) : 200  
Software ID (dec) : 1704034802  
Software ID (hex) : 0x659181f2  
Software Capability : 0x01f0  
-----
```

Service Menu

The following commands are available from the Service menu.

Main Menu: Enter command or menu > ser

```

---- Service Menu -----

```

Command	Description
-----	-----
ChassisCodes [<proc> ON OFF]	Display/enable/disable chassis codes
CLearLogs	Clear SEL and FPL logs
CLEARPIM	Clear (zero) the contents of PIM
MemRead <address> [<len>]	Read memory and I/O locations
PDT [CLEAR]	Display or clear the PDT
PIM [<proc>] [HPMC LPMC TOC]	Display PIM information
ScRoll [ON OFF]	Display or change scrolling ability
SCSI [<path> [<option> [<val>]]]	Display or set SCSI controller values
SErial [ON OFF] [A/B]	Display/enable/disable core serial ports

```

-----

```

The SCSI command is for displaying/setting the SCSI controller parameters like initiator ID and speed. These parameters are used by the OS device drivers to program the controller(s).

The serial port command automatically resets the system. When the serial ports are enabled, the ports can be used with HP-UX.



NOTE: If the HP-UX version was released prior to June 2004, the system might not boot if the serial ports are enabled.

Baseboard Management Controller

The Baseboard Management Controller (BMC) supports the industry-standard Intelligent Platform Management Interface (IPMI) specification. The management features have been built into the system board and include diagnostics (local and remote), console support, configuration management, hardware management, and troubleshooting.

Firmware Upgrades

To update the system and BMC firmware:

1. Download the firmware update from **<http://www.hp.com/bizsupport>**.
Follow the menu prompts to navigate to the support page:
 - a. Select **download drivers/software**.
 - b. Enter the product name in the search field (**HP workstation c8000**).
 - c. Select the search result.
 - d. Choose the firmware release you need to download.
 - e. Click the release notes for instructions on how to download, unpack, and install the firmware upgrade.
2. Download, unpack, and install the firmware upgrade.
3. Execute the **in FwrVersion** BCH command to confirm that the upgrade was successful.

Installing or Replacing Parts

This chapter contains the following sections:

- Locating System Components, page 3-1
- Tools and Safety, page 3-5
- Removing and Replacing Access Panels, page 3-6
- Removing and Replacing Internal Components, page 3-8

Locating System Components

This section contains diagrams to help you locate system components. The diagrams in this section include only the most frequently accessed components and connectors. For comprehensive component and system board diagrams, see the label on the inside of the main access panel.

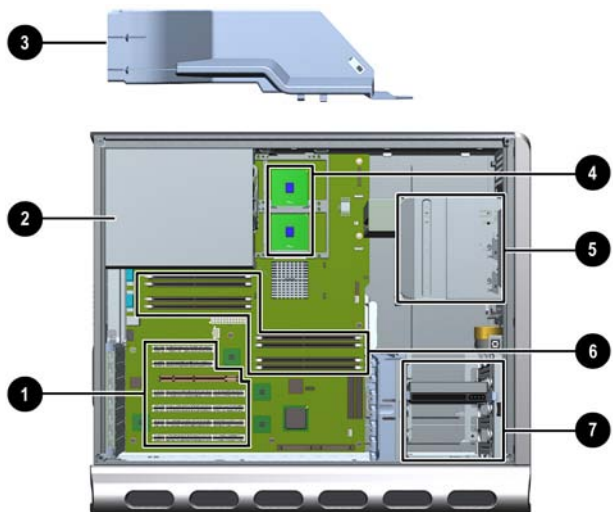
- Location of Internal Components, page 3-2
- Exploded View of Main System Components, page 3-3
- System Board Components and Connectors, page 3-4

For the location of items on the front and rear panel of the system, see:

- Front Panel, page 1-7
- Rear Panel, page 1-9

Location of Internal Components

This diagram identifies main system components. For a comprehensive component diagram, see the label on the inside of the main access panel.

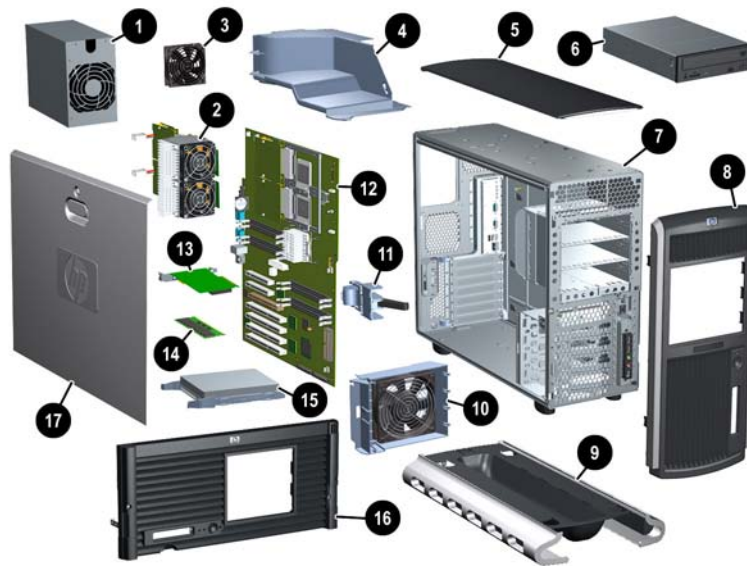


Location of internal components

❶ PCI and AGP slots	❺ Optical drive bays
❷ Power supply	❻ Memory slots
❸ Air flow guide and memory fan	❼ Hard drive bays
❹ CPU sockets	

Exploded View of Main System Components

This diagram identifies main system components. For a comprehensive component diagram, see the label on the inside of the main access panel.

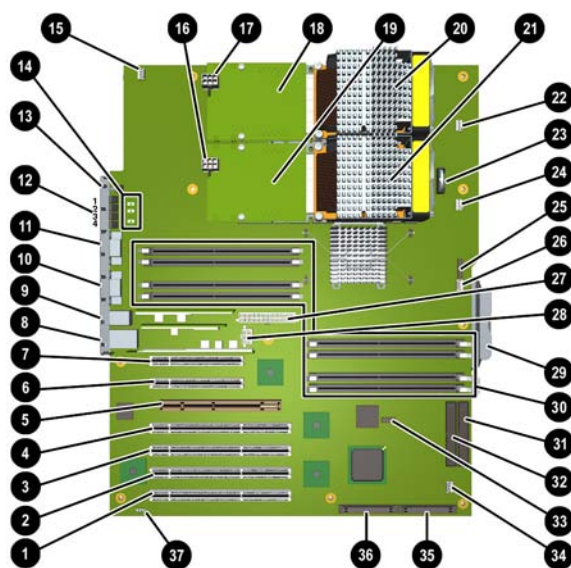


Exploded view of system components

❶ Power supply	❷ Hard drive fan
❸ CPU0 and CPU1 with power modules	❸ AGP retainer
❹ Chassis fan	❹ System board
❺ Airflow guide and memory fan	❺ AGP graphics card
❻ Top panel	❻ Memory module
❼ Optical drive	❼ Hard drive with rails
❼ Chassis	❼ Front access panel (rack-mount)
❽ Front access panel (tower)	❽ Main (side) access panel
❾ Pedestal	

System Board Components and Connectors

This diagram identifies main system board components and connectors. For a comprehensive system board diagram, see the label on the inside of the main access panel.



System board connectors and slots

1	Slot 7 PCI-X connector (133 MHz 64 Bit)	11	Serial A (console) connector	21	Processor—CPU 1 (option)	31	Primary IDE 0 connector
2	Slot 6 PCI-X connector (66 MHz 64 Bit)	12	Diagnostic LEDs	22	Processor fan connector—CPU 0	32	Secondary IDE 1 connector
3	Slot 5 PCI-X connector (66 MHz 64 Bit)	13	Transfer of Control (TOC) button	23	Battery connector	33	Front panel USB connector
4	Slot 4 PCI connector (33 MHz 64 Bit)	14	On-board LEDs	24	Processor fan connector—CPU 1	34	Hard drive fan connector
5	Slot 3 AGP Pro 8X connector	15	Chassis fan connector	25	Front control panel connector	35	SCSI A connector
6	Slot 2 PCI connector (half-length 33 MHz 32 Bit)	16	Input power connector—CPU 1 (option)	26	Memory fan connector	36	SCSI B connector
7	Slot 1 PCI connector (half-length 33 MHz 32 Bit)	17	Input power connector—CPU 0	27	Main power connector		Hard drive activity LED connector
8	LAN connector	18	Processor power module—CPU 0	28	Auxiliary power connector		
9	Rear USB connectors (3)	19	Processor power module—CPU 1 (option)	29	System board tray release		
10	Serial B connector	20	Processor—CPU 0	30	Memory module connectors		

Tools and Safety

Most hardware replacement tasks do not require any tools. However, to prevent possible damage from static electricity, you will need:

- Static-free mat
- Static strap

These tasks require tools:

- If you are adding or replacing a processor, you will need the special processor tool that is provided with the new processor.
- If you are removing or replacing the front control module, you will need a T-15 Torx driver.



WARNING: For hardware installation procedures, you must power off the system, unplug the power cord from the outlet, and wait for all LEDs to turn off.



WARNING: If you have any doubt that you can lift the system or monitor safely, do not try to move them without help.

NOTE: To maintain FCC/EMI (Electromagnetic Interference) compliance, replace all covers and make sure all screws are properly seated after you replace components.

To prevent damage to this system, observe all of the following ESD precautions while performing the system parts removal/replacement procedures:

- Work on a static-free mat.
- Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to ground.
- Create a common ground for the equipment you are working on by connecting the static-free mat, static strap and peripheral units to that piece of equipment.
- Keep uninstalled printed circuit boards in their protective antistatic bags.
- Handle printed circuit boards by their edges, once you have removed them from their protective antistatic bags.

Removing and Replacing Access Panels

To upgrade, remove or replace system components, you need to remove one or both access panels from the system chassis.



WARNING: Never remove the system access panel(s) without first turning the system off and unplugging the power cord from the back of the system. Always replace the cover(s) before turning the workstation on.

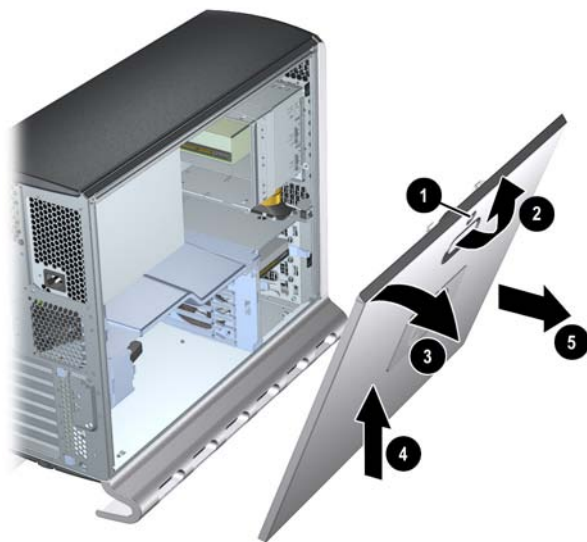
Removing the Main System Access Panel

To remove or install most components, you only need to remove the main system access panel.



NOTE: The front system access panel only needs to be removed when removing the “[Front Control Module](#)” on page 3-29 or the “[Optical Drives \(CD or DVD\)](#)” on page 3-17.

1. Unlock the panel if it is locked ❶.
2. Pull out on the latch to release it ❷.
3. Rotate the panel ❸, pull up ❹, and lift it away ❺.

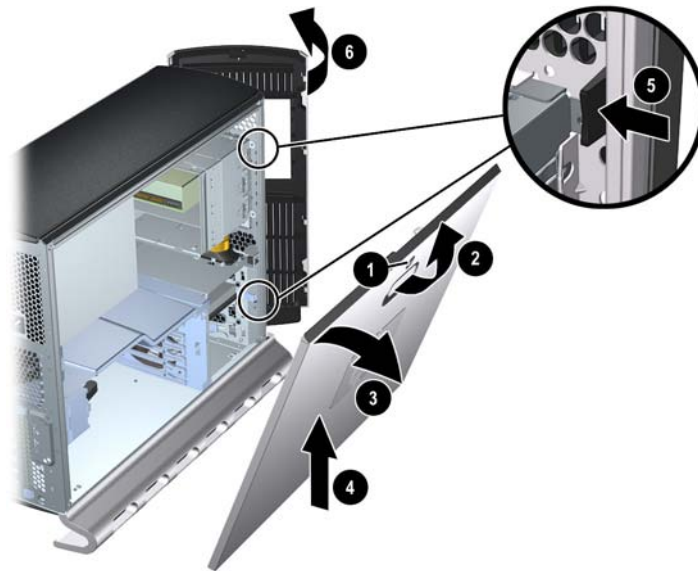


Removing the main system access panel

Removing the Front Access Panel

To install or replace the “[Front Control Module](#)” on page 3-29 or the “[Optical Drives \(CD or DVD\)](#)” on page 3-17, you need to remove the front access panel.

1. If you have already connected and turned on the system, turn off the system and disconnect all cables.
2. Remove the main system access panel:
 - a. Unlock the panel if it is locked ❶
 - b. Pull out on the latch to release it ❷
 - c. Rotate the panel ❸ and lift it off ❹
3. Remove the front system access panel:
 - a. Depress the clips on the inside of the case to release the front panel ❺
 - b. Rotate the panel and lift it off ❻



Removing the system access panels

Removing and Replacing Internal Components

This section includes instructions for removing and replacing the following components:

- Airflow Guide and Memory Fan, page 3-9
- Memory Modules, page 3-10
- PCI and AGP Cards, page 3-12
- Optical Drives (CD or DVD), page 3-17
- Hard Drives, page 3-19
- External SCSI Devices, page 3-23
- Power Supply, page 3-25
- Hard Drive and Chassis Fans, page 3-27
- Front Control Module, page 3-29
- Replacing the Processor or Installing an Additional Processor, page 3-32
- System Board, page 3-39
- System Battery, page 3-41

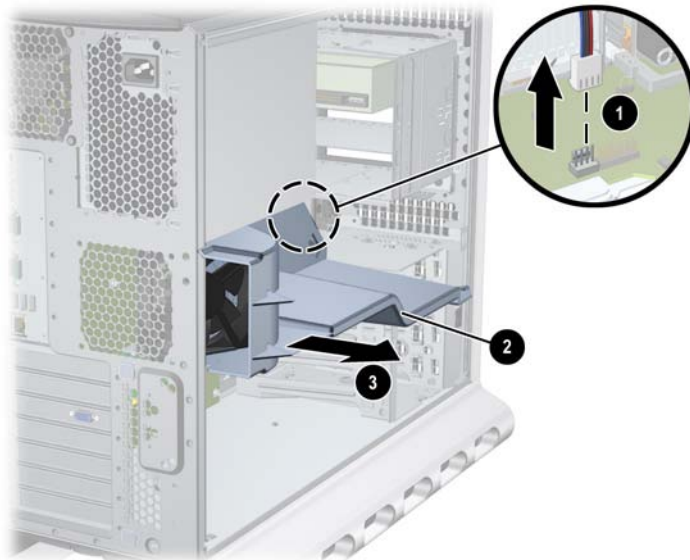
Instructions for the following procedures are included with kits containing the parts:

- Processor Replacement and Installation
- Tower-to-Rack Conversion
- Rack-to-Tower Conversion

Airflow Guide and Memory Fan

The system airflow guide and memory fan must be removed to access several other components. To remove the airflow guide and fan:

1. Turn off the system, disconnect the power cable, and remove the system access panel.
2. Unplug the memory fan connector from the system board ❶.
3. Grasp the airflow guide ❷ and lift it out of the system ❸.



Removing the airflow guide and fan

To replace the airflow guide and fan:

1. Insert the airflow guide into the system and press until it snaps into place.
2. Plug the memory fan connector into the system board.

Memory Modules

The HP workstation c8000 has eight memory slots for Dual Inline Memory Modules (DIMMs). These modules can be:

- 256 MB
- 512 MB
- 1 GB
- 2 GB
- 4 GB

DIMMs must be installed in matched pairs of equal size. You can install a minimum of 512 MB and a maximum of 32 GB of memory.

- To obtain detailed configuration information for your system, use the BCH Information menu (see page 2-6).
- For a list of approved memory modules, see:
<http://partsurfer.hp.com>

Removing Memory Modules

1. Turn off the system, disconnect all cables, and remove the main access panel and airflow guide.



WARNING: To ensure that memory modules are not damaged during removal or installation, power off the workstation and unplug the power cord from the AC power outlet. Wait until the power supply LED (page 1-7) turns off before removing or installing memory.

2. Press downward and outward on the memory module retainer clips, then lift the DIMM out of the slot by its edges.



Removing DIMMs

3. If the removed memory is functional, store it in a static-free container for future use.
4. Replace the airflow guide and system access panel, reconnect all cables, and turn on the system.
5. Check the configuration using the BCH **Information menu** (page 2-6).

Installing Memory Modules

1. Turn off and unplug the system, disconnect the power cable, and remove the system access panel and airflow guide.



WARNING: To ensure that memory modules are not damaged during removal or installation, power off the workstation and unplug the power cord from the AC power outlet. Wait until all LEDs on the system board turn off before removing or installing memory.

2. Holding the DIMM by its left and right edges, insert it into the slot. Make sure DIMMs are inserted fully and that the side clips fully clasp the DIMM edges.



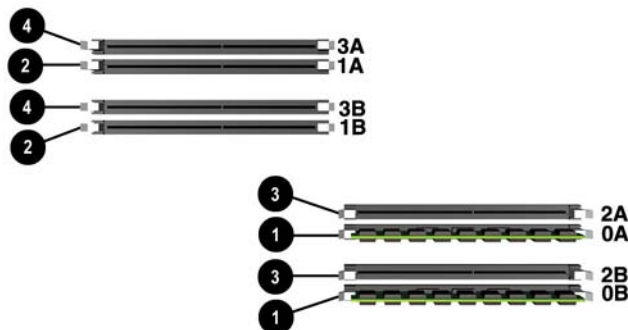
CAUTION: The memory modules are keyed and can only be inserted in one direction. Do not try to force a DIMM into a slot backwards. When the module is correctly seated, the retainer clips will return to their fully upright position. Snap the clips firmly into place to ensure that the DIMMs are seated properly.

3. Replace the airflow guide and system access panel, reconnect all cables, and turn on the system.
4. Check the memory configuration using the BCH **Information menu** (page 2-6).

DIMM Installation Guidelines

The HP workstation c8000 has eight memory DIMM slots organized as four a/b pairs: 0a and 0b, 1a and 1b, 2a and 2b, 3a and 3b.

- ❑ The DIMM in each **a** slot must match the DIMM in the corresponding **b** slot.
- ❑ DIMMs match if they have the same HP part number. (Two empty slots also match.)
- ❑ For maximum system performance, install DIMMs so that the even pairs match the odd pairs: 0a and 0b match 1a and 1b; 2a and 2b match 3a and 3b.
- ❑ Matched pairs should be loaded in this order:
 - ① slots 0A and 0B
 - ② slots 1A and 1B
 - ③ slots 2A and 2B
 - ④ slots 3A and 3B



DIMM slots

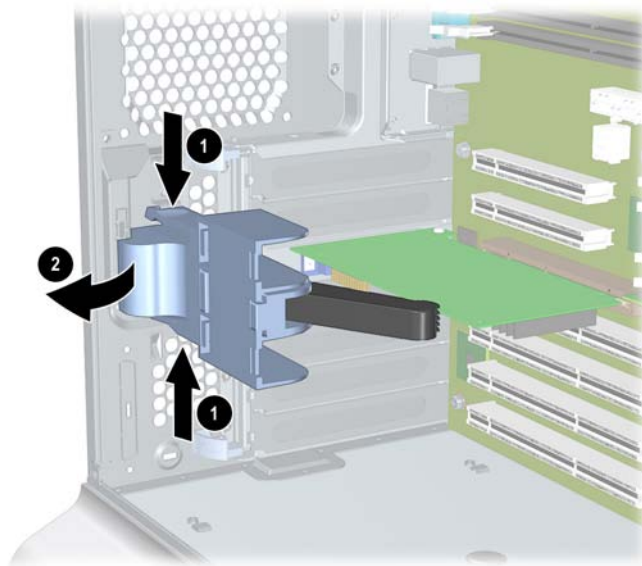
PCI and AGP Cards

This section explains how to:

- access the AGP and PCI slots, and
- remove and replace AGP graphics and PCI accessory cards.

Removing PCI or AGP Card

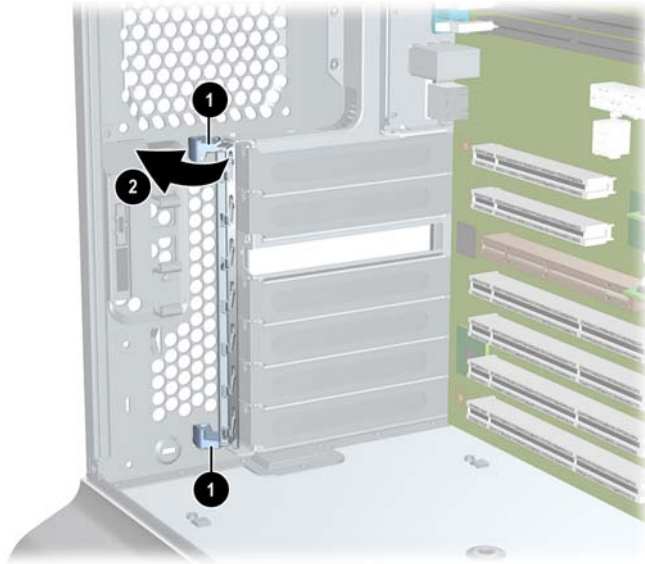
1. Turn off the system, disconnect all cables, and remove the main access panel.
2. Remove the AGP retainer if it is blocking the card you wish to access:
 - a. Press in on the release snaps on the AGP retainer ❶.
 - b. Rotate the retainer outwards ❷ and lift it out of the system.



Removing the AGP retainer

3. Open the PCI/AGP retainer clip:

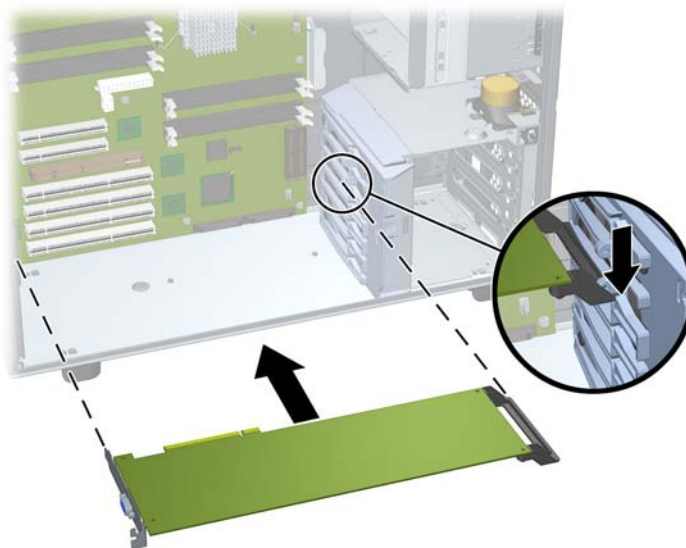
- ❑ Push in on the two blue levers at the ends of the PCI/AGP retainer clip ❶ then rotate the clip into the open position ❷.



Opening the PCI/AGP retainer clip

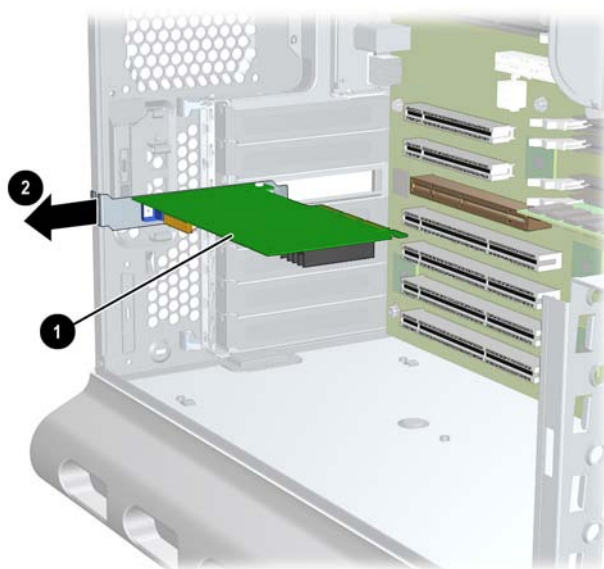
4. Remove the card:

- a. If the card is an audio card, unplug the connectors attached to the front control panel (see figure on page 3-29).
- b. If the card is a full length card, push the card edge stop to the side to allow the card to slide out of the guide.



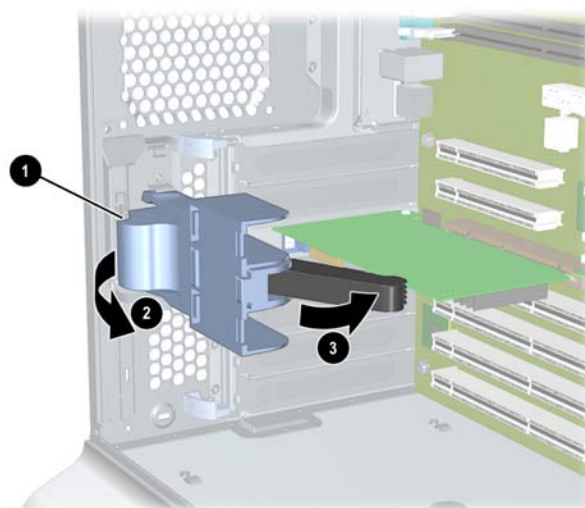
Full-length AGP or PCI card

- c. Grasp the card at the edges ❶ and lift it out of the slot ❷.



Removing an AGP or PCI card

5. If you are not installing a new card in the same slot, insert a filler blank. If you are installing a new card in the same slot, see page 3-15.
6. Close the PCI/AGP retainer clip and press the two blue release snaps on the rear panel of the system to lock it in place. (See figure on page 3-13).
7. Replace the AGP retainer if you removed it.
 - a. Insert the tab on the retainer securely into the slot on the rear edge of the system chassis ❶ and rotate the retainer until it snaps into place ❷.
 - b. Make sure the retainer ❸ is securely holding the AGP card in place.



Replacing the AGP retainer

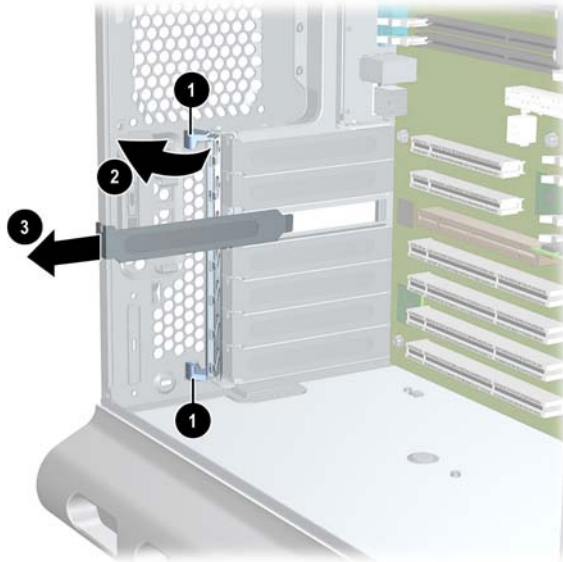
8. Replace the main access panel, reattach the power cable and any external cables attached to the PCI/AGP cards, and turn on the system.

Installing or Replacing a PCI or AGP Card

NOTE: For specifications on your graphics card, visit the manufacturer's web site or refer to the graphics documentation included in the accessory kit.

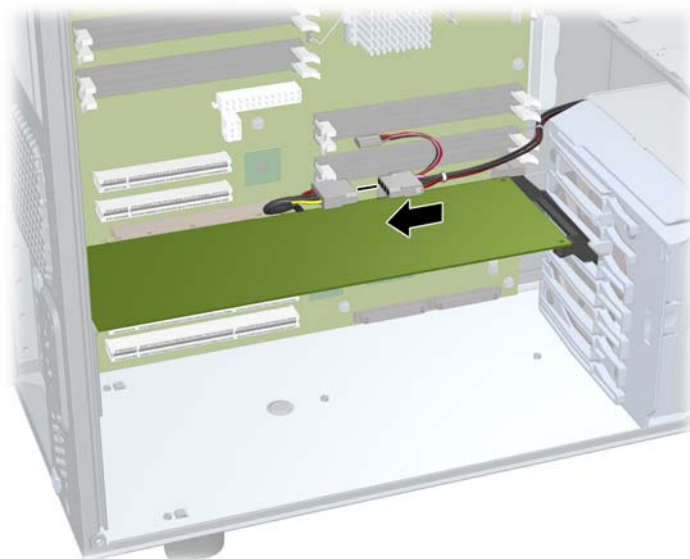
To install an accessory or graphics card:

1. Remove the existing card or bulkhead blank that is in the slot you want to use.
 - a. From the inside of the case, push on the two blue release snaps at the ends of the PCI/AGP retainer clip ❶ then rotate the clip into the open position ❷.
 - b. If the slot has a card installed, remove it (page 3-12).
 - c. If the slot is empty, pull the filler blank out of the system ❸.



Removing the existing card or bulkhead blank

2. Install the card:
 - a. Grasp the edges of the new card and insert it into the slot.
 - b. If the card has a power connector, plug it in.



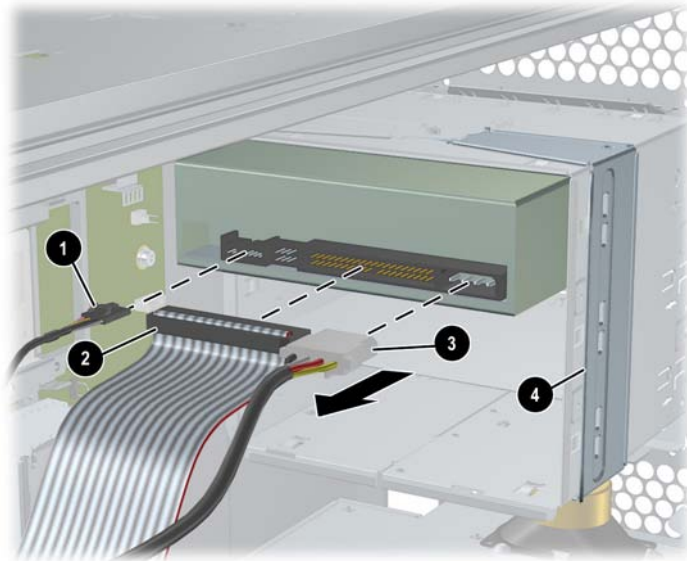
Plugging in a PCI or AGP card power connector

- c. If the card is a full length card, the end of the card will automatically snap into place (not shown).
3. Close the PCI/AGP retainer clip and press the two blue release snaps on the rear panel of the system to lock it in place. (See the figure on page 3-13).
4. Replace the AGP retainer and system access panel and reconnect all cables.
5. Turn on the system and check the configuration using the BCH **Information menu** (page 2-6).

Optical Drives (CD or DVD)

Removing an Optical Drive

1. Turn off the system, disconnect all cables, and remove the system access panel and front panel.
2. Disconnect the audio **1**, IDE **2**, and power **3** cables from the optical drive.
3. Pull outward on the lever to release the optical drives from the bay **4**.



Disconnecting an optical drive

4. Grasp the optical drive firmly and slide it forward to pull it out of the drive bay.



Removing an optical drive from tower and rack-mounted systems

5. If you are not replacing the optical drive with a new drive, install a blank in the drive bay opening and a plastic filler in the front panel.

Installing an Optical Drive

1. Turn off the system, disconnect all cables, and remove the system access panels.
2. Pull the release handle on the optical drive bay, and slide the optical drive into the bay until it stops and snaps into place. Verify that the drive is properly installed by checking that the small alignment holes on the side of the drive bay are aligned with the holes on the drive (4 below).

If you need help performing these steps, refer to “Removing an Optical Drive” on page 3-17.

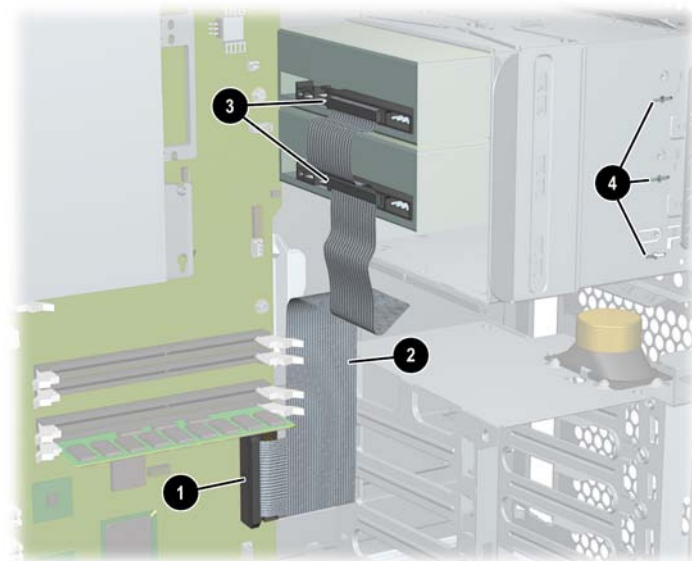
3. Connect the power and audio cables to the optical drive.
4. Connect the IDE cable to the optical drive:

The system has two IDE cables:

- ❑ If you have IDE hard drives installed, one cable is used to connect the hard drives, the other to connect up to two optical drives.
- ❑ If you have SCSI hard drives installed, two optical drive IDE cables are available to connect up to three optical drives.

To connect the IDE cable:

- a. Locate the IDE cable(s) connected to the secondary IDE connector on the system board 1 and route the cable(s) 2 to the optical drives. If you have three optical drives, connect the third drive to the cable connected to the primary IDE connector.
- b. Plug the cable in to the connector on the optical drive 3.



Connecting an optical drive

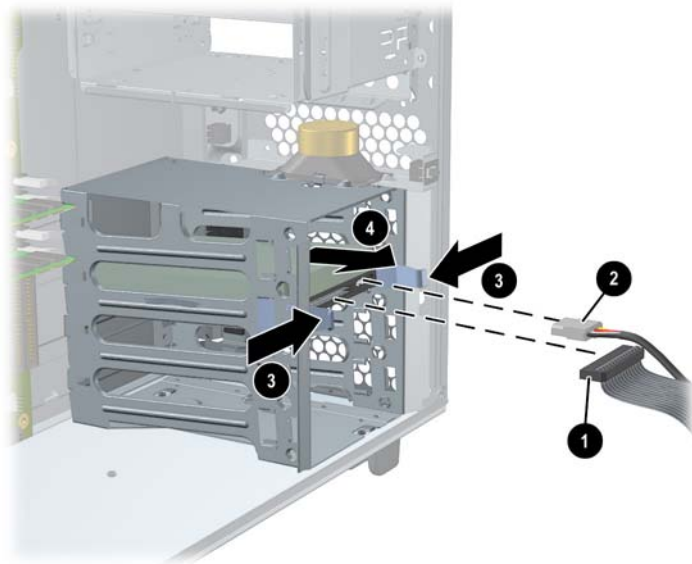
NOTE: The black connector on each cable is for the master device; the gray connector is for the slave device. Make sure the jumper on the optical drive is set to cable select (CSEL), not to master (M) or slave (S). See the documentation provided with your drive for help locating the jumper.

5. Replace the access panels and reconnect all cables.
6. Turn the system on, then check the configuration using the BCH **Information menu** (page 2-6).

Hard Drives

Removing a Hard Drive

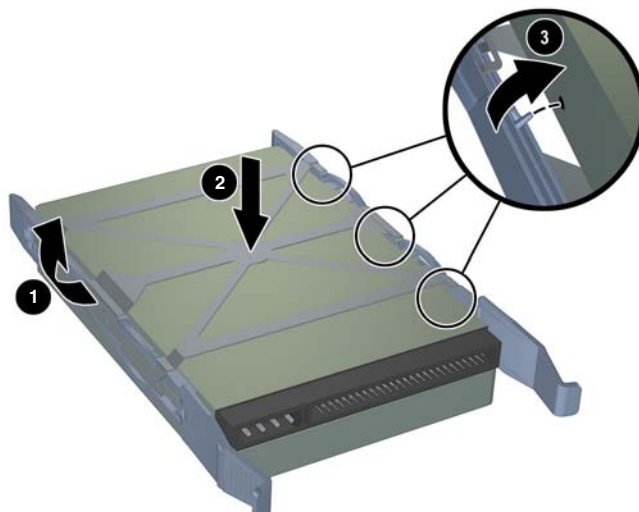
1. Turn off the system, disconnect all cables, and remove the system access panel.
2. Disconnect the hard drive IDE or SCSI cable ❶ and power connector ❷.
3. Squeeze inward on the blue release clips located on the sides of the drive ❸. Then, pull outward to remove the drive from the system ❹.



Removing a hard drive

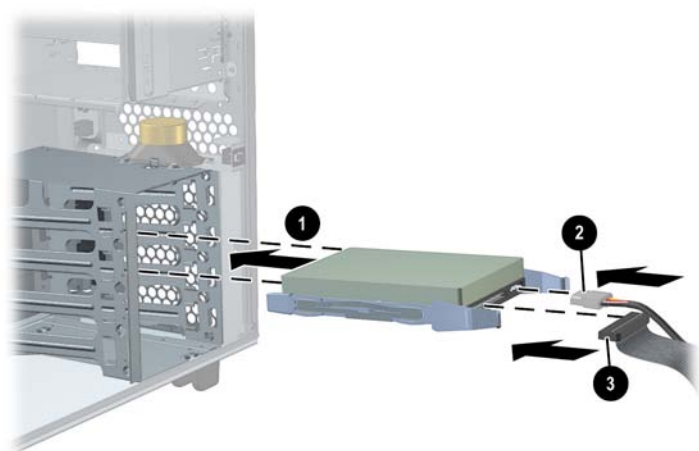
Replacing a Hard Drive

1. Review “Hard Drive Installation Guidelines” on page 3-21 for instructions on configuring drives and installing drives in the correct bays.
2. Select a drive bay in which to install the drive. Squeeze inward on the blue release clips located on the sides of the tray with attached drive rails. Pull forward to remove the tray from the empty bay (see step 3 in figure of removing a drive on page 3-19).
3. Snap the drive inside the drive tray to attach rails to the hard drive. Pull outwards on the drive rails **1**, then place the tray onto the drive **2**. Align the pins on the tray with the holes on the drive and let the rails snap into place **3**.



Attach the rails

4. Push the drive into the bay until it snaps into place **1**. Then attach the power **2** and IDE or SCSI cable **3** to the drive.



Installing a hard drive

5. Replace the system access panel and cables.
6. Turn the system on, then check the configuration using the BCH **Information menu** (page 2-6).

Hard Drive Installation Guidelines

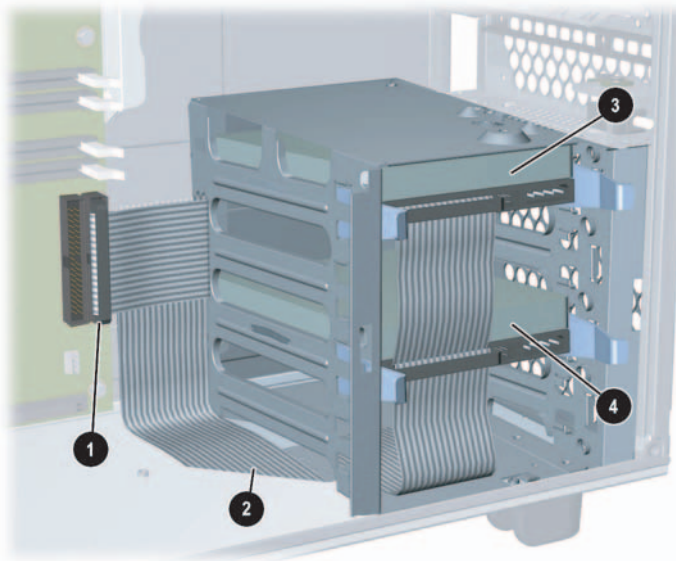
The system supports either IDE or SCSI hard drives, but not both in the same system.

IDE Drives

The HP workstation c8000 supports up to two IDE hard drives, attached to the primary IDE cable.

NOTE: For additional information on configuring IDE drives, see Appendix A, “Ultra ATA / IDE Guidelines.”

- ❑ The system has two IDE cables — one for connecting hard drives, and the other for connecting optical drives. Locate the IDE cable connected to the primary IDE connector on the system board ❶ and attach the cable ❷ to the hard drive.
- ❑ The black connector on each cable is for the master device ❸; the gray connector is for the slave device ❹. Make sure the jumper on the hard drive is set to cable select (CSEL), not to master (M) or slave (S). See the documentation provided with your drive for help locating the jumper.
- ❑ Install the first drive in the top bay ❸. Install the second drive in the bay above the bottom bay ❹.



IDE hard drive locations

NOTE: The Disk Activity LED automatically communicates with IDE and SCSI drives connected to the built-in controllers.

To get this functionality with an SCSI or IDE controller card, connect the card with an LED activity cable to the hard drive activity LED connector on the system board.

Refer to “System Board Components and Connectors” on page 3-4 for a picture showing where on the system board to connect the LED activity cable (item 36).

SCSI Drives

The HP workstation c8000 supports up to four SCSI hard drives attached to the SCSI A connector.

1. Set the SCSI ID on your drive(s):

- Drive 1 ID=3
- Drive 2 ID=4
- Drive 3 ID=5
- Drive 4 ID=6

See the label on the hard drive or documentation provided with the drive for instructions on setting SCSI IDs. These instructions should include a diagram of the jumper block and jumper settings for each SCSI ID.

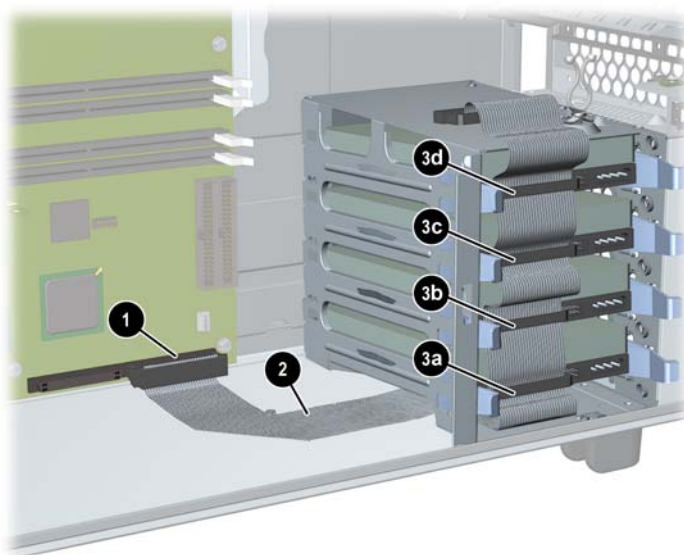
NOTE: See Appendix B, “SCSI Guidelines” for more information on configuring SCSI drives.

2. Locate the SCSI cable connected to the SCSI A connector on the system board **1** and attach the cable **2** to the hard drive(s).

3. Install drives in bays in the following order **3**:

- Use bay 3d for Drive 1
- Use bay 3b for Drive 2
- Use bay 3c for Drive 3
- Use bay 3a for Drive 4

NOTE: There is no need to terminate the SCSI chain. The supported SCSI cable includes an attached hardware terminator.



SCSI hard drive locations

NOTE: The Disk Activity LED automatically communicates with IDE and SCSI drives connected to the built-in controllers.

To get this functionality with an SCSI or IDE controller card, connect the card with an LED activity cable to the hard drive activity LED connector on the system board.

Refer to “System Board Components and Connectors” on page 3-4 for a picture showing where on the system board to connect the LED activity cable (item 36).

External SCSI Devices

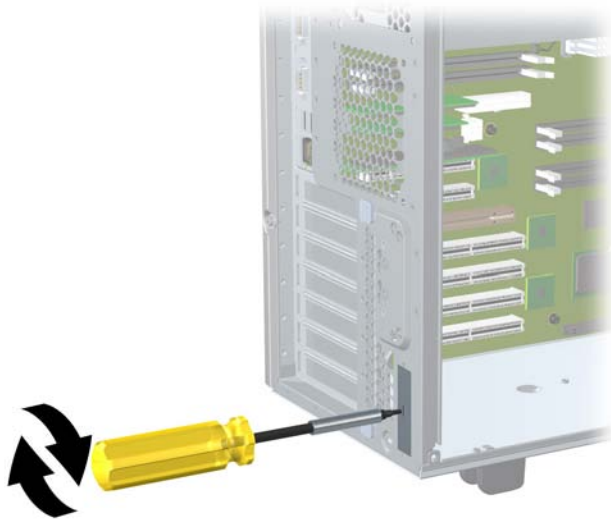
You can add an external SCSI connector (U320 SCSI port) to the on-board SCSI controller or to an optional PCI SCSI controller card.

Note that:

- You can connect up to 15 devices at any SCSI ID, except SCSI ID 7 which is used by the host controller.
- The bus should be terminated as normal if you use external devices. No termination is necessary if there are no devices connected.
- SCSI IDs are set by jumpering pins on the disk drive.
- If you are adding a SCSI hard drive to your system, you may need to change the SCSI ID of the new hard drive so that all SCSI devices have unique IDs. If two devices use ID 0, the system will not boot.
- 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.

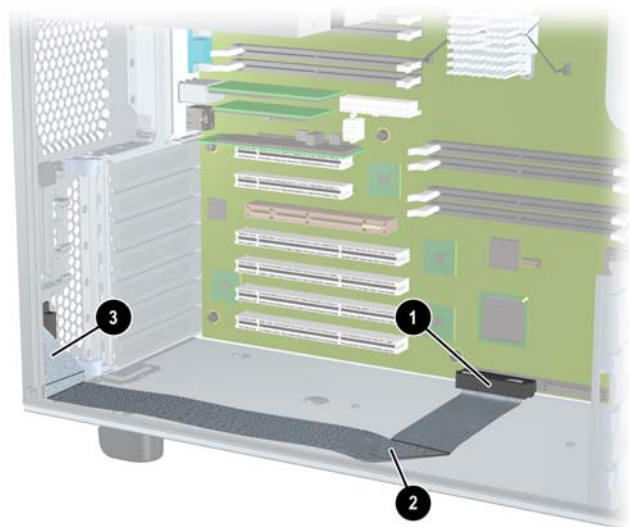
To install the external connector:

1. Remove the knockout panel in the chassis using a regular screwdriver. Insert a flat-head screwdriver into the rectangular hole and twist the metal until the panel comes out.



Remove knockout panel

2. Plug the cable into the connector ❶ and route as shown.



Installing external connector

3. Peel the release liner off of the pad on the cable and press the pad against the chassis wall ❷ to secure.
4. Thread the jackscrews through the rear chassis wall and into the connector ❸.

Power Supply

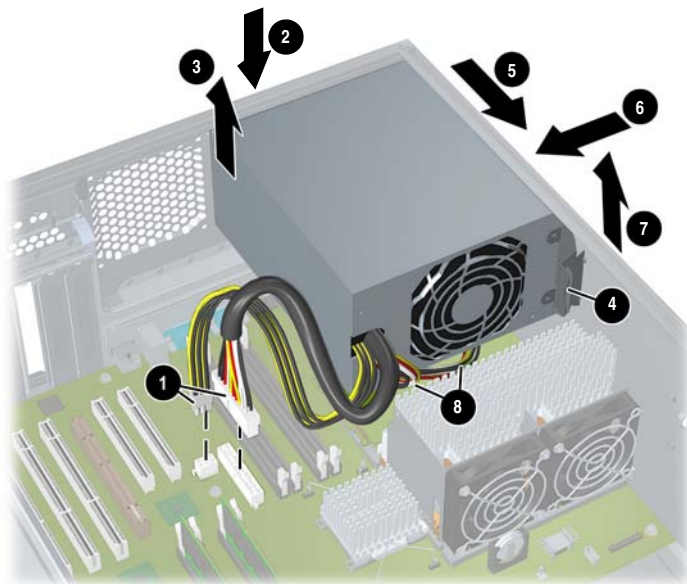
Before replacing the power supply, you can use the Built-In Self-Test (BIST) feature to find out if the power supply still works. Refer to Chapter 4, “Troubleshooting”, for more information.

Removing the Power Supply

1. Turn off the system, disconnect all cables, and remove the system access panel and airflow guide.
2. Unplug the power supply power connectors from all components ❶, including the:
 - hard drives
 - optical drives
 - graphics card
 - system board

NOTE: Use caution when lifting the power supply because there are cables below the power supply (illustrated on the next page) that must be removed before completely removing the power supply from the chassis.

3. Loosen the thumbscrew that secures the power supply to the rear panel ❷.
4. While supporting the power supply weight with your hand ❸, reach inside the system chassis and pull the lever that locks the power supply in place ❹.
5. Slide the power supply toward the front of the chassis ❺ and toward the PCI slots ❻, then lift it out ❼.
6. Unplug the power supply cables that connect to the power module(s) ❽.



Removing the power supply



NOTE: For information on testing the power supply, refer to “Troubleshooting the Power Supply” on page 4-14.

Replacing the Power Supply

1. Before inserting the power supply, reconnect the processor power module cable(s) from the power supply to the power modules on the system board.

NOTE: The power cables connecting to the power modules are interchangeable. The cables are different colors but all are designed for the same purpose.

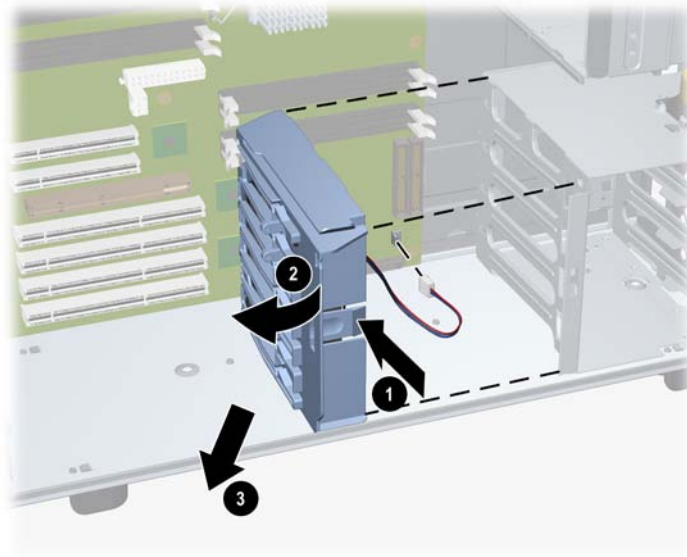
2. Align the tabs on the power supply with the mounting holes on the system chassis.
3. Insert the new power supply into the system chassis. Push the power supply up and slide it toward the back of the chassis until it snaps into place.
4. Tighten in the thumbscrew that secures the power supply to the rear panel.
5. Connect the remaining power supply power cables to all system components, including the hard drives, optical drives and system board. Be sure the cables are routed properly, so they do not block the airflow guide or interfere with the heatsinks on the processors.

Hard Drive and Chassis Fans

In addition to the fan attached to the airflow guide (page 3-9), two cooling fans are mounted at the front and rear of the system.

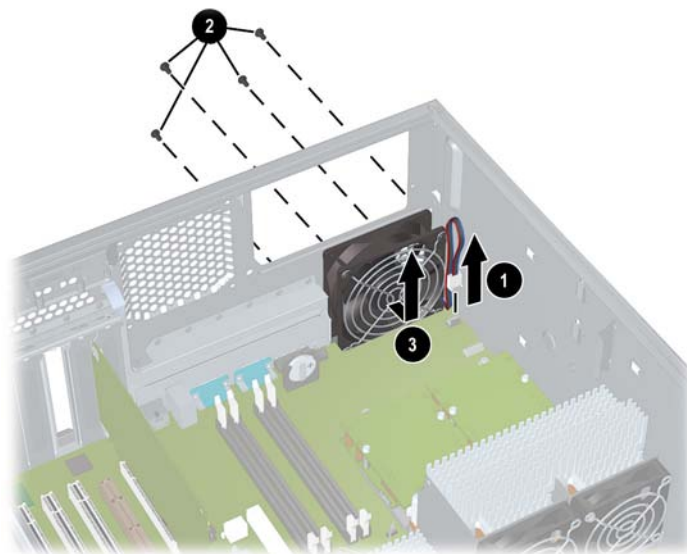
Removing the Hard Drive and Chassis Fans

1. Turn off the system, disconnect the power cable, and remove the system access panel and airflow guide.
2. To remove the hard drive fan:
 - a. Unplug the fan power cable from the system board.
 - b. Push in on the snap on the side of the fan ❶. Then rotate the fan towards the rear of the chassis ❷ and lift it out of the system ❸.



Removing hard drive fan

3. To remove the chassis fan:
 - a. Unplug the fan power cable ❶.
 - b. Remove the push rivets holding the fan in place ❷ then slide the fan towards the front of the chassis and lift the fan out of the system ❸.



Removing the chassis fan

Replacing the Hard Drive and Chassis Fans

1. Grasp the replacement fan module firmly and insert it into same location from which you removed the old fan.
 - ❑ If you are replacing the chassis fan, install the push rivets.
2. Re-attach the fan cable.
3. Replace the access panel and reconnect all cables.
4. Turn the system on, then check that the fans have been properly installed by verifying that none of the Diagnostic LEDs on the rear panel of the system are lit.

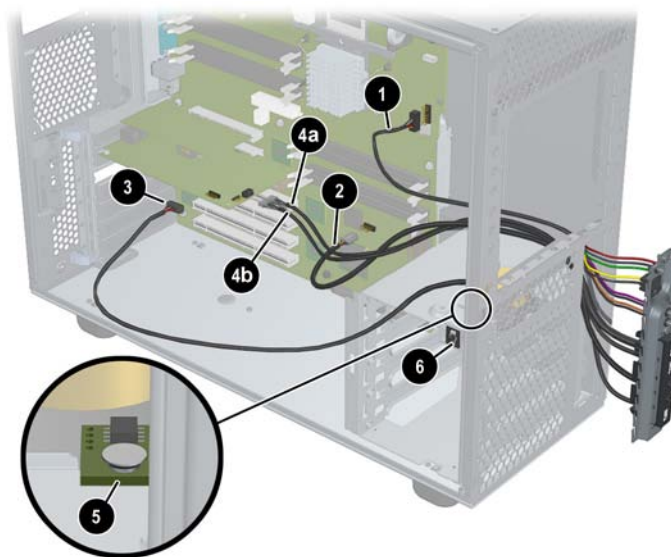
Front Control Module

The front control module contains these connectors and components:

- Front-access USB connector
- Microphone and headphone connectors (optional)
- IEEE-1394 FireWire connector (not supported)
- Power button
- System status LED
- Temperature sensor
- Chassis intrusion switch
- Disk activity LED
- LAN activity LED

Removing the Front Control Module

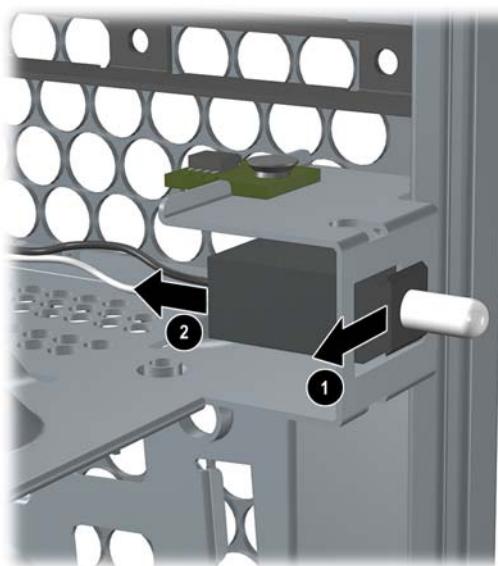
1. Turn off the system, disconnect all cables, and remove the system access panels.
2. Disconnect the front control module cables.



Location of front control module cables and connections

❶ Power	❷ USB	❸ Chassis speaker	❹ Audio (plugged into optional PCI card) • Microphone (a) • Headphone (b)
	❺ Temperature sensor	❻ Chassis intrusion switch	

3. Remove the chassis intrusion switch and temperature sensor:
 - a. Slide the switch out of the slot by pushing it in the direction shown ❶.
 - b. Pull the switch out of the opening ❷.
 - c. Pull up on the head of the plastic push rivet and remove it, then remove the sensor from the system ❸.



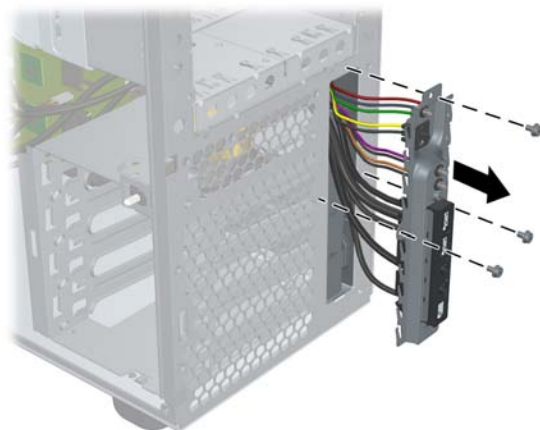
Removing the chassis intrusion switch

4. Remove the panel from the system:
 - a. Use a Torx T-15 or slot screwdriver to remove the screws holding the front control module in place ❶ ❷ ❸.



Unscrewing the front control module

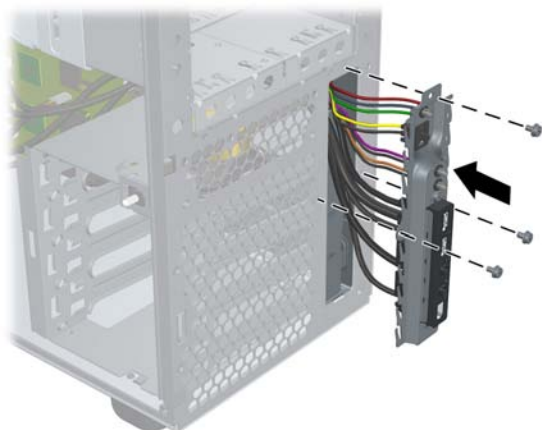
- b. Remove the module, carefully extracting the attached cables through the opening on the chassis.



Disconnecting the front control module

Replacing the Front Control Module

1. Insert the cables connected to the module through the opening in the system chassis and route them to the appropriate connectors.
2. Reconnect the chassis intrusion switch:
 - a. Insert the new switch housing into the system chassis.
 - b. Insert the switch into the housing and slide in until it snaps into place.
3. Replace the temperature sensor and attach it with a plastic push rivet.
4. Replace the I/O panel in the system and use a Torx T-15 or slot screwdriver to attach the mounting screws.



Replacing the front control module

5. Route the cables attached to the module to the appropriate components and connectors and reconnect all cables (page 3-29).
6. Replace the system access panels and reconnect all power cables and turn on the system. Verify that the System Status LED is working.

Replacing the Processor or Installing an Additional Processor

To replace an existing processor or install a new one in the HP workstation c8000, follow these steps.

Read Cautions and Warnings

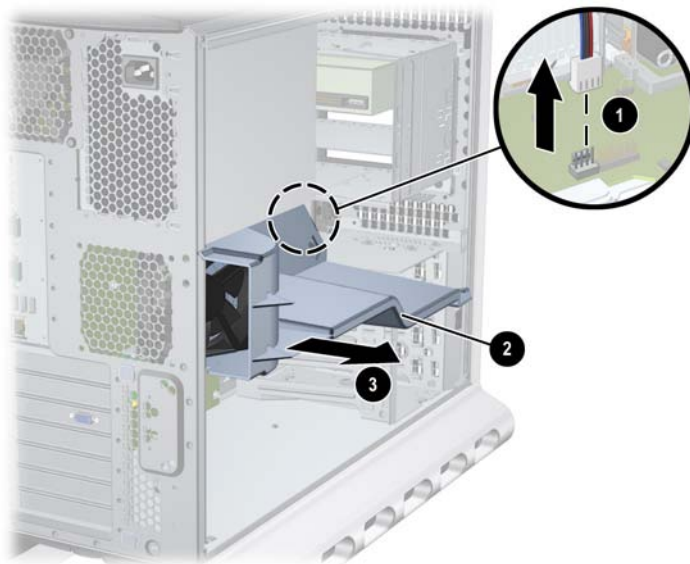
For your safety, you must read the “Important Safety Warnings” at the beginning of this guide and the “Tools and Safety” section at the beginning of this chapter before proceeding.

Remove the System Access Panel

1. Turn off the system and disconnect the power cable.
2. Place the unit on its side with the pedestal hanging over the edge of a table.
3. Remove the access panel (page 3-8).

Remove the Airflow Guide

1. Unplug the memory fan connector from the system board ❶.
2. Grasp the airflow guide ❷ and lift it out of the system ❸.



Removing the airflow guide and fan

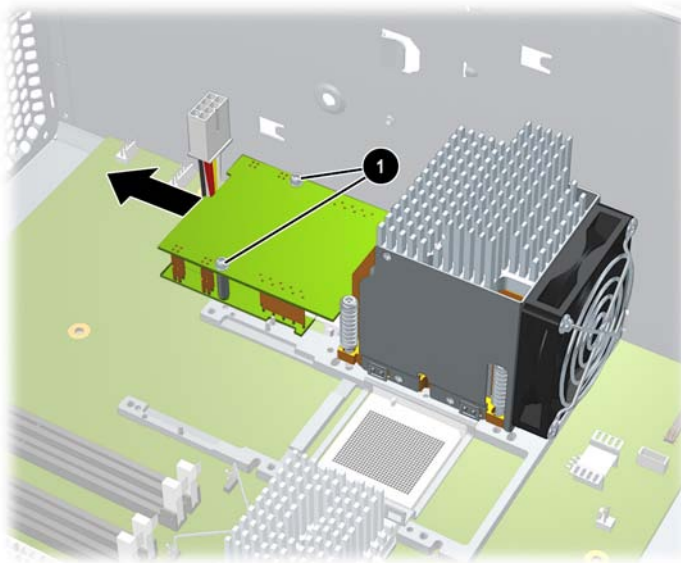
Remove the Power Supply

Follow the steps in “Removing the Power Supply” on page 3-25 to remove the power supply.

Remove the Processor (for Replacement)

 **CAUTION:** You must follow these steps **exactly and in the correct sequence** to avoid serious damage to the system.

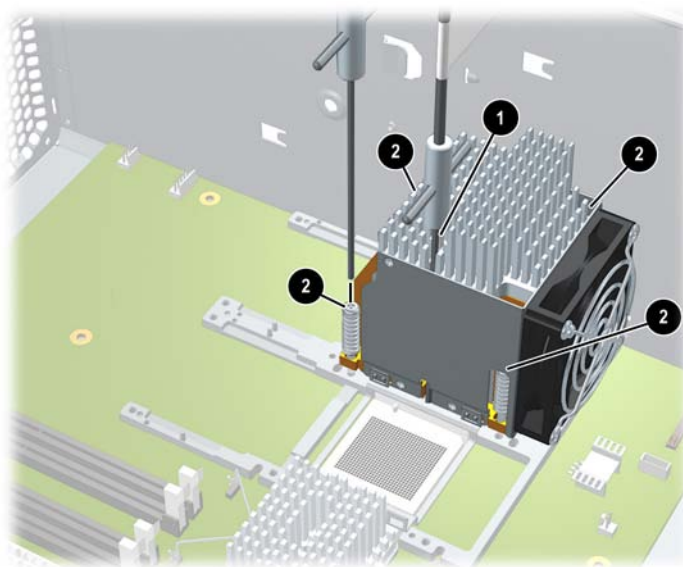
1. Remove the processor power module (CPU0 is shown):
 - a. Use the special processor tool (included with your processor kit) to remove the two screws **1** from the processor power module.
 - b. Slide the processor power module towards the rear of the system until it stops, then lift it out of the system.



Removing a processor power module

2. Remove the processor:

- a. Using the Torx driver end of the special processor tool, loosen the four screws on the processor assembly until they pop up into the released position ❶.
- b. Insert the other end of the special processor tool into the slot on the side of the heatsink and rotate the processor locking mechanism 180 degrees counter-clockwise to unlock it ❷.

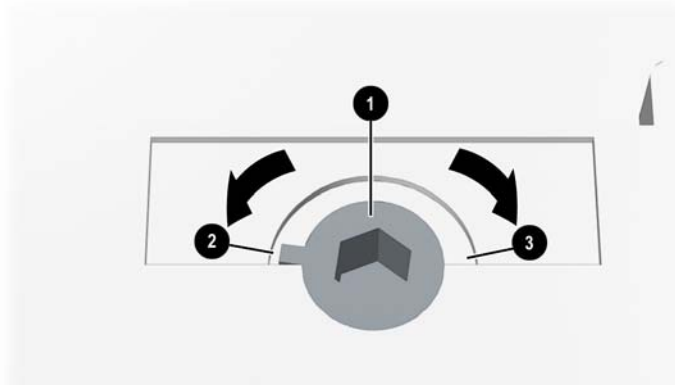


Removing the processor

3. Lift the processor out of the system.

Install the Processor

1. Prepare the CPU socket:
 - a. If you are adding a second CPU, remove the plastic film covering the socket.
 - b. Verify that the CPU locking mechanism is in the unlocked position.



Verifying unlocked position

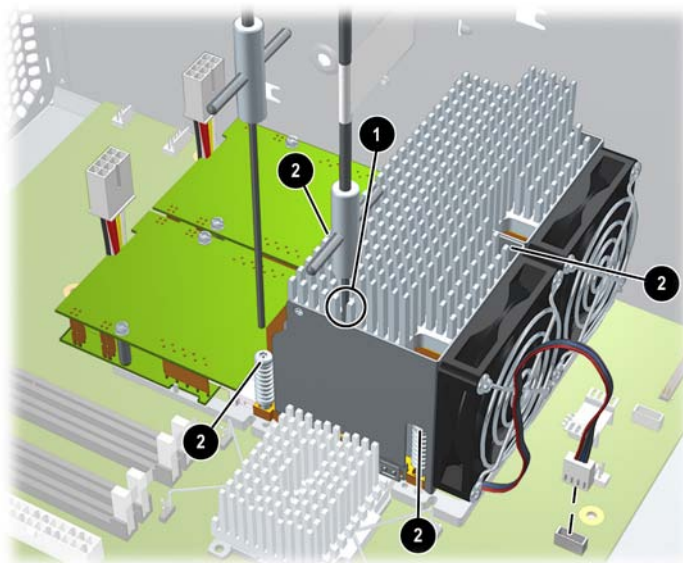
❶ The special processor tool rotates this lock

❷ Unlocked

❸ Locked

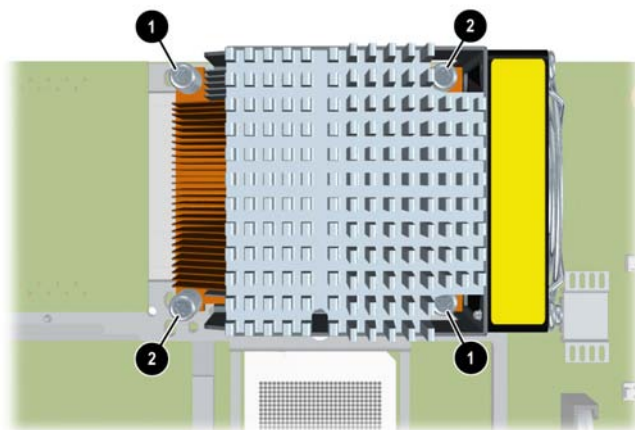
2. Install the processor power module and the CPU:
 - a. Insert the processor into the socket.
 - b. Insert the allen wrench end of the special processor tool into the hole that runs down the side of the heatsink. Engage the socket ❶, and rotate it clockwise 180 degrees to lock the processor in place. Remove the tool.
 - c. Using the other end of the special processor tool, tighten the four screws on the processor assembly ❷.

NOTE: If you are installing a new additional processor, the second power module shown in the figure below will not be present.

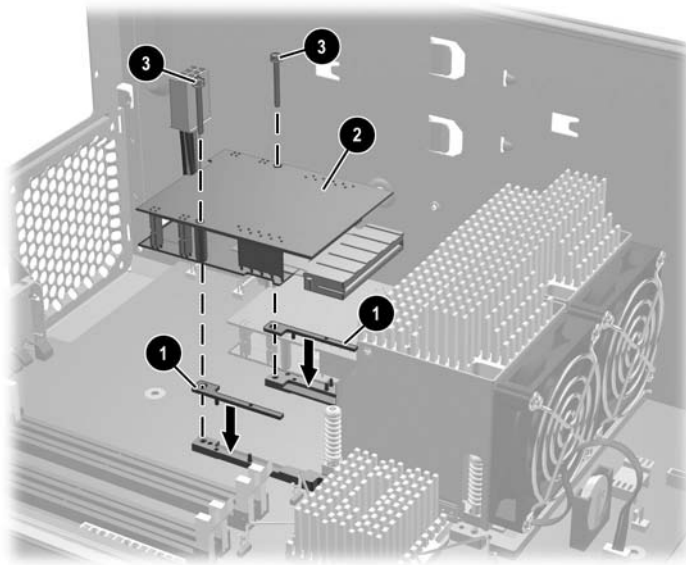


Using the special processor tool

CAUTION: While carefully holding the system board back against the rear of the chassis, screw in the four processor screws slowly, making sure to tighten all the screws evenly. Tighten one pair of diagonally opposite screws ❶ until the screw shank settles on the system board, then tighten the remaining pair ❷. Do not fully tighten one screw, then move on to the next. Tighten all of the screws a little at a time, making sure the processor remains level.

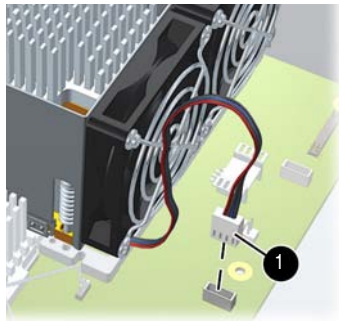


- d. Insert the shims provided with the kit ❶.
- e. Insert the processor power module into the system ❷ and slide it into the processor until it stops.
- f. Tighten the two screws from the processor power module firmly using the special processor tool provided with the new processor ❸.



Installing the processor power module

- g. Plug in the fan connector ❶.



Connecting fan connector

3. Replace the power supply (see “Replacing the Power Supply” on page 3-26) and reconnect all power cables.

Replace the Power Supply

Using the figure on page 3-34 as a guide:

1. Before inserting the power supply, be sure to re-connect the two processor power module cables (from the power supply) to the power modules (on the system board).
2. Align the tabs on the power supply with the mounting holes on the system chassis.
3. Insert the new power supply into the system chassis. Push the power supply up and slide it towards the back of the chassis until it snaps into place.
4. Connect the remaining power supply power cables to all system components, including the hard drive(s), optical drive(s) and system board. Make sure the cables are routed properly, so they do not block the airflow guide or interfere with the heatsinks on the processors.

Replace the Airflow Guide

Using the figure on page 3-38 as a guide:

1. Insert the airflow guide into the system and press until it snaps into place.
2. Plug the memory fan connector into the system board.

Replace the System Access Panel

Using the figure on page 3-8 as a guide:

1. Replace the system access panel.
2. Plug in the power cable and start the system to verify that it boots properly with the new processor.

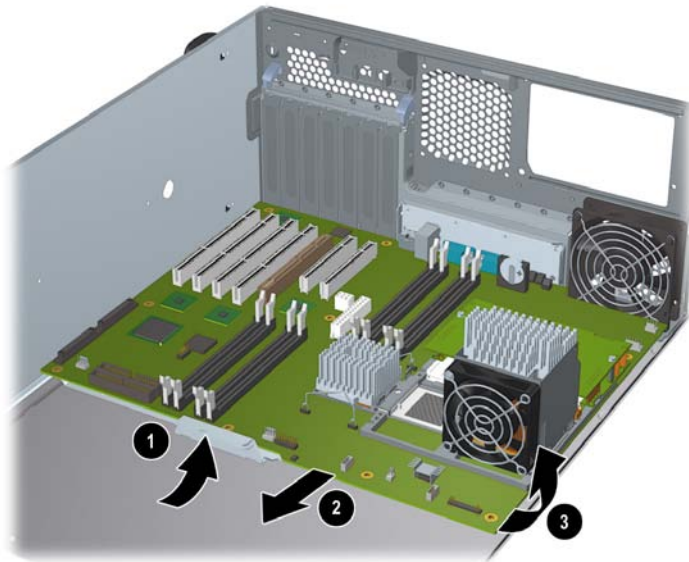
System Board

Removing the System Board

1. Turn off the system, disconnect all external cables, and remove the system access panel. Disconnect all devices attached to the system. Place the system on its side.
2. Disconnect the system board connectors (page 3-4) and remove all components except the CPU(s).
 - Power supply and all power cables connected to system board
 - Airflow guide and memory fan
 - Hard drive fan
 - DIMMs
 - AGP retainer
 - Accessory and graphics cards

NOTE: Disconnect IDE and SCSI cables from the system board. Leave them attached to the hard drives and optical drives.

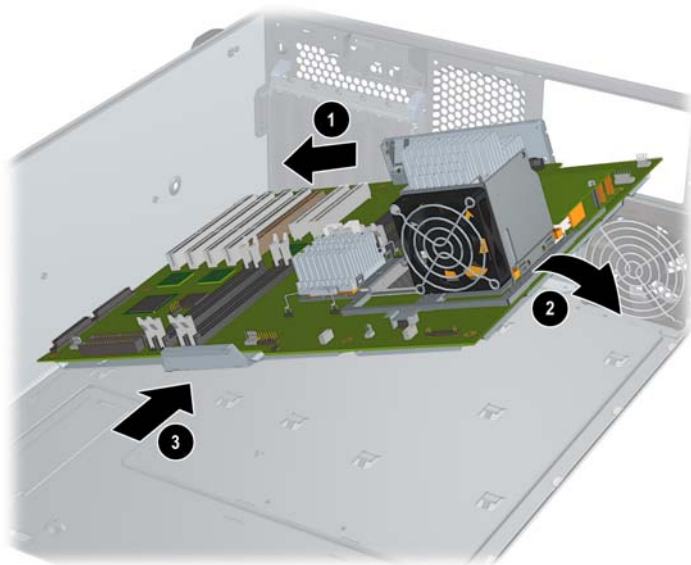
3. Pull up on the lever on the optical drive cage (see figure on page 3-17, ④) and slide the optical drives forward until the rear edge of the drives is aligned with the rear edge of the drive cage.
4. Depress the lever on the edge of the system board to release it from the chassis ①.
5. Slide the system board toward the front of the system ②.
6. Lift up the edge of the system board and lift it out of the chassis ③.



Removing the system board

Replacing the System Board

1. Complete all of the steps in the section “Removing the System Board” on page 3-39.
2. Grasp the new system board by its edges and carefully place it in the system. Remember that the system board keyholes must be aligned with their corresponding standoffs on the system’s chassis **1**. Once the system board is in the system aligned with the keyhole standoffs, rotate it into place **2** and slide it back toward the rear of the system until it snaps into place **3**.



Replacing the system board

3. Connect the system board cables and replace all components on the system board (page 3-39).
4. Slide the optical drives back into place.
5. Replace the system access panel and reconnect the cables.
6. Start the system. If the system does not boot up properly, see Chapter 4, “Troubleshooting.”
7. Use the **ss_update** utility (in the BCH **Service** menu) to reset the serial number.

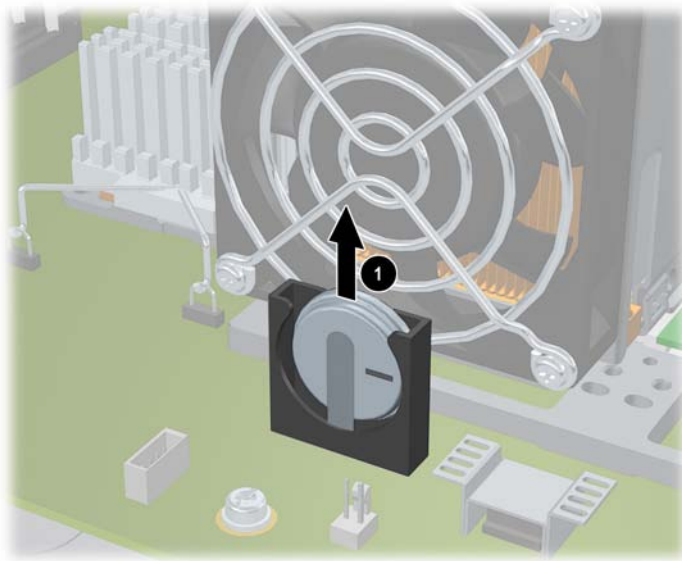
System Battery

Removing the System Board Battery

1. Turn off the system, disconnect all cables, and remove the system access panel.
2. Carefully pull the retainer clip away from the battery. Then rotate and lift ❶ the battery out of its holder.



CAUTION: Lift the battery just high enough to clear its holder. Too much stress on the retainer clip can break it.



Removing the system battery

Replacing the System Board Battery

1. Slide the battery into the battery holder. The negative side should be facing out. Look at the above image for correct battery orientation.
2. Replace the system access panel and reconnect all cables.
3. To verify that the battery has been installed correctly, check the time and date settings using the BCH **Time command** (page 2-4).

You may need to reset the system time and date. Once you have set the time, turn the system off, unplug the power cord, and wait for a minute before turning it back on. Execute the time command again. If the time and date are now correct, you have installed the battery correctly.

Troubleshooting

This chapter describes how to identify and solve common problems you may encounter when using your HP workstation c8000:

- E-Support, page 4-2
- Troubleshooting Overview, page 4-2
- Identifying and Diagnosing Hardware Problems, page 4-2
- BCH Error and Warning Messages, page 4-12
- Troubleshooting the Power Supply, page 4-14

For online access to technical support information and tools, go to:

<http://www.hp.com/bizsupport>

Support resources include web-based troubleshooting tools, technical knowledge databases, driver and patch downloads, online communities, and proactive notification services.

E-Support

For online access to technical support information and tools, go to:

<http://www.hp.com/bizsupport>

Support resources include Web-based troubleshooting tools, technical knowledge databases, driver and patch downloads, online communities, and proactive notification services.

Troubleshooting Overview

The HP workstation c8000 includes several tools to help you troubleshoot potential problems. Many problems have simple solutions, so try the tools and suggestions covered in this section before contacting HP support. The following sections provide additional information about:

- Identifying and diagnosing hardware problems
- Monitor troubleshooting
- System logs and error messages

Identifying and Diagnosing Hardware Problems

For basic troubleshooting tips, see the *HP workstation c8000 Getting Started Guide*. If you need further help with a hardware failure, the system LEDs and logs will help you identify the problem:

- **LEDs.** The lights on the front and rear panels of the workstation change color and blink in different patterns to help identify specific hardware problems.
 - LAN Activity LEDs
 - Hard Disk Activity LED
 - System Status and Diagnostic LEDs
 - System Board LED
- The **BCH Error and Warning Messages** provide additional detailed information about errors identified by the LEDs.

If the LEDs and log files do not provide enough information for you to identify the problem you are experiencing, HP also provides **software diagnostic tools**.

NOTE: See Chapter 2, “System Configuration” for detailed instructions on removing and replacing system components.

LEDs

Several LEDs are on the front and rear panels of the workstation (see figures on page 1-7 and page 1-9). See the following sections for a detailed description of these functions.

LAN LEDs (Front and Rear Panel)

The LAN Activity LED on the front panel of the system blinks green when LAN activity is present.

The two LAN LEDs on the LAN connector on the rear panel provide additional information about LAN connection and activity.

LAN LED	Location	Color	State
1. Activity	Tower: Right	Off	No LAN connection
	Rack-mounted: Top	Yellow	Link established
		Blinking	Activity on LAN port
2. Speed	Tower: Left	Off	10Mbps
	Rack-mounted: Bottom	Orange	100Mbps
		Green	Link at 1000Mbps

Disk Activity LED

The Disk Activity LED on the front panel indicates the state of disk and drive activity on the system.

Disk Activity LED	State
Off	Off or no current disk/drive activity
Blinking (green)	Disk/drive is being accessed

NOTE: The Disk Activity LED automatically communicates with IDE and SCSI drives connected to the built-in controllers.

To get this functionality with an SCSI or IDE controller card, connect the card with an LED activity cable to the hard drive activity LED connector on the system board.

Refer to “System Board Components and Connectors” on page 3-4 for a picture showing where on the system board to connect the LED activity cable (item 36).

System and Diagnostic LEDs

The System Status LED on the front panel of the system and the four Diagnostic LEDs on the rear panel of the system are used for diagnosing the health of the system (see figures on page 1-7 and page 1-9). These LEDs warn of impending hardware failures and allow you to take preventive action, such as making a system backup or replacing a component before it fails. The Diagnostic LEDs are labeled 1, 2, 3 and 4 on the rear panel.

The location of red LEDs can be used to identify the category of the fault or warning. For example, if LED one is red, there is a problem with memory. However, if LEDs one and two are both red, there is a problem with the system processor.

The following symbols are used in the LED tables.

- The **System Status LED** *on the front panel of the system* indicates the state of the system:

Off indicates the system is off.



Green indicates that the system is running normally. **Blinking green** indicates that the system is booting (slow blink 0.5Hz).



Blinking orange indicates a WARNING (medium blink 1.0Hz).



Blinking red indicates a FAULT (fast blink 1.5Hz).

- The **Diagnostic LEDs** *on the rear panel of the system* provide details about each specific warning or fault:





















Solid red indicates the failing part or sub-system.



Off or solid green diagnostic LEDs provide additional details about the failure (see page 4-6 and page 4-8).

Fault and Warning Categories

The faults and warnings fall into the following general categories, each specific error is described in detail on the following pages.



























LED1	LED2	LED3	LED4	Category
RED 				Memory
	RED 			Firmware
		RED 		System Board
			RED 	Fan
RED 	RED 			Processor
RED 		RED 		BMC
	RED 	RED 		System
RED 			RED 	Temperature
	RED 		RED 	Power
RED 	RED 	RED 	RED 	Unknown

Warnings (System LED is Blinking Orange)



The following tables provide additional information about each specific **warning** associated with the various possible Diagnostic LED lighting sequences **when the system LED is orange** (medium blink 1.0Hz).

LED1	LED2	LED3	LED4	Warning	Solution
<i>Unknown Warnings</i>					
RED 	RED 	RED 	RED 	Unknown warning.	Contact your HP Support Engineer.
<i>Memory Warnings</i>					
RED 	GREEN 			Mismatched memory pairs.	Use the memory sequence diagram in "Installing Memory Modules" on page 3-11.
RED 		GREEN 	GREEN 	Memory load order error.	Use the memory sequence diagram in "Installing Memory Modules" on page 3-11.
RED 	GREEN 	GREEN 	GREEN 	Can't detect memory type.	Contact your HP Support Engineer.
<i>System Board Warnings</i>					
GREEN 	GREEN 	RED 		Battery voltage low.	Replace the system board battery.

















LED1	LED2	LED3	LED4	Warning	Solution
<i>Fan Warnings</i>					
	GREEN 		RED 	Chassis fan not functioning properly.	Replace the fan that is not functioning. If a processor fan has failed, you must replace the CPU.
		GREEN 	RED 	CPU0 cooling fan not functioning properly.	
GREEN 	GREEN 		RED 	CPU1 cooling fan not functioning properly.	
	GREEN 	GREEN 	RED 	Memory fan not functioning properly.	
GREEN 	GREEN 	GREEN 	RED 	PCI/disk fan not functioning properly.	
<i>Processor Warning</i>					
RED 	RED 	GREEN 		CPU0 temperature exceeds limit.	If the processor fan has failed, you must replace the CPU.
RED 	RED 		GREEN 	CPU1 temperature exceeds limit.	
<i>Temperature Warning</i>					
RED 	GREEN 	GREEN 	RED 	External air temperature too high.	Make sure nothing is blocking the system's airflow and locate your system in an air-conditioned room.
<i>Video Warning</i>					
	RED 	RED 		No video adapter present.	Install a video adapter. See the installation instructions shipped with the video adapter.






















Faults (System LED is Blinking Red)












The following tables provide additional information about each specific **fault** associated with the various possible Diagnostic LED lighting sequences **when the system LED is red** (fast blink 1.5Hz).

LED1	LED2	LED3	LED4	Fault	Solution
<i>Unknown Faults</i>					
RED 	RED 	RED 	RED 	Unknown fault.	Contact your HP Support Engineer.
<i>Memory Faults</i>					
RED 	GREEN 			Mismatched memory pairs.	Use the memory sequence diagram in "Installing Memory Modules" on page 3-11.
RED 			GREEN 	Uncorrectable memory error.	Replace memory.
RED 	GREEN 	GREEN 		No memory installed.	Install memory in matched pairs (see "Installing Memory Modules" on page 3-11).
RED 	GREEN 	GREEN 	GREEN 	Bad memory. One or more DIMMs are bad or not seated properly.	Reseat the DIMMs. If the error persists, replace them.
<i>Firmware Fault</i>					
	RED 			System firmware hang.	Contact your HP Support Engineer.

LED1	LED2	LED3	LED4	Fault	Solution
<i>System Board Fault</i>					
GREEN 		RED 		VRM undervoltage.	Contact your HP Support Engineer.
	GREEN 	RED 		VRM overvoltage.	
GREEN 	GREEN 	RED 		Unknown system board fault.	
<i>System Fault</i>					
	RED 	RED 		Machine check.	The system resets due to a problem. If you cannot determine the reason for the reset, contact your HP Support Engineer.
<i>Cooling Unit Faults</i>					
	GREEN 		RED 	Chassis or CPU fan(s) not functioning properly.	Replace the fan that is not functioning. If the processor fan has failed, you must replace the CPU.
		GREEN 	RED 	Memory fan not functioning properly.	
GREEN 	GREEN 		RED 	PCI/disk fan not functioning properly.	

LED1	LED2	LED3	LED4	Fault	Solution
<i>Processor Faults</i>					
RED 	RED 	GREEN 		CPU0 temperature exceeds limit.	If the processor fan has failed, you must replace the CPU.
RED 	RED 		GREEN 	CPU1 temperature exceeds limit.	
RED 	RED 	GREEN 	GREEN 	No processor detected.	Replace the CPU(s).
<i>BMC Faults</i>					
RED 	GREEN 	RED 		BMC firmware is damaged.	Reflash the BMC firmware.
RED 	GREEN 	RED 	GREEN 	System board FRU inventory device inaccessible.	Replace the system board.
<i>Temperature Faults</i>					
RED 	GREEN 	GREEN 	RED 	External air temperature too high.	Make sure nothing is blocking the system's airflow and locate your system in an air-conditioned room.

LED1	LED2	LED3	LED4	Fault	Solution
<i>Power Faults</i>					
	RED 		RED 	CPU 0 Power Module fault.	Contact your HP Support Engineer.
GREEN 	RED 	GREEN 	RED 	CPU 1 Power Module fault.	
GREEN 	RED 		RED 	Power Supply fault.	Replace the power supply.

System Board LEDs

There are three additional LEDs that can help when troubleshooting the system. These LEDs are located on the system board close to the back of the system and can be viewed through the small holes in the system case just above the Diagnostic LEDs. See “Rear Panel” on page 1-9.

LED	Description
1 STBY	This standby LED comes on as soon as the system power cord is plugged in. If this LED is off when you plug the system in, check that the power cord is connected to the system and the outlet, and make sure the outlet is turned on. If this does not work, make sure the main and auxiliary cables are correctly plugged into the board. If the system is still not receiving power, test the power supply following the instructions in “Troubleshooting the Power Supply” on page 4-14. If you need to replace the power supply, refer to “Power Supply” on page 3-25.
2 BMC	A few seconds after the system is plugged in this LED starts blinking, which means that the Baseboard Management Controller is alive. If this LED is not blinking and the STBY (standby) LED is on, you may have to replace the system board.
3 F/W	A few seconds after the power button is pressed in the system firmware code fetch LED comes on indicating that the firmware has started the boot process. If this LED does not come on, make sure: <ul style="list-style-type: none"> • the processor(s) are correctly seated • each processor power module is correctly mounted and connected to the corresponding power supply cable • all appropriate power supply cables are properly connected to the system board

BCH Error and Warning Messages

BCH error and warning messages are displayed on the console as part of the boot process. They can also be retrieved via the **Warnings** BCH command.

Warnings and errors displayed are:

- WARNING: Processors are not installed in the correct order.
- WARNING: Setting DEFAULTS has failed.
- WARNING: Not enough error-free contiguous memory (GoodMem).
- WARNING: Memory page deallocation has been disabled because the Page Deallocation Table (PDT) is full.
- ERROR: Current loading of DIMMs failed the loading order check.
- WARNING: The Page Deallocation Table (PDT) is FULL.
- WARNING: The system serial number is invalid.
- ERROR: The BMC BT interface has failed on this system, Halt Boot.
- WARNING: The BMC System Event Log (SEL) is full.
- ERROR: The BMC BT port has failed on this system and an alternate BMC port is being used as a failover.
- WARNING: No graphics or serial consoles were found on this system.
- WARNING: No usable graphics console was found on this system. The console has defaulted to a serial port.

Displaying PIM Information

The **pim** command allows you to display the most recent PIM information for the specified fault type. To display PIM information for a specific fault, execute the following from the Service Menu:

```
pim <processor_number> <fault_type>
```

Clearing the FPL and SEL Logs

The BMC **clearlogs** command in the **Service** submenu empties the log files.

NOTE: IF the SEL logs are full, a warning will be displayed when the system boots. Capture the log contents be captured and archive them before clearing the logs if the system is experiencing problems. HP support representatives may need the information from these files.

Troubleshooting the VGA Monitor

It is normal for the display to remain blank for a minute or longer during system boot-up.

Direct the system output to a console device for troubleshooting:

1. With the workstation turned off, connect a 9-pin to 9-pin serial cable (HP F1044-80002) to *Serial Port A* on the rear panel of the workstation, and to a laptop or other device with terminal emulation software.

NOTE: If your system has a plug-in serial card (installed in slot 6), connect to the card's serial port instead of to Serial Port A.

2. Configure the terminal emulation software with these settings:
 - Terminal emulation: VT100+
 - Wrap lines: Off (unchecked)
 - Baud rate: 9600
 - Bits: 8
 - Parity: None
 - Stop Bits: 1 (one)
 - Flow Control: XON/XOFF
3. Using the terminal emulation software, connect to the workstation with a *direct connection*.
4. Turn on the workstation.

Troubleshooting the Power Supply

Before replacing the power supply, you can use the Built-In Self-Test (BIST) feature to find out if the power supply still works.

To test the power supply:

1. Disconnect all internal power supply cables.
2. Plug the power supply plug into a working electrical wall outlet.
3. On the rear panel of the workstation, look through the ventilation holes above the power cord connector for a green LED light. If the light is visible, the power supply is functional.

Refer to Chapter 1, in the “Rear Panel” section, for a picture showing where the LED is displayed.

Running HP Diagnostics

This section includes information on the Offline Diagnostics Environment (ODE) CD. These tools may be used to diagnose hardware-related problems on your HP system.

NOTE: References to the SupportPlus Media in the SupportPlus User's Guide, Chapter 3, should be ignored: they do not apply to c8000 systems. However, the conceptual and procedural information still applies to IPF systems. Any discrepancies have been noted and explained in the SupportPlus User's Guide, and elsewhere, as appropriate.

Before you run the HP diagnostic software, note any LED error messages. They give you an indication of the Field Replaceable Unit (FRU) to replace.

Offline Diagnostics Environment (ODE)

The Offline Diagnostics Environment is an offline support tools platform that enables users to troubleshoot a system that cannot be tested using online tools. The offline environment is also useful for some types of testing in which it is not desirable to have to boot the system first.

Tools Provided

The ODE includes a variety of diagnostics tools. Depending on your system and configuration, these may include some or all of the following tools, as well as additional tools specific to your system:

- MAPPER2 is an offline system configuration mapping utility. It identifies and displays a list of system components including hardware modules and peripheral devices.
- MAKODIAG is a CPU diagnostics tool.
- MEM2 is a memory diagnostics tool.

To access a detailed list of tools provided on your system, from the ODE Main Menu:

1. Select **View Release Notes and Documentation Menu**.
2. Browse the documentation and release notes.

Running ODE from the Offline Diagnostics Environment CD

ODE uses a command line interface, which allows the user to select specific tests and/or utilities to execute on a specific hardware module.

To run ODE from the *HP Offline Diagnostics Environment CD*:

1. Insert the CD into the CD/DVD drive and reset system power, the system should come up to the boot manager.
2. If the boot manager is already configured, and the CD/DVD drive is configured as one of the boot devices, move the cursor to the line which shows the CD/DVD drive, and press **Enter**. The CD then will boot to the Launch Menu.
3. Select **Run the Off-line Diagnostic Environment (ODE)** from the launch menu.

NOTE: If you are unable to boot from your CD/DVD drive, restart your system and check the boot options from the **Boot Options Maintenance Menu** to ensure that your system is configured to boot from the CD/DVD drive.

For further information, see <http://docs.hp.com/hpux/diag> under the section titled “Offline Diagnostics.” This site includes links to an FAQ, a conceptual overview, and a quick reference guide to ODE. Also see the section titled “Diagnostics (Support Tools) General,” especially the *SupportPlus: Diagnostic User's Guide*, Chapter 3. “Using the SupportPlus Media to Run Offline Diagnostics” is a useful chapter for more information on what ODE is, and how to run it.

Resetting the BMC Password

To reset the BMC password:

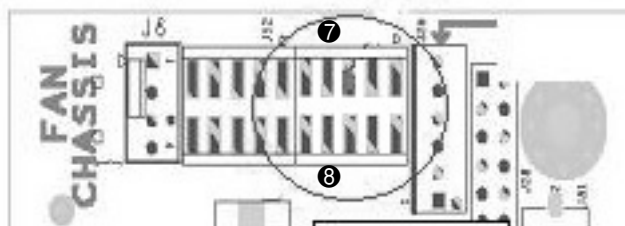
1. Shut down the operating system and then turn off the workstation and any external devices. Disconnect the power cord of the workstation and any external devices from the power outlets.
2. Disconnect the keyboard, monitor, and any other external devices that are connected to the workstation.

WARNING: To reduce the risk of personal injury from electrical shock and hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

CAUTION: When the workstation is plugged in, the power supply always has voltage applied to the system board even when the unit is turned off. Failure to disconnect the power cord can result in damage to the system.

CAUTION: Static electricity can damage the electronic components of the workstation or optional equipment. Before beginning these procedures, be sure that you are discharged of static electricity by briefly touching a grounded metal object.

3. Remove the access panel.
4. Remove the airflow guide and disconnect the memory fan.
5. Remove the power supply.
6. Locate the password header at J25, which is located at the edge of the system board between the chassis fan connector and the input power connector (CPU 0).
7. Place a jumper on pins 7 and 8 (connecting both pins together). You must provide your own jumper.



8. Reinstall the power supply.
9. Plug in the workstation and wait for the BMC heartbeat LED to start blinking green. There is about a 5-second delay before the LED begins to blink green.
10. Unplug the AC power cord and remove the jumper.
11. Replace the access panel.
12. Plug in the AC power cord and boot the system. The passwords are cleared.

NOTE: The password jumper only has to be installed for a few seconds while AC power is connected (system power does not have to be on). The BMC logs an event in the SEL when the jumper is set.

Ultra ATA / IDE Guidelines

Ultra ATA Jumpers

Ultra ATA drives are configured by means of jumper settings. Factory-installed drives ship with the jumpers preset to the cable-select mode; therefore, no jumper setting changes are required on factory pre-installed, replacement, or option drives. With cable-select, the drive is configured as either Master (Drive/Device 0) or Slave (Drive/Device 1) by its physical attachment to the cable.

If you purchase a third-party hard drive, refer to the documentation included with the drive kit to ensure proper cable installation and configuration.

NOTE: All drives on a controller channel need to have their jumpers either in the cable-select mode or have the individual drive jumper installed on the appropriate Master (Drive/Device 0) or Slave (Drive/Device 1) position.

Ultra ATA Cables

Drives operating at speeds faster than those of the Ultra ATA-33 require an industry standard 40-pin, 80-conductor Ultra ATA cable for optimal performance. These cables have a maximum length of 18 inches and a maximum distance of 6 inches between the two devices for a two-drive cable. These cables maintain the higher data transfer rates possible with the improved technology.

When using Ultra ATA-133, -100, -66, and slower -33 drives in the same system, each drive operates at its appropriate data transfer rate.

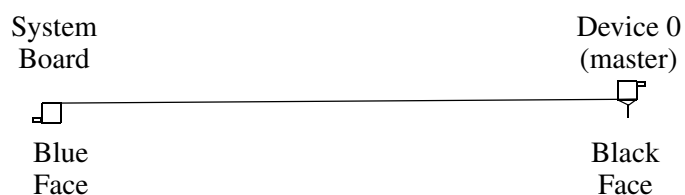
Cable Layout

The faces of industry-standard cable connectors are color coded for easy recognition:

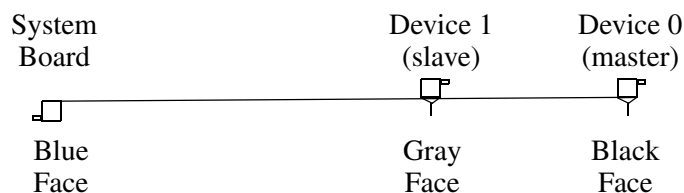
- System board connector = blue face
- Device 0 connector = black face
- Device 1 connector = gray face

NOTE: The color code of an industry-standard cable is valid only if the drive's jumper is in the cable-select position.

Single-drive Cable



Two-drive Cable



On a two-drive cable, the Drive/Device 0 connector is always the farthest one from the system board connector and the Drive/Device 1 connector is always the closest to the system board connector.

NOTE: Some cables may be labeled "Drive 0" instead of "Device 0" and "Drive 1" instead of "Device 1."

Drive Installation Guidelines

The c8000 has two ATA (IDE) channels with a dedicated connector for each controller. One controller is designated as the primary and the other as the secondary controller.

Each of the two controllers can have up to two devices attached to it. Each workstation system may therefore have a maximum of four ATA/ATAPI drives. All drives are connected to these controllers using an industry-standard 80-conductor cable.

Any drive attached to a controller must have a drive designation. If only a single drive is connected to a controller and its jumper is in the cable-select position, it is designated as the Master Drive (Drive/Device 0) by its attachment to the Drive/Device 0 cable position. If two cable-selected drives are connected to a single controller, one will be designated by its attachment to the cable as the Master (Drive/Device 0) and the other as Slave (Drive/Device 1).

For optimal performance of a workstation system, all drives need to be attached to the ATA controllers in a specified sequence. This sequence is determined by the device class of the drives and by specific attach sequence rules.

Device Classes

In order to determine the best drive attach sequence, ATA/ATAPI drives are segregated into four different classes based upon the bandwidth demands they place on an ATA controller. The most demanding devices are in Class 1 and the least demanding are in Class 4.

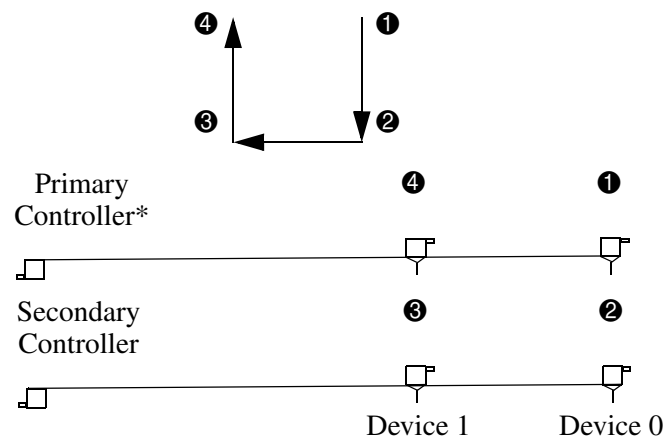
class 1 hard drives	class 2 high speed optical drives	class 3 optical storage drives	class 4 magnetic storage drives
ATA-133	DVD	R/W CD-ROM	LS-120
ATA-100	DVD-CD R/W	CD-ROM	Tape
ATA-66			Zip
ATA-33			

General Attach Guidelines

- The lower the device class number, the faster the device and the more bandwidth required.
- Drives installed in the Device 0 positions on both the primary and secondary controllers receive the greatest possible bandwidth.
- The bootable ATA hard drive should always be installed on the primary controller in the Device 0 position.

Attach Sequence Rules by Class Priority

Drives should be attached in the sequence shown for optimum performance starting at position ①.



*If there are three or more devices, two or more of which are hard drives, two hard drives should be attached to the primary controller first before following the General Attach Sequence Rule.

The attach sequence rule may also be stated in table format:

General Attach Sequence Rule*	
Sequence	Description
1	The lowest class drive – bootable hard drive recommended.
2	If only two drives, the last drive goes here; otherwise the lowest class of the remaining drives.
3	If only three drives, attach the final drive here. If a fourth drive exists, attach the lowest class drive here.
4	If there is a fourth drive, attach the final drive here - the drive with the highest class number of all devices.

*If there are three or more devices, two or more of which are hard drives, two hard drives should be attached to the primary controller first before following the General Attach Sequence Rule.

The rules allow for:

- Keeping the hard drive on a separate controller channel maximizes drive performance until a fourth device is added.
- Keeping the hard drives and removable media drives on separate controller channels maximizes compatibility.
- Keeping the hard drive and the writable optical drive on separate controller channels maximizes optical drive reliability.

Attach Sequence Worksheet

Use the worksheet below for obtaining optimum system performance when setting up a workstation with multiple drives. Use the General Attach Sequence Rule to determine the best drive installation sequence.

attach sequence worksheet				
device name	device class	position number	controller name	device number

Two examples of how to use the worksheet are:

- Three device installation
- Four device installation

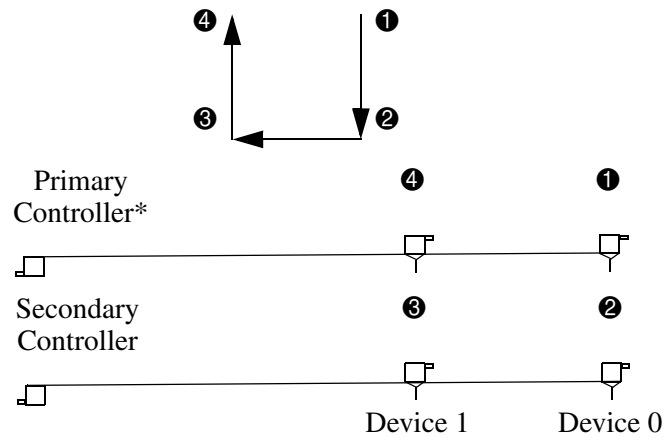
Example 1: Three Device Installation Sample

A system has three devices: Ultra ATA-133 hard drive, CD-ROM drive, and a DVD drive. Using the Device Class Table in Section 4.3.1, the devices may be identified as:

- Ultra ATA-133 hard drive = Class 1
- DVD drive = Class 2
- CD-ROM drive = Class 3

Attach Sequence Worksheet – Three Device Installation (Sample)

device name	device class	position number	controller name	device number
Ultra ATA-133 hard drive	1	①	Primary	0
DVD drive	2	②	Secondary	0
CD-ROM drive	3	③	Secondary	1



Example 2: Four Device Installation Sample

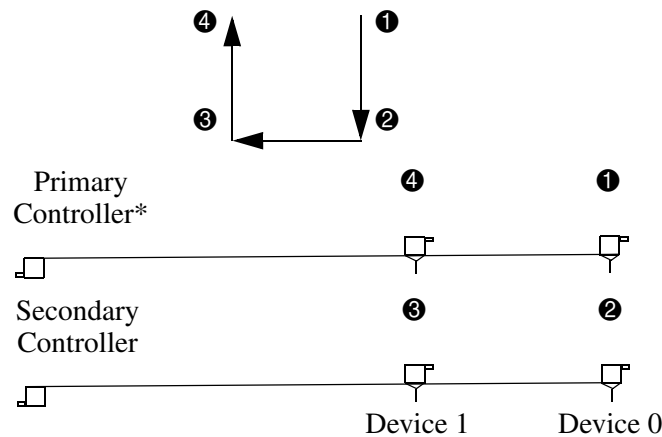
A system has four devices: Ultra ATA-133 hard drive, Ultra ATA-133 hard drive, DVD-CDR/W drive, and a ZIP-250 drive. Using the Device Class Table in Section 4.3.1, the devices may be reidentified as:

- Ultra ATA-133 hard drive = Class 1
- Ultra ATA-133 hard drive = Class 1
- DVD-CDR/W drive = Class 2
- ZIP-250 drive = Class 4

Attach Sequence Worksheet – Four Device Installation (Sample)

device name	device class	position number	controller name	device number
Ultra ATA-133 hard drive	1	①	Primary	0
DVD-CDR/W drive	2	②	Secondary	0
ZIP-250 drive	4	③	Secondary	1
Ultra ATA-133 hard drive*	1	④	Primary	1

*If there are three or more devices, two or more of which are hard drives, two hard drives should be attached to the primary controller first before following the General Attach Sequence Rule.



Additional Drive Application Notes

- When replacing a hard drive, the replacement should be of the same type (Ultra ATA-33, -66, -100, or -133) as that being removed to retain the same level of performance.
- When Ultra ATA and SCSI hard drives are mixed in the same system, the Ultra ATA drive will become the boot drive unless the boot order is changed.

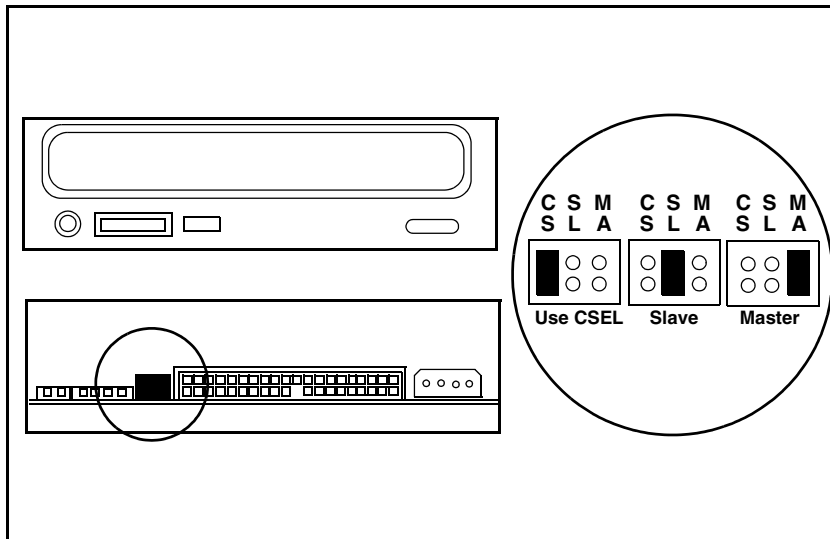
SMART

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for HP workstations have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive. The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

Jumpers

The specifications included below are the standard drive configurations.

CD-ROM or DVD-ROM Drive




SCSI Guidelines

NOTE: These systems have not been qualified with a mixed configuration of UATA/IDE and SCSI hard drives.

When installing and operating SCSI devices, you must follow these guidelines:

- These systems are equipped with a dual channel U320 SCSI controller. The primary channel can be used to connect up to 4 internal 68 pin SCSI Disk drives. The secondary SCSI channel can be connected to an external SCSI connector at the rear bulkhead of the system with an optional cable assembly.
- The Ultra 320 SCSI bus in these systems is a Low Voltage Differential (LVD) bus. HP does not recommend mixing Single Ended SCSI devices with LVD SCSI devices on the same SCSI bus. Mixing Single Ended devices on the same bus with LVD devices will result in the bus running in Single Ended mode, which will result in reducing the data transfer rate of the bus to the slower Single Ended transfer rate of 40Mbytes/second.
- If it is necessary to connect Single Ended SCSI devices to the system, it is recommended that these devices be connected to the secondary external SCSI port.
- If it is necessary to connect 50 pin SCSI devices to the system, it is recommended that these devices be connected to the secondary external SCSI port.
- It is not recommended to mix 50 pin SCSI devices with 68 pin SCSI devices on the same SCSI bus. If it is necessary to mix these devices on the same bus, care must be taken to insure integrity of the 68 pin bus.

 **CAUTION:** Do not route data cables near the air intake to the power supply. Cables routed in this manner may block the airflow and cause the workstation to overheat.

- All SCSI controllers require a unique SCSI ID (0-6 or 8-15) for each SCSI device installed. The controller identifies a SCSI device by its SCSI ID number rather than its location. Moving a SCSI device from one position to another on the SCSI chain does not affect communication between the controller and the device. Take care to ensure that all devices on the SCSI bus are set to unique SCSI ID numbers. When setting SCSI IDs, note that:

- 7 is reserved for the SCSI controller.
- 1 through 6 and 8 through 15 are available for all other SCSI devices.

To set the SCSI ID on a drive, see the instructions on top/back of the hard drive for the correct jumper settings.

The drive probably displays a diagram of the jumper block. This diagram shows you what blocks to cover with your jumper. For example, if the drive needs to be set to 3, the drive might show that the 3 ID bits are at the far left of the connector (ID0, ID1, ID2, and ID3), then using the jumpers provided, cover each block to set the SCSI ID.

- The SCSI controllers require a 68-pin twisted pair LVD cable with built-in terminator, for connection to a maximum of 4 internal SCSI LVD disk drives.
- Every SCSI bus or circuit must be terminated (closed) at both ends. The Internal SCSI bus in these systems is terminated on one end at the system board. The other end of the internal SCSI bus is terminated at the end of the SCSI cable. If the optional external SCSI port is used, this bus is terminated on one end at the system board. The other end of the External SCSI bus will need to be terminated at the last external SCSI device connected by the user with an approved LVD or Multimode SCSI terminator.
- Turn on all external SCSI devices before turning on the power to the workstation. This enables the SCSI controller to recognize the external devices.
- For additional information about installing optional SCSI devices, refer to the documentation included with the device option kit.

Self Monitoring Analysis and Reporting Technology (SMART)

The Self Monitoring Analysis and Reporting Technology (SMART) IDE and SCSI hard drives for HP workstations have built-in drive failure prediction that warns the user or the network administrator of an impending failure or crash of the hard drive. SMART drives track fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

Cable Pin-Outs

This appendix contains the pin assignments for many workstation connectors. Some of these connectors may not be used on the product being serviced.

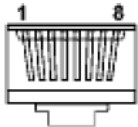
Enhanced Keyboard

The keyboard uses the USB port. Refer to “USB” on page 2 for more information.

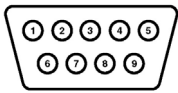
Mouse

The mouse uses the USB port. Refer to “USB” on page 2 for more information.

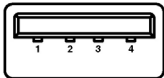
Ethernet RJ-45

connector	pin	signal
	1	(+) Transmit Data
	2	(-) Transmit Data
	3	(+) Receive Data
	4	Unused
	5	Unused
	6	(-) Receive Data
	7	Unused
	8	Unused


Serial Interface

connector	pin	signal
	1	Carrier Detect
	2	Receive Data
	3	Transmit Data
	4	Data Terminal Ready
	5	Signal Ground
	6	Data Set Ready
	7	Request to Send
	8	Clear to Send
	9	Ring Indicator


USB

connector	pin	signal
	1	+5 VDC
	2	- Data
	3	+ Data
	4	Ground


Microphone

connector and icon (1/8")	pin	signal
	1 (Tip)	Audio
	2 (Ring)	Power
	3(Shield)	Ground


Headphone

connector and icon (1/8")	pin	signal
	1 (Tip)	Audio_Left
	2 (Ring)	Audio_Right
	3(Shield)	Ground

Line-in Audio

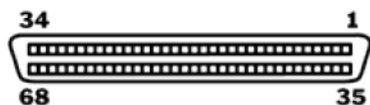
connector and icon (1/8")	pin	signal
	1 (Tip)	Audio_In_Left
	2 (Ring)	Audio_In_Right
	3(Shield)	Ground

Line-out Audio

connector and icon (1/8")	pin	signal
	1 (Tip)	Audio_Out_Left
	2 (Ring)	Audio_Out_Right
	3(Shield)	Ground

Ultra SCSI

connector

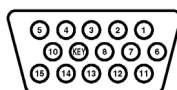


pin	signal	pin	signal
1	+DB12	35	-DB12
2	+DB13	36	-DB13
3	+DB14	37	-DB14
4	+DB15	38	-DB15
5	+DPB1	39	-DPB1
6	GND	40	GND
7	+DB0	41	-DB0
8	+DB1	42	-DB1
9	+DB2	43	-DB2
10	+DB3	44	-DB3
11	+DB4	45	-DB4
12	+DB5	46	-DB5
13	+DB6	47	-DB6
14	+DB7	48	-DB7
15	+DPB	49	-DPB
16	DIFFSENSE	50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	RES	53	RES
20	+ATN	54	-ATN
21	GND	55	GND
22	+BSY	56	-BSY
23	+ACK	57	-ACK

24	+RST	58	-RST
25	+MSG	59	-MSG
26	+SEL	60	-SEL
27	+C/D	61	-C/D
28	+REQ	62	-REQ
29	+I/O	63	-I/O
30	GND	64	GND
31	+DB8	65	-DB8
32	+DB9	66	-DB9
33	+DB10	67	-DB10
34	+DB11	68	-DB11

Monitor (VGA)

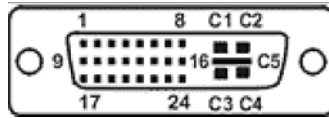
connector



pin	signal	pin	signal	pin	signal
1	Red Analog	6	Ground	11	Monitor ID
2	Green Analog	7	Ground	12	DDC Serial Data
3	Blue Analog	8	Ground	13	Horizontal Sync
4	Monitor ID	9	+5V DC	14	Vertical Sync
5	Ground	10	Ground	15	DDC Serial Clock

Monitor (DVI)

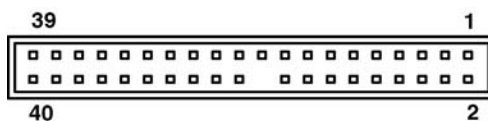
connector



pin	signal	pin	signal
1	T.M.D.S DATA 2-	16	HOT PLUG DETECT
2	T.M.D.S DATA 2+	17	T.M.D.S DATA 0-
3	T.M.D.S DATA 2/4 SHIELD	18	T.M.D.S DATA 0+
4	T.M.D.S DATA 4-	19	T.M.D.S DATA 0/5 SHIELD
5	T.M.D.S DATA 4+ 2	0	T.M.D.S DATA 5-
6	DDC CLOCK	21	T.M.D.S DATA 5+
7	DDC DATA	22	T.M.D.S CLOCK SHIELD
8	ANALOG VERT. SYNC	23	T.M.D.S CLOCK+
9	T.M.D.S DATA 1-	24	T.M.D.S CLOCK-
10	T.M.D.S DATA 1+		
11	T.M.D.S DATA 1/3 SHIELD	C1	ANALOG RED
12	T.M.D.S DATA 3-	C2	ANALOG GREEN
13	T.M.D.S DATA 3+	C3	ANALOG BLUE
14	+5V POWER	C4	ANALOG HORZ SYNC
15	GND	C5	ANALOG GROUND

ATA/ATAPI (IDE) Standard Drive Cable

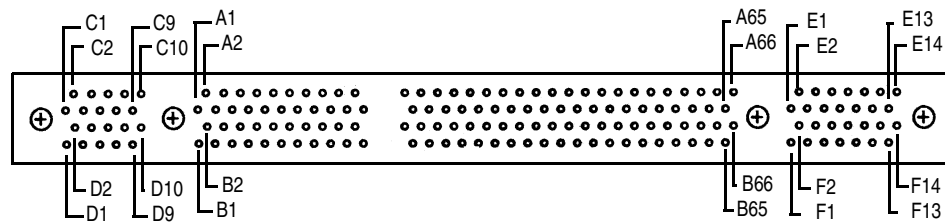
connector



pin	signal	pin	signal	pin	signal
1	Reset	15	DD1	29	DMAK
2	Ground	16	DD14	30	Ground
3	DD7	17	DD0	31	INTRQ
4	DD8	18	DD15	32	IOCS16
5	DD6	19	Ground	33	DA1
6	DD9	20	(Key)	34	PDIAG (cable detect)
7	DD5	21	DMARQ	35	DA0
8	DD10	22	Ground	36	DA2
9	DD4	23	DIOW	37	CS1FX
10	DD11	24	Ground	38	CS3FX
11	DD3	25	DIOR	39	DASP
12	DD12	26	Ground	40	Ground
13	DD2	27	IORDY		
14	DD13	28	CSEL		

Accelerated Graphics Port (AGP Pro)

connector



Pins A1-A66 and B1-B66

pin	signal A	signal B	pin	signal A	signal B
1	+12 V	OVRcnt#	34	Vddq	Vddq
2	TYPEDET#	+ 5V	35	AD22	AD21
3	Reserved	+ 5V	36	AD20	AD19
4	USB-	USB+	37	Ground	Ground
5	Ground	Ground	38	AD18	AD17
6	INTA#	INTB#	39	AD16	C/BE2#
7	RST#	CLK	40	Vddq	Vddq
8	GNT#	REQ#	41	FRAME#	IRDY#
9	VCC1.5	VCC1.5	42	Reserved	1.5VAux
10	ST1	ST0	43	Ground	Ground
11	Reserved	ST2	44	Reserved	Reserved
12	PIPE#	RBF#	45	VCC 1.5	VCC 1.5
13	Ground	Ground	46	TRDY#	DEVSEL#
14	WBF#	Reserved	47	STOP#	Vddq
15	SBA1	SBA0	48	PME#	PERR#
16	VCC 1.5	VCC 1.5	49	Ground	Ground
17	SBA3	SBA2	50	PAR	SERR#
18	SB_STB#	SB_STB	51	AD15	C/BE1#
19	Ground	Ground	52	Vddq	Vddq
20	SBA5	SBA4	53	AD13	AD14
21	SBA7	SBA6	54	AD11	AD12
22	Reserved	Reserved	55	Ground	Ground
23	Ground	Ground	56	AD9	AD10
24	Reserved	1.5 Vaux	57	C/BE0#	AD8
25	VCC 1.5	VCC 1.5	58	Vddq	Vddq
26	AD30	AD31	59	AD_STB0#	AD_STB0
27	AD28	AD29	60	AD6	AD7
28	VCC 1.5	VCC 1.5	61	Ground	Ground
29	AD26	AD27	62	AD4	AD5
30	AD24	AD25	63	AD2	AD3
31	Ground	Ground	64	Vddq	Vddq
32	AD_STB1#	AD_STB1	65	AD0	AD1
33	C/BE3#	AD23	66	VREFGC	VREFGC

extended connector pinout**Pins C1-C10, D1-D10, E1-E14 and F1-F14**

pin	signal C	signal D	signal E	signal F
1	VCC1.5	VCC1.5	Reserved	Reserved
2	Ground	VCC1.5	Reserved	Reserved
3	VCC1.5	VCC1.5	VCC12	Ground
4	Ground	VCC1.5	VCC12	Ground
5	Ground	VCC1.5	VCC12	Ground
6	Ground	VCC1.5	VCC12	Ground
7	Ground	VCC1.5	VCC12	Ground
8	Ground	VCC1.5	VCC12	Ground
9	Reserved	PRSNT2#	VCC12	Ground
10	Reserved	PRSNT1#	VCC12	Ground
11			VCC12	Ground
12			VCC12	Ground
13			VCC12	Ground
14			VCC12	Ground

24-pin Power (Main)

No illustration available.

connector	position	output	awg	wire color
P1 MAIN-24 PIN LENGTH=520				
	1	V3P3	18	ORANGE
	2	V3P3	18	ORANGE
	3	GROUND	18	BLACK
	4	V5	18	RED
	5	GROUND	18	BLACK
	6	V5	18	RED
	7	GROUND	18	BLACK
	8	PWR_OK	22	GRAY
	9	5VSB	18	PURPLE
	10	V12-IO	18	YELLOW
	11	V12-IO	18	YELLOW
	12	V3P3	18	ORANGE
	13	V3P3	18	ORANGE
	14	V12N	18	BLUE
	15	GROUND	18	BLACK
	16	PS_ON_L	22	GREEN
	17	GROUND	18	BLACK
	18	GROUND	18	BLACK
	19	GROUND	18	BLACK
	20	V3P3-RSENSE	22	BROWN
	21	V5	18	RED
	22	V5 V5-RSENSE	18 22	RED RED
	23	V5	18	RED
24	GROUND	18	BLACK	

6-pin Power (Auxiliary)

No illustration is available.

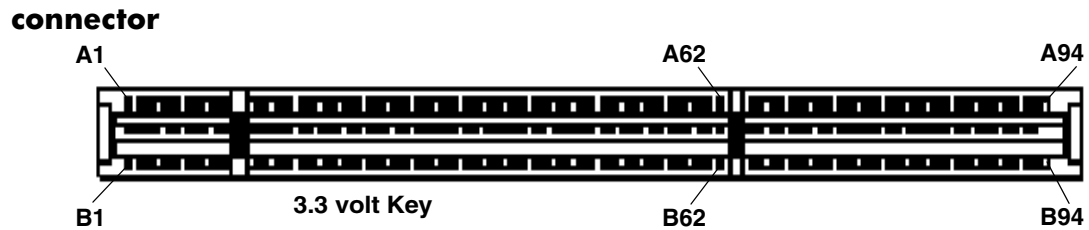
connector	position	output	awg	wire color
P2 SSi-6-PIN LENGTH=520				
	1	V3P3	18	ORANGE
	2	V3P3	18	ORANGE
	3	V12-IO	18	YELLOW
	4	GROUND	18	BLACK
	5	GROUND	18	BLACK
	6	V12-IO	18	YELLOW

Hard Drive Activity Connector

No illustration available.

pin	signal
1	NC
2	PCIACT_L
3	PCIACT_L
4	NC

PCI 3.3V Connector



Pin	Side B	Side A	Comments
1	-12V	TRST#	32-bit connector start
2	TCK	+12V	
3	Ground	TMS	
4	TDO	TDI	
5	+5V	+5V	
6	+5V	INTA#	
7	INTB#	INTC#	
8	INTD#	+5V	
9	PRSNT1#	Reserved	
10	Reserved	+3.3V	
11	PRSNT2#	Reserved	
12	CONNECTOR	KEY	3.3 volt key
13	CONNECTOR	KEY	3.3 volt key
14	Reserved	3.3Vaux	
15	Ground	RST#	
16	CLK	+3.3V	
17	Ground	GNT#	
18	REQ#	Ground	
19	PME#	+3.3V	
20	AD[31]	AD[30]	
21	AD[29]	+3.3V	
22	Ground	AD[28]	

23	AD[27]	AD[26]	
24	AD[25]	Ground	
25	+3.3V	AD[24]	
26	C/BE[3]#	IDSEL	
27	AD[23]	+3.3V	
28	Ground	AD[22]	
29	AD[21]	AD[20]	
30	AD[19]	Ground	
31	+3.3V	AD[18]	
32	AD[17]	AD[16]	
33	C/BE[2]#	+3.3V	
34	Ground	FRAME#	
35	IRDY#	Ground	
36	+3.3V	TRDY#	
37	DEVSEL#	Ground	
38	Ground	STOP#	
39	LOCK#	+3.3V	
40	PERR#	Reserved*	
41	+3.3V	Reserved*	
42	SERR#	Ground	
43	+3.3V	PAR	
44	C/BE[1]#	AD[15]	
45	AD[14]	+3.3V	
46	Ground	AD[13]	
47	AD[12]	AD[11]	
48	AD[10]	Ground	
49	M66EN	AD[09]	
50	Ground	Ground	5 volt key
51	Ground	Ground	5 volt key

52	AD[08]	C/BE[0]#	
53	AD[07]	+3.3V	
54	+3.3V	AD[06]	
55	AD[05]	AD[04]	
56	AD[03]	Ground	
57	Ground	AD[02]	
58	AD[01]	AD[00]	
59	+5V	(I/O)	
60	ACK64#	REQ64#	
61	+5V	+5V	
62	+5V	+5V	32-bit connector end
CONNECT OR	KEY	64-bit	spacer
CONNECT OR	KEY	64-bit	spacer
63	Reserved	Ground	64-bit connector start
64	Ground	C/BE[7]#	
65	C/BE[6]#	C/BE[5]#	
66	C/BE[4]#	+3.3V	
67	Ground	PAR64	
68	AD[63]	AD[62]	
69	AD[61]	Ground	
70	AD[60]	+3.3V	
71	AD[59]	AD[58]	
72	AD[57]	Ground	
73	Ground	AD[56]	
74	AD[55]	AD[54]	
75	AD[53]	+3.3V	
76	Ground	AD[52]	
77	AD[51]	AD[50]	

78	AD[49]	Ground	
79	+3.3V	AD[48]	
80	AD[47]	AD[46]	
81	AD[45]	Ground	
82	Ground	AD[44]	
83	AD[43]	AD[42]	
84	AD[41]	+3.3V	
85	Ground	AD[40]	
86	AD[39]	AD[38]	
87	AD[37]	Ground	
88	+3.3V	AD[36]	
89	AD[35]	AD[34]	
90	AD[33]	Ground	
91	Ground	AD[32]	
92	Reserved	Reserved	
93	Reserved	Ground	
94	Ground	Reserved	64-bit

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