HP Workstation xw6200

Service and Technical Reference Guide

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Part number: 361758-001
First Edition: June 2004
Second Edition: August 2004
Third Edition: October 2004

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Contents

Preface

Important Safety Warnings

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

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

WARNING! *Grounding your Equipment.* For your safety always connect the equipment to a grounded wall outlet. Always use a power cord with a properly grounded plug, such as the one provided with the equipment, or one in compliance with your national safety standards. This equipment can be disconnected from the power by removing the power cord from the power outlet. This means the equipment must be located close to an easily accessible power outlet.

WARNING! *Protecting your Ears.* If your system is a multimedia model, or if you have installed a sound card in your system, always turn the volume down before connecting the headphones or speakers. This prevents discomfort from unexpected noise or static. Listening to loud sounds for prolonged periods of time may permanently damage your hearing. Before putting on headphones, place them around your neck and turn the volume down. When you put on the headphones, slowly increase the volume until you find a comfortable listening level. When you can hear comfortably and clearly, without distortion, leave the volume in that position.

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

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

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

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

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

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

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

WARNING! if you have a modem:

Do not attempt to connect this product to the phone line during a lightning storm. Never install telephone jacks in wet locations unless the telephone line has been disconnected at the network interface. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Use caution when installing or modifying telephone lines. Avoid using a telephone (other than a cordless type) during an lightning storm. There may be a risk from lightning.

Do not use the telephone to report a gas leak in the vicinity of the leak.

Never touch or remove the communications board without first removing the connection to the telephone network.

CAUTION *Avoid Static Electricity.* Static electricity can damage electronic components. Turn OFF all equipment and disconnect the power cable before installing an accessory card. Do not let your clothes touch any accessory card. Handle the card as little as possible and with care.

CAUTION *Information on Ergonomic Issues.* It is strongly recommended that you read the ergonomics information in the *Safety and Comfort Guide* on the *Documentation Library* CD before using your system. You can access more extensive ergonomics information at: http://www.hp.com/ergo.

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

Updating BIOS, Drivers, and Software

HP continually strives to implement new enhancements that will increase functionality, performance, and reliability of your HP Workstation. To ensure that your workstation takes advantage of the latest enhancements, HP recommends that you install the latest BIOS, driver, and software updates on a regular basis.

To download available updates from the HP Web site:

- Go to www.hp.com/go/bizsupport

  Or

- Click **Start>Help & Support Center**. Then, click the **HP Software & Drivers Download** icon, select your operating system, and review or select available updates.

Finding Information

E-Support

For online access to technical support information and tools, go to http://www.hp.com/support. Support resources include web-based troubleshooting tools, technical knowledge databases, driver and patch downloads, online communities, and proactive notification services.

The following sites are also available to you.

- http://www.hp.com—Provides useful product information.
- http://www.hp.com/support/workstation_manuals—Provides the latest online documentation.

- http://welcome.hp.com/country/us/eng/wwcontact.html—Provides a listing of the worldwide technical support phone numbers.

Additional Documentation

Refer to the *Documentation Library* CD for additional product information in PDF format. The CD contains the following:

- ***Getting Started*** (available in print and PDF on library CD)
  Helps you set up hardware and factory-provided software; also includes basic troubleshooting information should you encounter any problems during initial startup.
- ***Safety and Comfort Guide*** (PDF on library CD)
  Provides safety and ergonomic information to assist you in setting up a safe and comfortable workstation environment.
- ***Safety & Regulatory Information Guide*** (PDF on library CD)
  Provides safety and regulatory information that ensures compliance with U.S., Canadian, and various international regulations.

Helpful links

The following links can also be accessed for additional information:

- Product Bulletin—The product bulletin contains the QuickSpecs and is available at:

  http://h18000.www1.hp.com/products/quickspecs/productbulletin.html
- For information about the Microsoft® Windows® operating system:
  http://www.microsoft.com
- For information about the Linux operating system:
  http://www.redhat.com
- Additional product information is available from the HP website at http://www.hp.com/go/workstations.

Using the *Documentation Library* CD

To access the contents of the *Documentation Library* CD follow the steps that are applicable to your workstation.

Windows-Based Workstations

Insert the CD into the CD-ROM drive. The CD Autorun feature begins.

If there is no CD-ROM drive activity for two minutes or more, the Autorun feature might not be enabled on the workstation. To run the CD:

1. Click **Start>Run**.
2. In the text box, enter:

   ```
   X:\index.htm
   ```

   (where X is the drive letter designator for the CD-ROM drive)
3. Click **OK**.

Linux-Based Workstations

If the workstation is running a Linux operating system, browse the CD and click the **index.htm** file to launch the CD interface. To view the documents on the CD, download and install Adobe® Acrobat® Reader for Linux from http://www.adobe.com.

Locating Regulatory Information

Refer to the *Safety & Regulatory Information* guide on the *Documentation Library* CD for product class information. You can also refer to the label on the rear of the chassis.

Parts and Accessories

For complete and current information on supported accessories and components, visit http://partsurfer.hp.com

Subscriber's Choice

Subscriber's Choice, an HP program, allows you to sign up to receive driver and software alerts, proactive change notifications (PCNs), the HP newsletter, and more. Sign up today at http://www.hp.com/go/subscriberschoice

Chapter 1 Product Overview

This chapter presents an overview of the hardware components of the HP Workstation.

Product Features

Exploded View

The following image shows a typical HP Workstation xw6200. Drive configurations can vary.

For complete and current information on supported accessories and components, visit http://partsurfer.hp.com.

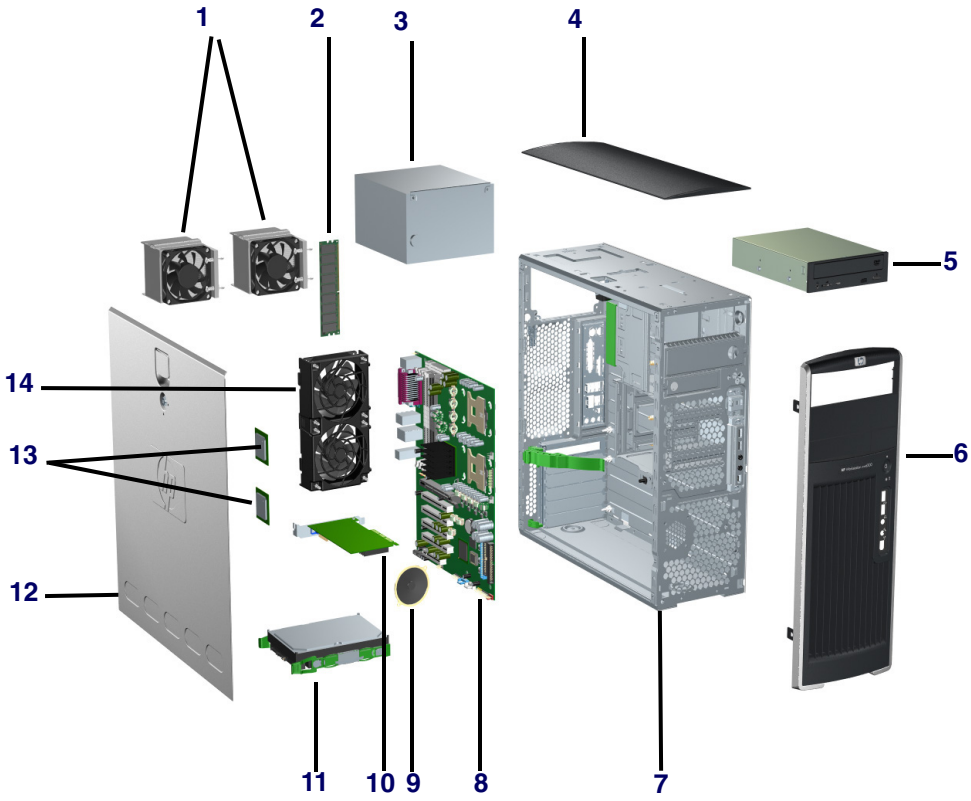


Table 1-1 Exploded View

1	CPU Heatsinks	**6**	Front Bezel	**11**	Hard Drive
2	Memory Module	**7**	Chassis	**12**	Access Panel
3	Power Supply	**8**	System Board	**13**	Processors
4	Top Cover	**9**	System Speaker	**14**	System Fans
5	Optical Drive*	**10**	PCI-E (graphics)		

*An optical drive is a CD-ROM, CD-R/RW, DVD-ROM, DVD+R/RW, or CD-RW/DVD combo drive.

Front Panel Components

The following image shows a typical HP Workstation xw6200. Drive configurations can vary.

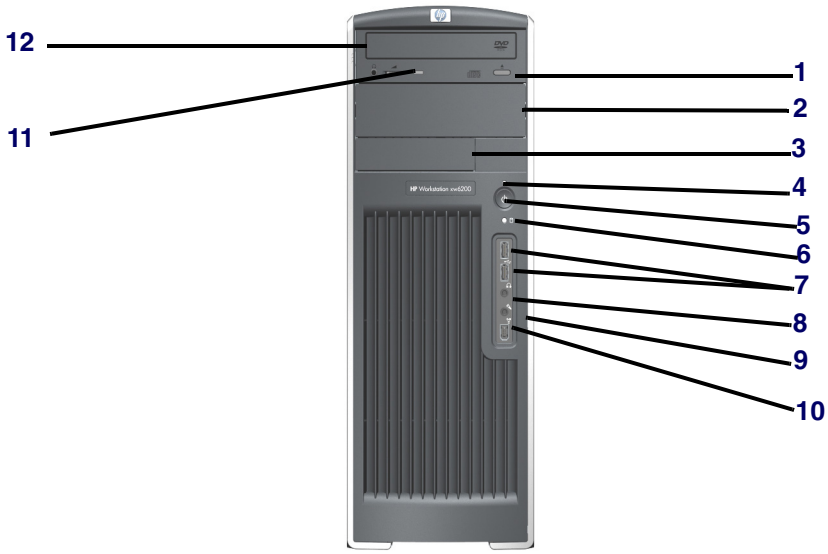


Table 1-2 Front Panel View

1	Optical Drive Eject Button	**5**	Power Button	**9**	Microphone Connector
2	5.25-Inch Drive Bay	**6**	Hard Drive Activity Light	**10**	IEEE-1394 Connector**
3	Diskette Drive (optional)	**7**	Universal Serial Bus (USB)	**11**	Optical Drive Activity Lights
4	Power On Light	**8**	Headphone Connector	**12**	Optical Drive*

*An optical drive is a CD-ROM, CD-R/RW, DVD-ROM, DVD+R/RW, or CD-RW/DVD combo drive.

**IEEE-1394 is an optional feature. If the workstation was purchased without this option, then this connector will be covered.

Rear Panel Components

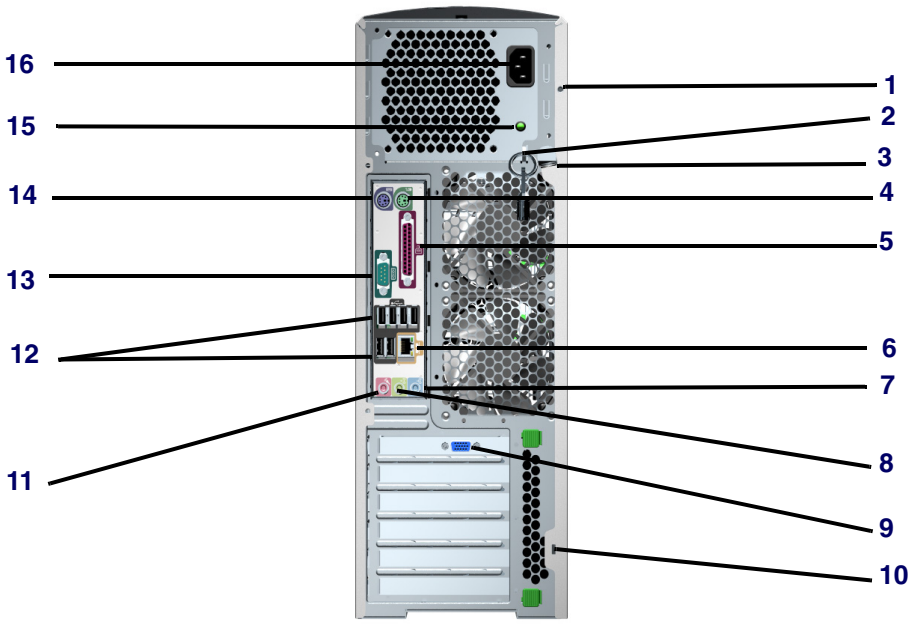


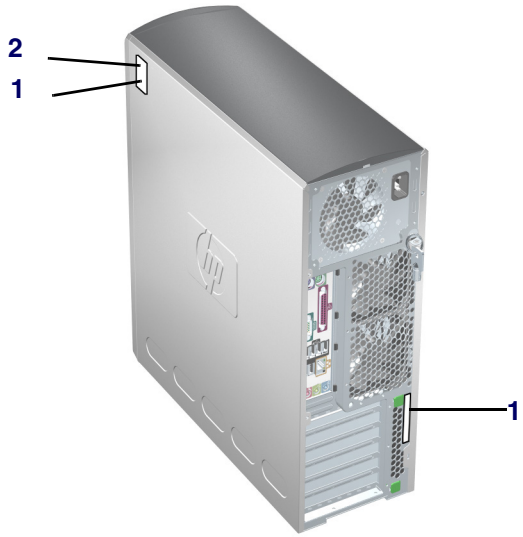
Table 1-3 Rear Panel Components

1	Universal Chassis Clamp Lock Hole	**9**	Graphics Adapter
2	Padlock Loop	**10**	Cable Lock Slot
3	Access Panel Key	**11**	Microphone Connector (pink)
4	PS/2 Mouse Connector (green)	**12**	USB Ports (x6)
5	Parallel Connector (burgundy)	**13**	Serial Connector (teal)
6	RJ-45 Network Connector	**14**	PS/2 Keyboard Connector (purple)
7	Audio Line-In Connector (light blue)	**15**	Built-In Self Test (BIST) LED
8	Audio Line-Out Connector (lime)	**16**	Power Cord Connector

NOTE: To assist you in connecting your peripheral devices, the rear panel connectors are labeled and color-coded according to industry standard.

Serial Number and COA Label Location

Each workstation has two unique serial number labels. Systems preinstalled with Windows XP also have a certificate of authentication (COA) label **2**. The serial number labels **1** are located on the side panel of the unit and on the rear panel. Keep this number available when contacting customer service for assistance.



Product Specifications

The following table lists the physical dimensions.

Table 1-4 Physical Characteristics

Weight (typical configuration)	16kg (35 lb)
Tower Dimensions	441 mm (17.4 in.) tall 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 <4U 425mm (16.75 in.) fits in standard 19 in. rack. 440 mm (17.3 in.) deep

Power Supply and Cooling

The workstation has 8 outputs:

- +3.3V—used with PCI, MCH, ICH5, PXH, LAN, SATA hard drives, and on-board logic
- +5V—used with storage (disk, optical, diskette), PCI, Audio, USB, and on-board logic
- +12V-A—used with PCI, fans, input to onboard regulators that supply 1.2V, 1.5V, and 1.8V
- +12V-B—used with storage (disk, optical, floppy), PCI Express x16 auxiliary connector
- +12VCPU0—input to onboard regulator that supplies power for CPU0
- +12VCPU1—input to onboard regulator that supplies power for CPU1
- -12V—used by PCI
- 5VSB—used for sleep circuitry

Table 1-5 Power Supply and Cooling (Voltage)

Voltage	Minimum	Maximum
3.3 V	3.17 V	3.47 V
5 V	4.85 V	5.25 V
12 VCPU0	11.52 V	12.6 V
12 VCPU1	11.52 V	12.6 V
12 V-A	11.52 V	12.6 V
12 V-B	11.52 V	12.6 V
V12N	-11.4 V	-12.6 V
5 VSB	4.85 V	5.25 V

Table 1-6 Power Supply and Cooling (Current)

Current	Minimum	Operating	Continuous	Maximum
3.3 V	0 A	3.1 A	23 A	31.0 A
5 V	0 A	2.3 A	18 A	23.0 A
12 VCPU0	0 A	3.1 A	11.4 A	13.7 A
12 VCPU1	0 A	0 A	11.4 A	13.7 A
12 V-A	0 A	0 A	13.7 A	17.0 A
12 V-B	0 A	0 A	13.7 A	14.0 A
V12N	0 A	0 A	0.5 A	0.8 A

Table 1-6 Power Supply and Cooling (Current)

Current	Minimum	Operating	Continuous	Maximum
5 VSB	0 A	0 A	2 A	2 A

WARNING! Do not exceed 110 W of a 5 V and 3.3 V power combination.

WARNING! Do not exceed 456 W of 12 V (CPU0/CPU1/A/B) power combination.

WARNING! Do not exceed 182.4 W of a 12 V (A and B) power combination.

WARNING! Do not exceed 500 W of total continuous output power.

Power Supply Specifications

Table 1-7 Power Supply Specifications

Full Ranging Input (No Line Select Switch)	Yes
Active Power Factor Correction (APFC) (Input Current is nearly 1/2 a non-APFC PS)	Yes
Passive Power Factor Correction (PFC)	No
Operating Voltage Range	90 - 264 VAC / 118 VAC
Rated Voltage Range	100 -240 VAC
Rated Line Frequency	50-60 Hz / 400Hz
Operating Line Frequency Range	47 - 66 Hz / 393 - 407Hz
Rated Input Current	9A / 9A
Maximum Rated Power	500 W
Heat Dissipation	Typical 1228.9 btu/hr Maximum 2625.4 btu/hr
Power Supply Fan	92mm variable speed
PS Size (wide x high x deep)	97.8mm x 149.9mm x168.10mm
ENERGY STAR compliant	Yes
FEMP Standby Power Compliant(<2W in S5 - Power Off)	No

Table 1-7 Power Supply Specifications

BIST LED	Yes
Surge Tolerant Full Ranging Power Supply	Withstands power surges up to 2000V

Power Consumption and Cooling

The following table shows the power consumption for a typical configuration (based on primary power consumptions):

- Two processors (2x3.6GHz Xeon)
- 1 GB memory (2x512 MB)
- Two hard drives (2xSATA 40 GB)
- DVD-ROM drive
- PCI Express graphics card (FX1300)
- Diskette drive
- One monitor

Table 1-8 Power Consumption and Cooling

Input Power Consumption[a]	**@ 120Vac/60Hz**
Typical operating mode	360 W = 1228.9 btu/hr
Windows XP Idle	201 W = 685.9 btu/hr
Hibernate mode (S4)	6.4 W = 21.84 btu/hr
Power Off (S5)	6.4 W = 21.84 btu/hr

a. Approximate values

NOTE When you turn off your workstation with the power button on the front panel, the power consumption falls below 10 W. To reach zero power consumption, either unplug the workstation from the power outlet or use a power strip with a switch.

For additional information on power-saving features, refer to your operating system documentation.

System Fans and Airflow

The workstation includes two rear system fans, one CPU heatsink fan for each processor (CPU), plus optional front system fans.

Resetting the Power Supply

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

1 Disconnect the power cord.

2 Determine what caused the overload and fix the problem.

3 Reconnect the power cord and reboot the workstation.

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

Environmental Specification

Table 1-9 Environmental Specifications

Temperature (operating)	40° to 95° F (5° to 35° C)
Temperature (non-operating)	-40° to 140° F (-40° to 60° C)
Humidity (operating)	8% to 85% RH, non-condensing
Humidity (non-operating)	8% to 90% RH, non-condensing
Shock (operating)	1/2-sine: 40G, 2–3ms
Shock (non-operating)	1/2-sine: 160 cm/s, 2–3ms, (~100g) square: 20G, 422 cm/s
Vibration (operating)	Operating random: 0.5G(RMS), 5–300Hz
Vibration (non-operating)	Random: 2.0g(RMS), 10–500Hz
Maximum Altitude (operating)	0–10,000 ft (3,048 m)
Maximum Altitude (non-operating)	0–30,000 ft (9,144 m)

PCI and PCI Express Slot Power Specifications

The following table describes the slots, card types, and maximum slot power.

Table 1-10 PCI and PCI Express Slot Power Specifications

Slot#	Slot Type	Slot Power (Maximum)
1	PCI Express x16 graphics	150 W**
2	PCI	25 W*
3	PCI	25 W*

Table 1-10 PCI and PCI Express Slot Power Specifications

Slot#	Slot Type	Slot Power (Maximum)
4	PCI	25 W*
5	PCI	25 W*
6	PCI Express x8' (x4 performance)	25 W*

* In addition to these slot power specifications, the overall power consumption of the system (including I/O cards, processor, and memory) must not exceed the maximum ratings of the system power supply.
** Includes 75W maximum from the system board connector, and 75W maximum from the auxiliary graphics power connector.

NOTE If a graphics card requiring more than 75W is installed, HP recommends not using slot 2, which is the PCI slot adjacent to the graphics slot. In addition to these slot power specifications, the overall power consumption of the system (including I/O cards, processors, memory, drives) must not exceed the maximum ratings of the system power supply.

For hardware specifications of other system components, such as graphics cards or optical drives, refer to the website of the specific manufacturer.

ENERGY STAR

The ENERGY STAR® program, a government-backed initiative, promotes energy efficiency by identifying ways to reduce energy consumption. Select HP workstations participate in the ENERGY STAR program.

NOTE ENERGY STAR is not supported on Linux-based workstations.

For those workstations that support ENERGY STAR and have it enabled, the power management features will be set as follows:

- Monitor—goes into sleep mode after 20 minutes of inactivity.
- System—goes into Hibernate mode after 25 minutes of inactivity.
- Hard Drive—goes into power savings mode after the system goes into Hibernate mode.

NOTE If you have to restore the operating system, reset the ENERGY STAR settings (if applicable) after the restore.

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

ENERGY STAR Compliance

HP products purchased with the ENERGY STAR configuration are compliant with the U.S. Environmental Protection Agency (EPA) ENERGY STAR Computers Program. The EPA ENERGY STAR

configuration does not imply endorsement by the EPA. As an ENERGY STAR Partner, HP has determined that products with the ENERGY STAR configuration meet the ENERGY STAR guidelines for energy efficiency.

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. HP products achieve this by reducing the power consumption when not being used.

ENERGY STAR on HP Workstations uses ACPI power management. The system can wake as a result of a user action (keyboard or mouse) or from the network or a modem.

The Power Management feature, when used in conjunction with an external ENERGY STAR-compliant monitor, will support the power-down features of the monitor. The Power Management feature allows an external monitor to go into low-power mode when the energy save timeout occurs.

CAUTION Using the Energy Save Monitor feature with non-ENERGY STAR-compliant monitors might cause video distortion when the Energy Save timeout occurs.

Hyper-Threading Technology

Hyper-Threading Technology, developed by Intel®, enables a single processor to execute multiple threads of instructions simultaneously. Hyper-Threading Technology enables the processor to utilize its execution resources more efficiently, delivering performance increases and improving user productivity. Not all systems benefit from the Hyper-Threading Technology.

To see if Hyper-Threading Technology can benefit you, test your system by turning the feature on. To do this, run Computer Setup (F10) during the boot process and select **Advanced>Processors>Hyper-Threading**, and enable the Hyper-Threading Technology.

NOTE The Hyper-Threading Technology is recommended for use with Windows XP systems. This technology is detected by the system and is turned on in the operating system after it is enabled in the system BIOS.

NOTE The Hyper-Threading Technology is not recommended for use with Windows 2000-based workstations.

NOTE With the release of Red Hat Enterprise Linux WS 3.0, Hyper-Threading Technology is compatible with Linux-based systems. Before this technology can be enabled, an SMP kernel must be installed on your system.

For more information about the Hyper-Threading Technology, visit the Intel website at http://www.intel.com.

Chapter 2 Installing or Restoring the Operating System

This chapter describes the installation and restoration of the operating system.

If the workstation was shipped with a preinstalled OS, it is configured automatically the first time the workstation is turned on.

△ **CAUTION** Adding optional hardware devices to your workstation before the operating system successfully installs can cause errors and prevent the operating system from installing properly.

△ **CAUTION** After the automatic installation has begun, DO NOT TURN OFF THE WORKSTATION UNTIL THIS PROCESS COMPLETES. Turning off the workstation during the installation process might damage the software that runs the system.

Installing the Operating System and Software

The following section discusses the operating system and HP software installation procedures.

Microsoft Windows XP Professional

The first time you turn on your workstation, you are 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 takes approximately 10 minutes, depending on the system hardware configuration. During the process, do not turn off your workstation unless you are directed to do so.

Installing or Upgrading Device Drivers

To install hardware devices, such as a printer, a display adapter, or network adapter after the operating system installation is completed, the operating system needs access to the appropriate software drivers for the devices. Device drivers are usually provided on a CD supplied with the peripheral device.

Some existing peripheral devices might not have been shipped with drivers developed for Windows XP. To locate the most current device drivers, visit http://www.hp.com/go/workstationsupport.

Creating a Restore Diskette

To create a restore diskette for Windows XP, select **Start>Programs>Accessories>System Tools>System Restore** and follow the on-screen instructions.

Linux-Preinstalled Workstations

If you have a Linux-preinstalled workstation, follow the instructions in this section to set up your OS and software.

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

NOTE For additional information concerning the setup of Linux-preinstalled or Linux-enabled workstations, refer to the *HP User Manual for Linux*, which is located at http://www.hp.com/support/linux_user_manual.

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

Starting Up the Linux Operating System

The first time the workstation is booted, 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 TURN OFF THE WORKSTATION UNTIL THE PROCESS IS COMPLETE. Turning off the workstation during the installation process might damage the software that runs the workstation or prevent its proper installation.

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

Restoring the Linux Operating System

NOTE To restore the Linux OS, the HP Driver CD and Red Hat box set are required.

Download the latest HP Driver CD to get any new enhancements.

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

DOWNLOADING THE LATEST HP DRIVER CD

To download the latest HP Driver CD:

1. Download the ISO image to a local hard drive from the HP support website for the appropriate workstation platform (such as http://www.hp.com/support/xw6200).
   a. Click the download drivers and software link.
   b. Select the Linux OS that matches your box set.
   c. Select the latest version from the Utility Tools section.
   d. Download and unpack it (`tar zxvf filename.tgz`).
2. Copy the ISO image to CD-R bootable media. On another Linux workstation, use the cdrecord utility. Identify the device address for the CD burner (`cdrecord --scanbus`). The default is usually 2, 0, 0.

   Example:
   ```
   cdrecord -v -eject dev=2,0,0 CD0_golden.iso
   ```

INSTALLING WITH THE HP DRIVER CD

To install with the HP Driver CD:

1. Boot the workstation from the Red Hat box set Binary CD 1.
2. Insert the Linux operating system CDs from the Red Hat box set as prompted.
3. Continue following the prompts until the operating system is successfully installed.
4. Configure the X server to start on reboot.
5. Reboot the workstation.
6. Follow the prompts to set up your system with the Red Hat First Boot utility.
7. When prompted in First Boot to add additional CDs, insert the HP Driver CD into the CD-ROM tray of the workstation.

8 Click **Install** next to “Additional CDs.”
The HP Driver CD window opens.

9 Click **Press to begin install...**

10 When the install is done, you will have two options, “Reboot now...” on the left side and “Press to continue, reboot later...” on the right side.

11 Click **Reboot now...**

Upgrading Device Drivers

If you must upgrade a Linux device driver, visit the HP website at http://www.hp.com/go/workstationsupport.

Linux-Enabled Workstations

Linux-enabled workstations are not preinstalled with Linux. They require the HP Installer Kit for Linux and the purchase of a Red Hat box set. The Installer kit includes the HP CDs necessary to complete the installation of all versions of the Red Hat box set that have been verified to work on HP workstation hardware.

Verifying Hardware Compatibility

To see which Linux versions have been verified to work on HP workstation hardware:

1 Go to http://www.hp.com/support/workstation_manuals.

2 Select your HP workstation model.

3 Click the **Hardware Support Matrix for Linux** link.

Installing the Linux Operating System

To install the Linux operating system on your Linux-enabled system:

1 Follow the instructions for “Restoring the Linux Operating System” in the previous section.

2 Follow the instructions for “Starting Up the Linux Operating System” in the previous section.

NOTE For more information concerning the setup of Linux-preinstalled or Linux-enabled workstations, refer to the *HP User Manual for Linux*, which is located at http://www.hp.com/support/linux_user_manual.

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

Upgrading Device Drivers

If you must upgrade a Linux device driver, visit the HP website at http://www.hp.com/go/workstationsupport.

HP Software

The following HP software will also be installed the first time the workstation is turned on:

- Computer Setup (F10) Utilities and diagnostic features
- HP Support Software including device drivers
- HP Client Manager Software (available for download from http://www.hp.com/go/EasyDeploy)
- System Software Manager (available for download from http://www.hp.com/go/ssm)
- Power Management Setup with energy saver features (not supported for Linux)
- Security Management tools
- Software Support Management tools

Certain drivers and utilities are available only in selected languages. You can obtain the latest version of these files, in English and selected other languages, in one of four ways:

- Support Software CD
- HP website at http://www.hp.com
- *Restore Plus!* CD, which is supplied with Windows-based workstations
- *HP Workstations Red Hat Linux with HP Additions* CD, which is supplied with Linux-based workstations

NOTE Additional HP software might be required in certain situations.

Restoring the Operating System

Restore the original Microsoft Windows XP Professional operating and factory-installed software by using the *Restore Plus!* CD and the OS CD that came with the workstation. Carefully read and follow the instructions provided with the *Restore Plus!* CD.

For more information about restoring the Linux OS or software, see “Restoring the Linux Operating System” in this chapter.

Protecting the Software

To protect software from loss or damage, keep a backup copy of all system software, applications, and related files stored on the hard drive. See the operating system or backup utility documentation for instructions on making backup copies of data files.

Ordering Backup Software

All software that shipped with the workstation, including the *Restore Plus!* CD, can be ordered from HP as a single set, or you can order the various software packages separately.

NOTE Before calling HP to order the software, be sure to have the serial number of the workstation available. See the "Serial Number and COA Label Location" section on page 19.

Chapter 3 System Management

This section describes the various tools and utilities that allow for the system management of the workstation.

Computer Setup (F10)

The Computer Setup (F10) utilities enable 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 of the devices installed on the workstation are recognized by the system and functioning properly.
- Determine information about the operating environment of the workstation.
- Solve system configuration errors 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 timeouts (not supported for 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 bootable devices, such as hard drives, diskette drives, optical drives, or LS-120 drives.
- Configure the boot priority of SATA, IDE (ATA), and SCSI hard drive controllers.
- Enable Quick Boot, which is faster than Full Boot but does not run all of the diagnostic tests run during a Full Boot. You can set your system to:
  - always Quick Boot (default)
  - periodically Full Boot (from every 1 to 30 days)
  - always Full Boot
- 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.
- Select POST Messages Enabled or Disabled to change the display status of POST messages. POST Messages Disabled suppresses most POST messages, such as memory count, product name, and other non-error 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**).
- Establish an Ownership Tag, the text of which is displayed each time the system is turned on or restarted.
- Enter the Asset Tag or property identification number assigned by your company to this workstation.
- Enable power-on password prompting during system restarts (warm boots) as well as during power-on.
- Secure the integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that the I/O functionality cannot be used until they are unsecured.
- Enable or disable Master Boot Record (MBR) Security.

- Enable or disable removable media boot ability.
- Enable or disable removable media write ability (when supported by hardware).
- Solve system configuration errors detected, but not automatically fixed, during the POST.
- Replicate your system setup by saving system configuration information on diskette and restoring it on one or more workstations.
- Execute self-tests on specified SATA and IDE (ATA) hard drives (when supported by the drive).

BIOS ROM

The Basic Input/Output System (BIOS) of the computer is a collection of machine language programs stored as firmware in read-only memory (ROM). The BIOS ROM includes such functions as POST, PCI device initialization, Plug 'n Play support, power management activities, and the Setup utility. The firmware contained in the BIOS ROM supports the following systems and specifications:

- Microsoft WHQL
- Alert-On-LAN (AOL) and Wake-On-LAN (WOL)
- ACPI 1.0 and 2.0 and OnNow
- SMBIOS 2.3.5
- PC98/99/00 and NetPC
- Intel PXE boot ROM for the integrated LAN controller
- BIOS Boot Specification 1.01
- Enhanced Disk Drive Specification 3.0
- “El Torito” Bootable CD-ROM Format Specification 1.0
- ATAPI Removable Media Device BIOS Specification 1.0
- MPS Specification 1.4 (for booting Linux SMP)

The BIOS ROM is a 1-MB Intel Firmware Hub (or Firmware Hub-compatible) part. The runtime portion of the BIOS resides in a 128-K block from EA000h to FFFFFh (approximation).

Using Computer Setup (F10)

You can only open Computer Setup by turning on the workstation or restarting the system. To access the Computer Setup Utilities menu:

1. Turn on or restart the workstation.
2. Press the **F10** key as soon as the monitor light turns green.

NOTE If you do not press the **F10** key at the appropriate time, you must try again. Turn the workstation off, then on again, and press the **F10** key again to access the utility.

3. Select your language from the list and press **Enter**. In the Computer Setup Utilities menu, four headings are displayed: File, Storage, Security, and Advanced.
4. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, then press **Enter**.

5 To apply and save changes, select **File>Save Changes and Exit**.

- If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
- To reset to factory settings, select **Set Defaults and Exit**. This option restores the original factory system defaults.

CAUTION Do NOT turn the workstation power OFF while the ROM is saving your Computer Setup F10 changes because the CMOS could become corrupted. After you exit the F10 Setup screen, it is safe to turn off all power to the workstation.

Computer Setup Menu

NOTE The following content is subject to change with new firmware releases, so your menu may be different than shown below.

Table 3-1 Computer Setup Menu Descriptions

Heading	Option	Description
File	System Information	Lists product name, processor type/speed/stepping, cache size (L1/L2), system ROM family and version, installed memory size, chassis serial number, integrated MAC for enabled or embedded NIC (if applicable), and asset tracking number.
	About	Displays copyright information.
	Set Time and Date	Enables you to set system time and date.
	Save to Diskette	Saves system configuration, including CMOS, to a formatted, blank 1.44-MB diskette in the CPQsetup.txt file. Save/Restore for is supported.
	Restore from Diskette	Restores system configuration from a diskette.
	Set Defaults and Exit	Restores factory default settings, which includes clearing any established passwords.
	Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.
	Save Changes and Exit	Saves changes to system configuration and exits Computer Setup.

Table 3-1 Computer Setup Menu Descriptions

Heading	Option	Description
Storage	Device Configuration	Lists all installed non-SCSI storage devices. SCSI storage drives will not be listed in Computer Setup (F10). When a device is selected, detailed information and options are displayed. The following options might be presented:
		Hard Disk Identifies the hard disk drives on the system.
		CD-ROM Identifies the hard disk drives on 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 **Multisector Transfers *(IDE disks only)*** Specifies how many sectors are transferred per multi-sector PIO operation. Options (subject to device capabilities) are Disabled, 8, and 16. **Transfer Mode** *(IDE devices only)* Specifies the active data transfer mode. Options (subject to device capabilities) are PIO 0, Max PIO, Enhanced DMA, Ultra DMA 0, and Max UDMA. **Translation Mode** *(IDE disks only)* Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (for example, SCO UNIX version 3.2). Options are Bit-Shift, LBA Assisted, User, and None. **CAUTION:** A new Automatic option has been added to allow for BIOS to automatically determine the translation mode used to configure a previously formatted IDE, SATA, or USB mass storage device. This prevents you from having to know how the mass storage device was previously formatted. Ordinarily, the translation mode selected automatically by the BIOS should not be changed. If the selected translation mode is not compatible with the translation mode that was active when the disk was partitioned and formatted, the data on the disk will be inaccessible.
	Options	**Removable Media Boot** Enables/disables ability to boot the system from removable media.
		Removal Media Diskette Write Enables/disables ability to write data to removable media.
		BIOS DMA Data Transfers Allows you to enable or disable the BIOS use of DMA for IDE data transfers.
		SATA Configuration Add as separate controller and replace separate controller.
		Primary IDE Controller Enables/disables primary IDE controller.
		Secondary IDE Controller Enables/disables secondary IDE controller.

Table 3-1 Computer Setup Menu Descriptions

Heading	Option	Description
		Boot Order Allows you to configure the boot, diskette drive, and hard drive orders by physically reordering the menu entries. Each device on the list can be individually excluded from or included for consideration as a bootable operating system source. **NOTE:** MS-DOS drive lettering assignments might not apply after a non-MS-DOS operating system has started. **Shortcut to Temporarily Override 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 `F10=Setup` message appears on the screen. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press **Enter.** The workstation then boots from the selected non-default device for this one time.
		Controller Order Allows you to specify the order of the attached hard drive controllers. The first hard drive controller in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached). **NOTE:** The selection will not appear if all hard drives are attached to the embedded IDE controllers.
Security	Setup Password	Allows you to set and enable setup (administrator) password. **NOTE** If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.
	Power-On Password	Allows you to set and enable power-on password.
	Smart Cover	Allows you to disable cover removal sensor or to notify user if sensor has been activated.
	System IDs	Allows you to set: ■ Asset tag (16-byte identifier) and ownership tag (80-byte identifier displayed during POST). ■ Chassis serial number or Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.) ■ Keyboard locale setting (for example, English or German) for System ID entry. ■ Monitor tracking
	Master Boot Record Security	Enables you to enable or disable MBR Security. When enabled, the BIOS rejects all requests to write to the MBR on the current bootable disk. Each time the computer is powered on or rebooted, the BIOS compares the MBR of the current bootable disk to the previously saved MBR. If changes are detected, you are given the option of saving the MBR on the current bootable disk, restoring the previously saved MBR, or disabling MBR Security. You must know the setup password, if one is set. **NOTE** Disable MBR Security before intentionally changing the formatting or partitioning of the current bootable disk. Several disk utilities (such as FDISK and FORMAT) attempt to update the MBR. If MBR Security is enabled and disk accesses are being serviced by the BIOS, write requests to the MBR are rejected, causing the utilities to report errors. If MBR Security is enabled and disk accesses are being serviced by the operating system, any MBR change will be detected by the BIOS during the next reboot, and an MBR Security warning message will be displayed.

Table 3-1 Computer Setup Menu Descriptions

Heading	Option	Description
Advanced**	Boot	Allows you to set: ■ POST mode (QuickBoot, FullBoot, or FullBoot every 1–30 days). ■ POST messages (enable/disable). ■ Safe POST (enable/disable). Enabling this features allows a watchdog timer to operate during Option ROM execution. If an option ROM hangs and the user cycles the power on the system, POST detects that an error occurred during the last boot, and displays a message. The offending option ROM code is skipped. **NOTE** This setting might need to be disabled if an option ROM takes a long time to execute. The watchdog timer might expire on a normally executing option ROM and skip it on the next boot. ■ **F9** prompt (enable/disable). Enabling this feature will display the text `F9=Boot Menu` during POST. Disabling this feature prevents the text from being displayed. However, pressing the F9 key will still access the Shortcut Boot [Order] Menu screen. ■ **F10** prompt (enable/disable). Enabling this feature displays the text `F10=Setup` during POST. Disabling this feature prevents the text from being displayed but pressing **F10** still accesses the Setup screen. ■ **F12** prompt (enable/disable). Enabling this feature displays the text `F12=Network Service Boot` during POST. Disabling this feature prevents the text from being displayed but pressing **F12** still forces the system to attempt booting from the network. ■ Option ROM* prompt (enable/disable). Enabling this feature causes the system to display a message before loading options ROMs. ■ POST Delay (in seconds) (enable/disable). Enabling this feature adds a user-specified delay to the POST process. This delay is sometimes needed for hard disks 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 more time to select **F10** to enter Computer Setup (F10). ■ Num Lock State at Power-On (enable/disable). Enabling this feature automatically turns on Num Lock at startup.
	Power/Sleep/ Wake	Options: ■ Remote Wakeup Boot Source ■ After Power Loss (on/off). ■ S5 wake on LAN (enable/disable). ■ Unique Sleep State Blink Rates (enable/disable). Allows you to choose an LED blink pattern that uniquely identifies each sleep state.
	Processors	Enable/disable processor cache, Hyper-Threading Technology, and power management features. **NOTE** Enabling Power Management turns on Demand-Based Switching, a feature which reduces processor frequency and voltage (thus, power) when usage is low (but the system is still in S0/ working state).
	Chipset/ Memory	ECC support enables hardware-based error correction for ECC-capable memories. ■ Memory scrubbing (enable/disable) ■ Memory remapping (enable/disable) ■ PCI SERR# generation (enable/disable) ■ PCI VGA palette snooping (enable/disable), which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed.

Table 3-1 Computer Setup Menu Descriptions

Heading	Option	Description
	Onboard Devices	Enables you to set resources for or disable onboard system devices (serial ports, parallel ports, diskette controllers, and so on).
	Device Options	Allows you to set the Printer Mode to EPP+ECP, Output-Only or Bi-directional. **NOTE** These settings are included for backward compatibility. Many older printers cannot use newer protocols like EPP+ECP. Allows you to enable/disable: ■ Number Lock state at power-on or off during POST ■ PME Wakeup Events, such as a wake on LAN magic packet to bring the machine out of Hibernate. ■ Processor Cache. Enabling this turns on the processors L1 and L2 cache and disabling turns off the processors L1 and L2 cache, which is one way to slow the processor down. ■ SATA RAID Option ROM ■ SCSI Option ROM ■ Network Controller Option ■ Standby wake events **NOTE** This setting might need to be disabled if older PCI cards do not use the PME signal correctly and keep turning on the system.
	Slot 1 (PCI)	Enables you to configure control, power management, option ROM, and interrupt.
	Slot 2 (PCI Express x 16)	Enables you to configure control, power management, option ROM, and interrupt.
	Slot 3 (PCI)	Enables you to configure control, option ROM, and latency timer.
	Slot 4 (PCI Express x 16)	Enables you to configure control, option ROM, and latency timer.
	Slot 5 (PCI-X 133)	Enables you to configure control, speed, option ROM, and latency timer.
	Slot 6 (PCI-X 133)	Enables you to configure control, speed, option ROM, and latency timer.
	Slot 7 (PCI-X 133)	Enables you to configure control, speed, option ROM, and latency timer.

*Available on select models.
**These options should be used by advanced users only.

Desktop Management

HP Client Management Solutions (available for download from http://www.hp.com/go/EasyDeploy) provides standards-based solutions for managing and controlling workstations in a networked environment. This section summarizes the capabilities and features of the key components of desktop management:

- Initial Configuration and Deployment
- Remote System Installation
- Software Updating and Management
- ROM Flash
- Asset Tracking and Security
- Fault Notification and Recovery

NOTE Support for specific features described in this guide might vary by model or software version.

Initial Configuration and Deployment

The workstation comes with a preinstalled system software image. After a brief software “unbundling” process, the workstation is ready to use.

You may prefer to replace the preinstalled software image with a customized set of system and application software. There are several methods for deploying a customized software image. They include:

- Installing additional software applications after unbundling the preinstalled software image.
- Using software deployment tools, such as Altiris Deployment Solutions™, to replace the preinstalled software with a customized 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. The PC Deployment section of the HP Lifecycle Solutions Web site (http://whp-sp-orig.extweb.hp.com/country/us/en/solutions.html) provides information to help you select the best deployment method.

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.

Remote System Installation

Remote System Installation lets you start and set up your system using the software and configuration information located 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 one or more new PCs
- Formatting a hard drive
- Installing application software or drivers
- Updating the operating system, application software, or drivers

To initiate Remote System Installation, press **F12** when the `F12=Network Service Boot` message appears in the lower-right corner of the HP logo screen. Follow the on-screen instructions to continue the process. The default boot order is a BIOS configuration setting that can be changed to always attempt to PXE boot.

HP and Altiris have partnered to provide tools designed to make the task of corporate PC deployment and management easier and less time-consuming, ultimately lowering the total cost of ownership and making HP PCs the most manageable client PCs in the enterprise environment.

Software Updating and Management

HP provides several tools for managing and updating software on desktops and workstations—HP Client Manager Software, Altiris Client Management Solutions, System Software Manager; Proactive Change Notification; and Subscriber's Choice.

HP Client Manager Software

HP Client Manager Software (HP CMS) assists HP customers in managing the hardware aspects of their client workstations with features that include:

- 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 machines with thermal warnings, memory alerts, and more
- Remote updating of system software such as device drivers and ROM BIOS
- Remote changing of boot order
- Configuring the system BIOS settings

For more information on the HP Client Manager, visit http://www.hp.com/go/im.

Altiris Client Management Solutions

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

- Inventory and Asset Management
  - SW license compliance
  - PC tracking and reporting
  - Lease contract, fixing asset tracking
- Deployment and Migration
  - Microsoft Windows XP Professional or Home Edition migration
  - System deployment
  - Personality migrations
- Help Desk and Problem Resolution
  - Managing help desk tickets

- Remote troubleshooting
- Remote problem resolution
- Client disaster recovery

- Software and Operations Management
  - Ongoing desktop management
  - HP system SW deployment
  - Application self-healing

For more information and details on how to download a fully-functional 30-day evaluation version of the Altiris solutions, visit http://h18000.www1.hp.com/im/prodinfo.html#deploy.

For more information, visit http://www.hp.com/go/EasyDisplay.

System Software Manager

System Software Manager (SSM) is a utility that lets you update system-level software on multiple systems simultaneously. When executed on a PC client system, SSM detects both hardware and software versions, then updates the appropriate software from a central repository, also 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 on SSM, visit http://www.hp.com/go/ssm.

Proactive Change Notification

The Proactive Change Notification program uses the Subscriber's Choice Web site in order to proactively and automatically:

- Send you Proactive Change Notification (PCN) e-mails informing you of hardware and software changes to most commercial workstations and servers, up to 60 days in advance.
- Send you e-mail containing Customer Bulletins, Customer Advisories, Customer Notes, Security Bulletins, and Driver alerts for most commercial workstations and servers.

You create your own profile to ensure that you only receive the information relevant to a specific IT environment. To learn more about the Proactive Change Notification program and create a custom profile, visit http://www.hp.com/go/pcn.

Subscriber’s Choice

Subscriber’s Choice is a client-based service from HP. Based on your profile, HP will supply you with personalized product tips, feature articles, and/or driver and support alerts/notifications. Subscriber’s Choice Driver and Support Alerts/Notifications will deliver e-mails 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, visit http://www.hp.com/go/pcn.

ROM Flash

The workstation comes with a programmable flash ROM (read only memory). By establishing a setup password in the Computer Setup (F10) Utility, you can protect the ROM from being unintentionally updated or overwritten. This is important to ensure the operating integrity of the workstation. Should you need or want to upgrade the ROM, you may:

- Order an upgraded ROMPaq diskette from HP.

- Download the latest ROMPaq images from HP driver and support page, http://www.hp.com/support/ files.

CAUTION For maximum ROM protection, be sure to establish a setup password. The setup password prevents unauthorized ROM upgrades. System Software Manager allows the system administrator to set the setup password on one or more PCs simultaneously. For more information, visit http://www.hp.com/go/ssm.

Remote ROM Flash

Remote ROM Flash allows the system administrator to safely upgrade the ROM on remote HP workstations directly from the centralized network management console. Enabling the system administrator to perform this task remotely, on multiple workstations and personal computers, results in a consistent deployment of and greater control over HP PC ROM images over the network. It also results in greater productivity and lower total cost of ownership.

The workstation must be powered on, or turned on through Remote Wakeup, to take advantage of Remote ROM Flash.

For more information on Remote ROM Flash, see the HP Client Manager Software or System Software Manager at http://h18000.www1.hp.com/im/prodinfo.html.

HPQFlash

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

For more information on HPQFlash, visit http://www.hp.com/support/files and enter the name of the workstation when prompted.

FailSafe Boot Block ROM

The FailSafe Boot Block ROM allows for system recovery in the unlikely event of a ROM flash failure, for example, if a power failure were to occur during a ROM upgrade. The Boot Block is a flash-protected section of the ROM that checks for a valid system ROM flash when power to the system is turned on.

- 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 ROMPaq diskette, which will program the system ROM with a valid image.

NOTE Some models also support recovery from a ROMPaq CD. ISO ROMPaq images are included with selected models in the downloadable ROM softpaqs.

When the boot block detects an invalid system ROM, the System Power LED blinks RED 8 times, one every second, followed by a 2-second pause. Also, eight simultaneous beeps will be heard. A Boot Block recovery mode message is displayed on the screen (some models).

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

1. If there is a diskette in the diskette drive or a CD in the CD drive, remove the diskette and CD and turn off the power.
2. Insert a ROMPaq diskette into the diskette drive or, if permitted on this workstation, a ROMPaq CD into the CD drive.

3 Turn on the workstation.

If no ROMPaq diskette or ROMPaq CD is found, you will be prompted to insert one and restart the workstation.

If a setup password has been established, the Caps Lock light will turn on and you will be prompted to enter the password.

4 Enter the setup password.

If the system successfully starts from the diskette and successfully reprograms the ROM, then the three keyboard lights will turn on. A rising tone series of beeps also signals successful completion.

5 Remove the diskette or CD and turn the power off.

6 Turn the power on again to restart the workstation.

The following table lists the various keyboard light combinations used by the Boot Block ROM (when a PS/2 keyboard is attached to the workstation), and explains the meaning and action associated with each combination.

Table 3-2 Keyboard Light Combinations Used by Boot Black ROM

FailSafe Boot Block Mode	Keyboard LED Activity	State/Message
Num Lock	On	ROMPaq diskette or ROMPaq CD not present, is bad, or drive not ready.
Caps Lock	On	Enter password.
Num, Caps, Scroll Lock	Blink On in sequence, one at a time–N,C, SL	Keyboard locked in network mode.
Num, Caps, Scroll Lock	On	Boot Block ROM Flash successful. Turn power off, then on to reboot.

NOTE: Diagnostic lights do not flash on USB keyboards

Replicating the Setup

The following procedures give an administrator the ability to easily copy one setup configuration to other workstations of the same model. This allows for faster, more consistent configuration of multiple workstations.

NOTE Both procedures require a diskette drive.

NOTE To collect and replicate BIOS settings on multiple computers, use System Software Manager or HP Client Manager Software. For more information, visit http://www.hp.com/go/easydeploy.

COPYING TO A SINGLE WORKSTATION

CAUTION A setup configuration is model-specific. File system corruption may result if source and target workstations are not the same model. For example, do not copy the setup configuration from a dc7100 Ultra-Slim Desktop to a dx6100 Slim Tower.

1. Select a setup configuration to copy. Turn off the workstation. If you are in Windows, click **Start>Shut Down>Shut Down**.
2. Turn on the workstation.
3. As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

4. If you are using a a diskette, insert it now.
5. Click **File>Replicated Setup>Save to Removable Media**. Follow the instructions on the screen to create the configuration diskette.
6. Turn off the workstation to be configured and insert the configuration diskette.This procedure gives an administrator the ability to easily copy one setup configuration to other workstations of the same model. This allows for faster, more consistent configuration of multiple workstations.
7. Turn on the workstation to be configured.
8. As soon as the workstation is turned on, press and hold the **F10** key until you enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.
9. Click **File>Replicated Setup>Retore from Removable Media**, and follow the instructions on the screen.
10. Restart the workstation when the configuration is complete.

COPYING TO MULTIPLE WORKSTATIONS

CAUTION A setup configuration is model-specific. File system corruption may result if source and target workstations are not the same model. For example, do not copy the setup configuration from a HP Workstation xw4200 to HP Workstation xw8200.

This method takes a little longer to prepare the configuration diskette, but copying the configuration to target workstations is significantly faster.

NOTE A bootable diskette is required for this procedure. If Windows XP is not available to use to create a bootable diskette, use the method for copying to a single workstation instead (see "Copying to A Single Workstation" section on page 47).

1. Create a bootable diskette.
2. Select a setup configuration to copy. Turn off the workstation. If you are in Windows, click **Start>Shut Down>Shut Down**.
3. Turn on the workstation.
4. As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

5. If you are using a a diskette, insert it now.
6. Click **File>Replicated Setup>Save to Removable Media**. Follow the instructions on the screen to create the configuration diskette.
7. Download a BIOS utility for replicating setup (repset.exe) and copy it onto the configuration diskette. To obtain this utility, go to http://welcome.hp.com/support/files and enter the model number of the workstation.
8. On the configuration diskette, create an autoexec.bat file containing the following command: **repset.exe**.
9. Turn off the workstation to be configured. Insert the configuration diskette and turn the workstation on. The configuration utility will run automatically.
10. Restart the workstation when the configuration is complete.

Dual-State Power Button

With Advanced Configuration and Power Interface (ACPI) enabled, the power button can function either as an on/off switch or as a hibernate button. The Hibernate feature does not completely turn off power, but instead causes the workstation to enter a low-power standby state. This allows you to power down quickly without closing applications and to return quickly to the same operational state without any data loss.

To change the power button configuration:

1. Left click on the **Start** button, then select **Control Panel>Power Options**.
2. In the **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 hibernate button, press the power button to put the system in a very low power state (Hibernate). Press the button again to quickly bring the system out of hibernate to full power status. To completely turn off all power to the system, press and hold the power button for four seconds.

CAUTION Do not use the power button to turn off the workstation unless the system is not responding; turning off the power without operating system interaction could cause damage to or loss of data on the hard drive.

World Wide Web Site

HP engineers rigorously test and debug software developed by HP and third-party suppliers, and develop operating system specific support software, to ensure performance, compatibility, and reliability for HP workstations.

When making the transition to new or revised operating systems, it is important to implement the support software designed for that operating system. If you plan to run a version of Microsoft Windows that is different from the version included with the workstation, you must install corresponding device drivers and utilities to ensure that all features are supported and functioning properly.

HP has made the task of locating, accessing, evaluating, and installing the latest support software easier. You can download the software from http://www.hp.com/support.

The Web site contains the latest device drivers, utilities, and flashable ROM images needed to run the latest Microsoft Windows operating system on the HP workstation.

Building Blocks and Partners

HP management solutions integrate with other systems management applications, and are based on industry standards, such as:

- Web-Based Enterprise Management (WBEM)
- Windows Management Interface (WMI)
- Wake on LAN Technology
- ACPI
- SMBIOS
- Pre-boot Execution (PXE) support

Asset Tracking and Security

Asset tracking features incorporated into the workstation provide key asset tracking data that can be managed using HP Systems Insight Manager, HP Client Manager Software 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 the environment and to leverage the investment in existing tools.

HP also offers several solutions for controlling access to valuable components and information. ProtectTools Embedded Security, if installed, prevents unauthorized access to data and checks system integrity and authenticates third-party users attempting system access. Security features such as ProtectTools, the Hood Sensor (Smart Cover Sensor) and the Hood Lock (Smart Cover Lock), available on select models, help to prevent unauthorized access 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.

NOTE ProtectTools, the Hood Sensor (Smart Cover Sensor), and the Hood Lock (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 Utilities.
- Remotely, using HP Client Manager Software or System Software Manager. This software enables the secure, consistent deployment and control of security settings from a simple command-line utility.

The following table and sections refer to managing security features of the workstation locally through the Computer Setup (F10) Utilities.

Table 3-3 Security Features Overview

Feature	Purpose	How It Is Established
Removable Media Boot Control	Prevents booting from the removable media drives.	From the Setup Utilities menu.
Serial, Parallel, USB, or Infrared Interface Control	Prevents transfer of data through the integrated serial, parallel, USB, or infrared interface.	From the Setup Utilities menu.
Power-On Password	Prevents use of the workstation until the password is entered. This can apply to both initial system startup and restarts.	From the Setup Utilities menu.
Setup Password	Prevents reconfiguration of the workstation (use of the Setup Utilities) until the password is entered.	From the Setup Utilities menu.
Network Server Mode	Provides unique security features for workstations being used as servers.	From the Setup Utilities menu.
DriveLock	Prevents unauthorized access to the data on specific hard drives.	From the Setup Utilities menu.
Master Boot Record Security	Might prevent unintentional or malicious changes to the MBR of the current bootable disk and provides a means of recovering the “last known good” MBR.	From the Setup Utilities menu.
Ownership Tag	Displays ownership information, as defined by the system administrator, during system startup (protected by setup password).	From the Setup Utilities menu.
Kensington Cable Lock Provision	Prevents entire system theft only.	Install a Kensington cable lock to secure the workstation to a fixed object.
Padlock Loop	Prevents access panel from being removed. This loop can also be used to secure the unit to a fixed object.	Install a padlock.
Access Panel Key Lock (Standard)	Prevents removal of the access panel and all internal components including optical and floppy drives	Lock the access panel.

Table 3-3 Security Features Overview (Continued)

Feature	Purpose	How It Is Established
Hood Lock (Smart Cover Lock) (Optional)	Prevents removal of the access panel and all internal components including optical and floppy drives. Eliminates the need for a physical key by enabling password-protected locking & unlocking by a local or remote user.	Install a hood lock.
Universal Chassis Clamp Lock (Optional)	The version without a cable discourages access panel removal and prevents theft of IO devices. The version with a cable additionally prevents entire system theft and allows multiple systems to be secured with a single cable.	Install a chassis clamp lock.
Hood Sensor (Optional)	Notifies a local or remote user when the chassis access panel has been opened.	Install an intrusion sensor.
For more information about Computer Setup, refer to "Computer Setup Menu" section on page 37.		

Password Security

The power-on password prevents unauthorized use of the workstation by requiring entry of a password to access applications or data each time the workstation is turned on or restarted. The setup password specifically prevents unauthorized access to Computer Setup, and can also be used as an override to the power-on password. That is, when prompted for the power-on password, entering the setup password instead will allow access to the workstation.

A network-wide setup password can be established to enable the system administrator to log in to all network systems to perform maintenance without having to know the power-on password.

NOTE System Software Manager and HP Client Manager Software allow remote management of Setup Passwords and other BIOS settings in a networked environment. For more information, visit http://www.hp.com/go/EasyDeploy.

ESTABLISHING A SETUP PASSWORD USING COMPUTER SETUP

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

To establish a setup password using workstation setup:

1. Turn on or restart the workstation. If you are in Windows, click **Start>Turn off>Restart**.
2. As soon as the computer is turned on, press and hold the **F10** 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3. Select **Security>Setup Password** and follow the on-screen instructions.

4 Before exiting, select **File>Save Changes and Exit**.

ESTABLISHING A POWER-ON PASSWORD USING WORKSTATION SETUP

Establishing a power-on password through Computer Setup prevents access to the workstation when power is turned on, unless the password is entered. When a power-on password is set, Computer Setup presents Password Options under the Security menu. The password options include Network Server Mode and Password Prompt on Warm Boot.

When Network Server Mode is disabled, the password must be entered each time the workstation is turned 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 will remain locked until the user enters the power-on password.

To establish a power-on password through workstation setup:

1 Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart**.

2 As soon as the computer is turned on, press and hold the **F10** 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 Select **Security>Power-On Password** and follow the on-screen instructions.

4 Before exiting, select **File>Save Changes and Exit**.

ENTERING A POWER-ON PASSWORD

To enter a power-on password:

1 Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart the Computer**.

2 When the key icon appears on the monitor, enter the current password, then press **Enter**.

NOTE 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 turn off the workstation, then turn it on again before you can continue.

ENTERING A SETUP PASSWORD

If a setup password has been established on the workstation, you will be prompted to enter it each time you run Computer Setup.

To enter a setup password:

1 Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart the Computer**.

2 As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 When the key icon appears on the monitor, enter the setup password, then press **Enter**.

NOTE 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 turn off the workstation, then turn it on again before you can continue.

CHANGING A POWER-ON OR SETUP PASSWORD

To change a power-on or setup password:

1 Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart the Computer**. To change the setup password, run Computer Setup.

2 To change the Power-On password, go to step 3.

To change the Setup password, as soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 When the key icon appears, type the current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:

```
current password/new password/new password
```

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

4 Press **Enter**.

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

NOTE See the "National Keyboard Delimiter Characters" section on page 54 for information about the alternate delimiter characters. The power-on password and setup password can also be changed using the Security options in Computer Setup.

Deleting a Power-On or Setup Password

To delete a power-on or setup password:

1. Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart the Computer**.
2. To delete the Power-On password, go to Step 3.

   To delete the Setup Password, as soon as the workstation is turned 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 computer and press and hold the **F10** key again to access the utility.

Use the appropriate operating system shutdown process. To delete the setup password, run Computer Setup.

3. When the key icon appears, enter your current password followed by a slash (/) or alternate delimiter character as shown:

   ```
   current password/
   ```

4. Press **Enter**.

NOTE See the "National Keyboard Delimiter Characters" section on page 54 section for information about the alternate delimiter characters. The power-on password and setup password can also be changed using the Security options in Computer Setup.

NATIONAL KEYBOARD DELIMITER CHARACTERS

Each keyboard is designed to meet country-specific requirements. The syntax and keys that you use for changing or deleting your password depend on the keyboard that came with your workstation.

Table 3-4 National Keyboard Delimiter Characters

Arabic	/	Greek	-	Russian	/
Belgian	=	Hebrew	.	Slovakian	-
BHCSY*	-	Hungarian	-	Spanish	-
Brazilian	/	Italian	-	Swedish/Finnish	/
Chinese	/	Japanese	/	Swiss	-
Czech	-	Korean	/	Taiwanese	/
Danish	-	Latin American	-	Thai	/

Table 3-4 National Keyboard Delimiter Characters

Arabic	/	Greek	-	Russian	/
French	!	Norwegian	-	Turkish	.
French Canadian	é	Polish	-	U.K. English	/
German	-	Portuguese	-	U.S. English	/

*For Bosnia-Herzegovina, Croatia, Slovenia, and Yugoslavia

CLEARING PASSWORDS

If you forget your password, you cannot access the workstation. See Appendix H, “Additional Password Security and Resetting CMOS” for instructions on clearing passwords.

DriveLock

DriveLock prevents unauthorized access to the data on MultiBay hard drives. DriveLock has been implemented as an extension to Computer Setup. It is only available when DriveLock-capable hard drives are detected.

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 end-user. There is no “back-door” that 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.

△ **CAUTION** If both DriveLock passwords are lost, the hard drive is rendered unusable.

USING DRIVELOCK

The DriveLock option appears under the Security menu in Computer Setup. The user is presented with options to set the master password or to enable DriveLock. A user password must be provided to enable DriveLock. Since 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 keep it disabled. This will give the administrator the ability to modify DriveLock settings if the drive is locked in the future. Once the master password is set, the system administrator can enable DriveLock or choose to keep it disabled.

If a locked hard drive is present, POST will require a password to unlock the device. If a power-on password is set and it matches the user password of the device, POST will not prompt the user to re-enter the password. Otherwise, the user will be prompted to enter a DriveLock password. Either the master or the user password can be used. Users will have two attempts to enter a correct password. If neither attempt succeeds, POST will continue but the data on the drive will remain inaccessible.

DRIVELOCK APPLICATIONS

The most practical use of the DriveLock security feature is in a corporate environment where a system administrator provides users with multibay hard drives for use in some desktop workstations. The system administrator would be responsible for configuring the MultiBay hard drive which would involve, among other things, setting the DriveLock master password. In the event that the user forgets the user password or the equipment is passed on to another employee, the master password can always be used to reset the user password and regain access to the hard drive.

HP recommends that corporate system administrators who choose to enable DriveLock also establish a corporate policy for setting and maintaining master passwords. This should be done to prevent a situation where an employee intentionally or unintentionally sets both DriveLock passwords before leaving the company. In such a scenario, the hard drive would be rendered unusable and require 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 has been designed to protect. Access to Computer Setup and DriveLock can be restricted through the Setup password. By specifying a Setup password and not giving it to end users, system administrators are able to restrict users from enabling DriveLock.

Hood Sensor (Smart Cover Sensor)

The hood sensor is an optional feature that is a combination of hardware and software technology that can alert you when the workstation side access panel has been removed.This option is available as a kit that includes the Hood Lock (Smart Cover Lock) (see the following section). There are three levels of protection, as described in the following table.

Table 3-5 Hood Sensor Protection Levels

Level	Setting	Description
Level 0	Disabled	Hood sensor is disabled (default).
Level 1	Notify User	When the workstation is restarted, the screen displays a message indicating that the workstation side access panel has been removed.
Level 2	Setup Password	When the workstation is restarted, the screen displays a message indicating that the workstation side access panel has been removed. You must enter the setup password to continue.
NOTE: These settings can be changed using Computer Setup.		

SETTING THE HOOD SENSOR PROTECTION LEVEL

To set the hood sensor protection level:

1. Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart**.
2. As soon as the workstation is turned 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 computer and press and hold the **F10** key again to access the utility.

If you are using a PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3. Select **Security>Smart Cover>Cover Removal Sensor**, then side access panel, and follow the on-screen instructions.

4 Before exiting, click **File>Save Changes and Exit**.

Hood Lock (Smart Cover Lock)

When installed, the hood lock can prevent unauthorized access to the internal components

CAUTION For maximum cover lock security, be sure to establish a setup password. The setup password prevents unauthorized access to the Computer Setup utility.

LOCKING THE SOLENOID LOCK

To activate and lock the solenoid lock:

1 Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart**.

2 As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 Select **Security>Smart Cover>Cover Lock>Lock** option.

4 Before exiting, select **File>Save Changes and Exit**.

UNLOCKING THE SOLENOID LOCK

To unlock the solenoid lock:

1 Turn on or restart the workstation. If you are in Windows, click Start>Shut Down>Restart.

2 As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 Select **Security>Smart Cover>Cover Lock>Unlock**.

4 Before exiting, select **File>Save Changes and Exit**.

USING THE FAILSAFE KEY

If you enable the hood 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 the HP Web site (http://www.hp.com) for ordering information.
- Visit the Contact HP Worldwide Web site (http://welcome.hp.com/country/us/en/wwcontact.html) for contact information.

Master Boot Record Security

The MBR contains information needed to successfully boot from a disk and to access the data stored on the disk. Master Boot Record Security detects and reports unintentional or malicious changes to the MBR, such as those caused by some workstation viruses or by the incorrect use of certain disk utilities. It also allows you to recover the “last known good” MBR, should changes to the MBR be detected when the system is restarted.

To enable MBR Security:

1. Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart**.
2. As soon as the workstation is turned 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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3. Select **Security>Master Boot Record Security>Enabled**.
4. Select **Security>Save Master Boot Record**.
5. Before exiting, click **File>Save Changes and Exit**.

When MBR Security is enabled, the BIOS prevents any changes being made to the MBR of the current bootable disk while in MS-DOS or Windows Safe Mode.

NOTE Most operating systems control access to the MBR of the current bootable disk; the BIOS cannot prevent changes that might occur while the operating system is running.

Each time the workstation is turned on or restarted, the BIOS compares the MBR of the current bootable disk to the previously saved MBR. If changes are detected and if the current bootable disk is the same disk from which the MBR was previously saved, the following message is displayed:

```
1999 - Master Boot Record has changed.
Press any key to enter Setup to configure MBR Security.
```

Upon entering Computer Setup, you must perform one of the following tasks:

- Save the MBR of the current bootable disk
- Restore the previously saved MBR
- Disable the MBR Security feature

You must know the setup password, if one exists.

If changes are detected and if the current bootable disk is not the same disk from which the MBR was previously saved, the following message is displayed:

```
2000 - Master Boot Record Hard Drive has changed.
Press any key to enter Setup to configure MBR Security.
```

Upon entering Computer Setup, you must perform one of the following tasks:

- Save the MBR of the current bootable disk
- Disable the MBR Security feature

You must know the setup password, if one exists.

In the unlikely event that the previously saved MBR has been corrupted, the following message is displayed:

```
1998 - Master Boot Record has been lost.
Press any key to enter Setup to configure MBR Security.
```

Upon entering Computer Setup, you must perform one of the following tasks:

- Save the MBR of the current bootable disk
- Disable the MBR Security feature

You must know the setup password, if one exists.

Before You Partition or Format the Current Bootable Disk

Before you partition or format the current bootable disk, ensure that MBR Security is disabled before you change partitioning or formatting of the current bootable disk. Some disk utilities, such as FDISK and FORMAT, attempt to update the MBR. If MBR Security is enabled when you change partitioning or formatting of the disk, you might receive error messages from the disk utility or a warning from MBR Security the next time the workstation is turned on or restarted.

To disable MBR Security:

1. Turn on or restart the workstation. If you are in Windows, click **Start>Shut Down>Restart the Computer**.
2. As soon as the workstation is turned 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 **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 PS/2 keyboard, you may see a Keyboard Error message—disregard it.

3 Select **Security>Master Boot Record Security>Disabled**.

4 Before exiting, click **File>Save Changes and Exit**.

Cable Lock Provision (Optional)

The rear panel of the chassis can accommodate a cable lock accessory that allows the workstation to be physically secured to a work area.

Security Lock (Optional)

Prevents entire system theft and discourages access panel removal.

Universal Chassis Clamp Lock (Optional)

The version without a cable discourages access panel removal and prevents theft of IO devices. The version with a cable also prevents entire system theft and allows multiple systems to be secured with a single cable.

Hood Lock (Smart Cover Lock) (Optional)

Prevents removal of the access panel and all internal components including optical and diskette drives.This lock eliminates the need for a physical key by enabling password-protected locking and locking by a local or a remote user.

Hood Sensor (Smart Cover Sensor) (Optional)

This sensor is set in the Computer Setup utility. You can set this to notify a user if the access panel has been removed.

Access Panel Key Lock

This lock prevents removal of the access panel and all internal components. The key is shipped on the rear of the workstation.

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 managed by HP Client Manager Software, the computer sends a fault notice to the network management application. With HP Client Manager Software, you can also remotely schedule diagnostics to automatically run on all managed PCs and create a summary report of failed tests.

Drive Protection System

The DPS is a diagnostic tool built into the hard drives installed in select HP workstations. DPS is designed to help diagnose problems that might result in unwarranted hard drive replacement.

When HP workstations are built, each installed hard drive is tested using DPS, and a permanent record of key information is written onto the drive. Each time DPS is run, test results are written to the hard

drive. Each time DPS is run, test results are written to the hard drive. The service provider can use this information to help diagnose conditions that caused you to run the DPS software.

Ultra ATA Integrity Monitoring

Ultra ATA Integrity Monitoring monitors the integrity of data as it is transferred between an Ultra ATA hard drive and the system's core logic. If the workstation detects an abnormal number of transmission errors, the workstation displays a Local Alert message with recommended actions.

ECC Fault Prediction and Prefailure Warranty

When the workstation encounters an excessive number of error checking and correcting (ECC) memory errors, the workstation displays a Local Alert message. This message contains detailed information about the errant memory module, allowing you to take action before you experience non-correctable memory errors. The Prefailure Warranty for ECC memory modules allows you to replace these modules, free of charge, before the modules actually fail. ECC memory modules are optional on selected HP systems.

NOTE To use this feature, you must replace the standard DIMMs with HP ECC DIMMs.

Surge-Tolerant Power Supply

An integrated surge-tolerant power supply provides greater reliability when the workstation is hit with an unpredictable power surge. This power supply is rated to withstand a power surge of up to 2000 V (Line to PE or Neutral to PE) and 1000 V (Line to Line) without any data loss or system downtime.

Thermal Sensor

The thermal sensor is a hardware and software feature that tracks the internal temperature of the workstation. When combined with HP Client Manager Software, this features notifies the network administrator when the normal range is exceeded.

The thermal sensor monitors the processor temperature and if the temperature gets too hot, the processor clock automatically begins to throttle. If the temperature does not go down, then the system eventually shuts down.

Chapter 4 Removal and Replacement Procedures

This chapter describes removal and replacement procedures of most internal components.

Service Considerations

The following sections discuss service considerations that should be reviewed and practiced 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 unit to fall and harm the user and damage the workstation. To properly and safely lift the workstation, lift it from the bottom of the unit.

Read Cautions, Warnings and Safety Precautions

For your safety, you must review the "Important Safety Warnings" on page ix before accessing the components of the workstation. Also, review the *Safety and Regulatory Guide* that came with your workstation for more information.

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

Electrostatic Discharge Information

A sudden discharge of static electricity from your finger or other conductor can destroy static-sensitive devices or microcircuitry. Often the spark is neither felt nor heard, but damage occurs. An electronic device exposed to electrostatic discharge (ESD) might not appear to be affected at all and can work perfectly throughout a normal cycle. The device 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	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V

Table 4-1 Static Electricity

NOTE 700 volts can degrade a product.

Preventing Electrostatic Damage to Equipment

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 all electrostatic parts and assemblies with conductive 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 their container.
- 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 conductive foam.

Personal Grounding Methods and Equipment

Use the following equipment to prevent static electricity damage to equipment:

- Wrist straps 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 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.

Table 4-2 Static Shielding Protection Levels

Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the Work Area

To prevent static damage at the work area:

- Cover the work surface with approved static-dissipative material. Provide 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 at static-free work areas.
- Turn off 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 ordinary plastic assembly aids and Styrofoam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended Materials and Equipment

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

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm ± 10% resistance
- Static-dissipative table or floor mats with 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 screwdriver or Flat-bladed screwdriver (can be used in place of the Torx screwdriver)
- Diagnostics software

Screws

The screws used in the workstation are not interchangeable. They might have standard or metric threads and might be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the removed part, then returned to their proper locations.

Special Handling of Components

The following components require special handling when servicing the workstation.

Cables and Connectors

Cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector or pull strap whenever possible. In all cases, avoid bending or twisting the 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.

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

Hard Drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package “Fragile: Handle With Care.”
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the workstation.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the workstation. Do not remove a hard drive while the workstation is on or in Hibernate mode.
- Before handling a drive, be sure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to “Electrostatic Discharge Information” on page 64.
- Do not use excessive force when inserting a drive.
- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

Lithium Coin Cell Battery

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

For instructions on battery removal and replacement, see the “Battery” section on page 94.

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 external contacts, dispose in water or fire, or expose it to temperatures higher than 140 F (60 C).

CAUTION Batteries, battery packs, and accumulators should not be disposed of together with the general household waste.

Pre-Disassembly Procedures

Perform the following steps before servicing the workstation:

1. Remove/disengage any security devices that prohibit opening the workstation.
2. Close any open software applications.
3. Remove any diskette or compact disc from the workstation.
4. Exit the operating system.
5. Turn off the workstation and any peripheral devices that are connected to it.
6. Remove/disengage any security devices that prohibit opening the workstation.

CAUTION Turn off the workstation before disconnecting any cables.

CAUTION The cooling fan is off **only** when the workstation is turned off or the power cable has been disconnected. The cooling fan is always on when the workstation is in the “On” or “Standby” modes. You must disconnect the power cord from the power source before opening the workstation to prevent system board or component damage.

7. Disconnect the power cord from the electrical outlet and then from the workstation.
8. Disconnect all peripheral device cables from the workstation.

System Board Components

The following image shows the system board connectors and sockets on the HP Workstation xw6200.

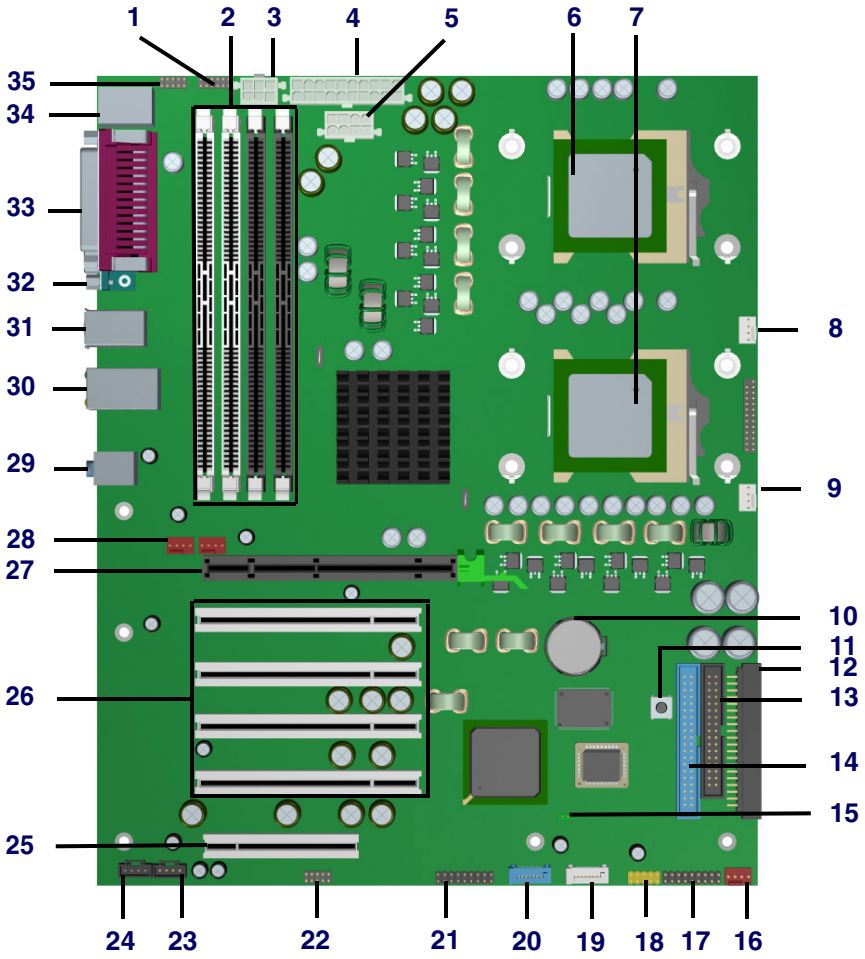


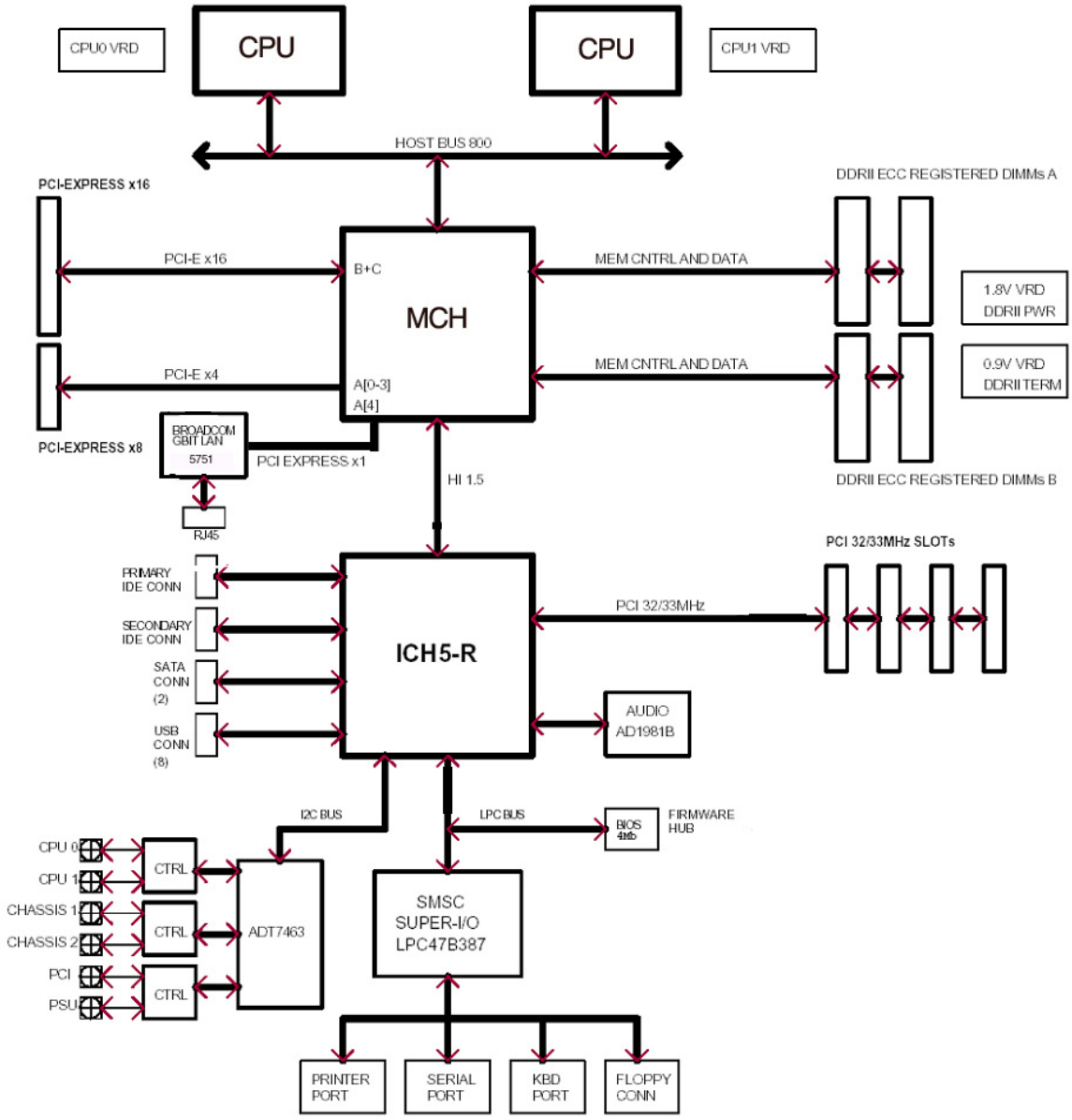
Table 4-3 System Board Components

1	MultiBay	**10**	Battery	**19**	Serial ATA	**28**	Rear chassis fans
2	Memory module pairs	**11**	Clear CMOS button	**20**	Serial ATA (primary)	**29**	Audio
3	Auxiliary power	**12**	Secondary IDE*	**21**	Trusted Platform Module	**30**	USB/network
4	Main power	**13**	Diskette drive	**22**	Front audio	**31**	USB
5	Processor power	**14**	Primary IDE**	**23**	Auxiliary audio	**32**	Serial
6	Processor 1	**15**	Password header	**24**	CD-ROM audio	**33**	Parallel
7	Processor 2	**16**	Front chassis fan	**25**	PCI Express x8 prime	**34**	PS2 Keyboard/mouse
8	Processor 1 fan	**17**	Front control panel	**26**	PCI	**35**	Hood lock (Smart Cover lock)
9	Processor 2 fan	**18**	Front USB	**27**	PCI Express x 16 (graphics)		

*The Secondary IDE connector is generally used for optical drives.
**The Primary IDE connector is generally used for hard drives

System Board Architecture

The following image shows the HP Workstation xw6200 block diagram.



Removal and Replacement of Components

This section discusses the procedures necessary to remove and install various hardware components on your workstation. Review the safety and precautions and the "Service Considerations" on page 64, as well as the *Safety and Regulatory Guide,* before servicing or upgrading your system.

1. Read all safety information and precautions.
2. Locate and clear a suitable work area.
3. Shut down the system and remove power from the unit.
4. Gather your tools.
5. Service your unit.
6. Restore power to your unit.

Disassembly Order

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

- Pre-Disassembly (page 68)
- Locks (page 72)[1]
  - Access Panel (page 74)
    - Hood Sensor (page 82)
    - Top Cover (page 76)[2]
      - Hood Lock (page 77)
    - Front Bezel (page 75)
      - Front Panel I/O Device Assembly (page 78)
        - Power Button and Front Speaker (page 79)
      - Optical Drive (page 96)
      - Diskette Drive (page 98)
      - Bezel Blanks (page 75)
    - System Fan Assembly (page 80)
    - Power Supply (page 81)
    - Memory (page 82)
    - Front Fan Removal (Optional) (page 93)
    - Battery (page 94)
    - Hard Drive (page 100)
    - CPU Heatsink (page 105)
      - Processor (page 108)
    - PCI Card Support (page 87)
      - PCI Retainer (page 88)
        - PCI or PCI Express card (page 90)
          - CPU Heatsink (page 105)
            - Processor (page 108)
            - System Board (page 110)

1. Some locks do not need to be removed before proceeding to the next step. For example, you only need to unlock the lock on the access panel before opening it.
2. The top cover can be removed anytime, but you must remove it after removing the access panel when removing the hood lock.

Security Lock (Optional)

If a security padlock is installed, remove it before servicing the unit. To remove the padlock, unlock it and slide it out of the padlock loop as shown in the following image.

Cable Lock (Optional)

If a cable lock is installed, remove it before servicing the unit. To remove the cable lock, unlock it and pull it out of the cable lock slot as shown in the following image.

Universal Chassis Clamp Lock (Optional)

If a universal chassis clamp lock is installed, remove it before servicing the unit.

To remove the lock:

1 Unlock the device and remove the locking mechanism.

2 Remove the screw attaching the lock to the chassis.

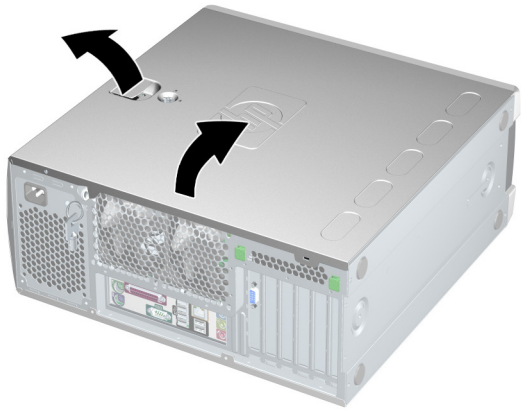
Access Panel

Before accessing the internal components of the workstation, the access panel must be removed.

To remove the access panel:

WARNING! Before removing the workstation access panel, be sure that the workstation is turned off and that the power cord is disconnected from the electrical outlet.

1. Disconnect power from the system (page 68).
2. If necessary, unlock the access panel (page 72 or page 72).
3. Pull up on the handle and lift off the cover.



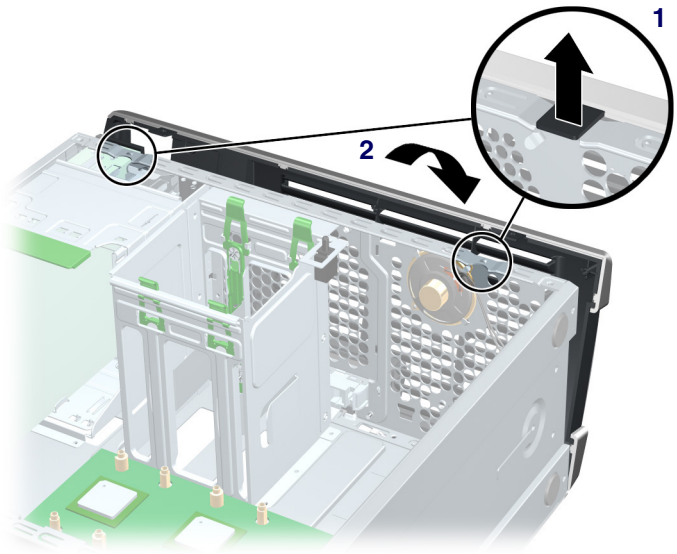
To replace the access panel, slide the cover back on until it snaps into place.

Front Bezel

To remove the bezel:

1 Lift up on the two **1** tabs located on the front bezel.

2 Rotate the front bezel away **2** from the chassis and remove the bezel.

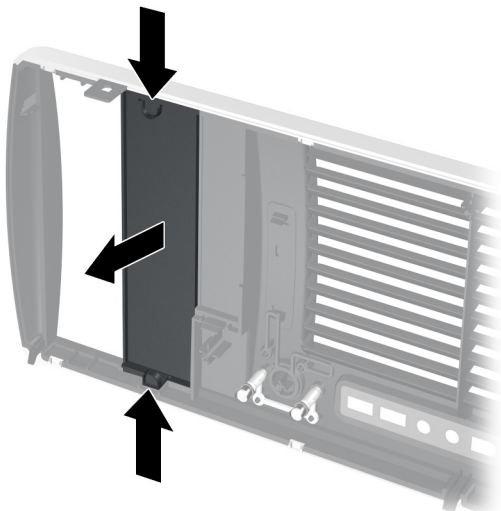


Bezel Blanks

To remove the bezel blanks:

1 Disconnect power from the system (page 68) and remove the front bezel (page 75).

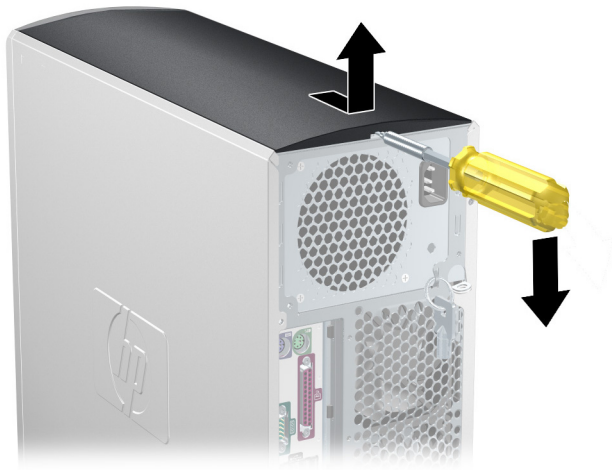
2 Remove the bezel blanks by squeezing in on the tabs and pushing the bezel blanks out.



Top Cover

NOTE It is unnecessary to remove the top cover for most removal or replacement procedures.

1. Disconnect power from the system (page 68), remove the access panel (page 74), and remove the front bezel (page 75).
2. Push a flat screw driver into tab **1** on the rear of the chassis and gently pry the cover upward.



3. Push the top cover toward the back of the chassis and lift up.

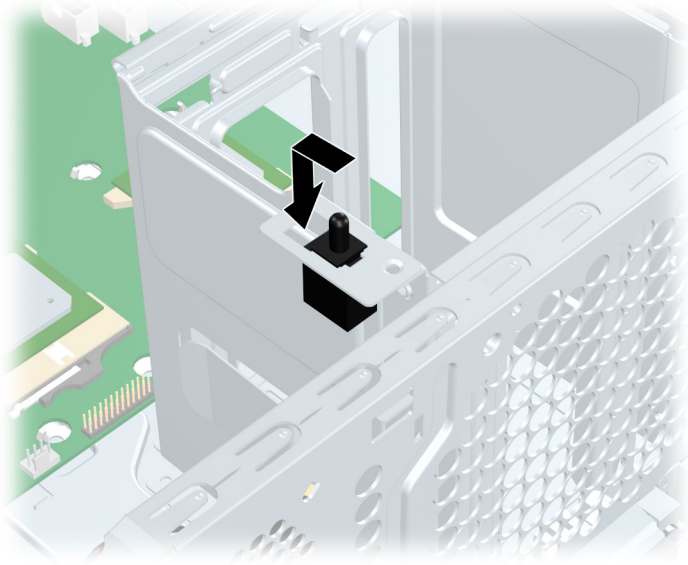
Hood Sensor (Smart Cover Sensor) (Optional)

To remove the hood sensor:

1. Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.
2. Disconnect the white 1x3 hood sensor connector from the inline connector attached to the front panel harness.
3. Slide the hood sensor forward.

CAUTION Be careful when sliding the hood sensor forward. The hood sensor bracket and the chassis contain sharp edges that present a safety hazard.

4 Push the hood sensor down and remove it from the chassis.



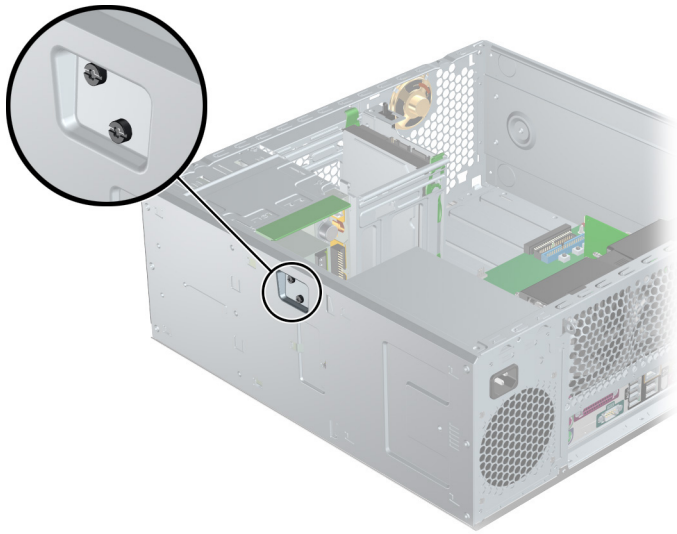
To replace the hood sensor, reverse the previous steps.

Hood Lock (Smart Cover Lock) (Optional)

To remove the hood lock:

1 Disconnect power from the system (page 68), remove the access panel (page 74), remove the top cover (page 76) and lay the workstation on its side with the system board facing up.

2 Using the FailSafe Key (included with the kit), remove the two tamper-resistant screws that secure hood lock to the chassis.

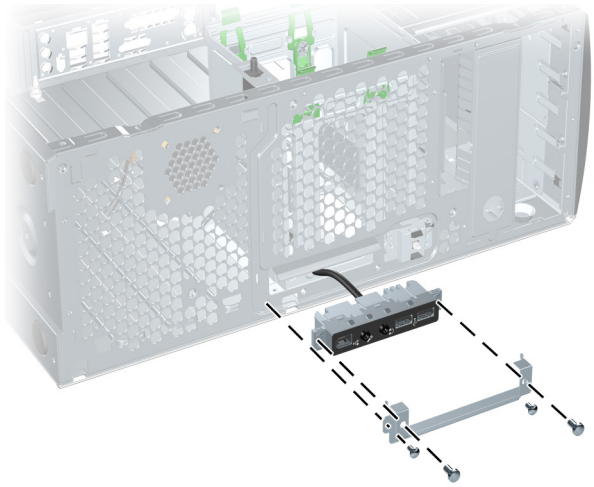


3 Disconnect the hood lock cable from the system board and remove the lock assembly.

To install the hood lock, reverse the previous steps.

Front Panel I/O Device Assembly

1. Disconnect power from the system (page 68), remove the access panel (page 74), and remove the front bezel (page 75).
2. Unlatch the plastic snap that secures the cables inside the chassis and disconnect the front panel I/O device assembly cables from the system board.
3. Remove the screws that hold the front panel I/O device assembly and bracket to the chassis and remove the screws that hold the front panel I/O device assembly to the bracket.
4. Pull the front panel I/O device assemblyout about two inches away from the chassis.
5. Separate the bracket away from the front panel I/O device assembly.



WARNING! The next step requires the removal of cables through the chassis. Some edges on the chassis might be sharp. Be careful when removing these cables.

6. Slide the front panel cables through the chassis and out the front of the unit.

To replace the front panel I/O device assembly, reverse the previous steps.

Power Button Assembly and System Speaker

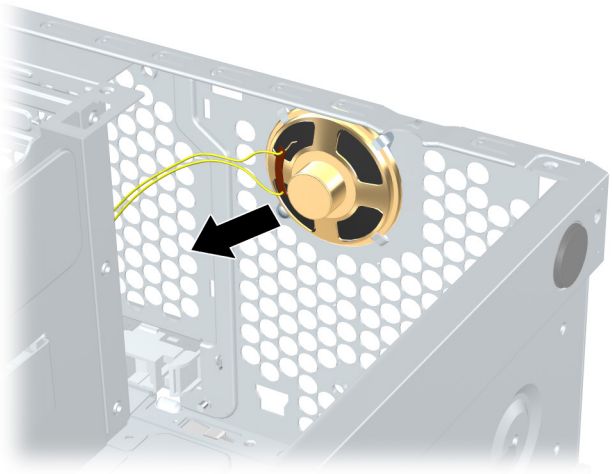
The power button and the system speaker are part of the same assembly.

To remove the power button:

1. Disconnect power from the system (page 68), remove the access panel (page 74), remove the front bezel (page 75), and remove the front panel I/O device assembly (page 78).
2. Disconnect the power button assembly cable from the system board.
3. Disconnect the speaker wire and the hood sensor (if installed) from the in-line connectors on the power button assembly cable.
4. Remove the screw that secures the power button assembly to the chassis.
5. Pull the power button assembly away from the chassis.
6. Slide the power button assembly out from the front of the chassis.

To remove the speaker:

1. Disconnect the speaker cable from the in-line front panel I/O device assembly cable, if you have not already done so.
2. Slide the speaker away from the three flanges and remove it from the chassis.

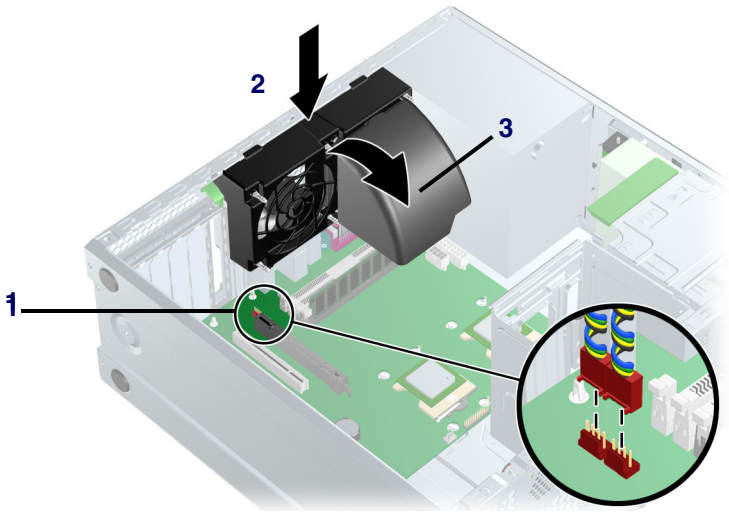


System Fan Assembly

To remove the system fan assembly:

1. Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.
2. Disconnect the fan plugs **1** from the system board.
3. Press in on the ribbed portion of the fan housing **2**, rotate the fan housing down **3**, and lift it out of the chassis.

   This illustration shows the system fan with an airflow duct installed. This duct is only required on some systems. Refer to the next section for more information.



To replace a system fan assembly, reverse the previous steps.

Airflow Duct

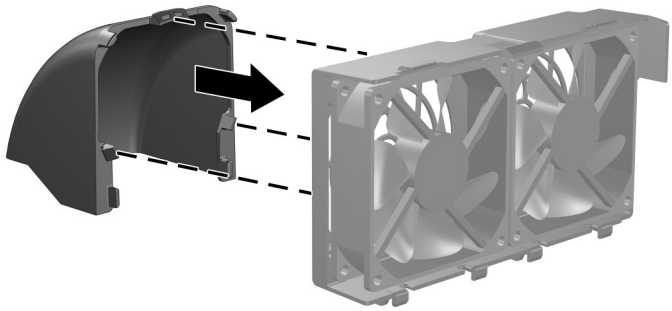
The airflow duct ships with certain DIMM configurations on this workstation. If your system did not ship with the duct from the factory, the duct is not required.

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

To install the airflow duct (if separated from the system fan assembly):

1. Install the duct by pushing the duct toward the fan and snapping it into place. The duct must be installed on the fan that is closest to the power supply. See the previous image for proper orientation.

2 Reinstall the system fan assembly (page 80).



Power Supply

1 Disconnect power from the system (page 68), remove the access panel (page 74), remove the system fan assembly (page 80), and lay the workstation on its side with the system board facing up.

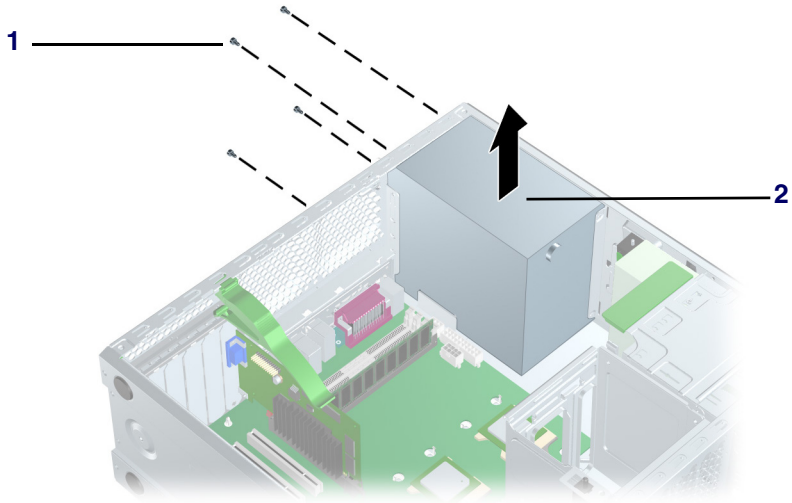
2 Disconnect the power supply from the system board.

3 Disconnect the optical drives, diskette drive, hard drives, and graphics card (select models only) from the power supply.

CAUTION Be sure 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 two cables look very similar. The PCI Express power cable has a black connector and the power cable has a white connector. When power is present, you must NEVER connect the PCI Express power cable to the system board. If you do so, the system board may be damaged and your warranty voided. To see a picture of the PCI Express cable and where it must be connected, refer to the “PCI or PCI Express Installation” section on page 91.

4 Remove the four screws **1** from the back panel.

5 Slide the power supply toward the front and lift up **2** to remove it from the chassis.



To install the power supply, reverse the previous steps.

Memory

Memory Module Features

- 4 memory slots for DIMMS
- 256-MB, 512-MB, 1-GB and 2-GB pairs
- 8 GB maximum configuration (4 GB maximum on Windows and 16 GB maximum on Linux)
- Supports single-channel or dual-channel DIMMs
- Supports DDR2-400
- No support for mirroring, no spare DIMM support
- Standard ECC (72-bit ECC)
- Enhanced ECC (x4 SDDC or 144-bit ECC) in dual-channel mode when all DIMMs are x4
- DED retry

Memory Module Requirements

- Use only industry-standard, registered, PC2-3200 DIMMs
- Match DIMM pairs by size and type
- No support for unbuffered memory

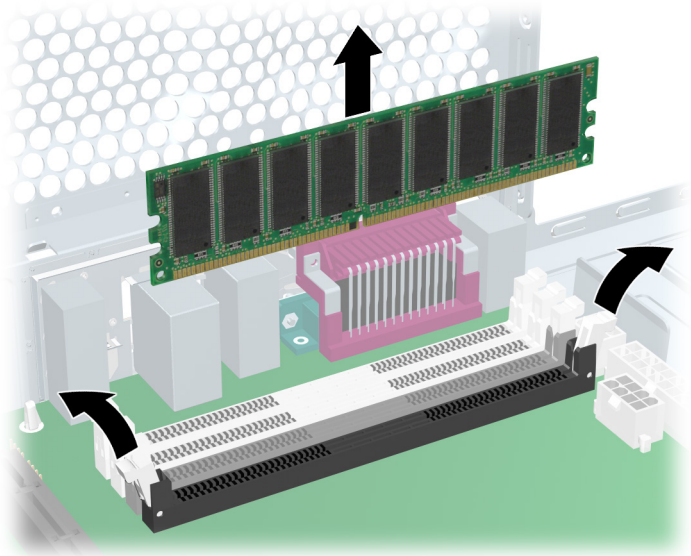
Removing Memory Module

1 Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up. If an airflow duct is installed, remove the system fan assembly (page 80) to gain access to the DIMMs.

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. Wait until the LED on the back of the power supply turns off before removing memory. If you do not unplug the power cord while installing memory, your memory modules might be damaged and the system will not recognize the memory changes.

2 Gently push outwards on the socket levers.

3 Lift the DIMM straight up and remove it from the unit.



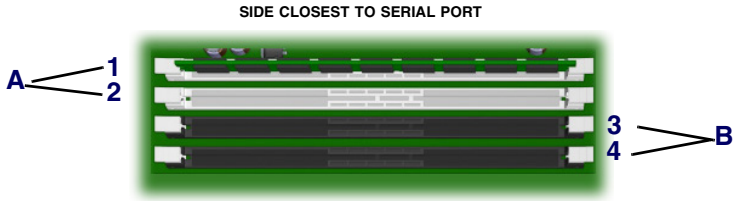
NOTE DIMMs and the DIMM sockets are keyed for proper installation. Be sure these guides line up when installing a DIMM.

Installing Memory Module

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

You must load memory modules in valid configurations:

- Load DDR SDRAM as matched pairs. For example, if you place a memory module of 1 GB in slot 1, you must also insert a 1-GB module in slot 2.
- Load the memory module pairs in order of size, from smallest to largest, beginning with memory module pair A (closest to serial port). For example, if you have 1.5 GB of memory composed of two 256-MB modules and two 512-MB modules, load the 256-MB modules in memory module pair A and the 512-MB modules in pair B.
- Install the DIMM in socket 1 if only installing one DIMM.
- Install the first matched DIMM pair in socket set A.
- Install subsequent matched DIMM pairs in set B (farthest from serial port).



The BIOS generates warnings/errors on invalid memory configurations.

- In DDR2 mode, dual-rank DIMMs are placed farther from the Memory Controller Hub (MCH) than single-rank DIMMs.
- If there is no way to obtain a valid memory configuration by disabling some of the plugged-in memory, the BIOS will halt with a diagnostics 2004 code for memory error (4 beeps/blinks).
- If the BIOS can find a valid memory configuration by disabling some of the plugged-in memory, it will do so and will report a warning during POST ("215-mismatched memory"). The system can still be booted in this condition.

To install a DIMM:

1. Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up. If an airflow duct is installed, remove the system fan assembly (page 80) to gain access to the DIMMs.
2. Gently push outwards on the socket levers.
3. Lower the DIMM straight down and be sure the socket levers secure the module into place.

Peripheral Component Interconnect (PCI) Slots

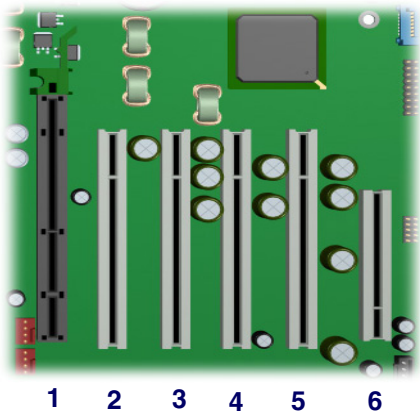


Table 4-4 PCI Slot Types

Slot	Type	Ref
1	PCI Express x16	J41
2	PCI	J23
3	PCI	J20
4	PCI	J21
5	PCI	J22
6	PCI Express x4	J31

Table 4-5 PCI Device List

Device	Bus#	Dev#	Fn#
MCH	0	0	0
MCH Errors	0	0	1
MCH EXP A (Slot 1)	0	2	0
MCH EXP A1 (NIC)	0	3	0
MCH EXP B (Slot 2)	0	4	0
MCH Test Overflow	0	8	0
ICH5 USB #1	0	29	0
ICH5 USB #2	0	29	1
ICH5 USB #3	0	29	2
ICH5 USB #4	0	29	3
ICH5 USB 2.0	0	29	7

Table 4-5 PCI Device List

Device	Bus#	Dev#	Fn#
ICH5 PPB (PCI slots)	0	30	0
ICH5 LPC	0	31	0
ICH5 IDE	0	31	1
ICH5 SATA	0	31	2
ICH5 SMBus (1)	0	31	3
ICH5 Audio	0	31	5
ICH5 Modem (2)	0	31	6
Broadcom PCI Express NIC	1	0	0
Slot 3 (PCI)	2	4	0
Slot 4 (PCI)	2	9	0
Slot 5 (PCI)	2	10	0
Slot 2 (PCI)	2	11	0
Slot 6 (PCI Express x4 EXP A)	32	0	0
Slot 1 (PCI Express x16 EXP B)	64	0	0

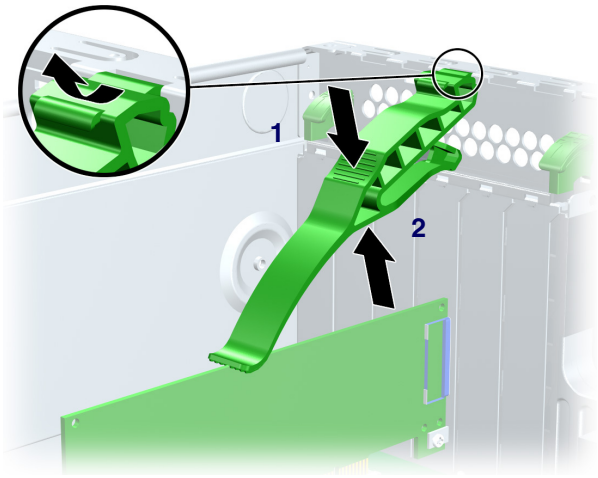
PCI Card Support

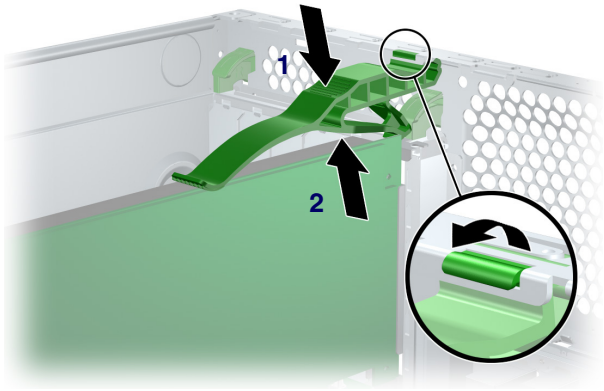
For added protection, some cards have PCI holders installed to prevent movement during shipping.

REMOVING CARD SUPPORT

1 Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.

2 For short or tall PCI cards, press down on the holder arm **1** while lifting up on the other side of the arm **2**.



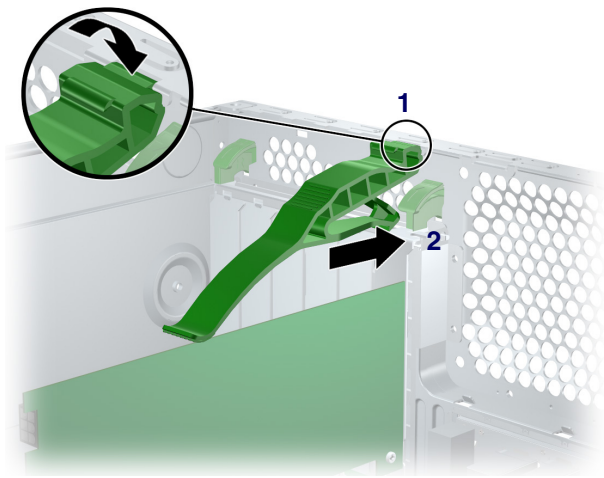


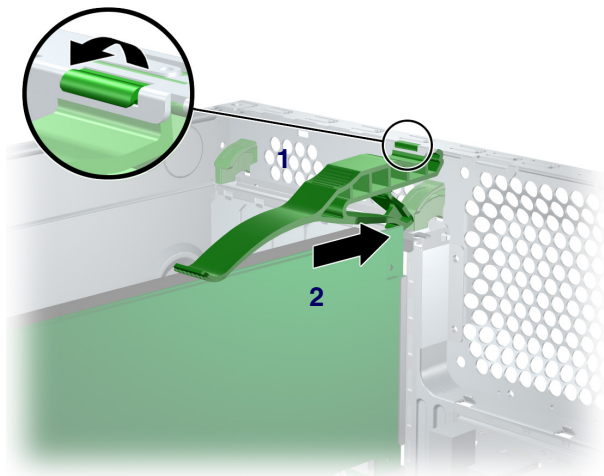
INSTALLING CARD SUPPORT

1 Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.

2 Attach the card support arm on different sides of the chassis slots depending on if supporting a short or tall card. Use the following images as a guide and also the imprint on the card support arm.

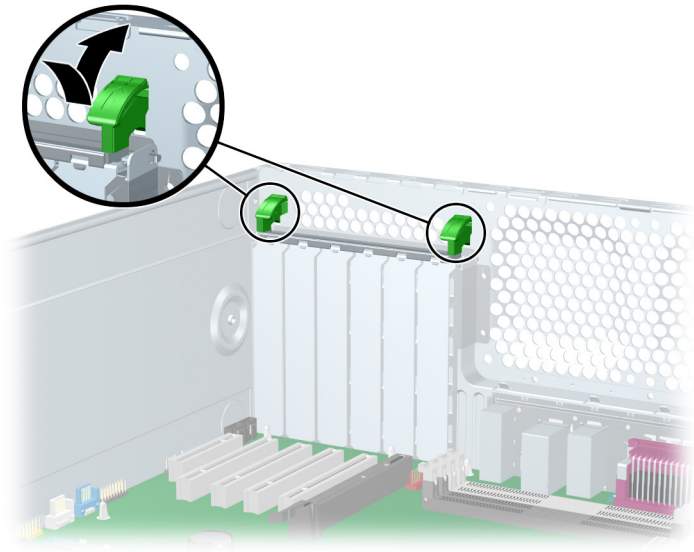
- For short cards, attach the lip of the support arm over the chassis slot **1** and pull the lower part of the arm over the PCI retainer **2**.
- For tall cards, attach the lip of the support arm under the chassis slot **1** and pull the lower part of the arm over the PCI retainer **2**.





PCI Retainer

1. Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.
2. Open the PCI retainer by pressing down on the two green clips at the ends of the retainer and rotating the retainer towards the back of the system.



PCI Express

PCI Express is a new hardware interconnect standard (for example, I/O slots). PCI Express is a point-to-point architecture and uses a serial data transmission protocol. A single PCI Express lane consists of 4 wires and is capable of transmitting 250 MB/sec in a single direction or 500 MB/sec in both directions simultaneously. This bandwidth is not affected by what is happening on other PCI Express buses or legacy PCI/PCI-X buses (provided that total bandwidth can be handled by the CPU and the memory subsystem.) The transmission protocol is somewhat similar to that used for a LAN connection and contains error correction and detection, packet addressing and other network features.

PCI Express improves system attributes. PCI Express enables a low-power, scalable, high-bandwidth communication path with a small number of connections (wires) compared to traditional parallel interfaces (e.g. PCI).

The PCI Express IO slots can support other PCI Express cards with lesser bus bandwidth than what is physically defined for the slot. Use the following table to determine compatibility.

For example, a PCI Express x8 card does not work in a PCI Express x1 slot, but a PCI Express x1 card works in a PCI Express x8 slot.

NOTE The HP Workstation xw6200 contains one PCI Express x8 slot that supports x4 bandwidth. If a PCI Express x8 card is plugged into the PCI Express x8 slot, the card runs at x4 bandwidth.

Table 4-6 PCI Express Compatibility Matrix for xw6200

	PCI Express x1 Slot (not available)	PCI Express x4 Slot (not available)	PCI Express x8 Slot	PCI Express x16 Slot
PCI Express x1 Card	Y	Y	Y	Y
PCI Express x4 Card	N	Y	Y	N
PCI Express x8 Card	N	N	Y	N
PCI Express x16 Card	N	N	N	Y

PCI or PCI Express Removal

1. Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up, remove the PCI retainer (page 88), and remove PCI card support (page 87), if necessary.
2. Lift the PCI levers by first pressing down on them and then out.
3. Lift the PCI card out of the chassis. If removing a PCI Express card, remove the power supply cable (not illustrated), if required, and move the “hockey stick” lever to release the card and lift it out of the chassis. Store the card in an anti-static bag.
4. Close the PCI levers.

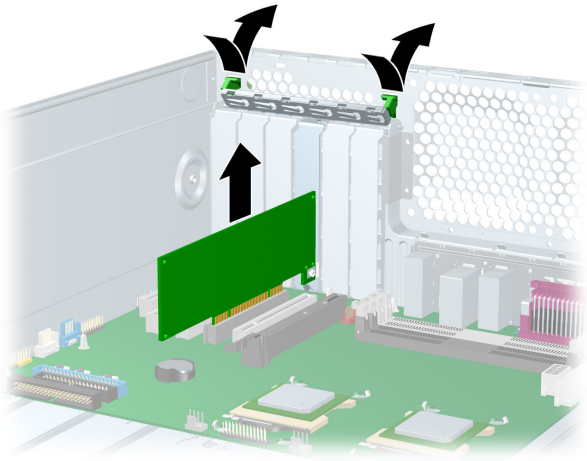


Figure 4-1 PCI Removal

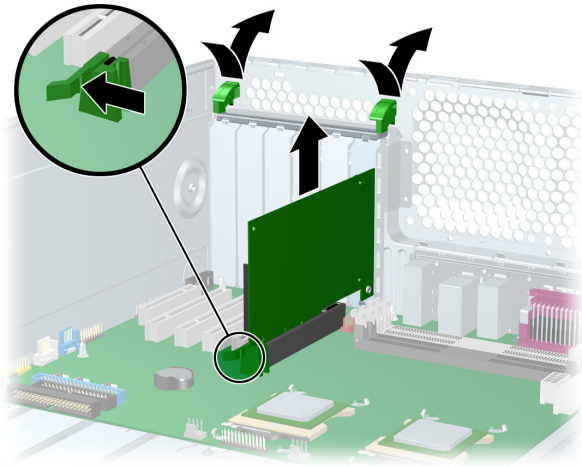


Figure 4-1 PCI Express Removal

PCI or PCI Express Installation

1. Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up, and remove the PCI retainer (page 88).
2. Lift the PCI levers **1** by first pressing down on them and then out.
3. Remove the PCI slot cover **2**.
4. Lower the PCI **3** or PCI Express **3** card into the chassis. Verify that the keyed components of the card align with the socket. If installing a PCI Express card, plug in the power supply cable, required.
5. Close the PCI levers. If the PCI levers do not close, be sure all cards are properly seated and then try again.
6. If installing a PCI Express card, plug in the power supply cable, if required.

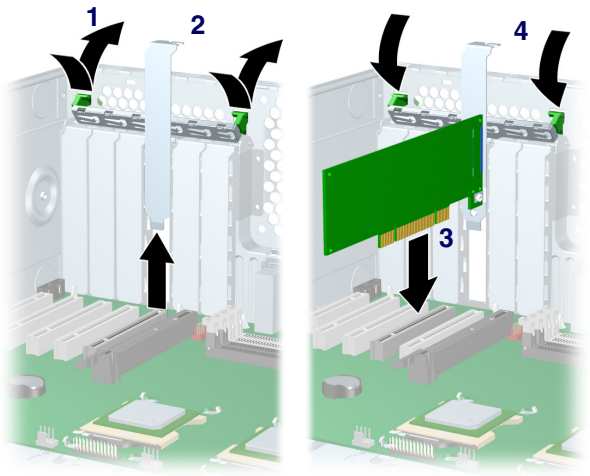


Figure 4-2 PCI Installation

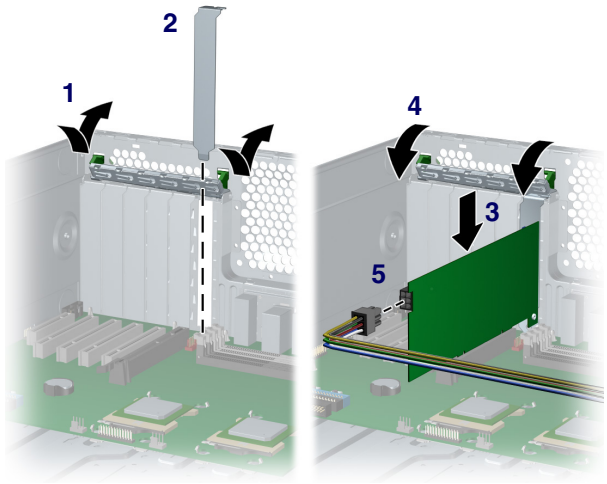
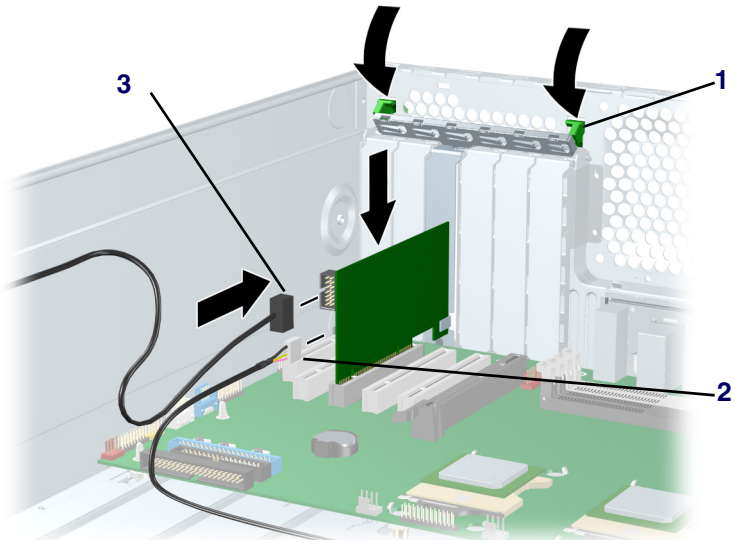


Figure 4-2 PCI Express Installation

IEEE-1394 (Optional)

To install an optional IEEE-1394 adapter:

1. Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.
2. Install the IEEE-1394 card into the PCI socket.
3. Close the PCI levers **1**.
4. Connect the power cable **2** into the card.
5. Connect the front panel IEEE-1394 cable **3** into to the card.

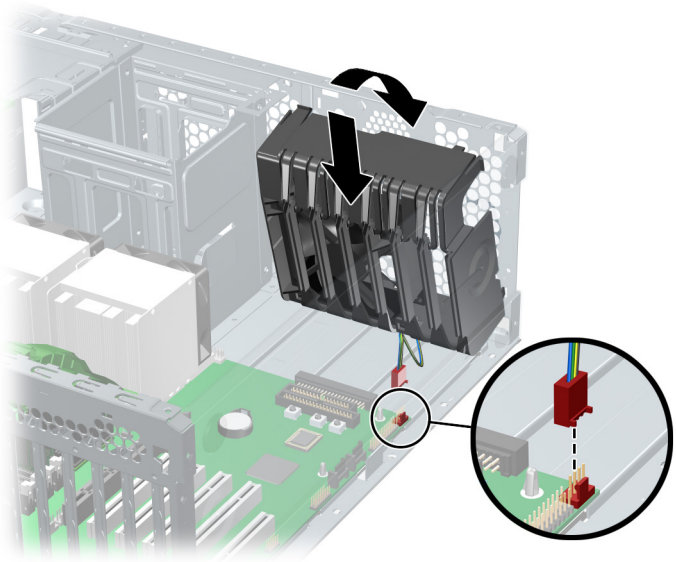


Front Fan Removal (Optional)

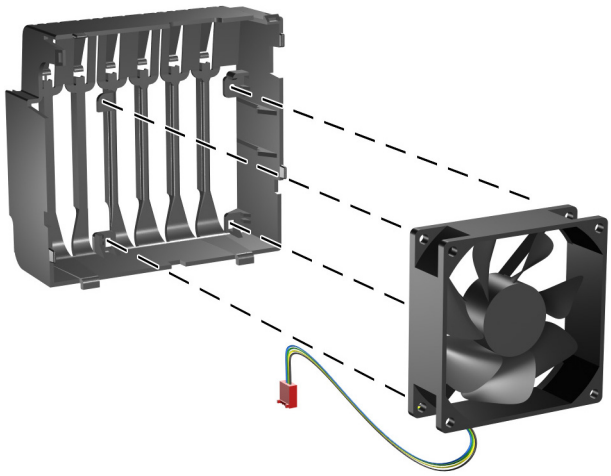
1 Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.

2 Disconnect the connector **1** from the header on the system board.

3 Unsnap the fan housing from the chassis and lift it out of the workstation.



4 Remove the fan from the fan housing by applying outward pressure on the fan housing while lifting the fan away.

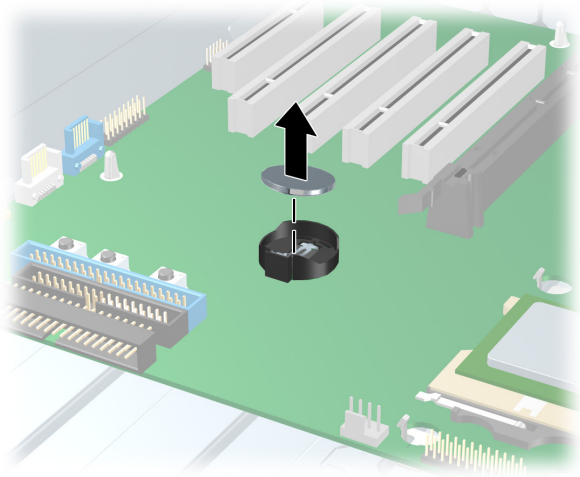


To install the front fan, reverse the previous steps. When installing the fan, it must blow toward the rear of the chassis, so be sure that the airflow direction arrow on the side of the fan housing faces the rear of the chassis.

Battery

CAUTION Before removing the battery, be sure your CMOS settings are backed up as all CMOS settings are lost when the battery is removed. To back up the CMOS settings, use Computer Setup and run the Save to Diskette option from the File menu.

1. Disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.
2. On the system board, press on the release tab of the battery holder.
3. Rotate the battery enough to get beyond the latch and lift it straight up.

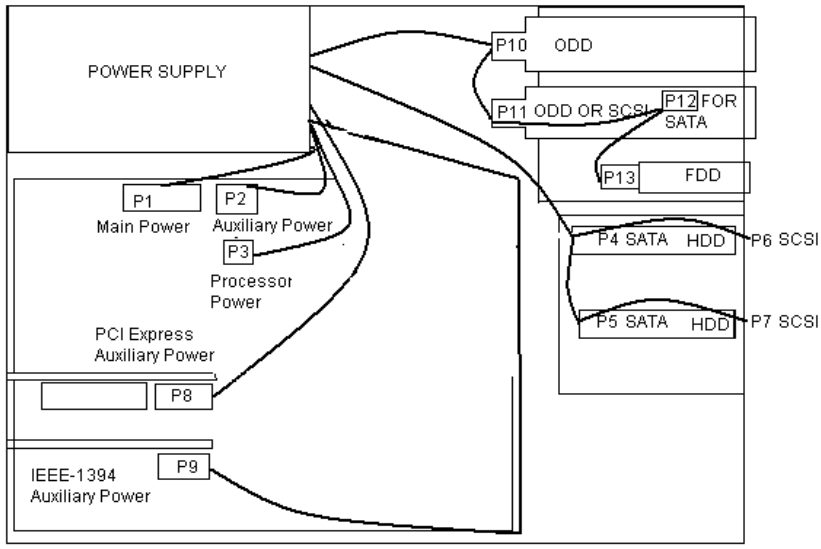


To install the battery slide the battery back in until it snaps back into place.

Power Connections to Drives

For help in identifying power cables, refer to the following information. Route or tie cables so that there is no possible way for them to interfere with the CPU heatsink fans.

CAUTION Be sure you can differentiate which power cable connects to the PCI Express x16 graphics card and which power cable connects to the system board. These two cables look very similar. The PCI Express power cable has a black connector and the power cable has a white connector. When power is present, you must NEVER connect the PCI Express power cable to the system board. If you do so, the system board may be damaged and your warranty voided. To see a picture of the PCI Express cable and where it must be connected, refer to the "PCI or PCI Express Installation" section on page 91.

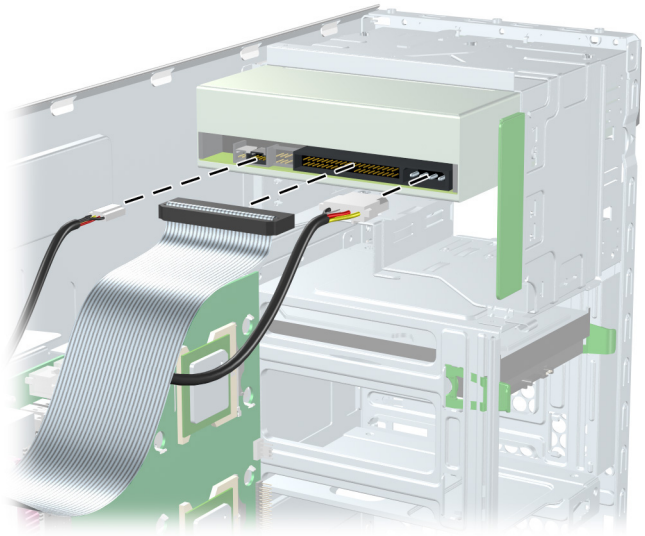


Optical Drive

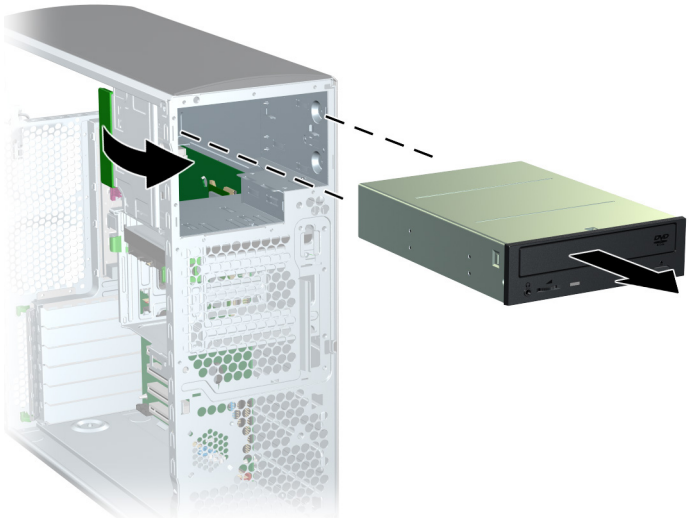
1 Disconnect power from the system (page 68), remove the access panel (page 74), and remove the front bezel (page 75).

2 Disconnect the power, drive, and audio cables from the drive. The connector colors may be different than illustrated.

NOTE The audio cable is only required for Linux-based systems.



3 Lift the green drivelock release lever and gently slide the drive out of the chassis.



To replace an optical drive:

1 Lift the green drivelock release lever while sliding the optical drive into the bay. When the optical drive is partially inserted, release the drivelock release lever and slide the drive completely into the bay until the drive is secured.

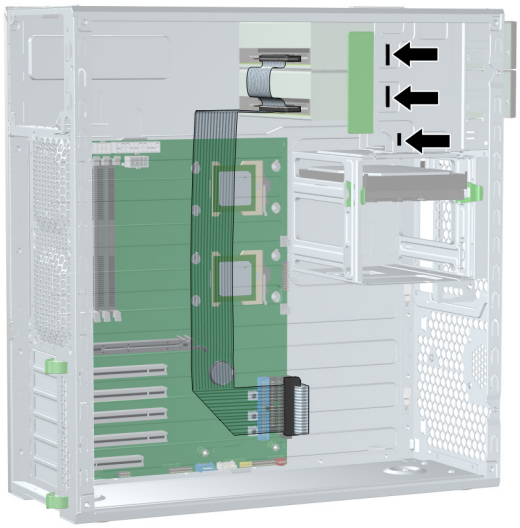
CAUTION Ensure that the optical drive is secure. Failure to do so can cause damage to the drive when moving the workstation.

2 Connect the power, drive, and audio (if required) cables to the drive and workstation.

NOTE The audio cable is only required for Linux-based systems.

If you are installing more than one optical drive, route the cable as in the following image.

NOTE The optical drive cable is routed under the system board.



Replacing Optical Drive Cable

The optical IDE cable is routed behind the system board.

1 Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up, remove all expansion boards and graphics cards (page 90), remove the CPU heatsinks (page 105), disconnect the optical IDE cable from the system board, and remove the system board (page 110).

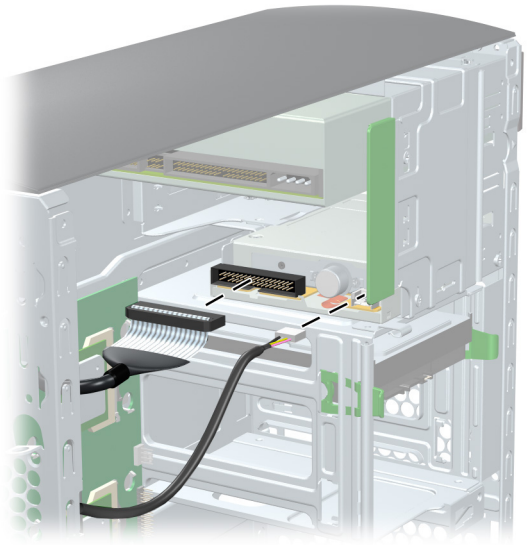
2 Remove the plastic ties and tape from the IDE cable, then remove the IDE cable

3 Replace the cable and cable ties. Refer to the previous image for cable routing information.

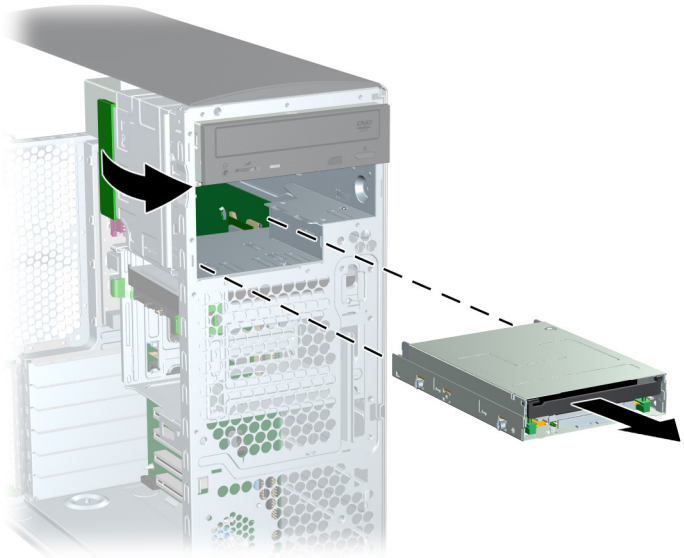
Diskette Drive (Optional)

To remove a diskette drive:

1. Disconnect power from the system (page 68), remove the access panel (page 74), and remove the front bezel (page 75).
2. Disconnect the cables from the back of the diskette drive.



3. While lifting the green drivelock release tab, slide the drive forward out of the chassis.



To replace an optional diskette drive:

1 While lifting the green drivelock release tab, slide the drive forward into the chassis.

2 Route the diskette drive data cable between the system board and the hard drive cage. Your cable might look different than the one shown.

CAUTION The cable must stay between the system board and the hard drive cage. It might be necessary to push the cable down so that it catches on the system board. This routing method is important because you do not want to interfere with the CPU heatsink fans or block airflow.

3 Connect the cables from the back of the diskette drive.

Hard Drive

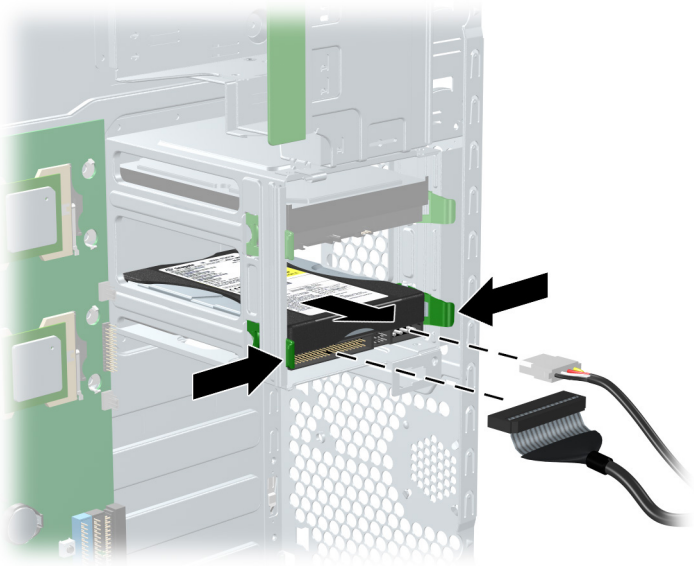
For more information on SATA hard drives and the SATA RAID configuration, see Appendix B, “SATA Devices,” on page 155.

Removing a Hard Drive

1 Disconnect power from the system (page 68) and remove the access panel (page 74).

2 Disconnect the cables from the back of the hard drive.

3 Push in on the green drivelock release tabs and slide the hard drive out of the chassis.



Installing a Hard Drive

This section describes how to install SCSI and SATA hard drives.

- “Installing a SCSI hard drive” section on page 100
- “intalling a SATA hard drive” section on page 103

INSTALLING A SCSI HARD DRIVE

For more information on SCSI hard drives, see Appendix B, “SCSI Devices,” on page 151.

Before installing a SCSI hard drive on your system, you must give the hard drive a unique SCSI ID.

All SCSI controllers require a unique SCSI ID (0–15) for each SCSI device that is installed. The reserved and available SCSI ID numbers are displayed in the following list:

- 0 is reserved for the primary hard drive (not reserved for the primary hard drive on Linux).
- 7 is reserved for the SCSI controller.
- 1 through 6 and 8 through 15 are available for all other SCSI devices.

When 0 is used for the primary hard drive, set the second hard drive to 1, the third to 2, and so on.

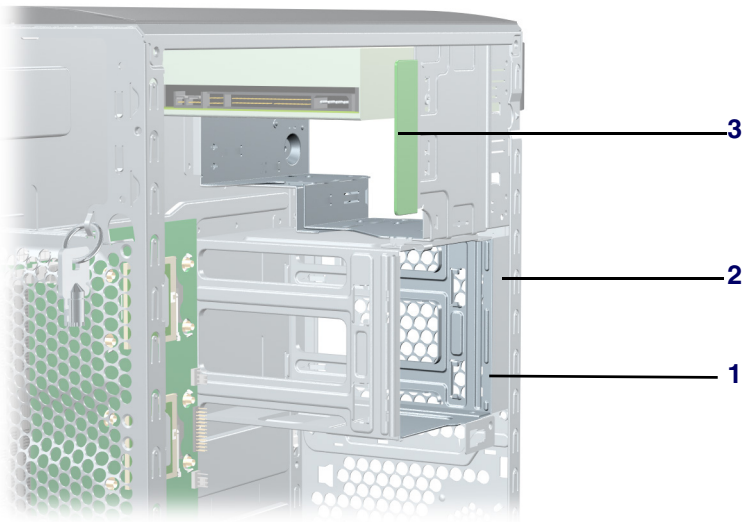
To set the SCSI ID on a drive, see the instructions on top/back of the hard drive for the correct jumper settings. The drive probably displays a diagram of the jumper block. This diagram shows you which blocks to cover with your jumper to get the desired ID.

For example, if the drive must be set to 3, the drive might show that the 4 ID bits are at the far left of the connector (ID0, ID1, ID2, and ID3), then using the jumpers provided, cover each block to set the SCSI ID.

After you have given the hard drive a unique SCSI ID, you can install the hard drive into your system.

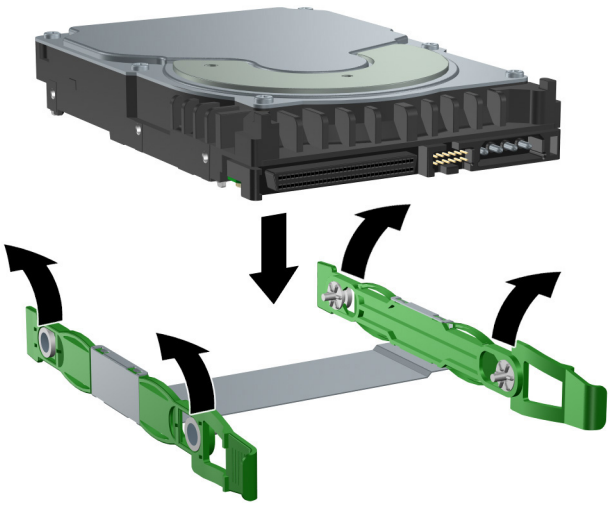
1 Select a drive bay in which to install the drive. If installing more than one hard drive, use the hard drive order in the following image.

If installing the hard drive into the 5.25-inch bay, you must install the optional bracket (page 104).



2 Simultaneously disengage the green tabs of the rail assembly and slide the rails out of the empty bay.

3 Attach the rails to the hard drive by first inserting the hard drive rail assembly pins into one side of the hard drive screw holes. Next, gently flex open the opposite side of the hard drive rail assembly and insert the remaining pins into the holes in the hard drive. If installing the hard drive into the 5.25-inch bay, skip this step.



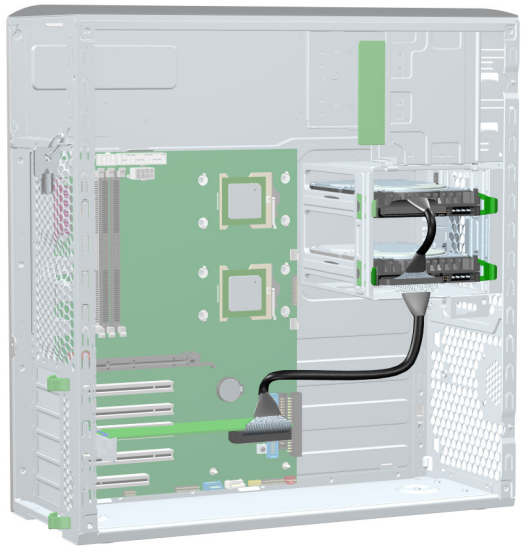
4 Push the drive into the selected bay until it snaps into place. Then attach the power and SCSI cable to the drive.

5 Insert the SCSI controller card into an available PCI expansion slot (page 91).

6 Connect the SCSI cable to the SCSI controller card.

7 Connect the hard drive LED cable to the SCSI card and to the system board. The LED header location is available on the system board image on the access panel.

The hard drive cable might have extra connectors for other hard drives, but for clarity those connectors have been omitted in the following image.



INTALLING A SATA HARD DRIVE

For more information on SATA hard drives and the SATA RAID configuration, see Appendix B, “SATA Devices,” on page 155.

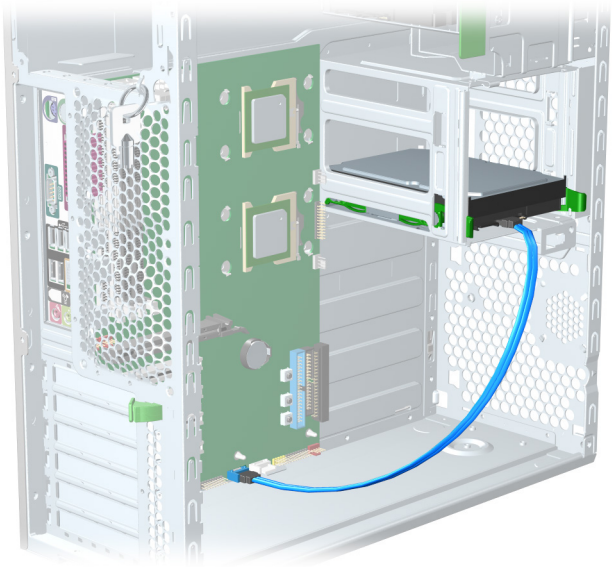
1 Select a drive bay in which to install the drive. Squeeze the green tabs and slide the rails out of the empty bay.

2 Attach the rails to the hard drive by aligning the notches with the holes and squeezing it into place (see image on page 101).

3 Push the drive into the selected bay until it snaps into place.

4 Attach the power cable and data cable to the drive.

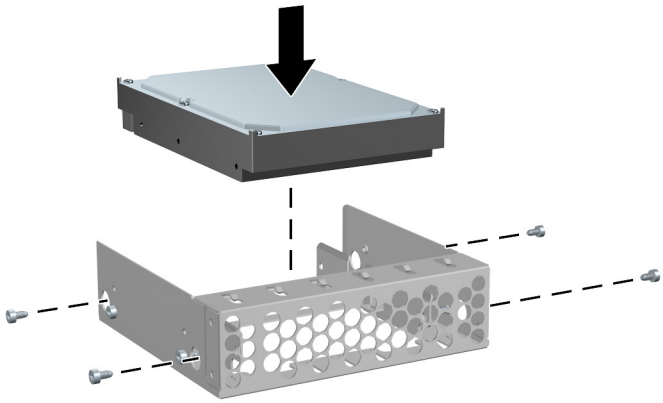
5 Connect the data cable to the serial ATA port.



Installing a Hard Drive into the 5.25-Inch Bay (Optional)

If you want to install a hard drive into a 5.25-inch bay, you must install an optional bracket.

1. Lower the hard drive into the bracket and secure the drive by inserting four #6-32 screws (shipped with this kit) through the holes in the sides of the bracket and into the threaded holes in the hard drive.



2. Insert the hard drive into the 5.25-inch optical drive bay.
3. After inserting the hard drive into the bay, secure the hard drive to the chassis by inserting one M3 screw (shipped with the bracket kit) into the available opening on the side of the optical drive bay.
4. To complete the installation, follow the instructions for installing your type of hard drive (page 100 or page 103).

Processor Heatsink

Removing the CPU Heatsink

NOTE The following illustrated CPU heatsink is typical of what you might have in your workstation. Be aware that different variations of the CPU heatsinks exist, but the overall procedures listed are sufficient to assist you in removing the CPU heatsink.

1 Turn on the workstation and enter Computer Setup (F10) (page 35). Let the workstation run in this mode for five minutes.

This action warms the thermal interface material between the CPU heatsink and processor so that the thermal bond loosens and can more easily be broken.

CAUTION If you remove the CPU heatsink while the thermal pad is cold, you could lift the processor out of the socket, even if the socket is closed. This could damage the processor and the processor socket.

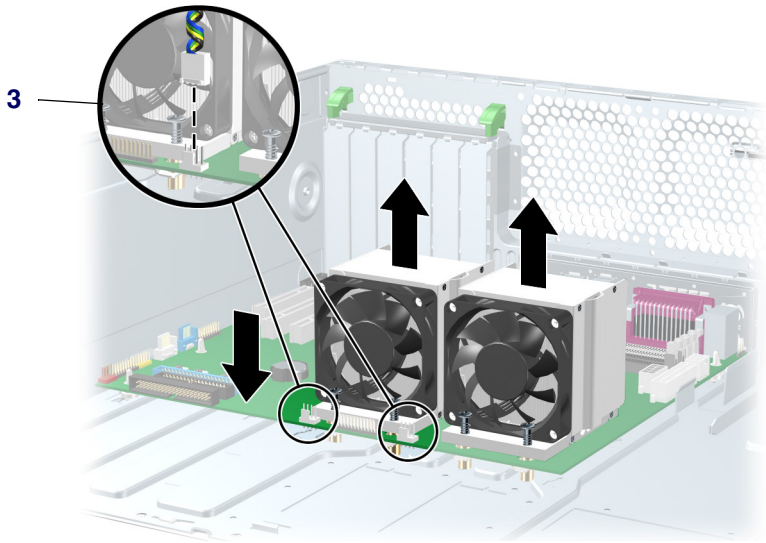
NOTE Windows in idle state does not provide sufficient heat to warm the compound.

2 After warming the thermal interface, quickly shut down the system, disconnect power from the system (page 68), remove the access panel (page 74), and lay the workstation on its side with the system board facing up.

3 Remove the four processor screws slowly, making sure to loosen all the screws evenly. Loosen one pair of diagonally opposite screws **1** until the screw shanks disengage from the system board, then loosen the remaining pair **2**. Do not fully loosen one screw, then move on to the next. Loosen all of the screws a little at a time, making sure the processor remains level.

4 Disconnect the CPU heatsink fan connector **3** from the system board.

5 Before lifting the heatsink, carefully break the adhesive compound between the CPU heatsink and processor by rotating the heatsink back and forth.



6 Use alcohol and a soft cloth to clean all of the thermal interface material residue from the CPU heatsink and processor.

CAUTION Allow the alcohol on the processor and CPU heatsink to dry completely.

Replacing the CPU Heatsink

1 Disconnect power from the system (page 68), remove the access panel (page 74), and remove the CPU heatsink (page 105).

2 Use alcohol and a soft cloth to clean all of the thermal interface material residue from the CPU heatsink and processor.

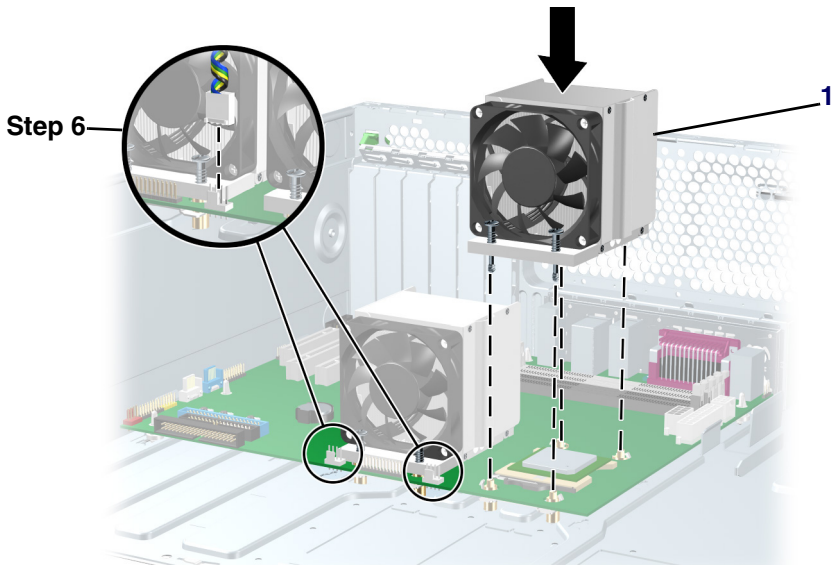
CAUTION Allow the alcohol on the processor and CPU heatsink to dry completely.

3 Apply the thermal grease to center of the processor.

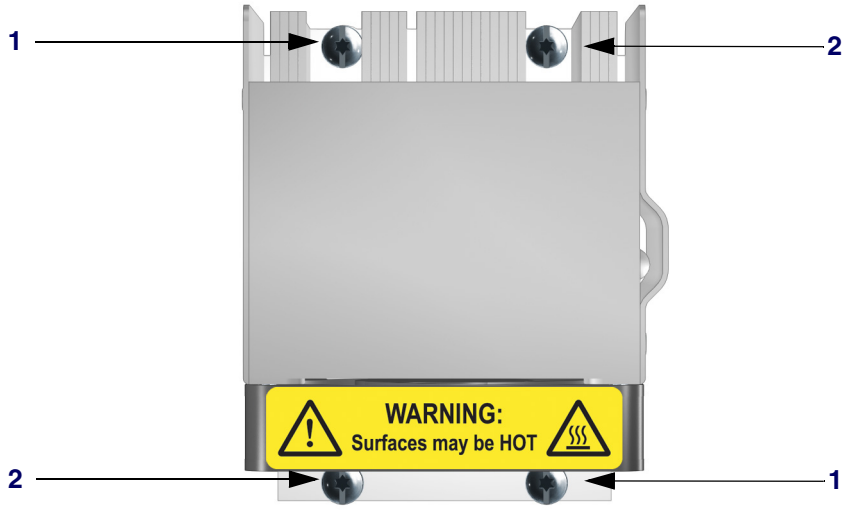
4 Place the CPU heatsink on top of the processor and align the four mounting screws with the holes **1** in the system board.

NOTE If both CPU heatsinks were removed, be sure all system board standoffs engage with the keyholes in the chassis, be sure the system board connectors engage correctly with the rear I/O panel,

and push back on the system board while engaging the CPU heatsink screws with the chassis standoffs. You only need to push back when trying to engage the first screw.



5 Screw in the four CPU heatsink screws. First, tighten all of the screws partially so that the CPU heatsink remains level. Next, fully tighten one pair of diagonally opposite screws **1** then fully tighten the remaining pair **2**. Tighten firmly to a torque setting of 6 in-lbs.



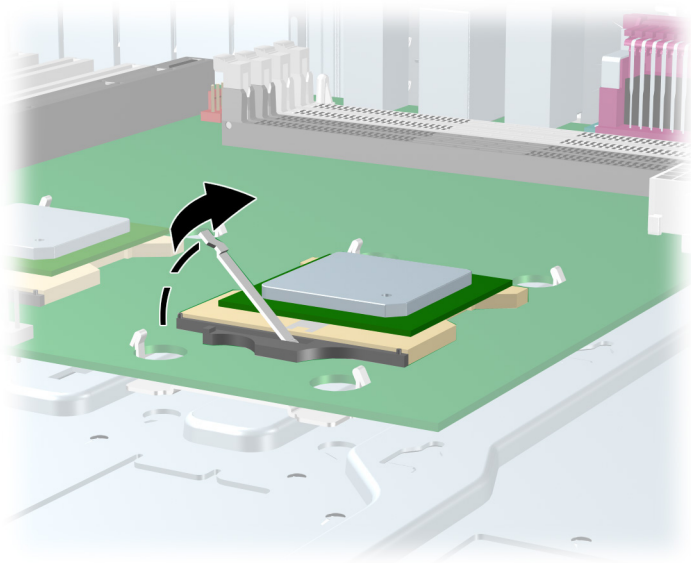
6 Connect the CPU heatsink fan connector to the system board.

Processor

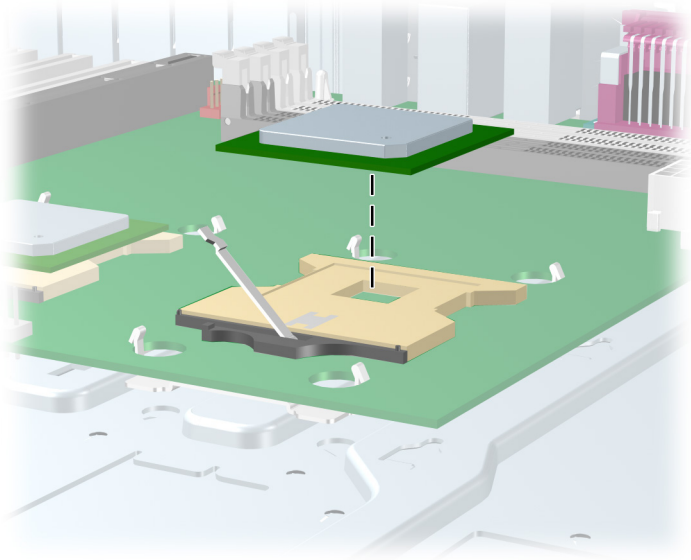
Removing the Processor

1 Disconnect power from the system (page 68), remove the access panel (page 74), and remove the CPU heatsink (page 105).

2 Raise the processor socket handle fully (the full swing angle of the lever is approximately 135 degrees).



3 Pull the processor straight out of the socket.



CAUTION Handle the processor carefully. To avoid bending the processor pins, keep the processor perfectly flat when removing and storing it.

NOTE Store the processor in a safe place where it will not be damaged.If you are permanently removing a second processor, check your OS documentation to determine if you should change any OS settings to disable multiprocessor support or enable Hyper-Threading support.

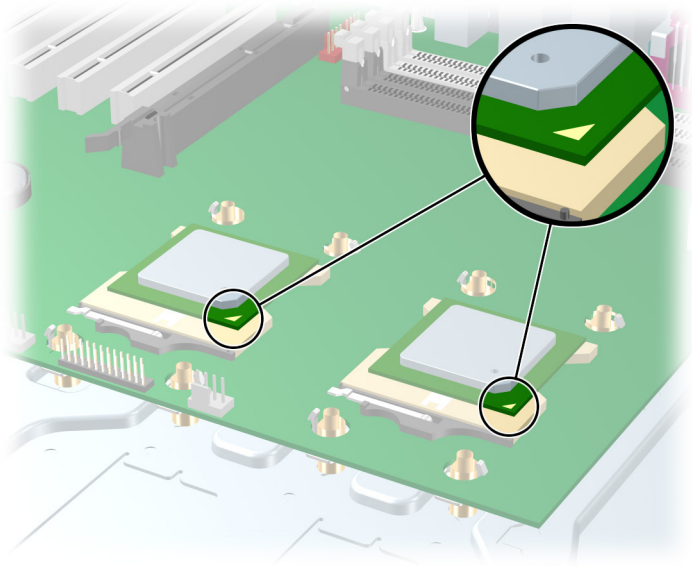
Replacing the Processor

1 Disconnect power from the system (page 68), remove the access panel (page 74), remove the CPU heatsink (page 105), and remove the processor (page 108).

2 Raise the processor socket handle fully (the full swing angle of the lever is approximately 135 degrees).

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

3 Line up the triangle on the top of the processor with the triangle on the corner of the processor socket and install the processor into the socket. Ensure that the underside of the processor is level with the top of the processor socket. Lightly press down on the top of the processor while closing the socket lever.



4 Check for proper processor seating in the socket by carefully trying to lift the processor out of the socket with your fingers. A properly seated processor does not lift out of the socket.

System Board

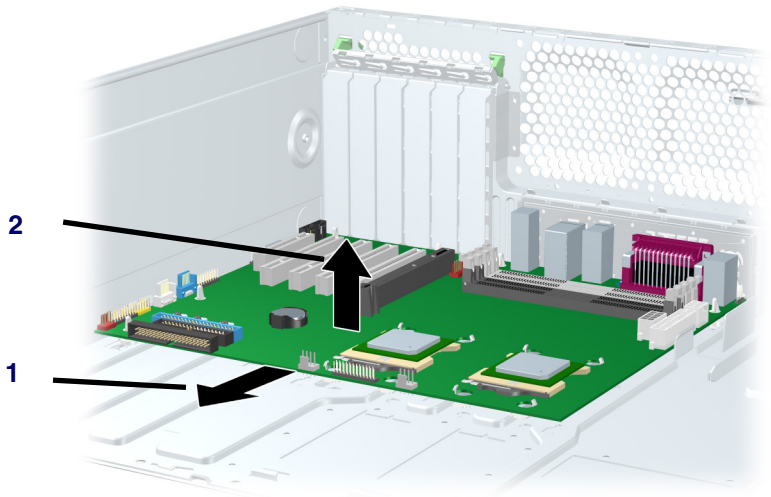
To remove the system board:

1. Disconnect power from the system (page 68), remove the access panel (page 74), lay the workstation on its side with the system board facing up, remove all expansion boards and graphics cards (page 90), remove the CPU heatsink (page 105), and if an airflow duct is installed, remove the system fan assembly (page 80).
2. Disconnect all cabling from the system board.

CAUTION Be sure 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 two cables look very similar. The PCI Express power cable has a black connector and the power cable has a white connector. When power is present, you must NEVER connect the PCI Express power cable to the system board. If you do so, the system board may be damaged and your warranty voided. To see a picture of the PCI Express cable and where it must be connected, refer to the "PCI or PCI Express Installation" section on page 91.

NOTE Make note of the cable connections before disconnecting them from the system board. Refer to "Power Connections to Drives" section on page 95 for more information.

3. Slide the system board forward **1** to disengage the plastic mounting standoffs from the chassis.
4. Lift the system board out **2** of the chassis, being careful not to damage the cables and rear panel connectors.



To replace the system board:

1. Insert straight down and make sure all system board standoffs engage with the keyholes in the chassis.

NOTE Be sure the system board connectors engage correctly with the rear I/O panel.

2 Push back while maintaining downward pressure on the board, so all standoffs remain engaged.

NOTE You only need to push back while engaging the first screw.

WARNING! The system board is not secure until the CPU heatsinks are installed.

3 Install the heatsink (page 106).

Chapter 5 System Diagnostics and Troubleshooting

This chapter discusses the tools available for diagnosing and troubleshooting system issues.

E-Support

Help & Support Center (HSC) and E-Support

HSC provides online access to technical support information, software updates and downloads, diagnostic tools, and HP support contact information.

To open HSC from your desktop, click **Start>Help and Support**.

HSC contains four sections:

- 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 & Driver Downloads (requires Internet access)—Links to HP-specific software downloads and updates.
- HP Support Tools (requires Internet access)—Links to self-help tools and diagnostics offered by HP Instant Support Professional Edition.
- Contact HP for Support (option available that does not require Internet access)—Provides two different 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 the workstation and HP support contact phone number worldwide.

Troubleshooting Checklist

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

- Are the workstation and monitor connected to a working electrical outlet?
- Is the workstation turned on?
- Is the green power light illuminated?
- Is the monitor turned on?
- Is the green monitor light illuminated?
- Turn up the monitor brightness and contrast controls if the monitor is dim.
- Press and hold any key. If the system beeps, then the keyboard is operating correctly.
- Check all cables for loose or incorrect connections.
- Reconfigure the workstation after installing a non-PnP expansion board or other option, such as a diskette drive.
- Are all of the necessary device drivers installed?
- Have all printer drivers been installed for each application?
- Remove all diskettes and CDs from the drives before you turn on the system.
- Are you running the latest BIOS version, drivers, and/or software updates?

LED Color Definitions

An LED light exists on the front panel of your workstation. The following table describes what each color signifies.

Table 5-1 LED color definitions

LED State	LED Color	System Status
Solid	Green	System is on.
Blinking	Green	System is in Standby.
Solid or Blinking	Red	System has error. Refer to "Diagnostic Light Codes" on page 121
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 allows 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 the 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 to be flexible to enable the user to customize test selections by providing different modes and types of testing.

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

A Complete Test provides a predetermined script where each hardware component is fully tested. You can select Interactive or Unattended tests. This will change 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 the user to specifically select which devices, tests, and test parameters are run. Users are provided the ability to 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 that was shipped with your workstation.

To start the diagnostic utility on the *Documentation Library* CD:

1. Turn on your workstation and press the **F10** key during the initial boot process to enter the Computer Setup (F10) Utility (page 35).
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.
3. Use the right arrow key to select **Storage**. Use the down arrow key to select **Boot Order**, then press **Enter**.
4. Select **CD-ROM Drive** and enable it as a bootable device by pressing the **F5** key (if not already enabled, pressing the F5 key again disables the device).
5. Set the **CD-ROM Drive** to the top of the boot order. To do this, select **CD-ROM**, press the **Enter** key, and use the up arrow to move it to the top of the boot order.
6. To apply and save changes, press the **F10** key, and select **File>Save Changes and Exit**.
7. Insert the *Documentation Library* CD into the workstation.
8. Restart your system and HP Insight Diagnostics launches automatically.

Download the ISO Image

To download the latest diagnostic utility:

1. Visit http://www.hp.com.
2. Click the **Support & Drivers** link.
3. Click the **Download driver and software** radio button.
4. Enter your product number (for example, xw6200) in the text box and press the **Enter** key.
5. Select your OS.
6. Click the **Diagnostic** link.
7. Locate **HP Insight Diagnostics** and click **Download**.

User Interface

NAVIGATION

The Insight Diagnostics home page contains the following 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 displays 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—The Overview view gives you a listing of general information about the computer.

All—The All view gives a listing of all information about the computer.

Architecture—The Architecture view shows the type of bus the computer uses. In addition, if the bus is PCI, information about the PCI configuration is displayed.

Asset Control—The Asset Control view shows the serial number of the computer (system identification number).

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

Graphics—The Graphics view shows information about the graphics subsystem of the computer. This includes information about the graphics card, mode, and ROM.

Input Devices—The Input Devices view shows information about the type of keyboard, mouse, and other input devices connected to the computer.

Internal Conditions—The Internal Conditions view shows information about the health of the computer. This includes fan, temperature, and power-supply information.

Memory—The Memory view shows information about all memory in the computer. This includes memory on the board and any memory modules installed.

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

Multimedia—The Multimedia view shows information about all multimedia devices in the computer. This includes audio devices installed.

Resources—The Resources view shows the system device resource usage information. This includes information about I/O, memory, IRQ, slot, and bus usage.

Storage—The Storage view shows information about storage media connected to the computer. This list includes all fixed disks, floppy drives, and CD-ROM drives.

System—The System view shows product type, processor type and speed, and coprocessor information. Also shown in this display is information about all ROMs in the computer.

TEST TAB

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

Quick Test—Provides a predetermined script where a sample of each hardware component is exercised and requires no user intervention.

Complete Test—Provides a predetermined script where each hardware component is fully tested. You can select **Interactive** or **Unattended** tests. This will change the devices tested during the Complete Test. There are more tests 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 allows the user to specifically select which devices, tests, and test parameters are run. Users are provided the ability to select tests that do not require any user interaction through the **Interactive** and **Unattended** test modes.

To begin testing:

1. Select the **Test** tab.
2. Select the **Type of Test** to perform and then select the **Test Mode**, 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 desire to have the diagnostic test for a specified time period, enter the amount of time in minutes.

NOTE Testing will automatically stop, if one test loop has been completed, when the elapsed test time has reached the specified time limit.

4. Click **Begin Testing** to start the test.

   While tests are being performed, the user can monitor the progress by viewing the Status tab. Any errors that are detected are summarized in the Error Log. Select the Print button to print or save the report.

   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 for the type of error and the error code.

   To view all test failure information, select the 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**, **Custom**) is displayed. The main progress bar displays the percent complete of the current set of tests. While testing is in progress a **Cancel** testing button, which will cancel the test job, is displayed.

After testing has completed the **Cancel** testing button is replaced with two buttons, **Select New Tests** and **Retest**. The **Select New Tests** button allows you to go back to the previous test selection page to select a new set of tests. The **Retest** button will retest the last set of tests executed. This enables you to re-run the set of tests without having to go back to the test selection page.

The Status page also shows:

- The devices being tested.
- The tests that are running.
- The overall elapsed time.
- The individual elapsed test times.
- The condition status of each test.

LOG TAB

The Log tab consists of three views.

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

Error Log—Displays the tests that have failed during the 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 failed hardware. The error count is the number of times the test has failed. The Clear Error Log button will clear the contents of the Error Log.

TEST COMPONENTS

Hardware and software tests can be performed on the following components:

- **Audio**—Identifies all audio devices installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these devices.
- **CPU**—Identifies all processors installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these devices.
- **Inspect**—Captures general system configuration information.
- **Keyboard**—Identifies the keyboard installed in a system and provides the ability to verify proper operation of this device.
- **Memory**—Identifies all memory modules installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these modules.
- **Modem**—Identifies all modem devices installed in a system, captures any associated configuration information, and provides the ability to verify the proper operation of these devices.
- **Mouse**—Identifies the mouse installed in a system and provides the ability to verify proper operation of this device.
- **Network**—Identifies all network devices installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these devices. NIC testing is only performed if drivers are installed during discovery.
- **Parallel Port**—Identifies all parallel devices installed in a system and captures any associated configuration information. If the parallel port is properly configured and the information is available to the operating system, the associated DMA, IRQ, and I/O ports are reported. This test component also provides the ability to verify proper operation of these devices.
- **PCI Bus**—Identifies all PCI devices installed in a system and provides the ability to verify proper PCI I/O operation to the devices.
- **Serial Port**—Identifies all serial devices installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these devices.
- **Storage**—Identifies storage devices connected to a system through IDE, USB, SCSI, or a Fibre Channel network. Supported devices include:
  - IDE hard disk drives
  - USB disk drives
  - SATA disk drives

- SCSI disk drives
- SCSI tape drives
- SCSI controllers
- RAID controllers

  Controllers can be connected to the host through PCI, I2C, or serial port. The component also captures any associated configuration information, and provides the ability to verify proper operation of these devices.

- **Stress**—Provides a solution for stress testing hardware in a system.
- **USB**—Identifies all USB devices installed in a system, captures any associated configuration information, and provides the ability to verify proper operation of these devices.
- **Graphics**—Identifies all graphic devices installed in a system, captures any associated configuration information, such as the ASIC and monitor types, and provides the ability to verify proper operation of these devices.

A list of available tests for each test component and a list of error codes can be accessed through the Test Component and Error Codes menu selections on the Help tab menu bar.

Diagnostic Error Codes

This sections provides an overview of the diagnostic lights and error codes that are related to your workstation.

Diagnostic Light Codes

NOTE The beeps are heard through the on-board piezo speaker and not the chassis speaker. The blinking lights and beeps repeat for five cycles. After that, only the blinking lights repeat.

Table 5-2 Diagnostic Light Codes

Chassis Indicator Lights	
Power LED and Sound Activity	**Diagnosis and Service Action**
None	System does not power on Press power button. If HDD LED = GREEN, then: **1** Remove expansion cards one at a time. **2** Replace the system board. OR Press power button. If HDD LED does not illuminate, then: **1** Check that the unit is plugged into a working AC outlet. **2** Open access panel and check that the power button harness is properly connected to the in-line front panel I/O device assembly connector. **3** Check that the power supply cables are properly connected to the system board. **4** Check 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 BIST LED lights, then the power supply is good. Replace the system board. ● If the power supply fan does not spin or the BIST LED does not light, replace the power supply.
Blinks RED 2 times, once per second, then 2 second pause, 2 beeps	Thermal Shutdown: **1** Ensure the workstation air vents are not blocked and cooling fan is running. **2** Open hood, press power button, and see if processor fan spins. If not spinning, ensure fan cable is plugged into the system board. Ensure fan is fully/properly seated. **3** If fan is plugged in and seated but not spinning, then replace processor fan. **4** Reseat CPU heatsink and verify fan assembly properly attached.

Table 5-2 Diagnostic Light Codes (Continued)

Chassis Indicator Lights (Continued)	
Power LED and Sound Activity	**Diagnosis and Service Action**
Blinks RED 3 times, once per second, then 2-second pause, 3 beeps	CPU not installed: **1** Install CPU. **2** Reseat CPU.
Blinks RED 4 times, once per second, then 2 second pause, 4 beeps	Power supply failure: **1** Open the access panel and be sure the four-wire power supply cable is properly connected to the system board. **2** Locate faulty device by removing all devices and then reinstalling one at a time until workstation fails. Replace the device causing the failure. Continue adding devices to ensure all are functioning properly. **3** Check 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 BIST LED lights, then the power supply is good. Replace the system board. ● If the power supply fan does not spin or the BIST LED does not light, replace the power supply.
Blinks RED 5 times, once per second, then 2 second pause, 5 beeps	Pre-video memory error. **1** Reseat memory modules. **2** Replace memory modules one at a time to find the faulty module. **3** Replace third-party modules with HP memory. **4** Replace system board.
Blinks RED 6 times, once per second, then 2 second pause, 6 beeps	Pre-video graphics card error. For systems with integrated graphics, replace system board. For systems with graphic cards, **1** Reseat the graphics card. Power on the system. **2** Replace the graphics card. **3** Replace the system board.
Blinks RED 7 times, once per second, then 2 second pause, 7 beeps.	System board failure (ROM detected failure before video). Replace system board.
Blinks RED 8 times, once per second, then 2 second pause, 8 beeps	Invalid ROM based on bad checksum. **1** Reflash ROM. **2** Replace system board.
Blinks RED 9 times, once per second, then 2 second pause, 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 5-3 Minor Problems

Problem	Cause	Possible Solution
Workstation appears locked up and will not turn off 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 turns off. **2** Disconnect electrical plug from outlet.
Workstation seems to be locked up.	Program in use has stopped responding to commands.	**1** Attempt the normal Windows “Shut Down” procedure. **2** Press the power button for four or more seconds to turn off the power. **3** Restart the workstation using the power button.
Workstation date and time display is incorrect.	Real-time clock (RTC) battery might need to be replaced.	**1** Reset the date and time under 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 Computer Setup or Microsoft Windows Device Manager to disable the network controller.
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** key can be disabled (or enabled) in Computer Setup.
Cannot remove access panel.	Hood lock (Smart Cover Lock), featured on some workstations, is locked.	**1** Unlock the hood lock using Computer Setup. **2** Use the access panel FailSafe Key in case of forgotten password, power loss, or workstation malfunction.
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 CPU heatsink is installed properly.
	Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.
Workstation powered off automatically and the Power LED flashes Red two times, once every second, followed by a two-second pause, and two simultaneous beeps are heard.	Processor thermal protection activated: A fan might be blocked or not turning. OR The CPU heatsink is not properly attached to the processor.	**1** Be sure workstation air vents are not blocked and the cooling fan is running. **2** Open hood, press power button, and see if the processor fan spins. If not spinning, be sure the fan’s cable is plugged onto the system board header. Be sure the fan is fully/properly seated or installed. **3** Replace the processor fan. **4** Reseat CPU heatsink and verify that the fan assembly is properly attached.

Table 5-3 Minor Problems (Continued)

Problem	Cause	Possible Solution
System does not power on and the LEDs on the front of the workstation are not flashing.	System unable to power on.	Press and hold the power button for less than four seconds. If the hard drive LED turns green, then: **1** Remove the expansion cards. **2** Replace the system board. OR Press and hold the power button for less than four seconds. If HDD LED does not illuminate, then: **1** Check that the unit is plugged into a working AC outlet. **2** Open access panel and check that the power button harness is properly connected to the in-line front panel I/O device assembly connector. **3** Check that the power supply cables are properly connected to the system board. **4** Check 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 BIST LED lights, then the power supply is good. Replace the system board. ● If the power supply fan does not spin or the BIST LED does not light, replace the power supply.

Solving Power Supply Problems

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 Disconnect all internal power supply cables.

2 Plug in AC power.

   a If the green BIST LED 1 on the rear of the workstation is lit AND the fan is spinning, the power supply is functional.

   b If the green BIST LED is not lit OR the fan is not spinning, replace the power supply.

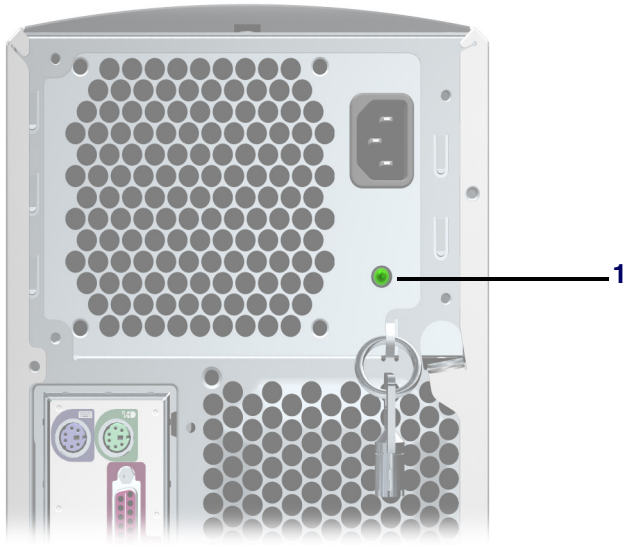


Table 5-4 Power Supply Problems

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 two times, once every second, followed by a two-second pause.	Processor thermal protection activated: A fan might be blocked or not turning. OR The CPU heatsink fan assembly is not properly attached to the processor.	1 Be sure that the workstation air vents are not blocked and the cooling fan is running. 2 Open the access panel, press the power button, and see if the processor fan spins. If the processor fan is not spinning, be sure the fan's cable is plugged onto the system board header. Be sure the fan is fully/ properly seated or installed. 3 Replace the processor fan. 4 Reseat CPU heatsink and verify that the fan assembly is properly attached.

Table 5-4 Power Supply Problems (Continued)

Problem	Cause	Solution
Power LED flashes Red, once every two seconds.	Power failure (power supply is overloaded).	**1** Check if 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 failure occurs. Replace the device causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. **2** Check 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 BIST LED lights, then the power supply is good. Replace the system board. • If the power supply fan does not spin or the BIST LED does not light, replace the power supply.

Solving Diskette Problems

Table 5-5 Diskette Problems

Problem	Cause	Solution
Diskette drive light stays on.	Diskette is damaged.	In Microsoft Windows 2000 and Microsoft Windows XP, right-click Start, click Explore, and select a drive. Select File>Properties>Tools. Under Error-checking, click Check Now.
	Diskette is incorrectly inserted.	Remove diskette and reinsert.
	Files on diskette are damaged.	Check 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.	Check the drive letter in the path statement.
	Not enough space is left on the diskette.	Use another diskette.
	Diskette write control is enabled.	Use Computer Setup to check the storage security feature disabled settings.
	Diskette is damaged.	Replace the damaged disk.

Table 5-5 Diskette Problems (Continued)

Problem	Cause	Solution
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.	In Windows 2000 and Windows XP, right-click Start, click Explore, and select a drive. Select File>Properties>Tools. Under Error-checking, click 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.	Check the type of drive that you are using and use the correct diskette type.
	You are reading the wrong drive.	Check 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 in the drive.	When drive activity stops, remove the diskette and press the **Spacebar.** The workstation should start up.
	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 Computer Setup and disable Diskette MBR Validation in Storage>Storage Options.

Solving Hard Drive Problems

Table 5-6 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.
Disk transaction problem.	Either the directory structure is bad or there is a problem with a file.	In Windows 2000 and Windows XP, right-click Start, click Explore, and select a drive. Select File>Properties>Tools. Under Error-checking, click Check Now.
Drive not found (identified).	Loose cable.	Check cable connections.

Table 5-6 Hard Drive Problems (Continued)

Problem	Cause	Solution
	The system might not have automatically recognized a newly installed device.	1 Run Computer Setup. 2 If the system still does not recognize the new device, check to see if the device is listed within Computer Setup. 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 is a newly installed drive, enter Setup and try adding a POST delay under Advanced>Power-On.
	Drive jumper settings might be incorrect.	If the drive is a secondary drive that has just been installed on the same cable as the primary drive, verify that the jumpers for both drives are set correctly.
	Drive's IDE (ATA) controller is disabled in Computer Setup.	Run Computer Setup and enable the Primary and Secondary IDE (ATA) controllers in Storage>Storage Options.
	Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced>Power-On Options.
Nonsystem disk/NTLDR missing message.	System is trying to start from a non-bootable diskette.	Remove the diskette from the diskette drive.
Nonsystem disk/NTLDR missing message.	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 selecting Security>Restore Master Boot Record.
	System files missing or not properly installed.	1 Insert a bootable system diskette and restart. 2 Verify hard drive is partitioned and formatted. 3 Install system files for the appropriate operating system if necessary.
	Hard drive boot disabled in Computer Setup.	Run Computer Setup and enable the hard drive entry in the Storage>Boot Order list.
Second Ultra ATA hard drive does not perform optimally.	Using the wrong cable for the drive type.	Reinstall the second Ultra ATA hard drive using an 80-conductor cable (standard on select models.)
	Both slow and fast UATA devices are on the same data cable.	Connect slower UATA devices to a separate data cable connected to the secondary IDE (ATA) controller.
Workstation will not start.	Hard drive is damaged.	Observe the beeps and LED lights on the front of the workstation. Refer to "Power On Self Test (POST) and Error Messages" on page 143.

Solving Display Problems

Table 5-7 Display Problems

Problem	Cause	Solution
Blank screen (no video).	The cable connections are not correct.	Check the cable connections from the monitor to the workstation and to a working electrical outlet.
	The monitor is turned off.	Switch the monitor to 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 click the mouse button and, if set, enter your password.
	System ROM is bad; system is running in FailSafe Boot Block mode (indicated by eight beeps).	Reflash the ROM using a ROMPaq diskette.
	Fixed-sync monitor will not sync at the resolution chosen.	Be sure that the monitor can accept the same horizontal scan rate as the resolution chosen.
	Computer is in Hibernate mode.	Press the power button to resume from Hibernate mode.
	Monitor settings in the workstation are not compatible with the monitor.	**1** Restart the workstation and press **F8** during startup when you see “Press F8” in the bottom-right corner of the screen. **2** Using the keyboard arrow keys, select Enable VGA Mode and press **Enter.** **3** In Windows Control Panel, double-click the Display icon and 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 OS starts.	The display settings in the OS are incompatible with your graphics card and monitor.	**1** Restart your workstation in VGA mode. **2** After the OS starts, change the display settings to match those supported by your graphics card and monitor. **3** Refer to your OS and graphics card documentation for information on changing display settings.
Power LED flashes Red six times, once every second, followed by a two second pause, and the workstation beeps six 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.	Check that the graphics cable is securely connected to the graphics card and the monitor.

Table 5-7 Display Problems (Continued)

Problem	Cause	Solution
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.
	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 two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart. 3 Fluorescent lights or fans might be too close to the monitor.
	Monitor needs to 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.
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 on-screen display menu. 2 Manually synchronize the Clock and Clock Phase on-screen display functions. Download SoftPaq SP20930 or SP22333, depending on the monitor, to assist with the synchronization.
Certain typed symbols do not appear correct.	The font you are using does not support that particular symbol.	Use the Character Map to locate the and select the appropriate symbol. Click Start>All Programs> Accessories>System Tools>Character Map. You can copy the symbol from the Character Map into a document.

Solving Audio Problems

Table 5-8 Audio Problems

Problem	Cause	Solution
Sound does not come out of the speaker or headphones.	Software volume control is turned down.	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.

Table 5-8 Audio Problems (Continued)

Problem	Cause	Solution
	External speakers plugged into the wrong audio jack.	See the sound card documentation for proper speaker connection.
	Audio cable not connected.	Connect audio cable between CD or DVD-ROM drive and the system board.
	Digital CD audio is not enabled.	Enable digital CD audio: **1** From the Control Panel, select System. **2** On the Hardware tab, click the Device Manager button. **3** Right-click the CD/DVD device and select Properties. **4** On the Properties tab, be sure “Enable digital CD audio for this CD-ROM device” is checked.
	Headphones or devices connected to the line-out connector mute 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 program, click Sound, Speech and Audio Devices, then click Sounds and Audio Devices. **2** Click the Mute checkbox to remove the check mark from the box.
	Computer is in Hibernate mode.	Press the power button to resume from Hibernate mode.
Noise or no sound comes out of the speakers or headphones.		**1** If using digital speakers that have a stereo jack and 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.
Sound cuts in and out.	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.

NOTE If you set digital as the Output Mode, the internal speaker and external analog speakers will 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 will not function until you change the output mode back to an auto-sense or digital mode.

Solving Printer Problems

Table 5-9 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 are 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 being used. If the printer works, reload the printer driver.
	If you are on a network, you might not have made the connection to the printer.	Make the proper network connections 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.
	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 Check the paper tray and refill it if it is empty. 2 Select online.

Solving Keyboard and Mouse Problems

Table 5-10 Keyboard and Mouse Problems

Problem	Cause	Solution
Keyboard commands and typing are not recognized by the workstation.	Keyboard connector is not properly connected.	1 Turn 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 needs repairs.	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.

Table 5-10 Keyboard and Mouse Problems

Problem	Cause	Solution
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 Computer Setup.
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 restart the workstation.
	Program in use has stopped responding to commands.	Shut down the workstation using the keyboard and then restart the workstation.
	Mouse needs repairs.	Replace the mouse.
	Workstation is in Hibernate mode.	Press the power button to resume from Hibernate mode.
Mouse will only move vertically or horizontally, or movement is jerky.	Mouse roller ball is dirty.	Remove roller ball cover from the bottom of the mouse and clean it.

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 5-11 Front Panel Component Problems

Problem	Cause	Solution
If a USB device, headphone, or microphone is not recognized by the workstation.	It is not properly connected.	**1** Turn 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.
	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.
If a USB, audio, and IEEE-1394 devices are not working.	The internal cables might not be connected to the system board or the PCI card.	**1** Turn off the workstation. **2** Connect the cables correctly.

Table 5-11 Front Panel Component Problems (Continued)

Problem	Cause	Solution
A device in the IEEE-1394 port is not responsive.	Cables of new 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.	Turn off the workstation, turn on the external device, then turn 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 IEEE1394 PCI adapter card. Contact an HP seller.
	The IEEE-1394 cable might not be connected to the adapter cable.	**1** Turn off the workstation. **2** Remove the access panel (page 74). **3** Be sure the power cable is connected to the card (page 92). **4** Be sure to connect the IEEE-1394 cable to the card (page 92).

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 PnP device, Windows 2000 and Windows XP automatically recognize the device and configure the workstation. If you install a non-PnP device, you must reconfigure the workstation after completing installation of the new hardware. In Windows 2000, select the Add New Hardware icon in the Control Panel (for Windows XP, use the Add Hardware Wizard) and follow the on-screen instructions.

Table 5-12 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 down.
	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 down.
	Power switch of new external device is not turned on.	Turn off the workstation, turn on the external device, then turn on the workstation to integrate the device with the workstation system.
	When the system advised you of changes to the configuration, you did not accept them.	Reboot the workstation and follow the instructions for accepting the changes.
	A PnP board might not automatically configure when added if the default configuration conflicts with other devices.	Use Windows 2000 or 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 Computer Setup 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 will 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 LED lights on the front of the workstation. Refer to "Power On Self Test (POST) and Error Messages" on page 143 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.
Power LED flashes Red five times, once every second, followed by a two second pause, and the workstation beeps five 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.

Table 5-12 Hardware Installation Problems (Continued)

Problem	Cause	Solution
Power LED flashes Red six times, once every second, followed by a two second pause, and the workstation beeps six times.	Video card is not seated properly or is bad, or system board is bad.	For systems with a graphics card: **1** Reseat the graphics card. Power on the system. **2** Replace the graphics card. **3** Replace the system board.

Solving Network Problems

These guidelines do not discuss the process of debugging the network cabling.

Table 5-13 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 Computer Setup and enable network controller.
	Incorrect network driver.	Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's website.
Network status link light does not turn on or it never flashes. The network status light should flash when there is network activity.	No active network is detected.	Check cabling and network equipment for proper connection.
	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 autosense 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.
	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 Advanced menu, change the resource settings for the board.
	The network controller is defective.	Replace the NIC.

Table 5-13 Network Problems (Continued)

Problem	Cause	Solution
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.	Select 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 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 a new expansion board were installed.
	The expansion board installed is a network card (NIC) and conflicts with the embedded NIC.	Under the Computer Setup 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.
	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.
New network card will 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.
System setup 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 non-ECC memory. Otherwise, the system will not boot the operating system.

Table 5-14 Memory Problems

Problem	Cause	Solution
System will not boot or does not function properly after installing additional memory modules.	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 non-ECC memory modules cannot be mixed.
Out of memory error.	Memory configuration might not be set up correctly.	Use the Device Manager to check memory configuration.
	You have run out of memory to run the application.	Check the application documentation to determine the memory requirements.
Memory count during POST is wrong.	The memory modules might not be installed correctly.	Check 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 programs (TSRs) are installed.	Delete any TSRs that you do not need.
	You have run out of memory for the application.	Check the memory requirements for the application or add more memory to the workstation.
Power LED flashes Red five times, once every second, followed by a two-second pause, and the workstation beeps five 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 5-15 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 CPU heatsink is installed properly.
Power LED is Red and stays on.	Processor is not seated properly or not installed.	**1** Check to see that the processor is present. **2** Reseat the processor.

Solving CD-ROM and DVD Problems

Table 5-16 CD-ROM and DVD Problems

Problem	Cause	Solution
System will not boot from CD-ROM or DVD drive.	The CD-ROM or DVD boot is not enabled through the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media and verify boot order settings.
	Non-bootable CD in drive.	Try a bootable CD in the drive.
CD-ROM or DVD devices are not detected or 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 will not play in the DVD drive.	Movie might be regionalized for a different country.	See the documentation that came with the DVD drive.
	Decoder software is not installed.	Install decoder software.
Cannot eject compact disc (tray-load unit).	Disc not properly seated in the drive.	**1** Turn off the workstation and insert a thin metal rod into the emergency eject hole and push firmly. **2** Slowly pull the tray out from the drive until the tray is fully extended, then remove the disc.
CD-ROM, CD-RW, DVD-ROM, or DVD-R/RW drive cannot read a disc or takes too long to start.	CD has been inserted upside down.	Re-insert 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.
	CD or DVD disc is dirty.	Clean CD or DVD with a CD cleaning kit.
	Windows does not detect the CD-ROM or DVD-ROM drive.	**1** Use Device Manager to remove or uninstall the device in question. **1** Restart the workstation and let Windows detect the device.
Recording audio CDs is difficult or impossible.	Wrong or poor quality media type.	**1** Try using 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 5-17 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. You should see a “power” LED light on the front of the cable/DSL modem.
	Cable/DSL service is not available or has been interrupted due to 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 will be on.)
	The CAT5 10/100/1000 cable is disconnected.	Connect the CAT5 10/100 cable between the cable modem and the workstations’s RJ-45 connector. (If the connection is good, the “PC” LED light 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.	Windows 2000 1 Select **Start>Settings>Control Panel**. 2 Double-click **Internet Options**. 3 On the General tab, click the **Delete Cookies** button. Windows XP 1 Select **Start>Control Panel**. 2 Double-click **Internet Options**. 3 On the General tab, click 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.

Table 5-17 Internet Access Problems (Continued)

Problem	Cause	Solution
Internet takes too long to download websites.	Modem is not set up properly.	Verify that the correct modem speed and COM port are selected. For Windows 2000 **1** Select **Start>Settings>Control Panel**. **2** Continue with step #2. For Windows XP **1** Select **Start>Control Panel**. Continue with step #2. **2** Double-click **System**. **3** Click the **Hardware** tab. **4** In the Device Manager area, click the **Device Manager** button. **5** Double-click **Ports** (COM & LPT). **6** Right-click the **COM port your modem uses**, then click **Properties**. **7** Under Device status, verify that the modem is working properly. **8** Under Device usage, verify the modem is enabled. **9** If there are further problems, click the Troubleshoot button and follow the on-screen instructions.

Power On Self Test (POST) and Error Messages

POST is a series of diagnostic tests that runs automatically when the system is turned on. An audible and/or visual message occurs if the POST encounters a problem. POST checks the following items to ensure that the workstation system is functioning properly:

- Keyboard
- Memory modules
- Diskette drives
- All SATA, IDE. and SCSI mass storage devices
- Processors
- Controllers

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 and see if the problem remains. **3** Clear CMOS. **4** If the message disappears, there might be a problem with the expansion card. **5** Replace the system board.
102—System Board Failure	DMA, timers, etc.	**1** Clear CMOS. **2** Remove expansion boards. **3** Replace the system board.
103—System Board Failure	DMA, timers, etc.	**1** Clear CMOS. **2** Remove 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 Computer Setup and enable the ACPO/USB Buffers at Top of Memory under the Advanced>Power-On option.
150—SafePost Active	A PCI expansion card is not responding.	**1** Restart the workstation. **2** Disable SafePost. **3** If the expansion card does not respond, replace the card.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
162—System Options Not Set	Configuration incorrect. RTC battery might need to be replaced.	**1** Run Computer Setup (F10 Setup). **2** Set the date and time under Control Panel or in F10 Setup depending on the operating system. **3** If the problem persists, replace the RTC battery.
163—Time and Date Not Set	Invalid time or date in configuration memory. RTC (real-time clock) battery might need to be replaced. CMOS jumper might not be properly installed.	**1** Set the date and time under Control Panel or in F10 Setup depending on the operating system. **2** If the problem persists, replace the RTC battery.
164—Memory Size Error	Memory configuration is incorrect.	**1** Run Computer Setup (F10 Setup) or Windows utilities. **2** Be sure memory module(s) (if any) are installed properly. **3** If third-party memory has been added, test using HP-only memory. **4** Verify proper memory module type.
183—Invalid Processor Jumper Setting	System board jumper improperly set.	Reset system board jumpers to match processor and bus speeds (select models).
201—Memory Error	RAM failure.	**1** Run Computer Setup (F10 Setup) 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 module(s) one at a time to isolate faulty module. **5** Replace the faulty memory module(s). **6** If error persists after replacing memory modules, replace the system board.
202—Memory Type Mismatch	Memory modules do not match each other.	Replace memory modules with matched sets.
207—ECC Corrected Single Bit Errors in Memory Socket(s) y,y	Single Bit ECC error.	**1** Verify proper memory module type. **2** Try another memory socket. **3** Replace memory module if problem persists.
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 Module in memory Socket(s) X,X, X	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** Try another memory socket. **3** Replace memory with a module conforming to the SPD standard.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
214—DIMM Configuration Warning	DIMMs not installed correctly (not paired correctly).	Refer to "Memory" on page 82 for the correct memory configurations and reseat the DIMMs accordingly.
215—Memory Mismatch Warning	There are one or more mismatched pairs of DIMMs between channel A and channel B. Some memory has been disabled. Install matching pairs or remove the mismatched DIMMs from channel B.	Refer to "Memory" on page 82 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 can support. **2** Remove the excessive memory.
219—ECC Memory Module Detected.	ECC modules not supported on this platform.	Remove the EDD module.
301—Keyboard Error	Keyboard failure.	**1** Reconnect keyboard with workstation turned off. **2** Check connector for bent or missing pins. **3** Be sure that none of the keys are pressed. **4** Replace keyboard.
303—Keyboard Controller Error	I/O board keyboard controller.	**1** Reconnect 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.
401—Parallel Port 1 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
402—Parallel Port 2 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
403—Parallel Port 3 Address Assignment Conflict	IRQ address conflicts with another device.	Reset the IRQ.
404—Parallel Port Address Conflict Detected	Both external and internal ports are assigned to parallel port X.	**1** Remove any parallel expansion cards. **2** Clear CMOS. **3** Reconfigure card resources and run Computer Setup (F10 Setup).
410—Audio Interrupt Conflict	IRQ address conflicts with another device.	Reset the IRQ.
411—Network Interface Card Interrupt Conflict	IRQ address conflicts with another device.	Reset the IRQ.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
501—Display Adapter Failure	Graphics display controller.	**1** Reseat the graphics card (if applicable). **2** Clear CMOS. **3** Verify that the monitor is attached and turned on. **4** Replace the graphics controller.
510—Splash Screen image corrupted	Splash Screen image has errors.	Install latest version of ROMPaq to restore image.
511—CPU, CPUA, or CPUB Fan not detected	Fan is not connected or might have malfunctioned.	**1** Reseat 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 chassis, rear chassis, or front chassis fan cable. **2** Reseat chassis, rear chassis, or front chassis fan. **3** Replace chassis, rear chassis, or front chassis fan.
514—CPU or Chassis Fan not detected	CPU fan is not connected or might have malfunctioned.	**1** Reseat CPU or chassis fan. **2** Replace CPU or chassis fan.
601—Diskette Controller Error	Diskette controller circuitry or diskette drive circuitry incorrect.	**1** Run Computer Setup (F10 Setup). **2** Check and replace cables. **3** Clear CMOS. **4** Replace diskette drive. **5** Replace the system board.
605—Diskette Drive Type Error	Mismatch in drive type.	**1** Run Computer Setup (F10 Setup). **2** Disconnect any other diskette controller devices (tape drives). **3** Clear CMOS.
610—External Storage Device Failure	External tape drive not connected.	Reinstall tape drive or press **F1** and allow system to reconfigure without the drive.
611—Primary Diskette Port Address Assignment Conflict	Configuration error.	**1** Run Computer Setup (F10 Setup). **2** Remove expansion cards. **3** Clear CMOS.
912—Computer Cover Has Been Removed Since Last System Start Up		No action required.
914—Hood Lock Coil is not Connected	Hood lock mechanism is missing or not connected.	**1** Reconnect or replace hood locking mechanism. **2** Reseat or replace hood locking mechanism cable.
916—Power Button Not Connected	The power button is not connected.	Connect power button.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
917—Front Audio Not Connected	The front audio cable is not connected.	Connect front audio cable.
918—Front USB Not Connected	Front USB is not connected.	Connect front USB cable.
919—Multi-Bay Riser Not Connected	Multi-Bay riser is not connected.	Connect Multi-Bay riser.
920—Fan Command 2 Pin Connector from Power Supply Not Connected	The 2-pin fan connector from the power supply is not connected.	Connect 2-pin fan connector.
940—Extended ROM signature not found	The signature at the start of the ROM flash is missing. Your firmware (BIOS) is incomplete.	Run ROMPaq again.
960—CPU Overtemp occurred	The ambient temperature could exceed operating limits (maximum=95°F), or there are obstructions to airflow, including dust build up.	**1** Be sure you are not operating the system in an environment that exceeds 95°F. **2** Disconnect power and open the access panel. **3** Check that cables are not blocking CPU heatsink fans or front fan, if installed. **4** Check that there is not excessive dust on major components. **5** If airflow is acceptable and there is not excessive dust, the thermal sensing circuitry has failed on the processors or on the system board. You must replace the processors and/or the system board.
1151—Serial Port 1 Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	**1** Remove any Comm port expansion cards. **2** Clear CMOS. **3** Reconfigure card resources and run Computer Setup (F10 Setup). Run Computer Setup or Windows utilities.
1152—Serial Port 2 Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	**1** Remove any Comm port expansion cards. **2** Clear CMOS. **3** Reconfigure card resources and run Computer Setup (F10 Setup). Run Computer Setup or Windows utilities.
1155—Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	**1** Remove any Comm port expansion cards. **2** Clear CMOS. **3** Reconfigure card resources and run Computer Setup (F10 Setup). Run Computer Setup or Windows utilities.
1201—System Audio Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ.
1202—MIDI Port Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
1203—Game Port Address Conflict Detected	Device IRQ address conflicts with another device.	Reset the IRQ
1720 SMART Hard Drive Detect Imminent Failure	Hard drive is about to fail. (Some hard drives have a firmware patch that will fix an erroneous error message.)	**1** Determine if hard drive is giving correct error message. Run the Drive Protection System test if applicable. **2** Apply firmware patch if applicable (see http://www.hp.com/support). **3** Back up contents and replace hard drive.
1721—SMART SCSI Hard Drive detects imminent failure	Hard drive is about to fail. (Some hard drives have a firmware patch that will fix an erroneous error message.)	**1** Determine if hard drive is giving correct error message. Run the Drive Protection System test if applicable. **2** Apply firmware patch if applicable (see http://www.hp.com/support). **3** Back up contents and replace hard drive.
1780—Disk 0 Failure	The drive is not installed correctly or has failed.	**1** Make sure that any jumpers are set correctly, and that power and drive cables are connected, both to the drive and the system board. **2** Verify that the cables are the correct cables for your computer model. If this message persists, you may need service for your workstation.
1781—Disk 1 Failure	The drive is not installed correctly or has failed.	**1** Make sure that any jumpers are set correctly, and that power and drive cables are connected, both to the drive and the system board. **2** Verify that the cables are the correct cables for your computer model. If this message persists, you may need service for your workstation.
1782—Disk Controller Failure	Hard drive circuitry error.	**1** Run Computer Setup (F10 Setup). **2** Clear CMOS. **3** Check cable seating/jumper settings. **4** Run hard drive diagnostics. **5** Disconnect additional drives. **6** Run the Drive Protection System test if available. **7** Check http://www.hp.com\support\techpubs\customer_advisories for possible changes when using Windows NT 4.0 Service Pack 4. **8** Replace the hard drive. **9** Replace the system board.
1785—Multibay incorrectly installed	No other IDE device may be attached to the same IDE controller.	Attach the Multibay as device 0 on the secondary IDE controller.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
1790—Disk 0 Error	The drive is not installed correctly or has failed.	**1** Make sure that any jumpers are set correctly, and that power and drive cables are connected, both to the drive and the system board. **2** Verify that the cables are the correct cables for your computer model. If this message persists, you may need service for your workstation.
1791—Disk 1 Error	The drive is not installed correctly or has failed.	**1** Make sure that any jumpers are set correctly, and that power and drive cables are connected, both to the drive and the system board. **2** Verify that the cables are the correct cables for your computer model. If this message persists, you may need service for your workstation.
1792—Secondary Disk Controller Failure	Hard drive circuitry error.	**1** Run Computer Setup (F10 Setup). **2** Clear CMOS. **3** Check cable seating/jumper settings. **4** Run hard drive diagnostics. **5** Disconnect additional drives. **6** Run the Drive Protection System test if available. **7** Replace the hard drive.
1793—Secondary Controller or Disk Failure	Hard drive circuitry error.	**1** Run Computer Setup (F10 Setup). **2** Clear CMOS. **3** Check cable seating/jumper settings. **4** Run hard drive diagnostics. **5** Disconnect additional drives. **6** Run the Drive Protection System test if available. **7** Replace the hard drive.
1794—Inaccessible devices attached to primary IDE controller	Devices attached to the primary IDE controller are inaccessible while the SATA controller is set to “Replace Primary IDE Controller” in Setup.	**1** Run Computer Setup (F10 Setup). **2** Select Storage > Storage Options and set SATA controller to Add as Separate Controller.
1800—Temperature Alert	Internal temperature exceeds specification.	**1** Check that workstation air vents are not blocked and cooling fan is running. **2** Verify processor speed selection. **3** Replace the processor. **4** Replace the system board.
1801—Microcode Patch Error	Processor not supported by ROM BIOS.	Upgrade BIOS to proper version.

Table 5-18 POST Error Messages (Continued)

Screen Message	Probable Cause	Recommended Action
1802—Processor Not Supported	The system board does not support the processor.	Replace the processor with a compatible one.
1803-BIOS Update Needed for Processor	This BIOS revision does not support the installed processor.	Install the latest BIOS located at www.hp.com.
1998—Master Boot Record has been lost	The previously saved copy of the MBR has been corrupted.	Run Computer Setup and save the MBR of the current bootable disk.
1998—Master Boot Record has been changed	The current MBR does not match the previously saved copy of the MBR.	Use extreme caution. The MBR might have been updated due to normal disk maintenance activities (disk manager, fdisk, or format). Replacing the previously saved MBR in such situations can cause data loss. If certain that the MBR change is unintentional and undesired (for example, due to a virus), run Computer Setup and restore the previously saved MBR copy. Otherwise, run Computer Setup and either disable MBR security or save the MBR of the current bootable disk.
Invalid Electronic Serial Number	Electronic serial number has become corrupted.	Run Computer Setup. If Setup already has data in the field or will not allow the serial number to be entered, download from http://www.hp.com and run SP5572.EXE (SNZERO.EXE). Run Computer Setup and try to enter serial number under Security, System ID, then save changes.
ECC Multiple Bit Error Detected in Memory Module	Chipset has detected more than one bad bit in a 64-bit quadword of the memory array.	Replace the memory module.
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

Appendix A SCSI Devices

SCSI Guidelines

NOTE These systems support a mixed configuration of UATA/IDE and SCSI hard drives. In a mixed configuration the UATA/IDE drive must be specified as the boot drive.

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

- A narrow (50-pin) SCSI controller enables you to daisy-chain up to seven additional SCSI devices. Counting the controller, that amounts to eight total SCSI devices.
- A wide (68-pin) SCSI controller enables you to daisy-chain up to 15 additional SCSI devices. Counting the controller, that amounts to 16 total SCSI devices.
- If two narrow (50-pin) SCSI controllers are each connected to separate system board SCSI connectors, each controller can have seven SCSI devices attached. Counting the controller, this gives a total of 16 SCSI devices on the system.
- HP does not recommend mixing different width SCSI devices on the same SCSI chain or on the same SCSI channel. Mixing devices of different widths on the same chain or channel will always result in a data transfer rate of the slowest machine in that chain. The only exception to this is that Ultra Wide SCSI devices will cause a speed degradation when mixed with other 68-pin devices.
- If multiple SCSI devices are used, split the devices between Channels A and B for optimum performance. Cable length for the second channel should not be longer than 18 inches.
- If two controllers are used, each can use SCSI devices having widths and speeds different from the other. If a 68-pin data cable is used on a controller having 50-pin SCSI devices, use an internal cable adapter or an external cable adapter.

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

- All SCSI controllers require a unique SCSI ID (0–15) for each SCSI device installed. Refer to the “Jumpers” section on page 153 for more information.
- 68-pin SCSI controllers require a 53 inch maximum length-twisted pair, LVD cable with built-in terminator, maximum of five drives with a minimum driving spacing of 5.25 inches.
- Every SCSI chain or circuit must be terminated (closed) at both ends. Some system boards have both ends of the SCSI cable connected to, and terminated by, the system board. Termination can be accomplished in one of several ways:
  - Use a cable with a built-in terminator.

- Use a cable with a terminating resistor plug in the last connector.
- Connect a SCSI device with its termination enabled into the last connector.
- Connect an external SCSI device with its termination enabled to the external SCSI connector on the rear panel of the workstation.

- Turn on all external SCSI devices before turning on the power to the workstation. This enables the SCSI controller to recognize the external devices.

Using SCSI*Select* with SCSI Devices

The Ultra160 and faster SCSI host adapters include the SCSI*Select* utility to configure the host adapter and to run the SCSI disk utilities. To run the SCSI*Select* utility:

- In POST Messages Enabled mode: Press **Ctrl**+**A** when the “Press<Ctrl><A> for SCSI*Select* Utility” message appears during POST.
- In POST Messages Disabled mode: When the HP logo screen appears, press any key to exit the logo screen. Immediately after exiting the logo screen, press **Ctrl**+**A** to access the SCSI*Select* utility.

A menu appears with the following options:

- Configure/View Host Adapter Settings
  - SCSI Bus Interface Definitions
    - Host Adapter SCSI ID
    - SCSI Parity Checking
    - Host Adapter SCSI Termination
  - Additional Options
    - Boot Device Options
    - SCSI Device Configuration
    - Advanced Configuration Options
- SCSI Disk Utilities
  - Lists all SCSI devices and SCSI ID numbers

NOTE For additional information about configuring POST message display status, refer to “Computer Setup Menu” on page 37.

SMART

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

Jumpers

All SCSI controllers require a unique SCSI ID (0–15) for each SCSI device installed.

The controller identifies a SCSI device by its SCSI ID number rather than its location. Moving a SCSI device from one position to another on the SCSI chain does not affect communication between the controller and the device. The reserved and available SCSI ID numbers are displayed in the following list:

- 0 is reserved for the primary hard drive (not reserved for the primary hard drive on Linux).
- 7 is reserved for the SCSI controller.
- 1 through 6 and 8 through 15 are available for all other SCSI devices.

When 0 is used for the primary hard drive, set the second hard drive to 1, the third to 2, and so on.

To set the SCSI ID on a drive, see the instructions on top/back of the hard drive for the correct jumper settings. The drive probably displays a diagram of the jumper block. This diagram shows you which blocks to cover with your jumper to get the desired ID.

For example, if the drive needs to be set to 3, the drive might show that the 3 ID bits are at the far left of the connector (ID0, ID1, ID2, and ID3), then using the jumpers provided, cover each block to set the SCSI ID.

NOTE After changing the jumper settings, reboot the workstation to recognize the new address.

Appendix B SATA Devices

SATA Guidelines

NOTE These systems support a mixed configuration of UATA/IDE, SCSI, and SATA hard drives. While HP supports the presence of IDE drives, it does not ship any configurations using those drives.

NOTE The HP Workstation xw6200 has two SATA ports on the system board to cover all the internal hard drive mounting points. Connect the first SATA drive (boot drive if booting from SATA) to the port labeled SATA0. If installing a second drive, connect it to SATA1.

When installing and operating SATA devices:

- If the hard drive is installed in the hard drive cage, connect the 90-degree connector on the SATA cable (326965-006) to the hard drive and the straight connector to the system board.
- If the hard drive is installed in a 5.25-inch bay, connect the straight connector on the SATA cable (326965-006) to the hard drive and the 90-degree connector to the system board.
- If using a SATA controller card, connect the 4-4 pin LED cable (included with SATA controller board) from the card header “JP1” (4-pin header) to the system board header labeled “SCSI LED” (4-pin header).

For complete and current information on supported accessories and components, visit http://partsurfer.hp.com.

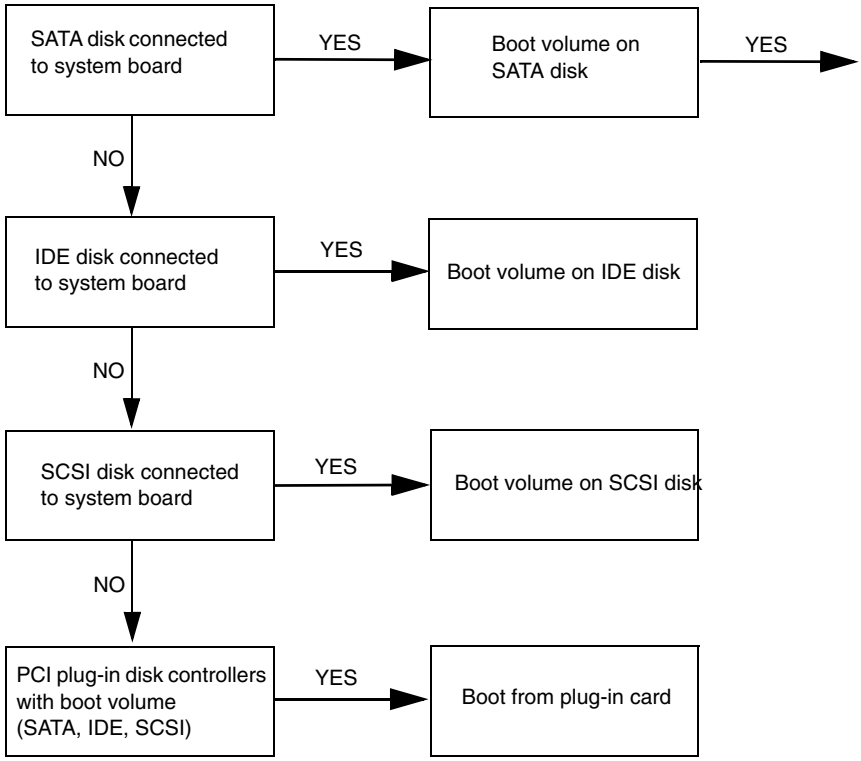
Boot Order

The following flow diagram shows the boot order of hard drives (C:) connected to the different controllers in the workstation system.

You can modify the boot order in the Computer Setup Utility by arranging the Controller Order on the Storage tab.

For more information on accessing Computer Setup Utility, refer to the Computer Setup section in Chapter 3 on page 34.

The diagram does not show other bootable device options such as a diskette, CD-ROM, USB, network, and so on. In the Computer Setup Utility, you can arrange the boot order on the Storage tab.



NOTE The first hard drive bay is the recommended position for the drive containing the bootable OS.

SATA Raid Configurations

This workstation supports an embedded SATA RAID. RAID (Redundant Array of Inexpensive Disks) combines multiple physical drives together to provide either increased performance or increased redundancy.

For an embedded SATA RAID, there are two primary configurations.

- RAID 0 is a striping configuration. For example, this combines two 80 GB drives into one 160 GB drive. Both physical drives can be accessed simultaneously for better performance. This is faster than using two 80 GB drives separately.
- RAID 1 is a mirroring configuration. For example, this uses two 80 GB drives, but one drive is a complete mirror of the other drive. The system remains functional and no data is lost if one of the drives should fail.

There are other RAID configurations, but they are not supported on an embedded SATA RAID.

NOTE For information on the integrated SATA RAID, visit http://www.hp.com/go/workstationsupport and review the supplier's documentation. For information on supported SATA RAID configurations, visit http://www.hp.com/go/productbulletin.

Appendix C Ultra ATA Devices

NOTE This system supports a mixed configuration of UATA/IDE, SCSI, and SATA hard drives. While HP supports the presence of IDE drives, it does not ship any configurations using those drives.

Ultra ATA Jumpers

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

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

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

Ultra ATA Cables

When installing a second device on either the primary or secondary controller, you must use an industry standard 80-conductor Ultra ATA cable for optimal performance. These cables have a maximum length of 18 inches and a maximum distance of six inches between the two devices for a two-drive cable.

Drives operating at speeds faster than those of the Ultra ATA-33 devices require industry-standard 40-pin, 80-conductor cables to maintain the higher data transfer rates possible with the improved technology.

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

Drive Installation Guidelines

Most workstation system boards have two ATA (IDE) controller channels with a dedicated connector for each controller. One controller is designated as the primary and the other as the secondary controller.

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

NOTE The industry standard, 1.44-MB diskette drive has its own separate channel and is not included as a part of the maximum four drives.

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

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

Device Classes

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

Table C-1 Device Classes

Class 1 Hard Drives	Class 2 High Speed Optical Drives	Class 3 Optical Storage Drives	Class 4 Magnetic Storage Drives
ATA-100 ATA-66 ATA-33	DVD DVD-CD R/W	R/W CD-ROM CD-ROM	LS-120 Tape Zip

General Attach Guidelines

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

Attach Sequence Rules by Class Priority

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

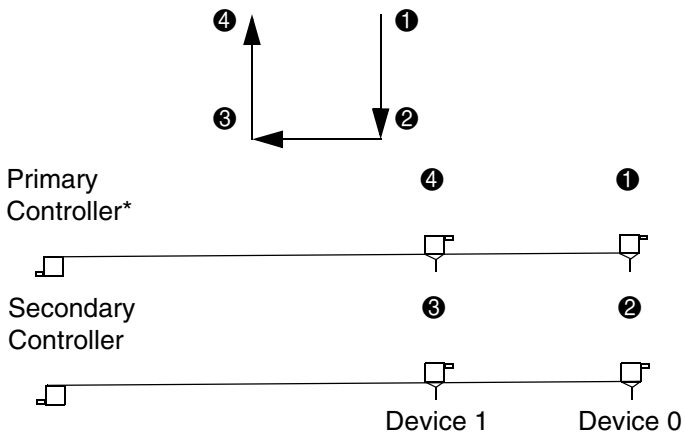


Figure C–1 Installing Drive Order

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

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

Table C-2 General Attach Sequence Rule*

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

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

The rules allow for:

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

Attach Sequence Worksheet

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

Table C-3 Attach Sequence Worksheet

Device Name	Device Class	Position Number	Controller Name	Device Number

Two examples of how to use the worksheet are:

- Three device installation
- Four device installation

Example 1: Three Device Installation Sample

A system has three devices: Ultra ATA-100 hard drive, CD-ROM drive, and a DVD drive. Using the Device Class Table, the devices can be identified as:

- Ultra ATA-100 hard drive = Class 1
- DVD drive = Class 2
- CD-ROM drive = Class 3

Table C-4 Attach Sequence Worksheet—Three Device Installation (Sample)

Device Name	Device Class	Position Number	Controller Name	Device Number
Ultra ATA-100 hard drive	1	❶	Primary	0
DVD drive	2	❷	Secondary	0
CD-ROM drive	3	❸	Secondary	1

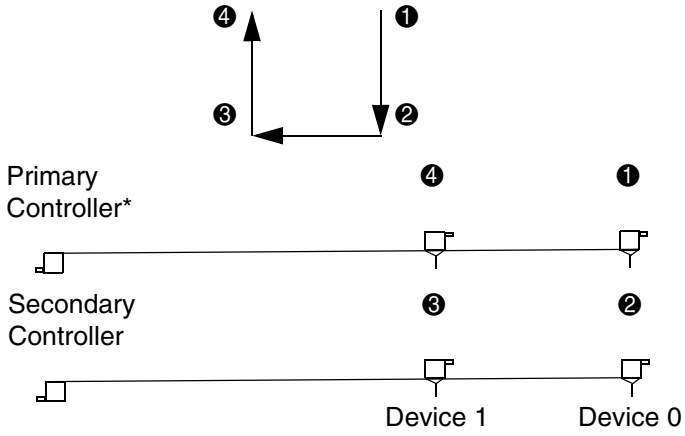


Figure C–2 Installing Drive Order (2)

Example 2: Four Device Installation Sample

A system has four devices: Ultra ATA-100 hard drive, Ultra ATA-100 hard drive, DVD-CDR/W drive, and a ZIP-250 drive.

- Ultra ATA-100 hard drive = Class 1
- Ultra ATA-100 hard drive = Class 1
- DVD-CDR/W drive = Class 2
- ZIP-250 drive = Class 4

Table C-5 Attach Sequence Worksheet—Four Device Installation (Sample)

Device Name	Device Class	Position Number	Controller Name	Device Number
Ultra ATA-100 hard drive	1	❶	Primary	0

Table C-5 Attach Sequence Worksheet—Four Device Installation (Sample)

Device Name	Device Class	Position Number	Controller Name	Device Number
DVD-CDR/W drive	2	❷	Secondary	0
ZIP-250 drive	4	❸	Secondary	1
Ultra ATA-100 hard drive*	1	❹	Primary	1

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

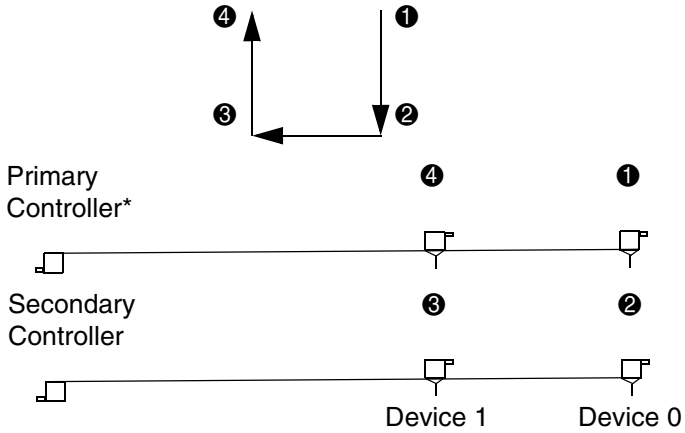


Figure C–3 Installing Drive Order (3)

Additional Drive Application Notes

- When replacing a hard drive, the replacement should be of the same type (Ultra ATA-33, -66, or -100) as that being removed to retain the same level of performance.
- When Ultra ATA and SCSI hard drives are mixed in the same system, the Ultra ATA drive will become the boot drive unless the boot order is changed in Computer Setup (F10).

SMART

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

Jumpers

The following specification is are the standard drive configurations.

CD-ROM or DVD-ROM Drive

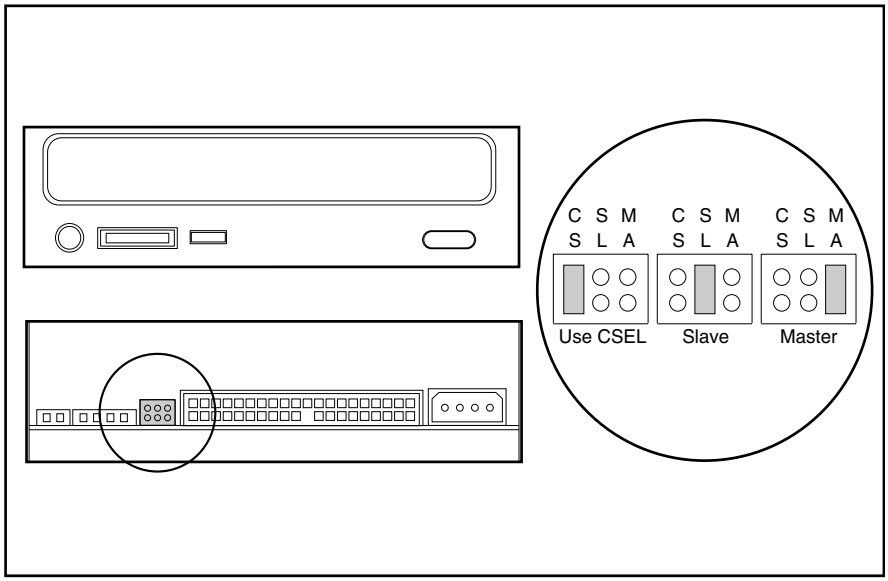


Figure C–4 CD-ROM or DVD-ROM drive jumpers

Appendix D Connector Pins

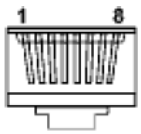
Enhanced Keyboard

Keyboard Connector	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

Mouse

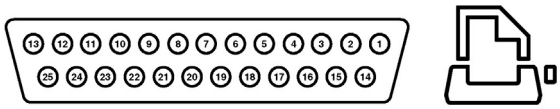
Mouse Connector	Pin	Signal
	1	Data
	2	Unused
	3	Ground
	4	+5 VDC
	5	Clock
	6	Unused

Ethernet RJ-45

Ethernet Connector	Pin	Signal
	1	(+) Transmit Data
	2	(-) Transmit Data
	3	(+) Receive Data
	4	Unused
	5	Unused
	6	(-) Receive Data
	7	Unused
	8	Unused

Parallel Interface

Parallel Connector



Pin	Signal	Pin	Signal	Pin	Signal
1	Strobe	7	Data Bit 5	13	Select
2	Data Bit 0	8	Data Bit 6	14	Auto Linefeed
3	Data Bit 1	9	Data Bit 7	15	Error
4	Data Bit 2	10	Acknowledge	16	Initialize Printer
5	Data Bit 3	11	Busy	17	Select IN
6	Data Bit 4	12	Paper End	18-25	Signal Ground

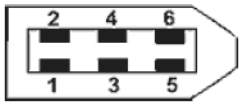
Serial Interface

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

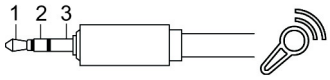
USB

USB Connector	Pin	Signal
	1	+5 VDC
	2	- Data
	3	+ Data
	4	Ground

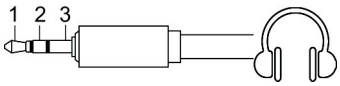
IEEE 1394

IEEE 1394 Connector	Pin	Signal
	1	power
	2	gnd
	3	tpb-
	4	tpb+
	5	tpa-
	6	tpa+

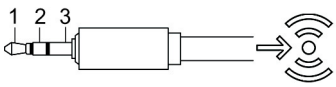
Microphone

Microphone Connector (1/8 inch)	Pin	Signal
	1 (Tip) 2 (Ring) 3 (Shield)	Audio Power Ground

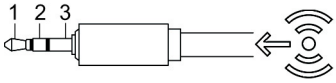
Headphone

Headphone Connector (1/8 inch)	Pin	Signal
	1 (Tip) 2 (Ring) 3 (Shield)	Audio_Left Audio_Right Ground

Line-in Audio

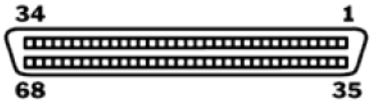
Line-in Audio Connector (1/8 inch)	Pin	Signal
	1 (Tip) 2 (Ring) 3 (Shield)	Audio_In_Left Audio_In_Right Ground

Line-out Audio

Line-out Audio Connector (1/8 inch)	Pin	Signal
	1 (Tip) 2 (Ring) 3 (Shield)	Audio_Out_Left Audio_Out_Right Ground

Ultra SCSI

Ultra SCSI connector

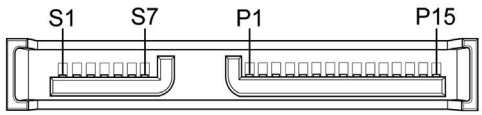


Pin	Signal	Pin	Signal
1	+DB12	35	-DB12
2	+DB13	36	-DB13
3	+DB14	37	-DB14
4	+DB15	38	-DB15
5	+DPB1	39	-DPB1
6	GND	40	GND
7	+DB0	41	-DB0
8	+DB1	42	-DB1
9	+DB2	43	-DB2
10	+DB3	44	-DB3
11	+DB4	45	-DB4
12	+DB5	46	-DB5
13	+DB6	47	-DB6
14	+DB7	48	-DB7
15	+DPB	49	-DPB
16	DIFFSENSE	50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR

19	RES	53	RES
20	+ATN	54	-ATN
21	GND	55	GND
22	+BSY	56	-BSY
23	+ACK	57	-ACK
24	+RST	58	-RST
25	+MSG	59	-MSG
26	+SEL	60	-SEL
27	+C/D	61	-C/D
28	+REQ	62	-REQ
29	+I/O	63	-I/O
30	GND	64	GND
31	+DB8	65	-DB8
32	+DB9	66	-DB9
33	+DB10	67	-DB10
34	+DB11	68	-DB11

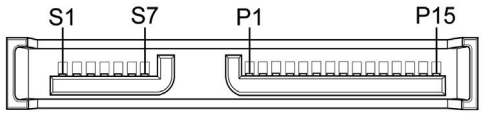
SATA

SATA Connector



Pin	Signal	Pin	Signal	Pin	Signal
Data Cable		**Power Cable**		**Power Cable**	
S-1	Ground	P-1	3.3-V power	P-8	5-V power
S-2*	A+	P-2	3.3-V power	P-9	5-V power
S-3*	A-	P-3	3.3-V power	P-10	Ground
S-4	Ground	P-4	Ground	P-11	Reserved
S-5**	B-	P-5	Ground	P-12	Ground
S-6**	B+	P-6	Ground	P-13	12-V power

SATA Connector



Pin	Signal	Pin	Signal	Pin	Signal
Data Cable		**Power Cable**		**Power Cable**	
S-7	Ground	P-7	5-V power	P-14	12-V power
* S2 and S3 differential signal pair **S5 and S6 differential signal pair				P-15	12-V power

Monitor (VGA)

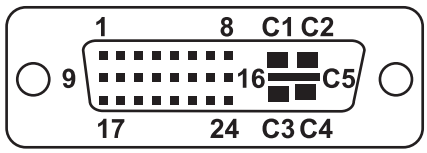
VGA Connector

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

NOTE: Monitor connectors can vary depending on your configuration.

Monitor (DVI)

DVI Connector

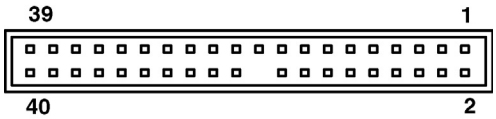


Pin	Signal	Pin	Signal
1	T.M.D.S DATA 2-	16	HOT PLUG DETECT
2	T.M.D.S DATA 2+	17	T.M.D.S DATA 0-

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

ATA/ATAPI (IDE) Standard Drive Cable

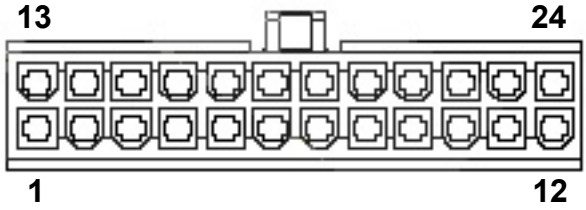
ATA/ATAPI (IDE) Connector



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

24-Pin Power (Main)

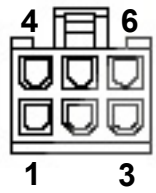
24-Pin Main Power Connector



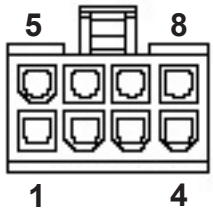
1	+3.3 V	8	POK	14	-12 V	21	+5 V
2	+3.3 V	9	+5 Vaux	15	GND	22	+5 V and +5 V-Rsense
3	GND	10	+12 V-A	16	PS_ON_L		
4	+5 V	11	+12 V-A	17	GND	23	+5 V
5	GND	12	+3.3 V	18	GND	24	GND
6	+5 V	13	+3.3 V and +3.3V-Rsense	19	GND		
7	GND			20			

6-Pin Power (Auxiliary System Board)

CAUTION Be sure you can differentiate which power cable connects to the PCI Express x16 graphics card and which power cable connects to the system board. These two cables look very similar. The PCI Express power cable has a black connector and the power cable has a white connector. When power is present, you must NEVER connect the PCI Express power cable to the system board. If you do so, the system board may be damaged and your warranty voided. To see a picture of the PCI Express cable and where it must be connected, refer to the "PCI or PCI Express Installation" section on page 91.

6-Pin Power (Auxiliary System Board) Connector	Pin	Color	Signal
	1	ORG	+3.3V
	2	ORG	+3.3V
	3	YEL	+12V-A
	4	BLK	GND
	5	BLK	GND
	6	YEL	-12 V

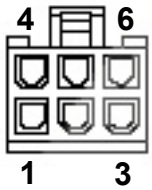
8-Pin Power (for Processors)

8-Pin Power (for CPUs)	Pin	Color	Signal
	1	BLK	GND
	2	BLK	GND
	3	BLK	GND
	4	BLK	GND
	5	WHT	+12VCPU0
		WHT	+12VCPU0 RSENSE
	6	WHT	+12VCPU0
	7	WHT with stripe	+12VCPU1
	8	WHT with stripe	+12VCPU1

6-Pin Power (Auxiliary PCI Express)

CAUTION Be sure you can differentiate which power cable connects to the PCI Express x16 graphics card and which power cable connects to the system board. These two cables look very similar. The PCI Express power cable has a black connector and the power cable has a white connector. When power is present, you must NEVER connect the PCI Express power cable to the system board. If you do so, the system board may be damaged and your warranty voided. To see a picture of the PCI Express cable and where it must be connected, refer to the "PCI or PCI Express Installation" section on page 91.

NOTE The 6-pin power (auxiliary PCI Express) is only required with high-powered graphics cards.

6-Pin Power (Auxiliary PCI Express)	Pin	Color	Signal
	1	YEL	+12V-B
	2	YEL	+12V-B
	3	YEL	+12V-B
	4	BLK	GND

6-Pin Power (Auxiliary PCI Express)	Pin	Color	Signal
	5	BLK	GND
	6	BLK	GND

Appendix E System Board Designators

This appendix lists the system board designators for this system.

Table E-1 System Board Designators

Designators	Silkscreen	Component
N/A	N/A	Mounting holes
N/A	N/A	LED: 5V_AUX power indicator
D13	N/A	Power LED
E14	N/A	Boot block header/jumper
E49	N/A	Clear password header/jumper
J20	SLOT3 PCI	PCI slot
J21	SLOT4 PCI	PCI slot
J22	SLOT5 PCI	PCI slot
J23	SLOT2 PCI	PCI slot
J31	SLOT6 PCI-E X8	PCI Express slot
J41	SLOT1 PCI-E X16	PCI Express x16 slot for graphics
J50	N/A	Parallel port
J68	N/A	Stacked keyboard/mouse connector
J9	N/A	Stacked RJ45/Dual USB
J10	N/A	Quad stacked USB
J83	N/A	Triple stacked audio jack
J87	N/A	Reset header
P1	N/A	Power supply connector (24 pin)
P2	N/A	Second power supply connector
P3	N/A	Processor 12V header
P10	FDD	Diskette drive connector

Table E-1 System Board Designators

Designators	Silkscreen	Component
P101	SEC	Security board connector
P7	CD	CD analog audio connector
P11	AUX	Auxiliary audio connector
P124	SLND	Hood lock header
P20	IDEP	Primary IDE connector
P21	IDES	Secondary IDE connector/Multi-bay Connector
P23	AUDFRNT	Front panel audio header
P24	FRNT USB	Front panel USB connector
P27	MBAY	Multi-bay header
P29, J90	N/A	HDD LED connector
P60	SATA0	Primary serial ATA (SATA) connector
P61	SATA1	Second serial ATA (SATA) connector
P5	FRNT-P	Main power/HDD LED connector
P53	N/A	Serial port
P70	CPU1FAN	Primary CPU fan header
P71	CPU2FAN	Secondary CPU fan header
P8	RCHFAN1	Primary chassis fan header
P9	RCHFAN2	Secondary chassis fan header
SW50	N/A	Clear CMOS switch/push button
XBT	BAT	Battery retainer
MMX1	DIMM1	Memory slot
MMX2	DIMM2	Memory slot
MMX3	DIMM3	Memory slot
MMX4	DIMM4	Memory slot
XU1	CPU1	Primary processor socket
XU2	CPU2	Secondary processor socket
XU15	N/A	ROM socket

Appendix F Power Cord Set Requirements

The power cord set (flexible cord or wall plug) received with this product meets the requirements for use in the country where you purchased the equipment.

If you must obtain a power cord for a different country, you should purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 0.75 mm^2 or 18 AWG, and the length of the cord must be between 6 feet (1.8 m) and 12 feet (3.6 m). If you have questions about the type of power cord to use, contact the HP authorized service provider.

A power cord should be routed so that it is not likely to be walked on or pinched by items placed on it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

Appendix G Routine Care

General Cleaning Safety Precautions

1. Never use solvents or flammable solutions to clean the workstation.
2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
3. Always unplug the workstation when cleaning with liquids or damp cloths.
4. Always unplug the workstation before cleaning the keyboard, mouse, or air vents.
5. Disconnect the keyboard before cleaning it.
6. Wear safety glasses equipped with side shields when cleaning the keyboard.

Maximizing the Airflow

Keep your workstation in an area where the airflow to the front and rear of the system is not obstructed.

- If possible, keep the unit off of surfaces where dust can gather.
- Keep the back of the unit at least 6 inches away from a wall or other obstruction.
- Keep the front of the unit clear of any obstruction that keeps air from entering the front of the system.
- Remove any dust on the front panel (vent area) and the rear fans with a small vacuum, compressed air, dust rag.

Cleaning the Workstation Case

Follow previously stated safety precautions before cleaning the workstation.

To clean the workstation case:

- 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 needed as the alcohol will evaporate quickly and not leave a residue.
- After cleaning, always wipe the unit 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

Follow all safety precautions stated earlier before cleaning the keyboard.

CAUTION Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- 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. Caution should be used as too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.

CAUTION Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard might not function properly.

- Cleaning under a key can be done with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

Cleaning the Monitor

Follow all safety precautions stated earlier before cleaning the monitor.

To clean the monitor, wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. 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.

Cleaning the Mouse

Follow all safety precautions stated earlier before cleaning the mouse.

To clean the mouse:

- Clean the mouse ball by first removing the retaining plate and the ball from the housing.
- Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.

Appendix H Additional Password Security and Resetting CMOS

This workstation supports security password features, which can be established through the Computer Setup Utilities menu. These features are:

- setup password
- power-on password

When you establish only a setup password, the power-on password is required to access Computer Setup and any other information on the workstation. When you establish both passwords, only the setup password will give you access to Computer Setup.

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

If you forget the password for the computer, there are two method for clearing that password so you can gain access to the information on the workstation.

- resetting the password jumper
- using the Clear CMOS button

CAUTION Pushing the 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 needed later. To back up the CMOS settings, use Computer Setup and run the Save to Diskette option from the File menu.

Resetting the Password Jumper

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

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

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

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

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

3 Remove the access panel.

4 Locate the password header and jumper. The password header is E49.

NOTE The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, refer to "System Board Components" on page 69.

5 Remove the jumper from either pin 1 or 2. Place the jumper on pins 1 and 2 (connecting both pins together).

6 Replace the access panel.

7 Reconnect the external equipment.

8 Plug in the workstation and turn on the power. Allow the operating system to start. This clears the current passwords and disables the password features.

9 To establish new passwords, repeat steps 1 through 4, replace the password jumper on either pin 1 or pin 2 (but not both), then repeat steps 6 through 8. Establish the new passwords in Computer Setup.

Clearing and Resetting the CMOS

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

Using the CMOS Button

1 Shut down the operating system and then turn off the workstation and any external devices. Disconnect the power cord of the workstation and any external devices from the power outlets.

2 Disconnect the keyboard, monitor, and any other external devices that are connected to the workstation.

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

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

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

3 Remove the access panel.

CAUTION Pushing the 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 needed later. To back up the CMOS settings, use Computer Setup and run the Save to Diskette option from the File menu.

4 Locate, press, and hold the CMOS button in 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, refer to "System Board Components" on page 69.

5 Replace the access panel.

6 Reconnect any external devices.

7 Plug in the workstation power and turn the power back on.

NOTE The workstation passwords and any special configurations along with the system date and time will have to be reset.

Using Computer Setup to Reset CMOS

To reset CMOS using Computer Setup, access the Computer Setup Utilities menu. When the Computer Setup message appears in the lower-right corner of the screen, press the F10 key. 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 turned off, then on again, to access the utility.

From the Computer Setup menu, select **File>Set Defaults** and **Exit**. This restores the soft settings that include boot sequence order and other factory settings. It does not, however, force hardware rediscovery.

NOTE The workstation passwords and any special configurations along with the system date and time will have to be reset.

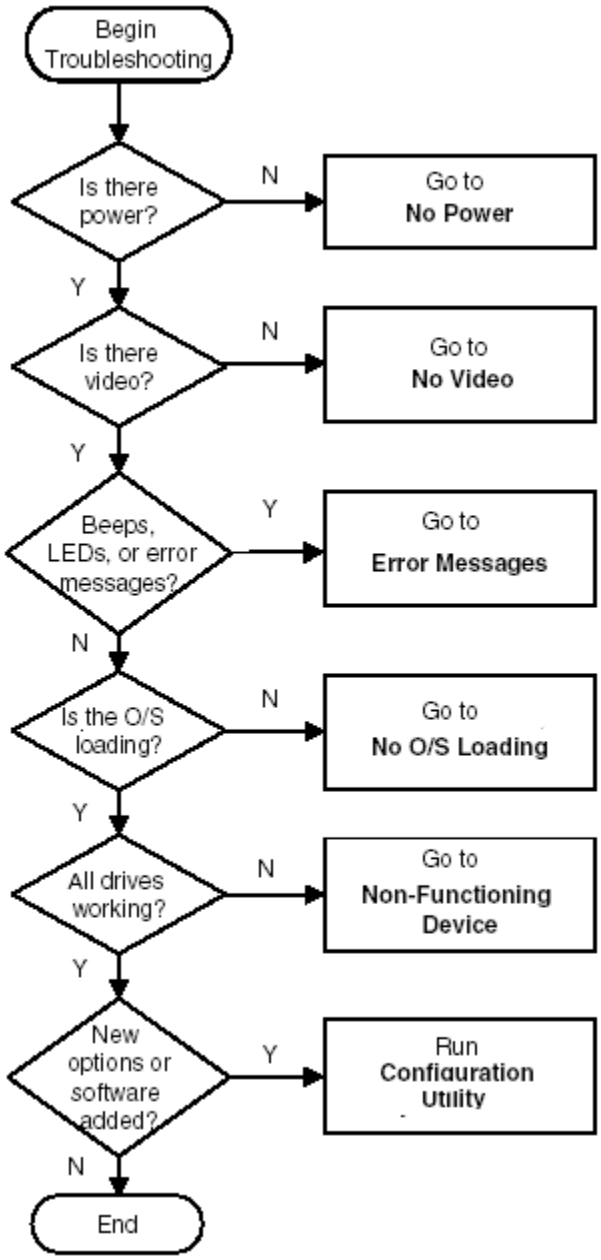
Appendix I Quick Troubleshooting Flows

This appendix presents some quick troubleshooting flowcharts for some common issues.

NOTE The flowcharts presented here are for general troubleshooting purposes only and they might not apply to your specific workstation.

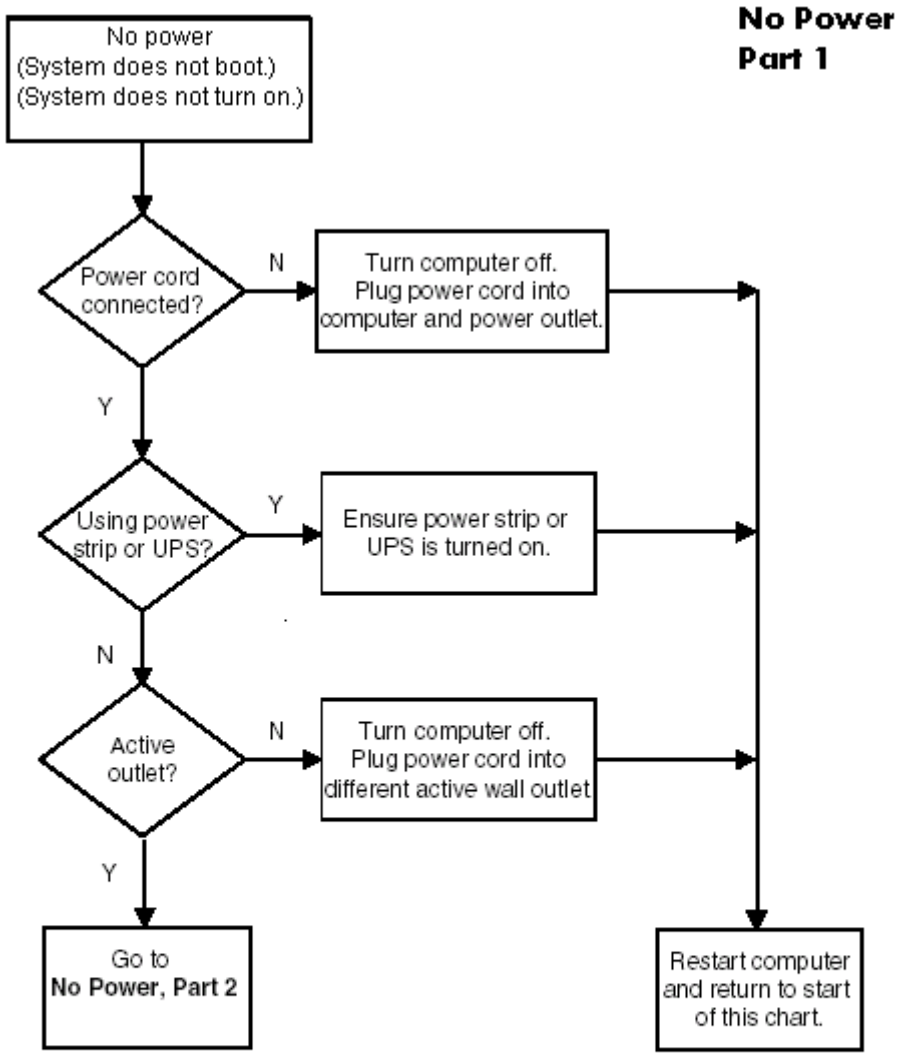
- “Initial Troubleshooting”
- “No Power”
- “No Video”
- “Error Messages”
- “No OS Loading”
- “No OS Loading from Hard Drive”
- “No OS Loading from Diskette Drive”
- “No OS Loading from CD-ROM Drive”
- “No OS Loading from Network”
- “Non-functioning Device”

Initial Troubleshooting



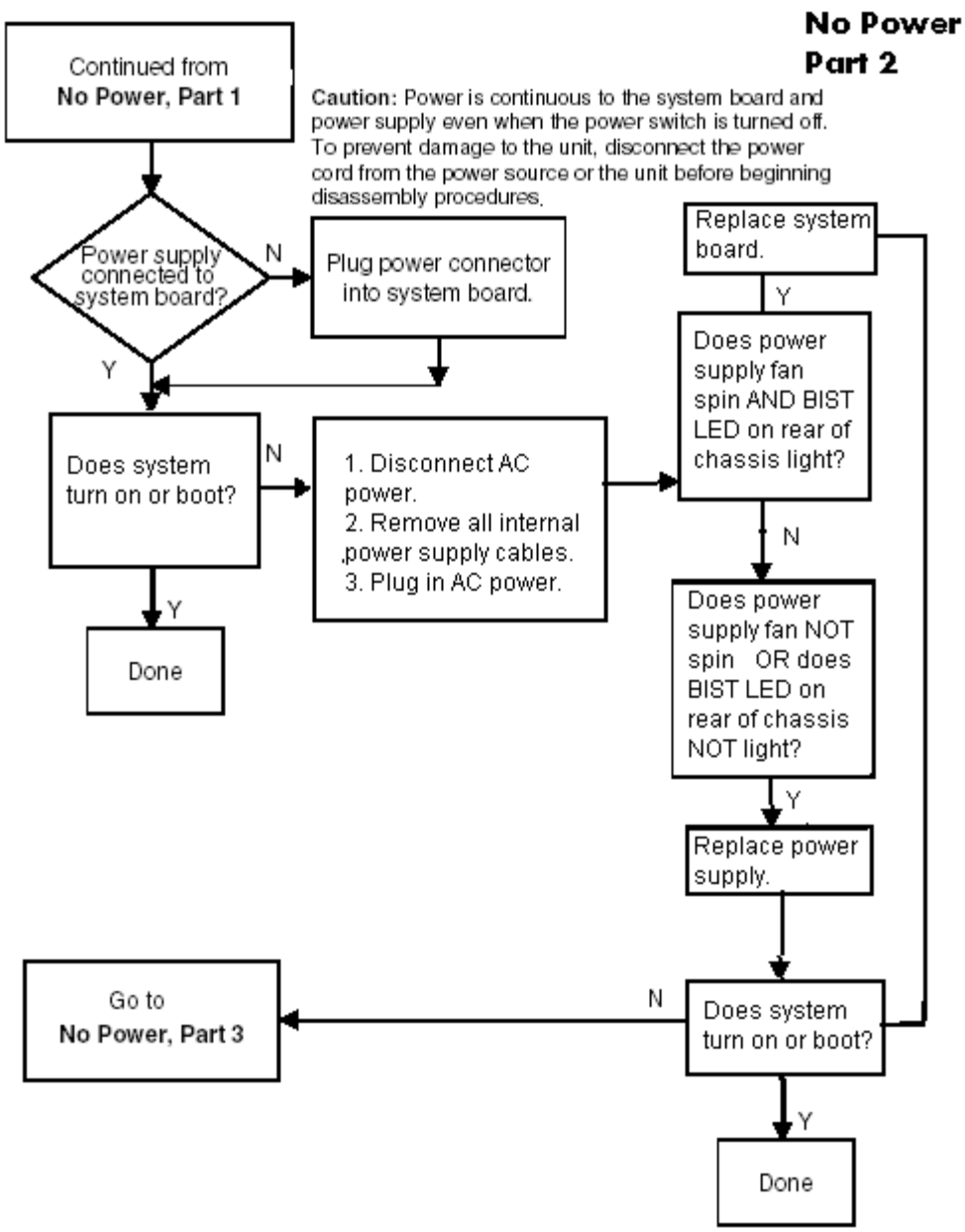
No Power

No Power, Part 1

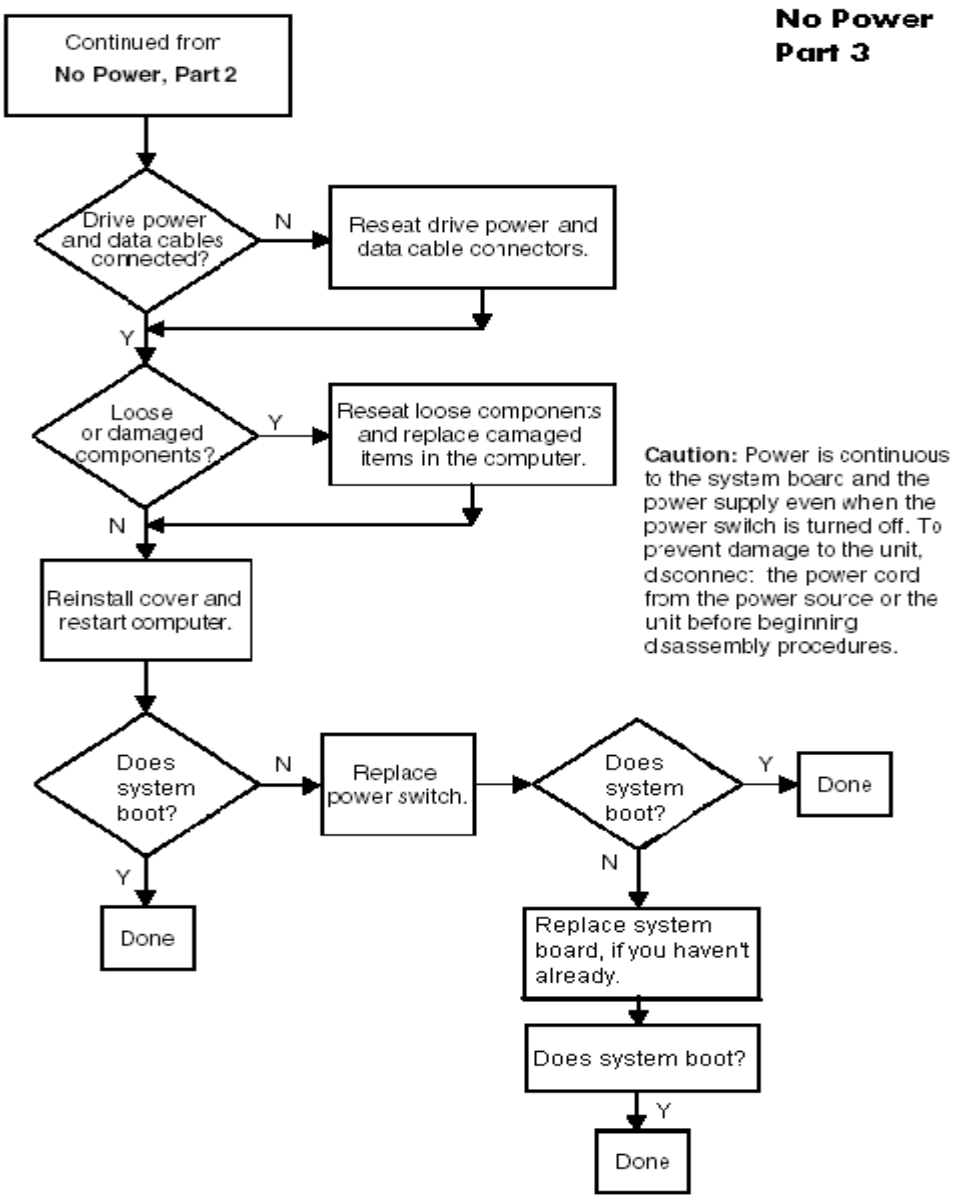


Caution: Power is continuous to the system board and power supply even when the power switch is turned off. To prevent damage to the unit, disconnect the power cord from the power source or the unit before beginning disassembly procedures.

No Power, Part 2

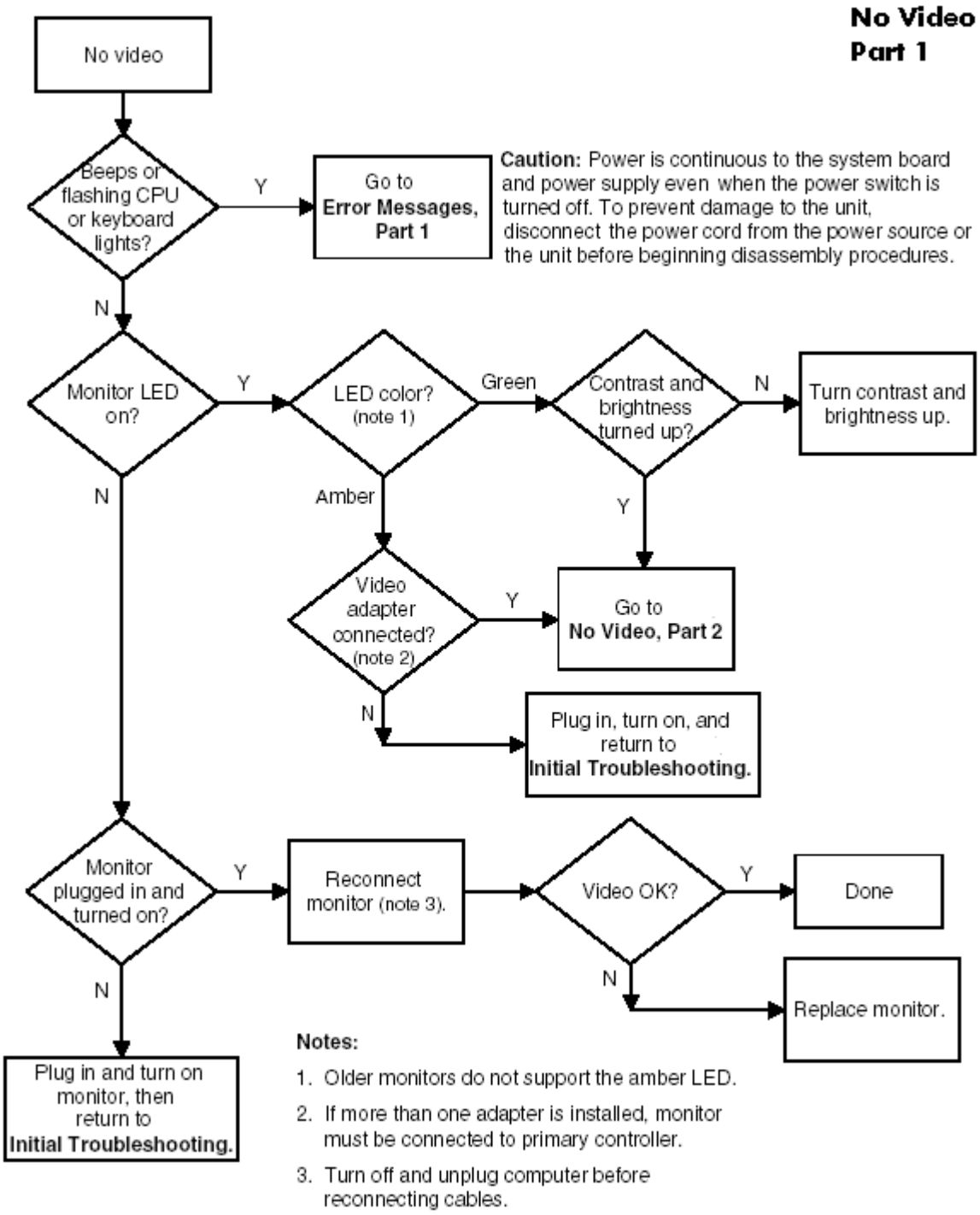


No Power, Part 3

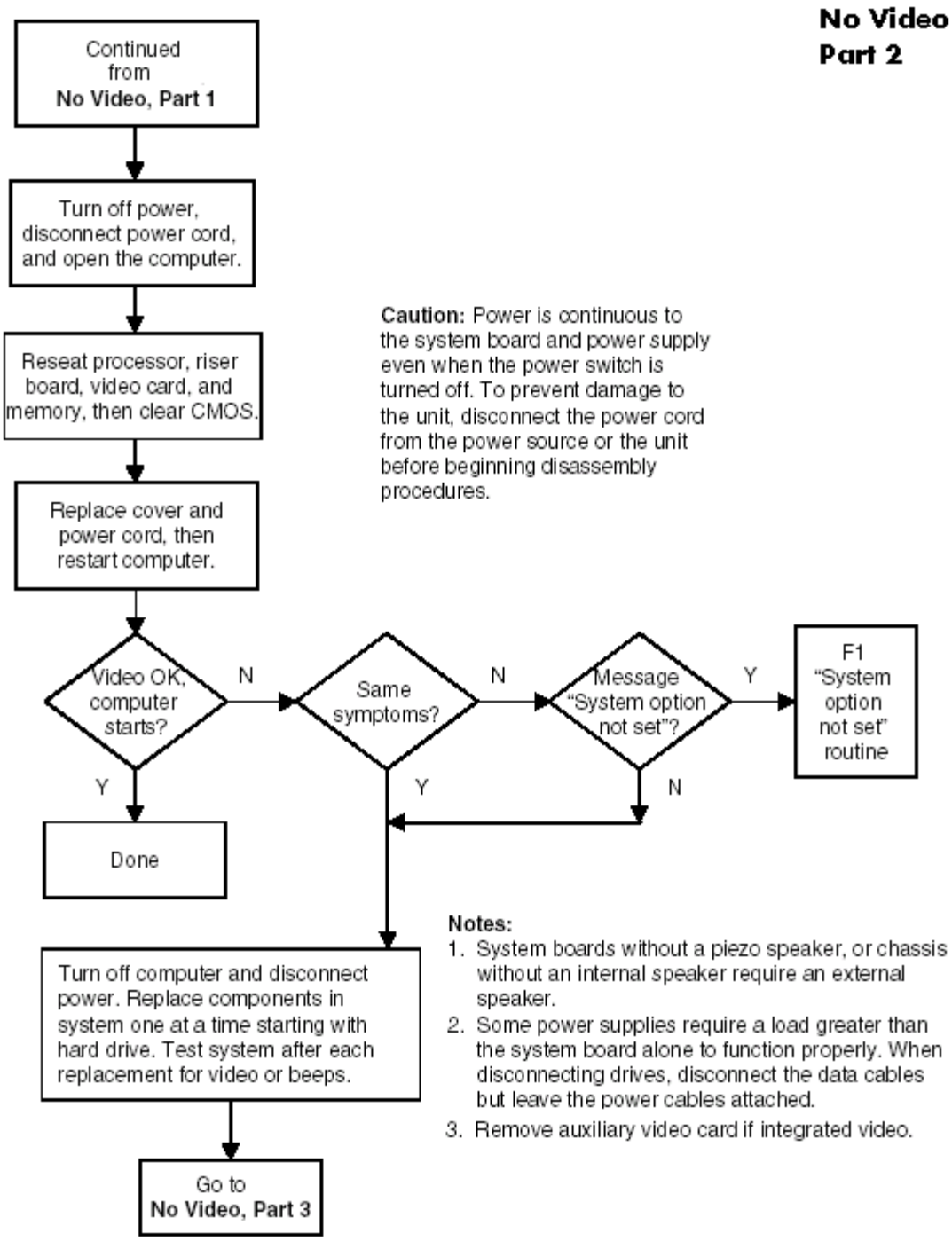


No Video

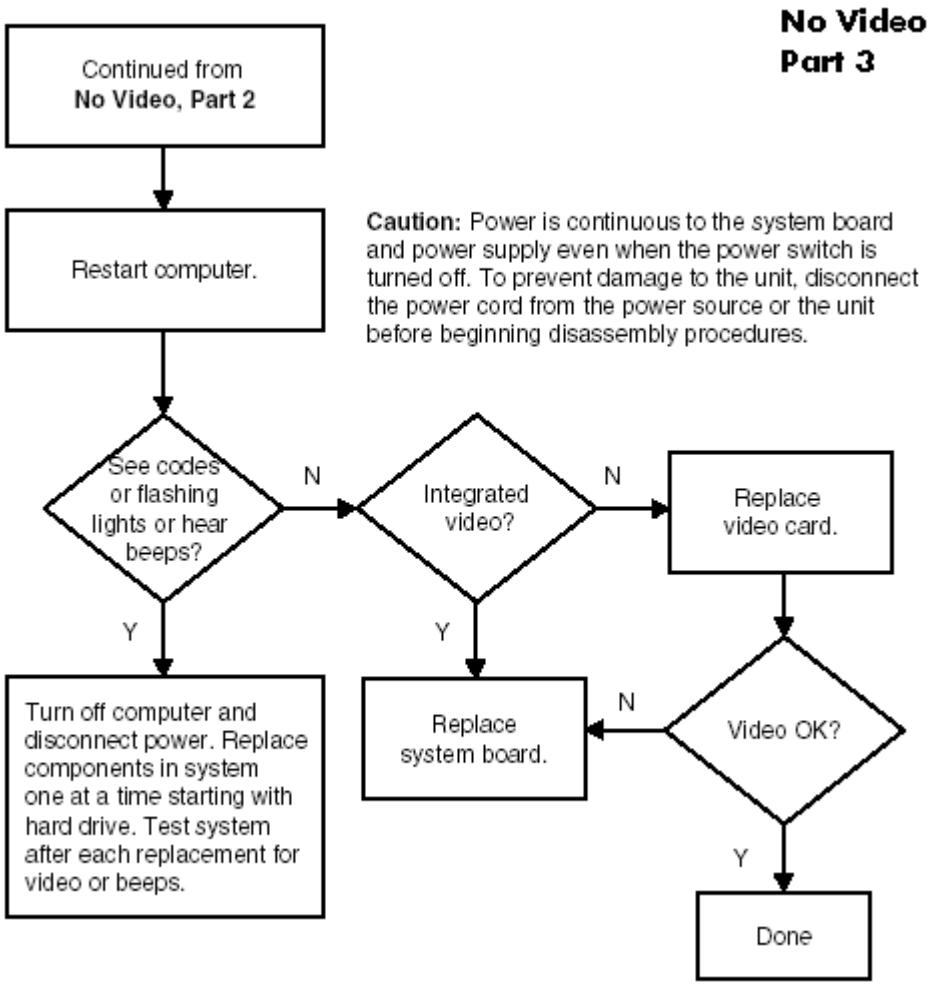
No Video, Part 1



No Video, Part 2

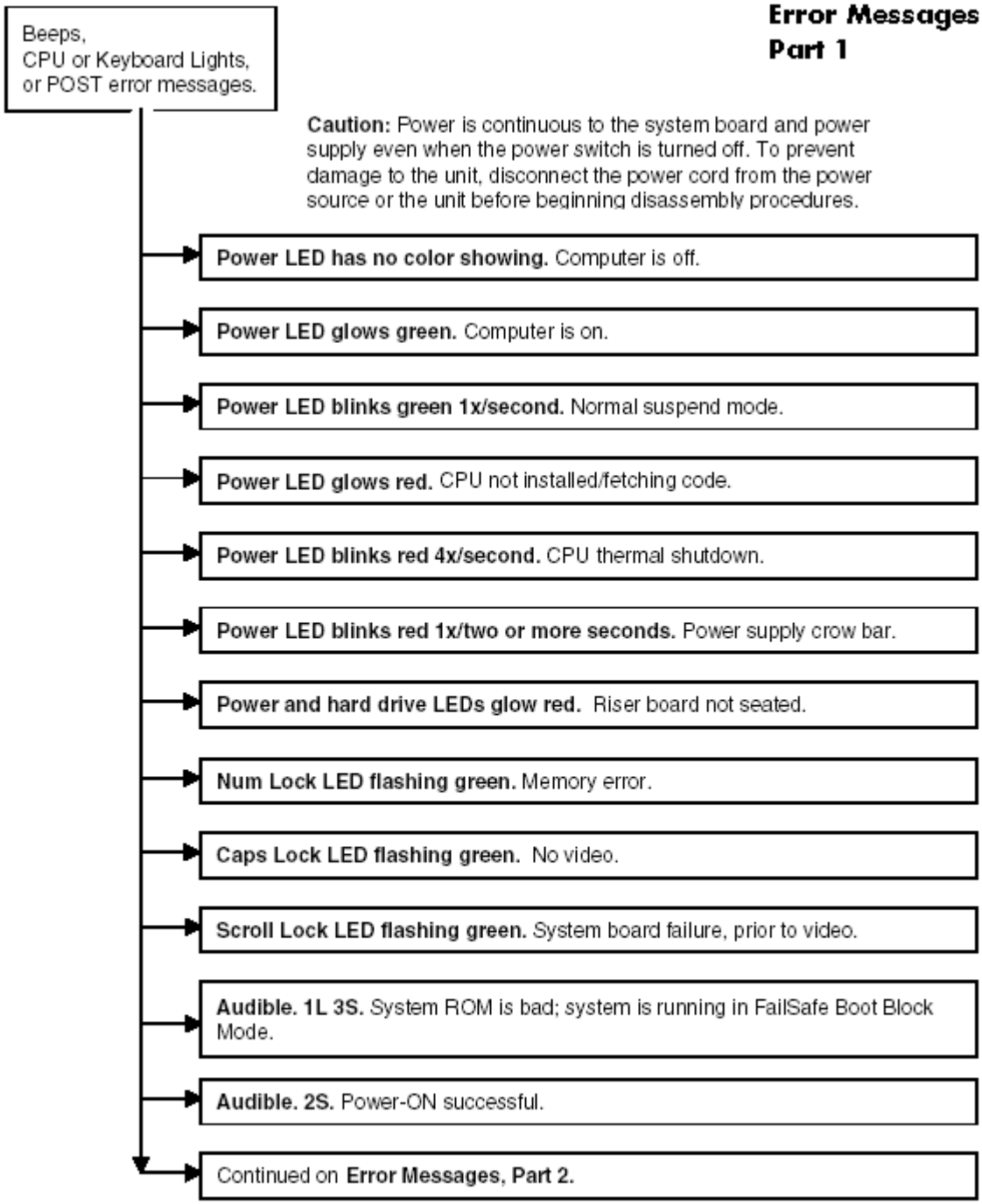


No Video, Part 3



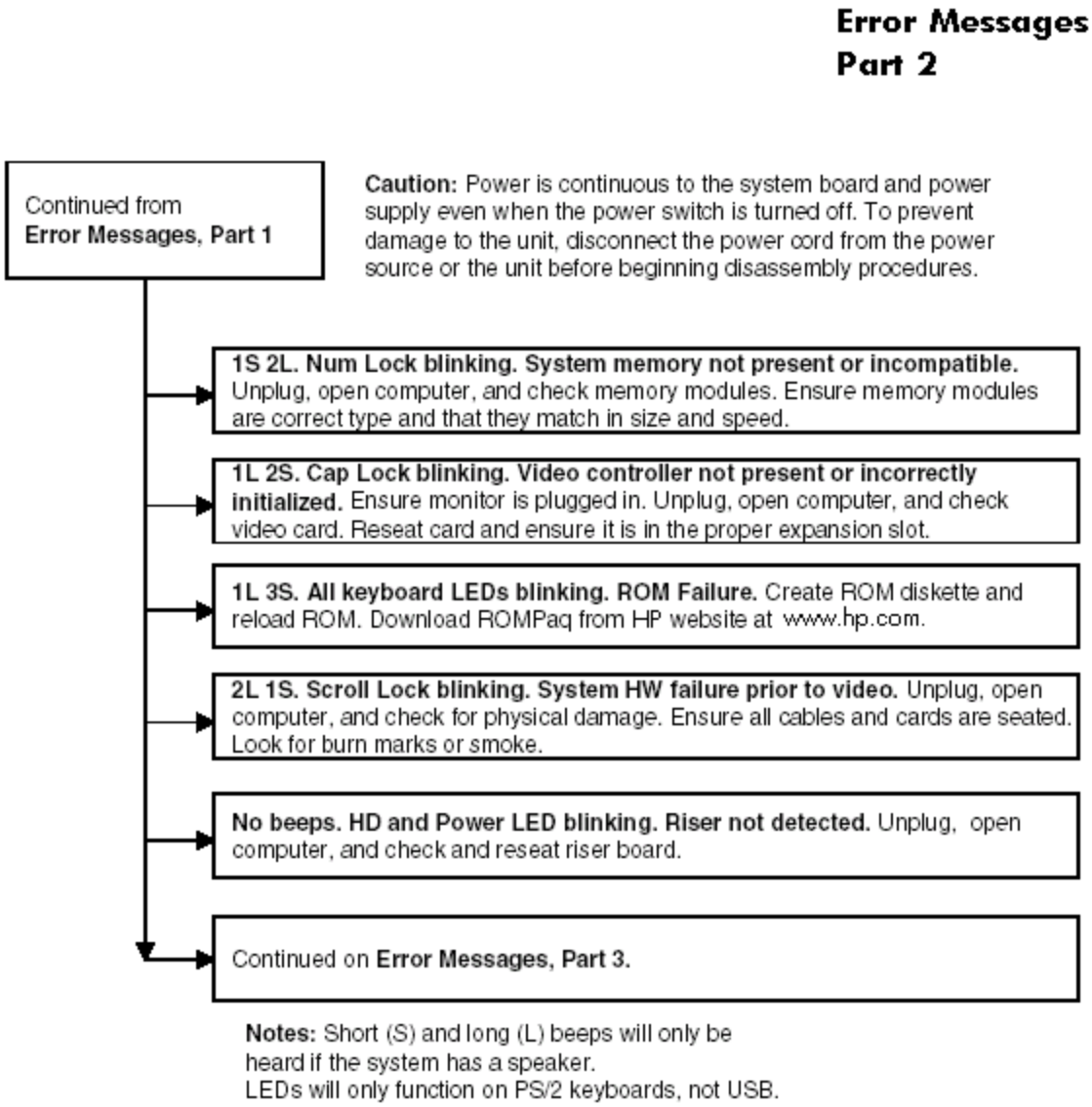
Error Messages

Error Messages, Part 1

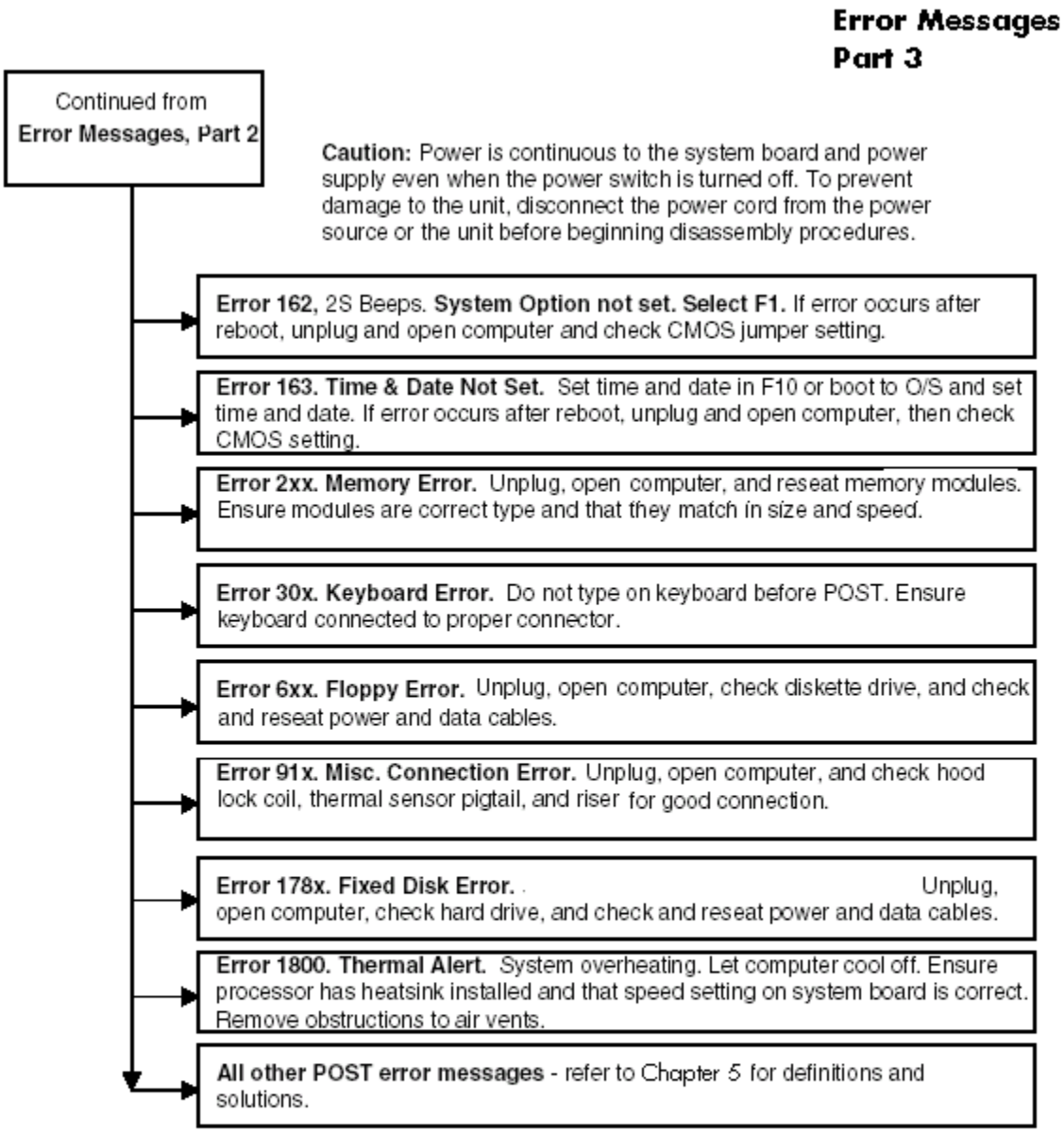


Notes: Short (S) and long (L) beeps will only be heard if the system has a speaker.
LEDs will only function on PS/2 keyboards, not USB.

Error Messages, Part 2



Error Messages, Part 3

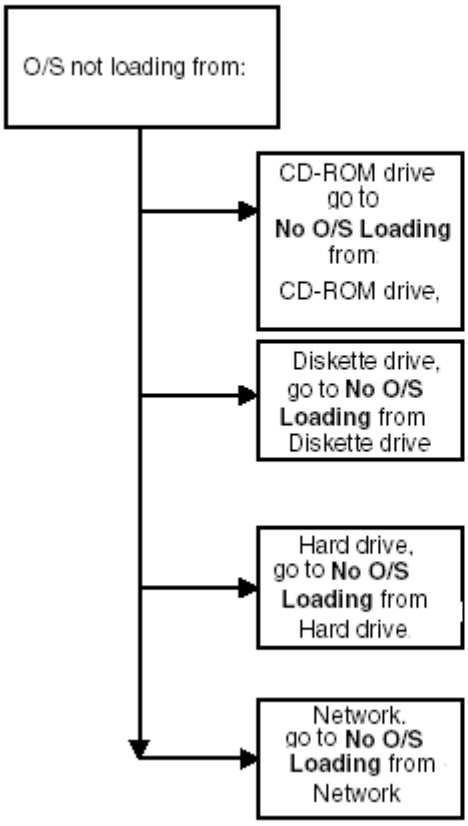


Notes: Short (S) and long (L) beeps will only be heard if the system has a speaker.
LEDs will only function on PS/2 keyboards, not USB.

x = Numbers 1 - 9

No OS Loading

No OS Loading



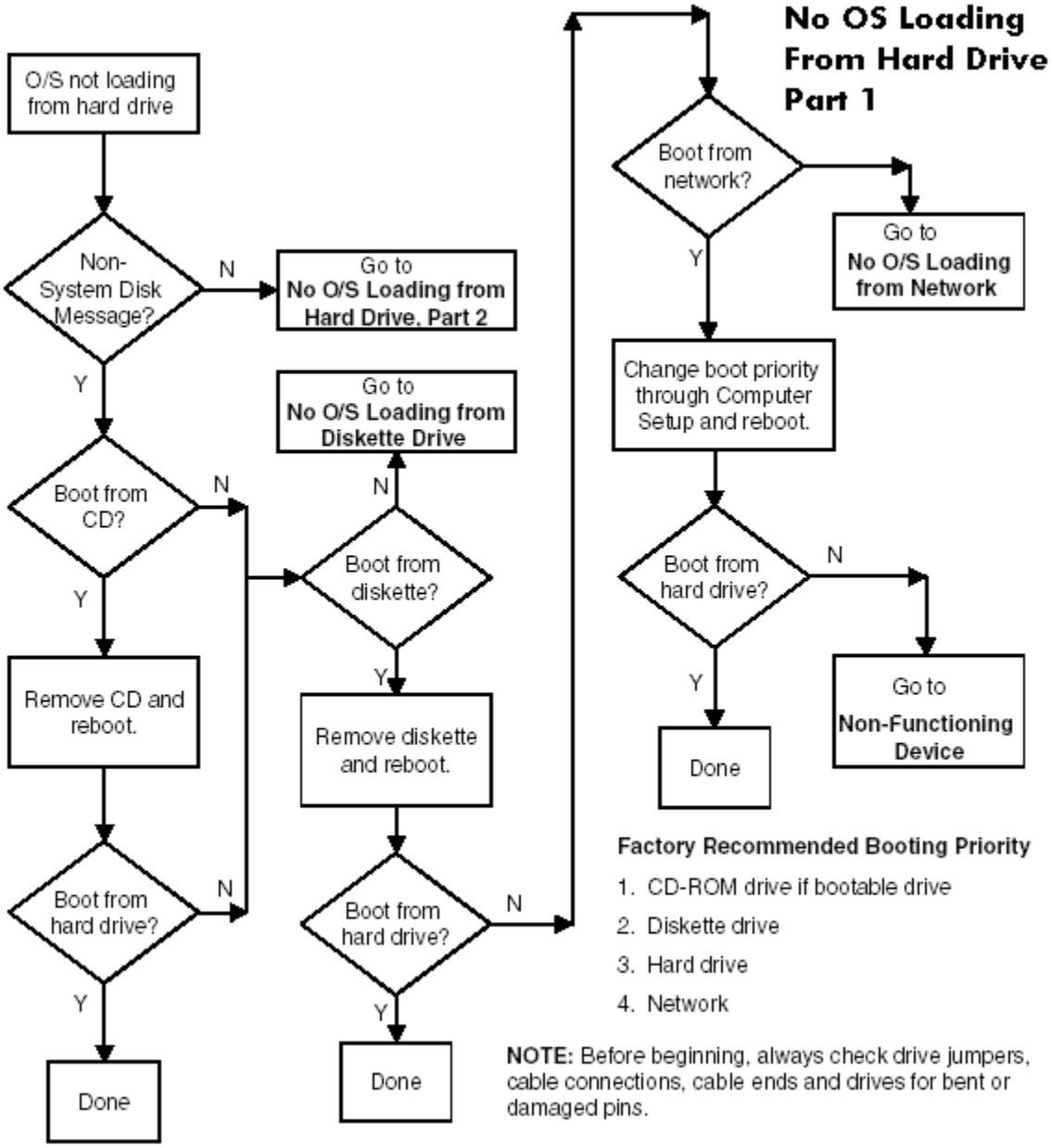
Factory recommended booting priority

1. CD-ROM drive
2. Diskette drive
3. Hard drive
4. Network

NOTE: Before beginning, always check drive jumpers, cable connections, cable ends, and drives for bent or damaged pins.

No OS Loading from Hard Drive

No OS Loading from Hard Drive, Part 1



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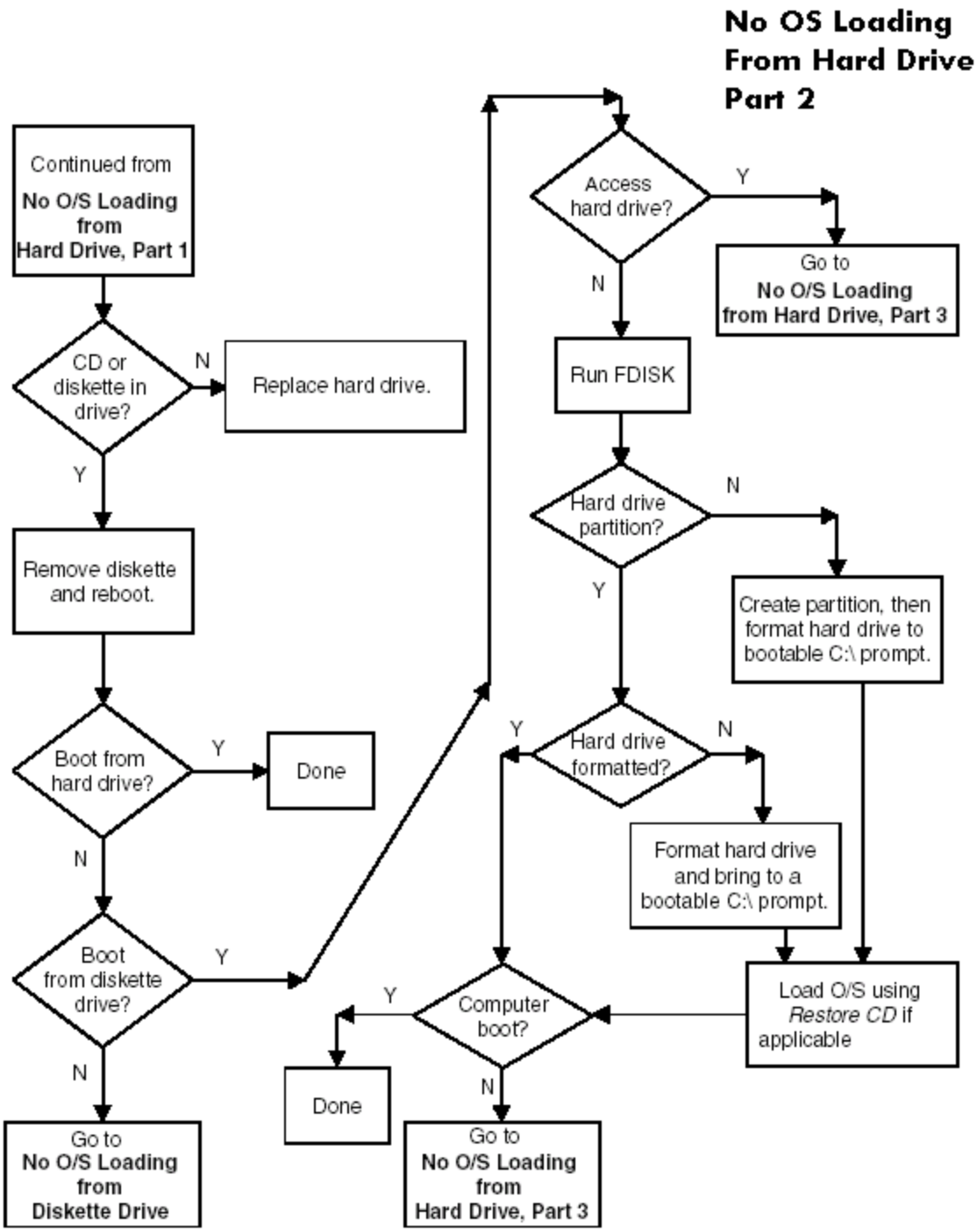

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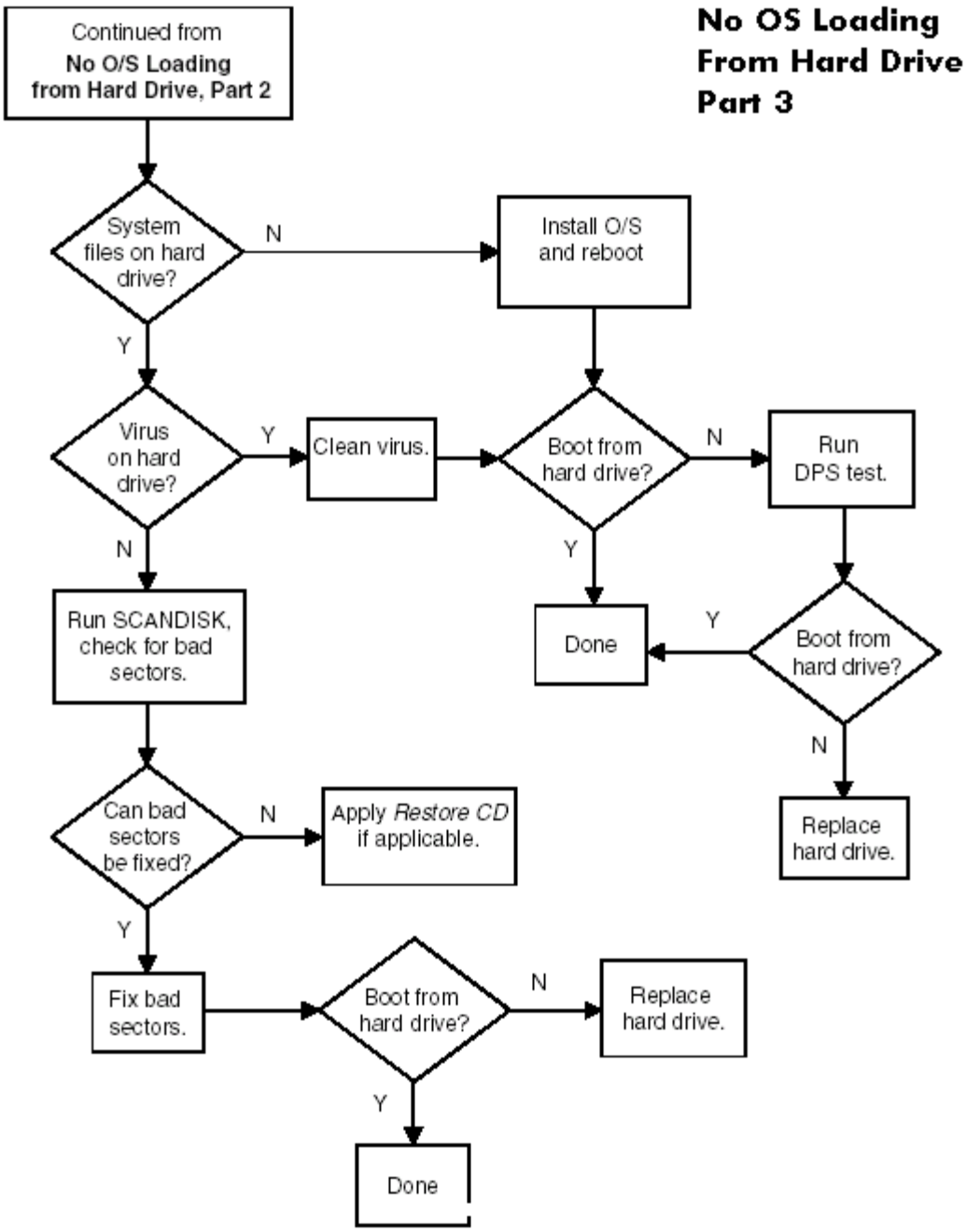
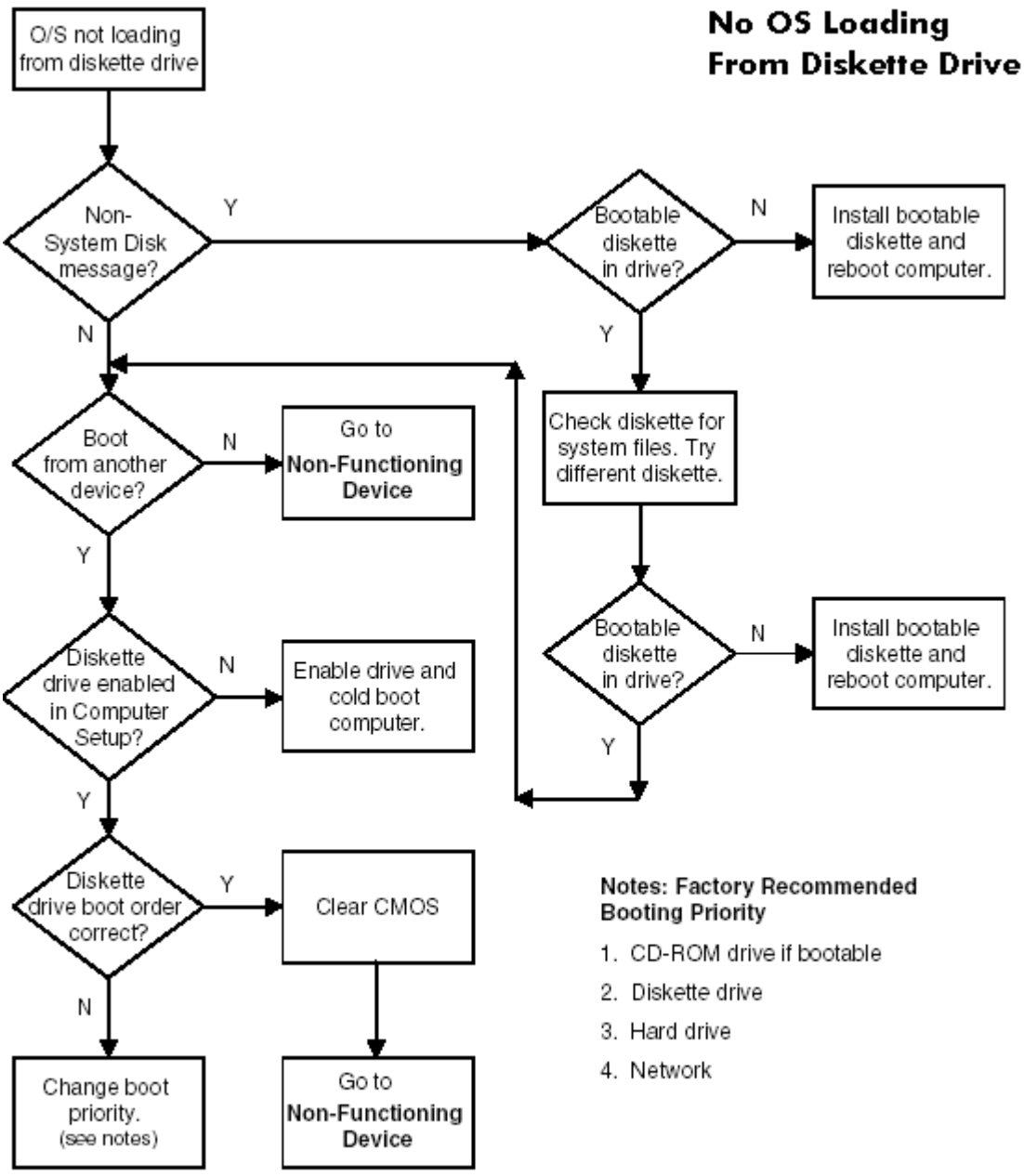
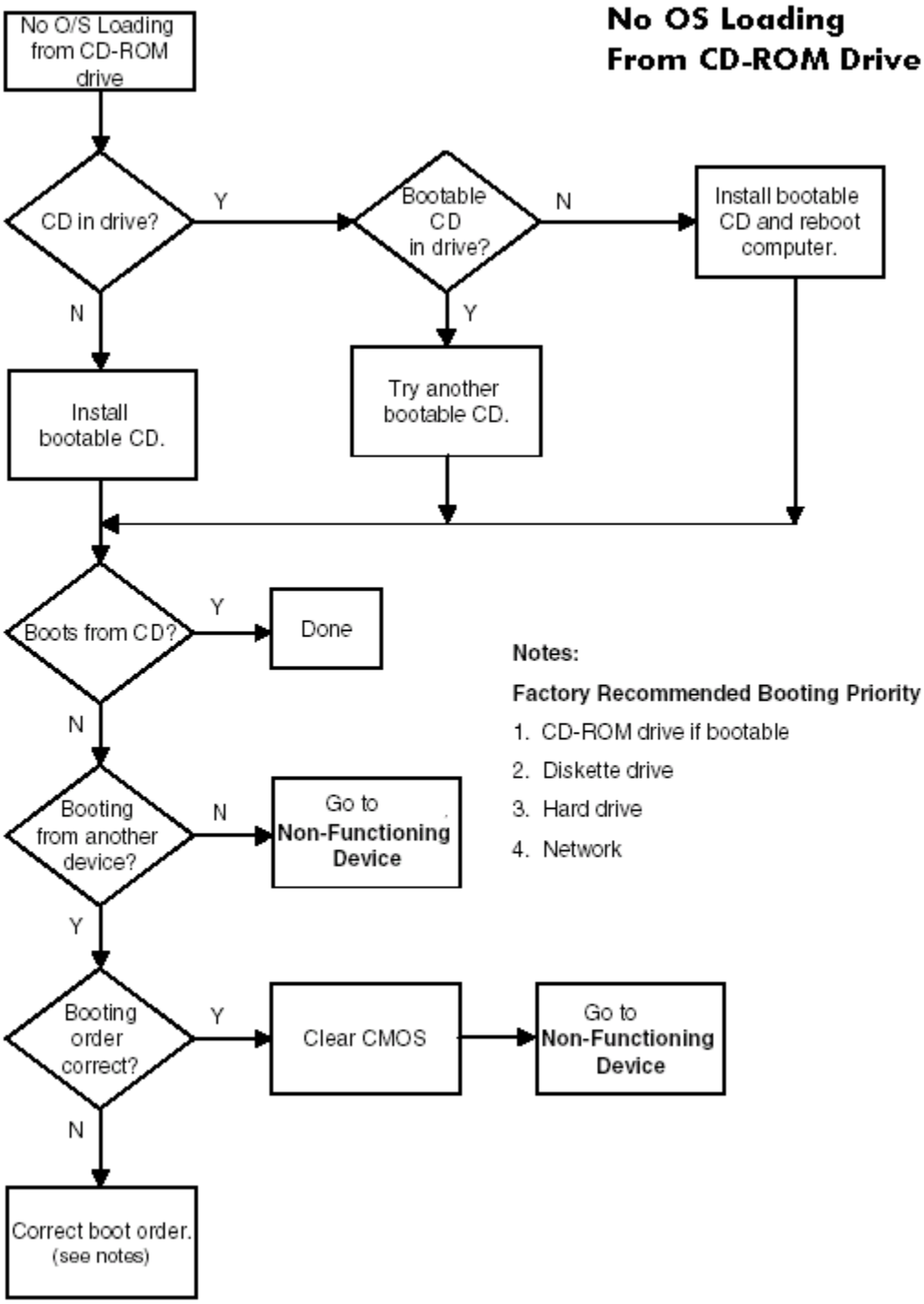


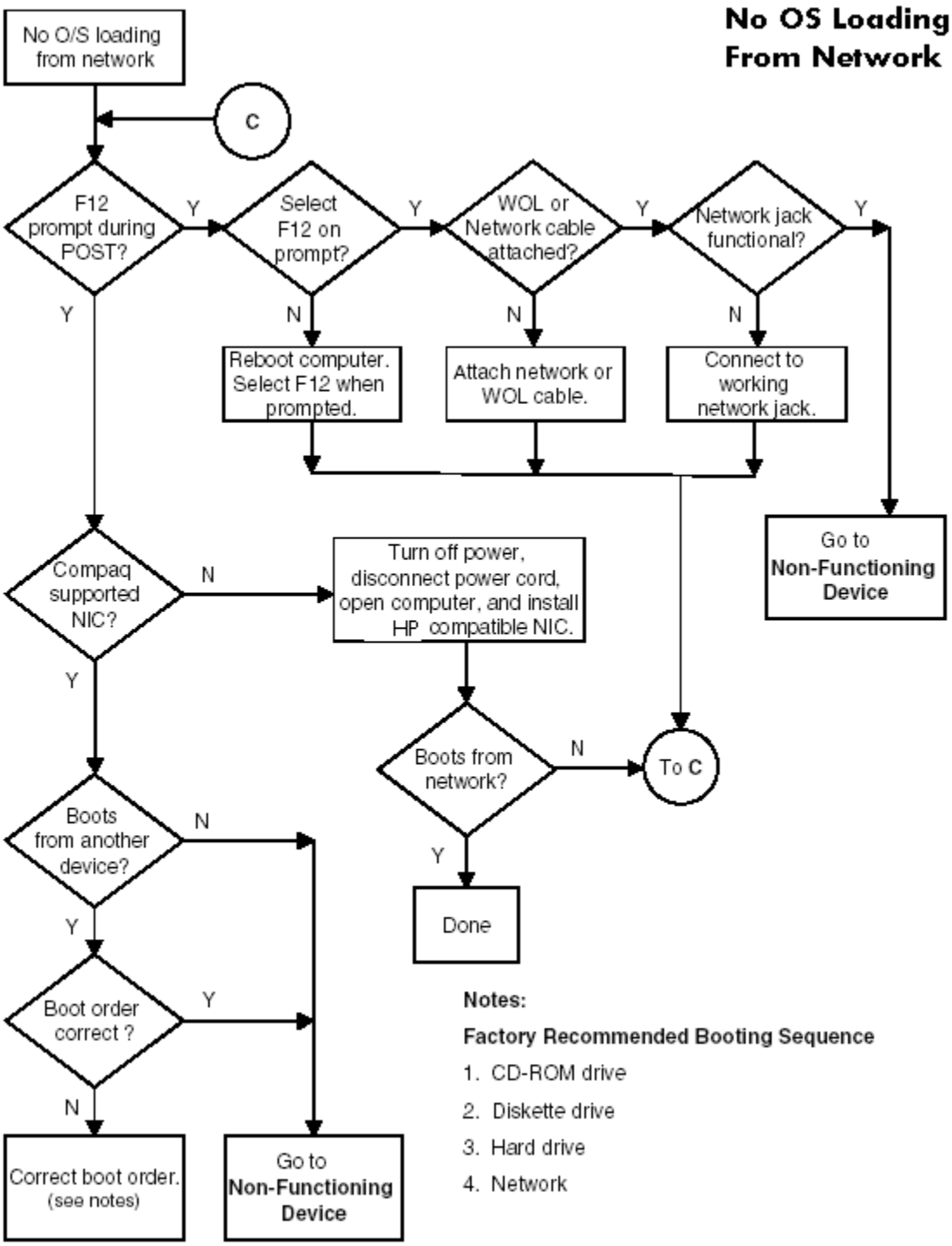
No OS Loading from Diskette Drive



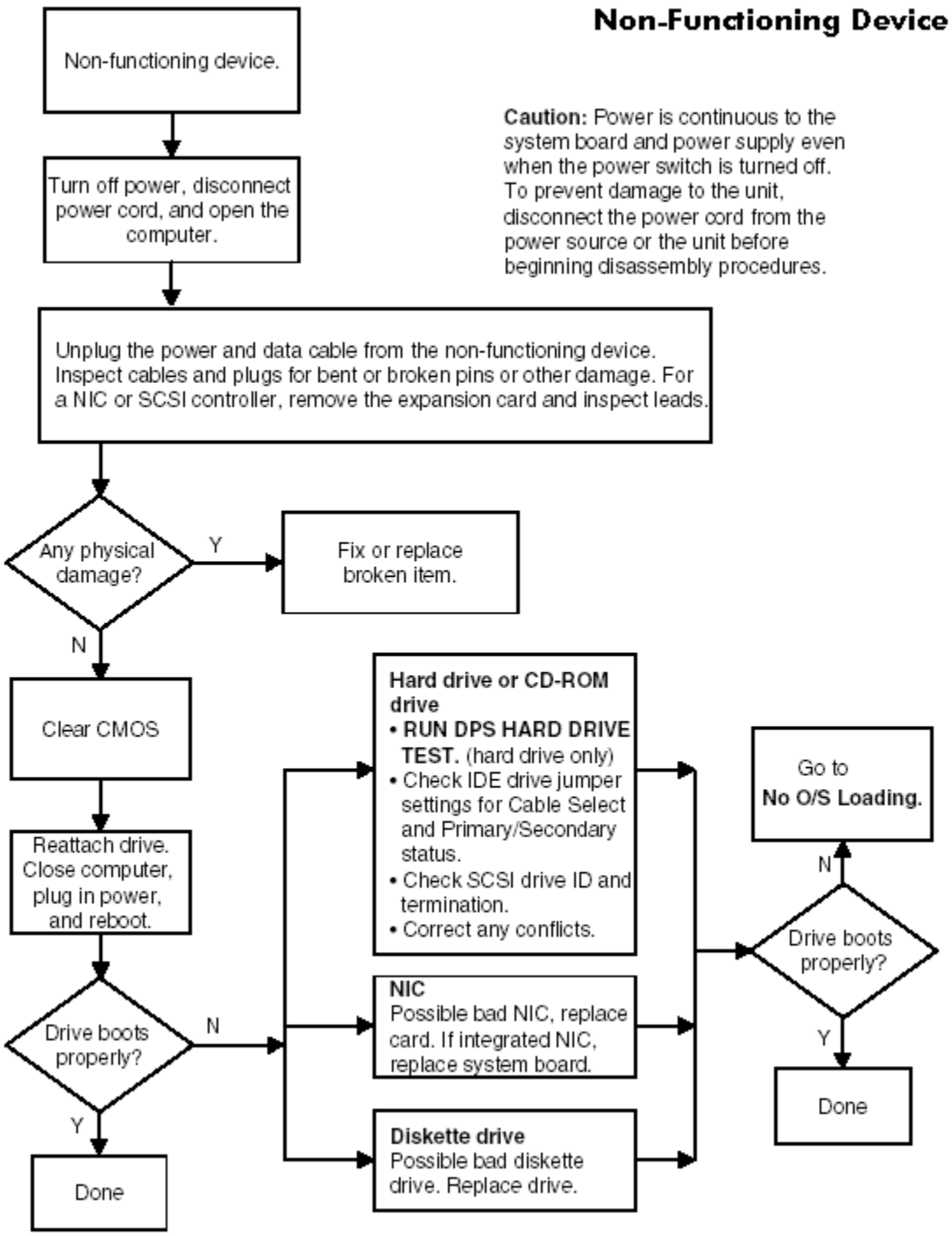
No OS Loading from CD-ROM Drive



No OS Loading from Network



Non-functioning Device



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