HP xw6600 Workstation
Service and Technical Reference Guide

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1 Product overview

This chapter presents an overview of the hardware components of the HP xw6600 Workstation, including the following topics:

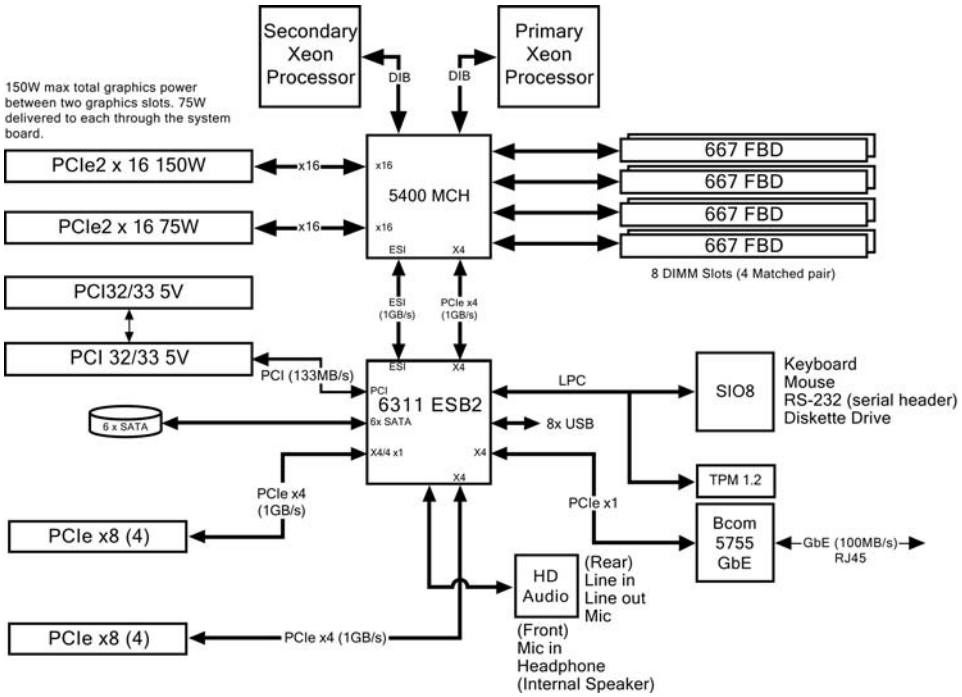
Product features

The following sections describe the HP xw6600 Workstation system board architecture and components.

System board architecture

The following figure shows the HP xw6600 Workstation system board block diagram, including a second optional Xeon processor.

Figure 1-1 System board block diagram



Workstation components

The following figure shows the components of a typical HP xw6600 Workstation. Drive configurations can vary.

For information about supported spare parts, see http://partsurfer.hp.com.

Figure 1-2 Workstation components view

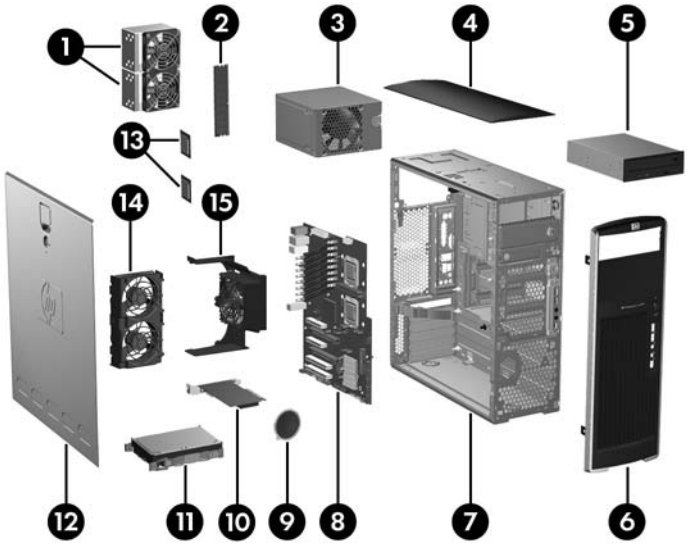


Table 1-1 Component view

Item	Description	Item	Description
1	Processor heat sinks	**9**	Speaker
2	Memory module	**10**	Graphics card
3	Power supply	**11**	Hard drive
4	Top bezel	**12**	Side access panel
5	Optical drive	**13**	Processors
6	Front bezel	**14**	System fans
7	Chassis	**15**	Memory Fan
8	System board		

Front panel components

The following figure shows the front panel components of a typical HP xw6600 Workstation. Drive configurations can vary.

Figure 1-3 Front panel components

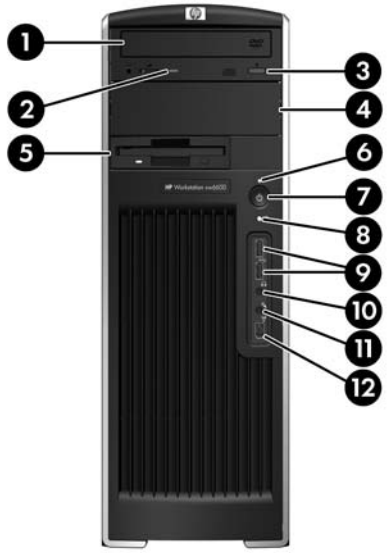


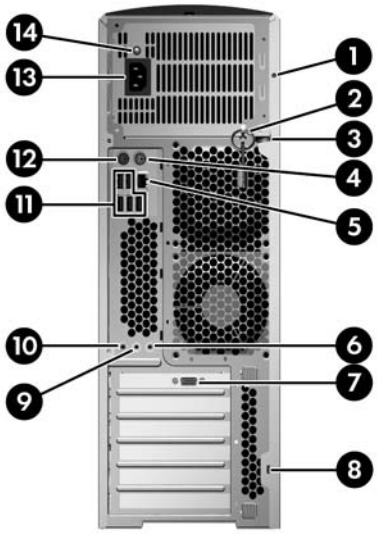
Table 1-2 Front panel components

Item	Symbol	Description	Item	Symbol	Description
1		Optical drive	7		Power button
2		Optical drive activity light	**8**		Hard drive activity light
3		Optical drive eject button	**9**		USB 2.0 (2)
4		Secondary optical drive bay (2 total)	**10**		Headphone connector
5		Optional 3.5” diskette drive bay	**11**		Microphone connector
6		Power on light	**12**		IEEE-1394a connector (optional)

Rear panel components

The following figure shows the rear panel components of a typical HP xw6600 Workstation.

Figure 1-4 Rear panel components



The rear panel connectors are labeled with industry-standard icons and colors to assist you in connecting your peripheral devices.

Table 1-3 Rear panel components

Item	Symbol	Description	Item	Symbol	Description
1		Universal chassis clamp lock opening	8		Cable lock slot
2		Access panel key loop	9		Audio line-out connector (green) *
3		Padlock loop	10		Microphone connector (pink)
4		PS/2 mouse connector (green)	11		USB 2.0 (5)
5		RJ-45 network connector	12		PS/2 keyboard connector
6		Audio line-in connector (blue)*	13		Power cord connector
7		Graphics connector	14		Power supply Built-In Self Test (BIST) LED

*HP does not support external audio cables longer than three meters.

Serial number and COA label location

As shown in the following figure, each workstation has a unique serial number label affixed to the outside of the workstation in two locations, as shown in (1) and (2) in the following figure. A Certificate of Authentication (COA) label for Microsoft® Windows® preinstalled systems only is also affixed to the workstation near the serial number in location (1). Have the workstation serial number available when contacting customer service for assistance.

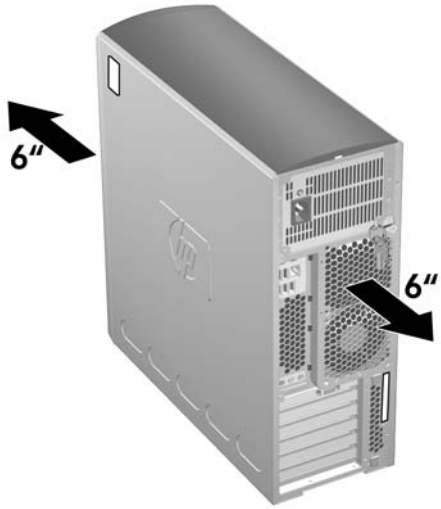
Figure 1-5 Location of serial number and COA label

Maximizing airflow

- Keep your workstation in an area where airflow is not obstructed.
- Keep the workstation off from surfaces where dust can gather.
- Keep the front of the workstation clear of obstructions.

- Remove dust on the front panel (vent area) and the rear fans with a small vacuum, compressed air, or dust rag.
- Keep the front and back of the workstation at least 0.15 m (6 in.) away from a wall or other obstruction, as shown here.

Figure 1-6 Maintain proper clearance



Workstation specifications

The following table lists the physical characteristics of the HP xw6600 Workstation.

Table 1-4 Physical characteristics

Weight	14.4 -19.4 kg (31.7 - 42.7 lb.)
Tower dimensions	441 mm (17.4 in.) high 165 mm (6.5 in.) wide 440 mm (17.3 in.) deep
Rack-mount dimensions (top cover and foot removed)	165 mm (6.5 in) tall (less than 4U) 425 mm (16.75 in) wide (fits a standard 19-in. rack) 440 mm (17.3 in.) deep

80 Plus power supply

The HP xw6600 Workstation includes a 650W energy efficient 80 Plus® power supply compatible with ENERGY STAR requirements. This section describes the power supply and lists its specifications.

Table 1-5 Power supply source voltages

Source voltage	Description
+3.3V	PCI, PCI Express, audio, CK505, ICH9R, super I/O, BIOS ROM, and onboard logic

Table 1-5 Power supply source voltages (continued)

Source voltage	Description
+5.1V	Storage (hard drive, optical drive, diskette drive), PCI, PCI Express, ICH9R, audio, keyboard/mouse
+12 V-B	PCI, PCI Express, and system fans
+12 V-D	Storage (hard drive, optical drive, diskette drive), PCI Express x16 auxiliary connector
+12 VCPU0	Input to onboard regulator that supplies power to processor 0.
+12 VCPU1	Input to onboard regulator that supplies power to processor 1.
+12 V-M	Input to onboard regulators that supply power to memory and chipsets.
-12V	PCI, serial ports
+5 VSB	Sleep circuitry

Table 1-6 Maximum current per rail

Voltage rail	Maximum continuous current
+3.3V	18A
+5.1V	21A
+12 VCPU0	14A
+12 VCPU1	17.5A
+12 V-M	17.5A
+12 V-B	18A
+12 V-D	12.5A
-12V-N	0.15A
+5.1 VSB	3A

⚠ **WARNING!** Do not exceed 125W of combined 5V and 3.3V power.

Do not exceed 51.5A of 12V (CPU0/CPU1/M/B/D) power combined.

Do not exceed 650W of total continuous output power.

Power supply specifications

Table 1-7 Power supply specifications

Item	Description
Power supply	650 watt custom power supply – (Wide Ranging, Active Power Factor Corrected)
Operating input voltage range	88 – 269 VAC
Rated input voltage range	**100–240 VAC**
Rated input line frequency	50–60 Hz

Table 1-7 Power supply specifications (continued)

Item	Description
Operating input line frequency range	47–66 Hz
Rated input current	10A @ 90 VAC 6A @ 200–240 VAC
Rated input voltage range	**118 VAC**
Rated input line frequency	400 Hz
Operating input line frequency range	393–407 Hz
Rated input current	10A @ 118 VAC
Heat dissipation (Configuration and software dependent)	Typical 434 BTU/hr = (109 kg-cal/hr) Maximum 964 BTU/hr = (243 kg-cal/hr)
Power supply fan	92x25 mm variable speed
80 Plus compliant and compatible with ENERGY STAR compliant configurations.*	Yes
FEMP Standby Power compliant @115V (<2W in S5 – Power Off, WOL disabled)	Yes
Power Consumption in ES Mode – Suspend to RAM (S3) (Instantly Available PC)	3W

*ENERGY STAR Compliant depends on the actual system configuration. See ENERGY STAR specifications for detail.

Power consumption and cooling

The HP xw6600 Workstation Quickspecs lists the energy consumption and heat dissipation figures for three typical workstation configurations. To access these power consumption and heat dissipation examples, see http://www.hp.com/go/quickspecs for the HP xw6600 Workstation.

To reach zero power consumption, disconnect the workstation from the power source outlet or use a power strip with an on/off switch to provide power to the workstation. For additional information about power-saving features, see your operating system documentation.

NOTE: This product is in compliance with U.S. Executive Order 13221.

System fans

This workstation includes two rear system fans, one heatsink fan per processor, one power supply fan, and a fan on the memory controller heatsink, and one memory module fan. In addition, an optional front system (PCI) fan is available for special PCI card environments, Some graphics cards also include onboard fans.

Resetting the power supply

If an overload triggers the power supply overload protection, power is immediately disconnected. To reset the power supply:

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

When you power off the workstation through the operating system, power consumption falls below what is considered low power consumption, but does not reach zero. This low power consumption feature extends the life of the power supply.

Environmental specifications

The following table describes the environmental specifications of your workstation.

Table 1-8 Environmental specifications

Temperature (operating)	5° to 35°C (40° to 95°F) **NOTE:** Derate by one degree C (1.4 degrees F) for every 305m (1,000 ft) altitude over 1524m (5,000 ft).
Temperature (nonoperating)	-40° to 60°C (-40° to 140°F)
Humidity (operating)	5% to 95% RH, noncondensing
Humidity (nonoperating)	8% to 90% RH, noncondensing
Altitude (operating)	0 to 3,048m (10,000 ft)
Altitude (nonoperating)	0 to 9,155m (30,000 ft)
Shock (operating)	1/2-sine: 40G, 3 ms
Shock (nonoperating)	1/2-sine: 160 cm/s, 3 ms (~100g) Square: 20G, 422 cm/s **NOTE:** Values represent individual shock events and do not indicate repetitive shock events.
Vibration (operating)	Operating random: 1.0G (rms), 5–300 Hz
Vibration (nonoperating)	Random: 5.0G (rms), 10–500 Hz **NOTE:** Values do not indicate continuous vibration.

ENERGY STAR compliance

HP computers marked with the ENERGY STAR® logo are compliant with the applicable U.S. Environmental Protection Agency (EPA) ENERGY STAR specifications for computers. The EPA ENERGY STAR logo does not imply endorsement by the EPA. As an ENERGY STAR Partner, Hewlett-Packard Company has determined the products marked with the ENERGY STAR logo are ENERGY

STAR qualified per the applicable ENERGY STAR guidelines for energy efficiency. The following logo appears on ENERGY STAR qualified computers.

Figure 1-7 ENERGY STAR logo

The ENERGY STAR Computers Program was created by the EPA to promote energy efficiency and reduce air pollution through more energy-efficient equipment in homes, offices, and factories. One way products achieve this energy efficiency is by reducing power consumption when not being used through the Microsoft Windows Power Management feature.

The Power Management feature enables the workstation to enter a low-power (or “sleep”) mode after inactivity. When used with an external monitor that is ENERGY STAR compliant, this feature also supports the monitor's similar power management features.

To take advantage of this energy savings:

- The Power Management feature has been preset to power down the computer after 30 minutes of inactivity.
- The Power Management feature has been preset to power down the monitor after 15 minutes of inactivity.

Both the computer and monitor can be activated from sleep mode through computer input devices (mouse, keyboard, and so on). When configured with wake on LAN (WOL) enabled, the workstation can also be activated by a network signal.

For more information about the energy and financial savings potential of the Power Management Feature, see the EPA ENERGY STAR Power Management Web site : http://www.energystar.gov/powermanagement.

For more information about the ENERGY STAR program and its environmental benefits, see the EPA ENERGY STAR Web site : http://www.energystar.gov.

△ **CAUTION:** Using the Energy Save Monitor feature with monitors that are not ENERGY STAR compliant can cause video distortion when an Energy Save timeout occurs.

NOTE: ENERGY STAR is not supported on Linux workstations.

If it is necessary to restore the operating system, you must reset the power management settings (if applicable) after the restore.

To verify the factory default power settings for your workstation, select **Start>Control Panel** and double-click **Power Options**.

Dual- and quad-core processors

The HP xw6600 Workstation supports dual- and quad-core processors that provide two or four true processors (processor cores) in a single socket. Dual- and quad-core processors are better at handling the load of multithreaded applications (such as rendering images in Digital Content Creation) and highly multitasked environments (such as running several productivity applications while listening to music).

HP Cool Tools (when using Windows XP and Vista)

An HP xw6600 Workstation running the windows XP operating system includes additional preloaded software that is not automatically installed when you first boot your system. Additionally, a number of preinstalled tools on your workstation can enhance your workstation experience. To access or learn more about these applications:

1. Open the HP Cool Tools folder by selecting **Start>All Programs>HP Cool Tools**
2. Select the **HP Cool Tools** icon on the desktop.
3. To learn more about these applications, select **HP Cool Tools—Learn More**.
4. To install or launch the applications, select the appropriate application.

In an HP xw6600 Workstation running preinstalled Vista, there is no icon, shortcut, or folder. However, several of the tool programs are included, such as Performance Tuning Framework.

2 Configuring and restoring the operating system

This chapter describes how to install and restore the operating system and includes the following topics.

If your workstation includes a preinstalled operating system, it is configured automatically the first time you power on the workstation.

△ **CAUTION:** Do not add optional hardware or third-party devices to the HP workstation until the operating system is successfully installed. Adding hardware might cause errors and prevent the operating system from installing correctly.

Setting up Microsoft Windows Vista Business software

This section describes how to install and restore Microsoft® Windows Vista® Business on your workstation.

Configuring the Windows Vista Business operating system

This section describes how to configure the Windows Vista Business operating system on your HP workstation.

Configuring the software

When you first power on the workstation, the operating system is configured. Configuration takes approximately 5 to 10 minutes. Carefully follow the instructions on the screen to complete the configuration.

△ **CAUTION:** After the automatic configuration has begun, do not power off your workstation until this process is complete. Powering off your workstation during the process might damage the software that runs the system.

If it is necessary to reinstall the operating system, see the operating system documentation included with your workstation. Additional information is available from the online help tool after you have successfully configured the operating system.

Selecting a language

When the preinstalled operating system is first booted, you might be prompted to select a language for the operating system. After selecting the language, read and follow the instructions on the screen to complete the installation of the operating system. This process might take a while, depending on the

system hardware configuration and the language choice. During the process, do not power off your workstation unless you are prompted to do so.

After you have selected a language during the initial boot of the operating system, the language is locked on the hard drive. If the system is restored using HP Backup and Recovery, only the previously selected language can be installed. If using RestorePlus! DVDs, the RestorePlus! DVD looks for the language stored on the hard drive and restores only the original preinstalled language. If a new hard drive is installed or no language is found on the disk, the RestorePlus! DVD installs any language requested.

Creating recovery disks

For more information about the HP Backup and Recovery, see Restoring the Windows Vista Business operating system on page 14.

Installing or upgrading device drivers

To install hardware devices after the operating system installation is complete, the appropriate device drivers must be installed before the devices are installed. In addition, for optimum performance, your operating system must have the most recent updates, patches, and software fixes. For driver and software updates, access the following resources:

- The Microsoft Web site provides updates for your operating system, including current patches and software fixes.
- Device drivers are provided on CDs supplied with peripheral devices.
- Some peripheral device drivers developed for Microsoft Windows XP™ or Vista might not be included with your workstation. Current device drivers are available at http://www.hp.com/support/workstation_swdrivers.
- Driver installation and workstation operation documentation is available at http://www.hp.com/support/workstation_manuals/.

Restoring the Windows Vista Business operating system

There are several methods to restore the Windows Vista Business operating system on your workstation to a near-factory state, or to the state of the system at a predefined restore point. Your workstation has a recovery partition on the system hard drive that contains the software and data required for the restore process as described in the following sections.

If you must restore the operating system with Windows Vista Business Original Equipment Manufacturer (OEM) DVDs (that is, installing without using the Restore Plus! DVDs), you will need to activate Vista after it is installed. To active Vista, you must have a valid 25-character Product ID (PID).

NOTE: The PID located on the Microsoft COA sticker is NOT valid for activation. To obtain a valid PID, you must call Microsoft and provide your Stock Keeping Unit (SKU) number. The SKU information is listed on the service label, located on the inside of the workstation chassis side access panel. It appears as the OS product number in the lower right hand portion of the label in the following format: “OS: *XXXXXXX*,” where “*XXXXXXX*” is the OS product number.

Using the HP Backup and Restore process

The Windows operating system and device drivers (for devices included with the system) are reinstalled using the HP Backup and Restore (HPBR) process. This process can be executed from a DVD, CD, or from the recovery partition on your system hard drive.

To launch the HPBR, slect **Start>All Programs>HP Backup & Recovery>HP Backup and Recovery Manager**.

△ **CAUTION:** Before you attempt any operating system restore, backup your data. All data on the Windows partition is deleted when you perform a system restore using the HPBR process. However, the recovery partition on the system drive and other partitions will not be affected.

Creating system recovery DVDs or CDs

You can create a set of system recovery DVDs or CDs if you have a writable optical drive. After launching the HP Backup and Restore Manager, you can create International Standards Organization (ISO) images of the factory image, or write them directly to CD or DVD. You can also create a supplemental HP Backup and Recovery Manager CD. (There may be additional CDs you can create depending on the options purchased.) You can also move CD images to another location, such as a network share, or to be copied to a DVD or CD at a later time or from another system.

Restoring from HPBR DVDs or CDs

To start the system recovery process, boot from the DVD or CD you created previously, then carefully follow the online instructions.

Restoring a system directly from the recovery partition

Follow these steps to start the HPBR system restore process from the Recovery Manager:

1. Boot the workstation.
2. When prompted on the boot splash screen to enter the Recovery Manager, press F11.
3. Follow the prompts to restore the system to factory-like condition.

Reclaiming hard drive space from the recovery partition

To free up hard drive space, you can remove only the recovery partition, or you can completely uninstall the HP Backup and Recovery Manager application.

△ **CAUTION:** If the recovery partition is removed:

– The F11 Emergency Recovery function becomes unavailable.

– The ability to recover the system is lost.

– Any recovery images contained in the recovery partition are deleted.

– The ability to create a recovery media set is lost.

△ **CAUTION:** If you uninstall the HP Backup and Recovery Manager application, emergency recovery and data backup and recovery are no longer possible.

- **Removing only the recovery partition**—The recovery partition can be removed by selecting **Remove HP Recovery Partition** from the HP Backup and Recovery program folder. When the HP Recovery Partition is removed, the recovery partition is deleted, the user partition is extended to reclaim the unused hard drive space, and the F11 boot prompt is removed. The HP Backup and Recovery Manager application remains and can be used for data backup and restore.
- **Uninstalling the HP Backup and Recovery Manager application**—The HP Backup and Recovery Manager application can be uninstalled using the Programs and Features utility under **Windows Control Panel>Programs and Features**. When the application is uninstalled, the recovery partition is deleted, the user partition is extended to reclaim the unused space, and the F11 boot prompt is removed. After the application is uninstalled, emergency recovery and data backup and recovery can no longer be performed.

△ **CAUTION:** Deleting the recovery partition or uninstalling the HP Backup and Recovery Manager application reduces or eliminates the ability to recover the system.

Ordering backup software

If you are unable to create system recovery CDs or DVDs, you can order a recovery disk set from the HP support center. Before calling HP to order the software, have your workstation serial number available.

To obtain the support center telephone number for your region:

1. Go to http://welcome.hp.com/country/us/en/wwcontact_us.html.
2. Select your region.
3. Under the Call HP heading, select **Technical support after you buy**.

Transferring files and settings using Windows Easy Transfer

Windows Easy Transfer, a Microsoft data migration tool, provides a guide that helps you choose what files and data to transfer from another Windows computer to your Windows Vista Business workstation and explains how to transfer it. You can use one of the following interconnect or storage methods with Windows Easy Transfer to migrate data from another Windows computer to your workstation:

- **Network**—can be used when both the source computer and your workstation are connected to the same network.
- **Easy Transfer cable**—a specially designed USB cable that connects the source computer to your workstation when performing a Windows Easy Transfer. While an Easy Transfer cable is not a standard USB cable, it is commonly available from local electronics suppliers.
- **DVDs or CDs**—can be used if you have writeable DVD or CD drives on the source computer and your workstation.
- **USB flash drive or an external hard drive**—can access both the source computer and your workstation.

To use the Windows Easy Transfer tool, select **Start>All Programs>Accessories>System Tools>Windows Easy Transfer**.

NOTE: For more information about using Windows Easy Transfer with your workstation, see http://www.microsoft.com/windows/products/windowsvista/features/details/easytransfer.mspx.

Setting up Microsoft Windows XP Professional

This section describes how to configure and restore Microsoft Windows XP™ Professional on your workstation.

Configuring Windows XP Professional

This section describes how to configure Windows XP on your workstation.

When you first power on to the workstation, the operating system is configured. Configuration takes approximately 5 to 10 minutes. Carefully follow the instructions on the screen to complete the configuration.

△ **CAUTION:** After configuration begins, do not power off your workstation until the process is complete. Powering off your workstation during the configuration process might damage the software that runs the system.

If it is necessary to reinstall the operating system, see the operating system documentation included with your workstation. Additional information is available from the online help tool after you have successfully configured the operating system.

Selecting a language

When the preinstalled operating system is first booted, you might be prompted to select a language for the operating system. After selecting the language, read and follow the instructions on the screen to complete the installation of the operating system. This process might take quite a while, depending on the system hardware configuration and the language choice. During the process, do not power off your workstation unless you are prompted to do so.

NOTE: After you have selected a language during the initial boot of the operating system, the language is locked on the hard drive. If the system is restored using HP Backup and Recovery, only the previously selected language can be installed. If using RestorePlus! DVDs, the RestorePlus! DVD looks for the language stored on the hard drive and restores only the original preinstalled language. If a new hard drive is installed, or no language is found on the disk, the RestorePlus! DVD installs any language requested.

Creating recovery disks

Refer to or Restoring the Windows XP Professional operating system on page 17 for details on the HP Backup and Recovery process.

Installing or upgrading device drivers

To install hardware devices after the operating system installation is complete, the appropriate device drivers must be installed before the devices are installed. In addition, for optimum performance, your operating system must have the most recent updates, patches, and software fixes. For driver and software updates, access the following resources:

- The Microsoft Web site provides updates for your operating system, including current patches and software fixes.
- Device drivers are provided on CD supplied with peripheral devices.
- Some peripheral device drivers developed for Windows XP or Vista might not be included with your workstation. Current device drivers are available at: http://www.hp.com/support/.
- For documentation on installing drivers and workstation operation, see http://www.hp.com/support/workstation_manuals/.

Restoring the Windows XP Professional operating system

There are several methods to restore the Windows XP operating system on your workstation to a near-factory state, or to the state of the system at a predefined snapshot in time. Your workstation has a recovery partition on the system hard drive that contains the software and data required for the restore process as described in the following sections.

The RestorePlus! process

The Windows operating system and device drivers (for devices included with the system) are reinstalled using the RestorePlus! process. Some application software might not be restored using this process. If specific application software was not restored, you must install the application software from the appropriate application DVD. The RestorePlus! process can be executed from a DVD or from the recovery partition on your system hard drive.

△ **CAUTION:** Before you attempt any operating system restore, back up your data. The RestorePlus! process deletes everything on the primary hard drive, including the Windows partition and the recovery partition.

Creating a RestorePlus! DVD

You can create a set of the system recovery DVDs if you have a writable optical drive. When you first boot the workstation, you are prompted to create DVDs for RestorePlus!, the Windows operating system, and a supplemental HP Backup and Recovery Manager. (There might be additional DVDs you can create, depending on the options purchased.) You also have the option to move DVD images to another location, such as a network share, to be copied to DVD at a later time, or from another system.

Restoring your system from RestorePlus! DVDs

Start the RestorePlus! process by booting from the RestorePlus! DVD.

Restoring your system from RestorePlus! on the recovery partition

Follow these steps to start the RestorePlus! process from the Emergency Recovery menu:

1. Boot the workstation.
2. When prompted during the boot process to select the Emergency Recovery menu, press F11 . The F11 prompt appears briefly during the boot process.

   If you have a recovery partition but the F11 prompt is not visible:

   a. To access the setup menu, press F10.

   b. From the drop down menu, select **Advanced**.

   c. Select **Power-On Options**.

   d. Ensure that the F11 prompt is set to **Displayed**.

   e. Ensure that Factory Recovery Boot Support is set to **Enabled**.

   f. Reboot the workstation and press F11 when prompted.
3. Select **Recover PC's factory installed operating system, drivers, utilities, and applications** from the Emergency Recovery menu.

NOTE: Some applications might not be restored using this method.

Reclaiming hard drive space from the recovery partition

The recovery partition can be removed to reclaim the hard drive space.

△ **CAUTION:** If the recovery partition is removed:

- The F11 Emergency Recovery function becomes unavailable.

- The ability to recover the system from data on the recovery partition is lost.

- Any recovery images contained in the recovery partition are deleted.

- The ability to create a recovery media set is lost.

To gain unused hard drive space, you can remove only the recovery partition, or you can completely uninstall the HP Backup and Recovery Manager application.

△ **CAUTION:** If you uninstall the HP Backup and Recovery Manager application, Emergency Recovery and data backup and recovery can no longer be performed.

- **Removing only the recovery partition**—The recovery partition can be removed by selecting **Remove HP Recovery Partition** from the HP Backup and Recovery program folder. When the HP Recovery Partition is removed, the recovery partition is deleted, the user partition is extended to reclaim the unused hard drive space, and the F11 boot prompt is removed. The HP Backup and Recovery Manager application remains, and can be used for data backup and restore.
- **Uninstalling the HP Backup and Recovery Manager application**—The HP Backup and Recovery Manager application can be uninstalled using the Programs and Features utility under **Windows Control Panel>Programs and Features**. When the application is uninstalled, the recovery partition is deleted, the user partition is extended to reclaim the unused space, and the F11 boot prompt is removed. After the application is uninstalled, emergency recovery as well as data backup and recovery can no longer be performed.

△ **CAUTION:** Deleting the recovery partition or uninstalling the HP Backup and Recovery Manager application reduces or eliminates the ability to recover the system.

Using the HP Backup and Restore process

The Windows operating system and device drivers (for devices included with the system) are reinstalled using the HP Backup and Restore (HPBR) process. This process can be executed from a DVD, CD, or from the recovery partition on your system hard drive.

To launch the HPBR, slect **Start>All Programs>HP Backup & Recovery>HP Backup and Recovery Manager**.

△ **CAUTION:** Before you attempt any operating system restore, backup your data. All data on the Windows partition is deleted when you perform a system restore using the HPBR process. However, the recovery partition on the system drive and other partitions will not be affected.

Creating system recovery DVDs or CDs

You can create a set of system recovery DVDs or CDs if you have a writable optical drive. After launching the HP Backup and Restore Manager, you can create International Standards Organization (ISO) images of the factory image, or write them directly to CD or DVD. You can also create a supplemental HP Backup and Recovery Manager CD. (There may be additional CDs you can create depending on the options purchased.) You can also move CD images to another location, such as a network share, or to be copied to a DVD or CD at a later time or from another system.

Restoring from HPBR DVDs or CDs

To start the system recovery process, boot from the DVD or CD you created previously, then carefully follow the online instructions.

Restoring a system directly from the recovery partition

Follow these steps to start the HPBR system restore process from the Recovery Manager:

1. Boot the workstation.
2. When prompted on the boot splash screen to enter the Recovery Manager, press F11 .
3. Follow the prompts to restore the system to factory-like condition.

Ordering backup software

If you are unable to create system recovery CDs or DVDs, you can order a recovery disk set from the HP support center.

NOTE: Before calling HP to order the software, have your workstation serial number available.

To obtain the support center telephone number for your region:

1. Visit http://www.hp.com/support/contactHP.
2. Select your region.
3. Under the Call HP heading, select **Technical support after you buy**.

Protecting your software

To protect your software from loss or damage, keep a backup copy of all system software and related files that are normally stored on the hard drive. It is best to store your backup copy in a location that is not on your system. For instructions on making backup copies of data files, see the operating system or backup utility documentation.

HP software

The following HP software might be installed on your workstation, depending on the operating system and options purchased:

- Computer Setup (F10) Utility and diagnostics
- HP support software, including device drivers
- Security management tools (optional)
- Software support management tools

Additional software is available for download:

- HP Client Manager Software is available at http://www.hp.com/go/easydeploy
- System Software Manager is available at http://www.hp.com/go/ssm

NOTE: In certain situations, additional HP software might be required.

Setting up Red Hat Linux

This section describes how to install and restore the Red Hat Linux operating system on your workstation.

Linux preinstalled workstations

With Linux preinstalled, follow the instructions in this section to set up your operating system and software.

After the boot process is complete, you can view additional HP Linux documentation by opening your Web browser (the browser is automatically set to use the local HP documentation page as its default). You can also access Linux links for Red Hat (Internet access is required) by using your Web browser.

For additional information about setting up Linux-preinstalled or Linux-enabled workstations, see the *HP User Manual for Linux* at: http://www.hp.com/support/linux_user_manual.

For more information about HP and Linux, see http://www.hp.com/linux.

Starting the Linux operating system

The first time you boot your workstation, the Red Hat First Boot utility displays. This program enables you to enter your password, network, graphics, time, and keyboard settings for your workstation.

△ **CAUTION:** After the automatic installation has begun, do not power down your workstation until the process is complete. Powering down your workstation during the installation process might damage the software that runs your workstation or prevent its proper installation.

When you enable the YPBind feature in the Network tab of the Linux Setup Tool, you might get a blank screen for approximately 15–30 seconds after you have selected and saved all of your settings and exited the utility. This behavior is expected. The boot process continues its execution after the screen returns.

Restoring the Linux operating system on preloaded workstations

The HP Driver CD and Red Hat Enterprise Linux (RHEL) restore media are required to restore the Linux operating system. Download the most recent HP Driver CD to obtain new enhancements.

NOTE: Linux does not support mixed drive types in a manufacturing preload. When restoring the operating system, mixed drive types can be handled with the restoration media.

Creating restore media

HP Red Hat Enterprise Linux includes a Red Hat ISO icon on the desktop. You can click on this icon to go to the /iso directory. The /iso directory contains all the iso images used to preload your workstation.

To recover or restore the original image, follow the instructions in the readme file in the /iso directory to copy the ISO image file onto CDs

NOTE: HP recommends that you copy the ISO recovery images to CD as backup files in case your workstation experiences a hard drive failure.

The /iso directory also contains an ISO image of the HP Driver CD used to create your preloaded system. You can use this version or download the latest version from the HP Website.

Downloading the latest HP driver CD contents

To download the latest HP Driver CD:

1. Go to http://www.hp.com and select **Software and Drive Downloads**.
2. Locate your workstation and operating system.
3. Select your driver CD and then follow the directions under the Release Notes.

Reinstalling the factory Linux image with the HP driver CD

1. Boot your workstation from the Red Hat box set, Binary CD 1.
2. When prompted, insert the Linux operating system restore media CDs.
3. Continue following the installation prompts until the operating system is successfully installed.
4. Configure the X server to start on reboot.
5. Reboot your workstation.
6. Follow the onscreen prompts to set up your system with the Red Hat First Boot utility.

7. When prompted by First Boot to add additional CDs, insert the HP Driver CD into the optical drive of your workstation.
8. Select **Install** next to Additional CDs. The HP Driver CD window opens.
9. To begin the installation, select **Press to continue**.

   When installation is complete, you are given two options— **Reboot now...** (on the left side), and **Press to continue, reboot later...** (on the right side).
10. Select **Reboot now...**

Upgrading device drivers

To upgrade a Linux device driver, see http://www.hp.com/support/workstation_swdrivers.

Linux-enabled workstations

Linux-enabled workstations do not have Linux preinstalled, nor do they include installation media for a Linux distribution. To install Linux, you must have the installation binary set for a Linux distribution (CD or DVD media, or a version on your network), and the HP Installer Kit for Linux. The HP Installer kit includes the HP CDs necessary to complete the installation of all versions of the distribution box set that are supported by HP workstation hardware. See the Linux hardware support matrix at http://www.hp.com/support/linux_hardware_matrix to determine which versions of are supported on your workstation.

NOTE: If you want to use the drivers available in the HP Installer kit with Linux distributions other than RHEL, you must manually extract the drivers from the HP Driver CD and install them. HP does not test the installation of these drivers on other Linux distributions, nor does HP support this type of operation.

Verifying hardware compatibility

To determine which Linux versions are supported on your HP workstation hardware:

1. See http://www.hp.com/support/linux_hardware_matrix.
2. Select your HP workstation model.

3 System management

This section describes the tools and utilities that provide system management for your workstation and includes the following topics:

The Computer Setup (F10) Utility

The Computer Setup (F10) Utility enables you to:

- Change factory default settings and set or change the system configuration, which might be necessary when you add or remove hardware.
- Determine if all devices installed on the workstation are recognized by the system and functioning.
- Determine information about the operating environment of the workstation.
- Solve system configuration errors that are detected but not automatically fixed during the Power-On Self-Test (POST).
- Establish and manage passwords and other security features.
- Establish and manage energy-saving time-outs (not supported on Linux platforms).
- Modify or restore factory default settings.
- Set the system date and time.
- Set, view, change, or verify the system configuration, including settings for processor, graphics, memory, audio, storage, communications, and input devices.
- Modify the boot order of installed mass storage devices such as SATA, SAS, diskette drives, optical drives, and network drives.
- Configure the boot priority of SATA hard-drive controllers.
- Enable or disable Network Server Mode, which enables the workstation to boot the operating system when the power-on password is enabled with or without a keyboard or mouse attached. When attached to the system, the keyboard and mouse remain locked until the power-on password is entered.
- Enable or disable POST Messages to change the display status of POST messages. POST Messages suppresses most POST messages, such as memory count, product name, and other nonerror text messages. If a POST error occurs, the error is displayed regardless of the mode selected. To manually switch to POST Messages Enabled during POST, press any key except F1 through F12.
- Specify an Ownership Tag, which appears when the system is powered on or restarted.
- Enter the Asset Tag or property identification number assigned by your company to this workstation.
- Enable power-on password prompts during system restarts (warm-boots) and power on.

- Hide or show the integrated I/O functionality, including serial, USB, audio, or embedded NIC. Hidden devices are inaccessible, which increases system security.
- Enable or disable removable media boot ability.
- Enable or disable removable media write ability (if supported by hardware).
- Replicate your system setup by saving system configuration information on CD or diskette and restoring it on workstations.
- Execute self-tests on specified SATA hard drives (if supported by the drive).

BIOS ROM

The BIOS ROM is a collection of machine language programs stored as firmware in ROM. It includes functions such as POST, PCI device initialization, Plug and Play support, power management, and the Computer Setup (F10) Utility. The BIOS ROM is a 1-MB Serial Peripheral Interface (SPI) port. The firmware contained in the BIOS ROM supports the following systems and specifications:

- Advanced Configuration and Power Management Interface, Version 2.0
- Alert Standard Format Specification, Version 2.0
- AT Attachment 6 with Packet Interface (ATA/ATAPI – 6), Revision 3b
- ATAPI Removable Media Device BIOS Specification Version 1.0
- BIOS Boot Specification v1.01
- Standard BIOS 32-bit Service Directory Proposal
- "El Torito" Bootable CD-ROM Format Specification Version 1.0
- Enhanced Disk Drive Specification Version 1.1
- BIOS Enhanced Disk Drive Specification Version 3.0
- Enhanced Host Controller Interface Specification for Universal Serial Bus, Revision 1.0
- PCI Local Bus Specification, Revision 2.3
- PCI Power Management Specification, Revision 1.1
- PCI Express Base Specification, Revision 2.0
- Serial ATA Specification, Revision 1.0a
- Serial ATA II: Extensions to Serial ATA 1.0, Revision 1.0
- System Management BIOS Reference Specification, Version 2.5
- PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
- TCG TPM Specification Version 1.2
- Universal Host Controller Interface Design Guide, Revision 1.1
- Universal Serial Bus Revision 1.1 Specification
- Universal Serial Bus Revision 2.0 Specification

Using the Computer Setup (F10) Utility

You can only open the Computer Setup (F10) Utility by powering on or restarting the workstation.

To access the Computer Setup (F10) Utility menu:

1. Power on or restart the workstation.
2. As soon as your display is active and **F10=Setup** appears in the lower right corner of the screen, press F10 .

   If you do not press F10 at the appropriate time, try again. Turn the workstation off, then on, and press F10 again to access the utility. You can also press the Ctrl + Alt + Delete keys before boot if you miss the opportunity to press F10.
3. Select your language from the list and press the Enter key.

   In the Computer Setup (F10) Utility menu, five headings are displayed: **File**, **Storage**, **Security**, **Power**, and **Advanced**.
4. Use the left and right arrow keys to select the appropriate heading, use the up and down arrow keys to select an option, and then press Enter.
5. Choose from the following:
   - To apply and save changes, select **File>Save Changes**, and then select **F10=YES**.
   - To ignore changes you have made, select **Ignore Changes** and then select **F10=YES**.
   - To reset to factory settings, select **File>Default setup>Restore Factory Settings as Default**, press F10 to accept the changes and then select **Apply Defaults and Exit**.

     This option restores the original factory system defaults.

   △ **CAUTION:** Do not power off the workstation while the ROM is saving your Computer Setup (F10) Utility changes because the Complementary Metal-Oxide Semiconductor (CMOS) could become corrupted. After you exit the F10 Setup screen, you can disconnect power from the workstation.

The Computer Setup (F10) Utility menu

NOTE: With new BIOS releases, the following content is subject to change, so your menu might be different than shown.

Table 3-1 Computer Setup (F10) Utility menu descriptions

Heading	Option	Description
File	System Information	Displays the following system characteristics: • Product Name • SKU Number • Processor Type/Speed/Stepping • Cache Size (L1/L2) • Installed Memory Size • Integrated MAC 1 • System BIOS • Boot block date • Chassis Serial Number • Asset Tracking Number
	About	Displays copyright information.

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
	System Temperatures	Displays system temperatures for CPU0 and CPU1, and fan speeds for processors, memory, chipsets, chassis, and PCI cards.
	Set Time and Date	Enables you to set system time and date.
	Flash System ROM	Enables you to upgrade the BIOS from a ROM image on diskette, CD or USB.
	Replicated Setup	Provides these options: • Save to Removable Media—Saves the system configuration, including CMOS, in the qsetup.txt file. This file can be saved to a formatted, blank 1.44-MB diskette, or to a USB device. • Restore from Removable Media—Restores the system configuration from a diskette or USB media.
	Default Setup	Provides these options: • Save Current Settings as Default—Saves the current settings as default settings for the next operation. • Restore Factory Settings as Default—Restores the factory settings as the default settings for the next operation.
	Apply Defaults and Exit	Restores the default settings defined in Default Setup, above in this table.
	Ignore Changes and Exit	Exits computer setup without applying or saving changes.
	Save Changes and Exit	Saves changes to system configuration and exits the computer setup.
Storage	Device Configuration	Lists installed non-SCSI storage devices (except SATA devices) and provides options for obtaining specific information about each device: • Hard disk—Provides information about the hard drives in the system. • CD-ROM—Provides information about the optical drives in the system. • Diskette type (for legacy diskette drives only)—Identifies the highest capacity media type accepted by the diskette drive. Options are 3.5" (1.44 MB), 5.25" (1.2 MB), and Not Installed. • Default values—Resets devices to their default configuration (SATA is the default). • Multisector Transfers—Defines the transfer of data per interrupt. Options are 8, 16, and Disable (16 is the default). • Transfer Mode—Specifies the active data transfer mode. Options (which are subject to device capabilities) are: Max UDMA, PIO 0, Max PIO, Enhanced DMA, and Ultra DMA0 (Max UDMA is the default). • Translation Mode—Enables the BIOS to determine the translation mode used to configure a formatted SATA or USB mass storage device. This prevents you from needing to know how the mass storage device was formatted. Options are Automatic, Bit Shift, LBA Assisted, Use (Cylinders, Heads, Sectors), and Off. Automatic is the default. Ordinarily, you should not change the translation mode selected by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the drive was partitioned and formatted, the data on the disk is inaccessible.

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
	Storage Options	Provides these options: • Removable Media Boot—Enables and disables the ability to boot the system from removable media. • Legacy Diskette Write—Enables and disables the ability to write data to removable media. • BIOS DMA Data Transfers—Enables and disables DMA data transfers. • SATA Emulation—Sets the SATA emulation mode with the following options: ◦ RAID + AHCI–Both the RAID and AHCI OPROMs execute. This emulation mode is the default and offers the best performance and most functionality. ◦ Separate IDE Controller–Offers standard SATA supports (four ports only). ◦ Combined IDE Controller–Makes the SATA controller look like an IDE controller and offers best IDE compatibility (two ports only). • SATA PORT0–5—Enables and disables SATA ports 0–5. • SATA/eSATA SPEED PORT4 Setup—Enables you to set the following port speeds: ◦ GEN2/3.0 Gbps (Internal Only) ◦ GEN1/1.5 Gbps (eSATA Only) • SATA/eSATA PORT5 Setup—Enables you to set the following port speeds: ◦ GEN2/3.0 Gbps (Internal Only) ◦ GEN1/1.5 Gbps (eSATA Only)
	DPS Self-test	Select a drive—Enables you to select a drive to test. The DPS Self-test tells an IDE hard disk to go run its own internal self-test and report the results. If the SATA controller is not in IDE emulation mode–either Separate IDE Controller or Combined IDE Controller–the DPS Self-test option is not displayed in the Setup menu. By default, the SATA controller is in RAID+AHCI mode, so this option is not displayed.
	Boot Order	Enables you to configure the boot, diskette drive, and hard drive orders by physically reordering the menu entries. The following is the default boot order: • Optical Drive • Diskette Drive • USB Device • Hard Drive To drag a device to a preferred place, press Enter. Tto remove the device from consideration as a bootable device, press F5. MS-DOS drive lettering assignments might not apply after an operating system other than MS-DOS has started. Boot devices can be disabled in the boot order process. These order changes are stored in the physical ROM when the F10 Setup changes are confirmed with File>Save Changes and Exit. You can temporarily override the boot order. To boot one time from a device other than the default device specified in Boot Order, restart the workstation and press F9 when the F9=Boot Menu message appears on the screen. After POST completes, a list of bootable devices appears. Use the arrow keys to select the preferred bootable device and press Enter. The workstation then boots from the selected nondefault device for this one time.
Security	Setup Password	Enables you to set and enable a setup password for the administrator. If you create a setup password, you must use it to change computer setup options, to flash the ROM, and to make changes to Plug and Play settings under Windows.

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
	Power-On Password	Enables you to set and enable the power-on password.
	Password Options (becomes available when you set either a Power-On or Setup password)	Provides these options: • Lock Legacy Resources–Prevents the operating system from changing resources to Serial, Parallel, or Diskette controller. • Network Server Mode. • Password Prompt on Warm Boot.
	Smart Cover	Allows you to enable and disable the cover removal sensor, or to notify you if the sensor is activated.
	Device Security	Makes the following devices available or hidden to the system: • Serial port • All USB ports • Front USB port • System audio • IDE controller security • SATA controller security • Network controller • Embedded security device
	Embedded Security Device	This option becomes available if Embedded Device is set to Available. Embedded Security Device (Hidden or Available) turns the Trusted Platform Mechanism (TPM) on and off. Device Hidden is the default. If this option is made available, the following options become available: • Power-On Authentication Support—Enables and disables an authentication feature that requires you to enter a TPM user key password to boot the system. This feature uses the TPM to generate and store the authentication password. • Reset Authentication Credential—Resets the authentication functionality and clears authentication credentials. You must create a setup password to enable an Embedded Security Device and to access security features associated with the device. Setting a to available enables the operating system to access the device. Hidden makes the device unavailable. It is disabled by the BIOS and cannot be enabled by the operating system.
	Network Service Boot	Enables or disables the ability to boot to the network using the F12 key or the boot order.
	System IDs	Provides these options: • Asset Tag—A 16–byte string identifying the system. • Ownership Tag—An 80–byte string identifying ownership of the system. This tag appears on the screen during POST. • Universal Unique Identifier (UUID)—Automatically generated by the system. • Keyboard—Enables you to set the keyboard locale for System ID entry.

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
	OS Security	Provides these options: • Data Execution Prevention—Enables or disables Data Execution Prevention mode in the processors. This mode prohibits code from running in pages that were set up as data pages, and prevents attacks such as buffer overflows. Operating system support is required for this feature. • Intel Virtualization Technology (VTx)—Enables or disables Intel Virtualization Technology to increase workstation performance. • Intel IO Virtualization—Enables or disables Virtualization Technology to increase workstation I/O performance. • OS Management of Embedded Security Device—Enables or disables the ability of the operating system to control the TPM device, including turning it on and off, initializing it, and resetting it. • Reset of Embedded Security Device through OS—Enables or disables the ability of the operating system to reset the TPM.
Power	OS Power Management	Enables or disables: • Runtime Power Management • Idle Power Savings • ACPI S3 Hard Disk Reset • ACPI S3 PS 2 Mouse Wakeup • USB Wake on Device Insertion
	Hardware Power Management	SATA Power Management—Enables or disables SATA Power Management.
	Thermal	Enables you to set the rate of the system fan when the processor is in idle.
Advanced**	Power-On Options	Enables you to set the following: • POST Messages—Enables or disables the Splash screen during POST. • F1 Prompt on Recoverable Errors—Enables or disables the presentation of the F1 prompt on recoverable errors. • F9 Prompt (Displayed or Hidden)—Selecting **Displayed** displays the **F9=Boot Menu** during POST. Selecting **Hidden** prevents the text from being displayed. However, pressing F9 still accesses the boot menu. • F10 Prompt (Displayed or Hidden)—Selecting **Displayed** displays **F10=Setup** during POST. Selecting **Hidden** prevents the text from being displayed, but pressing F10 still accesses the Setup screen. • F11 Prompt (Displayed or Hidden)—Selecting **Displayed** makes the Factory Recovery option visible during POST. Selecting **Hidden** prevents the text from being displayed, but pressing F11 still boots into the factory recovery partition Setup screen. Factory Recovery Boot Support must be enabled to use this option. • F12 Prompt (Displayed or Hidden)—Selecting **Displayed** displays **F12=Network Service Boot** during POST. Selecting **Hidden** prevents the text from being displayed but pressing F12 still forces the system to attempt booting from the network. • Factory Recovery Boot Support (Enable or Disable)—Recovery partition hard disk drive (HDD) option available. The Vista factory setting has this support enabled. • Option ROM prompt* (Enable or Disable)—Enabling this feature causes the system to display a message before loading options ROMs.

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
		• Remote Wakeup Boot Source—Enables you to set the remote wakeup boot source as: ◦ Local Hard Drive ◦ Remote Server • After Power Loss (On, Off, Previous State)—The default is Off. • POST Delay (in seconds) (5, 10, 15, 20, None)—Adds a specified delay to the POST process. This delay is sometimes needed for hard drives on some PCI cards that spin up slowly (so slowly that they are not ready to boot by the time POST is finished). The POST delay also gives you time to select F10 to enter the Computer Setup (F10) Utility. • Setup Browse Mode (Enable or Disable)—Enables or disables browse mode setup.
	BIOS Power-On	Enables you to disable or specify a weekday and time for BIOS power-on.
	Processors	Provides these options: • Multi Core Support (Enable or Disable)—Select a single core or multiple cores per socket. • Limit CPUID Maximum Value to 3 (Enable or Disable)—Sets the number of allowable CPU IDs.
	Onboard Devices	Enables you to set resources for or disable onboard system devices such as serial ports and diskette controllers. Operating system parameters generally override Onboard Devices settings.
	Chipset/ Memory	Provides these options: • PCI SERR# Generation (Enable or Disable)—Controls PCI SERR# generation for ill-behaved PCI add-in cards (that can generate SERR# spuriously). • PCI VGA Palette Snooping (Enable or Disable)—Controls PCI VGA Palette Snooping for compatibility purposes. • MCH Error Handling—Sets the following signals to use on serious MCH (North Bridge) errors: ◦ SMI which is handled by the BIOS and causes a reboot. ◦ NMI and Machine-Check Error which are handled by the operating system and cause a crash. ◦ Ignore. • Memory Write Combining (Enable or Disable)—Implements special caching for rapid I/O.
	Device Options	Enables you to set the following device options: • Num Lock State at Power-On (On or Off) • S5 Wake-on-LAN (Enable or Disable) • Unique Sleep State Blink Rates (Enable or Disable) • Monitor Tracking (Enable or Disable) • NIC PXE Option ROM* Download (Enable or Disable) • SATA RAID Option ROM* Download (Enable or Disable) • PCIX Secondary Latency Timer: ◦ Default • Peer-to-Peer Reads • Fast Delayed Transaction Timer
	Slot 1 — PCI Express x 8 (4)	Slot 1 option ROM* download (Enable or Disable).

Table 3-1 Computer Setup (F10) Utility menu descriptions (continued)

Heading	Option	Description
		NOTE: This slot receptacle is physically open-ended, which mechanically allows the installation of a x16 card. However, the slot remains an x4 slot electrically.
	Slot 2 — PC Express x16	Slot 2 option ROM* download (Enable or Disable).
	Slot 3 — PCI Express x8 (4)	Slot 3 option ROM* download (Enable or Disable). **NOTE:** This slot receptacle is physically open-ended, which mechanically allows the installation of a x16 card. However, the slot remains an x4 slot electrically.
	Slot 4 — PCI Express x16	Slot 4 option ROM* download (Enable or Disable).
	Slot 5 — PCI	Slot 5 option ROM* download (Enable or Disable) plus latency timer.
	Slot 6 — PCI	Slot 6 option ROM* download (Enable or Disable) plus latency timer.

* Available on selected models.

**These options should be used by advanced users only.

Workstation management

The HP Client Management Solutions (CMS) available for download from http://www.hp.com/go/easydeploy, are standards-based solutions for managing and controlling workstations in a networked environment. This section summarizes capabilities, features, and key components of workstation management, including:

- Initial workstation configuration and deployment on page 31
- Installing a remote system on page 32
- Replicating the setup on page 32
- Updating and managing software on page 33
- ROM Flash on page 35
- Recovering from a ROM flash failure: the FailSafe Boot Block ROM and SoftPaq-created BIOS image CD on page 36
- Asset tracking and security on page 36
- Fault notification and recovery on page 45
- Dual-state power button on page 45

Support for specific features described in this guide can vary by model and software version.

Initial workstation configuration and deployment

Your workstation includes a preinstalled system software image. After a brief software unbundling process, the workstation is ready to use.

If you prefer to replace the preinstalled software image with a customized set of system and application software, several methods are available for deploying a customized software image, including:

- Installing additional software applications after unbundling the preinstalled software image
- Using a disk cloning process to copy the contents from one hard drive to another

The best deployment method depends on your information technology environment and processes. To help you select the best deployment method see the PC Deployment section of the HP Lifecycle Solutions Web site (http://www.hp.com/support/HPLS).

The Restore Plus! CD, ROM-based setup, and ACPI hardware provide further assistance with recovery of system software, configuration management and troubleshooting, and power management.

Installing a remote system

Remote system installation enables you to start and set up your system using software and configuration information on a network server. This feature is usually used as a system setup and configuration tool and can be used for the following tasks:

- Deploying a software image on new PCs
- Formatting a hard drive
- Installing application software or drivers
- Updating the operating system, application software, or drivers

To initiate a remote system installation, press F12 when **F12=Network Service Boot** appears in the lower right corner of the HP logo screen. Follow the onscreen instructions to continue the installation process. The default boot order is a BIOS configuration setting that can be changed to always attempt a PXE boot.

Replicating the setup

The following procedures enable you to copy one setup configuration to other workstations of the same model for faster, more consistent configuration of multiple workstations. The procedures require a diskette drive or a USB device such as an HP Drive Key.

Copying a setup configuration to a single workstation

△ **CAUTION:** A setup configuration is model-specific. File system corruption can result if source and target workstations are not the same model. For example, do not copy the setup configuration from an HP xw4200 Workstation to an HP xw6600 Workstation.

1. Select a setup configuration to copy, and then reboot the workstation.
2. As soon as the workstation powers on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   If necessary, press Enter to bypass the title screen.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
3. If you are using a diskette or other storage device, insert it now.
4. Select **File>Replicated Setup>Save to Removable Media** and follow the instructions on the screen to create the configuration diskette or USB media device.
5. Power off the workstation you are configuring and insert the configuration diskette into the diskette drive or USB media device.
6. Power on the workstation you are configuring.
7. Press F10 to enter the Computer Setup (F10) Utility.

If necessary, press Enter to bypass the title screen.

8. Select **File>Replicated Setup>Restore from Removable Media**, and then follow the instructions on the screen.
9. Restart the workstation when the configuration is complete.

Copying a setup configuration to multiple workstations

△ **CAUTION:** A setup configuration is model-specific. If source and target workstations are not the same model, file system corruption can result. For example, do not copy the setup configuration from an HP xw4200 Workstation to an HP xw6600 Workstation.

This method takes longer to prepare the configuration diskette, but copying the configuration to target workstations is fast.

A bootable diskette is required for this procedure. If Windows XP is not available to create a bootable diskette, use the method for copying to a single workstation instead (see Copying a setup configuration to a single workstation on page 32.)

1. Create a bootable diskette or USB media device.
2. Select a setup configuration to copy.
3. Restart the workstation.
4. As soon as the workstation powers on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   If necessary, press Enter to bypass the title screen.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
5. If you are using a diskette or other storage device, insert it now.
6. Select **File>Replicated Setup>Save to Removable Media** and follow the instructions on the screen to create the configuration diskette.
7. Download a BIOS utility for replicating setup (repset.exe) and copy it to the configuration diskette.
8. To obtain this utility, see http://www.hp.com/support/files. Enter the model number of the workstation.
9. On the configuration diskette, create an autoexec.bat file containing `repset.exe and cpqsetup.txt.`
10. Power off the workstation you are configuring, insert the configuration diskette, and then power on the workstation.

    The configuration utility runs automatically.
11. When the configuration is complete restart the workstation.

Updating and managing software

HP provides several tools for managing and updating software on workstations:

- HP Client Manager Software
- Altiris Client Management Solutions

- System Software Manager
- Proactive Change Notification
- Subscriber's Choice

HP Client Manager Software

HP Client Manager Software (HP CMS) assists customers in managing workstation hardware. It offers:

- Detailed views of hardware inventory for asset management
- PC health-check monitoring and diagnostics
- Proactive notification of changes in the hardware environment
- Web-accessible reporting of business-critical details such as thermal warnings and memory alerts
- Remote updating of system software such as device drivers and ROM BIOS
- Remote changing of boot order
- Configuration of system BIOS settings

For more information about HP CMS, see http://www.hp.com/go/ssm.

Altiris Client Management Solutions

Altiris and HP have partnered to provide comprehensive, tightly integrated systems management solutions to reduce the cost of owning HP client PCs. The HP CMS is the foundation for additional Altiris Client Management Solutions that address:

- Inventory and asset management
- Deployment and migration
- Help desk and problem resolution
- Software and operations management

For more information about the following topics, go to http://www.hp.com/go/ssm:

- How HP CMS works
- Which solutions are compatible with your operating system
- How to download a fully functional, 30-day evaluation version of Altiris solutions

System Software Manager

System Software Manager (SSM) is a utility that enables you to update system-level software on multiple systems simultaneously. When executed on a PC client system, SSM detects hardware and software versions and then updates the software from a central repository, known as a *file store*.

Driver versions that are supported by SSM are denoted with a special icon on the software, the driver download Web site, and on the Support Software CD. To download the utility or to obtain more information about SSM, see http://www.hp.com/go/ssm.

Proactive Change Notification

The Proactive Change Notification program uses the Subscriber's Choice Web site to:

- Send Proactive Change Notification (PCN) e-mail informing you up to 60 days in advance of hardware and software changes to most commercial workstations and servers
- Send you e-mail containing customer bulletins, customer advisories, customer notes, and driver alerts for most commercial workstations and servers

You can create your own profile to ensure that you only receive the information relevant to your specific IT environment. To learn more about the PCN program and to create a custom profile, see Subscriber's Choice on page 35.

Subscriber's Choice

Subscriber's Choice is a client-based service from HP that supplies you with personalized product tips, feature articles, and driver and support alerts and notifications based on your profile.

Subscriber's Choice Driver and Support Alerts and Notifications delivers e-mail notifying you that the information you subscribed to in your profile is available for review and retrieval.

To learn more about Subscriber's Choice and create a custom profile, see http://www.hp.com/subscriberschoice.

ROM Flash

Your HP workstation comes with a programmable flash ROM. By establishing a setup password in the Computer Setup (F10) Utility, you can protect the ROM from being inadvertently updated or overwritten. This function is important to ensure the operating integrity of the workstation.

To upgrade the ROM, download the latest SoftPaq images from http://www.hp.com//support/files.

For maximum ROM protection, establish a setup password. The setup password prevents unauthorized ROM upgrades. SSM enables you to create the setup password on workstations simultaneously. For more information, see http://www.hp.com/go/ssm.

Remote ROM Flash

Remote ROM Flash allows system administrators to safely upgrade the ROM on remote HP workstations directly from a centralized network management console, resulting in a consistent deployment of, and greater control over, HP PC ROM images over the network.

To use Remote ROM Flash, the workstation must be powered on, or turned on using Remote Wakeup.

For more information about Remote ROM Flash, see the HP Client Manager Software or System Software Manager sections at http://www.hp.com/go/ssm.

HPQFlash

The HPQFlash utility is used to locally update or restore the system ROM on PCs using a Windows operating system.

For more information about HPQFlash, seehttp://www.hp.com/go/ssm, and enter the name of your workstation.

Recovering from a ROM flash failure: the FailSafe Boot Block ROM and SoftPaq-created BIOS image CD

The FailSafe Boot Block ROM enables system recovery in the unlikely event of a ROM flash failure. For example, if a power failure occurs during a ROM upgrade, the Boot Block uses a flash-protected section of the ROM to verify a valid system ROM flash when power is restored to the system:

If the system ROM is valid, the system starts normally.

If the system ROM fails the validation check, the FailSafe Boot Block ROM provides enough support to start the system from a BIOS image CD created from a SoftPaq. The BIOS image CD programs the system ROM with a valid image.

When Boot Block detects an invalid system ROM, the workstation power LED blinks red eight times and beeps eight times, then the workstation pauses for two seconds and eight simultaneous beeps are sounded. On some models, a Boot Block recovery mode message appears.

△ **CAUTION:** To prevent a loss of data following a ROM flash failure and enable system recovery, use the BIOS CD media file in the SoftPaq to create a BIOS image CD when first setting up your workstation.

To recover your system after it enters Boot Block recovery mode:

1. Remove any media in the diskette or optical drives.
2. Insert a BIOS image CD into the CD drive.

   You can also use USB media (such as an HP DriveKey).
3. Power off, then power on the workstation.

   If no BIOS image CD or USB media is found, you are prompted to insert one and restart the workstation.
4. Enter the setup password.

   If the system starts from the CD or USB media and reprograms the ROM, three keyboard lights illuminate. A rising-tone series of beeps also signals successful recovery.
5. Remove the CD or USB media and power off the workstation.
6. Restart the workstation.

Asset tracking and security

Asset tracking features incorporated into your workstation provide asset tracking data that can be managed using HP Systems Insight Manager (HP SIM), HP CMS, or other system management applications.

Seamless, automatic integration between asset tracking features and these products enables you to choose the management tool that is best suited to your environment and to leverage investments in existing tools.

HP also offers several solutions for controlling access to valuable components and information.

- HP ProtectTools Embedded Security, if installed, prevents unauthorized access to data, checks system integrity, and authenticates third-party users attempting system access.
- Security features such as ProtectTools and the Hood Sensor (Smart Cover Sensor) help prevent unauthorized access to your data and to the internal components of the workstation.

- By disabling parallel, serial, or USB ports, or by disabling removable-media boot capability, you can protect valuable data assets.
- Memory Change and Hood Sensor (Smart Cover Sensor) alerts can be automatically forwarded to system management applications to deliver proactive notification of tampering with a workstation's internal components.

ProtectTools, the Hood Sensor (Smart Cover Sensor), and the (Smart Cover Lock) are available as options on select systems.

Use the following utilities to manage security settings on the HP workstation:

- Locally, using the Computer Setup (F10) Utility
- Remotely, using HP CMS or SSM which enables the secure, consistent deployment and control of security settings from a simple command line utility

The following table and sections refer to the management of workstation security through the Computer Setup (F10) Utility.

Table 3-2 Security features overview

Feature	Purpose	How it is established
Removable Media Boot Control	Prevents booting from removable media drives	From the Computer Setup (F10) Utility menu
Serial, Parallel, USB, or Infrared Interface Control	Prevents transfer of data through the integrated serial, parallel, USB, or infrared interface	From the Computer Setup (F10) Utility menu
Power-On Password	Prevents use of the workstation until the password is entered (applies to initial system startup and restarts)	From the Computer Setup (F10) Utility menu
Setup Password	Prevents reconfiguration of the workstation (use of the Setup utility) until the password is entered	From the Computer Setup (F10) Utility menu
Network Server Mode	Provides unique security features for workstations used as servers	From the Computer Setup (F10) Utility menu

NOTE: For more information about the Computer Setup (F10) Utility, see The Computer Setup (F10) Utility menu on page 25.

Password security

The power-on password prevents unauthorized use of the workstation by requiring entry of a password to access applications or data when the workstation is powered on or restarted. The setup password specifically prevents unauthorized access to the Computer Setup (F10) Utility and can also be used as an override to the power-on password. When prompted for the power-on password, entering the setup password instead enables access to the workstation.

You can establish a network-wide setup password to enable the system administrator to log in to all network systems to perform maintenance without needing to know the power-on password.

SSM and HP CMS enable remote management of setup passwords and other BIOS settings in a networked environment. For more information, see http://www.hp.com/go/easydeploy.

Establishing a setup password using the Computer Setup (F10) Utility

Establishing a setup password through the Computer Setup (F10) Utility prevents reconfiguration of the workstation (through the use of the Computer Setup (F10) Utility) until the password is entered.

To establish a setup password using the Computer Setup (F10) menu:

1. Power on or restart the workstation.
2. As soon as the computer is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility. Press Enter to bypass the title screen, if necessary.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
3. Select **Security>Setup Password** and then follow the onscreen instructions.
4. Before exiting, select **File>Save Changes** and then select **Exit**.

Establishing a power-on password using workstation setup

Establishing a power-on password through the Computer Setup (F10) Utility prevents access to the workstation when power is connected, unless you specify the password. When a power-on password is set, the Computer Setup (F10) Utility presents Password Options in the Security menu. The password options include Network Server Mode and Password Prompt on Warm Boot.

When Network Server Mode is disabled, you must specify when the password when the workstation is powered on when the key icon appears on the monitor.

When Password Prompt on Warm Boot is enabled, the password must also be entered each time the workstation is rebooted.

When Network Server Mode is enabled, the password prompt is not presented during POST, but any attached PS 2 keyboard remains locked until you enter the power-on password.

To enable Network Server Mode, you set a power-on password. The option to set this password is available under Advanced>Password Options. This option enables the system to boot without requiring the power-on password, but the keyboard and mouse are locked until you enter the password. The keyboard LEDs rotate constantly when the system is in locked mode.

To establish a power-on password through the Computer (F10) menu:

1. Power on or restart the workstation.
2. As soon as your workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   Press Enter to bypass the title screen, if necessary.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
3. Select **Security>Power-On Password** and then follow the onscreen instructions.
4. Before exiting, select **File>Save Changes** and then **Exit**.

Entering a power-on password

1. Restart the workstation.
2. When the key icon appears on the monitor, enter the current password, and then press Enter.

   Type carefully. For security reasons, the characters you enter do not appear on the screen.

If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you must restart the workstation before you can continue.

Entering a Setup Password

If a setup password has been established on the workstation, you are prompted to enter it when you run the Computer Setup (F10) Utility.

To enter a setup password:

1. Restart the workstation.
2. As soon as the workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   Press Enter to bypass the title screen, if necessary.

   If you do not pressF10 at the appropriate time, you must restart the workstation and press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
3. When the key icon appears on the monitor, enter the setup password, and press Enter.

   Type carefully. For security reasons, the characters you enter do not appear on the screen.

   If you enter the password incorrectly, a broken key icon appears. Try again. After three unsuccessful tries, you will enter the F10 Setup screen with read-only permission. See F10

Changing a power-on or setup password

1. Restart the workstation.
2. To change the power-on password, go to step 4.
3. To change the setup password, as soon as the workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   Press Enter to bypass the title screen, if necessary.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message—disregard it.
4. When the key icon appears, enter the current password, a slash (/) or alternative delimiter character, your new password, another slash (/) or alternative delimiter character, and your new password again as shown:

   current password/new password/new password

   For information about the alternative delimiter characters, see National keyboard delimiter characters on page 40.

   Type carefully. For security reasons, the characters you enter do not appear on the screen.
5. Press Enter.

The new password takes effect the next time you power on the workstation.

You can also change the power-on and setup passwords using the Security options in the Computer Setup (F10) Utility.

Deleting a power-on or setup password

1. Power on or restart the workstation.
2. Choose from the following:
   - To delete the power-on password, when the key icon appears, enter your current password followed by a slash (/) or alternative delimiter character:

     current password/.

     For information about the alternative delimiter characters, see National keyboard delimiter characters on page 40.

     To delete the setup password, as soon as the workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

     Press Enter to bypass the title screen, if necessary.

     If you do not press the F10 key at the appropriate time, you must restart the computer and then press and hold the F10 key again to access the utility.

     Use the appropriate operating system shutdown process.
3. Press Enter.

National keyboard delimiter characters

Each keyboard meets country-specific requirements. The syntax and keys you use for changing or deleting passwords depend on the keyboard included with your workstation.

Table 3-3 National keyboard delimiter characters

Language	Delimiter	Language	Delimiter	Language	Delimiter
Arabic	/	Greek	-	Russian	/
Belgian	=	Hebrew	.	Slovakian	-
BHCSY*	-	Hungarian	-	Spanish	-
Brazilian	/	Italian	-	Swedish/Finnish	/
Chinese	/	Japanese	/	Swiss	-
Czech	-	Korean	/	Taiwanese	/
Danish	-	Latin American	-	Thai	/
French	!	Norwegian	-	Turkish	.
French Canadian	é	Polish	-	U.K. English	/
German	-	Portuguese	-	U.S. English	/

NOTE: * Bosnia-Herzegovina, Croatia, Slovenia, and Yugoslavia

Clearing passwords

If you forget your workstation power-on password, you cannot access the workstation until the established password is cleared and a new password established. For instructions about clearing passwords, see Clearing and resetting workstation passwords on page 141.

DriveLock

△ **CAUTION:** Enabling DriveLock can render a hard drive permanently inaccessible if the master password is lost or forgotten. No method exists to recover the password or access the data.

DriveLock uses an industry-standard security feature that prevents unauthorized access to data on an ATA hard drive. DriveLock has been implemented as an extension to Computer Setup (F10) functions. It is only available when hard drives that support the ATA security command set are detected. On HP workstations, it is not available when the SATA emulation mode is RAID+AHCI or RAID.

DriveLock is for HP customers for whom data security is a paramount concern. For such customers, the cost of a hard drive and the loss of the data stored on it is inconsequential when compared to the damage that could result from unauthorized access to its contents.

To balance this level of security with the need to address the issue of a forgotten password, the HP implementation of DriveLock employs a two-password security scheme. One password is intended to be set and used by a system administrator, while the other is typically set and used by the user.

No back door can be used to unlock the drive if both passwords are lost. Therefore, DriveLock is most safely used when the data contained on the hard drive is replicated on a corporate information system or is regularly backed up.

If both DriveLock passwords are lost, the hard drive is rendered unusable. For users who do not fit the previously defined customer profile, this might not be acceptable. For users who fit this profile, it might be a tolerable risk, given the nature of the data stored on the hard drive.

DriveLock applications

The most practical use of DriveLock is in a corporate environment. The system administrator would be responsible for configuring the hard drive, which involves setting the DriveLock master password and a temporary user password. If the user forgets the user password or if the equipment is passed on to another employee, the master password can be used to reset the user password and regain access to the hard drive.

HP recommends that corporate system administrators who enable DriveLock also establish a corporate policy for setting and maintaining master passwords. This should be done to prevent a situation where an employee sets both DriveLock passwords before leaving the company. In such a scenario, the hard drive is unusable and requires replacement. Likewise, by not setting a master password, system administrators might find themselves locked out of a hard drive and unable to perform routine checks for unauthorized software, other asset control functions, and support.

For users with less stringent security requirements, HP does not recommend enabling DriveLock. Users in this category include personal users, or users who do not maintain sensitive data on their hard drives as a common practice. For these users, the potential loss of a hard drive resulting from forgetting both passwords is much greater than the value of the data DriveLock protects.

Access to Computer Setup (F10) and DriveLock can be restricted through the setup password. By specifying a setup password and not giving it to users, system administrators can restrict users from enabling DriveLock.

Using DriveLock

When hard drives that support the ATA security command set are detected, the DriveLock option appears under the Security menu in Computer Setup (F10). You are presented with options to set the master password and to enable DriveLock.

You must provide a user password must be provided to enable DriveLock. Because the initial configuration of DriveLock is typically performed by a system administrator, a master password should be set first.

HP encourages system administrators to set a master password whether they plan to enable DriveLock or not. This gives the administrator the ability to modify DriveLock settings if the drive is locked in the future. After the master password is set, the system administrator can enable DriveLock or leave it disabled.

If a locked hard drive is present, POST requires a password to unlock the device. If a power-on password is set and it matches the device's user password, POST does not prompt the user to re-enter the password. Otherwise, the user is prompted to enter a DriveLock password.

For a cold boot, use the master or user password. For a warm boot, enter the same password used to unlock the drive during the preceding cold-boot.

Users have two attempts to enter a correct password. During cold boot, if neither attempt succeeds, POST continues but the drive remains inaccessible. During a warm boot or restart from Windows, if neither attempt succeeds, POST halts and the user is instructed to cycle power.

To enable and set the DriveLock user password:

1. Power on or restart the workstation.
2. As soon as the workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   Press Enter to bypass the title screen, if necessary.

   If you do not press F10 at the appropriate time, you must restart the workstation, and then press and hold F10 again to access the utility.

   If you are using a PS2 keyboard, you might see a keyboard error message. Disregard it.
3. Select **Security>DriveLock Security**.
4. For each DriveLock-capable drive, select a drive by pressing F10 to accept.
5. Under Enable/Disable DriveLock options, select **Enable**, and then press F10 to enable DriveLock for a particular drive.

△ **CAUTION:** Forgetting the DriveLock password renders the drive unusable.

6. Enter a new user password, and then press the F10 key to accept.

   This password can be 1 to 32 characters.
7. Enter the password again in the Enter New Password Again field.

   If you forget this password, the drive is rendered permanently disabled.
8. Select **File>Save Changes and Exit**, and then press F10.

   After you press F10, the system performs a cold-boot before invoking the DriveLock function.

   You can also use this process to set the DriveLock master password by selecting **Master** in Step 5.

When the workstation starts, you are prompted to enter the DriveLock password for each DriveLock-capable drive that you set a password. You have two attempts to enter the password correctly. If the password is not entered correctly, the workstation attempts to boot anyway. However, the boot process most likely fails because data from a locked drive cannot be accessed.

In a single drive workstation, if the drive has DriveLock enabled, the workstation might not be able to boot to the operating system, and might try to boot from the network or from another storage device (depending on the boot ordering options). Regardless of the outcome of the boot attempts, the drive-locked drive remains inaccessible without the DriveLock password.

In a two-drive workstation that has a boot drive and a data drive, you can apply the DriveLock feature to the data drive only. In this case, the workstation can always boot, but the data drive is accessible only when the DriveLock password is entered.

Cold boots require that you enter DriveLock passwords. However, DriveLock passwords are also required for warm boots. For example, if you boot to DOS and press Ctrl+Alt+Del, you must enter the DriveLock password before the workstation completes the next boot cycle. This warm-boot behavior is consistent with the DriveLock feature.

Hood lock solenoid (smart cover lock)

The optional Hood lock solenoid (smart cover lock) provides a locking solenoid that can prevent the side access cover from being removed from the workstation. When activated, the Hood lock solenoid prevents unauthorized access to the internal workstation components. The lock solenoid is controlled by the Lock and Unlock F10 Setup option for the hood lock. Access the F10 Setup functions is controlled by the setup password.

△ **CAUTION:** For maximum workstation access security, you must also establish a setup password. The setup password prevents unauthorized access to the Computer Setup utility, thereby protecting the integrity of the hood lock solenoid password.

Locking the solenoid lock

To activate the Hood lock solenoid:

1. Power on or restart the workstation.
2. As soon as the workstation is powered on, press and hold the **F10** key until you enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

   NOTE: If you do not press the **F10** key at the appropriate time, you must restart the workstation and press and hold the **F10** key again to access the utility.

   If you are using a PS2 keyboard, you might see a Keyboard Error message—disregard it.
3. Select **Security>Smart Cover>Cover Lock>Lock**.
4. Select **Fire>Save Changes and Exit**.

Unlocking the solenoid lock

1. Turn on or restart the workstation.
2. As soon as the workstation is powered on, press and hold the **F10** key until you enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

   NOTE: If you do not press the **F10** key at the appropriate time, you must restart the workstation and press and hold the **F10** key again to access the utility.

   If you are using a PS2 keyboard, you might see a Keyboard Error message—disregard it.
3. Select **Security>Smart Cover>Cover Lock>Unlock**.
4. Select **Fire>Save Changes and Exit**.

Using the FailSafe key

If you enable the solenoid lock and cannot enter your password to disable the lock, you will need a FailSafe Key to open the workstation side access panel. You will need the key in any of the following circumstances:

- Power outage
- Startup failure
- PC component failure (such as processor or power supply)
- Forgotten password

△ **CAUTION:** The side access panel FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need one.

To obtain the FailSafe Key, complete any one of the following tasks:

- Contact your authorized HP reseller or service provider.
- Visit http://www.hp.com for ordering information.
- Visit http://welcome.hp.com/country/us/en/wwcontact.html for contact information.

Hood Sensor (Smart Cover Sensor) (optional)

The optional Hood Sensor is a combination of hardware and software technology that can alert you when the workstation side access panel has been removed (if the sensor has been configured in the Computer Setup (F10) Utility). There are three levels of Hood Sensor protection:

Table 3-4 Hood Sensor protection levels

Level	Setting	Description
Level 0	Disabled	Hood Sensor is disabled (default).
Level 1	Notify User	When the workstation restarts, a message appears indicating that the workstation side access panel has been removed.
Level 2	Setup Password	When the workstation is restarted, a message appears indicating that the workstation side access panel has been removed. You must enter the setup password to continue.

Hood Sensor settings can be changed using the Computer Setup (F10) Utility.

Setting the Hood Sensor protection level

1. Power on or restart the workstation.
2. As soon as the workstation is powered on, press and hold F10 until you enter the Computer Setup (F10) Utility.

   Press Enter to bypass the title screen, if necessary.

   If you do not press F10 at the appropriate time, you must restart the computer, and then press and hold F10 again to access the Computer Setup (F10) Utility.

   If you are using a PS 2 keyboard, you might see a keyboard error message. Disregard it.
3. Select **Security>Smart Cover>Cover Removal Sensor**, and follow the onscreen instructions.
4. Before exiting, select **File>Save Changes**, and then select **Exit**.

Cable lock (optional)

To prevent theft, the rear chassis panel of your workstation accommodates a keyed cable lock. This cable lock attaches to the chassis and secures it to the work area.

Security lock Padlock loop (optional)

The rear chassis panel of your workstation provides a padlock loop. A padlock can be attached in this loop to prevent workstation access panel removal.

Universal chassis clamp lock (optional)

The universal chassis clamp lock secures the access panel to the chassis using a screw-type attachment. A built in key lock prevents access to the securing screw. In addition, you can add cables to the universal chassis clamp lock to secure workstation peripherals, and to secure the workstation to the work area.

Fault notification and recovery

Fault notification and recovery features combine innovative hardware and software technology to prevent the loss of critical data and minimize unplanned downtime.

If the workstation is connected to a network that is managed by HP CMS, the computer sends a fault notice to the network management application. With HP CMS, you can also remotely schedule diagnostics to run on managed PCs and create a summary report of failed tests.

Drive Protection System

The Drive Protection System (DPS) is a diagnostic tool built into hard drives and is installed in select HP workstations. The DPS helps diagnose problems that might result in unwarranted hard drive replacement.

When HP workstations are built, each installed hard drive is tested using the DPS, and a permanent record of key information is written onto each drive. Every time the DPS is run, test results are written to the hard drive. The service provider can use this information to help diagnose conditions that required you to run the DPS software.

ECC fault prediction

When the workstation encounters an excessive number of error checking and correcting (ECC) memory errors, it displays a local alert message. This message contains information about the errant memory module, enabling you to take action before you experience noncorrectable memory errors. ECC memory modules are standard on the HP xw6600 Workstation.

Thermal sensors

Several thermal sensors in your HP xw6600 Workstation regulate workstation fans to maintain an acceptable, efficient chassis temperature.

Dual-state power button

With ACPI enabled, the power button can function as an on/off switch or as a button. This feature does not completely turn off power, but instead causes the workstation to enter a low-power standby state. This allows you to power on the workstation without closing applications, and to return to the same operational state without data loss.

To change the power button configuration:

1. Select **Start**, and then select **Control Panel>Power Options**.
2. In Power Options Properties, select the **Advanced** tab.
3. In the Power Button section, select **Hibernate**.

   Hibernate must be enabled in the Hibernate tab.

After configuring the power button to function as a button, you can press the power button to put the system in a low power state. Press the button again to bring the system out of this low power state to full power state. To completely turn off power to the system, press and hold the power button for four seconds.

△ **CAUTION:** Do not use the power button to power off the workstation unless the system is not responding. Turning off the power without operating system interaction can cause damage to, or loss of data on, the hard drive.

4 Removal and replacement procedures

This chapter describes the removal and replacement procedures for most internal workstation components, including the following topics:

Warnings and cautions

⚠ **WARNING!**  Any surface or area of the equipment marked with this symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists. To reduce the risk of injury from a hot component, enable the surface to cool before touching.

⚠ **WARNING!**  Any surface or area of the equipment marked with this symbol indicates the presence of an electrical shock hazard. To reduce the risk of injury from electrical shock, do not open any enclosed area marked with this symbol.

⚠ **WARNING!** To reduce the risk of electric shock or damage to your equipment:

— Do not disable the power cord grounding plug. The grounding plug is an important safety feature.

— Plug the power cord in a grounded (earthed) outlet that is easily accessible at all times.

— Disconnect power from the equipment by unplugging the power cord from the electrical outlet.

⚠ **WARNING!** To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation setup, posture, health, and work habits for computer users, and provides important electrical and mechanical safety information. This guide is located at http://www.hp.com/ergo and on the documentation CD (if one is included with the product).

⚠ **WARNING!** If a product is shipped in packaging marked with this symbol,  , the product must always be lifted by two persons to avoid personal injury due to product weight.

△ **CAUTION:** Static electricity can damage the electronic components of the workstation. Before beginning these procedures, be sure you discharge static electricity by briefly touching a grounded metal object.

△ **CAUTION:** Observe the following cautions when removing or replacing a processor:

— Installing a processor incorrectly can damage the system board. Contact an HP authorized reseller or service provider to install the processor. If you plan to install the processor yourself, read all of the instructions carefully before you begin.

— Failure to follow the workstation preparation instructions can result in an improperly installed processor, causing extensive workstation damage.

— Processor socket pins are delicate and bend easily. Use extreme care when placing the processor in the socket.

△ **CAUTION:** To prevent damage to the workstation, observe the following Electrostatic Discharge (ESD) precautions while performing the system parts removal and 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 the 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.

NOTE: HP accessories are for use in HP Workstation products. They have been extensively tested for reliability and are manufactured to high quality standards.

Service considerations

The following sections describe service considerations that you should review and practice before removing and replacing any system components.

⚠ **WARNING!** When lifting or moving the workstation, do not use the front bezel as a handle or lifting point. Lifting the workstation from the front bezel, or lifting it incorrectly, can cause the workstation to fall, possibly harming you and damaging the workstation. To properly and safely lift the workstation, lift it from the bottom.

Cautions, warnings, and safety precautions

For your safety, review the cautions, warnings, and safety precautions before accessing the workstation components. Also, review the *Safety and Regulatory Guide* that came with your workstation for more information.

ESD information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often, the discharge is neither felt nor heard, but damage occurs nonetheless. An electronic device exposed to ESD might not appear to be affected at all and can function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

Networks built into many integrated circuits provide some protection, but in many cases, the discharge contains enough power to alter device parameters or melt silicon junctions.

Generating static

The following table shows that different activities generate different amounts of static electricity. Static electricity increases as humidity decreases.

Table 4-1 Static electricity

	Relative humidity		
Event	**55%**	**40%**	**10%**
Walking across carpet	7,500V	15,000V	35,000V
Walking across vinyl floor	3,000V	5,000V	12,000V
Motions of bench worker	400V	800V	6,000V
Removing bubble pack from PCB	7,000V	20,000V	26,500V
Packing PCBs in foam-lined box	5,000V	11,000V	21,000V

CAUTION: 700 volts can degrade a product.

Preventing ESD equipment damage

Many electronic components are sensitive to ESD. Circuitry design and structure determine the degree of sensitivity. The following packaging and grounding precautions are necessary to prevent damage to electric components and accessories:

- Transport products in static-safe containers such as tubes, bags, or boxes, to avoid hand contact.
- Protect electrostatic parts and assemblies with nonconductive or approved containers or packaging.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from containers.
- When handling or touching a sensitive component or assembly, ground yourself by touching the chassis.
- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or nonconductive foam.

Personal grounding methods and equipment

Use the following items to help prevent ESD damage to equipment:

- **Wrist straps**—These are flexible straps with a maximum of one megohm ± 10% resistance in the ground cords. To provide a proper ground, wear the strap against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.
- **Heel straps, toe straps, and boot straps**—These can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one megohm ± 10% resistance between the operator and ground.

The following table shows typical static shielding protection levels.

Table 4-2 Static shielding protection levels

Method	Voltage
Antistatic plastic	1,500V
Carbon-loaded plastic	7,500V

Table 4-2 Static shielding protection levels (continued)

Method	Voltage
Metallized laminate	15,000V

Grounding the work area

To prevent static damage in your work area:

- Cover the work surface with approved static-dissipative material. Use a wrist strap connected to the work surface, and properly grounded tools and equipment.
- Use static-dissipative mats, foot straps, or air ionizers to give added protection.
- Handle electrostatic-sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only in static-free work areas.
- Disconnect power and input signals before inserting and removing connectors or test equipment.
- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.
- Keep work area free of nonconductive materials, such as plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuums that are conductive.

Recommended ESD prevention materials and equipment

Materials and equipment that are recommended for use in preventing static electricity include:

- Antistatic tape
- Antistatic smocks, aprons, and sleeve protectors
- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with a ground cord of one megohm ± 10% resistance
- Static-dissipative table or floor mats with a hard-tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one megohm ± 10% resistance
- Material-handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

Tools and software requirements

- Torx T-15 driver
- Flat blade and cross-tip screwdrivers
- Diagnostics software

Special handling of components

The components included in this section require special handling when servicing the workstation.

⚠ **WARNING!** Do not use the front bezel as a handle or lifting point when lifting or moving the workstation. Lifting the workstation from the front bezel, or lifting it incorrectly, could cause the workstation to fall, causing possible injury to you and damage to the workstation. To properly and safely lift the workstation, lift from the bottom of the workstation for the desktop or minitower configuration.

Cables and connectors

Handle cables with care to avoid damage. Apply only the tension required to seat or unseat cables during insertion or removal from the connector. When possible, handle cables by the connector or pull-strap. Avoid bending or twisting all cables, and be sure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

When servicing the workstation, be sure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the workstation.

Hard drives

Hard drives are fragile, precision components. Therefore, you must avoid subjecting them to physical shock and vibration. The following guidelines apply to all drives, including failed drives, replacement drives, and spares.

- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are mounted in the workstation.
- Avoid dropping hard drives from any height.
- If you are inserting or removing a hard drive, power off the workstation. Do not remove a hard drive while the workstation is powered on or in standby mode.
- Before handling a drive, be sure that you discharge static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, see ESD information on page 48.

  △ **CAUTION:** To prevent ESD damage when the drive is installed, connect the drive power cable before connecting the data cable. This discharges accumulated static electricity through the drive power cable to the workstation chassis.

- When inserting a drive, do not use excessive force.
- Avoid exposing a hard drive to liquids, temperature extremes, or products with magnetic fields such as monitors or speakers.

Lithium coin cell battery

The battery included with the workstation provides power to the real-time clock and has a lifetime of approximately three years.

For instructions on battery removal and replacement, see Battery on page 101.

⚠ **WARNING!** This workstation contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short the external contacts, dispose of in water or fire, or expose the battery to temperatures higher than 60° Centigrade (140° Fahrenheit).

Do not dispose of batteries, battery packs, and accumulators with general household waste.

Customer Self-Repair

Customer Self-Repair enables you to obtain replacement parts and install them on the workstation. For more information, see http://www.hp.com/go/selfrepair/.

Predisassembly procedures

Perform the following steps before servicing a workstation:

1. Close all open software applications.
2. Remove all diskettes, CDs, and DVDs from the workstation.
3. Disable the optional solenoid lock (if installed) so side access panel can be removed.
4. Shut down the operating system.
5. Power off the workstation and all peripheral devices connected to it.
6. Remove or disengage security devices that prevent you from opening the workstation.
7. Disconnect the power cord from the electrical outlet and then from the workstation.
8. Disconnect peripheral device cables from the workstation.

System board components

The following figure shows the system board connectors and sockets on the HP xw6600 Workstation.

Figure 4-1 System board component identification

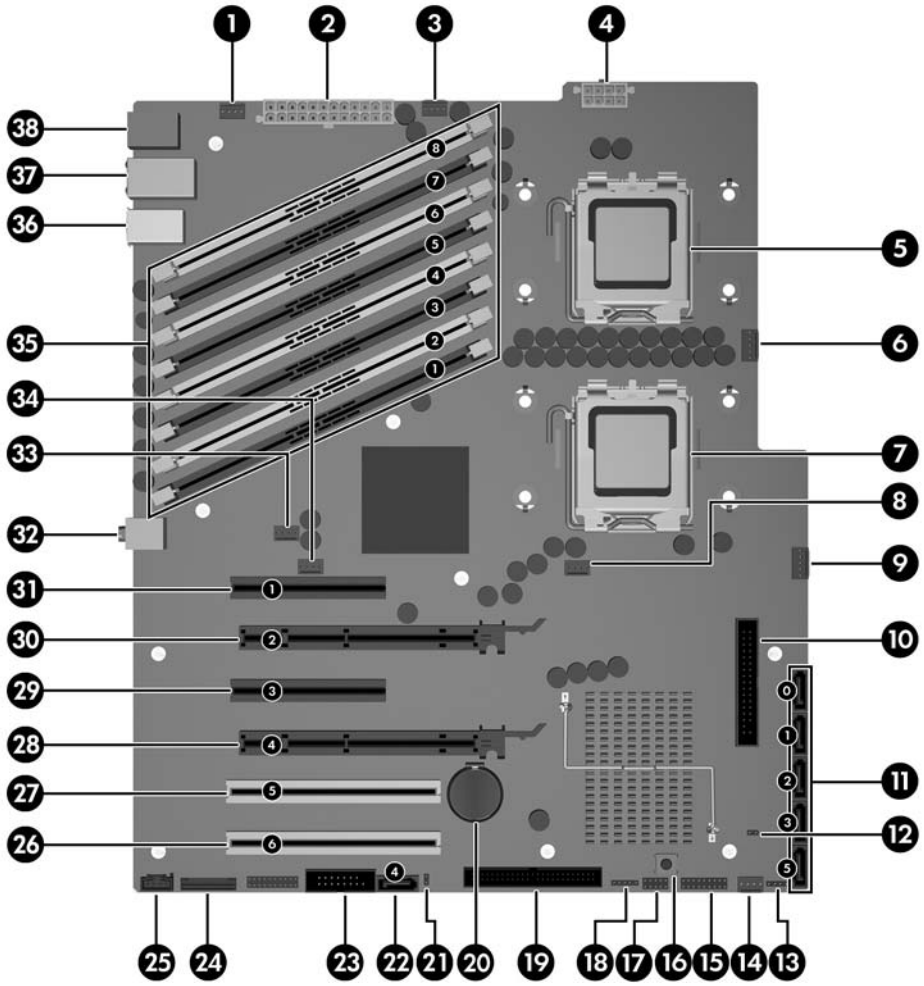


Table 4-3 System board components

Item	Component	Item	Component	Item	Component	Item	Component
1	Hood lock solenoid connector	11	SATA0 through SATA3 and SATA5 ports	21	Password jumper	31	PCIe x8 (4) slot * (open-ended slot that also allows installation of x16 card)
2	Main power connector	12	Crisis recovery jumper	22	SATA4 port	32	Audio jacks
3	Upper rear chassis fan connector	13	HDD activity LED connector	23	Serial port adapter	33	Lower rear chassis fan connector
4	Processor (CPU) power connector	14	Front PCI fan (optional) connector	24	Front audio connector	34	Chip set fan power connector
5	Primary processor (XU1)	15	Front control panel connector	25	Auxilliary Audio connector	35	Memory module sockets (x8)

Table 4-3 System board components (continued)

Item	Component	Item	Component	Item	Component	Item	Component
6	Processor 1 fan connector	16	Clear CMOS button	26	PCI 32 slot	36	Three USB receptacles
7	Second processor (XU2)	17	Front USB connector	27	PCI 32 slot	37	Two USB and one RJ45 LAN receptacle
8	Memory fan power connector	18	Internal USB connector	28	PCIe x16 (75W) slot	38	PS/2 mouse and keyboard jacks
9	Processor 2 fan connector	19	IDE (PATA) connector	29	PCIe x8 (4) slot * (open-ended slot that also allows installation of x16 card)		
10	Diskette drive connector	20	battery	30	PCIe x16 (75W +) slot		

* Electrically x4 bandwidth

Removing and replacing components

This section provides procedures to remove and install hardware components on your workstation.

1. Read all safety information and precautions.

   Before servicing your workstation, review the safety information and precautions in Service considerations on page 48, and the *Safety and Regulatory Information* for your workstation.

2. Locate and clear a suitable work area.
3. Power down the workstation and disconnect power from the workstation.
4. Gather your tools.
5. Service the workstation.
6. Restore power to the workstation.

Disassembly order

Use the following table to determine the sequence in which to remove major workstation components.

Table 4-4 Workstation component disassembly order

Predisassembly (Predisassembly procedures on page 52)
Security lock (Security lock padlock loop (optional) on page 56)
Cable lock (Cable lock (optional) on page 56)
Universal chassis clamp lock (Universal chassis clamp lock (optional) on page 57)
Side access panel (Side access panel on page 58)
Smart Cover Lock solenoid (Smart Cover Lock solenoid (optional) on page 59)
Hood Sensor (Hood sensor (Smart cover sensor) on page 61)
Front bezel (Front bezel on page 61)
Bezel blanks (Bezel blanks on page 62)
Front panel I/O device assembly (Front panel I/O device assembly on page 63)
Power button assembly (Power button assembly on page 65)
Optical drives (Optical drive on page 67
Diskette drive (Diskette drive (optional) on page 69)
System speaker (System speaker on page 71)
Power supply (Power supply on page 72)
System fan (System fan assembly on page 73)
Memory fan (Memory fan on page 74)
Memory (Memory on page 75)
PCI card support (PCI card support bracket on page 80)
PCI Express card (PCI Express cards on page 82)
PCI card (PCI card on page 84)

Table 4-4 Workstation component disassembly order (continued)

	Hard drives (SAS hard drive on page 86), SATA hard drive on page 91)	
	Processor heatsink (Processor heatsink on page 96)	
		Processor (System processor on page 98)
		System board (System board on page 100)
	Battery (Battery on page 101)	

Security lock padlock loop (optional)

If a security padlock is installed on your workstation, remove it before servicing the workstation.

Removing the security lock

To remove the padlock, unlock it and slide it out of the padlock loop, as shown in the following figure.

Figure 4-2 Removing the security lock

Cable lock (optional)

If a cable lock is installed on your workstation, remove it before servicing the workstation.

Removing the cable lock

To remove the cable lock, unlock it and pull it out of the cable lock slot, as shown in the following figure.

Figure 4-3 Removing the cable lock

Universal chassis clamp lock (optional)

If a universal chassis clamp lock is installed on your workstation, remove it before servicing the workstation.

Removing the chassis clamp lock

To remove the lock:

1. Unlock the device and remove the locking mechanism, as shown here:

   Figure 4-4 Unlocking the device

2. Remove the screw attaching the lock to the chassis, as shown:

Figure 4-5 Removing the lock screws

Side access panel

Before accessing the internal components of the workstation, you must remove the side access panel.

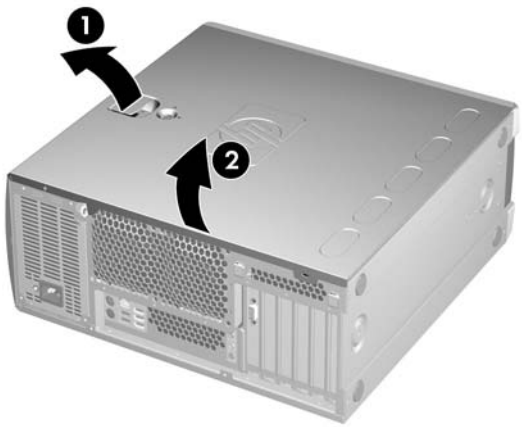
NOTE: If the optional solenoid hood lock is installed and activated, it must be deactivated prior to powering down the workstation and removing the side access panel.

To remove the side access panel:

WARNING!

1. Power off the workstation and disconnect the power cord from the electrical outlet.
2. Disconnect power from the system (see Predisassembly procedures on page 52).
3. If necessary, unlock the side access panel. The keys are on the rear panel. Also, unlock other locks that are present, such as a cable lock or padlock.
4. As shown in the following figure, pull up on the latch handle (1) and lift the cover off the workstation (2).

Figure 4-6 Opening the side access panel



To reinstall the side access panel, align the bottom groove of the side access panel with the bottom edge of the chassis, rotate the side access panel toward the chassis and press firmly until the latch engages.

Smart Cover Lock solenoid (optional)

This section describes how to remove the workstation top cover and Smart Cover Lock solenoid

Removing the workstation top cover

Remove the workstation top cover before removing the Smart Cover Lock solenoid. To remove the top cover:

1. Disconnect power from the system (see Predisassembly procedures on page 52).

△ **CAUTION:** Use care when prying up the workstation top cover. Installation locking tangs might break off if the top cover is pried upward more than 0.5 cm (0.2 in).

2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Front bezel on page 61).
4. Push the blade of a flat blade screw driver into the recessed tab of the top cover on the rear of the chassis and gently push the screw driver handle downward (1) to pry the top cover upward approximately 0.5 cm (0.2 in).
5. With the screw driver inserted and prying upward, use the palm of your hand to push against the front edge of the top cover. Push the top cover toward the rear of the workstation chassis.

   This releases the six locking hooks located on the underside of the top cover and allows it to slide toward the rear of the chassis approximately 1.25 cm (0.5 in). Lift the cover from the chassis (2) and store it for later reuse, as shown:

   Figure 4-7 Removing the top cover

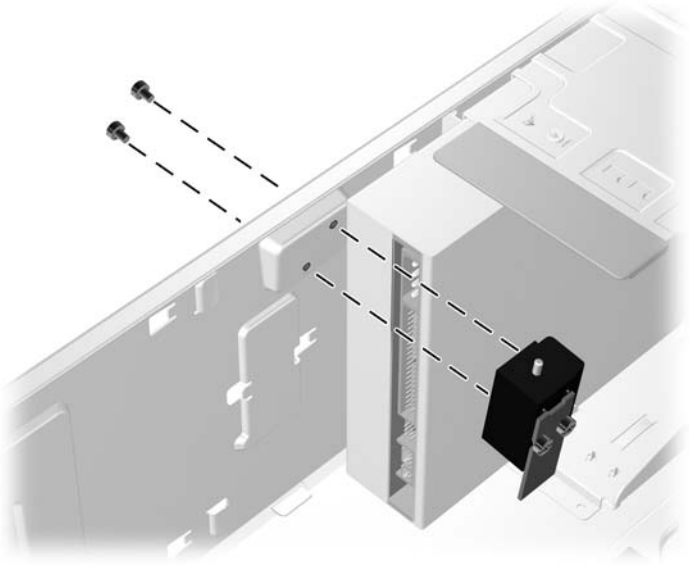
Removing the Smart Cover Lock solenoid

To remove the Smart Cover Lock solenoid:

NOTE: To purchase a FailSafe key, contact your authorized HP reseller or service provider, or see the HP Web site for ordering information.

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove top cover.
4. Disconnect the solenoid cable from the system board (1), as shown:

   Figure 4-8 Removing the Smart Cover Lock solenoid assembly



5. Use the FailSafe key (T-15 wrench) to remove the two screws from the back of the chassis (2).
6. Slide the solenoid assembly away from the chassis and out of the workstation (3).

Replacing the smart cover lock solenoid

To replace the Smart Cover Lock Solenoid assembly, reverse the previous removal steps.

Reinstalling the workstation top cover

To reinstall the workstation top cover:

1. Place the top cover on top of the workstation chassis and align the six locking hooks on the underside of the cover. Ensure that the locking hooks insert into the latch openings on the top of the chassis.

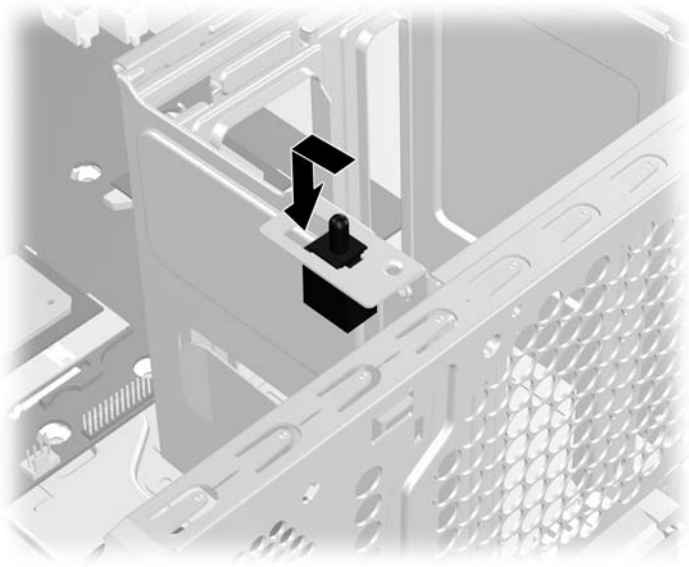
   Ensure that the open end of each locking hooks is facing toward the workstation front panel.
2. With the locking hooks inserted into the latch openings, push the top cover forward toward the front panel of the chassis until it snaps into the locked position.
3. Reinstall the front bezel and the workstation side access panel.

Hood sensor (Smart cover sensor)

To remove the hood sensor:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Disconnect the white 1x3 hood sensor connector from the in-line connector attached to the front panel harness.
4. Slide the hood sensor forward, push it down, and remove it from the chassis, as shown:

Figure 4-9 Removing the hood sensor



5. To replace the hood sensor, reverse the previous steps.

Front bezel

This section describes how to remove and replace the front bezel.

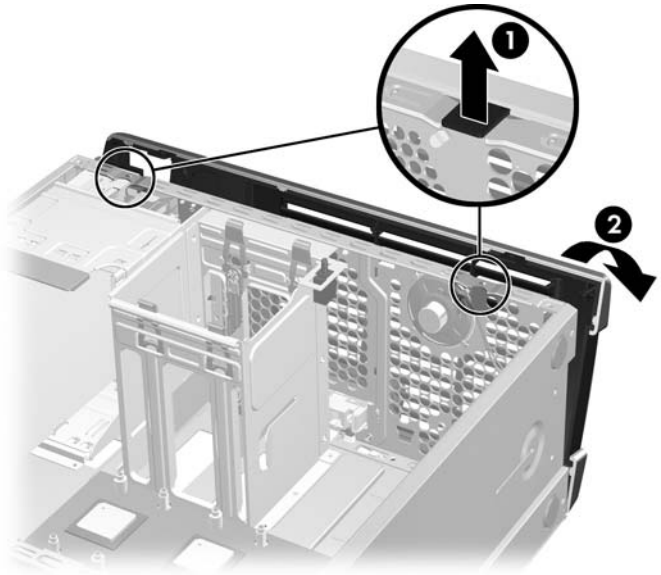
Removing the front bezel

To remove the front bezel:

1. Remove the side access panel.

2. Lift the two release snaps located on the front bezel (1), as shown in the following figure:

Figure 4-10 Removing the front bezel



3. Rotate the front bezel away from the chassis to remove the bezel (2).

Replacing the front bezel

To replace the front bezel, engage the three small hooks protruding on one side of the front bezel with matting holes on the workstation chassis and rotate the front bezel against the chassis front until the bezel snaps into place.

Bezel blanks

This section describes how to remove bezel blanks

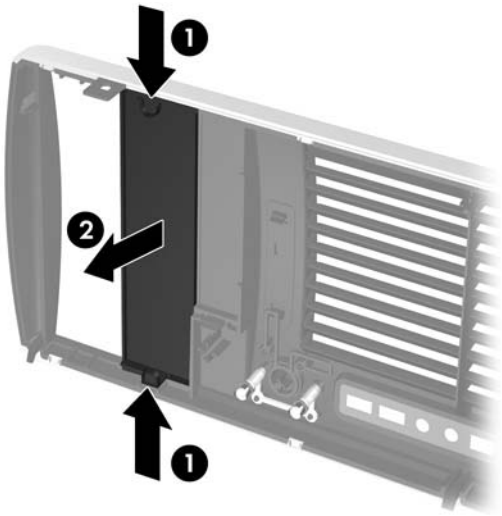
Removing bezel blanks

To remove bezel blanks:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the front bezel (see Removing the front bezel on page 61).

3. Remove the bezel blanks by squeezing in on the tabs (1) and simultaneously pushing the bezel blanks out (2), as shown:

Figure 4-11 Removing the bezel blanks



4. Remove the bezel blank by applying outward pressure on the subpanel (1) and pulling the blank away (2).

   A bezel blank has a hook on both sides. It is symmetric and can be installed upside down without issue. To replace a blank, align its hook on one side with the slot in the bezel, then rotate it until it snaps into place.

Front panel I/O device assembly

This section describes how to remove and install a front panel I/O device assembly.

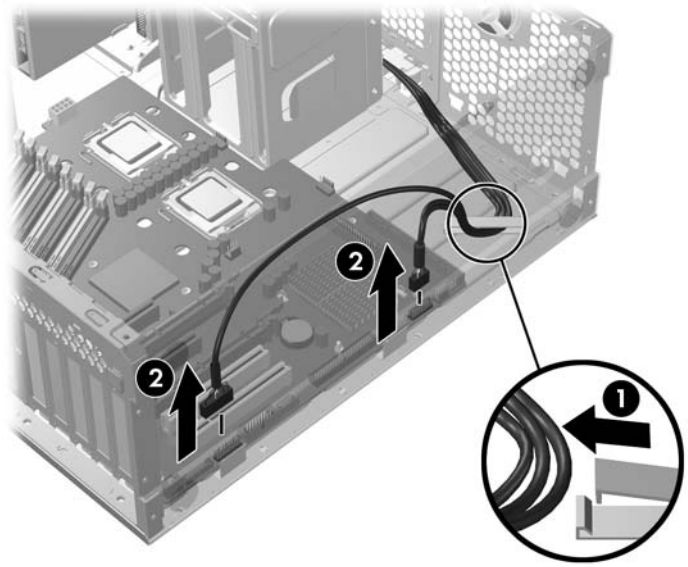
Removing the front panel I/O device assembly

To remove the front panel I/O device assembly:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).

4. Unlatch the plastic snap that secures the cables inside the chassis (1), and then disconnect the front panel I/O device assembly cables from the system board (2), as shown:

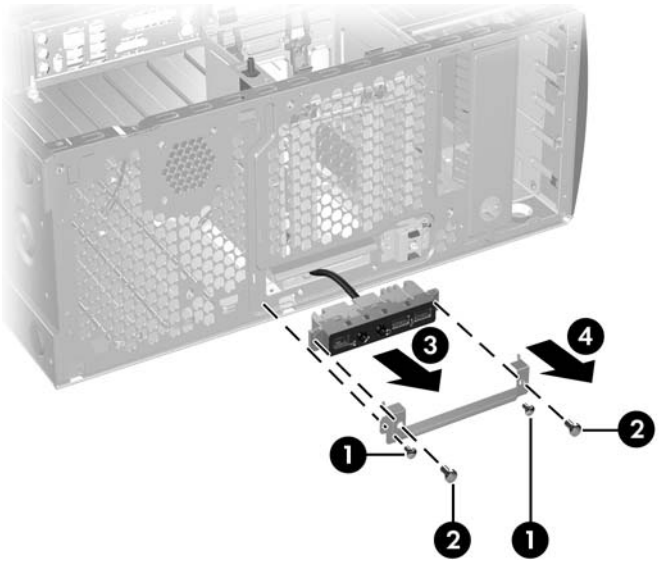
Figure 4-12 Removing front panel I/O device cables



5. Remove the two smaller Torx screws (1) that hold the front panel I/O device assembly and bracket to the chassis, as shown in the figure below.

6. Although not required, you can remove the mounting bracket from the I/O device assembly by removing the two larger Torx screws (2) and pulling the mounting bracket away separately (4), as shown in the following figure.

Figure 4-13 Removing the front panel I/O device assembly



7. Pull the front panel I/O device assembly and bracket out about two inches away from the chassis (3).

8. Guide the front panel cables through the chassis and out through the opening in the front of the workstation chassis.

You might need to slide the cables out one at a time.

Installing the front panel I/O device assembly

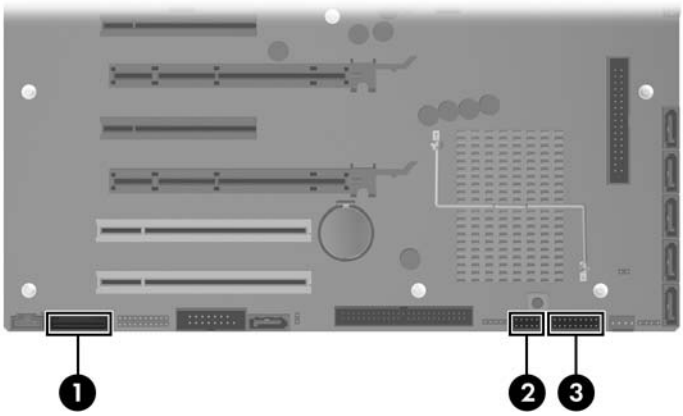
To install the front panel I/O device assembly:

1. Thread each front panel I/O device assembly cable through the same holes in the chassis front they were removed from.
2. Using your fingers, manipulate the cables inside the chassis so the front panel I/O device assembly will easily fit in its mounting slot without binding or stress on the cables.
3. Screw the mounting bracket to the chassis.
4. From the front panel I/O device assembly, connect the front audio cable to the system board audio connector (1), and connect the front USB cable to the USB connector (2), as shown in the figure below.

   Ensure that the front control panel cable to the system board control panel connector is also connected (3).

   The front panel I/O assembly harness also includes an IEEE 1394 cable. This cable can be connected to an installed IEEE 1394 PCI card, or stowed disconnected under the plastic cable harness clip.

Figure 4-14 Attaching the front panel I/O device assembly cables



Power button assembly

This section describes how to remove the power button assembly.

Removing the power button assembly

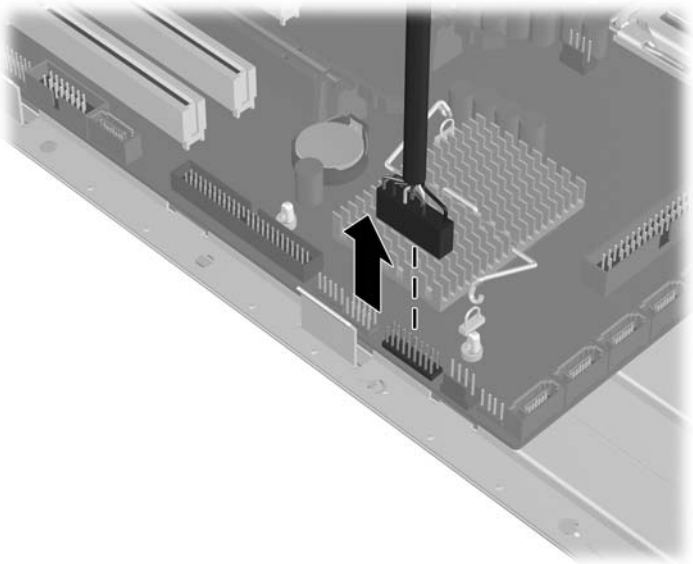
To remove the power button assembly:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).
4. Remove the two I/O device assembly mounting Torx screws and pull the I/O assembly out and away from the chassis approximately two inches (five centimeters). (See Removing the front panel I/O device assembly on page 63.)

If additional slack is required in the I/O device assembly cables, disconnect the cables from the system board.

5. Disconnect the control panel cable harness from the system board (as shown in the following figure).

Figure 4-15 Disconnecting the control panel assembly cable



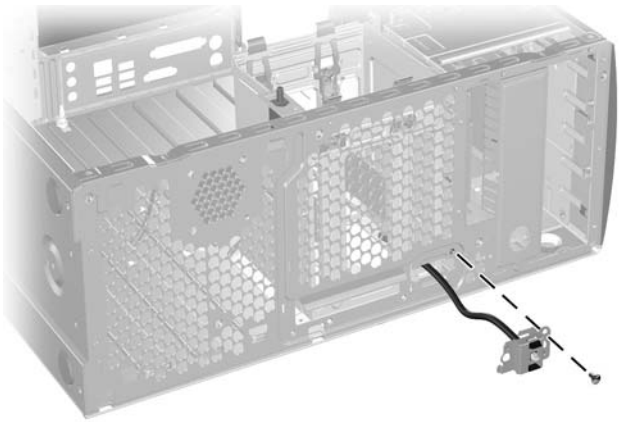
TIP: Remove the optional PCI card guide (if installed) and installed hard drives before attempting to feed the control panel wiring harness out the front of the workstation chassis.

6. If an optional hood sensor is installed, disconnect the white 1x3 hood sensor connector from its mating in-line connector attached to the front panel harness.

7. Disconnect the white speaker cable connector from its mating in-line connector attached to the front panel harness.

8. Remove the power button assembly mounting screw and rotate the assembly out and away from the chassis while feeding the power button assembly cable out through the front of the chassis, as shown in the following figure.

Figure 4-16 Removing the power button assembly



Reinstalling and replacing the speaker

To reinstall or replace the power button assembly, reverse the previous removal steps.

Optical drive

This section describes how to remove and install an optical disk drive in a minitower workstation configuration.

Removing an optical drive

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

△ **CAUTION:** To prevent damage to the workstation, observe the following Electrostatic Discharge (ESD) precautions while performing the system parts removal and replacement procedures:

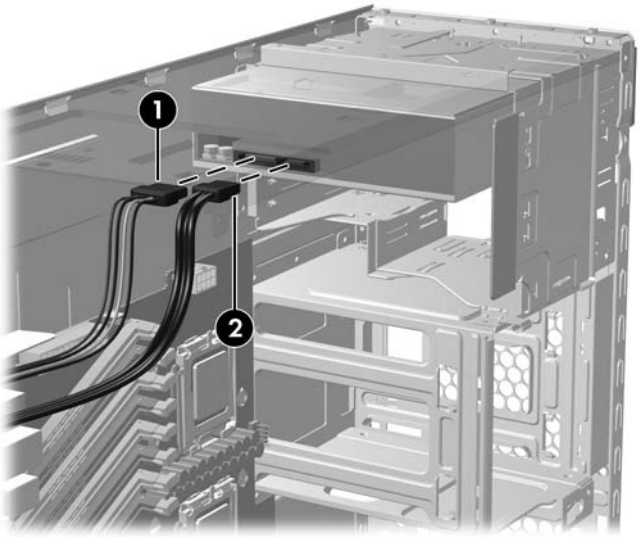
— Work on a static-free mat.

— Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to the 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.

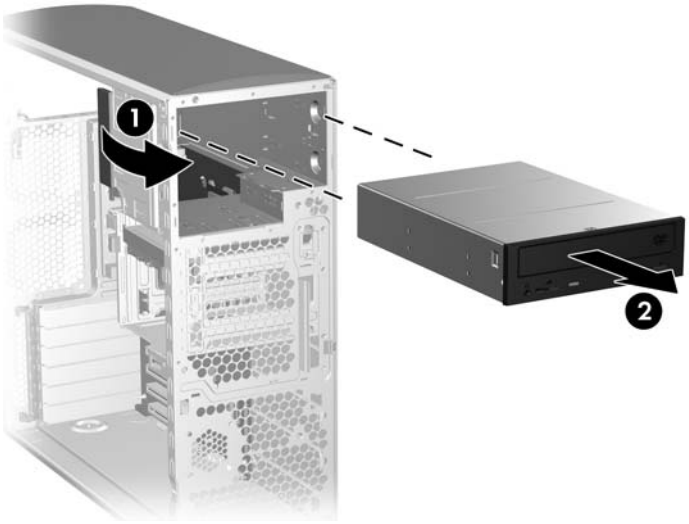
3. Remove the front bezel (see Removing the front bezel on page 61).
4. Disconnect the power (1) and data (2) cables from the optical drive, as shown:

Figure 4-17 Disconnecting the optical drive cables



5. Lift the green drive-lock release lever (1) and gently slide the drive out of the chassis (2), as shown in the following figure.

Figure 4-18 Removing the optical drive from the chassis



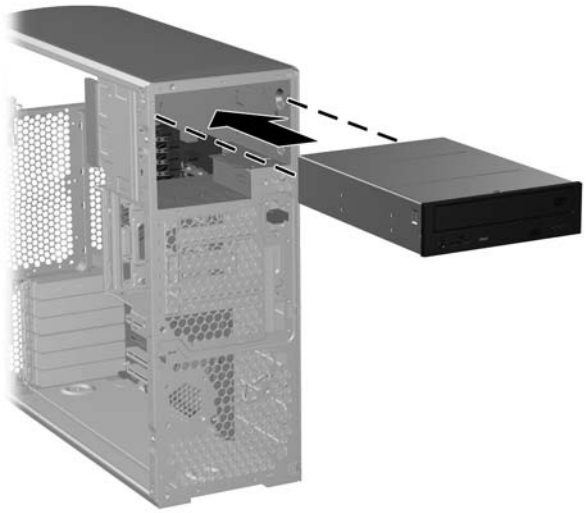
6. If you are not replacing this drive or installing another optical drive before workstation operation, add a bezel blank filler to the front bezel and an EMI filler to the optical drive slot.

Installing an optical drive

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).
4. Remove the blank filler in the front bezel (if still installed) for the drive bay in which you are installing the optical drive.
5. Remove the EMI filler from the optical drive cage where the device will be installed.

6. Insert the drive into the respective optical drive bay until it locks into place, as shown:

Figure 4-19 Installing the optical drive



△ **CAUTION:** Verify that the optical drive is secure in the workstation chassis by pulling on the drive to see if it can become easily disengaged. Failure to properly secure the drive can damage the drive when moving the workstation.

7. Reinstall the front bezel.
8. Connect the power and data cables to the drive and system board.

NOTE: Modes can be selected in the workstation BIOS that affect both optical and hard drives in the workstation. The HP xw6600 Workstation is set to the RAID+AHCI MODE in BIOS at the time of shipment.

The following constraints apply when the Configuration Mode for the workstation is set to:

IDE Mode—Only SATA ports 0 and 2 are functional for any SATA devices. RAID drives are not accessible in this mode.

AHCI Mode—All SATA ports are functional for any SATA devices. RAID drives are not accessible in this mode.

RAID + AHCI Mode—System BIOS cannot be updated from the optical drive. Also note that in this mode the option ROM might not allow certain DOS drive letter access at this time.

9. Reinstall the side access panel.

Diskette drive (optional)

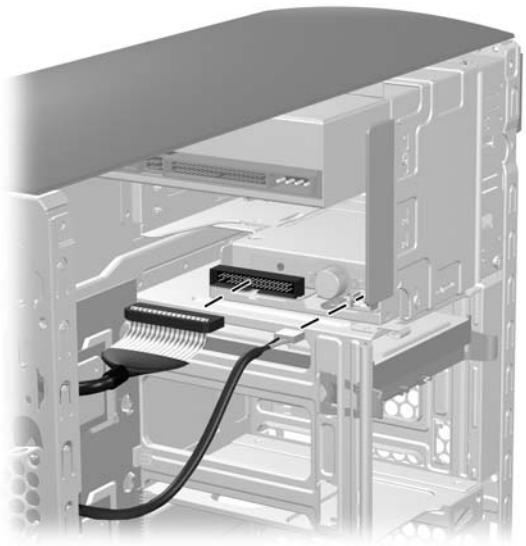
This section describes how to remove and install a diskette drive.

Removing a diskette drive

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).

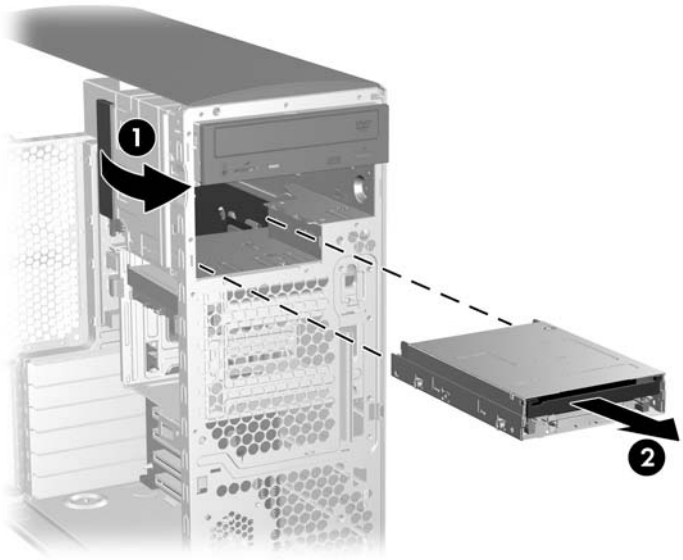
4. Disconnect the power (1) and data (2) cables from the back of the diskette drive, as shown:

Figure 4-20 Disconnecting the diskette drive cables



5. As shown in the following figure, lift the green drive-lock release tab (1) and gently slide the drive out of the chassis at the same time (2).

Figure 4-21 Removing the diskette drive from chassis



6. If not reinstalling or replacing the diskette drive, install an EMI filler in the diskette drive bay and add a diskette drive bay blank to the front bezel.

To install a diskette drive, reverse the previous steps. You might need to remove the front bezel to install the drive.

Installing a diskette drive

To install a diskette drive:

1. Disconnect power from the workstation (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).
4. If present, remove the diskette bay blank from the front bezel.
5. Remove the EMI filler from the diskette bay.
6. Slide the diskette drive into the bay until it locks solidly into place.
7. Connect the diskette drive power and data cables.
8. Reinstall the front bezel and side access panel.
9. Connect power to the workstation.

System speaker

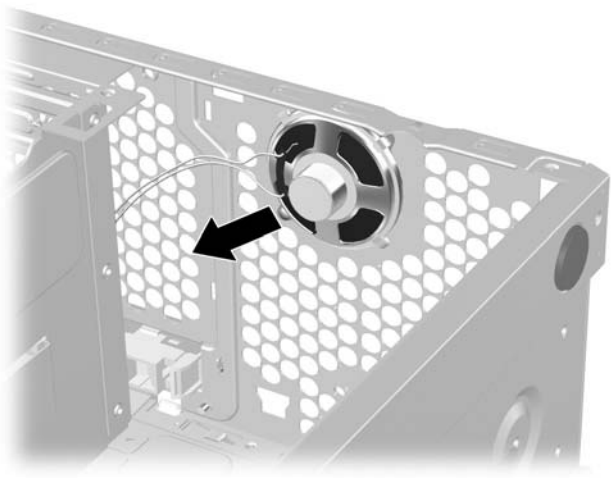
This section describes how to remove and reinstall or replace the system speaker.

Removing the system speaker

To remove the system speaker:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. To provide access to the speaker, remove the optional front chassis PCI card guide and fan, if installed.
4. Detach the speaker cable from the in-line control panel cable, if you have not already done so.
5. Slide the speaker away from the three flanges and remove it from the chassis, as shown:

   Figure 4-22 Removing the workstation speaker



6. To replace the speaker, reverse the previous steps.

Power supply

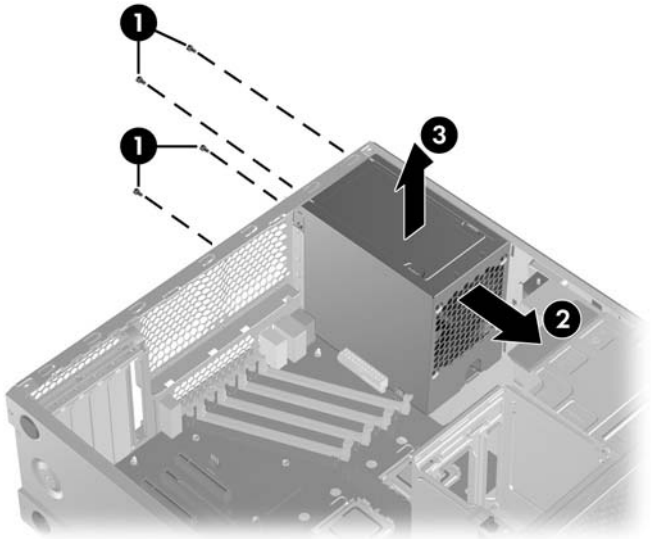
This section describes how to remove the power supply.

Removing the power supply

To remove the power supply:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. To ease installation of the power supply, write down the numbers on the cables so you can easily reconnect them to the correct devices.
4. Remove the memory fan and chassis fan assemblies.
5. Disconnect cables from the system board, drives, and cards.
6. Remove the four screws from the back panel (1), as shown:

Figure 4-23 Removing the power supply



7. Slide the power supply toward the front of the chassis and lift it out of the chassis (2).

Reinstalling or replacing the power supply

To install the power supply, reverse the steps completed for removal.

△ **CAUTION:** To prevent possible equipment damage, see Power connections on page 73 to ensure proper connection of power supply cables.

Power connections

To ensure proper power supply connections to drives and powered components, refer to the following diagram.

Figure 4-24 Workstation power supply cable connections

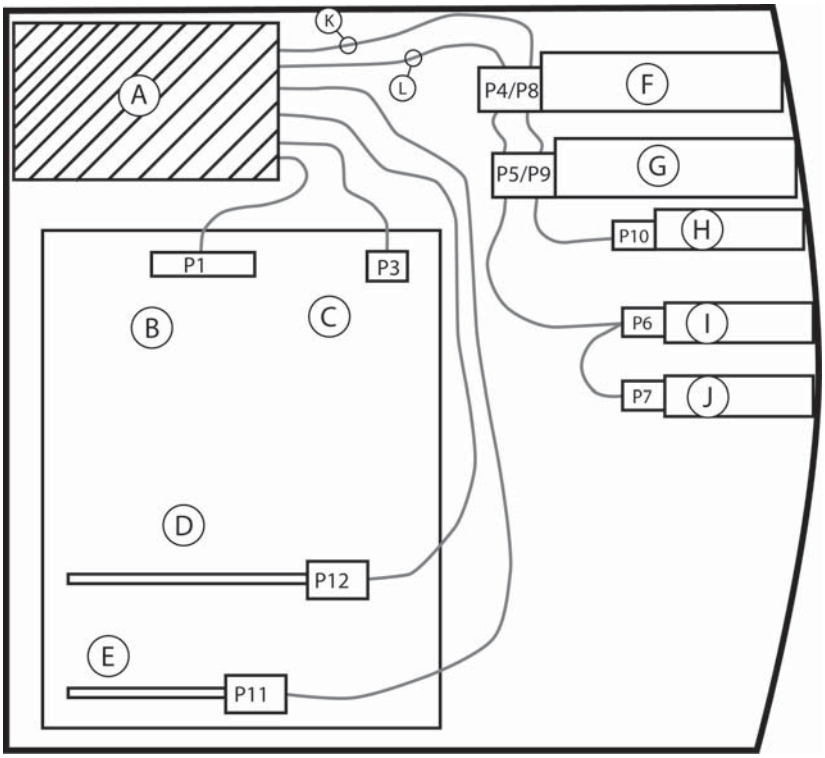


Table 4-5 Power supply cable connection guide

Item	Component	Item	Component	Item	Component
A	Power supply	E	Auxiliary power for PCI IEEE 1394 or audio card	I	Hard drive number 1
B	Main power connector	F	Optical drive 1	J	Hard drive number 2
C	Processor power connector	G	Optical drive 2	K	4–pin style connector (white) power harness
D	Auxiliary power for PCI Express card	H	Floppy drive	L	SATA-style connector (black) power harness

System fan assembly

This section describes how to remove the system fan assembly.

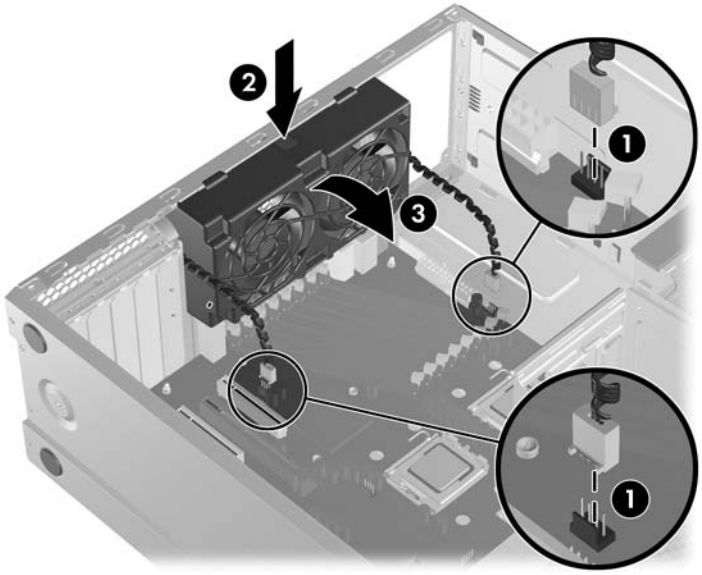
Removing the system fan assembly

To remove the system fan assembly:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

3. Remove the memory fan assembly (see Memory fan on page 74).
4. Disconnect the lower and upper fan plugs from the system board connectors (1), as shown in the following figure.

Figure 4-25 Removing the system fan



5. Press in on the ribbed release snap of the system fan housing (2), and then rotate the fan housing down (3).
6. Lift the system fan assembly out of the chassis.

Replacing the system fan assembly

To replace the system fan assembly, align the four plastic tabs protruding from the bottom back edge of the fan assembly with corresponding mounting holes on the rear of the chassis.

Rotate the fan assembly up against the rear chassis panel, and then snap it into place.

The fan assembly electrical connectors and their mating system board header connectors are red. To locate the system fan header connectors on the system board, refer to the service label located on the inside of the access panel.

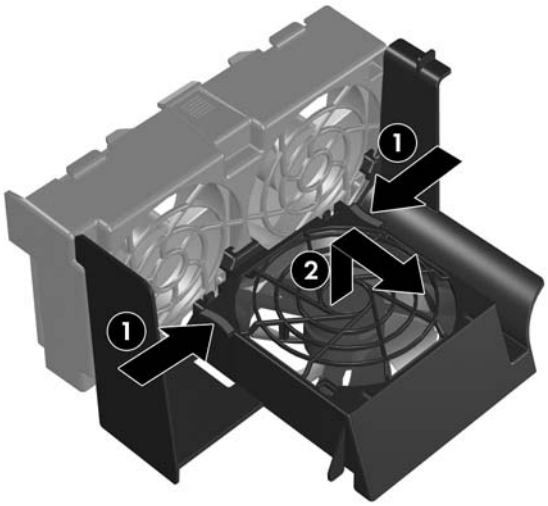
Memory fan

To remove the memory fan:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

3. Disconnect the memory fan cable from its connector on the system board (1), as shown:

Figure 4-26 Removing the memory fan

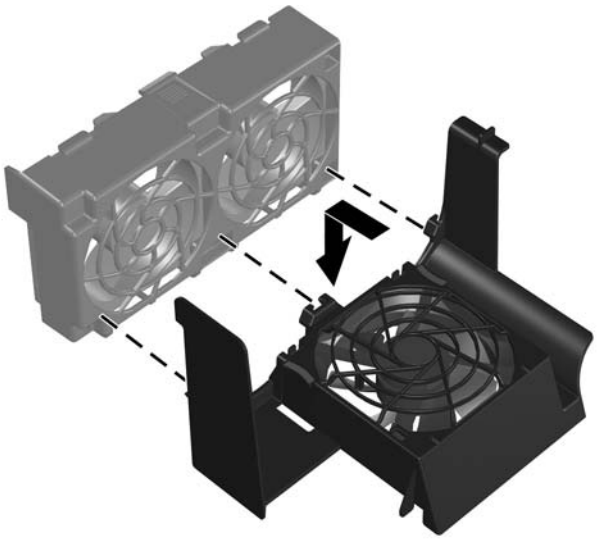


4. Grasp the two green touch point tabs (1) and lift up and away from the system fan housing (2).

To replace the memory fan:

1. Align the two center and two outer hooks to the circular opening of the system fan housing, as shown:

Figure 4-27 Replacing the memory fan



2. Press down on the memory fan housing until it drops into position.
3. Connect the memory fan cable to its connector on the system board.

   Both the Memory fan connector and the Chip Set heatsink fan connector are white. To locate the memory fan system board header connector, refer to the service label located on the inside of the access panel.

Memory

This section describes how to remove and install memory modules.

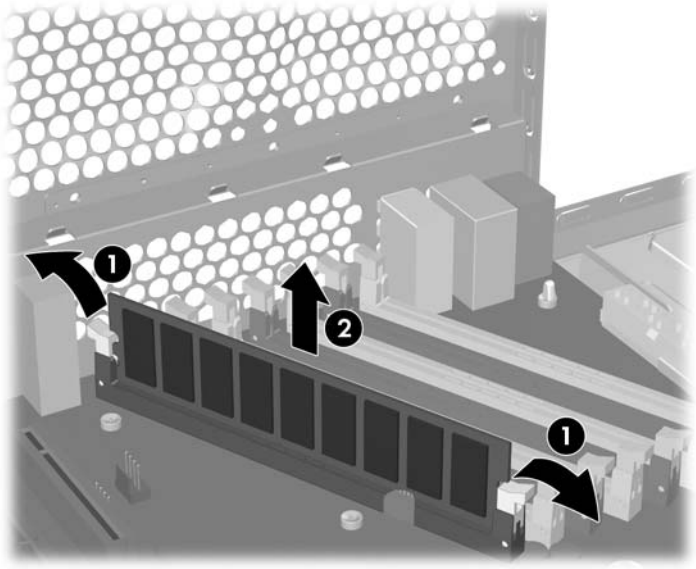
Removing a memory module

1. Disconnect power from the system (see Predisassembly procedures on page 52).

△ **CAUTION:** 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. If you do not unplug the power cord before installing memory, the modules might be damaged and the system will not recognize the memory changes.

2. Remove the side access panel (see Side access panel on page 58).
3. Remove the memory fan and system fan.
4. On the memory module to be removed, push gently outward to unlock the locking levers on the module socket (1), as shown in the following figure.

Figure 4-28 Unlocking and removing a memory module



5. Lift the DIMM straight up out of the socket (2) and store it in an antistatic bag.

Installing a memory module

This section describes how to install a memory module.

Supported DIMM configurations

The HP xw6600 Workstation supports the following memory module configurations:

- HP certified DDR2-667, Fully Buffered DIMMs (FBD), 72-bit ECC
- Eight DIMM slots
- 32 GB maximum configuration with 4-GB DIMMs
- Configurable for Single Channel (one DIMM), Dual Channel (two DIMMs), or Quad Channel (four to eight DIMMs)
- No support for mirroring
- No spare DIMM support

Memory module installation requirements

HP ships only DIMMs that are electrically and thermally compatible with this workstation. Because third-party DIMMs might not be electrically or thermally compatible, they are not supported by HP.

- To prevent possible damage to equipment or loss of data, ensure that the keyway cut into the bottom edge of each DIMM is aligned with the corresponding socket key as each DIMM is installed.
- Use only HP certified and warranted, PC2–5300F, 667 MHz fully buffered DIMMs.
- If multiple DIMMs are installed in a workstation, they must be installed in matched pairs of the same size in each channel.

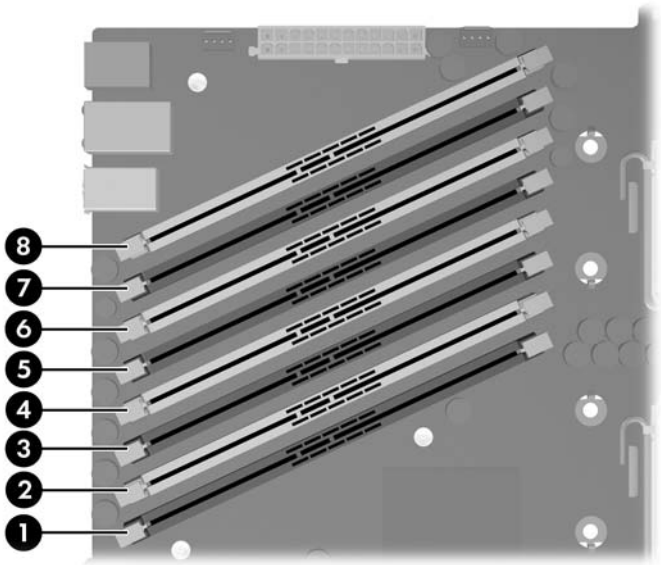
Required DIMM installation order

Use the following sequence as a guide for installing memory (see the following figure for socket location):

- Install a single DIMM configuration in socket 1.
- Install a two-DIMM configuration as a matched pairs in sockets 1/5.
- Install a four-DIMM configuration as two matched pairs in sockets 1/3, and 5/7.
- Install a six-DIMM configuration as three matched pairs in sockets 1/3, 5/7, and 2/4.
- Install an eight-DIMM configuration as four matched pairs in sockets 1/3, 5/7, 2/4, and 6/8.

When adding DIMMs to a two-DIMM configuration (installed in sockets 1/5), you might need to move a DIMM from socket 5 to socket 3 to maintain matched pairing.

Figure 4-29 DIMM slot numbering and location



When powered on, the workstation BIOS validates the installed memory configuration. If the memory configuration is invalid, the BIOS generates one of the following error scenarios:

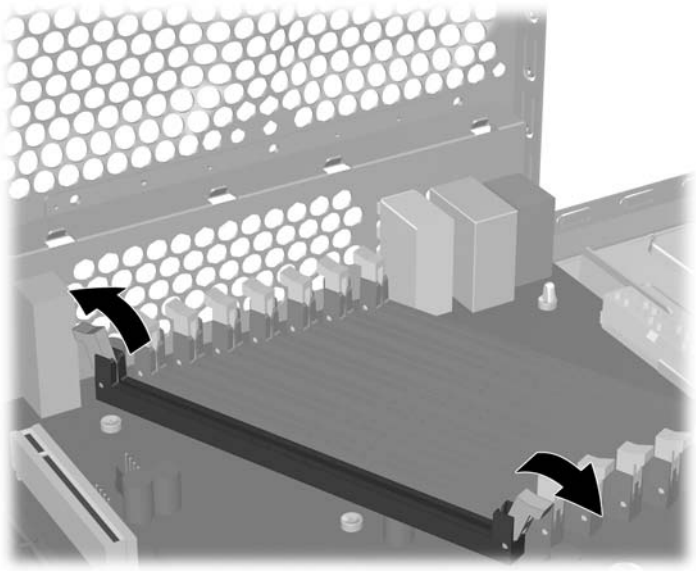
- If the BIOS cannot obtain a valid memory configuration by disabling some of the installed memory, the BIOS halts the boot process with a diagnostics 2006 code for memory error (five beeps and blinks).
- If the BIOS can find a valid memory configuration by disabling plugged-in memory, it does so and reports a warning during POST. The system can still be booted.

Installing a memory module

To install a memory module:

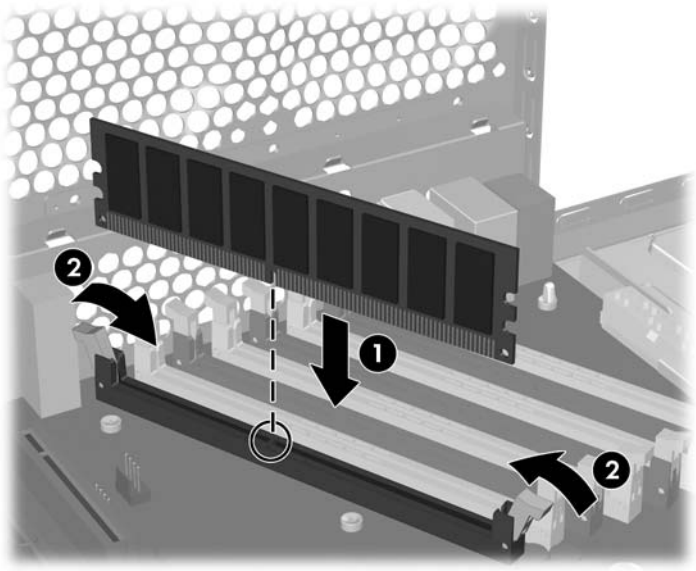
1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the memory fan and system fan.
4. Push gently outward on the socket levers, as shown:

   Figure 4-30 Opening the DIMM socket locking levers



5. Align the DIMM connector key with the DIMM socket keyway, and then seat the DIMM firmly into the socket (1), as shown:

   Figure 4-31 Installing a memory module



6. Secure the socket levers (2).
7. Reinstall the system fan assembly, memory fan, and side access panel.

PCI card slots

The following figure illustrates the xw6600 Workstation PCI card slots.

Figure 4-32 Identifying PCI card slots

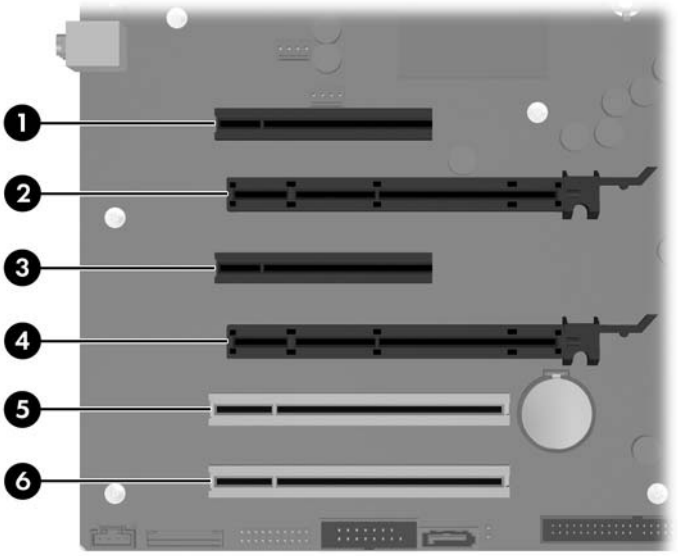


Table 4-6 PCI slots

Slot	Type	Slot power (Maximum)
1	PC-Express x8 (x4)*	25W
2	PCI-Express x16**	75W
3	PCI-Express x8 (x4)*	25W
4	PCI-Express x16*	75W
5	PCI 32/33	25W
6	PCI 32/33	25W

*Slots 1 and 3 have open-ended PCI Express connectors that allow a PCI Express x16 card can be plugged into them.

* *The maximum graphics configuration can be two 75-watt cards (one in slot two and one in slot four), or one 150-watt card in slot 2 or slot 4. If a 150-watt card is used, the adjacent slot must remain empty.

Graphics cards greater than 75W require the use of an auxiliary power cable–connector P12 (see power connection figure in Power connections on page 73.

A PCI Express x8 slot is open-ended, so it can mechanically accept an x16 card.

△ **CAUTION:** To prevent possible equipment damage when installing a PCI card, overall power consumption of the system (including I/O cards, processor, and memory) must not exceed the maximum rating of the system power supply.

PCI card support bracket

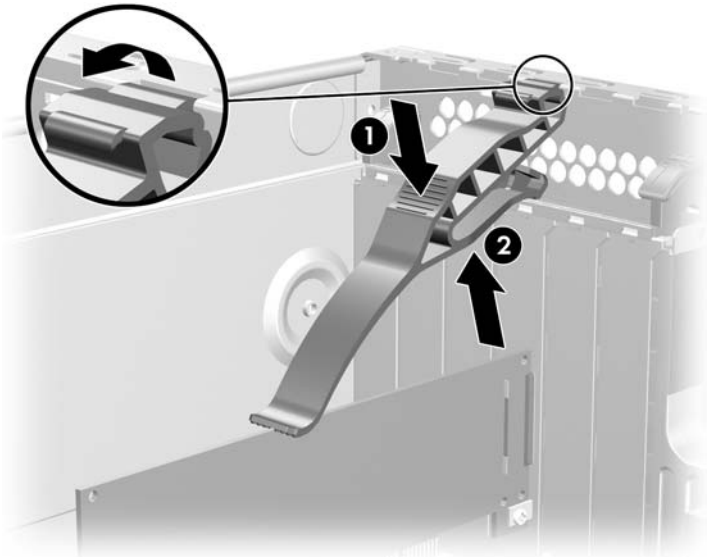
Some PCI cards have retainers installed to prevent movement during shipping.

Removing a PCI card support bracket

To remove a PCI card support bracket:

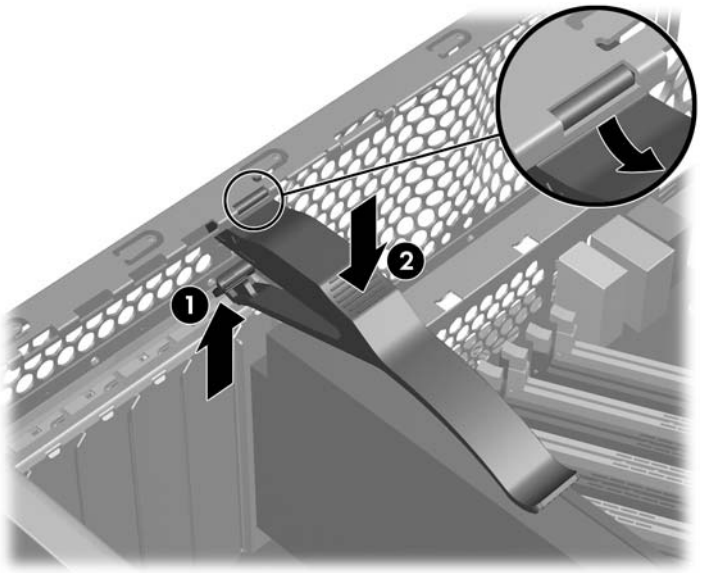
1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. For short or tall PCI cards:
   a. Press in on the ribbed portion of the holder (1).
   b. Apply upward pressure on the lower arm (2).
   c. Rotate the support bracket out of the chassis, as shown:

Figure 4-33 Removing a short PCI card support bracket



4. For a tall PCI card, press down on the support (2) while also pressing up on the small release tab protruding from the left under-side of the bracket (1), as shown in the following figure.

Figure 4-34 Removing a tall PCI card support bracket



Installing a PCI card support bracket

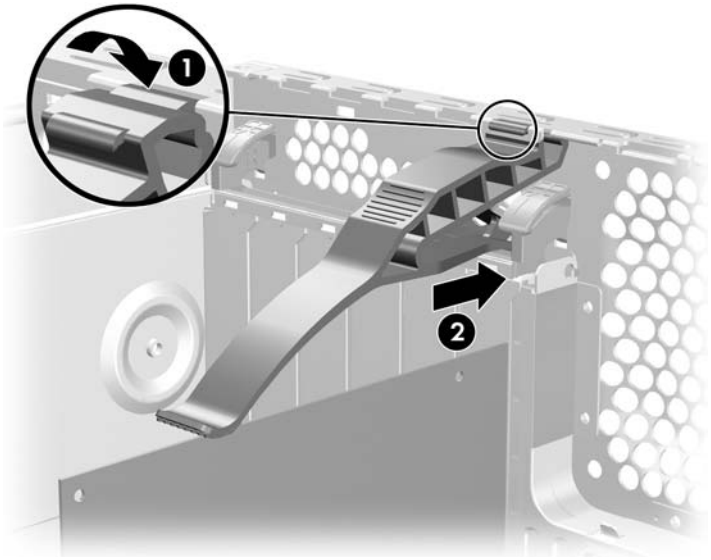
To install the PCI card support bracket:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

3. Attach the PCI support bracket:

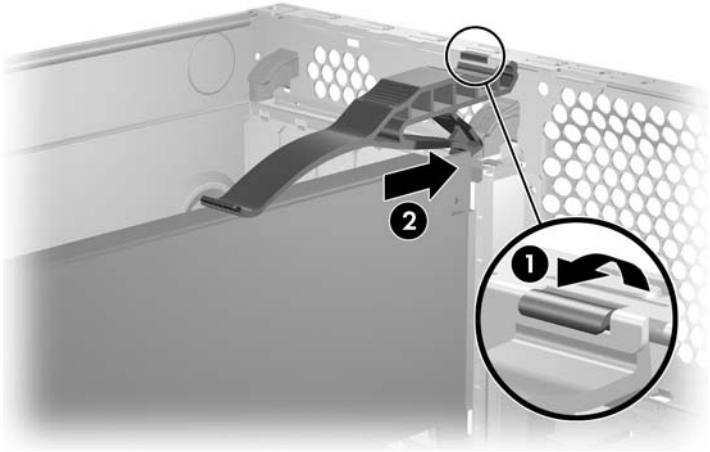
   - For short PCI cards, attach the lip of the PCI card support *over* the chassis slot (1) and pull the lower part of the arm over the PCI retention clamp (2), as shown:

     Figure 4-35 Installing PCI support on short card



   - For tall PCI cards, attach the lip of the PCI card support *under* the chassis slot (1) and pull the lower part of the arm over the PCI retention clamp (2), as shown:

     Figure 4-36 Installing the PCI support on tall card



PCI Express cards

PCI Express I/O slots can support other PCI Express cards with less bus bandwidth than what is physically defined for the slot. Use the following table to determine PCI Express card compatibility.

Table 4-7 HP xw6600 Workstation PCI Express compatibility matrix

Slot type	Mechanical compatibility	Electrical compatibility
PCI Express x8 (x4)	x1, x4, x8, and x16 **	x1 and x4 modes

Table 4-7 HP xw6600 Workstation PCI Express compatibility matrix (continued)

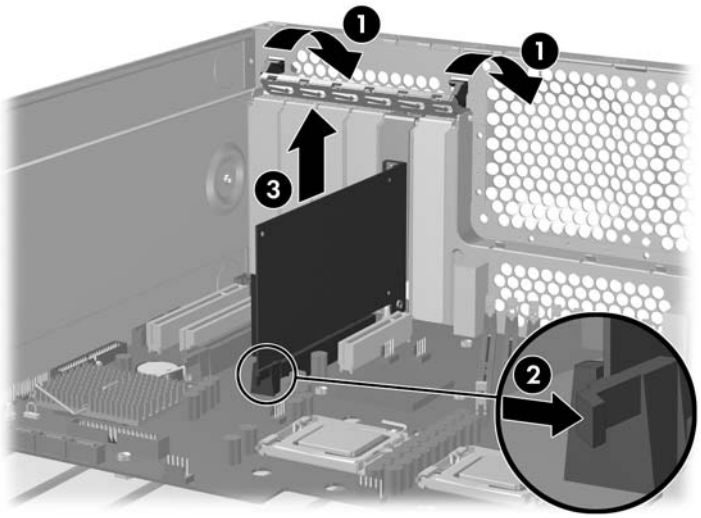
Slot type	Mechanical compatibility	Electrical compatibility
PCI Express x16	x1, x4, x8 and x16 cards	x1, x4, x8, and x16 modes
** Open-ended PCIe connector allows x16 cards to plug into x8 connector.		

Removing a PCI Express card

To remove a PCI Express card:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the PCI card support , if installed (see PCI card support bracket on page 80).
4. Remove any auxiliary power or data connector cables attached to the PCIe card.
5. Open the PCI card retention clamp, press the retention clamp levers down to unsnap, and then rotate them up (1), as shown:

   Figure 4-37 Removing a PCI Express card



6. Choose from the following:
   - If removing a PCI Express x16 graphics card, press the release lever in the direction of the arrow (2) while lifting the card out of the chassis (3).
   - If removing a full-length card and the optional front card guide is installed, press the release tab for that card on the front card guide.
   - If removing a PCI Express card from a slot that does not have a release lever, pull the card up and out of the slot.

   Store the card in an anti-static bag.

△ **CAUTION:** To prevent possible heat damage to equipment if the workstation is powered up before replacing or reinstalling a removed PCI card, install a blank PCI slot cover in its place to maintain workstation chassis air flow integrity, then close the PCI retention clamp.

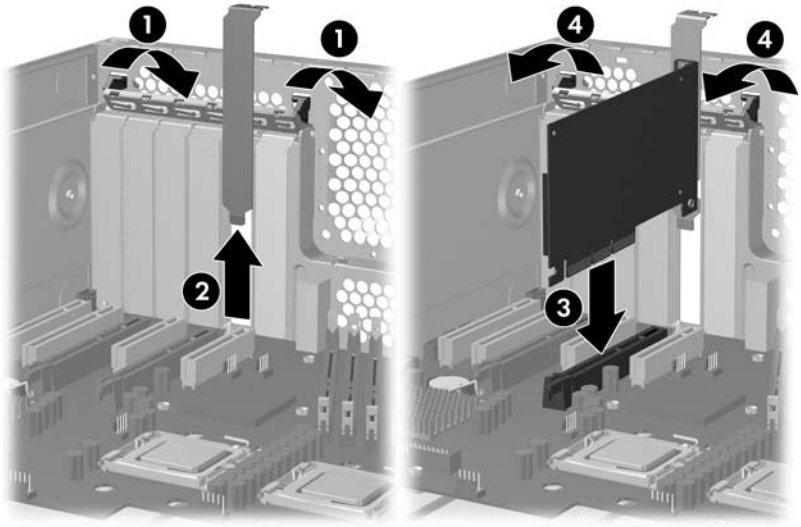
If the PCI retention clamp levers do not readily close, verify that all cards are properly seated, and then try again. Remember to reinstall the workstation side access panel (see Side access panel on page 58).

Installing a PCI Express card

To install a PCI Express card:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Open the PCI card retention clamp, press the retention clamp levers down to unsnap, and then rotate them up (1), as shown:

Figure 4-38 Installing a PCI Express card



4. Remove the PCI slot cover (2).
5. Align the keyed components of the PCI card with the slot and then firmly seat the card in the slot (3).
6. Close the PCI card retention clamp by rotating the clamp downward and pressing the two green clamp levers from the rear panel of the chassis (4).
7. Reinstall PCI Express card support brackets if necessary, and reinstall the workstation side access panel.

PCI card

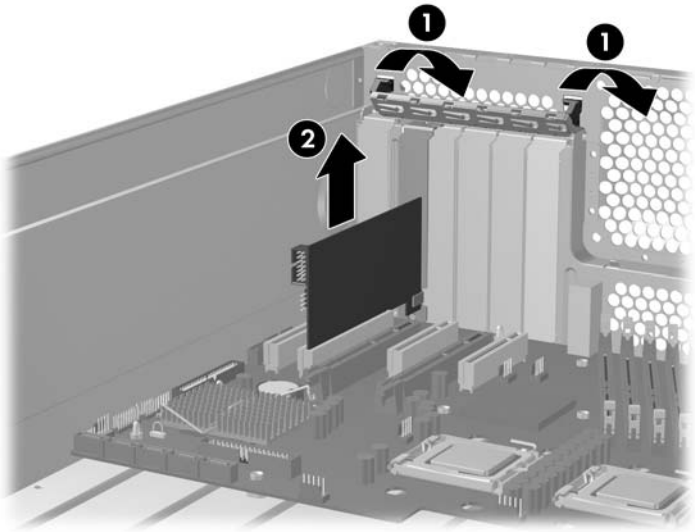
This section describes removing and installing PCI cards.

Removing a PCI card

To remove a PCI card:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the PCI card support bracket, if installed (see PCI card support bracket on page 80).
4. Remove auxiliary power or connector cables attached to the PCI card to be removed.
5. Open the PCI card retention clamp, press the retention clamp levers down to unsnap, and then rotate them up (1), as shown:

   Figure 4-39 Removing a PCI card



6. Pull the PCI card up and out of the chassis (2). Store the card in an anti static bag.

△ **CAUTION:** To prevent possible heat damage to equipment if the workstation is powered up before replacing or reinstalling a removed PCI card, install a blank PCI slot cover in its place to maintain workstation chassis air flow integrity, then close the PCI retention clamp.

If the PCI retention clamp levers do not readily close, verify that all cards are properly seated, and then try again. Remember to reinstall the workstation side access panel (see Side access panel on page 58).

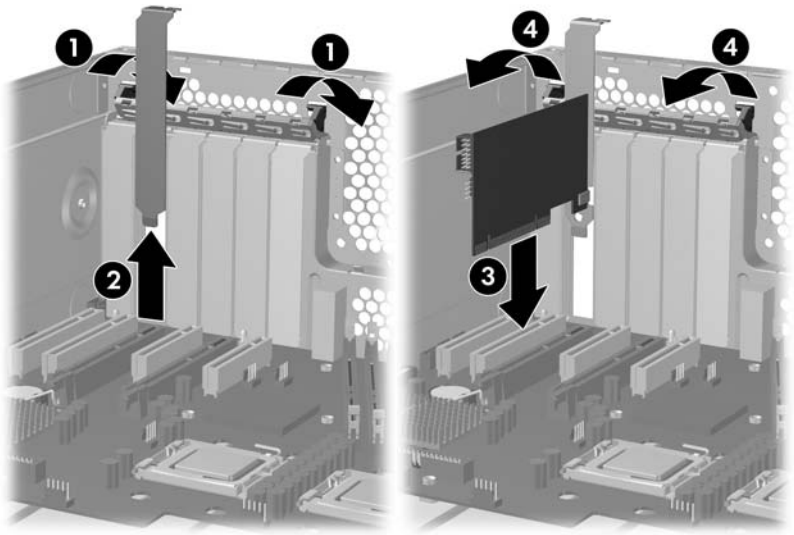
Installing a PCI card

To install a PCI card:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the PCI card support bracket, if installed (see PCI card support bracket on page 80).

4. Open the PCI card retention clamp, press the retention clamp levers down to unsnap, and then rotate them up (1), as shown:

Figure 4-40 Installing a PCI card



5. Remove the PCI slot cover (2).
6. Align the keyed components of the PCI card with the slot, and then firmly seat the card in the slot (3).
7. Close the PCI retention clamp by rotating the clamp downward and pressing the two green clamp levers from the rear panel of the chassis (4).
8. Connect the auxiliary power cable, if necessary.
9. Reinstall any PCI support brackets and the workstation side access panel.

SAS hard drive

This section describes how to remove and install a SAS hard drive.

Removing a SAS hard drive

NOTE: Each workstation hard drive bay can be configured at the factory to hold three small form factor hard drives instead of two standard size drives. To obtain the option kit documentation for removal and replacement of small form factor hard drives, refer to the *HP xw Workstation series - Small form factor bay converter and hard drive installation* user guide, located at: http://www.hp.com/support/xw6600manuals.

To remove a SAS hard drive:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

△ **CAUTION:** To prevent damage to the workstation, observe the following Electrostatic Discharge (ESD) precautions while performing the system parts removal and replacement procedures:

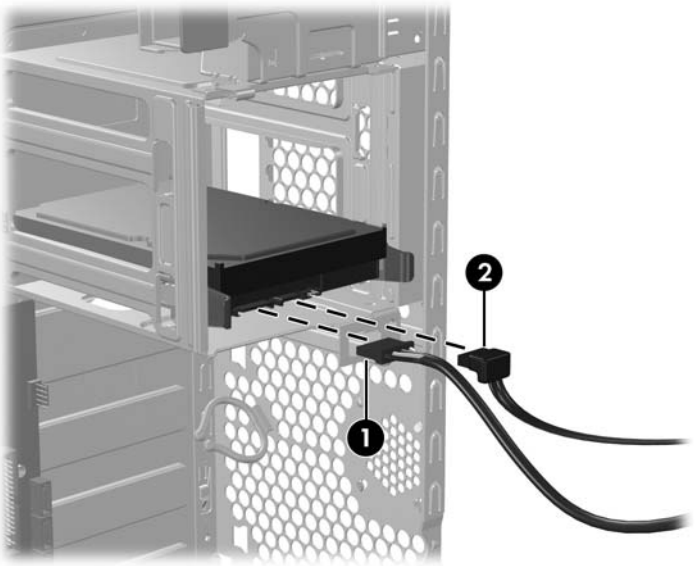
— Work on a static-free mat.

— Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to the 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.

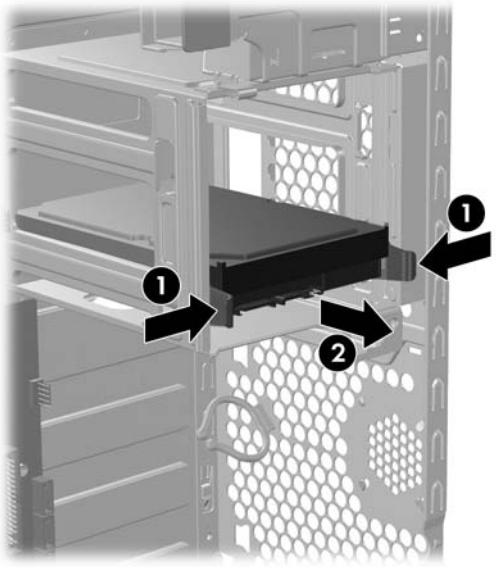
3. Disconnect the power (1) and data (2) cables from the hard drive, as shown:

Figure 4-41 Disconnecting the SAS hard drive cables



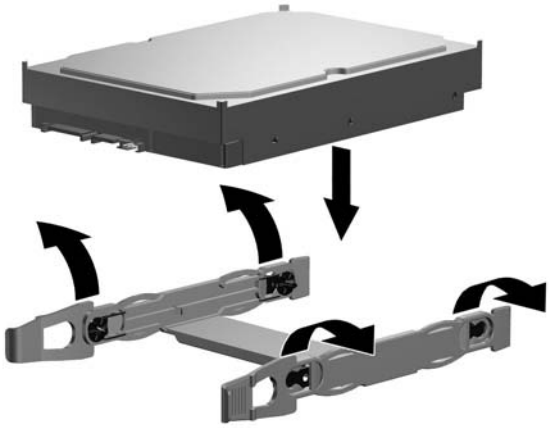
4. As shown below, squeeze and hold the two green mounting rail release tabs toward each other (1), and then slide the hard drive out of the chassis (2).

Figure 4-42 Removing the SAS hard drive



5. Remove the hard drive body from the mounting rails, as shown in the following figure.

Figure 4-43 Removing the hard drive body from the mounting rails



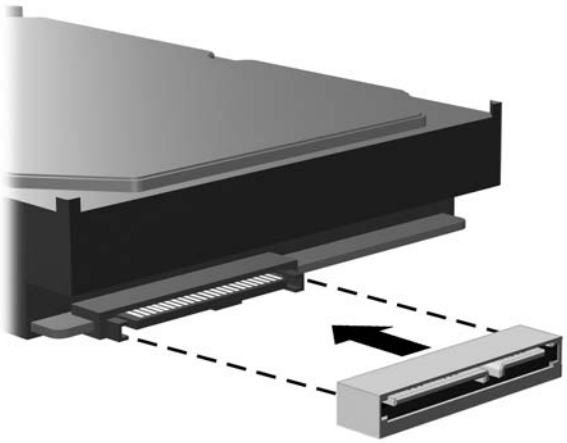
Installing a SAS hard drive

NOTE: Each workstation hard drive bay can be configured at the factory to hold three small form factor hard drives instead of two standard size drives. To obtain the option kit documentation for removal and replacement of small form factor hard drives, refer to the *HP xw Workstation series - Small form factor bay converter and hard drive installation* user guide at: http://www.hp.com/support/xw6600 manuals.

To install a SAS hard drive:

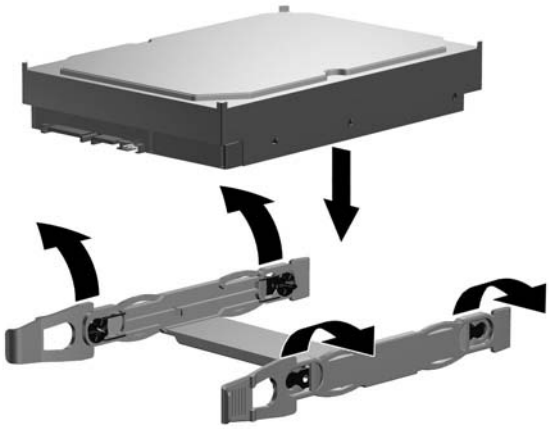
1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Attach a SAS-to-SATA cable adapter to the connector on the SAS hard drive, as shown:

   Figure 4-44 Attaching the SAS-SATA adapter to the SAS hard drive



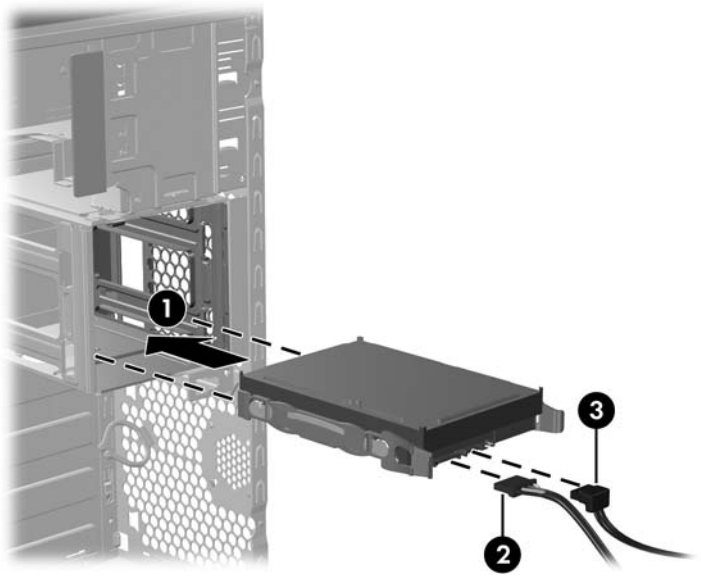
4. Install the hard drive body into the hard drive mounting rails, as shown:

   Figure 4-45 Installing the hard drive body into hard drive mounting rails



5. Push the drive into the selected bay until it snaps into place (1), as shown:

Figure 4-46 Installing the SAS hard drive



6. Attach the power (2) and data (3) cables to the SAS drive, and then insert the SAS controller card into an available PCI slot in the workstation chassis.

7. As shown in the following figure, connect the data cable from the hard drive to the controller card.

Figure 4-47 Connecting the SAS cable to SAS hard drive

8. If necessary, install the SAS card in an empty PCI Express slot, and then install the LED cable from the card to the system board. You can find the location of this connector on the service label on the inside of the side access panel.

To install three or four SAS drives, install the third and fourth drives in the workstation optical drive bays. For instructions, see Installing SATA hard drives in an optical drive bay (optional) on page 94.

SATA hard drive

For more information about SATA hard drives and SATA RAID configurations, see SATA hard drive on page 91.

This section describes how to remove and install a SATA hard drive.

Removing a SATA hard drive

NOTE: Each workstation hard drive bay can be configured at the factory to hold three small form factor hard drives instead of two standard size drives. To obtain the option kit documentation for removal and replacement of small form factor hard drives, refer to the *HP xw Workstation series - Small form factor bay converter and hard drive installation* user guide at: http://www.hp.com/support/xw6600 manuals

To remove a SATA hard drive:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

CAUTION: To prevent damage to the workstation, observe the following Electrostatic Discharge (ESD) precautions while performing the system parts removal and replacement procedures:

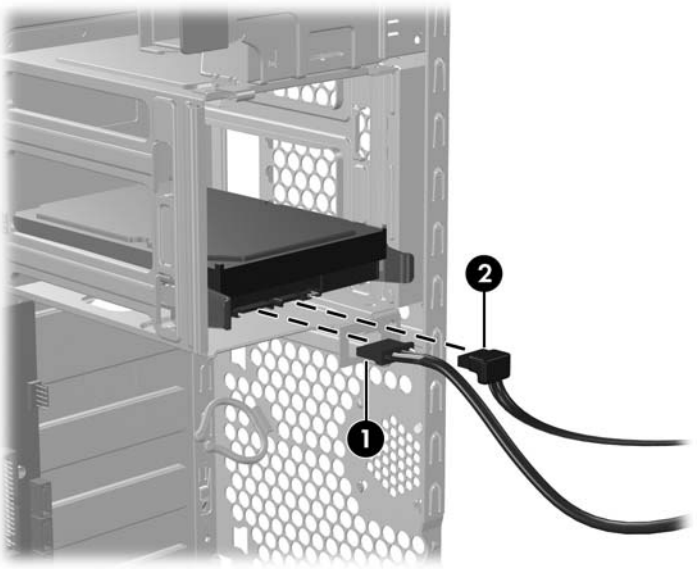
— Work on a static-free mat.

— Wear a static strap to ensure that any accumulated electrostatic charge is discharged from your body to the 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.

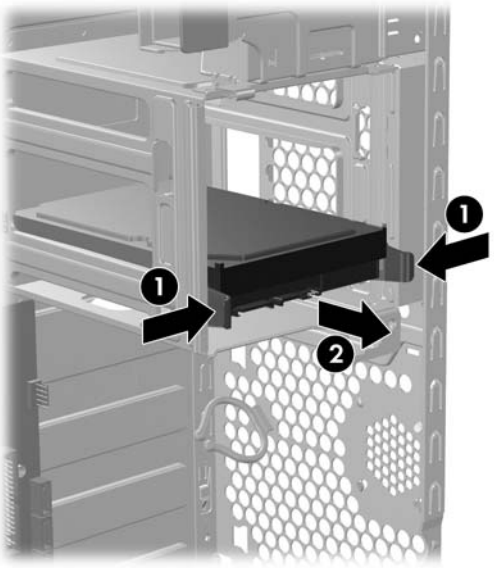
3. Disconnect the data (2) and power (1) cables from the SATA hard drive, as shown in the following figure.

Figure 4-48 Disconnecting the SATA hard drive cables



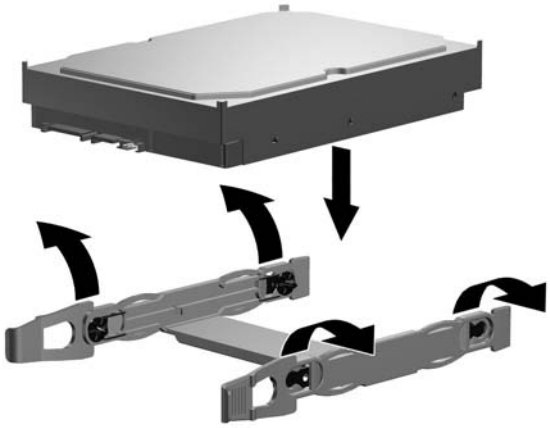
4. Lift the green drive-lock release tab (1) and slide the hard drive out of the chassis (2), as shown:

Figure 4-49 Removing the SATA hard drive



5. As shown in the following figure, remove the hard drive body from the drive mounting rails and retain the rails for later use.

Figure 4-50 Removing the hard drive body from the hard drive mounting rails



Installing a SATA hard drive

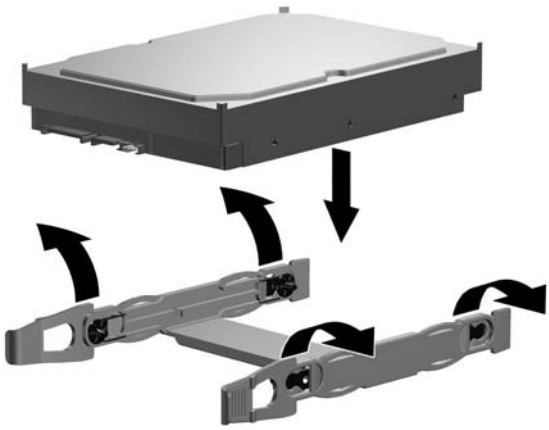
NOTE: Each workstation hard drive bay can be configured at the factory to hold three small form factor hard drives instead of two standard size drives. To obtain the option kit documentation for removal and replacement of small form factor hard drives, refer to the *HP xw Workstation series - Small form factor bay converter and hard drive installation* user guide at: http://www.hp.com/support/xw6600 manuals

To install one or two SATA hard drives:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Select a drive bay to install the SATA hard drive in, and remove the drive mounting rails from that slot.

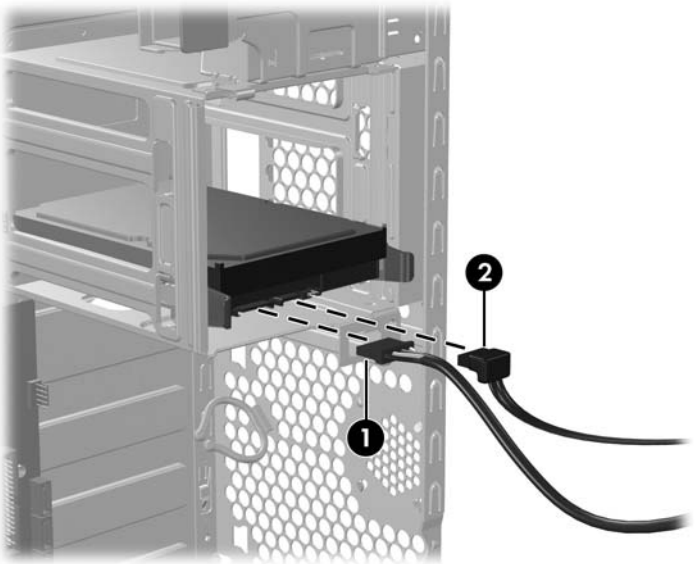
   If a drive was originally removed from that slot, retrieve the mounting rails from the removed drive.
4. Install the hard drive body into a set of hard drive mounting rails, as shown in the following figure.

   Figure 4-51 Installing the hard drive body into the hard drive mounting rails



5. Slide the SATA drive and mounting rails into the selected bay until it snaps into place.
6. As shown in the following figure, attach the data (2) and power (1) cables to the SATA drive.

   Figure 4-52 Connecting the SATA cables to the SATA drive



7. Choose from the following:

   - For a single SATA drive, connect the SATA 0 data cable from the hard drive to the SATA0 port in the workstation chassis, as shown in the following figure.
   - For a second SATA drive, connect the SATA 1 data cable from the hard drive to the SATA1 port in the workstation chassis.

   Figure 4-53 Connecting the SATA data cable to the workstation SATA port

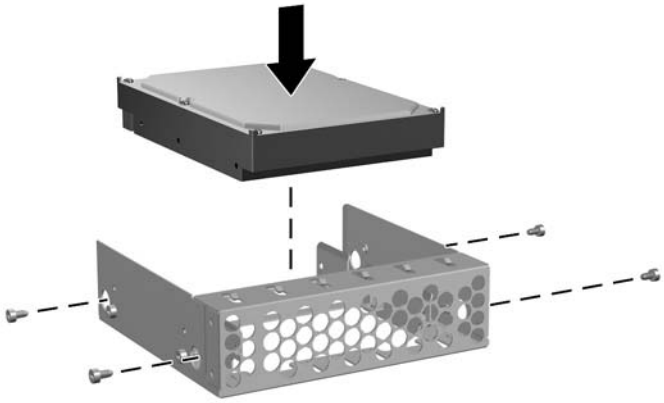
To install three or four SATA drives, install the third and fourth drives in the workstation optical bays. For instructions, see Installing SATA hard drives in an optical drive bay (optional) on page 94.

Installing SATA hard drives in an optical drive bay (optional)

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the front bezel (see Removing the front bezel on page 61).
4. If necessary, remove the EMI shield from the optical bay in which it will be installed.

5. As shown in the following figure, place the SATA hard drive in the drive bracket, and align the four threaded screw holes in the hard drive body with the four matching screw holes in the inner bracket flanges.

Figure 4-54 Installing the hard drive in bracket

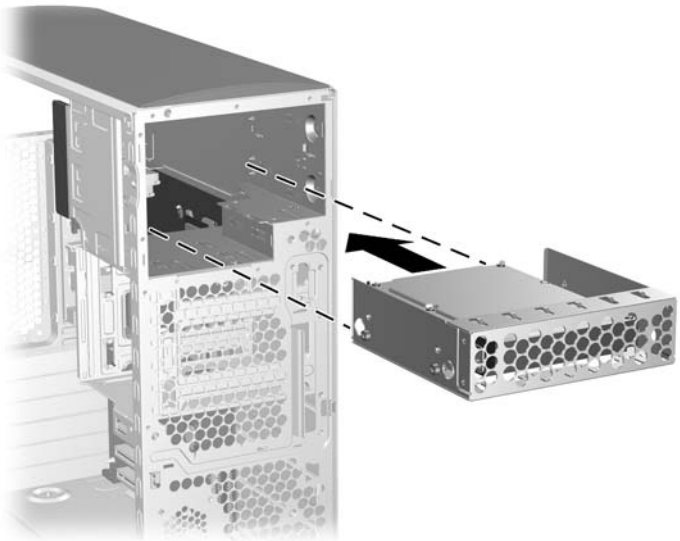


6. Install four silver ANSI 6–32 screws through the oversized holes in the bracket outer flanges, and into the bracket inner flanges and hard drive body, as shown in the figure above.

   The hard drive body should be securely mounted within the mounting bracket.

7. As shown in the following figure, lift the locking lever on the left as you start to insert the drive and bracket into the respective optical drive bay until it locks into place, and then check for secure fit.

Figure 4-55 Installing the hard drive in an optical drive bay



8. Connect the data cable to the hard drive and to the system board, as shown in the following figure.

Figure 4-56 Connecting the data cable

9. Connect the power cable (not shown).
10. Reinstall the workstation side access panel.

Processor heatsink

This section describes how to remove and install a processor heatsink.

Not all heatsinks are the same. The heatsink shown in the following figures is an example of what might be installed in your workstation.

Removing the processor heatsink

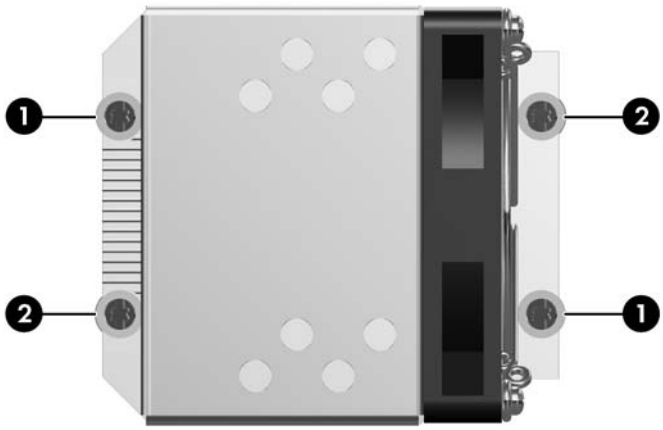
To remove a heatsink:

1. Power down the workstation (see Predisassembly procedures on page 52).
2. Disconnect power from the workstation (see Predisassembly procedures on page 52).
3. Remove the side access panel (see Side access panel on page 58).

4. As shown in the following figure, slowly and evenly loosen one pair of diagonally opposite screws (1) from the processor heat sink until the screw shanks disengage from the system board, and then loosen the remaining pair (2).

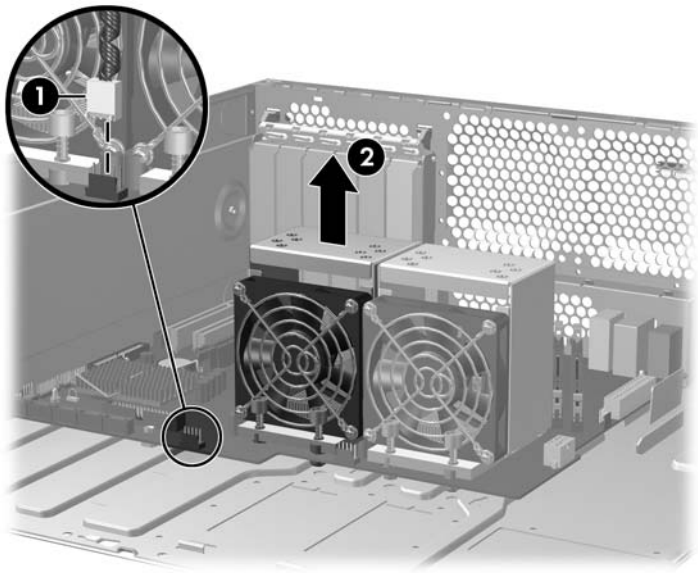
   Do not fully loosen one screw, and then move on to the next. Loosen all screws a little at a time, ensuring that the processor remains level.

   Figure 4-57 Identify proper screw loosening sequence



5. Disconnect the processor heatsink fan cable from the system board (1), as shown:

   Figure 4-58 Removing the processor heatsink



6. Gently twist the heatsink to break the thermal grease binding.
7. Lift the processor heatsink out of the chassis (2).
8. Use alcohol and a soft cloth to clean all of the thermal interface residue from the processor and the heatsink, allowing the alcohol on the processor and heatsink to dry completely.

Installing the processor heatsink

To install a heatsink:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the processor heatsink (see Removing the processor heatsink on page 96).
4. Do one of the following:
   - If you are reusing the original heatsink, apply thermal grease to the center of the processor top surface.
   - If you are using a new processor heatsink, do not apply thermal grease to the processor because the new heat sink has grease already applied to the heatsink surface. Instead, remove the thermal grease protective liner from the bottom of the new heatsink before installing it.
5. Carefully seat the processor heatsink onto the system board, ensuring that the heatsink fan is facing toward the front of the workstation.
6. Carefully tighten the four screws a little at a time. Do *not* fully tighten one screw and move onto the next. If you have a torque-limited drive, tighten the screws to 6 in-lbs.

△ **CAUTION:** Do not overtighten the heatsink screws. If you overtighten them, you might strip the threads in the system board tray.

Do *not* fully tighten one screw and then move on to the next. Instead, tighten all screws a little at a time, ensuring that the processor remains level.

7. When installation is complete, reinstall the workstation side access panel.

System processor

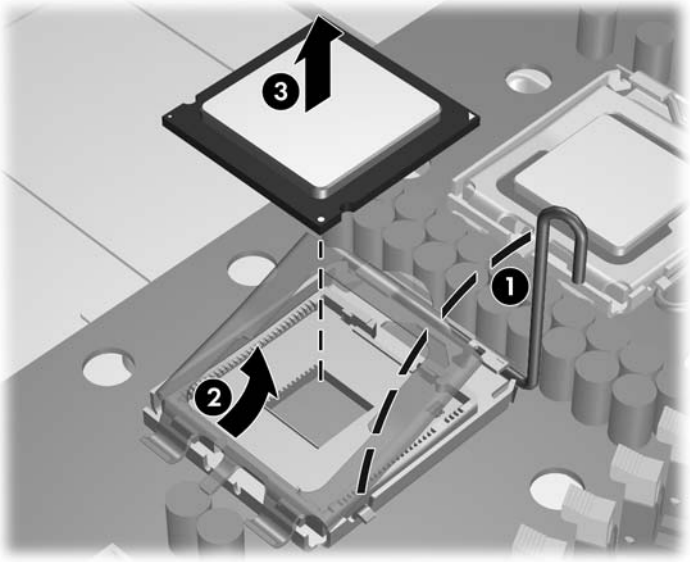
This section describes how to remove and install a system processor.

Removing a system processor

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

3. Raise the processor socket lever (1) and open the cover (2), as shown:

Figure 4-59 Removing the system processor



△ **CAUTION:** The processor socket contacts are delicate. To avoid bending the contacts, use extreme care when handling the processor.

4. Pull the processor straight out of the socket (3), making sure not to touch the processor socket pins or the gold pads underneath the processor, and handling the processor by the edges.
5. Store the processor in a static free container in a safe place.

Installing a system processor

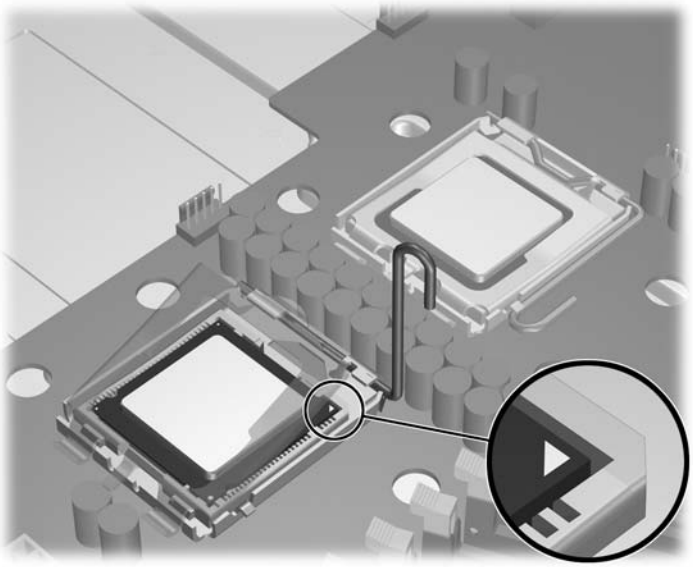
1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove the processor heatsink (see Removing the processor heatsink on page 96).
4. Remove the processor (see Removing a system processor on page 98).
5. Raise the processor socket lever and cover fully.
6. If adding second processor to a workstation that originally contained only one, remove the plastic cover from second processor socket

△ **CAUTION:** The processor socket contacts are delicate. To avoid bending the contacts, use extreme care when installing the processor in the socket.

7. As shown in the following figure, align the triangle on the top of the processor with the triangle on the corner of the processor socket, and then install the processor into the socket. Ensure that the underside of the processor is level with the top of the processor socket.

   Close the socket cover and lightly press down on processor while closing the socket lever.

   Figure 4-60 Seating the processor



8. Install the processor heatsink on top of the processor.

System board

Removing the system board

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).
3. Remove all PCIe and PCI cards.
4. Remove both processor heatsinks (see Processor heatsink on page 96).
5. Disconnect all cabling from the system board.

△ **CAUTION:** Be certain you can differentiate which power cable was disconnected from the PCI Express x16 graphics card, and which power cable was disconnected from the system board. These cables have different pin counts and different colors.

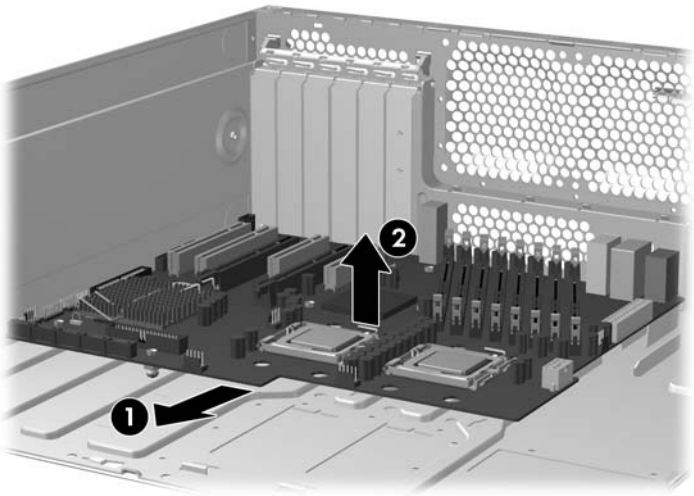
The PCI Express power cable has a 6-pin black connector, and the system board power cable has an 8-pin white connector. When power is present, do not connect the PCI Express power cable to the system board. If you do, the system board can be damaged.

6. Record the cable connections before disconnecting them from the system board. For more information, see Power connections on page 73.
7. Verify that the processor heatsinks have been removed.

8. As shown in the figure below, slide the system board forward to disengage the metal mounting standoffs from the chassis (1).

△ **CAUTION:** Do *not* attempt to remove the system board mounting screws. These are permanently secured and are not removable.

Figure 4-61 Removing the system board



9. Lift the system board out of the chassis (2), being careful not to damage the cables and rear panel connectors.

Battery

This section describes how to remove and install the battery.

The battery that comes with the workstation provides power to the real-time clock and has a minimum lifetime of about three years.

⚠ **WARNING!** This workstation includes a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose in water or fire, or expose it to temperatures higher than 60°C (140°F).

△ **CAUTION:** Before removing the battery, back up the CMOS settings in case they are lost when the battery is removed. To back up the CMOS settings, select the **Save to Diskette** option in the Computer Setup (F10) Utility.

NOTE: Do not dispose of batteries, battery packs, and accumulators in household waste.

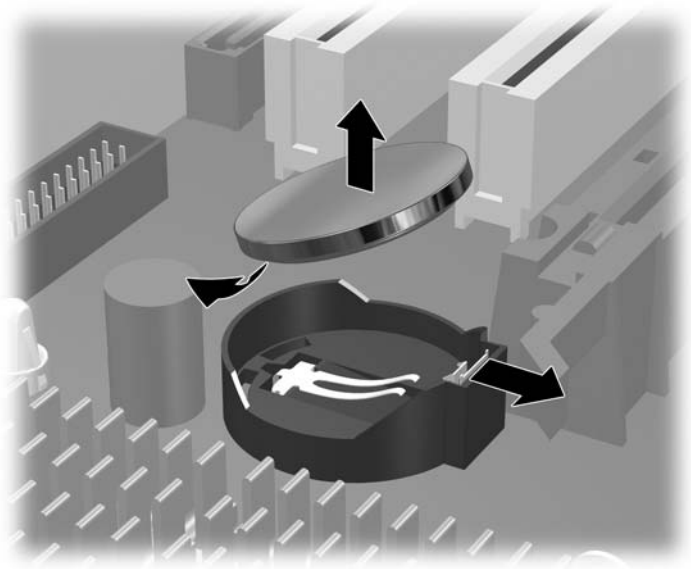
Removing the battery

To remove the battery:

1. Disconnect power from the system (see Predisassembly procedures on page 52).
2. Remove the side access panel (see Side access panel on page 58).

3. On the system board, press outward on the release tab of the battery holder, as shown in the following figure.

Figure 4-62 Removing the battery



4. Rotate the battery enough to get beyond the latch, and then lift it straight up.

Installing the battery

To install the battery:

1. Confirm the polarity (positive or negative) of the battery to position it correctly in the battery holder.
2. Place the battery edge under the plastic housing tab.
3. Press down on the battery until the metal snaps engage.

Replacing the system board

1. With the workstation chassis laying flat (access opening facing upward) and the system board held horizontally (component side up), orient the system board so that the I/O connectors are facing the rear of the chassis.

   Carefully lower the system board into the chassis and ensure all system board standoffs engage with mating keyholes in the chassis.
2. Ensure that the system board connectors engage correctly with the rear I/O panel.
3. While maintaining an even downward pressure, push the system board back into the rear I/O chassis openings until the heat sink screw holes line up, then install the heat sinks while holding pressure against the system board to keep the holes aligned and making certain that all system board standoffs remain engaged.
4. Install the heatsinks (see Processor heatsink on page 96), and all PCIe and PCI cards.

5. As shown in the following figure and table, reconnect workstation power supply cables to the system board and installed drives.

Figure 4-63 HP xw6600 Workstation cable connection

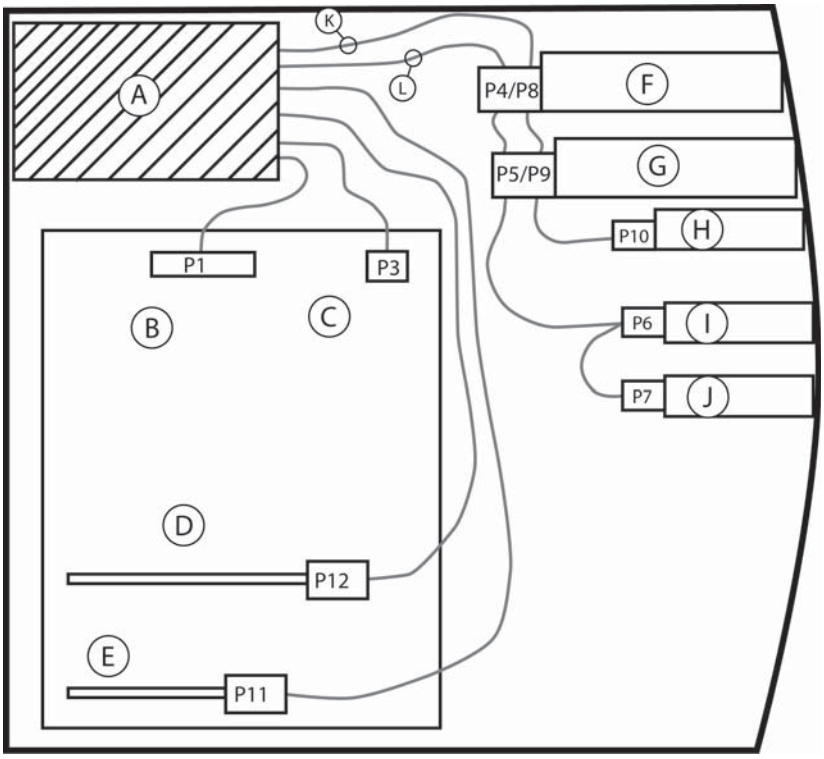


Table 4-8 Power supply cable connection guide

Item	Component	Item	Component	Item	Component
A	Power supply	E	Auxiliary power for PCI IEEE 1394 or audio card	I	Hard drive number 1
B	Main power connector	F	Optical drive 1	J	Hard drive number 2
C	Processor power connector	G	Optical drive 2	K	4–pin style connector (white) power harness
D	Auxiliary power for PCI Express card	H	Floppy drive	L	SATA-style connector (black) power harness

6. Reconnect all required system board connectors, as shown in System board components on page 53.

Product recycling

The Planet Partners recycling service provides an easy way to recycle computer equipment, rechargeable batteries, or HP printing supplies. HP processes ensure that unwanted hardware or empty HP printing supplies are recycled responsibly.

For information about recycling HP components or products, see http://www.hp.com/go/recycle.

5 System diagnostics and troubleshooting

This chapter describes the tools available for diagnosing and troubleshooting system issues, and includes the following topics:

Customer Self Help

Help and Support Center

The HP Help and Support Center (HSC) provides online access to technical support information, software updates and downloads, diagnostic tools, and HP support contact information.

To open the online HSC from your desktop, select **Start>Help and Support**.

HSC contains four support areas:

- HP Product Information (requires Internet access)—Links to the HP Technical Support website for your product. You can access all related documentation, downloads and updates, tools, and more.
- HP Software and Driver Downloads (requires Internet access)—Links to software downloads and updates specific to HP products.
- HP Support Tools (requires Internet access)—Links to self-help tools and diagnostics offered by HP Instant Support Professional Edition.
- Contact HP for Support (does not require Internet access)—Provides two options:
  - Chat with an expert online (requires Internet access)—Provides a tool to communicate with a support specialist online through Active Chat.
  - Call a support agent—Provides hardware details about your workstation and HP support phone numbers worldwide.

HP SoftPaq Download Manager

The HP SoftPaq Download Manager (when installed on your workstation) enables you to download software updates for your workstation from the HP support site. To download and install the HP Softpaq Manager on your workstation, complete the following:

1. Go to http://h20331.www2.hp.com/Hpsub/cache/509658-0-0-225-121.html to install download manager.
2. Once installed, run the application and select your workstation model, operating system, and language, and then click **Find Available SoftPaqs**. All available SoftPaqs matching the selected criteria are displayed.
3. Select the updates you want to download.
4. Select **Download**.

Diagnostic LED codes

NOTE: Workstation beeps are emitted from the chassis speaker. The flashing lights and beeps repeat for five cycles. After five cycles, only the flashing lights repeat.

Table 5-1 Diagnostic LED codes

Chassis indicator LEDs	
Power LED and sound activity	**Diagnosis and service action**
None	Workstation does not power on. Press the power button. If the hard drive LED is GREEN, then: 1. Locate a faulty device by sequentially removing devices one at a time and attempting power-on, as follows: **NOTE:** Remove the graphics card last. **a.** Disconnect AC power to the workstation. **b.** Remove the device. **c.** Reconnect AC power and attempt power-on. Replace the device causing the failure. 2. If a faulty device cannot be found, replace the system board. OR Press the power button. If the hard drive LED does not illuminate, then: 1. Verify that the workstation is plugged into a working AC outlet. 2. Open the access panel and verify that the power button harness is properly connected to the inline front panel I/O device assembly connector.

Table 5-1 Diagnostic LED codes (continued)

Chassis indicator LEDs	
Power LED and sound activity	**Diagnosis and service action**
	3. Verify that the power supply cables are properly connected to the system board. 4. Verify power supply functionality. a. Disconnect AC power. b. Remove all internal power supply cables from the system board. c. Plug in AC power. ◦ If the power supply fan spins and the BIST LED illuminates (Testing power supply on page 111), then the power supply is good. Replace the system board. ◦ If the power supply fan does not spin or the BIST LED does not illuminate (Testing power supply on page 111), then replace the power supply.
Blinks red 2 times (once per second), then a 2–second pause, and then 2 beeps	Thermal shutdown has occurred 1. Ensure that the workstation air vents are not blocked. 2. Open the access panel and press the workstation power button. 3. Verify that the system fan is running. 4. Verify that the processor heatsink fan spins. If it does not spin, ensure that the fan cable is plugged into the system board connector. Ensure that the heatsink is properly seated. 5. Replace the processor heatsink.
Blinks red 3 times (once per second), then a 2-second pause, and then 3 beeps	Processor is not installed 1. Install the processor. 2. Reseat the processor. 3. If the problem persists, replace the processor.
Blinks red 4 times (once per second), then a 2-second pause, and then 4 beeps	Power failure 1. Perform the power supply self-test (Testing power supply on page 111). 2. Open the access panel and ensure that the necessary power supply cables are connected to the system board. 3. Locate a faulty device by removing all devices and then reinstalling one at a time until the workstation fails: a. Disconnect AC power to the workstation. b. Remove all devices. c. Reinstall a device d. Reconnect AC power.

Table 5-1 Diagnostic LED codes (continued)

Chassis indicator LEDs	
Power LED and sound activity	**Diagnosis and service action**
	Replace the device causing the failure. Continue adding devices to ensure all are functioning properly. 4. Verify the power supply functionality. a. Disconnect AC power. b. Remove all internal power supply cables from the system board. c. Plug in AC power. • If the power supply fan spins and the LED illuminates (see Testing power supply on page 111), then the power supply is good. Replace the system board. • If the power supply fan does not spin or the LED does not illuminate (see Testing power supply on page 111), replace the power supply.
Blinks red 5 times (once per second), then a 2-second pause, and then 5 beeps	Pre-video memory error 1. Ensure that the memory modules are loaded correctly in pairs (refer to the *Memory* section in Chapter 4,). 2. Reseat memory modules. 3. Replace memory modules one at a time to find the faulty module. 4. Replace third-party modules with HP memory. 5. Replace the system board.
Blinks red 6 times (once per second), then a 2-second pause, and then 6 beeps	Pre-video graphic card error: 1. Reseat the graphics card. Power on the workstation. 2. Replace the graphic card. 3. Replace the system board.
Blinks red 7 times (once per second), then a 2-second pause, and then 7 beeps	System board failure (ROM detected a failure before video). Replace system board.
Blinks red 8 times (once per second), then a 2-second pause, and then 8 beeps	Invalid system ROM based on bad checksum Entering FailSafe (Boot Block) recovery mode 1. Reflash the system ROM. (See the *FailSafe Boot Block ROM* section in Chapter 3.) 2. Replace the system board.
Blinks red 9 times (once per second), then a 2-second pause, and then 9 beeps	System powers on, but is unable to boot. 1. Replace the system board. 2. Replace the processor.

Troubleshooting scenarios and solutions

This section presents an extensive overview of various troubleshooting scenarios and includes possible solutions for each.

Solving minor problems

Table 5-2 Minor problems

Problem	Cause	Possible Solution
Workstation appears frozen and does not shut down when the power button is pressed.	Software control of the power switch is not functional.	1. Press and hold the power button for at least four seconds until the workstation shuts down. 2. Disconnect the electrical plug from outlet. 3. Restart the workstation.
Workstation seems to be frozen.	Program in use has stopped responding to commands.	1. If possible, use the Windows Task Manager to isolate and terminate the offending process. 2. Attempt the normal Windows shutdown procedure. 3. Restart the workstation using the power button.
Workstation date and time display is incorrect.	Real-time clock (RTC) battery might need replacement.	1. Reset the date and time under the Control Panel. 2. Replace the RTC battery.
Workstation appears to pause periodically.	Network driver is loaded and no network connection is established.	Establish a network connection, or use the Computer Setup (F10) Utility or the Microsoft Windows Device Manager to disable the network controller.
Cursor does not move using the arrow keys on the keypad.	The Num Lock key might be on.	Press the Num Lock key. The **Num Lock** key can be disabled (or enabled) in the Computer Setup (F10) Utility.
Poor performance is experienced.	Processor is hot.	1. Be sure airflow to the workstation is not blocked. 2. Be sure the fans are connected and working properly (some fans only operate when needed). 3. Be sure the processor heatsink is installed properly.
	Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.

Table 5-2 Minor problems (continued)

Problem	Cause	Possible Solution
Workstation powered off automatically and the Power LED flashes red 2 times (once every second), followed by a 2-second pause, and then two simultaneous beeps sounded.	Processor thermal protection activated. A fan might be blocked or not turning. OR The processor heatsink is not properly attached to the processor.	1. Ensure that the workstation air vents are not blocked. 2. Open the access panel and press the workstation power button. 3. Verify that the system fan is running. 4. Verify that the processor heatsink fan spins. If it is not spinning, ensure that the heatsink fan cable is plugged into the system board connector. Ensure that the heatsink is properly seated. 5. Replace the processor heatsink.
System does not power on, and the LEDs on the front of the workstation are not flashing.	System is unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then: 1. To find a faulty device, remove all devices one at a time: a. Disconnect AC power to the workstation. b. Remove a device. c. Reconnect AC power and power-on the workstation. 2. Repeat this process until the faulty device is identified. (Remove the graphics card last.) Replace the faulty device. 3. If no faulty device is found, replace the system board. OR Press and hold the power button for less than 4 seconds. If the hard drive LED does not illuminate, then: Press and hold the power button for *less than* 4 seconds. If the hard drive LED does not illuminate, then: 1. Verify that the workstation is plugged into a working AC outlet. 2. Verify that the power button harness is properly connected to the inline front panel I/O device assembly connector. 3. Verify that the power supply cables are properly connected to the system board. 4. Verify power supply functionality: a. Disconnect AC power. b. Remove all internal power supply cables from the system board. c. Plug in AC power. • If the power supply fan spins and the BIST LED illuminates (see Testing power supply on page 111), then the power supply is good. Replace the system board. • If the power supply fan does not spin or the LED does not illuminate (see Testing power supply on page 111), replace the power supply.

Solving power supply problems

This section presents power supply troubleshooting scenarios.

Testing power supply

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

To test the power supply:

1. Unplug the AC power.
2. Disconnect all internal power supply cables from the system board.
3. Plug in AC power.
   - If the green BIST LED (illustrated below) on the rear of the workstation is illuminated *and* the fan is spinning, the power supply is functional.
   - If the green BIST LED is not illuminated **or** the fan is not spinning, replace the power supply.

Figure 5-1 Testing power supply with BIST LED

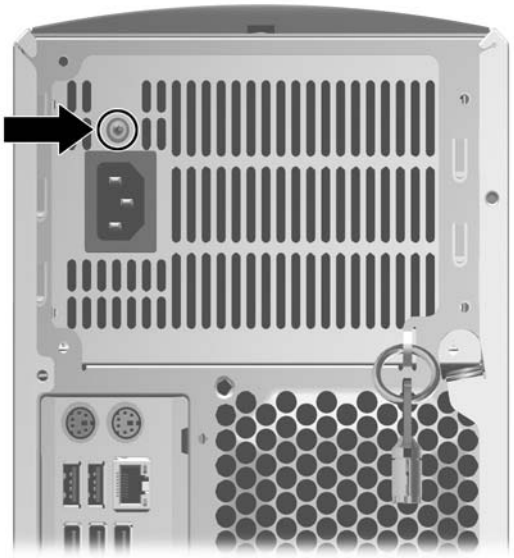


Table 5-3 Power supply problems

Problem	Cause	Solution
Power supply shuts down intermittently.	Power supply fault.	Replace the power supply.
Workstation powered off automatically and the Power LED flashes red 2 times (once every second), followed by a 2-second pause.	Processor thermal protection activated. A fan might be blocked or not turning. OR The processor heatsink fan assembly is not properly attached to the processor.	1. Ensure that the workstation air vents are not blocked and . 2. Open the access panel and press the workstation power button. 3. Verify that the system fan is running. 4. Verify that the processor heatsink fan spins. If the heatsink fan is not spinning, ensure that the fan cable

Table 5-3 Power supply problems (continued)

Problem	Cause	Solution
		is plugged into the system board connector. Ensure that the fan is properly seated. 5. Replace the processor heatsink.
Power LED flashes red (once every 2 seconds).	Power failure (power supply is overloaded).	1. Determine whether a device is causing the problem by removing all attached devices. Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until a failure occurs. Replace the device causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 2. Verify the power supply functionality. a. Disconnect AC power. b. Remove all internal power supply cables from the system board. c. Plug in AC power. • If the power supply fan spins and the LED illuminates (see Testing power supply on page 111), then the power supply is good. Replace the system board. • If the power supply fan does not spin or the LED does not illuminate (see Testing power supply on page 111), replace the power supply.

Solving diskette problems

Table 5-4 Diskette problems

Problem	Cause	Solution
Diskette drive light stays on.	Diskette is damaged.	Right-click **Start**, select **Explore**, and then select a drive. Select **File>Properties>Tools**. Under Error-checking, select **Check Now.**
	Diskette is incorrectly inserted.	Remove and reinsert diskette.
	Files on diskette are damaged.	Verify the program diskettes.
	Drive cable is not properly connected.	Reconnect power cable. Be sure that all four pins are connected.
Drive not found.	Cable is loose.	Reseat diskette drive data and power cables.
	Removable drive is not seated properly.	Reseat the drive.
Diskette drive cannot write to a diskette.	Diskette is not formatted.	Format the diskette.
	Diskette is write-protected.	Use another diskette or remove the write protection.
	Writing to the wrong drive.	Verify the drive letter in the path statement.
	Not enough space is left on the diskette.	Use another diskette.

Table 5-4 Diskette problems (continued)

Problem	Cause	Solution
	Diskette write-control is enabled.	Use the Computer Setup (F10) Utility to verify the storage security feature disabled settings.
	Diskette is damaged.	Replace the damaged disk.
Cannot format diskette.	Invalid media reported.	When formatting a disk in MS-DOS, you might need to specify diskette capacity. For example, to format a 1.44–MB diskette, enter the following command at the MS-DOS prompt: **FORMAT A: /F:1440**
A problem has occurred with a disk transaction.	The directory structure is bad, or there is a problem with a file.	Right-click **Start**, select **Explore**, and then select a drive. Select **File>Properties>Tools**. Under Error-checking, select **Check Now**.
Diskette drive cannot read a diskette.	Diskette is not formatted.	Format the diskette.
	You are using the wrong diskette type for the drive type.	Verify the type of drive that you are using and use the correct diskette type.
	You are reading the wrong drive.	Verify the drive letter in the path statement.
	Diskette is damaged.	Replace the diskette with a new one.
“Invalid system disk” message is displayed.	A diskette that does not contain the system files needed to start the workstation has been inserted into the drive.	When drive activity stops, remove the diskette and press the Spacebar. The workstation attempts to boot from the next device in the boot order.
	Diskette error has occurred.	Restart the workstation by pressing the power button.
Cannot Boot to Diskette.	Diskette is not bootable.	Replace with a bootable diskette.
	Diskette boot has been disabled in Computer Setup.	Run Computer Setup and enable diskette boot in **Storage>Boot Order**.
	Removable media boot has been disabled in Computer Setup.	Run Computer Setup and enable Removable Media Boot in **Storage>Storage Options**.
	Diskette MBR validation is enabled.	Run the Computer Setup (F10) Utility and disable Diskette MBR Validation in **Storage>Storage Options**.

Solving hard drive problems

Table 5-5 Hard drive problems

Problem	Cause	Solution
Hard drive error occurs.	Hard disk has bad sectors or has failed.	Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk. Or, if the drive is detected by the BIOS, then run DPS Self-test .
Disk transaction problem.	The directory structure is bad, or there is a problem with a file.	Right-click **Start**, select **Explore**, and select a drive. Select **File>Properties>Tools**. Under Error-checking, select **Check Now**.
Drive not found (identified).	Loose cable.	Verify cable connections.

Table 5-5 Hard drive problems (continued)

Problem	Cause	Solution
	The system might not have automatically recognized a newly installed device.	1. Run the Computer Setup (F10) Utility. 2. If the system still does not recognize the new device, verify that the device is listed in the Computer Setup (F10) Utility. If it is listed, the probable cause is a driver problem. If it is not listed, the probable cause is a hardware problem. 3. If this drive is newly installed, enter **Setup** and try adding a POST delay under **Advanced>Power-On**.
	Drive responds slowly immediately after power-up.	Run the Computer Setup (F10) utility, and then increase the POST Delay in **Advanced>Power-On Options**.
Nonsystem disk or NTLDR missing message.	System is trying to start from a nonbootable diskette.	Remove the diskette from the diskette drive.
	System is trying to start from a damaged hard drive.	1. Insert a bootable diskette into the diskette drive and restart the workstation. 2. If the hard drive is still inaccessible and MBR Security is enabled, try restoring the previously saved MBR image by entering **Setup**, and then selecting **Security>Restore Master Boot Record**.
	System files missing or not properly installed.	1. Insert a bootable system diskette and restart. 2. Verify that the hard drive is partitioned and formatted. 3. Install the system files for the appropriate operating system, if necessary.
	Hard drive boot disabled in Computer Setup.	Run the Computer Setup (F10) Utility, and then enable the hard drive entry in the **Storage>Boot Order** list.
Workstation will not start.	Hard drive is damaged.	Replace the hard drive.

Solving display problems

Table 5-6 Display problems

Problem	Cause	Solution
Blank screen (no video).	The cable connections are not correct.	Verify the cable connections from the monitor to the workstation and to a working electrical outlet.
	The monitor is off.	Switch the monitor on (LED is on). You might need to refer to the monitor manual for an explanation of the LED signals.
	Screen blanking utility installed or energy saver features enabled.	Press any key or press the mouse button, and, if set, enter your password.
	System ROM is bad; system is running in FailSafe Boot Block mode (indicated by 8 beeps).	Reflash the ROM using a SoftPaq. (See *Failsafe Boot Block ROM* section in Chapter 3.)
	Fixed-sync monitor does not sync at the resolution specified.	Be sure that the monitor can accept the same horizontal scan rate as the resolution specified.
	Computer is in Hibernate mode.	Press the power button to resume from Hibernate mode.

Table 5-6 Display problems (continued)

Problem	Cause	Solution
	Workstation monitor settings are not compatible with the monitor.	1. When you see **Press F8** in the bottom-right corner of the screen, restart the workstation and press F8 during startup. 2. Using the keyboard arrow keys, select **Enable VGA Mode** and then press Enter. 3. In Windows Control Panel, double-click the **Display** icon and then select the **Settings** tab. 4. Use the sliding control to reset the resolution.
The display works properly during the POST but goes blank when the operating system starts.	The display settings in the operating system are incompatible with your graphics card and monitor.	1. For Windows, restart your workstation in VGA mode. 2. After the operating system starts, change the display settings to match those supported by your graphics card and monitor. 3. Refer to your operating system and graphics card documentation for information about changing display settings.
Power LED flashes red 6 times (once every second), followed by a 2–second pause, and then the workstation beeps 6 times.	Pre-video graphics error.	For systems with a graphics card: 1. Reseat the graphics card. 2. Replace the graphics card. 3. Replace the system board.
Monitor does not function properly when used with Energy Saver features.	Monitor without Energy Saver capabilities is being used with Energy Saver features enabled.	Disable monitor Energy Saver feature.
Dim characters	The brightness and contrast controls are not set properly.	Adjust the monitor brightness and contrast controls.
	Cables are not properly connected.	Verify that the graphics cable is securely connected to the graphics card and the monitor.
Blurry video or requested resolution cannot be set.	If the graphics controller was upgraded, the correct video drivers might not be loaded.	Install the video drivers included in the upgrade kit, or download and install the latest drivers for your graphics card from http://welcome.hp.com/country/us/en/support.html.
	Monitor is not capable of displaying requested resolution.	Change requested resolution.
The picture is broken up, rolls, jitters, or flashes.	The monitor connections might be incomplete, or the monitor might be incorrectly adjusted.	1. Be sure the monitor cable is securely connected to the workstation. 2. In a multiple CRT monitor system, ensure that the monitors' electromagnetic fields are not interfering with each other . Move them apart if necessary. 3. Fluorescent lights or fans might be too close to the CRT monitor.
	Monitor must be degaussed.	Degauss the monitor.
Vibrating or rattling noise coming from inside a CRT monitor when powered on.	Monitor degaussing coil has been activated.	None. It is normal for the degaussing coil to be activated when the monitor is powered on.

Table 5-6 Display problems (continued)

Problem	Cause	Solution
Clicking noise coming from inside a CRT monitor.	Electronic relays have been activated inside the monitor.	None. It is normal for some monitors to make a clicking noise when turned on and off, when going in and out of Standby mode, and when changing resolutions.
High pitched noise coming from inside a flat-panel monitor.	Brightness and contrast settings are too high.	Lower brightness and contrast settings.
Fuzzy focus; streaking, ghosting, or shadowing effects; horizontal scrolling lines; faint vertical bars; or unable to center the picture on the screen (flat-panel monitors using an analog VGA input connection only.)	Flat-panel monitor's internal digital conversion circuits might be unable to correctly interpret the output synchronization of the graphics card.	1. Select the monitor's **Auto-Adjustment** option in the monitor's onscreen display menu. 2. Manually synchronize the Clock and Clock Phase onscreen display functions. Download SoftPaq SP20930 or SP22333 (depending on the monitor) to assist with the synchronization).
Certain typed symbols do not appear correctly.	The font you are using does not support that particular symbol.	Use the Character Map to locate and select the appropriate symbol. Select **Start>All Programs> Accessories>System Tools>Character Map**. You can copy the symbol from the Character Map into a document.

Solving audio problems

Table 5-7 Audio problems

Problem	Cause	Solution
Sound does not come out of the speaker or headphones.	Software volume control is turned down.	If using the Windows operating system, double-click the **Speaker** icon on the taskbar and use the volume slider to adjust the volume.
	The external speakers are not turned on.	Turn on the external speakers.
	External speakers plugged into the wrong audio jack.	See your sound card documentation for proper speaker connection.
	Digital CD audio is not enabled in a Windows operating system environment.	Enable digital CD audio: 1. From the Control Panel, select **System.** 2. On the Hardware tab, select the **Device Manager** button. 3. Right-click the **CD/DVD** device and select **Properties**. 4. On the Properties tab, ensure that **Enable digital CD audio for this CD-ROM device** is selected.
	Headphones or devices connected to the line-out connector have muted the internal speaker.	Turn on and use headphones or external speakers, if connected, or disconnect headphones or external speakers.
	Volume is muted.	1. From the Control Panel, select **Sound, Speech and Audio Devices**, and then select **Sounds and Audio Devices**. 2. Deselect the **Mute** checkbox.
	Computer is in Standby mode.	Press the power button to resume from Standby mode.

Table 5-7 Audio problems (continued)

Problem	Cause	Solution
Noise or no sound comes out of the speakers or headphones.		1. If using digital speakers that have a stereo jack and you want the system to auto switch to digital, use a stereo-to-mono adapter to properly engage the auto sense feature, or use the multimedia device properties to manually switch the audio signal from analog to digital. 2. If the headphones have a mono jack, use the multimedia device properties to switch the system to analog out.
NOTE: If you set digital as the Output Mode, the internal speaker and external analog speakers no longer output audio until you switch back to an auto sense or analog mode. If you set analog as the Output Mode, external digital speakers do not function until you change the output mode back to an auto-sense or digital mode.		
Sound occurs intermittently.	Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.
Workstation appears to be locked up while recording audio.	The hard disk might be full.	1. Before recording, be sure there is enough free space on the hard disk. 2. Try recording the audio file in a compressed format.

Solving printer problems

Table 5-8 Printer problems

Problem	Cause	Solution
Printer does not print.	Printer is not turned on and online.	Turn the printer on and be sure it is online.
	The correct printer driver for the application is not installed.	1. Install the correct printer driver for the application. 2. Try printing using the MS-DOS command: **DIR C:\> [printer port]** where *printer port* is the address of the printer used. If the printer works, reload the printer driver.
	If you are on a network, you might not have made a connection to the printer.	Make the proper network connection to the printer.
	Printer might have failed.	Run printer self-test.
Printer does not turn on.	The cables might not be connected properly.	Reconnect all cables.
Printer prints garbled information.	The correct printer driver is not installed.	Install the correct printer driver for the application.
	The cables might not be connected properly.	Reconnect all cables.

Table 5-8 Printer problems (continued)

Problem	Cause	Solution
	Printer memory might be overloaded.	Reset the printer by turning it off for one minute, then turn it back on.
Printer is offline.	The printer might be out of paper.	1. Verify that the paper tray and refill it if it is empty. 2. Select **Online**.

Solving keyboard and mouse problems

Table 5-9 Keyboard and mouse problems

Problem	Cause	Solution
Keyboard commands and typing are not recognized by the workstation.	Keyboard connector is not properly connected.	1. Power off the workstation. 2. Reconnect the keyboard to the back of the workstation and restart the workstation.
	Program in use has stopped responding to commands.	Shut down the workstation using the mouse, and then restart the workstation.
	Keyboard is defective.	Replace the keyboard.
	Keyboard key is stuck down.	Remove any debris from the keyboard.
	Workstation is in Hibernate mode.	Press the power button to resume from Hibernate mode.
Cursor will not move using the arrow keys on the keypad.	The Num Lock key might be on.	Press the Num Lock key. The Num Lock light should not be on if you want to use the arrow keys. The Num Lock key can be disabled or enabled in the Computer Setup (F10) Utility.
Mouse does not respond to movement or is too slow.	Mouse connector is not properly plugged into the back of the workstation.	1. Shut down the workstation using the keyboard. 2. Plug the mouse connector into the PS/2 mouse connector slot in the workstation, and then restart the workstation.
	Program in use has stopped responding to commands.	Shut down the workstation using the keyboard and then restart the workstation.
	Mouse is defective.	Replace the mouse.
	Workstation is in Standby mode.	Press the power button to resume from Standby mode.
Mouse only moved vertically or horizontally, or the movement is jerky.	Mouse rollerball is dirty.	Remove the rollerball cover from the bottom of the mouse, clean it, and then replace cover.

Solving front panel component problems

If you are experiencing problems with one of the front panel ports, you might be able to try your device in the corresponding port on the back side of the computer. If this does not fix the problem, or you must use the front panel ports, continue troubleshooting.

Some problems in this section are also discussed in other troubleshooting suggestions in this chapter.

Table 5-10 Front panel component problems

Problem	Cause	Solution
A USB device, headphone, or microphone is not recognized by the workstation.	The device is not properly connected.	1. Power off the workstation. 2. Reconnect the device to the front of the workstation and restart the workstation.
	The device does not have power.	If the USB device requires AC power, be sure one end is connected to the device and one end is connected to a live outlet.
	The correct device driver is not installed.	1. Install the correct driver for the device. 2. You might need to reboot the workstation if required by the device driver.
	The cable from the device to the computer does not work.	1. If possible, replace the cable. 2. Restart the workstation.
	The device is not working.	1. Replace the device. 2. Restart the workstation.
A USB, audio, or IEEE-1394 device is not working.	The internal cables might not be connected to the system board or the PCI card.	1. Power off the workstation. 2. Connect the cables correctly.
A device in the IEEE-1394 port is not responsive.	Cables of the external device are loose, or power cables are unplugged.	Be sure that all cables are properly and securely connected.
	The power switch on the device is not turned on.	Power off the workstation, power on the external device, then power on the workstation to integrate the device with the workstation system.
The IEEE-1394 port is not active.	The port is not there because it was not purchased with the system.	You can buy an IEEE 1394 PCI adapter card. Contact an HP seller.

Solving hardware installation problems

You might need to reconfigure the workstation when you add or remove hardware, such as an additional diskette drive. If you install a Plug and Play (PnP) device, the operating system automatically recognizes the device and configures the workstation. If you install a nonPnP device, you must reconfigure the workstation after completing installation of the new hardware.

Table 5-11 Hardware installation problems

Problem	Cause	Solution
A new device is not recognized as part of the system.	Device is not seated or connected properly.	Be sure that the device is properly and securely connected and that pins in the connector are not bent.
	Cables of new external device are loose, or power cables are unplugged.	Be sure that all cables are properly and securely connected and that pins in the cable or connector are not bent.
	Power switch of new external device is not turned on.	Power off the workstation, power on the external device, and then power on the workstation to integrate the device into the workstation system.
	When the system advises you about changes to the	Reboot the workstation and follow the instructions for accepting the changes.

Table 5-11 Hardware installation problems (continued)

Problem	Cause	Solution
	configuration, you do not accept them.	
	A PnP board might not automatically configure when added if the default configuration conflicts with other devices.	Use Windows XP Device Manager to deselect the automatic settings for the board and choose a basic configuration that does not cause a resource conflict. You can also use the Computer Setup (F10) Utility to reconfigure or disable devices to resolve the resource conflict.
	Device hardware is not properly jumpered or otherwise configured.	Read the device-specific configuration information and check for incorrect settings or conflicts with other devices already installed in the system.
Workstation does not start.	Wrong memory modules were used in the upgrade, or memory modules were installed in the wrong location.	1. Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation. 2. Observe the beeps and LEDs on the front of the workstation. Refer to POST error messages on page 129 to determine possible causes.
	PCI Express power cable might be plugged into the wrong connector on the system board.	Connect the auxiliary PCI Express power cable to the PCI Express card.

Solving network problems

The following table provides fixes for common network problems.

Table 5-12 Network problems

Problem	Cause	Solution
Wake-on-LAN feature is not functioning.	Wake-on-LAN is not enabled.	Use the network control application to enable Wake-on-LAN.
Network driver does not detect network controller.	Network controller is disabled.	Run the Computer Setup (F10) Utility to enable network controller.
	Incorrect network driver.	Obtain the latest driver from http://welcome.hp.com/country/us/en/support.html.
Network status link light does not illuminate or never flashes.	No active network is detected.	Verify cabling and network equipment for proper connection.
The network status light does not flash when there is network activity.	Network controller is not set up properly.	Use the network control application to verify that the device is working properly.
	Network driver is not properly loaded.	Reinstall network drivers.
	System cannot auto sense the network.	Disable auto sensing capabilities and force the system into the correct operating mode.
Diagnostics reports a failure.	The cable is not securely connected.	Be sure that both ends of the data cable are securely connected.
	The cable is attached to the incorrect connector.	Be sure that the cable is attached to the correct connector.

Table 5-12 Network problems (continued)

Problem	Cause	Solution
	There is a problem with the cable or a device at the other end of the cable.	Be sure that the cable and device at the other end are operating correctly.
	Network controller interrupt is shared with an expansion board.	Under the Computer Setup (F10) Utility Advanced menu, change the resource settings for the board.
	The network controller is defective.	Replace the NIC, or replace the system board if using an onboard NIC.
Diagnostics passes, but the workstation does not communicate with the network.	Network drivers are not loaded, or driver parameters do not match current configuration.	1. Be sure the network drivers are loaded and that the driver parameters match the configuration of the network controller. 2. Be sure the correct network client and protocol is installed.
	The network controller is not configured for this workstation.	In the Windows operating system environment, double-click the **Network** icon in the Control Panel and configure the network controller.
Network controller stopped working when an expansion board was added to the workstation.	Network controller interrupt is shared with an expansion board.	Under the Computer Setup (F10) Utility Advanced menu, change the resource settings for the board.
	The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for the expansion board were installed.
	The expansion board installed is a network card and conflicts with the embedded network card.	Under the Computer Setup (F10) Advanced menu, change the resource settings for the board.
Network controller stops working without apparent cause.	The files containing the network drivers are corrupted.	Reinstall the network drivers using the *Restore Plus!* CD, or download and install the latest drivers from http://welcome.hp.com/country/us/en/support.html.
	The cable is not securely connected.	Be sure that both ends of the cable are securely attached to the correct devices.
	The network controller is defective.	Replace the NIC, or replace the system board when using an onboard NIC.
New network card does not boot.	New network card might be defective or might not meet industry-standard specifications.	Install a working, industry-standard NIC, or change the boot sequence to boot from another source.
Cannot connect to network server when attempting remote system installation.	The network controller is not configured properly.	Verify network connectivity, that a DHCP server is present, and that the Remote System Installation Server contains the NIC drivers for your NIC.
Computer Setup (F10) Utility reports unprogrammed EEPROM.	Unprogrammed EEPROM.	Flash the ROM.

Solving memory problems

△ **CAUTION:** For those systems that support ECC memory, HP does not support mixing ECC and nonECC memory. The operating system does not boot with mixed-ECC memory.

Table 5-13 Memory problems

Problem	Cause	Solution
System does not boot (or does not function properly) after installing additional memory modules.	A memory module is not the correct type or speed or the new memory module is not seated properly.	Replace module with the correct, industry-standard device for the workstation.
		On some models, ECC and nonECC memory modules cannot be mixed.
Out of memory error.	Memory configuration might not be set up correctly.	Verify proper workstation memory configuration. (See the *Memory* section in Chapter 4..)
	You have run out of memory to run the application.	Review the application documentation to determine the memory requirements.
Memory count during POST is wrong.	The memory modules might not be installed correctly.	Verify that the memory modules have been installed correctly and that proper modules are used.
Insufficient memory error during operation.	Too many Terminate and Stay Resident (TSR) programs are installed.	Delete any TSRs that you do not need.
	You have run out of memory for the application.	Verify the memory requirements for the application or add more memory to the workstation.
Power LED flashes red 5 times (once every second), followed by a 2-second pause, and then the workstation beeps 5 times.	Memory is installed incorrectly or is bad.	1. Reseat DIMMs. 2. Replace DIMMs one at a time to isolate the faulty module. 3. Replace third-party memory with HP memory. 4. Replace the system board.

Solving processor problems

Table 5-14 Processor problems

Problem	Cause	Solution
Poor performance is experienced.	Processor is hot.	1. Be sure the airflow to the workstation is not blocked. 2. Be sure the fans are connected and working properly (some fans only operate when needed). 3. Be sure the processor heatsink is installed properly.
Power LED is red and stays on.	Processor is not seated properly or not installed.	1. Verify that the processor is present. 2. Reseat the processor.

Solving DVD problems

Table 5-15 DVD problems

Problem	Cause	Solution
System does not boot from DVD drive.	The DVD boot is not enabled through the Computer Setup (F10) Utility.	Run the Computer Setup (F10) Utility and enable booting to removable media and verify boot order settings.
	Nonbootable CD in drive.	Try a bootable CD in the drive.

Table 5-15 DVD problems (continued)

Problem	Cause	Solution
DVD devices are not detected or the driver is not loaded.	Drive is not connected properly or not properly configured.	1. Reconnect power and data cables to the drive. 2. Install correct device driver.
Movie does not play in the DVD drive.	Movie might be regionalized for a different country.	See the documentation included with the DVD drive.
	Decoder software is not installed.	Install decoder software.
Cannot eject CD (tray-load unit).	Disc not properly seated in the drive.	1. Power off the workstation and insert a thin metal rod (such as a paper clip) into the emergency eject hole and push firmly. 2. Slowly pull the tray out from the drive until the tray is fully extended, and then remove the disc.
CD-RW or DVD-R/RW drive cannot read a disc or takes too long to start.	CD has been inserted upside down.	Reinsert the CD with the label facing up.
	The DVD-ROM drive takes longer to start because it has to determine the type of media played, such as audio or video.	Wait at least 30 seconds to let the DVD-ROM drive determine the type of media being played. If the disc still does not start, read the other solutions listed for this topic.
	DVD disc is dirty.	Clean DVD with a CD cleaning kit.
	Windows does not detect the DVD-ROM drive.	1. Use Device Manager to remove or uninstall the device. 2. Restart the workstation and allow Windows to detect the device.
Recording audio CDs is difficult or impossible.	Wrong or poor-quality media type.	1. Use a slower recording speed. 2. Verify that you are using the correct media for the drive. 3. Try a different brand of media. Quality varies widely between manufacturers.

Solving Internet access problems

Table 5-16 Internet access problems

Problem	Cause	Solution
Unable to connect to the Internet.	Internet Service Provider (ISP) account is not set up properly.	Verify Internet settings or contact the ISP for assistance.
	Modem is not set up properly.	Reconnect the modem. Verify the connections are correct using the quick setup documentation.
	Web browser is not set up properly.	Verify that the Web browser is installed and set up to work with your ISP.
	Cable/ DSL modem is not plugged in.	Plug in cable/DSL modem. When properly connected, the power LED on the front of the cable/DSL modem should be illuminated.
	Cable/DSL service is not available or has been interrupted because of bad weather.	Try connecting to the Internet at a later time, or contact your ISP. If the cable/DSL service is connected, the cable LED light on the front of the cable/DSL modem is on.

Table 5-16 Internet access problems (continued)

Problem	Cause	Solution
	The CAT5 10/100/1000 cable is disconnected.	Connect the CAT5 10/100/1000 cable between the cable modem and the workstations's RJ-45 connector. (If the connection is good, the "PC" LED on the front of the cable/ DSL modem will be on.)
	IP address is not configured properly.	Contact the ISP for the correct IP address.
	Cookies are corrupted.	1. Select **Start>Control Panel**. 2. Double-click **Internet Options**. 3. On the General tab, select the **Delete Cookies** button.
Cannot automatically launch Internet programs.	You must log on to the ISP before some programs will start.	Log on to the ISP and launch the desired program.
Internet takes too long to download websites.	Modem is not set up properly.	1. Select **Start>Control Panel.** 2. Double-click **System**, and then select the **Hardware** tab. 3. In the Device Manager area, select the **Device Manager** button. 4. Double-click **Ports** (COM & LPT). 5. Right-click the COM port that your modem uses, and then select **Properties**. 6. Under Device status, verify that the modem is working properly. 7. Under Device usage, verify that the modem is enabled. 8. If there are further problems, select the **Troubleshoot** button and follow the onscreen instructions.

Troubleshooting checklist

Before running any of the diagnostic utilities, use the following checklist to find possible solutions for workstation or software problems.

- Is the workstation and monitor connected to a working electrical outlet?
- Is the workstation powered on?
- Is the green power light illuminated?
- Is the monitor on?
- Is the green monitor light illuminated?
- If the monitor is dim, adjust the monitor brightness and contrast controls .
- Press and hold any key. If the system beeps, then the keyboard is operating correctly.
- Check all cables for loose or improper connections.
- After installing a nonPnP expansion board or other option (such as a diskette drive), reconfigure the workstation.

- Are all of the necessary device drivers installed?
- Have all printer drivers been installed for each application?
- Have you removed all diskettes and CDs from the drives before you power on the workstation?
- Are you running the latest version of BIOS, drivers, and software?

LED color definitions

The following table describes what each LED light on your workstation front panel signifies.

Table 5-17 LED color definitions

LED state	LED color	System status
Solid	Green	System is on
Flashing	Green	System is in Standby
Solid or flashing	Red	System has experienced an error. See Diagnostic LED codes on page 106
None	No light	System is in Hibernate, or it is off

HP Insight Diagnostics Offline Edition

The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:

- Run diagnostics
- View the hardware configuration of the system

Key features and benefits

HP Insight Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating hardware issues.

In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest insight into potential system issues, is the configuration of the system. Insight Diagnostics helps provide higher system availability. Typical uses of the Insight Diagnostics are:

- Testing and diagnosing apparent hardware failures
- Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance
- Sending configuration information to another location for more in-depth analysis

Theory of operation

Insight Diagnostics Offline Edition operates in offline mode only. The operating system is not running and software information from the system is not available to the diagnostics.

Offline Survey is available to display the current system configuration.

The Insight Diagnostics Test feature provides the capability to test functionality of all the major hardware components in the system. The Test feature is designed with flexibility to enable you to customize test selections by specifying different modes and types of testing.

A Quick Test provides a predetermined script where a sample of each hardware component is tested and requires no user intervention.

A Complete Test provides a predetermined script during which each hardware component is fully tested. You can select Interactive or Unattended tests. This changes the devices tested during the Complete Test. There are more tests available in the interactive mode, but these require user intervention.

A Custom Test provides the most flexibility in controlling the testing of a system. The Custom Test mode enables you to specifically select which devices, tests, and test parameters are run. You can select tests that do not require any user interaction through the Interactive and Unattended tests modes.

Diagnostic utility on CD

HP Insight Diagnostics is available on the Documentation Library CD included with your workstation.

To start the diagnostic utility on the Documentation Library CD:

1. To enter the Computer Setup (F10) Utility, power on your workstation and press F10 during the initial boot process .
2. Select your language from the list and press the Enter key. In the Computer Setup Utilities menu, four headings are displayed: **File**, **Storage**, **Security**, and **Advanced**. There might be other headings, depending on your workstation.
3. Use the right arrow key to select **Storage**.
4. Use the down arrow key to select **Boot Order**, and then press Enter.
5. Select **CD-ROM Drive**, and then press F5 to enable it as a bootable device. (If the CD drive is not already enabled, pressing F5 again disables it.) The default setting is Enabled.
6. Set the optical drive at the top of the boot order. To do this, select **CD-ROM**, press the Enter key, and then use the up arrow to move it to the top of the boot order.
7. To apply and save changes, press the F10 key, and then select **File>Save Changes** and **Exit.**
8. Insert the Documentation Library CD into the workstation.
9. Restart your system and HP Insight Diagnostics launches automatically.

Downloading the latest diagnostic utility

1. Go to http://www.hp.com.
2. Select the **Support & Drivers** link.
3. Select the **Download driver and software** radio button.
4. Enter your product number (for example, xw4600) in the text box, and then press Enter.
5. Select your operating system.
6. Select the **Diagnostic** link.
7. Locate **HP Insight Diagnostics Offline** and select **Download.**
8. After the .iso file is downloaded, create an image on an optical medium (such as a CD).

User Interface

Navigation

The Insight Diagnostics home page contains these tabs: Survey, Test, Status, Log, and Help. These tabs separate the major functions of Insight Diagnostics.

Survey tab

When the Survey tab is selected, the Survey menu is displayed and enables you to view important system configuration information. The Summary view limits the amount of data displayed, while the Advanced view shows all the data in the selected category. Regardless of whether you choose **Advanced** or **Summary**, the following categories of information are available on the Survey menu:

Overview—Provides a listing of general information about the computer.

All—Provides a listing of *all* information about the computer.

Architecture—Displays the workstation bus type and BIOS information. In addition, if the bus is PCI, information about the PCI configuration is displayed.

Asset Control—Displays the serial number of the computer and also provides processor information.

Communication—Displays information about the computer parallel (LPT) and serial (COM) port settings, USB, and network controller information.

Graphics—Displays information about the graphics subsystem of the computer.

Input Devices—Displays information about the type of keyboard and mouse.

Memory—Displays information about all memory in the computer, including memory on the board and any memory modules installed.

Miscellaneous—Displays information obtained from the computers configuration memory (CMOS), BIOS data area, Interrupt Vector table, and diagnostics component information.

Storage—Displays information about storage media connected to the computer, including all fixed disks, diskette drives, and optical drives.

System—Displays product type, processor type and speed, coprocessor information, and information about all ROMs in the computer.

Test tab

The Insight Diagnostics utility provides the capability to test all the major hardware components in the workstation. You can select from several types of tests:

Quick Test—Provides a predetermined script that samples most hardware components and requires no user intervention.

Complete Test—Provides a predetermined script during which most hardware components are fully tested. You can select **Interactive** or **Unattended** tests. This changes the devices tested during the Complete Test. More tests are available in the interactive mode, but these require user intervention.

Custom Test—Provides the most flexibility in controlling the testing of a system. The Custom Test mode enables you to specifically select which devices, tests, and test parameters to run. You can select tests that do not require any user interaction through the Interactive and Unattended test modes. More tests are available in the interactive mode, but these tests require user intervention.

To begin diagnostics testing:

1. Select the **Test** tab.
2. Select **Type of Test** to perform, select **Test Mode**, and then select either **Interactive** or **Unattended**.
3. Choose how you want the test to be executed, either **Number of Loops** or **Total Test Time**.
   - When choosing to run the test over a specified number of loops, enter the number of loops to perform.
   - If you want to run the diagnostic test for a specified time period, enter the amount of time in minutes.
4. To start the test, select **Begin Testing** in the lower right corner of the display.

While tests are performed, you can monitor the progress by viewing the Status tab. Any errors that are detected are summarized in the Error Log. Select **Save** to save the report to a diskette or a USB key drive (if attached).

If the diagnostics utility detects an error during a test, the user can mouse over the failed text in the Status tab to display additional information about the type of error and the error code.

To view all test failure information, select **Error Log.** To view the status of all testing that has been performed, select the **Log** tab.

Status tab

The Status tab displays the status of the selected tests. The type of test executed (for example, Quick, Complete, or Custom) is displayed. The main progress bar displays the percentage of completion of the current set of tests. While testing is in progress, the Cancel Testing button is displayed. Select this to cancel the test.

After testing is complete, the Cancel Testing button is replaced with the Select New Tests and Retest buttons. Select New Tests enables you to go back to the previous test selection page to select a new set of tests. The Retest button retests the last set of tests executed. This enables you to rerun a set of tests without having to go back to the test selection page.

The Status page also shows:

- Devices being tested
- Tests currently running
- Overall test time
- Individual test times
- Condition status of each test

Log tab

The Log tab consists of the following views.

Test Log—Displays all tests that have been executed, number of times a test was executed, the number of times a test failed, and the time it took to complete the test. The Clear Test Log button clears the contents of the Test Log.

Error Log—Displays the tests that have failed during diagnostic testing. Besides displaying the device and test, this section might also include error details. The description section describes the error that the diagnostic test found. The Recommended Repair will give a recommended action that should be

performed to resolve the hardware problem. The error count is the number of times the test has failed. The Clear Error Log button clears the contents of the Error Log.

Help tab

The Help tab provides three views:

- **HP Insight Diagnostics**—Provides introductory and detailed information about Insight Field Diagnostics.
- **Error Codes**—Provides error code listings, including devices tested, messages, and recommended repair information.
- **Test Components**—Reloads and refreshes all components and displays component details after the refresh.

POST error messages

Power On Self Test (POST) is a program run at startup that initializes and runs tests on installed hardware. An audible and/or visual message appears if the POST encounters a problem. POST checks the following items to ensure that the workstation system is functioning properly:

NOTE: If the power-on password is set, a key icon appears on the screen while POST is running. You must enter the password before continuing.

Table 5-18 POST error messages

Screen message	Probable cause	Recommended action
101—Option ROM Error	System ROM checksum	Verify the correct ROM: 1. Flash the ROM, if needed. 2. If an expansion card was recently added, remove it to find out if the problem remains. 3. Clear CMOS. If the message disappears, there might be a problem with the expansion card 4. Replace the system board.
102, 103—System Board Failure	DMA, timers, etc. may be set improperly or defective	1. Clear the CMOS. 2. Remove the expansion boards. 3. Replace the system board.
110—Out of Memory for Option ROMs	Option ROM for a device was unable to run due to memory constraints.	Run the Computer Setup (F10) Utility to disable unneeded option ROMs, and to enable ACP0/USB Buffers at Top of Memory under the Advanced>Power-On options.
162—System Options Not Set, or Systems Options Error	Configuration incorrect. RTC battery might need replacement	1. Run the Computer Setup (F10) Utility. 2. Set the date and time from the Control Panel or in the setup utility (depending on the operating system). 3. If the problem persists, replace the RTC battery.

Table 5-18 POST error messages (continued)

Screen message	Probable cause	Recommended action
163—Time and Date Not Set	• Invalid time or date in configuration memory • RTC battery might need replacement • CMOS jumper might not be properly installed	1. Set the date and time from the Control Panel or in the Computer Setup (F10) Utility (depending on the operating system). 2. If the problem persists, replace the RTC battery.
164—Memory Size Error	Memory configuration is incorrect	1. Run the Computer Setup (F10) Utility or Windows utilities. 2. Verify that the memory modules (if any) are installed properly. 3. If third-party memory has been added, test the memory configuration using HP memory. 4. Verify proper memory module type.
183—Invalid processor jumper setting	Jumper set incorrectly	Reset the processor jumper correctly.
201—Memory Error	RAM failure	1. Run the Computer Setup (F10) utiltiy or Windows utilities. 2. Be sure that memory and continuity modules are installed correctly. 3. Verify proper memory module type. 4. Remove and replace memory modules one at a time to isolate faulty modules. 5. Replace faulty memory modules. 6. If error persists after replacing memory modules, replace the system board.
202—Memory Type Mismatch Mixed 553 MHz and 667 MHz memory detected	Memory modules do not match	Replace the memory modules with matched sets.
203—Memory module failed self-test and failing rank was disabled	Defective memory module	Replace the memory module.
204—Memory loaded incorrectly	Improper module load	Reseat the memory module correctly.
205—Memory high temperature detected	Insufficient memory module cooling	Ensure that a memory module cooling fan is installed and operating correctly.
206—Memory setup invalid	Memory configured incorrectly	Reconfigure the memory modules in the proper slots.
207—Incompatible memory modules detected	Single-bit ECC error	1. Verify proper memory module type. 2. Insert the DIMM in another memory socket. 3. Replace memory module if problem persists.
208—Two-DIMM configurations use slots one and five	DIMMs are loaded in incorrect slots for a two-DIMM configuration	Ensure that the two DIMMs are installed in slots one and five only.
209—Incompatible memory (FBDs) detected	Incorrect memory module type in use	Ensure memory modules are compatible with workstation requirements.

Table 5-18 POST error messages (continued)

Screen message	Probable cause	Recommended action
210—Mismatched memory (AMBs) detected	Different memory module types are matched	Ensure that compatible memory module types are used in matched pairs.
211—Memory warning condition detected	Improper or defective memory module	Replace the memory module.
212—Failed Processor	Processor has failed to initialize.	1. Reseat the processor in its socket. 2. If the processor does not respond, replace it.
213—Incompatible Memory Modules	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	1. Verify proper memory module type. 2. Insert the DIMM in another memory socket. 3. Replace module with a DIM conforming to the SPD standard.
214—DIMM Configuration Warning	DIMMs are not installed correctly (not paired correctly)	See the service label on the workstation access panel for the correct memory configurations, and reseat the DIMMs accordingly.
216—Memory Size Exceeds Maximum Supported	The amount of memory installed exceeds that supported by the hardware	1. Verify how much memory your system supports. 2. Remove the excess memory.
301—Keyboard Error	Keyboard failure.	1. Reconnect the keyboard with the workstation powered off. 2. Check the connector for bent or missing pins. 3. Be sure that none of the keys are pressed. 4. Replace the keyboard.
303—Keyboard Controller Error	I/O board keyboard controller is defective or is not set properly	1. Reconnect the keyboard with workstation turned off. 2. Replace the system board.
304—Keyboard or System Unit Error	Keyboard failure.	1. Reconnect the keyboard with workstation turned off. 2. Be sure that none of the keys are pressed. 3. Replace keyboard. 4. Replace system board.
510—Splash Screen image corrupted	Splash Screen image has errors.	Update system BIOS.
511—CPU. CPU A, or CPU B Fan not detected	Fan is not connected or is defective	1. Reseat the fan cable. 2. Reseat the fan. 3. Replace the fan.
512—Chassis, rear chassis, or front chassis fan not detected	Fan is not connected, might have malfunctioned.	1. Reseat the chassis, rear chassis, or front chassis fan cable. 2. Reseat the chassis, rear chassis, or front chassis fan. 3. Replace the chassis, rear chassis, or front chassis fan.
513—Memory fan not detected	Missing or disconnected memory fan	1. Ensure the memory fan is installed. 2. Ensure proper memory fan connections.

Table 5-18 POST error messages (continued)

Screen message	Probable cause	Recommended action
514—CPU or Chassis Fan not detected	CPU or chassis fan is missing, not connected, or defective	1. Insure the processor or chassis fan is installed and connected properly. 2. Replace the processor fan or the chassis fan.
515—CPU Overtemp ocurrred	Insufficient processor cooling, or processor defect	1. If necessary, add a heatsink to processor and ensure proper operation. 2. Replace the processor.
516—PCI fan not detected	Missing PCI fan, or disconnected fan cable	• Add a PCI fan if necessary. • Insure proper PCI fan cable connection and operation.
517—Low power CPU heatsink(s) detected for high power CPUs	Inadequate heatsink installed	Replace the low power heatsink with a high power heatsink.
518—Power supply wattage insufficient for hardware configuration	Workstation configuration requires more power than the power supply can provide	• Reduce the workstation power consumption. • Replace the power supply with a high output power supply.
601—Diskette Controller Error	Diskette controller circuitry or diskette drive circuitry incorrect	1. Run the Computer Setup (F10) utiltiy. 2. Verify cabling and replace defective cables if necessary. 3. Clear CMOS. 4. Replace diskette drive. 5. Replace the system board.
605—Diskette Drive Type Error	Mismatch in drive type	1. Run the Computer Setup (F10) Utility. 2. Disconnect any other diskette controller devices (tape drives). 3. Clear the CMOS.
610—External Storage Device Failure	External storage device not detected, improperly connected, or defective	1. Ensure the external device is present and connected properly. 2. Replace the external device.
912—Computer Cover Has Been Removed Since Last System Start Up	N/A	No action required.
914— Hood Lock Coil is not Connected	Mechanism is missing or not connected	1. Reconnect or replace the missing mechanism. 2. Reseat or replace the missing mechanism cable.
921—Device in PCI Express Slot failed to initialize	Missing, improperly seated, or defective card	1. Ensure the card is installed. 2. Reseat the card. 3. Replace the card.
922—Fatal error in slot #	Fatal error occurred in the designated slot	Move the card to a different slot. If the problem persists, replace the card.

Table 5-18 POST error messages (continued)

Screen message	Probable cause	Recommended action
923—Non fatal uncorrectable PCI error in slot #	A PCI or PCIe non-fatal error condition occurred for the card in the designated slot	Move the card to a different slot. If the problem persists, replace the card.
924—Non fatal correctable PCI error		Contact HP support.
925—Non fatal uncorrectable ESI error	Non-fatal, uncorrectable ESI error on slot # occured.	Contact HP support.
926—Non fatal correctable ESI error	Non-fatal, correctable ESI error on slot # occured.	Contact HP support.
927—Non fatal FSB error	Non-fatal FSB error on FSB # occured.	Contact HP support.
928—Non fatal uncorrectable FBD error	Non-fatal, uncorrectable FBD error on DIMM # occurred.	Contact HP support.
929–Non fatal correctable FBD error	Non-fatal, correctable FBD error on (DIMM is identified)	Contact HP support.
930–Non fatal internal Northbridge error	Non-fatal, Internal Northbridge error	Contact HP support.
1720—SMART Hard Drive Detect Imminent Failure	Hard drive is about to fail. (Some hard drives have a firmware patch that fixes erroneous error messages.)	1. Determine if hard drive is giving correct error message. 2. Run the Drive Protection System test (if applicable). 3. Apply firmware patch (if applicable). See http://www.hp.com/support. 4. Back up contents and replace the hard drive.
1783—Fixed Disk 0/1 locked	Hard disk drive failure	Diagnose the hard drive, and replace it if necessary.
1794—Inaccessible devices attached to SATA 1 and/or SATA 3	Missing or improperly attached cable	Ensure that a cable is attached. Reattach the cable.
1796—SATA Cabling Error	Missing or improperly attached cable	Ensure that a cable is attached. Reattach the cable.
1800—Temperature Alert	Insufficient coolling	Ensure proper fan operation, and increase fan speed.
1801—Microcode Patch Error	Processor not supported by ROM BIOS	Ensure that the installed processor is supported by the workstation. Upgrade BIOS to proper version for this workstation and processor.
1802—Processor Not Supported	The system board does not support the processor	Replace the processor with a compatible one.
ERROR: An unsupported processor is installed. System halted	Unsupported processor detected	Replace the processor.
ERROR: A processor requiring too much power is installed. System halted	Unsupported processor detected	Replace the processor.
ERROR: Mixing processors with different power requirements. This is not supported. System halted.	Mixed type processors detected	Replace the processors with matched processors.

Table 5-18 POST error messages (continued)

Screen message	Probable cause	Recommended action
Invalid electronic serial number	Incorrect serial number registered in the system	Use the F10 Setup Utility to reset the serial number.
Mixing processors with different power requirements. This is not supported. System halted.	Mixed type processors detected	Replace the processors with matched processors.
Mixing Two Different Processor Types MP and DP!!!	Mixed type processors detected	Replace the processors with matched processors.
Network Server Mode Active and No Keyboard Attached	Keyboard not detected	Ensure that a functioning keyboard is attached to the workstation.
Processor initialization fails!!!	Processor defective	Replace the processor.
The installed CPUs have different voltage requirements. This is not supported. System halted.	Mixed type processors detected	Replace processors with matched processors.
Two processors do not have the same frequency operating ranges!!!	Mixed type processors detected	Replace processors with matched processors.

6 Configuring RAID devices

This chapter describes how to configure SAS and SATA RAID devices:

For additional information about configuring RAIDs, see http://www.hp.com/support/RAID_FAQs. For information about preparing your workstation for RAID configuration, see http://www.hp.com/support/workstation_manuals.

Configuring SAS RAID devices

Supported configurations

The following RAID configurations are supported on the HP xw6600 Workstation.

NOTE: This section does not apply to configuring SAS RAID in the Linux environment. For Linux SAS RAID, including supported configurations, refer to *Installing and Configuring SAS Hardware RAID on HP Linux Workstations* at http://www.hp.com/support/xw6600_manuals.

- Up to four internal SAS hard disk drives
- SAS to SATA data and power converter
- LSI MegaRAID Storage Manager (MSM) for Windows

The following RAID configurations are supported on the HP xw6600 Workstation:

- RAID 0 – Striped disk array
  - Two drive minimum
  - Improved I/O performance
  - No fault tolerance
- RAID 1 — Mirrored disk array
  - Two drives
  - 100% redundancy
  - Can recover from single drive failure
  - Improved read performance
- RAID 1E
  - Three drives minimum
  - Can be an odd number of drives
  - Can always recover from a single drive failure and, in some cases, can recover from two drive failures

SAS RAID 0 configuration

Follow the steps below to configure an Integrated Striped (IS) volume with the BIOS-based configuration utility. The configuration procedure assumes that the system already has the required disk and disk controllers.

1. On the Main menu screen of the BIOS-based configuration utility, use the arrow keys to select an adapter.
2. Press **Enter** to go to the Adapter Properties screen.
3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties**.
4. Press **Enter** to go to the RAID Properties screen.
5. In the RAID Properties screen, use the arrow keys to select the first disk for the IS volume. Then use the arrow keys to move to the Array Disk column for this disk, and press the SPACE, +, or - key to select **Yes** as the value for this column. If partitions are defined on the selected disk, a message appears warning you that data on the disk will be lost when the striped volume is created. Press the **M** key to migrate, or the **D** key to delete the data on the drive.
6. Repeat the previous step to select up to three more disks for the striped volume.
7. Press the **C** key to create the array once all drives have been chosen, then press **Esc** and select **Save**.

SAS RAID 1 configuration

Follow the steps below to configure an Integrated Mirroring (IM) volume with the BIOS-based configuration utility. The configuration procedure assumes that the system already has the required disk and disk controllers.

1. On the Main menu screen of the BIOS-based configuration utility, use the arrow keys to select an adapter.
2. Press **Enter** to go to the Adapter Properties screen.
3. On the Adapter Properties screen use the arrow keys to select **RAID Properties**.
4. Press **Enter** to go to the RAID Properties screen. .
5. Chose one of the following options:

   To configure a two-disk mirrored volume with an optional hot spare disk:

   - In the RAID Properties screen, use the arrow keys to select the primary disk for the IM volume (the disk with the data you want to mirror.)
   - Use the arrow keys to move to the Array Disk column for this disk and use the SPACE key to select **Yes** as the value. If partitions are defined on the selected disk, a message appears warning you that data on the disk will be lost when the striped volume is created. Press the **M** key to migrate, or the **D** key to delete the data on the drive.
   - When the **Keep Data/Erase Disk** message appears, press **F3** to keep the data currently on this disk. The value in the Array Disk column changes to **Primary**.
   - Use the arrow keys to select the secondary (mirrored) disk for the IM volume. Select **Yes** as the value for the Array Disk column.

     If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk. Continue with Step 6.

SAS RAID 1E configuration

Follow the steps below to configure an Integrated Mirroring Extended (IME) volume with the BIOS-based configuration utility. The configuration procedure assumes that the system already has the required disk and disk controllers.

1. On the Main menu screen of the BIOS-based configuration utility, use the arrow keys to select an adapter.
2. Press **Enter** to go to the Adapter Properties screen.
3. On the Adapter Properties screen use the arrow keys to select **RAID Properties** on the screen.
4. Press Enter to go to the RAID Properties screen. Continue with Step 5 to configure a two-disk mirrored volume. Go to Step 6 to configure a mirrored volume with three to six disks.
5. To configure a mirrored volume with three to six disks, or three to five disks with an optional hot spare disk:
   - In the RAID Properties screen, use the arrow keys to select the first disk for the IME volume.
   - Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value.
   - When the **Keep Data/Erase Disk** message appears, press Delete to erase the disk.
   - Use the arrow keys to select the next disk for the IME volume. Select **Yes** as the value for the Array Disk column.

     If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk.
   - Repeat the previous steps to select up to four more disks for the IME volume. If you want to configure a hot spare disk for the volume, you can only select up to three more disks.
6. (Optional) Use the arrow keys to select a hot spare disk for the IME volume. Select **Yes** as the value for the Hot Spare column.
7. When you have selected all disks for the IME volume, press **Esc** and select **Save changes, then exit this menu**. If you do not want to create the IME volume, select **Discard changes, then exit this menu**.

   The IME volume exists as soon as you save the changes. The RAID Properties screen now displays the IME volume properties and status.

Configuring SATA RAID devices

This section describes how to use the Intel Matrix Storage Manager option ROM Configuration utility to set up and manage SATA RAID volumes.

NOTE: If only a single HDD is attached, the Intel Matrix Storage Manager option ROM will not execute. All associated messages will not be displayed.

The Intel SATA AHCI BIOS always executes when RAID/AHCI is selected for the SATA emulation mode. This BIOS is only used to support serial attached optical drives. When an HDD is attached, the AHCI BIOS properly identifies the HDD that is connected to the appropriate SATA port and displays **Device not supported in this configuration**. This message is expected and does not indicate a problem.

This section does not apply to configuring SATA RAID in the Linux environment. For Linux SATA RAID, please refer to the "Software RAID in Linux workstations" chapter in the HP Workstations for Linux User Guide at www.hp.com/support/linux_user_manual.

Attaching SATA HDDs

Attach the required number of SATA hard drives for the desired RAID level.

- RAID 0: two to three hard drives
- RAID 1: two hard drives
- RAID 5: three hard drives
- RAID 10: four hard drives

Configuring system BIOS

Configure the system BIOS to enable embedded SATA RAID functionality.

1. Press **F10** to enter the system BIOS setup.
2. Use the arrow keys to highlight the desired language, then press **Enter**.
3. Use the arrows on your keyboard to highlight **Storage>Storage Options**, then press **Enter**.
4. Use the up or down arrow key to highlight **SATA Emulation**.
5. Use the left or right arrow key to select **RAID/AHCI**.
6. Press **F10** to accept the new setting.
7. Use the arrows on your keyboard to highlight **Advanced > Power-On Options**, then press **Enter**.
8. Use the up or down arrow key to highlight **POST Messages**.
9. Use the left or right arrow key to select **Enable**.
10. Press **F10** to accept the new setting.
11. Use the arrow keys to highlight **Advanced>Device Options**, and press **Enter**.
12. Use the up or down arrow key to highlight **SATA RAID Option ROM Download**, and press **Enter**.
13. Use the left or right arrow key to select **Enable**.
14. Press **F10** to accept the new setting.
15. Use the arrows on your keyboard to highlight **File>Save Changes and Exit**, and press **Enter**.
16. Press **F10** when prompted.

Creating RAID volumes

Use the Intel Matrix Storage Manager option ROM Configuration utility to create RAID volumes.

1. Press **Ctrl+I** when prompted to enter the Intel Matrix Storage Manager option ROM Configuration utility.
2. If required, see Deleting RAID volumes on page 139 to make enough physical drives available to create the desired RAID volume.
3. Use the up or down arrow key to highlight **1. Create RAID Volume**, and press **Enter**.
4. Type the desired RAID volume name in the “Name:” field, and press **Tab**.
5. Use the up or down arrow key to select the desired RAID level in the RAID Level: field, then press **Tab**.
6. Press **Enter** to display the Select Disks dialog.
7. Use the up and down arrow keys and Space to mark individual physical disks as members of the volume.
8. Press **Enter** to exit the Select Disks dialog and return to the Create Volume Menu dialog.
9. If appropriate, use the up or down arrow key to select the Strip Size in the Strip Size: field, and press **Tab**.
10. Type the desired volume size in the Capacity: field, and press **Tab**.
11. Press **Enter** to initiate volume creation.
12. When prompted, press **Y** to acknowledge the warning message and create the volume.
13. Return to step 3 to create additional RAID volumes, or use ? or ? to highlight **4. Exit**, and press **Ente**r.
14. Press **Y** when prompted to confirm the exit.

Deleting RAID volumes

Use the Intel Matrix Storage Manager option ROM Configuration utility to delete RAID volumes.

1. Use the up or down arrow key to highlight **2. Delete RAID Volume**, and press **Enter**.
2. Use the up or down arrow key to highlight the RAID volume to be deleted, and press **Del**.
3. When prompted, press **Y** to confirm the deletion of the selected RAID volume.
4. Choose one of the following steps:
   - Return to step 1 to delete additional RAID volumes.
   - To create RAID volumes, see Creating RAID volumes on page 139.
   - Use the up or down arrow key to highlight **4. Exit**, and press **Enter**.
   - Use the up or down arrow key to highlight **3. Reset Disks to Non-RAID**, and press **Enter**.
5. Use the up and down arrow keys and Space to mark individual physical disks to be reset.
6. Press **Enter** to complete the selection.

7. When prompted, press **Y** to confirm the reset action.
8. Choose one of the following steps:
   - Return to step 1. to delete additional RAID volumes.
   - To create RAID volumes, see Creating RAID volumes on page 139.
   - Use the up or down arrow key to highlight **4. Exit,** and press **Enter**.

7 Configuring password security and resetting CMOS

This chapter describes how to configure password security and to reset CMOS, and includes these topics:

Preparing to configure passwords

The Computer Setup (F10) Utility enables you to create setup and power-on passwords.

When you create a setup password, only the power-on password is required to access the Computer Setup (F10) Utility and any other information on the workstation. When you create both passwords, only the setup password gives you access to the Computer Setup (F10) Utility.

When both passwords are created, the setup password can also be used in place of the power-on password as an override to log into the workstation (a useful feature for a network administrator).

If you forget a password, two methods are available for clearing the password to gain access to the information on the workstation:

- Reset the password jumper
- Press the **Clear CMOS** button

△ **CAUTION:** Pressing the Clear CMOS button resets CMOS values to factory defaults and erases any customized information, including passwords, asset numbers, and special settings. It is important to back up your workstation CMOS settings before resetting them in case they are necessary later. To back up the CMOS settings, run the Computer Setup (F10) Utility and select **Save to Diskette** from the File menu.

Clearing and resetting workstation passwords

To disable the power-on or setup password features and clear the power-on and setup passwords:

⚠ **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 workstation 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.

1. Shut down the operating system, and then power off the workstation and any external devices. Disconnect the workstation power cord and any external devices from the power outlets.
2. Disconnect the keyboard, monitor, and any other external devices that are connected to the workstation.
3. Remove the access panel.
4. Locate the password header and jumper on the system board. The password header is E49.

NOTE: Ensure that the AC power cord is disconnected from the power outlet. The CMOS button does not clear CMOS if the power cord is connected.

The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, see the service label located on the inside of the workstation access panel, or see *Chapter 4, System board components*, of this document.

5. Remove the jumper from pins 1 and 2 (normally connecting both pins).
6. Replace the access panel.
7. Reconnect the external equipment.
8. Plug in and power on the workstation. Allow the operating system to start. This process clears the current passwords and disables the password features.
9. To establish new passwords, repeat steps 1 through 4, replace the password jumper that connects pin 1 and pin 2, and repeat steps 6 through 8. Establish the new passwords using the Computer Setup (F10) Utility.

Clearing and Resetting the CMOS

The CMOS of the workstation stores password information and information about the workstation configuration. This section describes the steps necessary to successfully clear and reset the CMOS.

Using the CMOS Button

Follow the steps below to clear CMOS using the Clear CMOS button:

⚠ **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 workstation is powered 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.

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

△ **CAUTION:** Pushing the Clear CMOS button resets CMOS values to factory defaults and erases any customized information, including passwords, asset numbers, and special settings. It is important to back up the workstation CMOS settings before resetting them in case they are necessary later. To back up the CMOS settings, use the Computer Setup (F10) Utility and select **Save to Diskette** from the File menu.

4. Locate, press, and hold the CMOS button for five seconds.

NOTE: Be sure that the AC power cord is disconnected from the power outlet. The CMOS button does not clear CMOS if the power cord is connected.

NOTE: For assistance locating the CMOS button and other system board components, see *Chapter 4, System board components*, in this document.

5. Replace the access panel.
6. Reconnect any external devices.
7. Plug in and power on the workstation.

NOTE: The workstation passwords and any special configuration information, including the system date and time, must be reset.

The workstation powers up for three to five seconds, then powers down.

Using the Computer Setup (F10) Utility to Reset CMOS

1. Access the Computer Setup (F10) Utility menu. When the Computer Setup message appears in the lower-right corner of the screen, press **F10**. Press **Enter** to bypass the title screen, if necessary.

NOTE: If you do not press the F10 key while the message is displayed, the workstation must be powered off, then on again, to access the utility.

2. From the Computer Setup (F10) Utility menu, select **File>Set Defaults**, and then select **Exit**. This restores the settings that include boot sequence order and other factory settings. However, it does not force hardware rediscovery.

NOTE: The workstation passwords and any special configuration information, including the system date and time, must be reset.

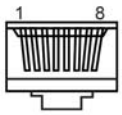
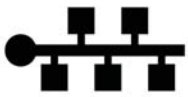
A Appendix A—Connector pins

Connector pin descriptions

NOTE: Your workstation configuration might not include all connectors shown in this appendix.

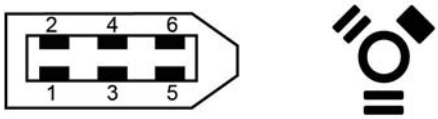
Workstation keyboard connector	Pin	Signal
 	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

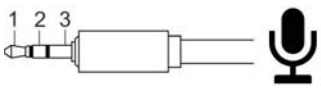
Workstation mouse connector	Pin	Signal
 	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

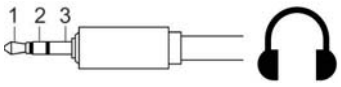
Workstation Ethernet connector	Pin	10/100–MbSignal	1000–Mb signal		
 	1	(+) Transmit Data	TX/RX	0	+
	2	(-) Transmit Data	TX/RX	0	–
	3	(+) Receive Data	TX/RX	1	+
	4	Unused	TX/RX	2	+
	5	Unused	RX/RX	2	–
	6	(-) Receive Data	TX/RX	1	–
	7	Unused	TX/RX	3	+
	8	Unused	TX/RX	3	–

Workstation serial connector (optional)	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

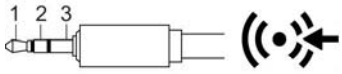
Workstation USB connector	Pin	Signal
	1	+5 VDC
	2	- Data
	3	+ Data
	4	Ground

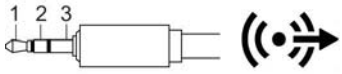
Workstation IEEE 1394 connector	Pin	Signal
	1	Power
	2	GND
	3	TPB-
	4	TPB+
	5	TPA-
	6	TPA+

Microphone cable connector (1/8 inch)	Pin	Signal
	1 (Tip)	Audio left / power
	2 (Ring)	Audio right / power
	3 (Shield)	Ground

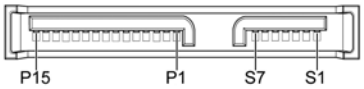
Headphone cable connector (1/8 inch)	Pin	Signal
	1 (Tip)	Audio Left
	2 (Ring)	Audio Right

Headphone cable connector (1/8 inch)	Pin	Signal
	3 (Shield)	Ground

Line-in audio cable connector (1/8 inch)	Pin	Signal
	1 (Tip)	Audio In Left
	2 (Ring)	Audio In Right
	3 (Shield)	Ground

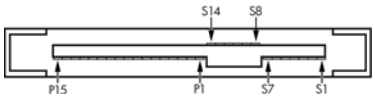
Line-out audio cable connector (1/8 inch)	Pin	Signal
	1 (Tip)	Audio Out Left
	2 (Ring)	Audio Out +Right
	3 (Shield)	Ground

SATA drive connector



Pin	Signal	Pin	Signal	Pin	Signal
Data Cable		Power Cable		Power Cable	
S1	Ground	P1	3.3V power	P8	5V power
S2*	A+	P2	3.3V power	P9	5V power
S3*	A-	P3	3.3V power	P10	Ground
S4	Ground	P4	Ground	P11	Reserved
S5**	B-	P5	Ground	P12	Ground
S6**	B+	P6	Ground	P13	12V power
S7	Ground	P7	5V power	P14	12V power
* S2 and S3 differential signal pair				P15	12V power
**S5 and S6 differential signal pair					

SAS drive connector

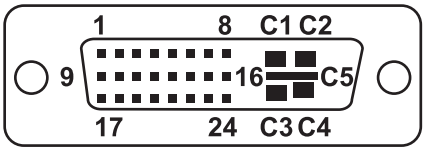


Segment	Pin	Backplane receptacle	Plug and cable receptacles
Primary signal segment	S1	SIGNAL GROUND	
	S2	TP+	RP+
	S3	TP-	RP-
	S4	SIGNAL GROUND	
	S5	RP-	TP-
	S6	RP+	TP+
	S7	SIGNAL GROUND	
Secondary signal segment	S8	SIGNAL GROUND	
	S9	TS+	RS+
	S10	TS-	RS-
	S11	SIGNAL GROUND	
	S12	RS-	TS-
	S13	RS+	TS+
	S14	SIGNAL GROUND	
Power segment	P1	V_{33}[c]	
	P2	V_{33}[c]	
	P3	V_{33}[c] precharge [c]	
	P4	GROUND	
	P5	GROUND	
	P6	GROUND	
	P7	V_5[c] precharge [c]	
	P8	V_5[c]	
	P9	V_5[c]	
	P10	GROUND	
	P11	READY LED [d]	
	P12	GROUND	
	P13	V_{12} precharge [c]	
	P14	V_{12}[c]	
	P15	V_{12}[c]	

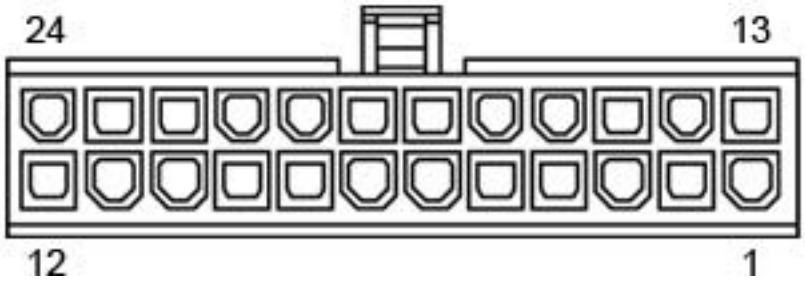
Workstation VGA connector (might be optional on you workstation model)

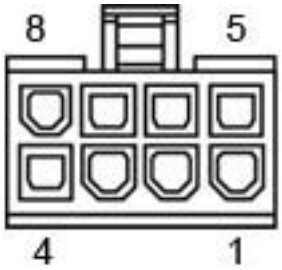
Pin	Signal	Pin	Signal	Pin	Signal
1	Red Analog	6	GND	11	Monitor ID
2	Green Analog	7	GND	12	DDC Serial Data
3	Blue Analog	8	GND	13	Horizontal Sync
4	Monitor ID	9	+5 VDC	14	Vertical Sync
5	GND	10	GND	15	DDC Serial Clock

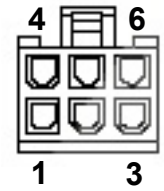
DVI-I cable connector



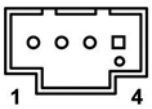
Pin	Signal	Pin	Signal
1	T.M.D.S DATA 2-	16	HOT PLUG DETECT
2	T.M.D.S DATA 2+	17	T.M.D.S DATA 0-
3	T.M.D.S DATA 2/4 SHIELD	18	T.M.D.S DATA 0+
4	T.M.D.S DATA 4-	19	T.M.D.S DATA 0/5 SHIELD
5	T.M.D.S DATA 4+ 2	0	T.M.D.S DATA 5-
6	DDC CLOCK	21	T.M.D.S DATA 5+
7	DDC DATA	22	T.M.D.S CLOCK SHIELD
8	ANALOG VERT. 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

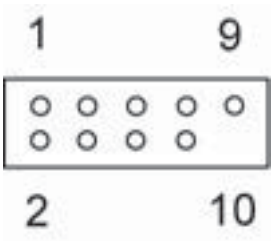
24-pin main power system board connector P1							
							
1	+3.3V	7	GND	13	+3.3V	19	GND
2	+3.3V	8	POK	14	-12V	20	PS_ID
3	GND	9	+5 Vaux	15	GND	21	+5V
4	+5V	10	+12 V-B	16	PS_ON_L	22	+5V
5	GND	11	+12 V-B	17	GND	23	V12-M
6	+5V	12	V12-M	18	GND	24	GND

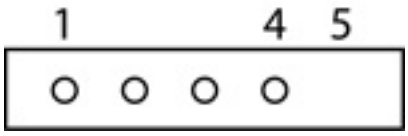
8-pin CPU power system board connector P3	Pin	Color	Signal
	1	BLK	GND
	2	BLK	GND
	3	BLK	GND
	4	BLK	GND
	5	BLK/WHT STRIPE	+12-VCPU0
	6	BLK/WHT STRIPE	+12-VCPU0
	7	BLK/LT BLUE STRIPE	+12-VCPU1
	8	BLK/LT BLUE STRIPE	+12-VCPU1

6-pin power (auxiliary PCI Express) cable connector P12	Pin	Color	Signal
	1	BLK/YEL STRIPE	+12 V-D
	2	BLK/YEL STRIPE	+12 V-D
	3	BLK/YEL STRIPE	+12 V-D
	4	BLK	GND
	5	BLK	GND
	6	BLK	GND

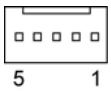
NOTE: The 6-pin power (auxiliary PCI Express) cable and connector is only used to power a high-powered graphics card.

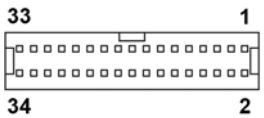
Workstation AUX_IN connector	Pin	Signal
	1	AUX_LEFT
	2	AGND
	3	AGND
	4	AUX_RIGHT

Front USB system board 2x5 header connector	Pin	Signal
	1	+5V
	2	+5V
	3	USB1–
	4	USB2–
CAUTION: Possible equipment damage. The 2x5 system board connector can be mated to either a wide 2x5 option cable connector or a narrow 1x5 option cable connector. To prevent damage to the connectors, always connect a narrow 1x5 option cable connector to pins 1,3,5, and 7 only of the 2x5 system board connector (pin 9 is not keyed on the system board connector).	5	USB1
	6	USB2
	7	GND
	8	GND
	9	Connector-present Detect
	10	key (no pin)

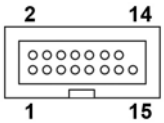
Internal USB system board 1x5 connector	Pin	Signal
	1	+5V
	2	USB-
	3	USB
	4	GND
	5	(not keyed)

Workstation memory and chipset fan connector	Pin	Signal
	1	Ground
	2	+12V
	3	Tach
	4	PWM

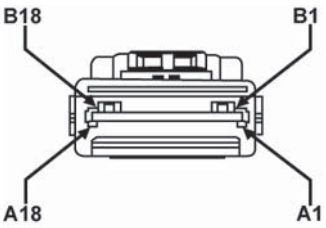
CPU fan system board connector	Pin	Signal
	1	GND
	2	+12V
	3	Tach 1
	4	PWM
	5	Tach 2

Workstation FDD connector	Pin	Signal	Pin	Signal
	1	Ground	18	FLP_DIR#
	2	FLP_LOWDEN#	19	Ground
	3	Key (no pin)	20	FLP_STEP#
	4	FLP_WDO	21	Ground
	5	Key (no pin)	22	FLP_WDATA#
	6	Unused	23	Ground
	7	Ground	24	FLP_WRTEN#
	8	FLP_INDEX#	25	Ground
	9	Ground	26	FLP_TRACK#
	10	FLP_MOTOR#	27	Ground

Workstation FDD connector	Pin	Signal	Pin	Signal
	11	Ground	28	FLP_WP#
	12	Unused	29	Ground
	13	Ground	30	FLP_RD_D#
	14	FLP_SEL_A#	31	Ground
	15	Ground	32	FLP_HD_SEL#
	16	Unused	33	Ground
	17	Ground	34	FLP_DSKCHG#

Workstation internal serial connector	Pin	Signal	Pin	Signal
	1	DTR1#	9	+5V
	2	RXD1	10	+3.3V AUX
	3	CTS1#	11	RTS1#
	4	DSR2#	12	+3.3V
	5	TXD1	13	DET#
	6	RI1#	14	-12V
	7	Ground	15	+12V
	8	Ground		

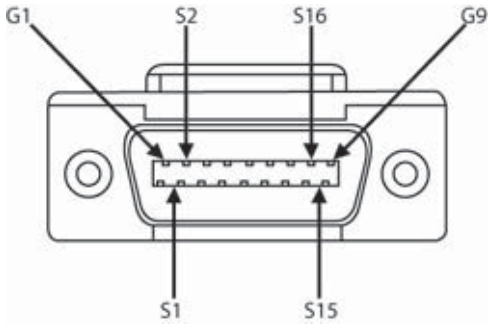
MiniSAS 4i cable connector



Pin 1	Pin 2	Pin 3	Pin 4	Signal
A2	A2	A2	A2	Rx 0+
A3	A3	A3	A3	Rx 0–
N/C*	A5	A5	A5	Rx 1+
N/C	A6	A6	A6	Rx 1–
A8	A8	A8	A8	Sideband 7
A9	A9	A9	A9	Sideband 3
A10	A10	A10	A10	Sideband 4
A11	A11	A11	A11	Sideband 5

MiniSAS 4i cable connector				
N/C	N/C	A13	A13	Rx 2+
N/C	N/C	A14	A14	Rx 2-
N/C	N/C	N/C	A16	Rx 3+
N/C	N/C	N/C	A17	Rx 3-
B2	B2	B2	B2	Tx 0+
B3	B3	B3	B3	Tx 0-
N/C	B5	B5	B5	Tx 1+
N/C	B6	B6	B6	Tx 1-
B8	B8	B8	B8	Sideband 0
B9	B9	B9	B9	Sideband 1
B10	B10	B10	B10	Sideband 2
B11	B11	B11	B11	Sideband 6
N/C	N/C	B13	B13	Tx 2+
N/C	N/C	B14	B14	Tx 2-
N/C	N/C	N/C	B16	Tx 3+
N/C	N/C	N/C	B17	Tx 3-
A1, A4, A7, A12, A15, A18, B1, B4, B7, B12, B15, B18				SIG GND
* N/C = not connected				

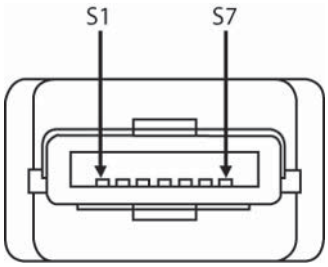
MiniSAS 4x cable connector



Pin 1	Pin 2	Pin 3	Pin 4	Signal
S1	S1	S1	S1	Rx 0+
S2	S2	S2	S2	Rx 0-
N/C	S3	S3	S3	Rx 1+
N/C	S4	S4	S4	Rx 1-
N/C	N/C	S5	S5	Rx 2+

N/C	N/C	S6	S6	Rx 2-
N/C	N/C	N/C	S7	Rx 3+
N/C	N/C	N/C	S8	Rx 3-
N/C	N/C	N/C	S9	Tx 3-
N/C	N/C	N/C	S10	Tx 3+
N/C	N/C	S11	S11	Tx 2-
N/C	N/C	S12	S12	Tx 2+
N/C	S13	S13	S13	Tx 1-
N/C	S14	S14	S14	Tx 1+
S15	S15	S15	S15	Tx 0-
S16	S16	S16	S16	Tx 0+
G1 - G9				SIG GND
Housing				CHASSIS GND
* N/C = not connected				

eSATA cable connector



Name	Type	Description	Cable Usage	Backplane Usage
S1	GND		1st mate	2nd mate
S2	A+	Differential signal pair A	2nd mate	3rd mate
S3	A-		2nd mate	3rd mate
S4	GND		1st mate	2nd mate
S5	B-	Differential signal pair B	2nd mate	3rd mate
S6	B+		2nd mate	3rd mate
S7	GND		1st mate	2nd mate

B Appendix B—System board component designators

HP xw6600 Workstation system board component designators

Designator	Silkscreen	Component
E49	E49	Clear password header/jumper
J20	SLOT 5–PC132	PCI slot
J21	SLOT 6–PC132	PCI slot
J32	SLOT 3 PCIe x8 (4)	PCI Express slot
J31	SLOT1 PCIe x8 (4)	PCI Express slot
J33	SLOT4 PCIe2 x16 75W	PCI Express slot
J41	SLOT2 PCIe2 x16 75W + 75W	PCI Express slot
P60-63	SATA0 – SATA3	SATA connectors
P66, P67	SATA4, SATA5	SATA connectors (external SATA capable)
P53	SERIAL	Serial port header
J68	KBD_MS	Stacked keyboard/mouse connector
J9	J9	Stacked RJ 45/dual USB
J10	QUAD USB	Quad stacked USB
J83	J83	Triple stacked audio jack
SW1	CMOS	Clear CMOS switch/push button
P1	P1	Power supply connector (24-pin)
P3	PWRCPU	Processor power
P10	FLPY	Diskette driver connector
P11	AUX-IN	Auxiliary audio connector
P23	FRNT AUD	Front panel audio header
P24	FRNT USB	Front panel USB header
P25	INT USB	Internal USB header
P29	HD-LED	HDD LED connector
J99	CONTROL PANEL	Main power/HDD LED/internal speaker connector
P70	CPU0_FAN	Primary processor fan header

Designator	Silkscreen	Component
P71	CPU1_FAN	Secondary processor fan header
P8, P9	CH_FAN1, CH_FAN2	Chassis fan headers
P93	PCI FAN	PCI fan header
P92	MEM_FAN	Memory fan header
P125	MCH_FAN	Chipset fan header
XBT	BAT	Battery retainer
XMM1 — XMM8	DIMM1 — DIMM8	Memory slots
U1	XU1	Primary processor socket
U2	XU2	Secondary processor socket
E15	E15	Crisis recovery header/jumper
P124	P124	Solenoid hood lock header
P20	IDE	IDE device connector

C Appendix C—Routine care

General cleaning safety precautions

- Never use solvents or flammable solutions to clean the workstation.
- Never immerse any component in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
- Always unplug the workstation before cleaning the keyboard, mouse, or air vents.
- Always disconnect the keyboard before cleaning it.
- Wear safety glasses equipped with side shields when cleaning the keyboard.

Cleaning the workstation case

- Follow the service consideration (Service considerations on page 48) presented before cleaning the workstation.
- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dish washing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is required because the alcohol evaporates quickly and does not leave a residue.
- After cleaning, always wipe the workstation with a clean, lint-free cloth.
- Occasionally, clean the air vents on the workstation. Lint and other foreign matter can block the vents and limit the airflow.

Cleaning the keyboard

△ **CAUTION:** Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- Follow the safety precautions presented in Service considerations on page 48 before cleaning the keyboard.
- Visible debris underneath or between the keys can be removed by vacuuming or shaking.
- Canned, pressurized air can be used to clean debris from under the keys. Use caution because too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key remover to prevent damage to the keys. This tool is available from many electronic supply outlets.

  △ **CAUTION:** Never remove a wide key (like the space bar key) from the keyboard. If these keys are improperly removed or installed, the keyboard might not function properly.

- Clean under a key with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Allow the parts to air dry before reassembly.
- Use tweezers to remove any fibers or dirt in confined areas.

Cleaning the monitor

- Follow the safety precautions presented in Service considerations on page 48 before cleaning the monitor.
- To clean the monitor, wipe the monitor screen with a towelette designed for cleaning monitors or a clean cloth moistened with water.

△ **CAUTION:** Do not use sprays or aerosols directly on the screen—the liquid might seep into the housing and damage a component.

Never use solvents or flammable liquids on the monitor because display or housing damage may result.

Cleaning the mouse

1. Follow the safety precautions presented in Service considerations on page 48 before cleaning the mouse.
2. Remove the mouse ball from the housing by removing the retaining plate.
3. Clean the mouse ball.
4. Pull out any debris from the ball socket, and wipe the ball with a clean, dry cloth.
5. Reassemble the mouse.