



# Maintenance and Service Guide

HP Compaq 4000 Pro Small Form Factor Business  
PC

© Copyright 2011 Hewlett-Packard Development Company, L.P. The information contained herein is subject to change without notice.

Microsoft and Windows are trademarks of Microsoft Corporation in the U.S. and other countries.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

This document contains proprietary information that is protected by copyright. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Hewlett-Packard Company.

**HP Compaq 4000 Pro Small Form Factor Business PC**

First Edition (January 2011)

Document Part Number: 640047-001

## About This Book

---

- ⚠ **WARNING!** Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.
  - ⚠ **CAUTION:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.
  - 📝 **NOTE:** Text set off in this manner provides important supplemental information.
-



---

# Table of contents

<b>1</b>	<b>Installing and Customizing the Software</b>	<b>1</b>
	Installing the Windows Operating System	1
	Downloading Microsoft Windows Updates	2
	Installing or Upgrading Device Drivers (Windows systems)	2
	Customizing the Monitor Display (Windows systems)	2
	Launching Windows XP from Windows 7	3
	Accessing Disk Image (ISO) Files	3
<b>2</b>	<b>Computer Setup (F10) Utility</b>	<b>4</b>
	Computer Setup (F10) Utilities	4
	Using Computer Setup (F10) Utilities	5
	Computer Setup—File	6
	Computer Setup—Storage	7
	Computer Setup—Security	9
	Computer Setup—Power	15
	Computer Setup—Advanced	16
	Recovering the Configuration Settings	19
<b>3</b>	<b>Serial ATA (SATA) Drive Guidelines and Features</b>	<b>20</b>
	SATA Hard Drives	20
	SATA Hard Drive Cables	20
	SATA Data Cable	20
	SMART ATA Drives	21
	Hard Drive Capacities	21
<b>4</b>	<b>Identifying the Chassis, Routine Care, and Disassembly Preparation</b>	<b>22</b>
	Chassis Designations	22
	Small Form Factor (SFF)	22
	Electrostatic Discharge Information	23
	Generating Static	23
	Preventing Electrostatic Damage to Equipment	23
	Personal Grounding Methods and Equipment	24
	Grounding the Work Area	24

Recommended Materials and Equipment .....	25
Operating Guidelines .....	25
Routine Care .....	26
General Cleaning Safety Precautions .....	26
Cleaning the Computer Case .....	26
Cleaning the Keyboard .....	27
Cleaning the Monitor .....	27
Cleaning the Mouse .....	27
Service Considerations .....	27
Power Supply Fan .....	28
Tools and Software Requirements .....	28
Screws .....	28
Cables and Connectors .....	28
Hard Drives .....	29
Lithium Coin Cell Battery .....	29
<b>5 Illustrated parts catalog .....</b>	<b>30</b>
Spare parts .....	30
Computer major components .....	30
Sequential part number listing .....	33
<b>6 Removal and Replacement Procedures Small Form Factor (SFF) Chassis .....</b>	<b>39</b>
Serial Number Location .....	39
Preparation for Disassembly .....	40
Computer Access Panel .....	41
Front Bezel .....	42
Bezel Blanks .....	43
System Board Connections .....	44
Installing Additional Memory .....	45
DIMMs .....	45
DDR3-SDRAM DIMMs .....	45
Populating DIMM Sockets .....	46
Installing DIMMs .....	47
Removing or Installing an Expansion Card .....	49
Cable Management .....	54
Cable Connections .....	55
Drives .....	56
Drive Positions .....	57
Installing and Removing Drives .....	57
Removing an Internal 5.25-inch Drive .....	59
Installing an Optical Drive into the 5.25-inch Drive Bay .....	61
Removing an Internal 3.5-inch Drive .....	63
Installing a Drive into the 3.5-inch Internal Drive Bay .....	65

Removing and Replacing the Primary 3.5-inch Internal SATA Hard Drive .....	68
Baffle .....	71
Front Fan Assembly .....	72
Hood Sensor .....	73
Front I/O, Power Switch Assembly .....	74
Speaker .....	75
Heat sink .....	76
Processor .....	78
Power Supply .....	80
System Board .....	82
Battery .....	84
Type 1 Battery Holder .....	85
Type 2 Battery Holder .....	85
Type 3 Battery Holder .....	86
Using the Small Form Factor Computer in a Tower Orientation .....	87
Installing a Security Lock .....	88
HP/Kensington MicroSaver Security Cable Lock .....	88
Padlock .....	89
Front Bezel Security .....	90
<b>Appendix A Connector Pin Assignments .....</b>	<b>92</b>
Keyboard .....	92
Mouse .....	92
Ethernet RJ-45 .....	93
Serial Interface, Powered and Non-Powered .....	93
USB .....	93
Microphone .....	94
Headphone .....	94
Line-in Audio .....	94
Line-out Audio .....	94
Monitor .....	95
DVI Connector .....	95
4-Pin Power (for CPU) .....	96
6-Pin Power (for CPU) (CMT, SFF) .....	96
SATA Data and Power .....	97
PCI Express .....	98
PCI Express .....	99
<b>Appendix B Power Cord Set Requirements .....</b>	<b>100</b>
General Requirements .....	100
Japanese Power Cord Requirements .....	100
Country-Specific Requirements .....	101

<b>Appendix C POST Error Messages .....</b>	<b>102</b>
POST Numeric Codes and Text Messages .....	103
Interpreting POST Diagnostic Front Panel LEDs and Audible Codes .....	108
<b>Appendix D Troubleshooting Without Diagnostics .....</b>	<b>112</b>
Safety and Comfort .....	112
Before You Call for Technical Support .....	112
Helpful Hints .....	113
Solving General Problems .....	115
Solving Power Problems .....	119
Solving Diskette Problems .....	121
Solving Hard Drive Problems .....	124
Solving Media Card Reader Problems .....	127
Solving Display Problems .....	129
Solving Audio Problems .....	134
Solving Printer Problems .....	136
Solving Keyboard and Mouse Problems .....	138
Solving Hardware Installation Problems .....	140
Solving Network Problems .....	142
Solving Memory Problems .....	145
Solving Processor Problems .....	147
Solving CD-ROM and DVD Problems .....	148
Solving USB Flash Drive Problems .....	150
Solving Front Panel Component Problems .....	151
Solving Internet Access Problems .....	152
Solving Software Problems .....	155
Contacting Customer Support .....	156
<b>Appendix E Password Security and Resetting CMOS .....</b>	<b>157</b>
Resetting the Password Jumper .....	158
Clearing and Resetting the CMOS .....	159
<b>Appendix F Drive Protection System (DPS) .....</b>	<b>161</b>
Accessing DPS Through Computer Setup .....	162
<b>Appendix G Computer Diagnostic Features .....</b>	<b>163</b>
Hewlett-Packard Vision Diagnostics .....	163
Accessing HP Vision Diagnostics .....	163
Survey Tab .....	164
Test Tab .....	165
Status Tab .....	166
History Tab .....	166
Errors Tab .....	166

Help Tab .....	167
Saving and Printing Information in HP Vision Diagnostics .....	167
Downloading the Latest Version of HP Vision Diagnostics .....	167
Protecting the Software .....	168
<b>Appendix H System Recovery .....</b>	<b>169</b>
System Recovery options .....	170
System Recovery from the Windows 7 Start Menu .....	170
System Recovery at system startup .....	170
System Recovery from recovery media .....	171
Recovery media .....	172
Choosing recovery media .....	172
Creating recovery media .....	173
<b>Appendix I Specifications .....</b>	<b>174</b>
<b>Index .....</b>	<b>176</b>



---

# 1 Installing and Customizing the Software

If your computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Additional information is available in online help after you install the operating system.

---

 **NOTE:** If the computer was shipped with Windows Vista or Windows 7 loaded, you will be prompted to register the computer with HP Total Care before installing the operating system. You will see a brief movie followed by an online registration form. Fill out the form, click the **Begin** button, and follow the instructions on the screen.

 **CAUTION:** Do not add optional hardware or third-party devices to the computer until the operating system is successfully installed. Doing so may cause errors and prevent the operating system from installing properly.

 **NOTE:** Be sure there is a 10.2-cm (4-inch) clearance at the back of the unit and above the monitor to permit the required airflow.

---

## Installing the Windows Operating System

The first time you turn on the computer, the operating system is installed automatically. This process takes about 5 to 10 minutes, depending on which operating system is being installed. Carefully read and follow the instructions on the screen to complete the installation.

---

 **CAUTION:** Once the automatic installation has begun, **DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE.** Turning off the computer during the installation process may damage the software that runs the computer or prevent its proper installation.

 **NOTE:** If the computer shipped with more than one operating system language on the hard drive, the installation process could take up to 60 minutes.

---

If your computer was not shipped with a Microsoft operating system, some portions of this documentation do not apply. Additional information is available in online help after you install the operating system.

## Downloading Microsoft Windows Updates

1. To set up your Internet connection, click **Start** > **Internet Explorer** and follow the instructions on the screen.
2. Once an Internet connection has been established, click the **Start** button.
3. Select the **All Programs** menu.
4. Click on the **Windows Update** link.

In Windows Vista and Windows 7, the **Windows Update** screen appears. Click **view available updates** and make sure all critical updates are selected. Click the **Install** button and follow the instructions on the screen.

In Windows XP, you will be directed to the **Microsoft Windows Update Web site**. If you see one or more pop-up windows that ask you to install a program from <http://www.microsoft.com>, click **Yes** to install the program. Follow the instructions on the Microsoft Web site to scan for updates and install critical updates and service packs.

It is recommended that you install all of the critical updates and service packs.

5. After the updates have been installed, Windows will prompt you to reboot the machine. Be sure to save any files or documents that you may have open before rebooting. Then select **Yes** to reboot the machine.

## Installing or Upgrading Device Drivers (Windows systems)

When installing optional hardware devices after the operating system installation is complete, you must also install the drivers for each of the devices.

If prompted for the i386 directory, replace the path specification with `C:\i386`, or use the **Browse** button in the dialog box to locate the i386 folder. This action points the operating system to the appropriate drivers.

Obtain the latest support software, including support software for the operating system from <http://www.hp.com/support>. Select your country and language, select **Download drivers and software (and firmware)**, enter the model number of the computer, and press **Enter**.

## Customizing the Monitor Display (Windows systems)

If you wish, you can select or change the monitor model, refresh rates, screen resolution, color settings, font sizes, and power management settings. To do so, right-click on the Windows Desktop, then click **Personalize** in Windows Vista and Windows 7 or **Properties** in Windows XP to change display settings. For more information, refer to the online documentation provided with the graphics controller utility or the documentation that came with your monitor.

## Launching Windows XP from Windows 7

Windows XP Mode for Windows 7 allows you to install and launch Windows XP applications from the Windows 7 taskbar. This feature is available on some computer models only.

To set up from a pre-installed Windows 7 desktop, click **Start > Windows Virtual PC > Virtual Windows XP** and follow the instructions on the screen.

## Accessing Disk Image (ISO) Files

There are disk image files (ISO files) included on your PC that contain the installation software for additional software. These CD image files are located in the folder C:\SWSetup\ISOs. Each .iso file can be burned to CD media to create an installation CD. It is recommended that these disks be created and the software installed in order to get the most from your PC. The software and image file names are:

- Corel WinDVD SD and BD – installation software for WinDVD – used to play DVD movies
- HP Insight Diagnostics OR Vision Diagnostics – software to perform diagnostic activities on your PC

---

## 2 Computer Setup (F10) Utility

### Computer Setup (F10) Utilities

Use Computer Setup (F10) Utility to do the following:

- Change 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 USB flash media devices.
- 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 the system to:
  - always Quick Boot (default);
  - periodically Full Boot (from every 1 to 30 days); or
  - always Full Boot.
- Select Post Messages Enabled or Disabled to change the display status of Power-On Self-Test (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 the company to this computer.
- Enable the power-on password prompt during system restarts (warm boots) as well as during power-on.
- Establish a setup password that controls access to the Computer Setup (F10) Utility and the settings described in this section.
- Secure integrated I/O functionality, including the serial, USB, or parallel ports, audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable removable media boot ability.

- Enable or disable legacy diskette write ability (when supported by hardware).
- Solve system configuration errors detected but not automatically fixed during the Power-On Self-Test (POST).
- Replicate the system setup by saving system configuration information on diskette and restoring it on one or more computers.
- Execute self-tests on a specified ATA hard drive (when supported by drive).
- Enable or disable DriveLock security (when supported by drive).

## Using Computer Setup (F10) Utilities

Computer Setup can be accessed only by turning the computer on or restarting the system. To access the Computer Setup Utilities menu, complete the following steps:

1. Turn on or restart the computer. If you are in Microsoft Windows, click **Start > Shut Down > Restart**.
2. As soon as the computer is turned on, press **F10** when the monitor light turns green to enter Computer Setup. Press **Enter** to bypass the title screen, if necessary.

---

 **NOTE:** If you do not press **F10** at the appropriate time, you must restart the computer and again press **F10** when the monitor light turns green to access the utility.

---

3. Select your language from the list and press **Enter**.
4. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.
5. 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**. To return to the Computer Setup Utilities menu, press **Esc**.
6. 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 or previously saved default settings (some models), select **Apply Defaults and Exit**. This option will restore the original factory system defaults.

---

△ **CAUTION:** Do NOT turn the computer power OFF while the BIOS is saving the Computer Setup (F10) changes because the CMOS could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

---

**Table 2-1 Computer Setup (F10) Utility**

Heading	Table
File	<a href="#">Computer Setup—File on page 6</a>
Storage	<a href="#">Computer Setup—Storage on page 7</a>
Security	<a href="#">Computer Setup—Security on page 9</a>

**Table 2-1 Computer Setup (F10) Utility (continued)**

Power	<a href="#">Computer Setup—Power on page 15</a>
Advanced	<a href="#">Computer Setup—Advanced on page 16</a>

## Computer Setup—File

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-2 Computer Setup—File**

Option	Description
<b>System Information</b>	Lists: <ul style="list-style-type: none"><li>• Product name</li><li>• SKU number (some models)</li><li>• Processor type/speed/stepping</li><li>• Cache size (L1/L2) (dual core processors have this listed twice)</li><li>• Installed memory size/speed, number of channels (single or dual) (if applicable)</li><li>• Integrated MAC address for embedded, enabled NIC (if applicable)</li><li>• System BIOS (includes family name and version)</li><li>• Chassis serial number</li><li>• Asset tracking number</li></ul>
<b>About</b>	Displays copyright notice.
<b>Set Time and Date</b>	Allows you to set system time and date.
<b>Flash System ROM</b>	Allows you to update the system ROM with a BIOS image file located on a USB flash media device or CD-ROM.
<b>Replicated Setup</b>	<b>Save to Removable Media</b> Saves system configuration, including CMOS, to a USB flash media device. <b>Restore from Removable Media</b> Restores system configuration from a USB flash media device.
<b>Default Setup</b>	<b>Save Current Settings as Default</b> Saves the current system configuration settings as the default. <b>Restore Factory Settings as Default</b> Restores the factory system configuration settings as the default.
<b>Apply Defaults and Exit</b>	Applies the currently selected default settings and clears any established passwords.

**Table 2-2 Computer Setup—File (continued)**

<b>Ignore Changes and Exit</b>	Exits Computer Setup without applying or saving any changes.
<b>Save Changes and Exit</b>	Saves changes to system configuration or default settings and exits Computer Setup.

## Computer Setup—Storage

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-3 Computer Setup—Storage**

Option	Description
--------	-------------

**Table 2-3 Computer Setup—Storage (continued)**

---

<b>Device Configuration</b>	<p>Lists all installed BIOS-controlled storage devices.</p> <p>When a device is selected, detailed information and options are displayed. The following options may be presented:</p> <p><b>Hard Disk:</b> Size, model, firmware, serial number, connector color, SMART, emulation type.</p> <ul style="list-style-type: none"><li>• None (prevents BIOS data accesses and disables it as a boot device)</li><li>• Hard Disk (treated as a hard disk)</li></ul> <p><b>CD-ROM:</b> Model, firmware, serial number, connector color.</p> <p><b>Translation Mode</b> (<i>ATA disks only</i>)</p> <p>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 (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.</p> <p><b>CAUTION:</b> 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.</p> <p><b>Default Values</b> (<i>ATA disks only</i>)</p> <p><b>NOTE:</b> This feature appears only when User translation mode is selected.</p> <p>Allows you to specify the parameters (logical cylinders, heads, and sectors per track) used by the BIOS to translate disk I/O requests (from the operating system or an application) into terms the hard drive can accept. Logical cylinders may not exceed 1024. The number of heads may not exceed 256. The number of sectors per track may not exceed 63. These fields are only visible and changeable when the drive translation mode is set to User.</p> <p><b>SATA Defaults</b></p> <p><b>Translation Mode</b> (<i>ATA disks only</i>)</p> <p>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 (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.</p> <p><b>CAUTION:</b> 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.</p>
-----------------------------	--

---

**Table 2-3 Computer Setup—Storage (continued)**

<b>Storage Options</b>	<p><b>Removable Media Boot</b></p> <p>Enables/disables ability to boot the system from removable media.</p> <p><b>Max SATA Speed</b></p> <p>Allows you to choose 1.5 Gbps or 3.0 Gbps as the maximum SATA speed. By default, the speed is limited to 1.5 Gbps for maximum reliability.</p> <p><b>SATA Emulation</b></p> <p>Allows you to choose how the SATA controller and devices are accessed by the operating system. Supported options: IDE and AHCI.</p> <p>IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode.</p> <p>AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.</p>
<b>DPS Self-Test</b>	<p>Allows you to execute self-tests on ATA hard drives capable of performing the Drive Protection System (DPS) self-tests.</p> <p><b>NOTE:</b> This selection will only appear when at least one drive capable of performing the DPS self-tests is attached to the system.</p>
<b>Boot Order</b>	<p>Allows you to:</p> <ul style="list-style-type: none"><li>Specify the order in which attached devices (such as a USB flash media device, hard drive, optical drive, or network interface card) are checked for a bootable operating system image. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source.</li><li>Specify the order of attached hard drives. The first hard drive in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached).</li></ul> <p><b>NOTE:</b> MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p> <p><b>Shortcut to Temporarily Override Boot Order</b></p> <p>To boot <b>one time</b> from a device other than the default device specified in Boot Order, restart the computer and press <b>F9</b> when the monitor light turns green. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press <b>Enter</b>. The computer then boots from the selected non-default device for this one time.</p>

## Computer Setup—Security

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-4 Computer Setup—Security**

Option	Description
--------	-------------

**Table 2-4 Computer Setup—Security (continued)**

---

<b>Setup Password</b>	<p>Allows you to set and enable a setup (administrator) password.</p> <p><b>NOTE:</b> 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.</p> <p>See the <i>Desktop Management Guide</i> for more information.</p>
<b>Power-On Password</b>	<p>Allows you to set and enable a power-on password. The power-on password prompt appears after a power cycle. If the user does not enter the correct power-on password, the unit will not boot.</p> <p><b>NOTE:</b> This password does not appear on warm boots, such as <b>Ctrl+Alt+Delete</b> or <b>Restart from Windows</b>, unless enabled in <b>Password Options</b> (see below).</p> <p>See the <i>Desktop Management Guide</i> for more information.</p>
<b>Password Options</b>  (This selection appears only if a power-on password or setup password is set.)	<p>Allows you to enable/disable:</p> <ul style="list-style-type: none"><li>• Lock Legacy Resources (appears if a setup password is set)</li><li>• Network Server Mode (appears if a power-on password is set)</li><li>• Password Prompt on Warm Boot (<b>Ctrl+Alt+Delete</b>) (appears if a power-on password is set)</li><li>• Setup Browse Mode (appears if a setup password is set) (allows viewing, but not changing, the F10 Setup Options without entering setup password)</li><li>• Stringent Password (appears if a power-on password is set), which when enabled bypasses the onboard password jumper to disable the power-on password.</li><li>• Password prompt on F9, F11, &amp; F12 (allows access to menus without entering setup password)</li></ul> <p>See the <i>Desktop Management Guide</i> for more information.</p>
<b>Smart Cover</b> (some models)	<p>Allows you to:</p> <ul style="list-style-type: none"><li>• Lock/unlock the Cover Lock.</li><li>• Set the Cover Removal Sensor to Disable/Notify User/Setup Password.</li></ul> <p><b>NOTE:</b> <i>Notify User</i> alerts the user that the sensor has detected that the cover has been removed. <i>Setup Password</i> requires that the setup password be entered to boot the computer if the sensor detects that the cover has been removed.</p> <p>This feature is supported on some models only. See the <i>Desktop Management Guide</i> for more information.</p>

---

**Table 2-4 Computer Setup—Security (continued)**

---

<b>Device Security</b>	Allows you to set Device Available/Device Hidden for: <ul style="list-style-type: none"><li>• Serial ports</li><li>• Parallel port</li><li>• System audio</li><li>• Network controllers (some models)</li><li>• Embedded security device (some models)</li><li>• SATA0</li><li>• SATA1</li></ul>
<b>USB Security</b>	Allows you to set Device Available/Device Hidden for: <ul style="list-style-type: none"><li>• Front USB Ports<ul style="list-style-type: none"><li>◦ USB Port 3</li><li>◦ USB Port 4</li><li>◦ USB Port 5</li><li>◦ USB Port 6</li></ul></li><li>• Rear USB Ports<ul style="list-style-type: none"><li>◦ USB Port 9</li><li>◦ USB Port 10</li><li>◦ USB Port 11</li><li>◦ USB Port 12</li></ul></li><li>• Accessory USB Ports<ul style="list-style-type: none"><li>◦ USB Port 1</li><li>◦ USB Port 2</li></ul></li></ul>
<b>Slot Security</b>	Allows you to disable any PCI or PCI Express slot
<b>Network Service Boot</b>	Enables/disables the computer's ability to boot from an operating system installed on a network server. (Feature available on NIC models only; the network controller must be either a PCI expansion card or embedded on the system board.)
<b>System IDs</b>	Allows you to set: <ul style="list-style-type: none"><li>• Asset tag (18-byte identifier), a property identification number assigned by the company to the computer.</li><li>• Ownership tag (80-byte identifier) displayed during POST.</li><li>• 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.)</li><li>• Keyboard locale setting (for example, English or German) for System ID entry.</li></ul>

---

**Table 2-4 Computer Setup—Security (continued)**

---

**DriveLock Security** Allows you to assign or modify a master or user password for hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.

**NOTE:** This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.

See the *Desktop Management Guide* for more information.

---

**Table 2-4 Computer Setup—Security (continued)**

<b>System Security</b> (some models: these options are hardware dependent)	<p>Data Execution Prevention (some models) (enable/disable) - Helps prevent operating system security breaches.</p> <p>PAVP (Models with Blu-ray drives) (disabled/min/max) - PAVP enables the Protected Audio Video Path in the Chipset. This may allow viewing of some protected high definition content that would otherwise be prohibited from playback. Selecting Max will assign 96 Megabytes of system memory exclusively to PAVP.</p> <p>Virtualization Technology (some models) (enable/disable) - Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on.</p> <p>Virtualization Technology Directed I/O (some models) (enable/disable) - Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on.</p> <p>Trusted Execution Technology (some models) (enable/disable) - Controls the underlying processor and chipset features needed to support a virtual appliance. Changing this setting requires turning the computer off and then back on. To enable this feature you must enable the following features:</p> <ul style="list-style-type: none"><li>• Embedded Security Device Support</li><li>• Virtualization Technology</li><li>• Virtualization Technology Directed I/O</li></ul> <p>Embedded Security Device Support (some models) (enable/disable) - Permits activation and deactivation of the Embedded Security Device. Changing this setting requires turning the computer off and then back on.</p> <p><b>NOTE:</b> To configure the Embedded Security Device, a Setup password must be set.</p> <ul style="list-style-type: none"><li>• Reset to Factory Settings (some models) (Do not reset/Reset) - Resetting to factory defaults will erase all security keys. Changing this setting requires turning the computer off and then back on.</li></ul> <p><b>CAUTION:</b> The embedded security device is a critical component of many security schemes. Erasing the security keys will prevent access to data protected by the Embedded Security Device. Choosing Reset to Factory Settings may result in significant data loss.</p> <p>OS management of Embedded Security Device (some models) (enable/disable) - This option allows the user to limit operating system control of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. This option allows the user to limit OS control of the Embedded Security Device.</p> <ul style="list-style-type: none"><li>• Reset of Embedded Security Device through OS (some models) (enable/disable) - This option allows the user to limit the operating system ability to request a Reset to Factory Settings of the Embedded Security Device. Changing this setting requires turning the computer off and then back on.</li></ul> <p><b>NOTE:</b> To enable this option, a Setup password must be set.</p>
---	--

**Table 2-4 Computer Setup—Security (continued)**

---

<b>Master Boot Record Security</b>	Protects the master boot record from viruses or other corruption. Saves a copy of the current master boot record.
<b>Setup Security Level</b>	<p>Provides a method to allow end-users limited access to change specified setup options, without having to know the Setup Password.</p> <p>This feature allows the administrator the flexibility to protect changes to essential setup options, while allowing the user to view system settings and configure nonessential options. The administrator specifies access rights to individual setup options on a case-by-case basis via the Setup Security Level menu. By default, all setup options are assigned Setup Password, indicating the user must enter the correct Setup Password during POST to make changes to any of the options. The administrator may set individual items to None, indicating the user can make changes to the specified options when setup has been accessed with invalid passwords. The choice, None, is replaced by Power-On Password if a Power-On Password is enabled.</p> <p><b>NOTE:</b> Setup Browse Mode must be set to Enable in order for the user to enter Setup without knowing the setup password.</p>

---

## Computer Setup—Power

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-5 Computer Setup—Power**

Option	Description
<b>OS Power Management</b>	<ul style="list-style-type: none"><li>• Runtime Power Management— Enable/Disable. Allows certain operating systems to reduce processor voltage and frequency when the current software load does not require the full capabilities of the processor.</li><li>• Idle Power Savings—Extended/Normal. Allows certain operating systems to decrease the processors power consumption when the processor is idle.</li><li>• ACPI S3 Hard Disk Reset—Enabling this causes the BIOS to ensure hard disks are ready to accept commands after resuming from S3 before returning control to the operating system.</li><li>• ACPI S3 PS2 Mouse Wakeup—Enables or disables waking from S3 due to any PS2 mouse activity or a button click only.</li><li>• USB Wake on Device Insertion (some models)—Allows system to wake from Standby on USB device insertion.</li><li>• Unique Sleep State Blink Rates—Enable/Disable. This feature is designed to provide a visual indication of what sleep state the system is in. Each sleep state has a unique blink pattern.<ul style="list-style-type: none"><li>◦ S0 = Solid green LED.</li><li>◦ S3 = 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 3 blinks and a pause.</li><li>◦ S4 = 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 4 blinks and a pause.</li><li>◦ S5 = LED is off.</li></ul></li></ul> <p><b>NOTE:</b> If this feature is disabled, S4 and S5 both have the LED off. S1 (no longer supported) and S3 use 1 blink per second.</p>
<b>Hardware Power Management</b>	<p>S5 Maximum Power Savings—Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 1 Watt power usage.</p> <p>SATA Power Management enables or disables SATA bus and/or device power management.</p>
<b>Thermal</b>	<p>Fan idle mode—This bar graph controls the minimum permitted fan speed.</p> <p><b>NOTE:</b> This setting only changes the minimum fan speed. The fans are still automatically controlled.</p>

## Computer Setup—Advanced

 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

**Table 2-6 Computer Setup—Advanced (for advanced users)**

Option	Heading
<b>Power-On Options</b>	Allows you to set: <ul style="list-style-type: none"><li>• POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days).<ul style="list-style-type: none"><li>◦ QuickBoot = Do not clear memory or perform a memory test.</li><li>◦ FullBoot = Memory test (count) on cold boot. Clears memory on all boots.</li></ul></li></ul>

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

- Clear Memory = No memory count on cold boot. Clears memory on all boots.
- FullBoot Every x Days = Memory count on 1st cold boot on or after the xth day. No more memory counts until 1st cold boot on or after x days. Clears memory on all boots.
- POST messages (enable/disable).
- F9 prompt (hidden/displayed). Enabling this feature will display the text **F9 = Boot Menu** during POST. Disabling this feature prevents the text from being displayed. However, pressing **F9** will still access the Shortcut Boot [Order] Menu screen. See **Storage > Boot Order** for more information.
- F10 prompt (hidden/displayed). Enabling this feature will display the text **F10 = Setup** during POST. Disabling this feature prevents the text from being displayed. However, pressing **F10** will still access the Setup screen.
- F11 prompt (hidden/displayed). Setting this feature to displayed will display the text **F11 = Recovery** during POST. Hiding the feature prevents the text from being displayed. However, pressing **F11** will still attempt to boot to the HP Backup and Recovery partition. See Factory Recovery Boot Support for more information.
- F12 prompt (hidden/displayed). Enabling this feature will display the text **F12 = Network** during POST. Disabling this feature prevents the text from being displayed. However, pressing **F12** will still force the system to attempt booting from the network.
- Factory Recovery Boot Support (enable/disable). Enabling this feature will cause an additional prompt, **F11 = Recovery**, to be displayed during POST on systems with HP Backup and Recovery software installed and configured with a recovery partition on the boot hard drive. Pressing **F11** causes the system to boot to the recovery partition and launch HP Backup and Recovery. The **F11 = Recovery** prompt can be hidden with the F11 prompt (hidden/displayed) option (see above).
- Option ROM Prompt (enable/disable). Enabling this feature will cause the system to display a message before loading option ROMs. (This feature is supported on some models only.)
- Remote Wakeup Boot Source (remote server/local hard drive).
- After Power Loss (off/on/previous state): Setting this option to:
  - Off—causes the computer to remain powered off when power is restored.
  - On—causes the computer to power on automatically as soon as power is restored.
  - Previous state—causes the computer to power on automatically as soon as power is restored, if it was on when power was lost.

**NOTE:** If you turn off power to the computer using the switch on a power strip, you will not be able to use the suspend/sleep feature or the Remote Management features.

- POST Delay (None, 5, 10 15, or 20 seconds). Enabling this feature will add a user-specified delay to the POST process. This delay is sometimes needed for hard disks on some PCI cards that spin up very 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 (F10) Setup.
- Bypass F1 Prompt on Configuration Changes (Enable/Disable). Allows you to set the computer not to confirm when changes were made.

---

<b>Execute Memory Test</b> (some models)	Restarts the computer and executes the POST memory test/logging.
---	--

---

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

<b>BIOS Power-On</b>	Allows you to set the computer to turn on automatically at a time you specify.
<b>Onboard Devices</b>	Allows you to set resources for or disable onboard system devices (diskette controller, serial port, or parallel port).
<b>PCI Devices</b>	<ul style="list-style-type: none"><li>• Lists currently installed PCI devices and their IRQ settings.</li><li>• Allows you to reconfigure IRQ settings for these devices or to disable them entirely. These settings have no effect under an ACPI-based operating system.</li></ul>
<b>PCI VGA Configuration</b>	<p>Displayed only if there are multiple PCI video adapters in the system. Allows you to specify which VGA controller will be the “boot” or primary VGA controller.</p> <p><b>NOTE:</b> In order to see this entry, you must enable Integrated Video (<b>Advanced &gt; Device Options</b>) and Save Changes and Exit.</p>
<b>Bus Options</b>	<p>On some models, allows you to enable or disable:</p> <ul style="list-style-type: none"><li>• PCI SERR# Generation.</li><li>• PCI VGA Palette Snooping, which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed.</li></ul>
<b>Device Options</b>	<p>Allows you to set:</p> <ul style="list-style-type: none"><li>• Printer mode (Bi-Directional, EPP + ECP, Output Only).</li><li>• Num Lock State at Power-On (off/on).</li><li>• S5 Wake on LAN (enable/disable).<ul style="list-style-type: none"><li>◦ To disable Wake on LAN during the off state (S5), use the arrow (left and right) keys to select the <b>Advanced &gt; Device Options</b> menu and set the <b>S5 Wake on LAN</b> feature to <b>Disable</b>. This obtains the lowest power consumption available on the computer during S5. It does not affect the ability of the computer to Wake on LAN from suspend or hibernation, but will prevent it from waking from S5 via the network. It does not affect operation of the network connection while the computer is on.</li><li>◦ If a network connection is not required, completely disable the network controller (NIC) by using the arrow (left and right) keys to select the <b>Security &gt; Device Security</b> menu. Set the <b>Network Controller</b> option to <b>Device Hidden</b>. This prevents the network controller from being used by the operating system and reduces the power used by the computer in S5.</li></ul></li><li>• Multi-Processor (enable/disable). This option may be used to disable multi-processor support under the OS.</li><li>• Internal Speaker (some models) (does not affect external speakers).</li><li>• NIC Option ROM Download (enable/disable). The BIOS contains an embedded NIC option ROM to allow the unit to boot through the network to a PXE server. This is typically used to download a corporate image to a hard drive. The NIC option ROM takes up memory space below 1MB commonly referred to as DOS Compatibility Hole (DCH) space. This space is limited. This F10 option will allow users to disable the downloading of this embedded NIC option ROM thus giving more DCH space for additional PCI cards which may need option ROM space. The default will be to have the NIC option-ROM-enabled.</li></ul>

**Table 2-6 Computer Setup—Advanced (for advanced users) (continued)**

<b>Management Devices</b>	<p>The Management Devices menu will only be displayed in the Advanced menu when the BIOS detects multiple management options.</p> <p>This option is for installed NIC cards that support ASF or DASH. Use the Management Devices menu to select if the BIOS management operations will be through the embedded solution or one of the installed NIC cards.</p>
<b>Management Operations</b>	<p>Allows you to set:</p> <ul style="list-style-type: none"><li>• MEBx Setup Prompt (enable/disable). Enabling this feature displays the <b>CTRL+P</b> prompt during POST. Disabling this feature prevents the prompt from being displayed. However, pressing <b>Ctrl+P</b> still accesses the utility used to configure manageability settings.</li></ul> <p>The <b>CTRL+P</b> function activates the MEBx Setup menu. If the Setup Password is configured, the user will be prompted to correctly enter it before being allowed to enter the MEBx Setup. If the password is entered incorrectly three times, the MEBx Setup will not be activated.</p> <ul style="list-style-type: none"><li>• Intel Remote PC Assist Prompt (Hidden/Displayed). Displaying this feature displays the <b>CTRL+ALT+F1</b> prompt during POST. Hiding this feature prevents the prompt from being displayed. However, pressing <b>Ctrl+Alt+F1</b> still accesses the utility used to attempt to connect to remote help server or services.</li><li>• Intel PC Assist Timeout (5, 10, 15, 20, 30, 40, 50, 60, 120, 180, 240 seconds). Allows the user/administrator is set a time limit for Remote Help to establish contact with a remote server when initiated.</li><li>• SOL Terminal Emulation Mode. Selects between VT100 and ANSI SOL terminal emulation. SOL terminal emulation mode is only activated during remote AMT redirection operations. The emulation options allow administrators to select which mode works best with their console.</li><li>• SOL Local Keyboard (enable/disable). Disable or enable client keyboard during SOL sessions. Some remote remediation may involve having the local client boot a remote image provided by an administrator. This option determines if the BIOS will keep the local keyboard enabled or disabled for possible local client interaction. If the local keyboard is disabled, all keyboard input is only accepted from the remote source.</li><li>• Unprovision AMT on next boot. Allows reset of AMT settings.</li></ul>

## Recovering the Configuration Settings

This method of recovery requires that you first perform the **Save to Removable Media** command with the Computer Setup (F10) Utility before **Restore** is needed. (See [Save to Removable Media on page 6](#) in the Computer Setup—File table.)

 **NOTE:** It is recommended that you save any modified computer configuration settings to a diskette, a USB flash media device, or a diskette-like device (a storage device set to emulate a diskette drive) and save the diskette or device for possible future use.

To restore the configuration, insert the diskette, USB flash media device, or other storage media emulating a diskette with the saved configuration and perform the **Restore from Removable Media** command with the Computer Setup (F10) Utility. (See [Restore from Removable Media on page 6](#) in the Computer Setup—File table.)

---

## 3 Serial ATA (SATA) Drive Guidelines and Features

 **NOTE:** HP only supports the use of SATA hard drives on these models of computer. No Parallel ATA (PATA) drives are supported.

---

### SATA Hard Drives

Serial ATA Hard Drive Characteristics	
Number of pins/conductors in data cable	7/7
Number of pins in power cable	15
Maximum data cable length	39.37 in (100 cm)
Data interface voltage differential	400-700 mV
Drive voltages	3.3 V, 5 V, 12 V
Jumpers for configuring drive	N/A
Data transfer rate	3.0 Gb/s

### SATA Hard Drive Cables

#### SATA Data Cable

Always use an HP approved SATA 3.0 Gb/s cable as it is fully backwards compatible with the SATA 1.5 Gb/s drives.

Current HP desktop products ship with SATA 3.0 Gb/s hard drives.

SATA data cables are susceptible to damage if overflexed. Never crease a SATA data cable and never bend it tighter than a 30 mm (1.18 in) radius.

The SATA data cable is a thin, 7-pin cable designed to transmit data for only a single drive.

## SMART ATA Drives

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for the HP Personal Computers 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.

## Hard Drive Capacities

The combination of the file system and the operating system used in the computer determines the maximum usable size of a drive partition. A drive partition is the largest segment of a drive that may be properly accessed by the operating system. A single hard drive may therefore be subdivided into a number of unique drive partitions in order to make use of all of its space.

Because of the differences in the way that drive sizes are calculated, the size reported by the operating system may differ from that marked on the hard drive or listed in the computer specification. Drive size calculations by drive manufacturers are bytes to the base 10 while calculations by Microsoft are bytes to the base 2.

Drive/Partition Capacity Limits					
				Maximum Size	
File System	Controller Type	Operating System	Partition	Drive	
FAT 32	ATA	Windows XP/Windows Vista/Windows 7	32 GB	2 TB	
NTFS	ATA	Windows XP/Windows Vista/Windows 7	2 TB	2 TB	

---

## 4 Identifying the Chassis, Routine Care, and Disassembly Preparation

This chapter provides general service information for the computer. Adherence to the procedures and precautions described in this chapter is essential for proper service.

- △ **CAUTION:** When the computer is plugged into an AC power source, voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.
- 

### Chassis Designations

#### Small Form Factor (SFF)

Figure 4-1 Small Form Factor chassis



# 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) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may 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.

Event	Relative Humidity		
	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 DIPs from plastic tube	400 V	700 V	2,000 V
Removing DIPs from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs from Styrofoam	3,500 V	5,000 V	14,500 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

These are then multi-packaged inside plastic tubes, trays, or Styrofoam.

 **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.

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- 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.
- Always be properly grounded when touching a sensitive component or assembly.
- 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  $\pm$  10% resistance in the ground cords. To provide proper ground, a strap must be worn snug 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/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  $\pm$  10% resistance between the operator and ground.

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, use the following precautions:

- 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

## Operating Guidelines

To prevent overheating and to help prolong the life of the computer:

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.

- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.
- Keep liquids away from the computer and keyboard.
- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including sleep states.

## Routine Care

### General Cleaning Safety Precautions

1. Never use solvents or flammable solutions to clean the computer.
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 computer when cleaning with liquids or damp cloths.
4. Always unplug the computer 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.

### Cleaning the Computer Case

Follow all safety precautions in [General Cleaning Safety Precautions on page 26](#) before cleaning the computer.

To clean the computer case, follow the procedures described below:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing 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 computer. Lint and other foreign matter can block the vents and limit the airflow.

## Cleaning the Keyboard

Follow all safety precautions in [General Cleaning Safety Precautions on page 26](#) before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in [Cleaning the Computer Case on page 26](#).

When cleaning debris from under the keys, review all rules in [General Cleaning Safety Precautions on page 26](#) before following these procedures:

---

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

---

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.
- Canned, pressurized air may 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 may not function properly.

---

- Cleaning under a key may 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

- 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 may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in [Cleaning the Computer Case on page 26](#).

## Cleaning the Mouse

Before cleaning the mouse, ensure that the power to the computer is turned off.

- 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.
- To clean the mouse body, follow the procedures in [Cleaning the Computer Case on page 26](#).

## Service Considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the computer.

## Power Supply Fan

The power supply fan is a variable-speed fan based on the temperature in the power supply.

- △ **CAUTION:** The cooling fan is always on when the computer is in the “On” mode. The cooling fan is off when the computer is in “Standby,” “Suspend,” or “Off” modes.

You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

## Tools and Software Requirements

To service the computer, you need the following:

- Torx T-15 screwdriver (HP screwdriver with bits, PN 161946-001)
- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)
- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)
- Phillips #2 screwdriver
- Diagnostics software
- HP tamper-resistant T-15 wrench (Smart Cover FailSafe Key, PN 166527-001) or HP tamper-resistant bits (Smart Cover FailSafe Key, PN 166527-002)

## Screws

The screws used in the computer are not interchangeable. They may have standard or metric threads and may 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 part that was removed, then returned to their proper locations.

- △ **CAUTION:** Metric screws have a black finish. U.S. screws have a silver finish and are used on hard drives only.

**CAUTION:** As each subassembly is removed from the computer, it should be placed away from the work area to prevent damage.

## Cables and Connectors

Most cables used throughout the unit are flat, flexible cables. These 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 whenever possible. In all cases, avoid bending or twisting the cables, and ensure 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 computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

## 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 CPU.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.
- Before handling a drive, ensure 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 23](#)
- 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 computer provides power to the real-time clock and has a minimum lifetime of about three years.

See the appropriate removal and replacement chapter for the chassis you are working on in this guide for instructions on the replacement procedures.

---

**⚠ WARNING!** This computer 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). Do not attempt to recharge the battery.

**📄 NOTE:** Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, their authorized partners, or their agents.

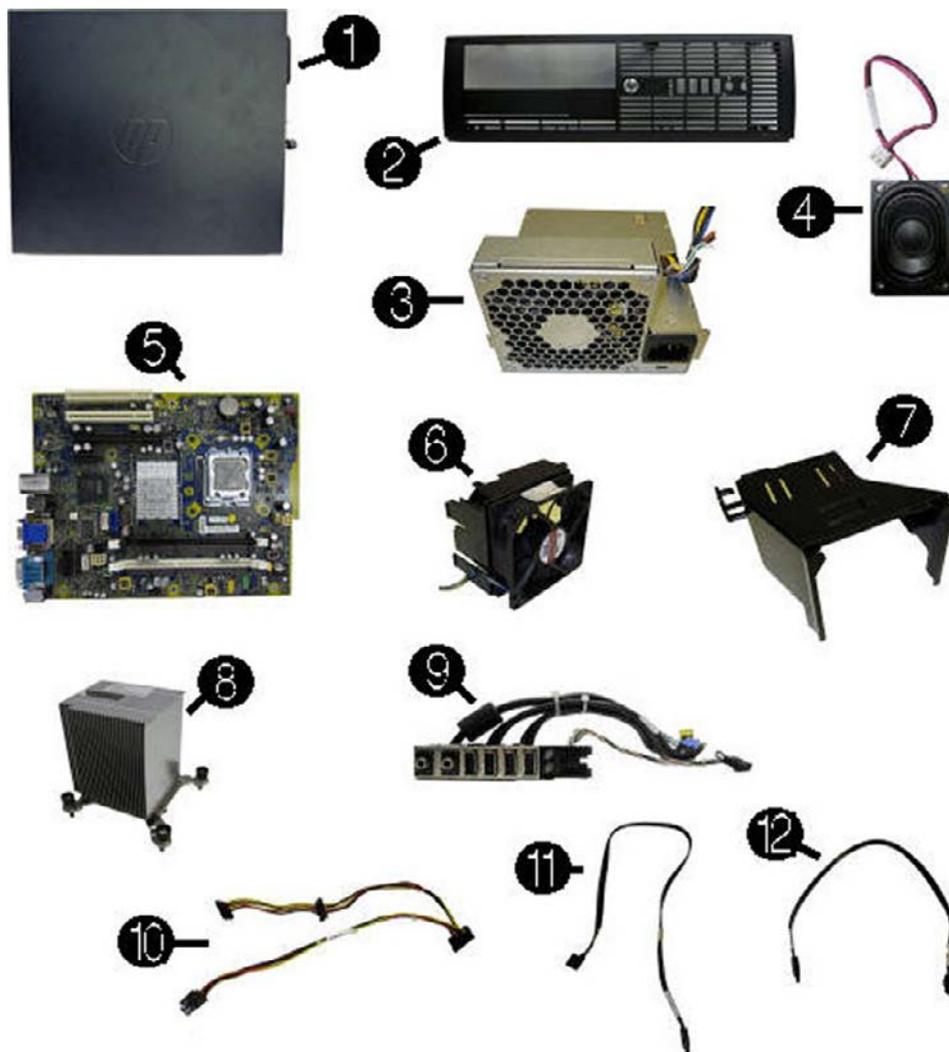
---

# 5 Illustrated parts catalog

This chapter provides parts information for the chassis.

## Spare parts

### Computer major components



<b>Item</b>	<b>Description</b>	<b>Spare part number</b>
(1)	<b>Access panel</b>	636924-001
(2)	<b>Front bezel</b>	636920-001
(3)	<b>Power supply</b>	
	240W, 85% efficiency	613663-001
	240W, High Voltage protection	613664-001
	240W	613763-001
(4)	<b>Speaker, internal</b>	636925-001
(5)	<b>System board</b> (includes replacement thermal material)	
	Standard system board	608748-001
	Netclone	640126-001
(6)	<b>Chassis fan</b>	636922-001
(7)	<b>Baffle</b>	636921-001
(8)	<b>Heat sink</b> (includes replacement thermal material)	636919-001
(9)	<b>Front I/O and power switch assembly</b>	636926-001
	<b>Cables</b>	
(10)	<b>SATA power cable</b>	636923-001
(11)	<b>SATA cable, 1 straight end, 1 angled end</b> (25 inch; 365 mm)	638814-001
(12)	<b>SATA cable, 2 straight ends</b> 19-inch; 483 mm)	638813-001
	<b>Memory modules</b> (PC3-10600, 1333-MHz)	
	4-MB	585157-001
	2-GB	635803-001
	1-GB	635802-001
	<b>Hard drives</b>	
	1-TB	636930-001
	500-GB	636929-001
	320-GB	636928-001
	250-GB	636927-001
	<b>Optical drives</b>	
	6X BD-Writer SuperMulti drive with LightScribe	617030-001
	16X DVD±RW SuperMulti drive with LightScribe	615646-001
	16X DVD-ROM drive	581058-001
	<b>Expansion cards</b>	

Item	Description	Spare part number
	ATI HD6350, 512-MB PCIe x16 graphics card	637995-001
	nVidia Quadro NVS300 PCIe x1 graphics card	632827-001
	nVidia Quadro NVS300 PCIe x16 graphics card	632486-001
<b>Keyboard</b>		
<b>NOTE:</b> For a list of supported countries and associated dash numbers, see <a href="#">Sequential part number listing on page 33</a> .		
	HP PS/2	537745-xxx
	HP USB	537746-xxx
	USB SmartCard	631411-xxx
	USB Mini	535873-xxx
	Washable	577495-xxx
<b>Processors (include replacement thermal material)</b>		
<b>Intel Celeron Processors</b>		
	• E3500, 1-MB cache, 2.70 GHz	633219-001
	• E3400, 1-MB cache, 2.60 GHz	602071-001
	• E3300, 1-MB cache, 2.50 GHz	585886-001
<b>Intel Core 2 Quad Processors</b>		
	• Q9550s, 2.83 GHz, 12-MB L2 cache	593228-001
	• Q9505s, 2.83 GHz, 6-MB L2 cache (95W)	593229-001
<b>Intel Core 2 Duo Processors</b>		
	• E8600, 6-MB cache, 3.33 GHz	497732-001
	• E8500, 6-MB cache, 3.16 GHz	466170-001
	• E8400, 6-MB cache, 3.00 GHz	509554-001
	• E7600, 3-MB cache, 3.06 GHz	573954-001
	• E6800, 2-MB cache, 3.33 GHz	631758-001
	• E6700, 2-MB cache, 3.20 GHz, 1066-MHz FSB	617840-001
	• E5800, 2-MB cache, 3.20 GHz, 800-MHz FSB	646376-001
<b>Mouse</b>		
	PS2, optical, black	537748-001
	USB, optical, black	537749-001
	USB, laser, black (not illustrated)	570580-001
	Washable	619580-001
<b>Bezel blank</b>		

Item	Description	Spare part number
	5.25-inch	570838-001
	3.5-inch	583653-001
<b>Ports</b>		
	Printer	638817-001
	Serial	638815-001
	<b>Card reader, 22-in-1</b>	636166-001
	<b>USB Speakers, external</b>	609249-001
	<b>Hood sensor</b>	638816-001
	<b>Rubber Feet Kit</b>	583654-001
	<b>Chassis stand</b>	587451-001

## Sequential part number listing

Spare part number	Description
466170-001	Intel Core2 Duo E8500 processor, 6-MB cache, 3.16 GHz
497732-001	Intel Core2 Duo E8600 processor , 6-MB cache, 3.33 GHz
509554-001	Intel Core2 Duo E8400 processor, 6-MB cache, 3.00 GHz
535873-001	Keyboard, USB, mini, the United States
535873-121	Keyboard, USB, mini, French Canada
537745-001	Keyboard, PS/2, the United States
537745-031	Keyboard, PS/2, the United Kingdom
537745-041	Keyboard, PS/2, Germany
537745-051	Keyboard, PS/2, France
537745-061	Keyboard, PS/2, Italy
537745-071	Keyboard, PS/2, Spain
537745-081	Keyboard, PS/2, Denmark
537745-091	Keyboard, PS/2, Norway
537745-101	Keyboard, PS/2, Sweden
537745-111	Keyboard, PS/2, Switzerland
537745-121	Keyboard, PS/2, French Canada
537745-131	Keyboard, PS/2, Portugal
537745-141	Keyboard, PS/2, Turkey

<b>Spare part number</b>	<b>Description</b>
537745-151	Keyboard, PS/2, Greece
537745-161	Keyboard, PS/2, Latin America
537745-171	Keyboard, PS/2, Saudi Arabia
537745-181	Keyboard, PS/2, Belgium
537745-201	Keyboard, PS/2, Brazil
537745-211	Keyboard, PS/2, Hungary
537745-221	Keyboard, PS/2, the Czech Republic
537745-231	Keyboard, PS/2, Slovakia
537745-241	Keyboard, PS/2, Poland
537745-251	Keyboard, PS/2, Russia
537745-261	Keyboard, PS/2, Bulgaria
537745-281	Keyboard, PS/2, Belarus
537745-331	Keyboard, PS/2, the Netherlands
537745-351	Keyboard, PS/2, Finland
537745-541	Keyboard, PS/2, Turkey F
537745-AA1	Keyboard, PS/2, Simplified Chinese
537745-AB1	Keyboard, PS/2, Taiwan
537745-AC1	Keyboard, PS/2, Hong Kong
537745-B31	Keyboard, PS/2, International English
537745-B41	Keyboard, PS/2, BHCSY
537745-BB1	Keyboard, PS/2, Israel
537745-BL1	Keyboard, PS/2, BHCSY
537745-CA1	Keyboard, PS/2, Estonia
537745-DD1	Keyboard, PS/2, Iceland
537745-DE1	Keyboard, PS/2, Arab
537745-DF1	Keyboard, PS/2, Kazakstan
537745-KD1	Keyboard, PS/2, South Korea
537745-L31	Keyboard, PS/2, International
537746-001	Keyboard, USB, the United States
537746-031	Keyboard, USB, the United Kingdom
537746-041	Keyboard, USB, Germany
537746-051	Keyboard, USB, France

<b>Spare part number</b>	<b>Description</b>
537746-061	Keyboard, USB, Italy
537746-071	Keyboard, USB, Spain
537746-081	Keyboard, USB, Denmark
537746-091	Keyboard, USB, Norway
537746-101	Keyboard, USB, Sweden
537746-111	Keyboard, USB, Switzerland
537746-121	Keyboard, USB, French Canada
537746-131	Keyboard, USB, Portugal
537746-141	Keyboard, USB, Turkey
537746-151	Keyboard, USB, Greece
537746-161	Keyboard, USB, Latin America
537746-171	Keyboard, USB, Saudi Arabia
537746-181	Keyboard, USB, Belgium
537746-201	Keyboard, USB, Brazil
537746-211	Keyboard, USB, Hungary
537746-221	Keyboard, USB, the Czech Republic
537746-231	Keyboard, USB, Slovakia
537746-241	Keyboard, USB, Poland
537746-251	Keyboard, USB, Russia
537746-281	Keyboard, USB, Belarus
537746-331	Keyboard, USB, the Netherlands
537746-351	Keyboard, USB, Finland
537746-541	Keyboard, USB, Turkey F
537746-AA1	Keyboard, USB, Simplified Chinese
537746-AB1	Keyboard, USB, Taiwan
537746-AC2	Keyboard, USB, Hong Kong
537746-B31	Keyboard, USB, International English
537746-BB1	Keyboard, USB, Israel
537746-BL1	Keyboard, USB, BHCSY
537746-CA1	Keyboard, USB, Estonia
537746-DD1	Keyboard, USB, Iceland
537746-DE1	Keyboard, USB, Arab

<b>Spare part number</b>	<b>Description</b>
537745-DF1	Keyboard, USB, Kazakstan
537746-KD1	Keyboard, USB, South Korea
537746-L31	Keyboard, USB, International
537748-001	Mouse, PS2, optical, black
537749-001	Mouse, USB, optical, black
570580-001	Mouse, USB
570838-001	Bezel blank, 5.25-inch
573954-001	Intel Core2 Duo E7600 processor, 3-MB cache, 3.06 GHz
574795-121	Keyboard, washable, French Canada
577495-001	Keyboard, washable, the United States
581058-001	16X DVD-ROM drive
617030-001	6X BD-Writer SuperMulti drive with LightScribe
583006-001	Intel Core2 Duo E7500 processor, 3-MB cache, 2.93 GHz
583653-001	Bezel blank, 3.5-inch
583654-001	Rubber Feet Kit
585157-001	Memory module, 4-GB, PC3 10600, 1333-MHz
585886-001	Intel Celeron E3300 processor, 1-MB cache, 2.50 GHz
587451-001	Chassis stand
593228-001	Intel Core 2 Quad Q9550s processor, 2.83 GHz, 12-MB L2 cache
593229-001	Intel Core 2 Quad Q9505s processor, 2.83 GHz, 6-MB L2 cache (95W)
602071-001	Intel Celeron E3400 processor, 1-MB cache, 2.60 GHz
608748-001	System board (standard) (includes replacement thermal material)
609249-001	USB speakers, external
613663-001	Power supply, 240W, 85% efficiency
613664-001	Power supply, 240W, High Voltage protection
613763-001	Power supply, 240 W
615646-001	16X DVD±RW SuperMulti drive with LightScribe
617840-001	Intel Core2 Duo E6700 processor, 2-MB cache, 3.20 GHz, 1066-MHz FSB
619580-001	Mouse, washable
631411-004	Keyboard, SmartCard, the United States
631411-034	Keyboard, SmartCard, the United Kingdom
631411-044	Keyboard, USB, SmartCard, Germany

<b>Spare part number</b>	<b>Description</b>
631411-054	Keyboard, USB, SmartCard, France
631411-064	Keyboard, USB, SmartCard, Italy
631411-074	Keyboard, USB, SmartCard, Spain
631411-084	Keyboard, USB, SmartCard, Denmark
631411-094	Keyboard, USB, SmartCard, Norway
631411-104	Keyboard, USB, SmartCard, Sweden
631411-114	Keyboard, USB, SmartCard, Switzerland
631411-124	Keyboard, USB, SmartCard, French Canada
631411-134	Keyboard, USB, SmartCard, Portugal
631411-144	Keyboard, USB, SmartCard, Turkey
631411-154	Keyboard, USB, SmartCard, Greece
631411-164	Keyboard, USB, SmartCard, Latin America
631411-174	Keyboard, USB, SmartCard, Saudi Arabia
631411-184	Keyboard, USB, SmartCard, Belgium
631411-204	Keyboard, USB, SmartCard, Brazil
631411-214	Keyboard, USB, SmartCard, Hungary
631411-224	Keyboard, USB, SmartCard, the Czech Republic
631411-234	Keyboard, USB, SmartCard, Slovakia
631411-244	Keyboard, USB, SmartCard, Poland
631411-254	Keyboard, USB, SmartCard, Russia
631411-264	Keyboard, USB, SmartCard, Bulgaria
631411-274	Keyboard, USB, SmartCard, Romania
631411-284	Keyboard, USB, SmartCard, Thailand
631411-334	Keyboard, USB, SmartCard, the Netherlands
631411-554	Keyboard, USB, SmartCard, Turkey F
631411-AA4	Keyboard, USB, SmartCard, Simplified Chinese
631411-AB4	Keyboard, USB, SmartCard, Taiwan
631411-B44	Keyboard, USB, SmartCard, International English
631411-BB4	Keyboard, USB, SmartCard, Israel
631411-BL4	Keyboard, USB, SmartCard, BHCSY
631411-CA4	Keyboard, USB, SmartCard, Estonia
631411-DD4	Keyboard, USB, SmartCard, Iceland

<b>Spare part number</b>	<b>Description</b>
631411-DE4	Keyboard, USB, SmartCard, Arab
631411-DF4	Keyboard, USB, SmartCard, Kazakstan
631411-KD4	Keyboard, USB, SmartCard, South Korea
631411-L34	Keyboard, USB, SmartCard, International
631758-001	Intel Core2 Duo E6800 processor, 2-MB cache, 3.33 GHz
632486-001	nVidia Quadro NVS300 PCIe x16 graphics card
632827-001	nVidia Quadro NVS300 PCIe x1 graphics card
633219-001	Intel Celeron E3500 processor, 1-MB cache, 2.70 GHz
635802-001	Memory module, 1-GB, PC3 10600, 1333-MHz
635803-001	Memory module, 2-GB, PC3 10600, 1333-MHz
636166-001	Card reader, 22-in-1
636919-001	Heat sink (includes replacement thermal material)
636920-001	Front bezel
636921-001	Baffle
636922-001	Chassis fan
636923-001	SATA power cable
636924-001	Access panel
636925-001	Speaker, internal
636926-001	Front I/O and power switch assembly
636927-001	250-GB hard drive
636928-001	320-GB hard drive
636929-001	500-GB hard drive
636930-001	1-TB hard drive
637995-001	ATI HD6350, 512-MB PCIe x16 graphics card
638813-001	SATA cable, 2 straight ends (19 inch (483 mm))
638814-001	SATA cable, 1 straight end, 1 angled end (25 inch; 635 mm)
638815-001	Serial port
638816-001	Hood sensor
638817-001	Printer port
640126-001	System board – Netclone
646376-001	Intel Core2 Duo E5800 processor, 2-MB cache, 3.20 GHz, 800-MHz FSB

---

## 6 Removal and Replacement Procedures

### Small Form Factor (SFF) Chassis

Adherence to the procedures and precautions described in this chapter is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

---

 **NOTE:** Not all features listed in this guide are available on all computers.

---

### Serial Number Location

Each computer has a unique serial number and product ID number in the location shown below. Keep these numbers available for use when contacting customer service for assistance.

**Figure 6-1** Serial Number and Product ID Location



# Preparation for Disassembly

See [Identifying the Chassis, Routine Care, and Disassembly Preparation on page 22](#) for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer ([Installing a Security Lock on page 88](#)).
2. Close any open software applications.
3. Exit the operating system.
4. Remove any compact disc or media card from the computer.
5. Turn off the computer and any peripheral devices that are connected to it.

---

△ **CAUTION:** Turn off the computer before disconnecting any cables.

Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems the cooling fan is on even when the computer is in the “Standby,” or “Suspend” modes. The power cord should always be disconnected before servicing a unit.

---

6. Disconnect the power cord from the electrical outlet and then from the computer.
7. Disconnect all peripheral device cables from the computer.

---

 **NOTE:** During disassembly, label each cable as you remove it, noting its position and routing. Keep all screws with the units removed.

△ **CAUTION:** The screws used in the computer are of different thread sizes and lengths; using the wrong screw in an application may damage the unit.

---

# Computer Access Panel

Description	Spare part number
Access panel	636924-001

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. If the computer is on a stand, remove the computer from the stand.
3. Loosen the captive thumbscrew (1), then lift the access panel off the computer (2).

**Figure 6-2** Removing the Access Panel



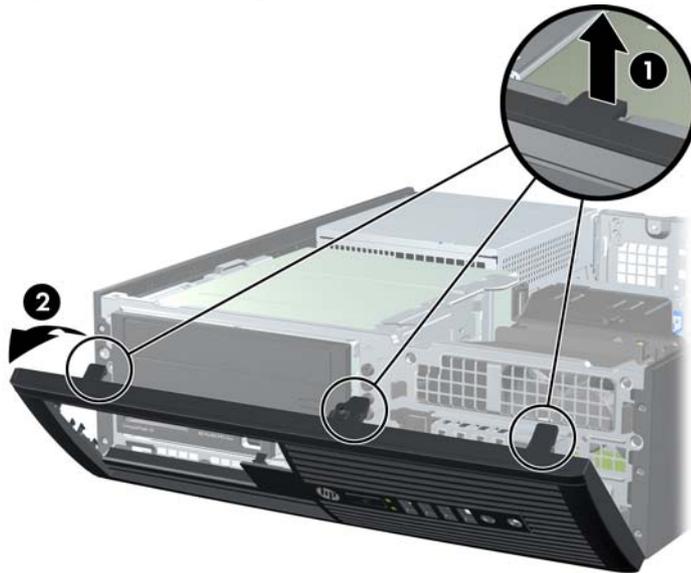
To install the access panel, reverse the removal procedure.

# Front Bezel

Description	Spare part number
Front bezel	636920-001

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).

**Figure 6-3** Removing the Front Bezel



To install the front bezel, reverse the removal procedure.

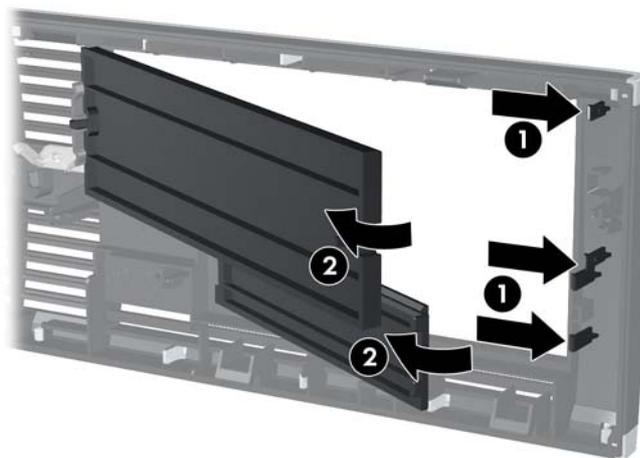
## Bezel Blanks

Description	Spare part number
3.5-inch bezel blank	583653-001
5.25-inch bezel blank	570838-001

On some models, there are bezel blanks covering the 3.5-inch and 5.25-inch external drive bays that need to be removed before installing a drive. To remove a bezel blank:

1. Remove the access panel ([Computer Access Panel on page 41](#)).
2. Remove the front bezel ([Front Bezel on page 42](#)).
3. To remove a bezel blank, push the two retaining tabs that hold the bezel blank in place towards the outer right edge of the bezel **(1)** and slide the bezel blank back and to the right to remove it **(2)**.

**Figure 6-4** Removing a Bezel Blank

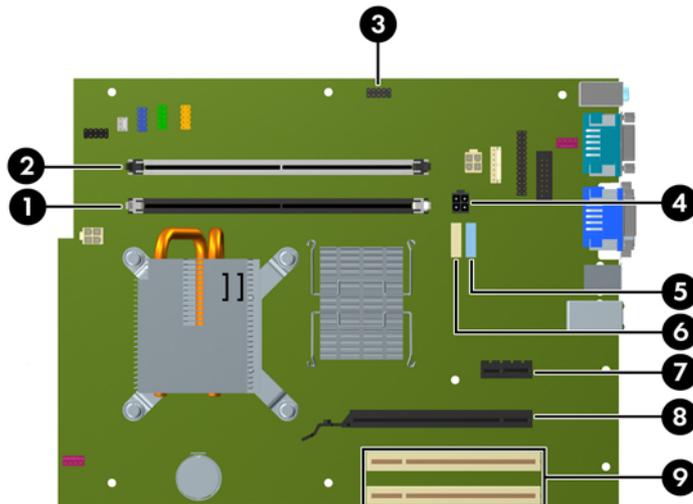


4. Replace the front bezel.

# System Board Connections

Refer to the following illustration and table to identify the system board connectors.

**Figure 6-5** System Board Connections



**Table 6-1** System Board Connections

No.	System Board Connector	System Board Label	Color	Component
1	DIMM (Channel A)	XMM1	black	Memory Module
2	DIMM (Channel B)	XMM3	white	Memory Module
3	Media Card Reader	MEDIA	black	Media Card Reader
4	Power	SATA PWR	black	SATA Drives
5	SATA	SATA0	dark blue	Hard Drive
6	SATA	SATA1	white	Optical Drive
7	PCI Express x1	X1PCIEXP1	black	Expansion Card
8	PCI Express x16	X16PCIEXP2	black	Expansion Card
9	PCI (2)	PCI1 and PCI2	white	Expansion Card

# Installing Additional Memory

Description	Spare part number
4-GB, PC3-10600	585157-001
2-GB, PC3-10600	635803-001
1-GB, PC3-10600	635802-001

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) dual inline memory modules (DIMMs).

## DIMMs

The memory sockets on the system board can be populated with up to two industry-standard DIMMs. These memory sockets are populated with at least one preinstalled DIMM. To achieve the maximum memory support, you can populate the system board with up to 8 GB of memory configured in a high-performing dual channel mode.

## DDR3-SDRAM DIMMs

For proper system operation, the DDR3-SDRAM DIMMs must be:

- industry-standard 240-pin
- unbuffered non-ECC PC3-8500 DDR3-1066 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 7 DDR3 1066 MHz (7-7-7 timing)
- contain the mandatory JEDEC SPD information

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided DIMMs
- DIMMs constructed with x8 and x16 DDR devices; DIMMs constructed with x4 SDRAM are not supported

---

 **NOTE:** The system will not operate properly if you install unsupported DIMMs.

---

## Populating DIMM Sockets

There are two DIMM sockets on the system board: XMM1 (black) and XMM3 (white) with one socket per channel. XMM1 operates in memory channel A. XMM3 operates in memory channel B. A memory module must occupy the black XMM1 socket.

 **NOTE:** For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

Total Memory	Socket	
	Channel A (black)	Channel B (white)
1 GB (single channel mode)	1 GB	
2 GB (dual channel mode)	1 GB	1 GB
4 GB (dual channel mode)	2 GB	2 GB
8 GB (dual channel mode)	4 GB	4 GB

The system will automatically operate in single channel mode, dual channel mode, or flex mode, depending on how the DIMMs are installed.

- The system will operate in single channel mode if the DIMM sockets are populated in one channel only.
- The system will operate in a higher-performing dual channel mode if the total memory capacity of the DIMM in Channel A is equal to the total memory capacity of the DIMM in Channel B.
- The system will operate in flex mode if the total memory capacity of the DIMM in Channel A is not equal to the total memory capacity of the DIMM in Channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. If one channel will have more memory than the other, the larger amount should be assigned to Channel A.
- In any mode, the maximum operational speed is determined by the slowest DIMM in the system.

## Installing DIMMs

- △ **CAUTION:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

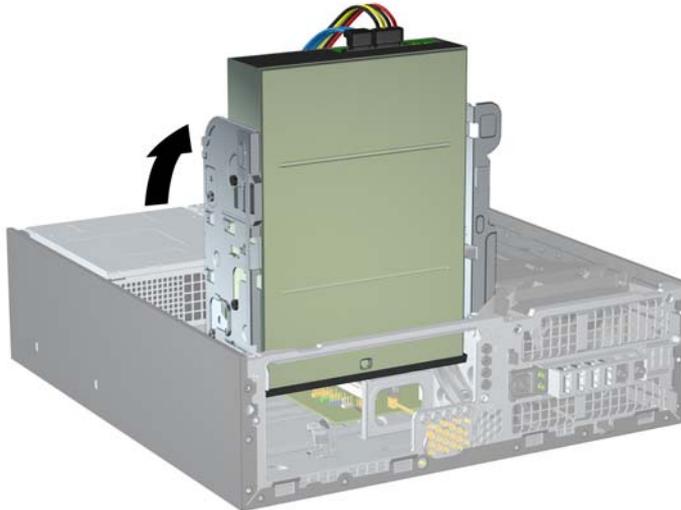
The memory module sockets have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

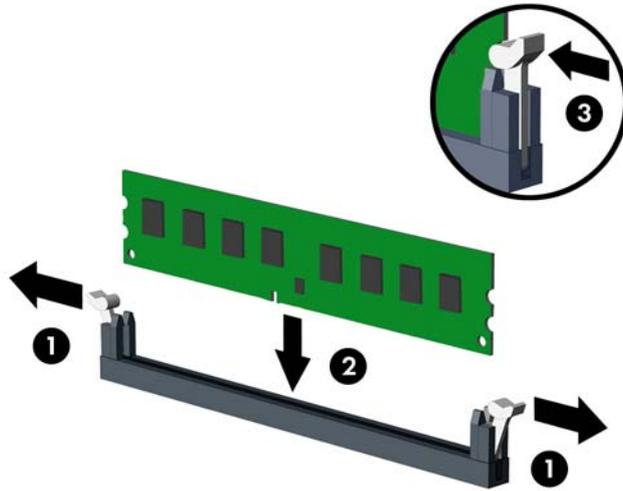
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Rotate up the drive bay housing to access the memory module sockets on the system board.

**Figure 6-6** Rotating the Drive Cage Up



4. Open both latches of the memory module socket (1), and insert the memory module into the socket (2).

**Figure 6-7** Installing a DIMM



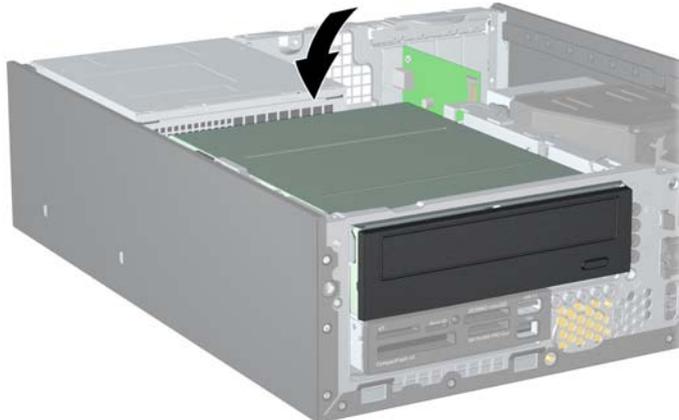
**NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

A DIMM must occupy the black XMM1 socket.

For maximum performance, populate the sockets so that the memory capacity is equal between Channel A and Channel B. Refer to [Populating DIMM Sockets on page 46](#) for more information.

5. Push the module down into the socket, ensuring that the module is fully inserted and properly seated. Make sure the latches are in the closed position (3).
6. Rotate the drive cage back down to its normal position.

**Figure 6-8** Rotating the Drive Cage Down



7. Replace the access panel.
8. If the computer was on a stand, replace the stand.

9. Reconnect the power cord and turn on the computer.
10. Lock any security devices that were disengaged when the access panel was removed.

The computer should automatically recognize the additional memory the next time you turn on the computer.

## Removing or Installing an Expansion Card

Description	Spare part number
ATI HD6350, 512-MB PCIe x16 graphics card	637995-001
nVidia Quadro NVS300 PCIe x1 graphics card	632827-001
nVidia Quadro NVS300 PCIe x16 graphics card	632486-001
Printer port	638817-001
Serial port, full height	638815-001

The computer has two PCI expansion slots, one PCI Express x1 expansion slot, and one PCI Express x16 expansion slot.

 **NOTE:** The PCI and PCI Express slots support only low profile cards.

**NOTE:** You can install a PCI Express x1, x4, x8, or x16 expansion card in the PCI Express x16 slot.

To install an expansion card:

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.

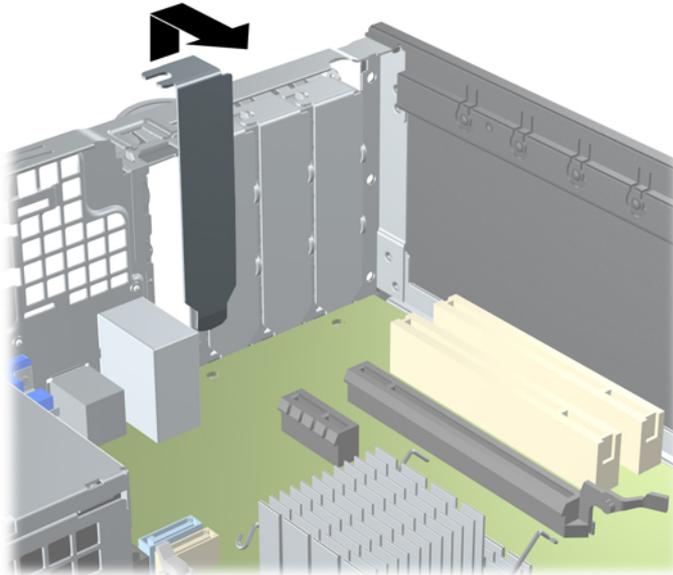
4. Release the slot cover retention latch that secures the slot covers by lifting the green tab on the latch and rotating the latch to the open position.

**Figure 6-9** Opening the Expansion Slot Retainer



5. Before installing an expansion card, remove the expansion slot cover or the existing expansion card.
  - a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of the chassis.

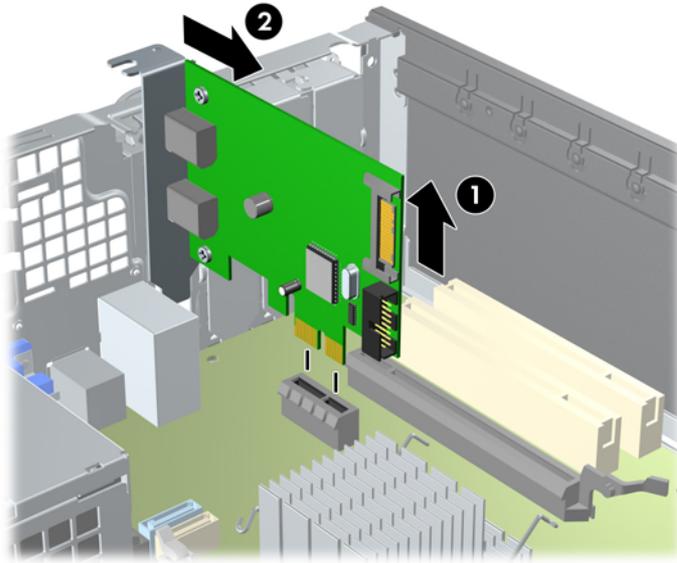
**Figure 6-10** Removing an Expansion Slot Cover



- b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket (1) then away from the inside of the chassis frame (2). Be sure not to scrape the card against the other components.

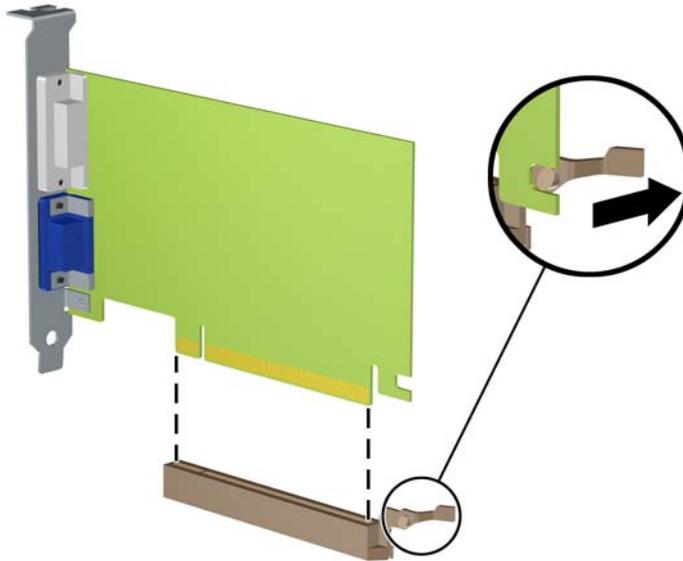
 **NOTE:** Before removing an installed expansion card, disconnect any cables that may be attached to the expansion card.

**Figure 6-11** Removing a PCI Express x1 Expansion Card



- c. If you are removing a PCI Express x16 card, pull the retention arm on the back of the expansion socket away from the card and carefully rock the card back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket then away from the inside of the chassis to release it from the chassis frame. Be sure not to scrape the card against the other components.

**Figure 6-12** Removing a PCI Express x16 Expansion Card



6. Store the removed card in anti-static packaging.
7. If you are not installing a new expansion card, install an expansion slot cover to close the open slot.

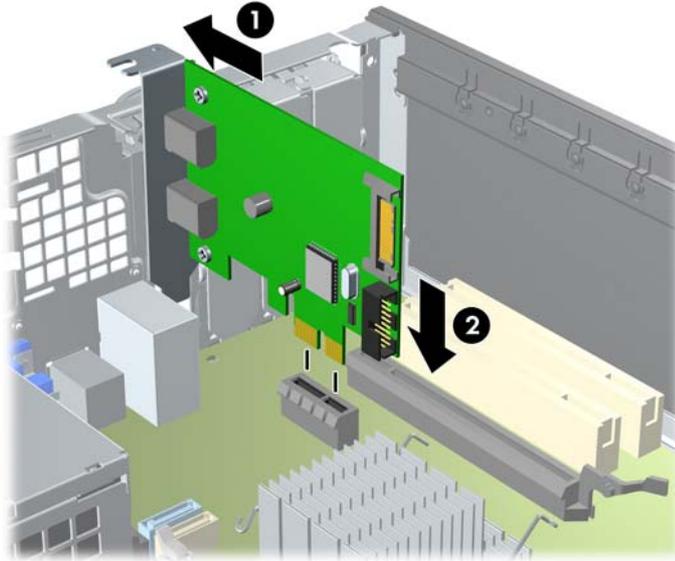
---

△ **CAUTION:** After removing an expansion card, you must replace it with a new card or expansion slot cover for proper cooling of internal components during operation.

---

8. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis (1) so that the bracket on the card is aligned with the open slot on the rear of the chassis. Press the card straight down into the expansion socket on the system board (2).

**Figure 6-13** Installing an Expansion Card



---

 **NOTE:** When installing an expansion card, press firmly on the card so that the whole connector seats properly in the expansion card slot.

---

9. Rotate the slot cover retention latch back in place to secure the expansion card.

**Figure 6-14** Closing the Expansion Slot Retainer



10. Connect external cables to the installed card, if needed. Connect internal cables to the system board, if needed.
11. Replace the access panel.

12. If the computer was on a stand, replace the stand.
13. Reconnect the power cord and turn on the computer.
14. Lock any security devices that were disengaged when the access panel was removed.
15. Reconfigure the computer, if necessary.

## Cable Management

The Small Form Factor chassis is a very compact computer and proper routing of the internal cables is critical to the operation of the computer. Follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.
- Do not jam cables on top of expansion cards or memory modules. Printed circuit cards like these are not designed to take excessive pressure on them.
- Keep cables clear of movable or rotating parts like the power supply and drive cage to prevent them from being cut or crimped when the component is lowered into its normal position.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases may damage the wires.
- Some flat ribbon cables come prefolded. Never change the folds on these cables.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.
- Do not rely on components like the drive cage, power supply, or computer cover to push cables down into the chassis. Always position the cables to lay properly by themselves.

When removing the power supply power cables from the connector on the system board, always follow these steps:

1. Squeeze on the top of the retaining latch attached to the cable end of the connector **(1)**.
2. Grasp the cable end of the connector and pull it straight up **(2)**.

△ **CAUTION:** Always pull the connector - NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.

**Figure 6-15** 6-pin power connector



## Cable Connections

System board connectors are color-coded to make it easier to find the proper connection.

System Board Connector	Connector Color	Description
P1	White	Power supply, 6-pin
PWRCPU	White	Power supply, 4-pin
SATA PWR1	Black	ODD power connector
SATA PWR2	Black	HDD power connector
CHFAN	Brown	Chassis fan
PB/LED	Black	Front power button/LED
FRONT USB1	Yellow	Front I/O USB
FRONT USB2	Green	Front I/O USB
FRONT AUD	Blue	Front audio
SPKR	White	Internal speaker
COMB	Black	Serial port
HLOCK	Black	Hood lock solenoid
HSENSE	White	Hood sensor
MEDIA	Black	Media card reader
PAR	Black	Flying parallel port header

## Drives

Description	Spare part number
<b>Optical drives:</b>	
6X BD-Writer SuperMulti drive with LightScribe	617030-001
16X DVD±RW SuperMulti drive with LightScribe	615646-001
16X DVD-ROM drive	581058-001
<b>Hard drives:</b>	
1 TB hard drive	636930-001
500 GB hard drive	636929-001
320 GB hard drive	636928-001
250 GB hard drive	636927-001
<b>Drive cables:</b>	
SATA cable, 2 straight ends (19 inch, 483 mm))	638813-001
SATA cable, 1 straight end, 1 angled end (25-inch (635 mm))	638814-001
SATA power cable	636923-001

A Torx T-15 screwdriver is needed to remove and install the guide screws on a drive.

- △ **CAUTION:** Make sure personal files on the hard drive are backed up to an external storage device before removing the hard drive. Failure to do so will result in data loss. After replacing the primary hard drive, you will need to run the *Restore Plus!* CD to load the HP factory-installed files.

## Drive Positions

Figure 6-16 Drive Positions

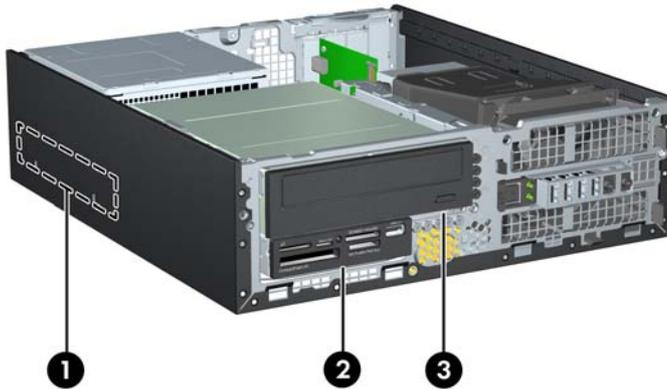


Table 6-2 Drive Positions

1	3.5-inch internal hard drive bay
2	3.5-inch internal drive bay for optional drives (media card reader shown)
3	5.25-inch internal drive bay for optional drives (optical drive shown)

**NOTE:** The drive configuration on your computer may be different than the drive configuration shown above.

To verify the type, size, and capacity of the storage devices installed in the computer, run Computer Setup.

## Installing and Removing Drives

When installing additional drives, follow these guidelines:

 **NOTE:** Refer to [System Board Connections on page 44](#) for an illustration of the system board drive connectors.

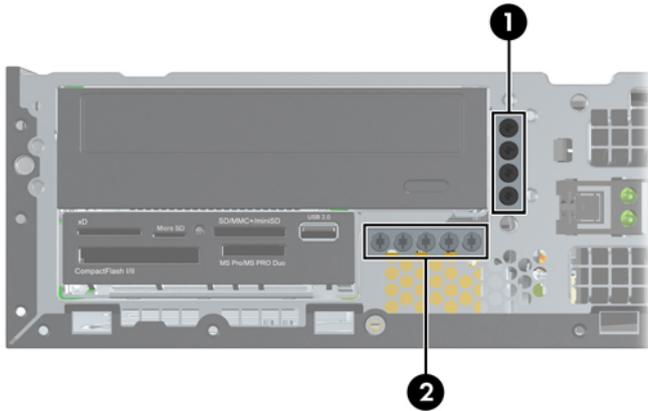
- The primary Serial ATA (SATA) hard drive must be connected to the dark blue primary SATA connector on the system board labeled SATA0.
- Connect a SATA optical drive to the white SATA connector on the system board labeled SATA1.
- Connect a media card reader USB cable to the USB connector on the system board labeled MEDIA.
- The power cable for the SATA drives is a three-headed cable that is plugged into the system board with the first connector routed to the rear of the hard drive, the second connector routed to the rear of the 3.5" drive, and the third connector routed to the rear of the 5.25" optical drive.
- The system does not support Parallel ATA (PATA) optical drives or PATA hard drives.
- You must install mounting screws to ensure the drive will line up correctly in the drive cage and lock in place. HP has provided extra mounting screws for the internal drive bays (five 6-32 standard screws and four M3 metric screws), installed in the front of the chassis, under the front bezel. The 6-32 standard screws are required for a secondary hard drive (not supported). All

other drives (except the primary hard drive) use M3 metric screws. The HP-supplied metric screws are black and the HP-supplied standard screws are silver.

**NOTE:** If you are replacing the primary hard drive, you must remove the four silver and blue 6-32 isolation mounting screws from the old hard drive and install them in the new hard drive.

**NOTE:** The computer supports one hard drive and one optical drive. If you want to use two hard drives, you must disconnect the optical drive from the SATA connector and plug the 2nd hard drive into that SATA connector.

**Figure 6-17** Extra Mounting Screw Locations



No.	Mounting Screw	Device
1	Black M3 Metric Screws	All Drives (except hard drives)
2	Silver 6-32 Standard Screws	Secondary Hard Drive (in systems supporting two hard drives)

There are at total of five extra silver 6-32 standard screws. Four are used as mounting screws for a secondary hard drive (not supported). The fifth is used for bezel security (see [Front Bezel Security on page 90](#) for more information).

**CAUTION:** To prevent loss of work and damage to the computer or drive:

If you are inserting or removing a drive, shut down the operating system properly, turn off the computer, and unplug the power cord. Do not remove a drive while the computer is on or in standby mode.

Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.

Handle a drive carefully; do not drop it.

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.

If a drive must be mailed, place the drive in a bubble-pack mailer or other protective packaging and label the package "Fragile: Handle With Care."

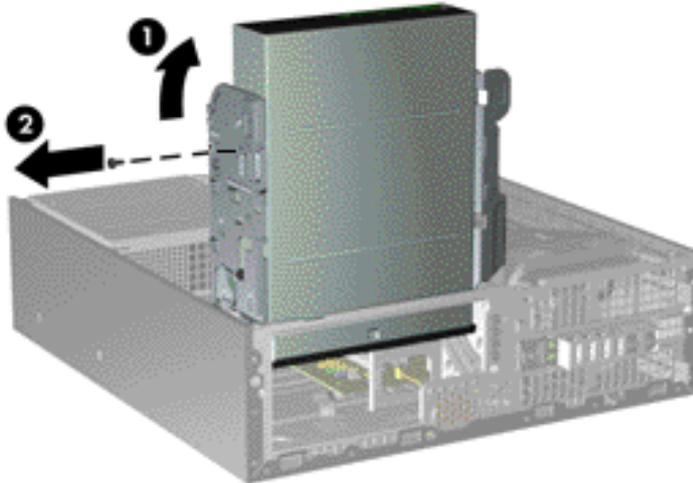
## Removing an Internal 5.25-inch Drive

- △ **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

To remove a 5.25-inch internal drive:

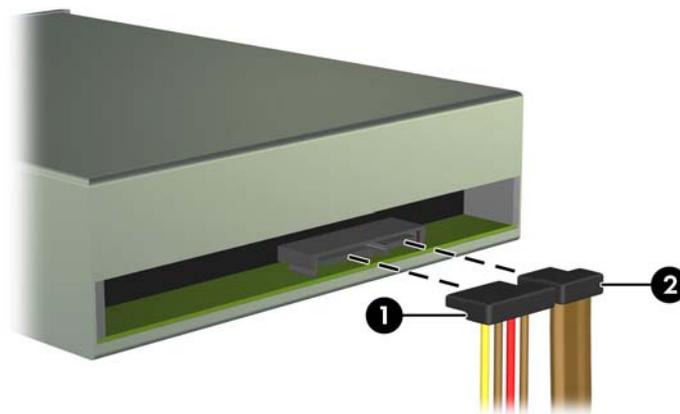
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Rotate the drive cage to its upright position (1) and remove the mounting screw on the back left side of the drive (2).

**Figure 6-18** Removing the Drive Mounting Screw



4. Press and hold down the latch to disconnect the power cable (1) and data cable (2) from the rear of the optical drive.

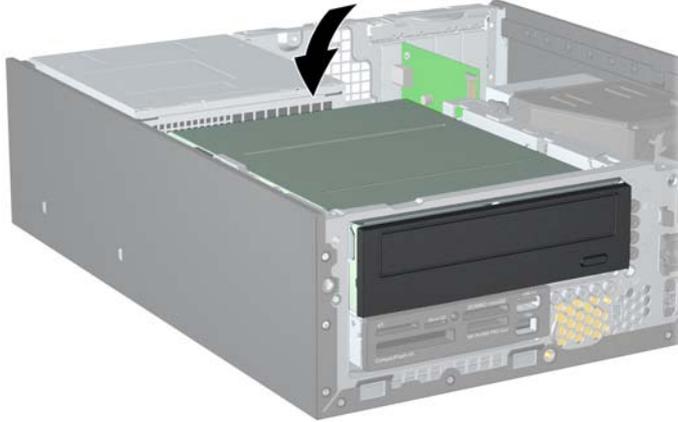
**Figure 6-19** Disconnecting the Power and Data Cables



5. Rotate the drive cage back down to its normal position.

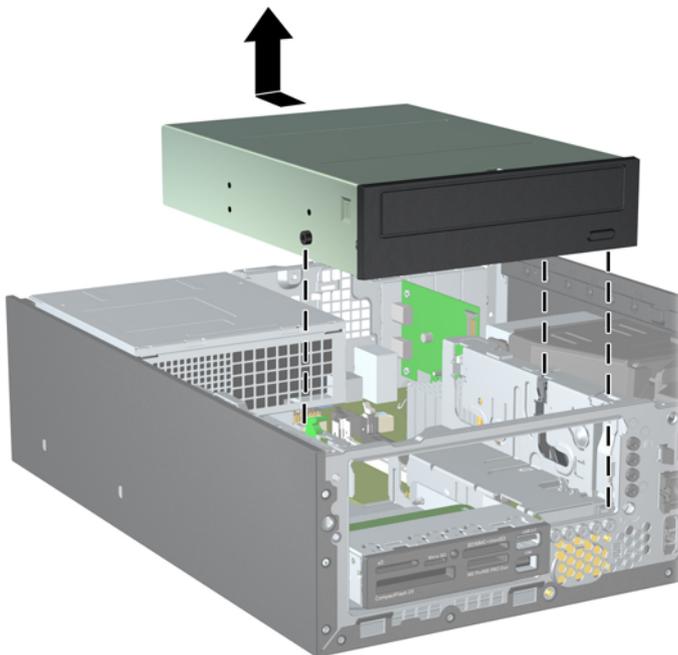
△ **CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 6-20** Rotating the Drive Cage Down



6. Slide the drive back until it stops, then lift it up and out of the drive cage.

**Figure 6-21** Removing the 5.25-inch Drive



📝 **NOTE:** When replacing a drive, transfer the four mounting screws from the old drive to the new one.

## Installing an Optical Drive into the 5.25-inch Drive Bay

To install an optional 5.25-inch optical drive:

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Bezel Blanks on page 43](#) for more information.
4. Install three M3 metric mounting screws in the lower holes on each side of the drive: two on the right side and one on the front left side. HP has provided extra M3 metric mounting screws on the front of the chassis, under the front bezel. The M3 metric mounting screws are black. Refer to [Installing and Removing Drives on page 57](#) for an illustration of the extra M3 metric mounting screws location.

---

△ **CAUTION:** Use only 5-mm long screws as mounting screws. Longer screws can damage the internal components of the drive.

📝 **NOTE:** When replacing the drive, transfer the three M3 metric mounting screws from the old drive to the new one.

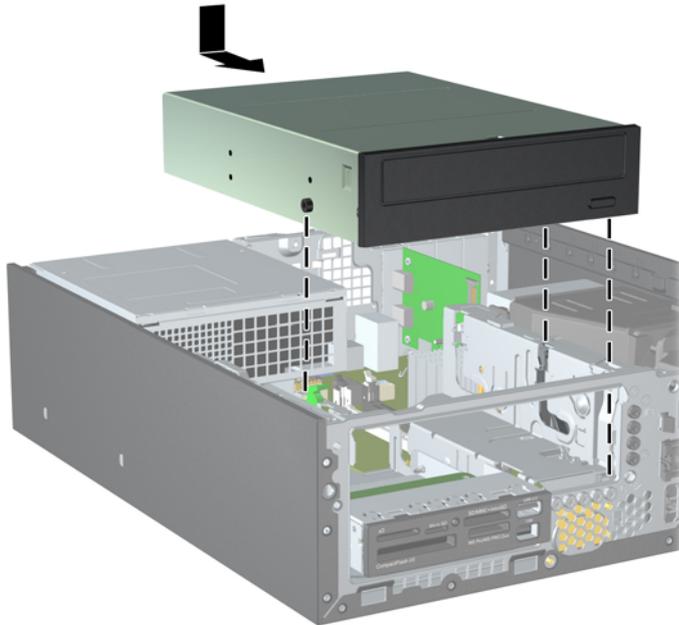
---

**Figure 6-22** Installing Mounting Screws in the Optical Drive



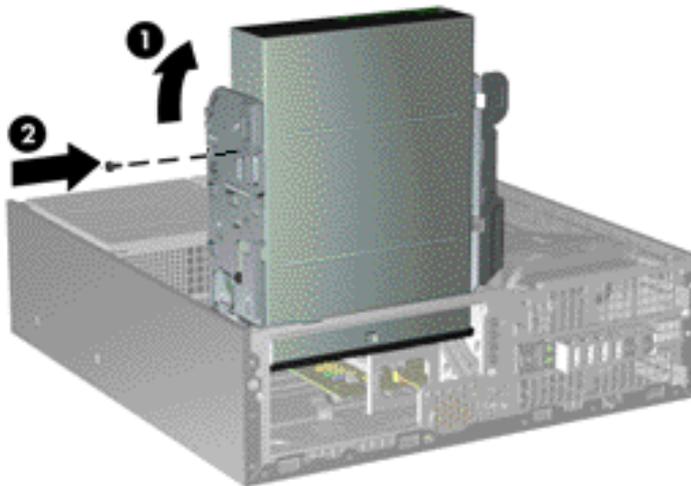
5. Position the mounting screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it stops.

**Figure 6-23** Installing the Optical Drive



6. Rotate the drive cage to its upright position (1) and install an M3 mounting screw in the back left side of the drive (2) to secure the drive to the drive cage.

**Figure 6-24** Securing the Drive in the Drive Cage



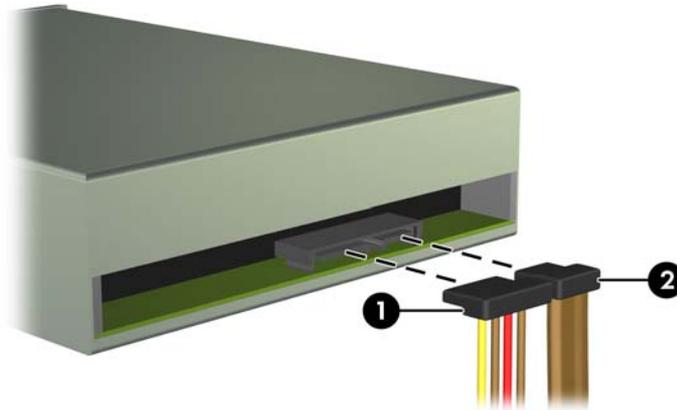
7. Connect the SATA data cable to the white system board connector labeled SATA1 if it is not already connected.
8. Route the data cable through the cable guides.

△ **CAUTION:** There are two cable guides that keep the data cable from being pinched by the drive cage when raising or lowering it. One is located on the bottom side of the drive cage. The other is located on the chassis frame under the drive cage. Ensure that the data cable is routed through these guides before connecting it to the optical drive.

9. Connect the power cable (1) and data cable (2) to the rear of the optical drive.

 **NOTE:** The power cable for the optical drive is a three-headed cable that is routed from the system board to the hard drive, then to the rear of the optical drive.

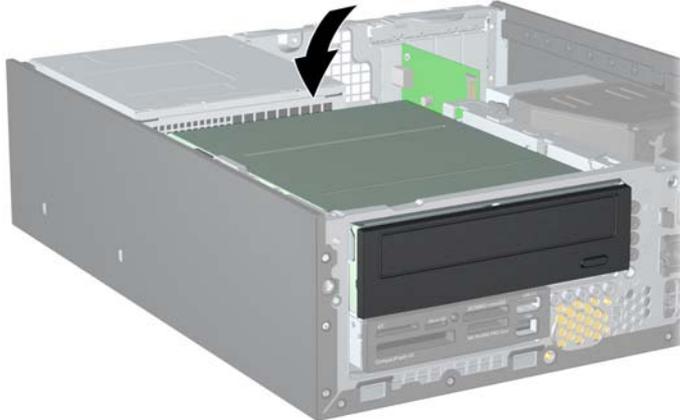
**Figure 6-25** Connecting the Power and Data Cables



10. Rotate the drive cage back down to its normal position.

 **CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 6-26** Rotating the Drive Cage Down



11. Replace the access panel.
12. If the computer was on a stand, replace the stand.
13. Reconnect the power cord and turn on the computer.
14. Lock any security devices that were disengaged when the access panel was removed.

The system automatically recognizes the drive and reconfigures the computer.

## Removing an Internal 3.5-inch Drive

 **CAUTION:** All removable media should be taken out of a drive before removing the drive from the computer.

The 3.5-inch drive is located underneath the 5.25-inch drive. You must remove the internal 5.25-inch drive before removing the internal 3.5-inch drive.

1. Follow the procedure in [Removing an Internal 5.25-inch Drive on page 59](#) to remove the 5.25-inch drive and access the 3.5-inch drive.

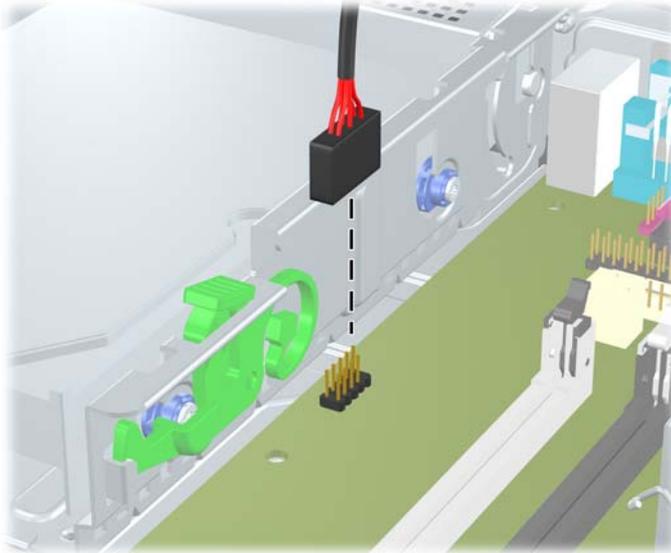
---

△ **CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

---

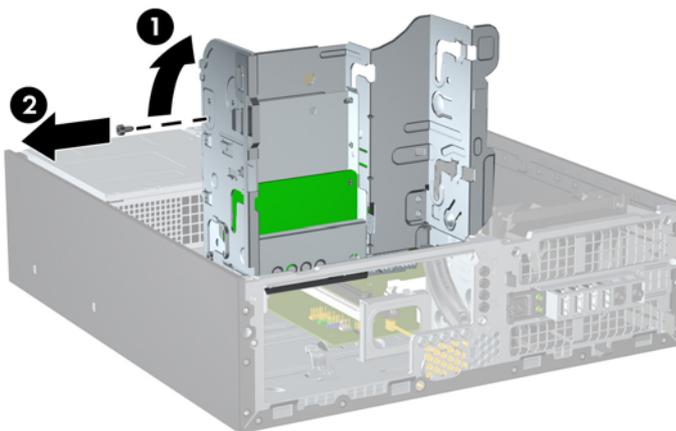
2. If you are removing a media card reader, disconnect the USB cable from the system board.

**Figure 6-27** Disconnecting the Media Card Reader USB Cable



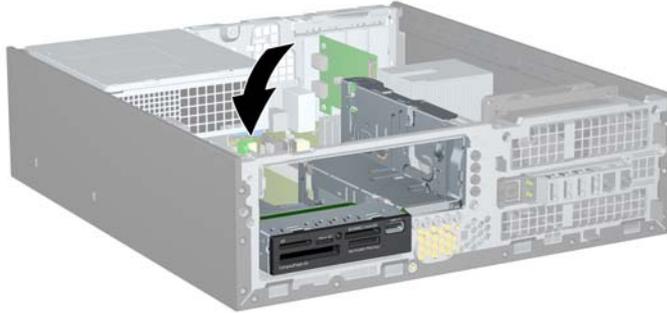
3. Rotate the drive cage to its upright position (1) and remove the mounting screw on the back left side of the drive (2).

**Figure 6-28** Removing the Drive Mounting Screw



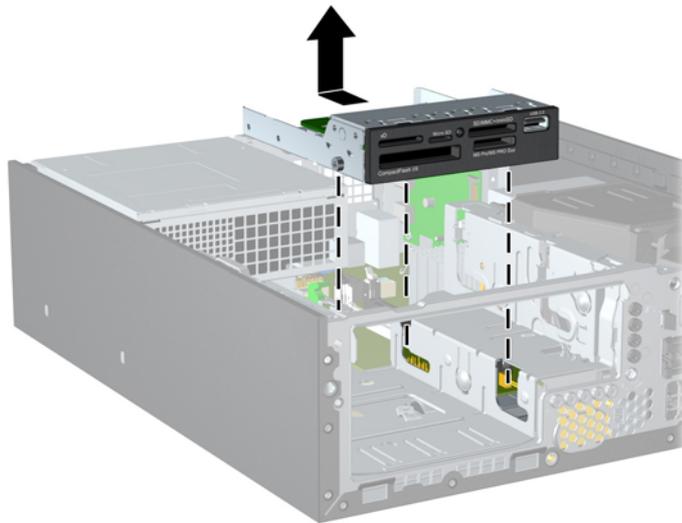
4. Rotate the drive cage back down to its normal position.

**Figure 6-29** Rotating the Drive Cage Down



5. Slide the drive back until it stops, then lift it up and out of the drive cage.

**Figure 6-30** Removing a 3.5-inch Drive (Media Card Reader Shown)



---

 **NOTE:** When replacing a 3.5-inch drive, transfer the four mounting screws from the old drive to the new one.

---

## Installing a Drive into the 3.5-inch Internal Drive Bay

The 3.5-inch bay is located underneath the 5.25-inch drive. To install a drive into the 3.5-inch bay:

1. Follow the procedure in [Removing an Internal 5.25-inch Drive on page 59](#) to remove the 5.25-inch drive and access the 3.5-inch drive bay.

---

 **CAUTION:** Ensure that the computer is turned off and that the power cord is disconnected from the electrical outlet before proceeding.

---

2. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See [Bezel Blanks on page 43](#) for more information.

3. Install three M3 metric mounting screws in the lower holes on each side of the drive: two on the right side and one on the front left side. HP has provided extra M3 metric mounting screws on the front of the chassis, under the front bezel. The M3 metric mounting screws are black. Refer to [Installing and Removing Drives on page 57](#) for an illustration of the extra M3 metric mounting screws location.

△ **CAUTION:** Use only 5-mm long screws as mounting screws. Longer screws can damage the internal components of the drive.

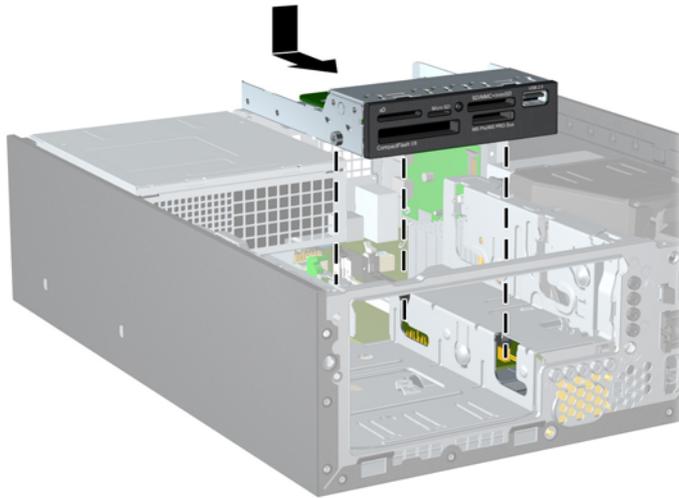
📄 **NOTE:** When replacing the drive, transfer the three M3 metric mounting screws from the old drive to the new one.

**Figure 6-31** Installing Mounting Screws in the Media Card Reader



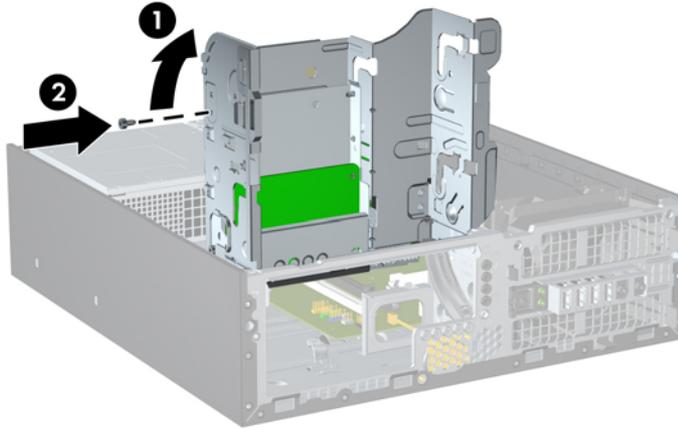
4. Position the mounting screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it stops.

**Figure 6-32** Installing a Drive into the 3.5-inch Drive Bay (Media Card Reader Shown)



5. Rotate the drive cage to its upright position (1) and install an M3 mounting screw in the back left side of the drive (2) to secure the drive to the drive cage.

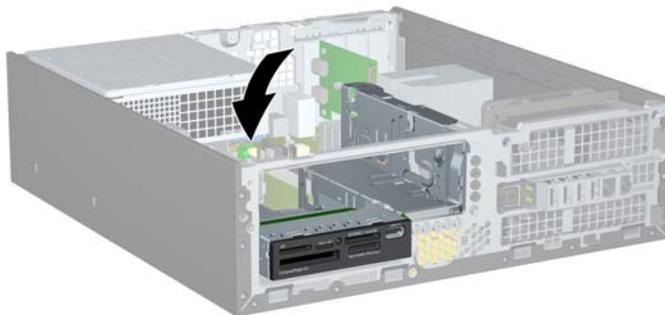
**Figure 6-33** Securing the Drive in the Drive Cage



6. Rotate the drive cage back down to its normal position.

**CAUTION:** Be careful not to pinch any cables or wires when rotating the drive cage down.

**Figure 6-34** Rotating the Drive Cage Down



7. If installing a media card reader, connect the USB cable from the media card reader to the USB connector on the system board labeled MEDIA.

**NOTE:** Refer to [System Board Connections on page 44](#) for an illustration of the system board drive connectors.

8. Replace the 5.25-inch drive.
9. Replace the access panel.
10. If the computer was on a stand, replace the stand.
11. Reconnect the power cord and turn on the computer.
12. Lock any security devices that were disengaged when the access panel was removed.

The system automatically recognizes the drive and reconfigures the computer.

## Removing and Replacing the Primary 3.5-inch Internal SATA Hard Drive

 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

The preinstalled 3.5-inch hard drive is located under the power supply. To remove and replace the hard drive:

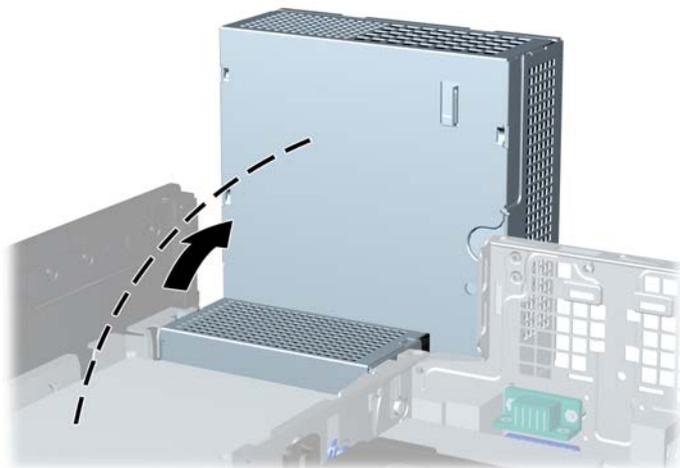
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Rotate the drive cage for internal drives to its upright position.

**Figure 6-35** Rotating the Drive Cage Up



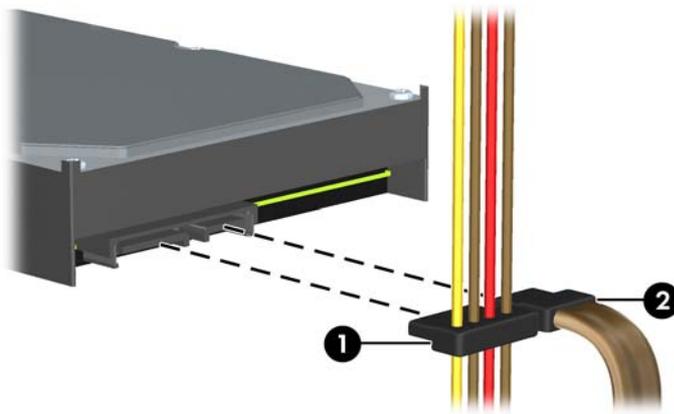
4. Rotate the power supply to its upright position. The hard drive is located beneath the power supply.

**Figure 6-36** Raising the Power Supply



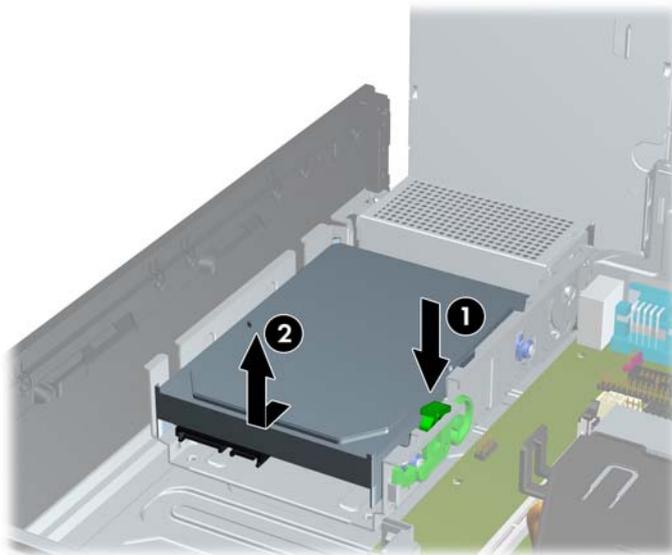
5. Press and hold down the latch to disconnect the power cable (1) and data cable (2) from the back of the hard drive.

**Figure 6-37** Disconnecting the Hard Drive Power Cable and Data Cable



6. Press down on the green release latch next to the hard drive (1). While holding the latch down, slide the drive forward until it stops, then lift the drive up and out of the bay (2).

**Figure 6-38** Removing the Hard Drive



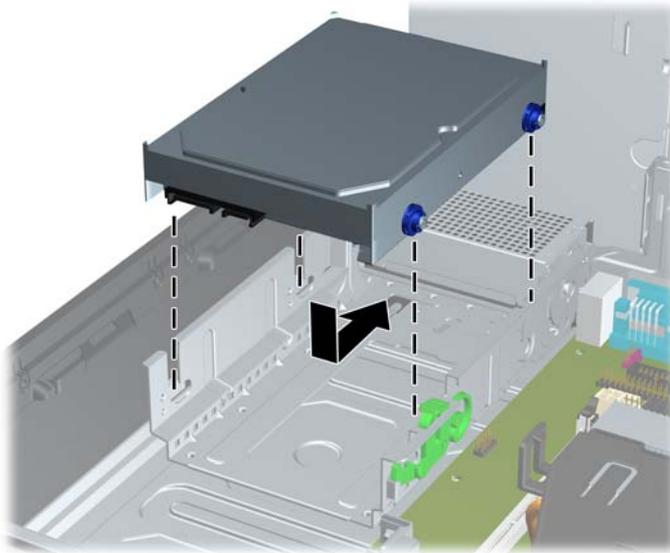
7. To install a hard drive, you must transfer the silver and blue isolation mounting screws from the old hard drive to the new hard drive.

**Figure 6-39** Installing Hard Drive Mounting Screws



8. Align the mounting screws with the slots on the chassis drive cage, press the hard drive down into the bay, then slide it back until it stops and locks in place.

**Figure 6-40** Installing the Hard Drive



9. Connect the power and data cables to the back of the hard drive.

---

 **NOTE:** When replacing the primary hard drive, be sure to route the SATA and power cables through the cable guide on the bottom of the chassis frame behind the hard drive.

The data cable must be connected to the dark blue connector labeled SATA0 on the system board to avoid any hard drive performance problems.

---

10. Rotate the drive cage for internal drives and the power supply down to their normal positions.
11. Replace the access panel.
12. If the computer was on a stand, replace the stand.
13. Reconnect the power cord and turn on the computer.
14. Lock any security devices that were disengaged when the access panel was removed.

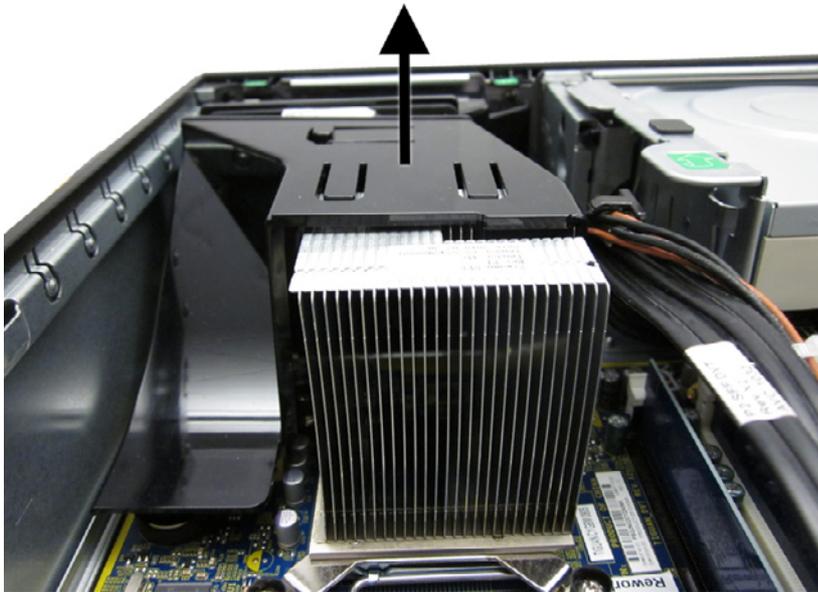
# Baffle

Description	Spare part number
Baffle	636921-001

The baffle sits between the front fan and the heat sink.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the cables from the holder on the side of the baffle.
4. Lift the baffle straight up out of the chassis.

**Figure 6-41** Removing the baffle



To install the baffle, reverse the removal procedure.

# Front Fan Assembly

Description	Spare part number
Front fan assembly	636922-001

The front fan assembly is attached to the front of the chassis.

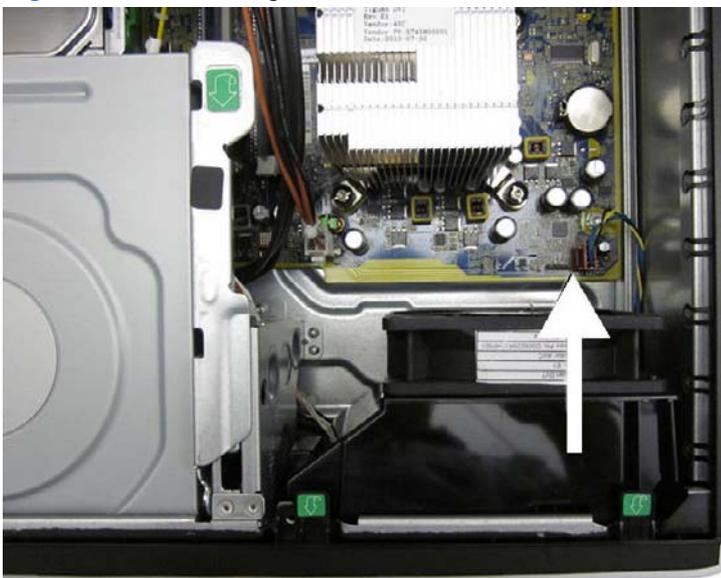
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the front bezel ([Front Bezel on page 42](#)).
4. Remove the baffle ([Baffle on page 71](#)).
5. Disconnect the fan cable from the red/brown system board connector labeled CHFAN1.
6. Press the two tabs (left, bottom) that secure the fan assembly to the chassis front.

**Figure 6-42** Front fan tab locations



7. Pull the assembly toward the rear of the unit, and then lift it out of the chassis.

**Figure 6-43** Removing the front fan



To install the front fan, reverse the removal procedure. Be sure to orient the air flow into the unit.

# Hood Sensor

Description	Spare part number
Hood sensor	638816-001

The hood sensor is attached in a slot in the rear of the chassis.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Unplug the sensor cable from the white system board connected labeled HSENSE.
4. Slide the hood sensor straight out of the notch in the chassis.

 **NOTE:** A flat blade screwdriver can be used to push the hood sensor out of the slot.

**Figure 6-44** Removing the hood sensor from the chassis fan



To install the hood sensor, reverse the removal procedure.

# Front I/O, Power Switch Assembly

Description	Spare part number
Front I/O and power switch assembly	636926-001

The front I/O and power switch/LEDs are one assembly, attached to the front of the chassis. Push the assembly into the chassis to remove.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the front bezel ([Front Bezel on page 42](#)).
4. Remove the chassis fan ([Front Fan Assembly on page 72](#)).
5. Rotate the drive cage to its upright position.
6. Disconnect the four cables from the system board as follows:
  - Yellow connector labeled FRNT USB1
  - Green connector labeled FRNT USB2
  - Blue connector labeled FRNT AUD
  - Black connector labeled PB/LED
7. Remove the screw that secures the assembly to the front of the chassis.

**Figure 6-45** Removing the front I/O, power switch/LED assembly screw



8. Route the cables through the slots beneath the drive cage, pull the assembly (right side first) into the chassis, and then remove the assembly from the computer.

**Figure 6-46** Routing the cables and removing the power switch assembly



To install the front I/O and power switch assembly, reverse the removal procedure.

 **NOTE:** Be sure to correctly route the cables beneath the drive cage when reinstalling the assembly. Proper cable routing prevents damage to the cables and allows the drive cage to close properly.

## Speaker

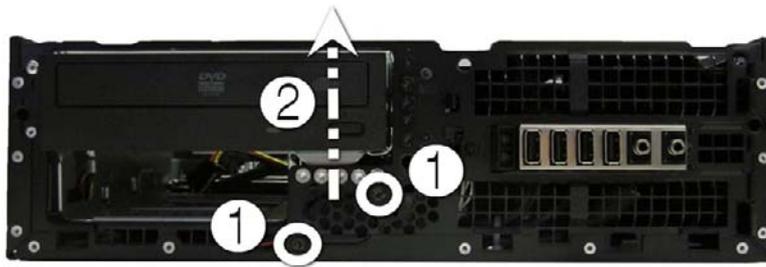
Description	Spare part number
Speaker	636925-001

The speaker is attached to the front of the chassis under the rotating drive cage.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the front bezel ([Front Bezel on page 42](#)).
4. Rotate the drive cage to its upright position.
5. Disconnect the speaker wire from the white system board labeled SPKR
6. Remove the two screws that secure the speaker to the chassis **(1)**.

7. Lift the speaker from the inside of the chassis to remove it (2).

**Figure 6-47** Removing the speaker



To install the speaker, reverse the removal procedures.

## Heat sink

Description	Spare part number
Heat sink	636919-001

The heat sink is secured atop the processor with four captive Torx screws. The heat sink does not include a fan.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the baffle ([Baffle on page 71](#)).
4. Remove the chassis fan ([Front Fan Assembly on page 72](#)).
5. Loosen the four captive screws that secure the heat sink to the system board tray.

△ **CAUTION:** Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

6. Lift the heat sink from atop the processor and set it on its side to keep from contaminating the work area with thermal grease.

**Figure 6-48** Removing the heat sink



When reinstalling the heat sink, make sure that its bottom has been cleaned with an alcohol wipe and fresh thermal grease has been applied to the top of the processor.

- △ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor to avoid damage that could require replacing the system board.

Failure to install the baffle may cause the computer to overheat.

# Processor

Description	Spare part number
<b>Intel Celeron Processors</b>	
E3500, 1-MB cache, 2.70 GHz	633219-001
E3400, 1-MB cache, 2.60 GHz	602071-001
E3300, 1-MB cache, 2.50 GHz	585886-001
<b>Intel Core 2 Quad Processors</b>	
Q9550s, 2.83 GHz, 12-MB L2 cache	593228-001
Q9505s, 2.83 GHz, 6-MB L2 cache (95W)	593229-001
<b>Intel Core2 Duo Processors</b>	
E8600, 6-MB cache, 3.33 GHz	497732-001
E8500, 6-MB cache, 3.16 GHz	466170-001
E8400, 6-MB cache, 3.00 GHz	509554-001
E7600, 3-MB cache, 3.06 GHz	573954-001
<b>Intel Pentium Processors</b>	
E6800, 2-MB cache, 3.33 GHz	631758-001
E6700, 2-MB cache, 3.06 GHz, 1066-MHz FSB	617840-001
E5800, 2-MB cache, 3.20 GHz, 800-MHz FSB	646376-001

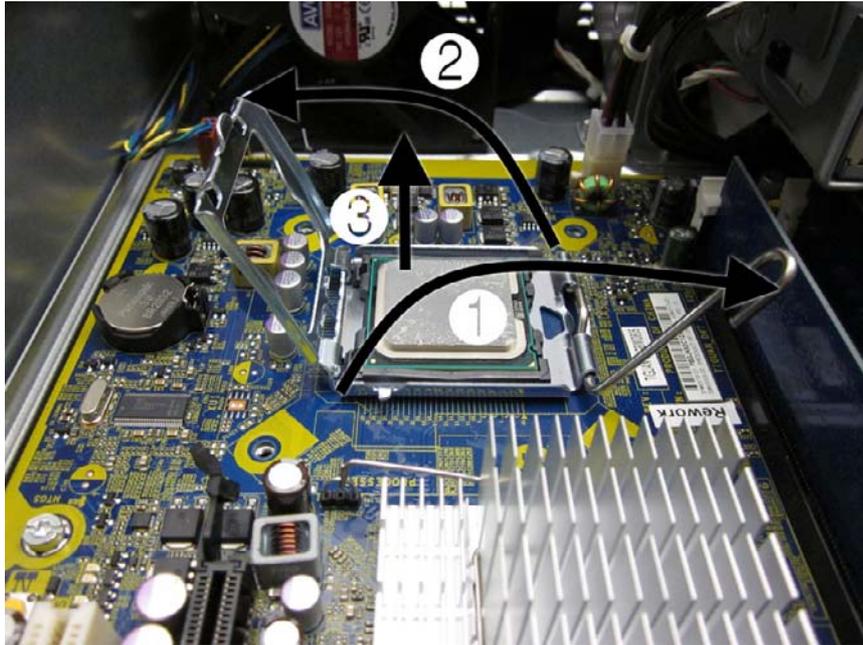
1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Remove the baffle ([Baffle on page 71](#)).
4. Remove the heat sink ([Heat sink on page 76](#)).
5. Rotate the locking lever to its full open position **(1)**.
6. Raise and rotate the microprocessor retainer to its fully open position **(2)**.

7. Carefully lift the processor from the socket (3).

△ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.

**Figure 6-49** Removing the processor



To install a new processor:

1. Place the processor in its socket and close the retainer.
2. Secure the locking lever. If reusing the existing heat sink, go to step 3. If using a new heat sink, go to step 6.
3. If reusing the existing heat sink, clean the bottom of the heat sink with the alcohol pad provided in the spares kit.

△ **CAUTION:** Before reinstalling the heat sink you must clean the top of the processor and the bottom of the heat sink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.

4. Apply the thermal grease provided in the spares kit to the top of the processor and install the heat sink atop the processor.
5. Go to step 7.

6. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.
7. Secure the heat sink to the system board and system board tray with the four captive screws and attach the heat sink control cable to the system board.

△ **CAUTION:** heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

 **NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: <http://h18000.www1.hp.com/support/files>.

## Power Supply

Description	Spare part number
Power supply, 240W, 85% efficiency	613663-001
Power supply, 240W, High voltage protection	613664-001
Power supply, 240W	613763-001

△ **WARNING!** To reduce potential safety issues, only the power supply provided with the computer, a replacement power supply provided by HP, or a power supply purchased as an accessory from HP should be used with the computer.

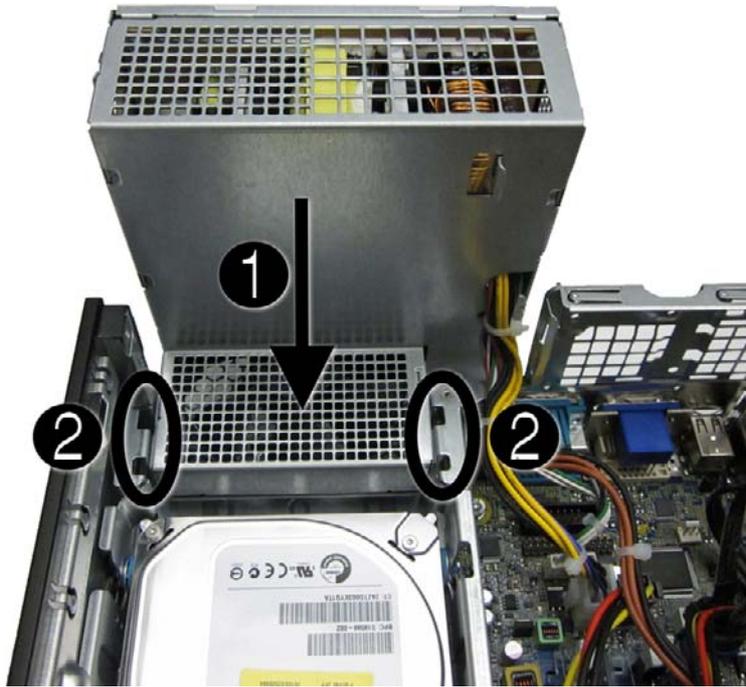
The rotating power supply is located at the rear of the chassis. It is held in place by a bracket – no screws are used.

△ **WARNING!** Voltage is always present on the system board when the computer is plugged into an active AC outlet. To avoid possible personal injury and damage to the equipment the power cord should be disconnected from the computer and/or the AC outlet before opening the computer.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. Rotate the drive cage up and disconnect the power cables from all of the drives.
4. Disconnect the power cables from the system board and drives.
5. Rotate the power supply to its full upright position.
6. Release the power supply cables from the cable retaining clip under the drive cage.

7. Pull the power supply forward (1) until the posts (2) on the power supply move forward in the power supply bracket, and then lift the power supply straight up and out of the chassis.

**Figure 6-50** Removing the power supply



Use the following table to determine the correct power supply/system board connections.

**Table 6-3** Power supply cable – system board connector

Power supply connector label	System board connector
P1	PWR (P1)
P2	P2
P3	PWRCPU

To install the power supply, reverse the removal procedure.

- △ **CAUTION:** When installing the power supply cables, make sure they are properly positioned so they are not cut by the drive cage and are not pinched by the rotating power supply.

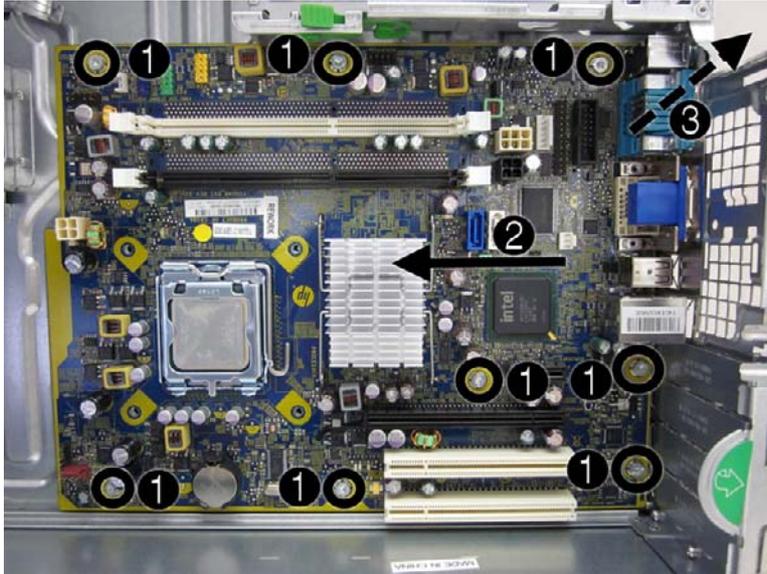
# System Board

Description	Spare part number
System board – standard (includes thermal material)	608748-001
System board – Netclone (includes thermal material)	640126-001

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Remove the access panel ([Computer Access Panel on page 41](#)).
3. When replacing the system board, make sure the following components are removed from the defective system board and installed on the replacement system board:
  - Memory modules (see [Installing Additional Memory on page 45](#))
  - Expansion cards ([Removing or Installing an Expansion Card on page 49](#))
  - Heat sink ([Heat sink on page 76](#))
  - Processor ([Processor on page 78](#))
4. Remove the baffle from the chassis ([Baffle on page 71](#)).
5. Remove the fan from the chassis ([Front Fan Assembly on page 72](#)).
6. Rotate the drive cage to its upright position.
7. Rotate the power supply to its full upright position.
8. Disconnect all data and power cables from the system board.
9. Disconnect the balance of the cables from the system board.
10. Remove the eight screws **(1)** that secure the system board to the chassis.

11. Slide the system board toward the front of the chassis (2), and then lift the rear of the system board up and out of the chassis (3).

**Figure 6-51** Removing the system board



To install the system board, reverse the removal procedure.

 **NOTE:** When replacing the system board, you must also change the chassis serial number in the BIOS.

 **CAUTION:** Before reinstalling the heat sink you must clean the top of the processor and the bottom of the heat sink with an alcohol pad supplied in the spares kit. After the alcohol has evaporated, apply thermal grease to the top of the processor from the syringe supplied in the spares kit.

**CAUTION:** When reconnecting the cables it is important that they be positioned so they do not interfere with the rotation of the drive cage or power supply.

# Battery

The battery that comes with your computer provides power to the real-time clock and has a lifetime of about three years. When replacing the battery, use a battery equivalent to the battery originally installed on the computer. The computer comes with a 3-volt lithium coin cell battery.

---

 **NOTE:** The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used when the computer is NOT connected to AC power.

 **WARNING!** This computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 140°F (60°C).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare designated for this product.

 **CAUTION:** Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared. Refer to [Computer Setup \(F10\) Utility on page 4](#) for information on backing up the CMOS settings.

 **NOTE:** HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to <http://www.hp.com/recycle>.

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

---

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).

2. Remove the access panel ([Computer Access Panel on page 41](#)).

---

 **NOTE:** It may be necessary to remove an expansion card to gain access to the battery.

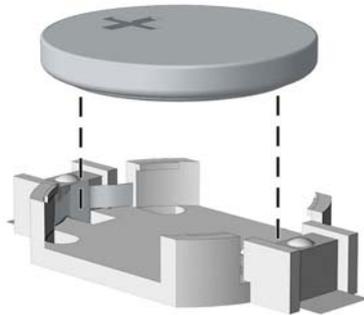
3. Locate the battery and battery holder on the system board.

4. Depending on the type of battery holder on your system board, complete the following instructions to replace the battery:

## Type 1 Battery Holder

1. Lift the battery out of its holder.

**Figure 6-52** Removing the battery from a type 1 holder

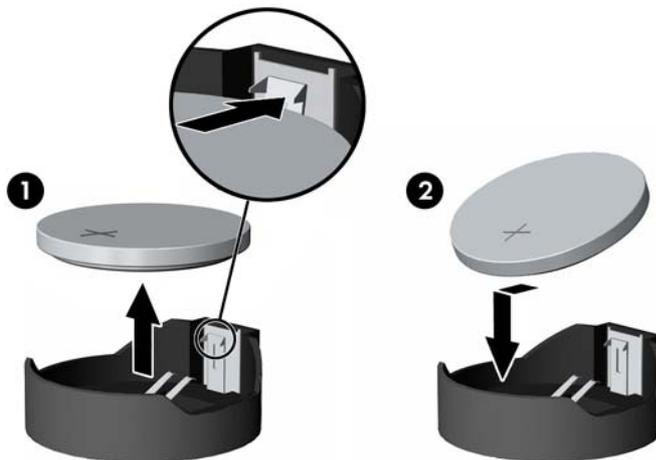


2. Slide the replacement battery into position, positive side up.
3. The battery holder automatically secures the battery in the proper position.
4. Replace the computer access panel.
5. Plug in the computer and turn on power to the computer.
6. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 4](#).

## Type 2 Battery Holder

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery. When the battery pops up, lift it out (1).
2. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up (2). Push the other edge down until the clamp snaps over the other edge of the battery.

**Figure 6-53** Removing the battery from a type 2 holder

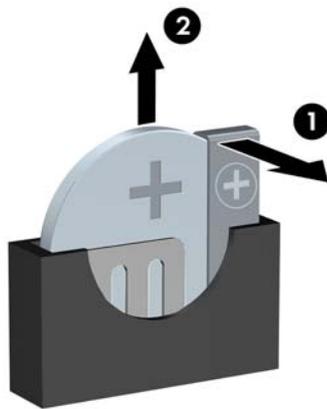


3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 4](#).

## Type 3 Battery Holder

1. Pull back on the clip (1) that holds the battery in place, then remove the battery (2).
2. Insert the new battery and position the clip back in place.

**Figure 6-54** Removing the battery from a type 3 holder



3. Replace the computer access panel.
4. Plug in the computer and turn on power to the computer.
5. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to [Computer Setup \(F10\) Utility on page 4](#).

## Using the Small Form Factor Computer in a Tower Orientation

The Small Form Factor computer can be used in a tower orientation. The HP logo plate on the front bezel is adjustable for either desktop or tower orientation.

1. Prepare the computer for disassembly ([Preparation for Disassembly on page 40](#)).
2. Orient the computer so that its right side is facing down and place the computer in the optional stand.

**Figure 6-55** Changing from Desktop to Tower Orientation



---

 **NOTE:** To stabilize the computer in a tower orientation, HP recommends the use of the optional tower stand.

---

3. Lock any security devices that were disengaged when the access panel was removed.

 **NOTE:** Ensure at least 10.2 centimeters (4 inches) of space on all sides of the computer remains clear and free of obstructions.

---

## Installing a Security Lock

The security locks displayed below and on the following pages can be used to secure the computer.

### HP/Kensington MicroSaver Security Cable Lock

**Figure 6-56** Installing a Cable Lock



## Padlock

Figure 6-57 Installing a Padlock



## Front Bezel Security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as compact discs or USB flash drives, from the computer.
3. Turn off the computer properly through the operating system, then turn off any external devices.
4. Disconnect the power cord from the power outlet and disconnect any external devices.

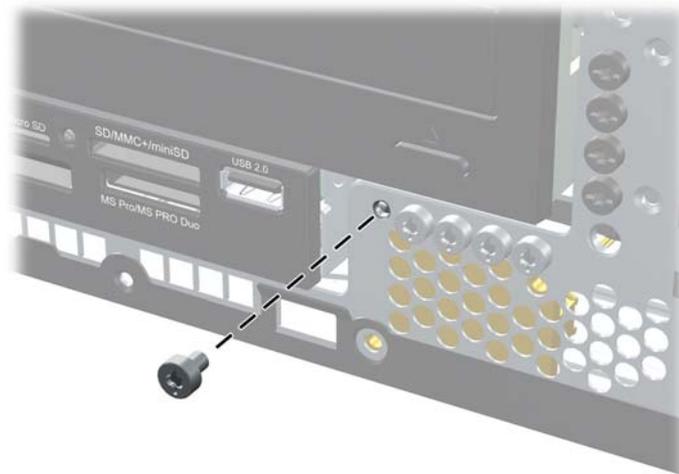
---

△ **CAUTION:** Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. You must disconnect the power cord to avoid damage to the internal components of the computer.

---

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the access panel and front bezel.
7. Remove one of the five silver 6-32 standard screws located on the front of the chassis behind the bezel.

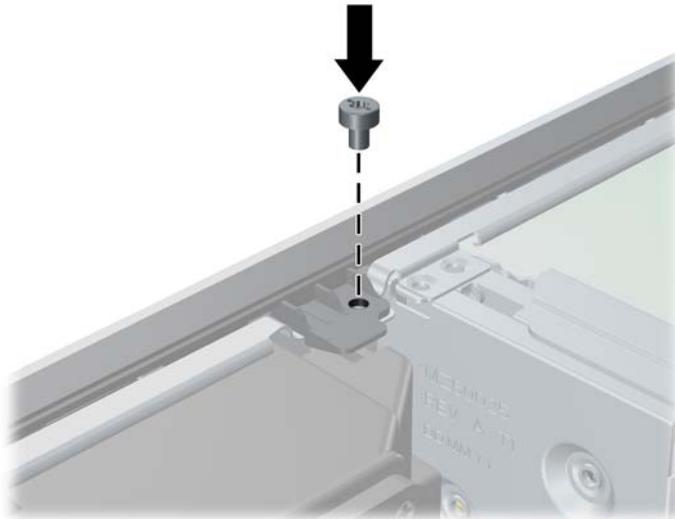
**Figure 6-58** Retrieving the Front Bezel Security Screw



8. Replace the front bezel.

9. Install the security screw next to the middle front bezel release tab to secure the front bezel in place.

**Figure 6-59** Installing the Front Bezel Security Screw

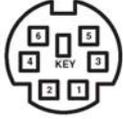
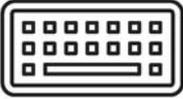


10. Replace the access panel.
11. If the computer was on a stand, replace the stand.
12. Reconnect the power cord and turn on the computer.
13. Lock any security devices that were disengaged when the access panel was removed.

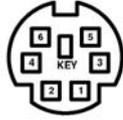
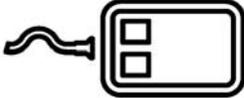
# A Connector Pin Assignments

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

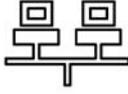
## Keyboard

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

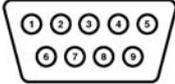
## Mouse

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

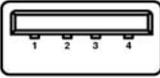
## Ethernet RJ-45

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

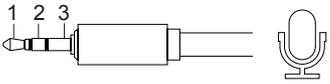
## Serial Interface, Powered and Non-Powered

Connector and Icon	Pin	Signal
 	1	Carrier Detect (12V if powered)
	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 (5V if powered)

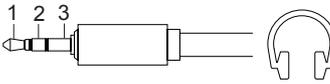
## USB

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

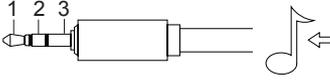
## Microphone

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_left
	2 (Ring)	Power_Right
	3 (Shield)	Audio_right

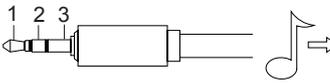
## Headphone

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_left
	2 (Ring)	Power_Right
	3 (Shield)	Ground

## Line-in Audio

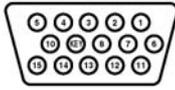
Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_In_Left
	2 (Ring)	Audio_In_Right
	3 (Shield)	Ground

## Line-out Audio

Connector and Icon (1/8" miniphone)	Pin	Signal
	1 (Tip)	Audio_Out_Left
	2 (Ring)	Audio_Out_Right
	3 (Shield)	Ground

# Monitor

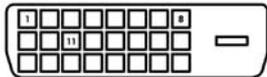
## Connector and Icon



Pin	Signal	Pin	Signal
1	Red Analog	9	+5V (fused)
2	Green Analog	10	Ground
3	Blue Analog	11	Not used
4	Not used	12	DDC Serial Data
5	Ground	13	Horizontal Sync
6	Ground	14	Vertical Sync
7	Ground	15	DDC Serial Clock
8	Ground		

# DVI Connector

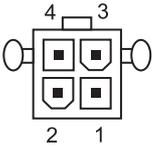
## Connector and Icon



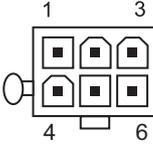
Pin	Signal	Pin	Signal
1	T.M.D.S. Data2-	13	T.M.D.S. Data3+
2	T.M.D.S. Data2+	14	+5V Power
3	T.M.D.S. Data2/4 Shield	15	Ground (for +5V)
4	T.M.D.S. Data4-	16	Hot Plug Detect

5	T.M.D.S. Data4+	17	T.M.D.S. Data0-
6	DDC Clock	18	T.M.D.S. Data0+
7	DDC Data	19	T.M.D.S. Data0/5 Shield
8	No Connect	20	T.M.D.S. Data5-
9	T.M.D.S. Data1-	21	T.M.D.S. Data5+
10	T.M.D.S. Data1+	22	T.M.D.S. Data Shield
11	T.M.D.S. Data1/3 Shield	23	T.M.D.S. Clock+
12	T.M.D.S. Data3-	24	T.M.D.S. Clock-

## 4-Pin Power (for CPU)

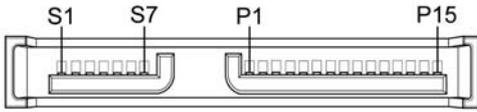
Connector and Icon	Pin	Signal
	1	GND
	2	GND
	3	+12V CPU
	4	-12V CPU

## 6-Pin Power (for CPU) (CMT, SFF)

Connector and Icon	Pin	Signal
	1	GND
	2	GND
	3	GND
	4	12V CPU
	5	12V CPU
	6	+12V

# SATA Data and Power

## Drive Connector

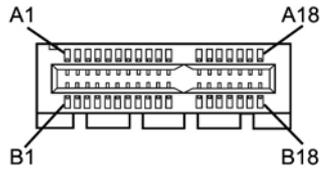


Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
S1	Ground	S2	A+	S3	A-	S4	Ground
S5	B-	S6	B+	S7	Ground		
P1	Ground	P2	V 3.3	P3	V 3.3	P4	Ground
P5	B-	P6	Ground	P7	V 5	P8	V 5
P9	V 5	P10	Ground	P11	Reserved	P12	Ground
P13	V 12	P14	V12	P15	V 12		

S = Data, P = Power

# PCI Express

## x1, x4, x8, and x16 PCI Express Connector



### Pin A

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	PRSNT1	6	JTAG3	11	PERST#	16	PERp0	21	PERp1
2	+12V	7	JTAG4	12	GND	17	PERn0	22	PERn1
3	+12V	8	JTAG5	13	REFCLK+	18	GND	23	GND
4	GND	9	+3.3V	14	REFCLK-	19	RSVD	24	GND
5	JTAG2	10	+3.3V	15	GND	20	GND	25	PERp2
26	PERn(2)	31	GND	36	PERn4	41	GND	46	GND
27	GND	32	RSVD	37	GND	42	GND	47	PERp7
28	GND	33	RSVD	38	GND	43	PERp6	48	PERn7
29	PERp3	34	GND	39	PERp5	44	PERn6	49	GND
30	PERn3	35	PERp4	40	PERn5	45	GND	50	RSVD
51	GND	56	PERp9	61	PERn10	66	GND	71	GND
52	PERp8	57	PERn9	62	GND	67	GND	72	PERp13
53	PERn8	58	GND	63	GND	68	PERp12	73	PERn13
54	GND	59	GND	64	PERp11	69	PERn12	74	GND
55	GND	60	PERp10	65	PERn11	70	GND	75	GND
76	PERp14	81	PERn15						
77	PERn14	82	GND						
78	GND								
79	GND								
80	PERp15								

**NOTE:** x1 PCI Express uses pins 1-18

x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-82

# PCI Express

## x1, x4, x8, and x16 PCI Express Connector



### Pin B

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	+12V	6	SMDAT	11	WAKE#	16	GND	21	GND
2	+12V	7	GND	12	RSVD	17	GND	22	GND
3	RSVD	8	+3.3 V	13	GND	18	GND	23	PETp2
4	GND	9	JTAG1	14	PETp0	19	PETp1	24	PETn2
5	SMCLK	10	3.3vAux	15	PETn0	20	PETn1	25	GND
26	GND	31	PRSNT2#	36	GND	41	PETp6	46	PETn7
27	PETp3	32	GND	37	PETp5	42	PRTn6	47	GND
28	PETn3	33	PETp4	38	PETn5	43	GND	48	PRSNT2#
29	GND	34	PETn4	39	GND	44	GND	49	GND
30	RSVD	35	GND	40	GND	45	PETp7	50	PETp8
51	PETn8	56	GND	61	GND	66	PETp12	71	PETn13
52	GND	57	GND	62	PETp11	67	PETn12	72	GND
53	GND	58	PETp10	63	PETn11	68	GND	73	GND
54	PETp9	59	PETn10	64	GND	69	GND	74	PETp14
55	PETn9	60	GND	65	GND	70	PETp13	75	PETn14
76	GND	81	PRSNT2#						
77	GND	82	RSVD						
78	PETp15								
79	PETn15								
80	GND								

**NOTE:** x1 PCI Express uses pins 1-18

x4 PCI Express uses pins 1-32

x8 PCI Express uses pins 1-49

x16 PCI Express uses pins 1-8

---

## B Power Cord Set Requirements

The power supplies on some computers have external power switches. The voltage select switch feature on the computer permits it to operate from any line voltage between 100-120 or 220-240 volts AC. Power supplies on those computers that do not have external power switches are equipped with internal switches that sense the incoming voltage and automatically switch to the proper voltage.

The power cord set received with the computer meets the requirements for use in the country where you purchased the equipment.

Power cord sets for use in other countries must meet the requirements of the country where you use the computer.

### General Requirements

The requirements listed below are applicable to all countries:

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 mm<sub>2</sub> or 18AWG, and the length of the cord must be between 1.8 m (6 feet) and 3.6 m (12 feet).

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

---

⚠ **WARNING!** Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.

---

### Japanese Power Cord Requirements

For use in Japan, use only the power cord received with this product.

---

⚠ **CAUTION:** Do not use the power cord received with this product on any other products.

---

# Country-Specific Requirements

Additional requirements specific to a country are shown in parentheses and explained below.

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

1. The flexible cord must be Type HO5VV-F, 3-conductor, 0.75mm<sub>2</sub> conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.
3. Appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 0.75 mm<sub>2</sub> conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

---

## C POST Error Messages

This appendix lists the error codes, error messages, and the various indicator light and audible sequences that you may encounter during Power-On Self-Test (POST) or computer restart, the probable source of the problem, and steps you can take to resolve the error condition.

POST Message Disabled suppresses most system messages during POST, such as memory count and non-error text messages. If a POST error occurs, the screen will display the error message. To manually switch to the POST Messages Enabled mode during POST, press any key (except [F10](#), [F11](#), or [F12](#)). The default mode is POST Message Disabled.

The speed at which the computer loads the operating system and the extent to which it is tested are determined by the POST mode selection.

Quick Boot is a fast startup process that does not run all of the system level tests, such as the memory test. Full Boot runs all of the ROM-based system tests and takes longer to complete.

Full Boot may also be enabled to run every 1 to 30 days on a regularly scheduled basis. To establish the schedule, reconfigure the computer to the Full Boot Every x Days mode, using Computer Setup.

---

 **NOTE:** For more information on Computer Setup, see the *Computer Setup (F10) Utility Guide*.

# POST Numeric Codes and Text Messages

This section covers those POST errors that have numeric codes associated with them. The section also includes some text messages that may be encountered during POST.

 **NOTE:** The computer will beep once after a POST text message is displayed on the screen.

**Table C-1 Numeric Codes and Text Messages**

Control panel message	Description	Recommended action
101-Option ROM Checksum Error	System ROM or expansion board option ROM checksum.	<ol style="list-style-type: none"> <li>1. Verify the correct ROM.</li> <li>2. Flash the ROM if needed.</li> <li>3. If an expansion board was recently added, remove it to see if the problem remains.</li> <li>4. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li> <li>5. If the message disappears, there may be a problem with the expansion card.</li> <li>6. Replace the system board.</li> </ol>
103-System Board Failure	DMA or timers.	<ol style="list-style-type: none"> <li>1. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li> <li>2. Remove expansion boards.</li> <li>3. Replace the system board.</li> </ol>
104-ECC Network Controller has been enabled	Enable network controller	<ol style="list-style-type: none"> <li>1. For this setting to take effect, remove power from the system for 15 seconds.</li> </ol>
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	<ol style="list-style-type: none"> <li>1. If a PCI expansion card was recently added, remove it to see if the problem remains.</li> <li>2. In Computer Setup, set <b>Advanced &gt; Device Options &gt; NIC PXE Option ROM Download</b> to <b>DISABLE</b> to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server.</li> </ol>
162-System Options Not Set	<p>Configuration incorrect.</p> <p>RTC (real-time clock) battery may need to be replaced.</p>	<p>Run Computer Setup and check the configuration in <b>Advanced &gt; Onboard Devices</b>.</p> <p>Reset the date and time under <b>Control Panel</b>. If the problem persists, replace the RTC battery. See the <i>Hardware Reference Guide</i> for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.</p>

**Table C-1 Numeric Codes and Text Messages (continued)**

Control panel message	Description	Recommended action
163-Time & Date Not Set	Invalid time or date in configuration memory.  RTC (real-time clock) battery may need to be replaced.	Reset the date and time under <b>Control Panel</b> (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the <i>Hardware Reference Guide</i> for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.
163-Time & Date Not Set	CMOS jumper may not be properly installed.	Check for proper placement of the CMOS jumper if applicable.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the <b>F1</b> key to save the memory changes.
164-MemorySize Error	Memory configuration incorrect.	<ol style="list-style-type: none"><li>1. Run Computer Setup or Windows utilities.</li><li>2. Make sure the memory module(s) are installed properly.</li><li>3. If third-party memory has been added, test using HP-only memory.</li><li>4. Verify proper memory module type.</li></ol>
201-Memory Error	RAM failure.	<ol style="list-style-type: none"><li>1. Ensure memory modules are correctly installed.</li><li>2. Verify proper memory module type.</li><li>3. Remove and replace the identified faulty memory module(s).</li><li>4. If the error persists after replacing memory modules, replace the system board.</li></ol>
213-Incompatible Memory Module in Memory Socket(s) X, X, ...	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	<ol style="list-style-type: none"><li>1. Verify proper memory module type.</li><li>2. Try another memory socket.</li><li>3. Replace DIMM with a module conforming to the SPD standard.</li></ol>
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
301-Keyboard Error	Keyboard failure.	<ol style="list-style-type: none"><li>1. Reconnect keyboard with computer turned off.</li><li>2. Check connector for bent or missing pins.</li><li>3. Ensure that none of the keys are depressed.</li><li>4. Replace keyboard.</li></ol>

**Table C-1 Numeric Codes and Text Messages (continued)**

Control panel message	Description	Recommended action
303-Keyboard Controller Error	I/O board keyboard controller.	<ol style="list-style-type: none"> <li>1. Reconnect keyboard with computer turned off.</li> <li>2. Replace the system board.</li> </ol>
304-Keyboard or System Unit Error	Keyboard failure.	<ol style="list-style-type: none"> <li>1. Reconnect the keyboard with computer turned off.</li> <li>2. Ensure that none of the keys are depressed.</li> <li>3. Replace the keyboard.</li> <li>4. Replace the system board.</li> </ol>
501-Display Adapter Failure	Graphics display controller.	<ol style="list-style-type: none"> <li>1. Reseat the graphics card (if applicable).</li> <li>2. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li> <li>3. Verify monitor is attached and turned on.</li> <li>4. Replace the graphics card (if possible).</li> </ol>
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.
513-Front Chassis fan not detected	Front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> <li>1. Reseat front chassis fan.</li> <li>2. Reseat fan cable.</li> <li>3. Replace front chassis fan.</li> </ol>
515-Power Supply fan not detected	Power supply fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> <li>1. Reseat power supply fan.</li> <li>2. Reseat fan cable.</li> <li>3. Replace power supply fan.</li> </ol>
660-Display cache is detected unreliable	Integrated graphics controller display cache is not working properly and will be disabled.	Replace system board if minimal graphics degrading is an issue.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.
917-Front Audio Not Connected	Front audio harness has been detached or unseated from motherboard.	Reconnect or replace front audio harness.
918-Front USB Not Connected	Front USB harness has been detached or unseated from motherboard.	Reconnect or replace front USB harness.
921-Device in PCI Express slot failed to initialize	There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1.	Try rebooting the system. If the error reoccurs, the device may not work with this system

**Table C-1 Numeric Codes and Text Messages (continued)**

Control panel message	Description	Recommended action
1151-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	<ol style="list-style-type: none"><li>1. Remove any serial port expansion cards.</li><li>2. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li><li>3. Reconfigure card resources and/or run Computer Setup or Windows utilities.</li></ol>
1152-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	<ol style="list-style-type: none"><li>1. Remove any serial port expansion cards.</li><li>2. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li><li>3. Reconfigure card resources and/or run Computer Setup or Windows utilities.</li></ol>
1155-Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	<ol style="list-style-type: none"><li>1. Remove any serial port expansion cards.</li><li>2. Clear CMOS. (See <a href="#">Password Security and Resetting CMOS on page 157.</a>)</li><li>3. Reconfigure card resources and/or run Computer Setup or Windows utilities.</li></ol>
1720-SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"><li>1. Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under <b>Storage &gt; DPS Self-test.</b></li><li>2. Apply hard drive firmware patch if applicable. (Available at <a href="http://www.hp.com/support">http://www.hp.com/support</a>.)</li><li>3. Back up contents and replace hard drive.</li></ol>
1796-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 connectors must be used before SATA 2 and SATA 3.	Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA 1, and SATA 2.
1801-Microcode Patch Error	Processor is not supported by ROM BIOS.	<ol style="list-style-type: none"><li>1. Upgrade BIOS to proper version.</li><li>2. Change the processor.</li></ol>

**Table C-1 Numeric Codes and Text Messages (continued)**

<b>Control panel message</b>	<b>Description</b>	<b>Recommended action</b>
2200-PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none"><li>1. Reboot the computer.</li><li>2. Unplug the power cord, re-seat the memory modules, and reboot the computer.</li><li>3. If the memory configuration was recently changed, unplug the computer, restore the original memory configuration, and reboot the computer.</li><li>4. If the error persists, replace the system board.</li></ol>
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	<ol style="list-style-type: none"><li>1. Reconnect keyboard with computer turned off.</li><li>2. Check connector for bent or missing pins.</li><li>3. Ensure that none of the keys are depressed.</li><li>4. Replace keyboard.</li></ol>
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

# Interpreting POST Diagnostic Front Panel LEDs and Audible Codes

This section covers the front panel LED codes as well as the audible codes that may occur before or during POST that do not necessarily have an error code or text message associated with them.

**⚠ WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

**📖 NOTE:** If you see flashing LEDs on a PS/2 keyboard, look for flashing LEDs on the front panel of the computer and refer to the following table to determine the front panel LED codes.

Recommended actions in the following table are listed in the order in which they should be performed.

Not all diagnostic lights and audible codes are available on all models.

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes**

Activity	Beeps	Possible Cause	Recommended Action
Green Power LED On.	None	Computer on.	None
Green Power LED flashes every two seconds.	None	Computer in Suspend to RAM mode (some models only) or normal Suspend mode.	None required. Press any key or move the mouse to wake the computer.
Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	2	Processor thermal protection activated:  A fan may be blocked or not turning.  OR  The heat sink/fan assembly is not properly attached to the processor.	<ol style="list-style-type: none"> <li>1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.</li> <li>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.</li> <li>3. If fan is plugged in, but is not spinning, then replace heat sink/fan assembly.</li> <li>4. Contact an authorized reseller or service provider.</li> </ol>
Red Power LED flashes three times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	3	Processor not installed (not an indicator of bad processor).	<ol style="list-style-type: none"> <li>1. Check to see that the processor is present.</li> <li>2. Reseat the processor.</li> </ol>

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded).  OR  The incorrect external power supply adapter is being used on the USDT.	<ol style="list-style-type: none"><li>1. Open the hood and ensure the 4 or 6-wire power supply cable is seated into the connector on the system board.</li><li>2. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). 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 that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly.</li><li>3. Replace the power supply.</li><li>4. Replace the system board.</li></ol> <p>OR</p> <p>The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter.</p>
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	<p><b>CAUTION:</b> To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.</p> <ol style="list-style-type: none"><li>1. Reseat DIMMs.</li><li>2. Replace DIMMs one at a time to isolate the faulty module.</li><li>3. Replace third-party memory with HP memory.</li><li>4. Replace the system board.</li></ol>
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none"><li>1. Reseat the graphics card.</li><li>2. Replace the graphics card.</li><li>3. Replace the system board.</li></ol> <p>For systems with integrated graphics, replace the system board.</p>

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes seven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	7	System board failure (ROM detected failure prior to video).	Replace the system board.
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	<ol style="list-style-type: none"><li>1. Reflash the system ROM with the latest BIOS image. See the "Boot Block Emergency Recovery Mode" section of the <i>Desktop Management Guide</i> for more information.</li><li>2. Replace the system board.</li></ol>
Red Power LED flashes nine times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	9	System powers on but is unable to boot.	<ol style="list-style-type: none"><li>1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region.</li><li>2. Unplug the AC power cord from the computer, wait 30 seconds, then plug the power cord back in to the computer.</li><li>3. Replace the system board.</li><li>4. Replace the processor.</li></ol>
Red Power LED flashes ten times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	10	Bad option card.	<ol style="list-style-type: none"><li>1. Check each option card by removing the card (one at a time if multiple cards), then power on the system to see if fault goes away.</li><li>2. Once a bad card is identified, remove and replace the bad option card.</li><li>3. Replace the system board.</li></ol>

**Table C-2 Diagnostic Front Panel LEDs and Audible Codes (continued)**

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes eleven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	11	The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none"><li>1. Install a TXT capable processor.</li><li>2. Disable TXT in the Computer Setup (F10) utility.</li><li>3. Reinstall the original processor.</li></ol>
System does not power on and LEDs are not flashing.	None	System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, the power button is working correctly. Try the following:</p> <ol style="list-style-type: none"><li>1. Check that the voltage selector (some models), located on the rear of the power supply, is set to the appropriate voltage. Proper voltage setting depends on your region.</li><li>2. Replace the system board.</li></ol> <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:</p> <ol style="list-style-type: none"><li>1. Check that the unit is plugged into a working AC outlet.</li><li>2. Open hood and check that the power button harness is properly connected to the system board.</li><li>3. Check that both power supply cables are properly connected to the system board.</li><li>4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness. If the problem persists, replace the system board.</li><li>5. If the 5V_aux light on the system board is not turned on, remove the expansion cards one at a time until the 5V_aux light on the system board turns on. If the problem persists, replace the power supply.</li></ol>

---

# D Troubleshooting Without Diagnostics

This chapter provides information on how to identify and correct minor problems, such as diskette drive, hard drive, optical drive, graphics, audio, memory, and software problems. If you encounter problems with the computer, refer to the tables in this chapter for probable causes and recommended solutions.

 **NOTE:** For information on specific error messages that may appear on the screen during Power-On Self-Test (POST) at startup, refer to [POST Error Messages on page 102](#).

---

## Safety and Comfort

 **WARNING!** Misuse of the computer or failure to establish a safe and comfortable work environment may result in discomfort or serious injury. Refer to the *Safety & Comfort Guide* at <http://www.hp.com/ergo> for more information on choosing a workspace and creating a safe and comfortable work environment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. For more information, refer to the *Safety & Regulatory Information* guide.

---

## Before You Call for Technical Support

If you are having problems with the computer, try the appropriate solutions below to try to isolate the exact problem before calling for technical support.

- Run the HP diagnostic tool.
- Run the hard drive self-test in Computer Setup. Refer to the *Computer Setup (F10) Utility Guide* for more information.
- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to [POST Error Messages on page 102](#) for more information.
- If the screen is blank, plug the monitor into a different video port on the computer if one is available. Or, replace the monitor with a monitor that you know is functioning properly.
- If you are working on a network, plug another computer with a different cable into the network connection. There may be a problem with the network plug or cable.
- If you recently added new hardware, remove the hardware and see if the computer functions properly.

- If you recently installed new software, uninstall the software and see if the computer functions properly.
- Boot the computer to the Safe Mode to see if it will boot without all of the drivers loaded. When booting the operating system, use “Last Known Configuration.”
- Refer to the comprehensive online technical support at <http://www.hp.com/support>.
- Refer to [Helpful Hints on page 113](#) in this guide.

To assist you in resolving problems online, HP Instant Support Professional Edition provides you with self-solve diagnostics. If you need to contact HP support, use HP Instant Support Professional Edition's online chat feature. Access HP Instant Support Professional Edition at: <http://www.hp.com/go/ispe>.

Access the Business Support Center (BSC) at <http://www.hp.com/go/bizsupport> for the latest online support information, software and drivers, proactive notification, and worldwide community of peers and HP experts.

If it becomes necessary to call for technical assistance, be prepared to do the following to ensure that your service call is handled properly:

- Be in front of your computer when you call.
- Write down the computer serial number, product ID number, and monitor serial number before calling.
- Spend time troubleshooting the problem with the service technician.
- Remove any hardware that was recently added to your system.
- Remove any software that was recently installed.
- Restore the system from the Recovery Disc Set that you created or restore the system to its original factory condition in HP Backup and Recovery Manager.

---

△ **CAUTION:** Restoring the system will erase all data on the hard drive. Be sure to back up all data files before running the restore process.

 **NOTE:** For sales information and warranty upgrades (Care Packs), call your local authorized service provider or dealer.

---

## Helpful Hints

If you encounter problems with the computer, monitor, or software, see the following list of general suggestions before taking further action:

- Check that the computer and monitor are plugged into a working electrical outlet.
- Check that the voltage select switch (some models) is set to the appropriate voltage for your region (115V or 230V).
- Check that the computer is turned on and the green power light is on.
- Check that the monitor is turned on and the green monitor light is on.

- Check the Power LED on the front of the computer to see if it is flashing red. The flashing lights are error codes that will help you diagnose the problem. Refer to [POST Error Messages on page 102](#) for more information.
  - Turn up the brightness and contrast controls of the monitor if the monitor is dim.
  - Press and hold any key. If the system beeps, then the keyboard should be operating correctly.
  - Check all cable connections for loose connections or incorrect connections.
  - Wake the computer by pressing any key on the keyboard or pressing the power button. If the system remains in suspend mode, shut down the computer by pressing and holding the power button for at least four seconds then press the power button again to restart the computer. If the system will not shut down, unplug the power cord, wait a few seconds, then plug it in again. The computer will restart if it is set to power on automatically as soon as power is restored in Computer Setup. If it does not restart, press the power button to start the computer.
  - Reconfigure the computer after installing a non-plug and play expansion board or other option. See [Solving Hardware Installation Problems on page 140](#) for instructions.
  - Be sure that all the needed device drivers have been installed. For example, if you are using a printer, you need a driver for that model printer.
  - Remove all bootable media (diskette, CD, or USB device) from the system before turning it on.
  - If you have installed an operating system other than the factory-installed operating system, check to be sure that it is supported on the system.
  - If the system has multiple video sources (embedded, PCI, or PCI-Express adapters) installed (embedded video on some models only) and a single monitor, the monitor must be plugged into the monitor connector on the source selected as the primary VGA adapter. During boot, the other monitor connectors are disabled and if the monitor is connected into these ports, the monitor will not function. You can select which source will be the default VGA source in Computer Setup.
- 
- △ **CAUTION:** When the computer is plugged into an AC power source, there is always voltage applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.
-

# Solving General Problems

You may be able to easily resolve the general problems described in this section. If a problem persists and you are unable to resolve it yourself or if you feel uncomfortable about performing the operation, contact an authorized dealer or reseller.

⚠ **WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

---

## Computer appears locked up and will not turn off when the power button is pressed.

---

Cause	Solution
Software control of the power switch is not functional.	<ol style="list-style-type: none"><li>1. Press and hold the power button for at least four seconds until the computer turns off.</li><li>2. Disconnect the power cord from the electrical outlet.</li></ol>

---

---

## Computer will not respond to USB keyboard or mouse.

---

Cause	Solution
Computer is in <b>standby</b> mode.	To resume from <b>standby</b> mode, press the power button or press any key.  <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
System has locked up.	Restart computer.

---

---

## Computer date and time display is incorrect.

---

Cause	Solution
RTC (real-time clock) battery may need to be replaced.  <b>NOTE:</b> Connecting the computer to a live AC outlet prolongs the life of the RTC battery.	First, reset the date and time under <b>Control Panel</b> (Computer Setup can also be used to update the RTC date and time). If the problem persists, replace the RTC battery. See the <i>Hardware Reference Guide</i> for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.

---

---

## Cursor will not move using the **arrow** keys on the keypad.

---

Cause	Solution
The <b>Num Lock</b> key may be on.	Press the <b>Num Lock</b> key. The Num Lock light should not be on if you want to use the <b>arrow</b> keys. The <b>Num Lock</b> key can be disabled (or enabled) in Computer Setup.

---

**There is no sound or sound volume is too low.**

<b>Cause</b>	<b>Solution</b>
System volume may be set low or muted.	<ol style="list-style-type: none"><li>1. Check the F10 BIOS settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers).</li><li>2. Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly.</li><li>3. Use the system volume control available in the operating system to make sure the speakers are not muted or to increase the volume.</li></ol>

**Cannot remove computer cover or access panel.**

<b>Cause</b>	<b>Solution</b>
Smart Cover Lock, featured on some computers, is locked.	Unlock the Smart Cover Lock using Computer Setup.  The Smart Cover FailSafe Key, a device for manually disabling the Smart Cover Lock, is available from HP. You will need the FailSafe Key in case of forgotten password, power loss, or computer malfunction. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.

**Poor performance is experienced.**

<b>Cause</b>	<b>Solution</b>
Processor is hot.	<ol style="list-style-type: none"><li>1. Make sure airflow to the computer is not blocked. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.</li><li>2. Make sure fans are connected and working properly (some fans only operate when needed).</li><li>3. Make sure the processor heat sink is installed properly.</li></ol>
Hard drive is full.	Transfer data from the hard drive to create more space on the hard drive.
Low on memory.	Add more memory.
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.

**Poor performance is experienced.**

<b>Cause</b>	<b>Solution</b>
Too many applications running.	<ol style="list-style-type: none"><li>1. Close unnecessary applications to free up memory.</li><li>2. Add more memory. Some applications run in the background and can be closed by right-clicking on their corresponding icons in the task tray. To prevent these applications from launching at startup, go to <b>Start &gt; Run</b> (Windows XP), <b>Start &gt; Accessories &gt; Run</b> (Windows Vista), or click on the Windows 7 start icon in the bottom left corner of the screen (Windows 7) and type <code>msconfig</code>. On the <b>Startup</b> tab of the System Configuration Utility, clear applications that you do not want to launch automatically.</li></ol>
Some software applications, especially games, are stressful on the graphics subsystem	<ol style="list-style-type: none"><li>1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application.</li><li>2. Add more memory.</li><li>3. Upgrade the graphics solution.</li></ol>
Cause unknown.	Restart the computer.

**Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing).**

<b>Cause</b>	<b>Solution</b>
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	<ol style="list-style-type: none"><li>1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.</li><li>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.</li><li>3. If fan is plugged in, but is not spinning, then replace the heat sink/fan assembly.</li><li>4. Contact an authorized reseller or service provider.</li></ol>

**System does not power on and the LEDs on the front of the computer are not flashing.**

---

<b>Cause</b>	<b>Solution</b>
System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then:</p> <ol style="list-style-type: none"><li>1. Check that the voltage selector, located on the rear of the power supply on some models, is set to the appropriate voltage. Proper voltage setting depends on your region.</li><li>2. Remove the expansion cards one at a time until the 5V_aux light on the system board turns on.</li><li>3. Replace the system board.</li></ol> <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:</p> <ol style="list-style-type: none"><li>1. Check that the unit is plugged into a working AC outlet.</li><li>2. Open hood and check that the power button harness is properly connected to the system board.</li><li>3. Check that both power supply cables are properly connected to the system board.</li><li>4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button harness.</li><li>5. If the 5V_aux light on the system board is off, then replace the power supply.</li><li>6. Replace the system board.</li></ol>

---

# Solving Power Problems

Common causes and solutions for power problems are listed in the following table.

## Power supply shuts down intermittently.

Cause	Solution
Voltage selector switch on rear of computer chassis (some models) not switched to correct line voltage (115V or 230V).	Select the proper AC voltage using the selector switch.
Power supply will not turn on because of internal power supply fault.	Contact an authorized service provider to replace the power supply.

## Computer powered off automatically and the Power LED flashes Red two times, once every second, followed by a two second pause, and the computer beeps two times. (Beeps stop after fifth iteration but LEDs continue flashing.)

Cause	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	<ol style="list-style-type: none"><li>1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.</li><li>2. Open hood, press power button, and see if the processor fan spins. If the processor fan is not spinning, make sure the fan's cable is plugged onto the system board header.</li><li>3. If fan is plugged in, but is not spinning, then replace the heat sink/fan assembly.</li><li>4. Contact an authorized reseller or service provider.</li></ol>

**Power LED flashes Red four times, once every second, followed by a two second pause, and the computer beeps four times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

Cause	Solution
Power failure (power supply is overloaded).	<ol style="list-style-type: none"><li>1. Check that the voltage selector, located on the rear of the power supply (some models), is set to the appropriate voltage. Proper voltage setting depends on your region.</li><li>2. Open the hood and ensure the 4- or 6-wire power supply cable is seated into the connector on the system board.</li><li>3. Check if a device is causing the problem by removing ALL attached devices (such as hard, diskette, or optical drives, and expansion cards). 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 that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly.</li><li>4. Replace the power supply.</li><li>5. Replace the system board.</li></ol>
The incorrect external power supply adapter is being used on the USDT.	The USDT power supply adapter must be at 135W and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied USDT power supply adapter.

# Solving Diskette Problems

Common causes and solutions for diskette problems are listed in the following table.

 **NOTE:** The computer does not support internal diskette drives. Only USB diskette drives are supported.

**NOTE:** You may need to reconfigure the computer when you add or remove hardware, such as an additional diskette drive. See [Solving Hardware Installation Problems on page 140](#) for instructions.

## Diskette drive light stays on.

Cause	Solution
Diskette is damaged.	<p>In Microsoft Windows XP, right-click <b>Start</b>, click <b>Explore</b>, and select a drive. Select <b>File &gt; Properties &gt; Tools</b>. Under <b>Error-checking</b> click <b>Check Now</b>.</p> <p>In Microsoft Windows Vista and Windows 7, right-click <b>Start</b>, click <b>Explore</b>, and right-click on a drive. Select <b>Properties</b> then select the <b>Tools</b> tab. Under <b>Error-checking</b> click <b>Check Now</b>.</p>
Diskette is incorrectly inserted.	Remove diskette and reinsert.
Drive cable is not properly connected.	Reconnect drive cable. Ensure that all four pins on the diskette power cable are connected to the drive.

## Drive not found.

Cause	Solution
Cable is loose.	Reseat diskette drive data and power cable.
Removable drive is not seated properly.	Reseat the drive.

## Diskette drive cannot write to a diskette.

Cause	Solution
Diskette is not formatted.	<p>Format the diskette.</p> <ol style="list-style-type: none"><li>1. From Windows Explorer select the disk (<b>A</b>) drive.</li><li>2. Right-click the drive letter and select <b>Format</b>.</li><li>3. Select the desired options, and click <b>Start</b> to begin formatting the diskette.</li></ol>
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.

#### Diskette drive cannot write to a diskette.

Cause	Solution
Not enough space is left on the diskette.	<ol style="list-style-type: none"><li>1. Use another diskette.</li><li>2. Delete unneeded files from diskette.</li></ol>
Diskette is damaged.	Replace the damaged disk.

#### Cannot format diskette.

Cause	Solution
Invalid media reported.	When formatting a disk in MS-DOS, you may need to specify diskette capacity. For example, to format a 1.44-MB diskette, type the following command at the MS-DOS prompt:  <b>FORMAT A: /F:1440</b>
Disk may be write-protected.	Open the locking device on the diskette.
Legacy diskette writes are disabled in Computer Setup.	Enter Computer Setup and enable <b>Legacy Diskette Write</b> in <b>Storage &gt; Storage Options</b> .

#### A problem has occurred with a disk transaction.

Cause	Solution
The directory structure is bad, or there is a problem with a file.	In Microsoft Windows XP, right-click <b>Start</b> , click <b>Explore</b> , and select a drive. Select <b>File &gt; Properties &gt; Tools</b> . Under <b>Error-checking</b> , click <b>Check Now</b> .  In Microsoft Windows Vista and Windows 7, right-click <b>Start</b> , click <b>Explore</b> , and right-click on a drive. Select <b>Properties</b> then select the <b>Tools</b> tab. Under <b>Error-checking</b> click <b>Check Now</b> .

#### Diskette drive cannot read a diskette.

Cause	Solution
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.**

<b>Cause</b>	<b>Solution</b>
A diskette that does not contain the system files needed to start the computer has been inserted in the drive.	When drive activity stops, remove the diskette and press the <a href="#">Spacebar</a> . The computer should start up.
Diskette error has occurred.	Restart the computer by pressing the power button.

**Cannot Boot to Diskette.**

<b>Cause</b>	<b>Solution</b>
Diskette is not bootable.	Replace with a bootable diskette.
Diskette boot has been disabled in Computer Setup.	<ol style="list-style-type: none"><li>1. Run Computer Setup and enable diskette boot in <b>Storage &gt; Boot Order</b>.</li><li>2. Run Computer Setup and enable diskette boot in <b>Storage &gt; Storage Options &gt; Removable Media Boot</b>.</li></ol> <p><b>NOTE:</b> Both steps should be used as the <b>Removable Media Boot</b> function in Computer Setup overrides the <b>Boot Order</b> enable command.</p>
Network server mode is enabled in Computer Setup.	Run Computer Setup and disable <b>Network Server Mode</b> in <b>Security &gt; Password Options</b> .

# Solving Hard Drive Problems

## Hard drive error occurs.

Cause	Solution
Hard disk has bad sectors or has failed.	<ol style="list-style-type: none"><li>1. In Microsoft Windows XP, right-click <b>Start</b>, click <b>Explore</b>, and select a drive. Select <b>File &gt; Properties &gt; Tools</b>. Under <b>Error-checking</b>, click <b>Check Now</b>.  In Microsoft Windows Vista and Windows 7, right-click <b>Start</b>, click <b>Explore</b>, and right-click on a drive. Select <b>Properties</b> then select the <b>Tools</b> tab. Under <b>Error-checking</b> click <b>Check Now</b>.</li><li>2. Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.</li></ol>

## Disk transaction problem.

Cause	Solution
Either the directory structure is bad or there is a problem with a file.	<p>In Microsoft Windows XP, right-click <b>Start</b>, click <b>Explore</b>, and select a drive. Select <b>File &gt; Properties &gt; Tools</b>. Under <b>Error-checking</b>, click <b>Check Now</b>.</p> <p>In Microsoft Windows Vista and Windows 7, right-click <b>Start</b>, click <b>Explore</b>, and right-click on a drive. Select <b>Properties</b> then select the <b>Tools</b> tab. Under <b>Error-checking</b> click <b>Check Now</b>.</p>

## Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	<p>See reconfiguration directions in the <a href="#">Solving Hardware Installation Problems on page 140</a> section. 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.</p> <p>If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under <b>Advanced &gt; Power-On</b>.</p>
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure <b>Device Available</b> is selected for the device's SATA port in <b>Security &gt; Device Security</b> .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in <b>Advanced &gt; Power-On Options</b> .

### Nonsystem disk/NTLDR missing message.

Cause	Solution
The system is trying to start from a diskette that is not bootable.	Remove the diskette from the diskette drive.
The system is trying to start from the hard drive but the hard drive may have been damaged.	<ol style="list-style-type: none"><li>1. Insert a bootable diskette into the diskette drive and restart the computer.</li><li>2. Check the hard drive format using fdisk: If NTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed.</li></ol>
System files missing or not properly installed.	<ol style="list-style-type: none"><li>1. Insert a bootable diskette into the diskette drive and restart the computer.</li><li>2. Check the hard drive format using Fdisk: If NFTFS formatting, use a third party reader to evaluate the drive. If FAT32 formatting, the hard drive cannot be accessed.</li><li>3. Install system files for the appropriate operating system.</li></ol>
Hard drive boot has been disabled in Computer Setup.	Run the Computer Setup utility and enable the hard drive entry in the <b>Storage &gt; Boot Order</b> list.
Bootable hard drive is not attached as first in a multi-hard drive configuration.	If attempting to boot from a hard drive, ensure it is attached to the system board connector labeled P60 SATA 0.
Bootable hard drive's controller is not listed first in the Boot Order.	Run the Computer Setup utility and select <b>Storage &gt; Boot Order</b> and ensure the bootable hard drive's controller is listed immediately under the <b>Hard Drive</b> entry.

### Computer will not boot from hard drive.

Cause	Solution
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure <b>Device Available</b> is selected for the device's SATA port in <b>Security &gt; Device Security</b> .
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in <b>Storage &gt; Boot Order</b> .
Hard Drive's "Emulation Type" is set to "None."	Run the Computer Setup utility and change the "Emulation Type" to "Hard Disk" in the device's details under <b>Storage &gt; Device Configuration</b> .
Hard drive is damaged.	Observe if the front panel Power LED is blinking RED and if any beeps are heard. See <a href="#">POST Error Messages on page 102</a> to determine possible causes for the blinking red and beep codes.  See the Worldwide Limited Warranty for terms and conditions.

---

**Computer seems to be locked up.**

---

<b>Cause</b>	<b>Solution</b>
Program in use has stopped responding to commands.	Attempt the normal Windows "Shut Down" procedure. If this fails, press the power button for four or more seconds to turn off the power. To restart the computer, press the power button again.

---

---

**The removable hard drive has no power to the hard drive enclosure.**

---

<b>Cause</b>	<b>Solution</b>
The lock on the enclosure is not turned to the "ON" position.	Insert the key and turn the lock clockwise 90 degrees. The green LED on the front of the enclosure should be on.
Power cable from the computer power supply to the enclosure frame is not properly connected.	Check the power supply to make sure it is properly connected to the rear of the enclosure frame.

---

---

**The removable hard drive is not recognized by the computer.**

---

<b>Cause</b>	<b>Solution</b>
The removable hard drive carrier is not fully seated in the enclosure frame or the hard drive is not fully seated in the carrier.	Push the carrier into the enclosure frame so that the connector on the rear of the frame is properly seated. If this does not solve the problem, turn off the computer, remove the carrier, and check to see if the connector on the hard drive is properly seated in the carrier.

---

---

**The removable hard drive enclosure is beeping and the green LED is flashing.**

---

<b>Cause</b>	<b>Solution</b>
Fan failure alarm on the removable hard drive enclosure has been activated.	Shut down the computer and contact HP for a replacement enclosure.

---

# Solving Media Card Reader Problems

## Media card will not work in a digital camera after formatting it in Microsoft Windows.

Cause	Solution
By default, Windows will format any media card with a capacity greater than 32MB with the FAT32 format. Most digital cameras use the FAT (FAT16 & FAT12) format and can not operate with a FAT32 formatted card.	Either format the media card in the digital camera or select FAT file system to format the media card in a computer with Windows.

## A write-protected or locked error occurs when attempting to write to the media card.

Cause	Solution
Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/Memory Stick/PRO card.	If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position.

## Can not write to the media card.

Cause	Solution
The media card is a read-only memory (ROM) card.	Check the manufacturer's documentation included with your card to see if it writable. Refer to the previous section for a list of compatible cards.
Media card is locked. Locking the media card is a safety feature that prevents writing to and deleting from an SD/Memory Stick/PRO card.	If using an SD card, make sure that the lock tab located on the right of the SD card is not in the locked position. If using a Memory Stick/PRO card, make sure that the lock tab located on the bottom of the Memory Stick/PRO card is not in the locked position.

## Unable to access data on the media card after inserting it into a slot.

Cause	Solution
The media card is not inserted properly, is inserted in the wrong slot, or is not supported.	Ensure that the card is inserted properly with the gold contact on the correct side. The green LED will light if inserted properly.

**Do not know how to remove a media card correctly.**

---

<b>Cause</b>	<b>Solution</b>
The computer's software is used to safely eject the card.	Open <b>My Computer</b> (Windows XP), <b>Computer</b> (Windows Vista), or <b>Devices and Printers</b> (Windows 7), right-click on the corresponding drive icon, and select <b>Eject</b> . Then pull the card out of the slot.  <b>NOTE:</b> Never remove the card when the green LED is flashing

---

**After installing the media card reader and booting to Windows, the reader and the inserted cards are not recognized by the computer.**

---

<b>Cause</b>	<b>Solution</b>
The operating system needs time to recognize the device if the reader was just installed into the computer and you are turning the PC on for the first time.	Wait a few seconds so that the operating system can recognize the reader and the available ports, and then recognize whatever media is inserted in the reader.

---

**After inserting a media card in the reader, the computer attempts to boot from the media card.**

---

<b>Cause</b>	<b>Solution</b>
The inserted media card has boot capability.	If you do not want to boot from the media card, remove it during boot or do not select the option to boot from the inserted media card during the boot process.

---

# Solving Display Problems

If you encounter display problems, see the documentation that came with the monitor and to the common causes and solutions listed in the following table.

## Blank screen (no video).

Cause	Solution
Monitor is not turned on and the monitor light is not on.	Turn on the monitor and check that the monitor light is on.
Bad monitor.	Try a different monitor.
The cable connections are not correct.	Check the cable connection from the monitor to the computer and to the electrical outlet.
You may have a screen blanking utility installed or energy saver features are enabled.	Press any key or click the mouse button and, if set, type your password.
System ROM is corrupted; system is running in Boot Block Emergency Recovery Mode (indicated by eight beeps).	Reflash the system ROM with the latest BIOS image. See the "Boot Block Emergency Recovery Mode" section of the <i>Desktop Management Guide</i> for more information
You are using a fixed-sync monitor and it 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 <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.  <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
Monitor cable is plugged into the wrong connector.	If the computer system has both an integrated graphics connector and an add-in graphics card connector, plug the monitor cable into the graphics card connector on the back of the computer.
Monitor settings in the computer are not compatible with the monitor.	<ol style="list-style-type: none"><li>In Windows XP Control Panel, double-click the <b>Display</b> icon and select the <b>Settings</b> tab.  In Windows Vista Control Panel, under <b>Appearance and Personalization</b>, select <b>Adjust screen resolution</b>.  In Windows 7, right click in an empty space on the desktop and select <b>Screen Resolution</b>.</li><li>Reset the resolution.</li></ol>
Monitor is configured to use an input that is not active.	Use the monitor's on-screen menu controls to select the input that is being driven by the system. Refer to the monitor's user documentation for more information on the on-screen controls and settings.

**Cannot enable integrated graphics after installing a PCI Express graphics card.**

<b>Cause</b>	<b>Solution</b>
On systems with Intel integrated graphics, the integrated graphics cannot be enabled after installing a PCI Express x16.	The integrated graphics can be enabled in Computer Setup if a PCI or PCI Express x1 graphics card is installed, but it cannot be enabled if there is a graphics card in the PCI Express x16 slot.

**Blank screen and the power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

<b>Cause</b>	<b>Solution</b>
Pre-video memory error.	<ol style="list-style-type: none"><li>1. Reseat DIMMs. Power on the system.</li><li>2. Replace DIMMs one at a time to isolate the faulty module.</li><li>3. Replace third-party memory with HP memory.</li><li>4. Replace the system board.</li></ol>

**Blank screen and the power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

<b>Cause</b>	<b>Solution</b>
Pre-video graphics error.	For systems with a graphics card: <ol style="list-style-type: none"><li>1. Reseat the graphics card. Power on the system.</li><li>2. Replace the graphics card.</li><li>3. Replace the system board.</li></ol> For systems with integrated graphics, replace the system board.

**Blank screen and the power LED flashes Red seven times, once every second, followed by a two second pause, and the computer beeps seven times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

<b>Cause</b>	<b>Solution</b>
System board failure (ROM detected failure prior to video).	Replace the system board.

**Monitor does not function properly when used with energy saver features.**

<b>Cause</b>	<b>Solution</b>
Monitor without energy saver capabilities is being used with energy saver features enabled.	Disable monitor energy saver feature.

### Dim characters.

Cause	Solution
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.

### Blurry video or requested resolution cannot be set.

Cause	Solution
If the graphics controller was upgraded, the correct graphics drivers may not be loaded.	Install the video drivers included in the upgrade kit.
Monitor is not capable of displaying requested resolution.	Change requested resolution.
Graphics card is bad.	Replace the graphics card.

### The picture is broken up, rolls, jitters, or flashes.

Cause	Solution
The monitor connections may be incomplete or the monitor may be incorrectly adjusted.	<ol style="list-style-type: none"><li>1. Be sure the monitor cable is securely connected to the computer.</li><li>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.</li><li>3. Fluorescent lights or fans may be too close to the monitor.</li></ol>
Monitor needs to be degaussed.	Degauss the monitor. Refer to the documentation that came with the monitor for instructions.

### Image is not centered.

Cause	Solution
Position may need adjustment.	Press the monitor's Menu button to access the OSD menu. Select <b>ImageControl/ Horizontal Position</b> or <b>Vertical Position</b> to adjust the horizontal or vertical position of the image.

**“No Connection, Check Signal Cable” displays on screen.**

<b>Cause</b>	<b>Solution</b>
Monitor video cable is disconnected.	Connect the video cable between the monitor and computer.  <b>CAUTION:</b> Ensure that the computer power is off while connecting the video cable.

**“Out of Range” displays on screen.**

<b>Cause</b>	<b>Solution</b>
Video resolution and refresh rate are set higher than what the monitor supports.	Restart the computer and enter Safe Mode. Change the settings to a supported setting then restart the computer so that the new settings take effect.

**Vibrating or rattling noise coming from inside a CRT monitor when powered on.**

<b>Cause</b>	<b>Solution</b>
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.**

<b>Cause</b>	<b>Solution</b>
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.**

<b>Cause</b>	<b>Solution</b>
Brightness and/or contrast settings are too high.	Lower brightness and/or 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).**

<b>Cause</b>	<b>Solution</b>
Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card.	<ol style="list-style-type: none"><li>1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu.</li><li>2. Manually synchronize the Clock and Clock Phase on-screen display functions. To download a SoftPak that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: <a href="http://www.hp.com/support">http://www.hp.com/support</a></li></ol>
Graphics card is not seated properly or is bad.	<ol style="list-style-type: none"><li>1. Reseat the graphics card.</li><li>2. Replace the graphics card.</li></ol>

**Certain typed symbols do not appear correct.**

<b>Cause</b>	<b>Solution</b>
The font you are using does not support that particular symbol.	Use the Character Map to locate and select the appropriate symbol. Click <b>Start &gt; All Programs &gt; Accessories &gt; System Tools &gt; Character Map</b> . You can copy the symbol from the Character Map into a document.

# Solving Audio Problems

If the computer has audio features and you encounter audio problems, see the common causes and solutions listed in the following table.

## Sound cuts in and out.

Cause	Solution
Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.
Direct sound latency, common in many media player applications.	In Windows XP only: <ol style="list-style-type: none"><li>1. From the <b>Control Panel</b>, select <b>Sounds and Audio Devices</b>.</li><li>2. On the <b>Audio</b> tab, select a device from the <b>Sound Playback</b> list.</li><li>3. Click the <b>Advanced</b> button and select the <b>Performance</b> tab.</li><li>4. Set the <b>Hardware acceleration</b> slider to <b>None</b> and the <b>Sample rate conversion quality</b> slider to <b>Good</b> and retest the audio.</li><li>5. Set the <b>Hardware acceleration</b> slider to <b>Full</b> and the <b>Sample rate conversion quality</b> slider to <b>Best</b> and retest the audio.</li></ol>

## Sound does not come out of the speaker or headphones.

Cause	Solution
Software volume control is turned down or muted.	Double-click the <b>Speaker</b> icon on the taskbar, then make sure that <b>Mute</b> is not selected and use the volume slider to adjust the volume.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: <b>Security &gt; Device Security &gt; System Audio</b> .
The external speakers are not turned on.	Turn on the external speakers.
The audio device may be connected to the wrong jack.	Ensure that the device is connected to the correct jack on the computer. The speakers should be plugged into the rear line-out jack and the headphones should be plugged into the front headphone jack.
External speakers plugged into the wrong audio jack on a recently installed sound card.	See the sound card documentation for proper speaker connection.
Digital CD audio is not enabled.	Enable digital CD audio. In the Device Manager, right-click on the CD/DVD device and select <b>Properties</b> . Make sure <b>Enable digital CD audio for this CD-ROM device</b> 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.

**Sound does not come out of the speaker or headphones.**

<b>Cause</b>	<b>Solution</b>
Computer is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.  <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.
Internal speaker is disabled in Computer Setup.	Enable the internal speaker in Computer Setup. Select <b>Advanced &gt; Device Options &gt; Internal Speaker</b> .
The application is set to use a different audio device than speakers.	Some graphics cards support audio over the DisplayPort connection, so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.
Some applications can select which audio output device is used.	Make sure the application has selected the correct audio device.
The operating system controls may be set to use a different audio device as the default output device than what is expected.	Set the operating system to use the correct audio device.

**Sound from headphones is not clear or muffled.**

<b>Cause</b>	<b>Solution</b>
Headphones are plugged into the rear audio output connector. The rear audio output connector is for powered audio devices and is not designed for headphone use.	Plug the headphones into the headphone connector on the front of the computer.

**Computer appears to be locked up while recording audio.**

<b>Cause</b>	<b>Solution</b>
The hard disk may be full.	Before recording, make sure there is enough free space on the hard disk. You can also try recording the audio file in a compressed format.

**Line-in jack is not functioning properly.**

<b>Cause</b>	<b>Solution</b>
Jack has been reconfigured in the audio driver or application software.	In the audio driver or application software, reconfigure the jack or set the jack to its default value.

**There is no sound or sound volume is too low.**

<b>Cause</b>	<b>Solution</b>
The application is set to use a different audio device than speakers.	Some graphics cards support audio over the DisplayPort connection, so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.
Some applications can select which audio output device is used.	Make sure the application has selected the correct audio device.
The operating system controls may be set to use a different audio device as the default output device than what is expected.	Set the operating system to use the correct audio device.

## Solving Printer Problems

If you encounter printer problems, see the documentation that came with the printer and to the common causes and solutions listed in the following table.

**Printer will not print.**

<b>Cause</b>	<b>Solution</b>
Printer is not turned on and online.	Turn the printer on and make sure it is online.
The correct printer drivers for the application are not installed.	<ol style="list-style-type: none"><li>1. Install the correct printer driver for the application.</li><li>2. Try printing using the MS-DOS command: <pre>DIR C:\ &gt; [printer port]</pre>where [printer port] is the address of the printer being used. If the printer works, reload the printer driver.</li></ol>
If you are on a network, you may not have made the connection to the printer.	Make the proper network connections to the printer.
Printer may have failed.	Run printer self-test.

**Printer will not turn on.**

<b>Cause</b>	<b>Solution</b>
The cables may not be connected properly.	Reconnect all cables and check the power cord and electrical outlet.

**Printer prints garbled information.**

<b>Cause</b>	<b>Solution</b>
The correct printer driver for the application is not installed.	Install the correct printer driver for the application.

**Printer prints garbled information.**

<b>Cause</b>	<b>Solution</b>
The cables may not be connected properly.	Reconnect all cables.
Printer memory may be overloaded.	Reset the printer by turning it off for one minute, then turn it back on.

**Printer is offline.**

<b>Cause</b>	<b>Solution</b>
The printer may be out of paper.	Check the paper tray and refill it if it is empty. Select online.

# Solving Keyboard and Mouse Problems

If you encounter keyboard or mouse problems, see the documentation that came with the equipment and to the common causes and solutions listed in the following table.

## Keyboard commands and typing are not recognized by the computer.

Cause	Solution
Keyboard connector is not properly connected.	<ol style="list-style-type: none"><li>1. On the Windows XP Desktop, click <b>Start &gt; Shut Down</b>.  On the Windows Vista or Windows 7 desktop, click <b>Start</b>, click the arrow on the lower right corner of the Start menu, then select <b>Shut Down</b>.</li><li>2. After the shutdown is complete, reconnect the keyboard to the back of the computer and restart the computer.</li></ol>
Program in use has stopped responding to commands.	Shut down your computer using the mouse and then restart the computer.
Keyboard needs repairs.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.  <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.

## Cursor will not move using the **arrow** keys on the keypad.

Cause	Solution
The <b>Num Lock</b> key may be on.	Press the <b>Num Lock</b> key. The Num Lock light should not be on if you want to use the <b>arrow</b> keys. The <b>Num Lock</b> key can be disabled (or enabled) in Computer Setup.

## Mouse does not respond to movement or is too slow.

Cause	Solution
Mouse connector is not properly plugged into the back of the computer.	Shut down the computer using the keyboard. <ol style="list-style-type: none"><li>1. Press the <b>Ctrl</b> and <b>Esc</b> keys at the same time (or press the <b>Windows logo</b> key) to display the <b>Start</b> menu.</li><li>2. Use the <b>arrow</b> keys to select <b>Shut Down</b> and then press the <b>Enter</b> key.</li><li>3. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart.</li></ol>

**Mouse does not respond to movement or is too slow.**

<b>Cause</b>	<b>Solution</b>
Program in use has stopped responding to commands.	Shut down the computer using the keyboard then restart the computer.
Mouse may need cleaning.	Remove the roller ball cover on the mouse and clean the internal components.
Mouse may need repair.	See the Worldwide Limited Warranty for terms and conditions.
Computer is in <b>standby</b> mode.	Press the power button to resume from <b>standby</b> mode.  <b>CAUTION:</b> When attempting to resume from <b>standby</b> mode, do not hold down the power button for more than four seconds. Otherwise, the computer will shut down and you will lose any unsaved data.

**Mouse will only move vertically, horizontally, or movement is jerky.**

<b>Cause</b>	<b>Solution</b>
Mouse roller ball or the rotating encoder shafts that make contact with the ball are dirty.	Remove roller ball cover from the bottom of the mouse and clean the internal components with a mouse cleaning kit available from most computer stores.

# Solving Hardware Installation Problems

You may need to reconfigure the computer when you add or remove hardware, such as an additional drive or expansion card. If you install a plug and play device, Windows automatically recognizes the device and configures the computer. If you install a non–plug and play device, you must reconfigure the computer after completing installation of the new hardware. In Windows, use the **Add Hardware Wizard** and follow the instructions that appear on the screen.

**⚠ WARNING!** When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the wall outlet and allow the internal system components to cool before touching.

---

## A new device is not recognized as part of the system.

---

Cause	Solution
Device is not seated or connected properly.	Ensure that the device is properly and securely connected and that pins in the connector are not bent down.
Cable(s) of new external device are loose or power cables are unplugged.	Ensure 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 computer, turn on the external device, then turn on the computer to integrate the device with the computer system.
When the system advised you of changes to the configuration, you did not accept them.	Reboot the computer and follow the instructions for accepting the changes.
A plug and play board may not automatically configure when added if the default configuration conflicts with other devices.	Use Windows 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.
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that <b>Device available</b> is selected for appropriate USB ports under <b>Security &gt; Device Security</b> .

---

## Computer will not start.

---

Cause	Solution
Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	<ol style="list-style-type: none"><li>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.  <b>NOTE:</b> DIMM 1 must always be installed.</li><li>2. Observe the beeps and LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems.</li><li>3. If you still cannot resolve the issue, contact Customer Support.</li></ol>

---

**Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

Cause	Solution
Memory is installed incorrectly or is bad.	<p><b>CAUTION:</b> To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.</p> <ol style="list-style-type: none"><li>1. Reseat DIMMs. Power on the system.</li><li>2. Replace DIMMs one at a time to isolate the faulty module.</li></ol> <p><b>NOTE:</b> DIMM 1 must always be installed.</p> <ol style="list-style-type: none"><li>3. Replace third-party memory with HP memory.</li><li>4. Replace the system board.</li></ol>

**Power LED flashes Red six times, once every second, followed by a two second pause, and the computer beeps six times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

Cause	Solution
Graphics card is not seated properly or is bad, or system board is bad.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none"><li>1. Reseat the graphics card. Power on the system.</li><li>2. Replace the graphics card.</li><li>3. Replace the system board.</li></ol> <p>For systems with integrated graphics, replace the system board.</p>

**Power LED flashes Red ten times, once every second, followed by a two second pause, and the computer beeps ten times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

Cause	Solution
Bad option card.	<ol style="list-style-type: none"><li>1. Check each option card by removing the cards one at time (if multiple cards), then power on the system to see if fault goes away.</li><li>2. Once bad card is identified, remove and replace bad option card.</li><li>3. Replace the system board.</li></ol>

# Solving Network Problems

Some common causes and solutions for network problems are listed in the following table. These guidelines do not discuss the process of debugging the network cabling.

## Wake-on-LAN feature is not functioning.

Cause	Solution
S5 Maximum Power Saving feature is enabled.	Disable the S5 Maximum Power Saving option in Computer Setup. Select <b>Power &gt; Hardware Power Management &gt; S5 Maximum Power Saving</b> .
Wake-on-LAN is not enabled.	<p>To enable Wake-on-LAN in Windows XP:</p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Double-click <b>Network Connections</b>.</li><li>3. Double-click <b>Local Area Connection</b>.</li><li>4. Click <b>Properties</b>.</li><li>5. Click <b>Configure</b>.</li><li>6. Click the <b>Power Management</b> tab, then select the check box to <b>Allow this device to bring the computer out of standby</b>.</li></ol> <p>To enable Wake-on-LAN in Windows Vista:</p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Under <b>Network and Internet</b>, select <b>View network status and tasks</b>.</li><li>3. In the <b>Tasks</b> list, select <b>Manage network connections</b>.</li><li>4. Double-click <b>Local Area Connection</b>.</li><li>5. Click the <b>Properties</b> button.</li><li>6. Click the <b>Configure</b> button.</li><li>7. Click the <b>Power Management</b> tab, then select the check box to <b>Allow this device to wake the computer</b>.</li></ol> <p>To enable Wake-on-LAN in Windows 7:</p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Under <b>Network and Sharing Center</b>, click <b>Change adapter settings</b>.</li><li>3. Right-click the network connection you want to enable WOL on and click <b>Properties</b>.</li><li>4. Click <b>Configure</b>.</li><li>5. Select <b>Allow this device to wake the computer</b>.</li><li>6. Click <b>OK</b>.</li></ol>

### Network driver does not detect network controller.

Cause	Solution
Network controller is disabled.	<ol style="list-style-type: none"><li>1. Run Computer Setup and enable network controller.</li><li>2. Enable the network controller in the operating system via Device Manager.</li></ol>
Incorrect network driver.	Check the network controller documentation for the correct driver or obtain the latest driver from the manufacturer's Web site.

### Network status link light never flashes.

**NOTE:** The network status light is supposed to flash when there is network activity.

Cause	Solution
No active network is detected.	Check cabling and network equipment for proper connection.
Network controller is not set up properly.	Check for the device status within Windows, such as Device Manager for driver load and the Network Connections applet within Windows for link status.
Network controller is disabled.	<ol style="list-style-type: none"><li>1. Run Computer Setup and enable network controller.</li><li>2. Enable the network controller in the operating system via Device Manager.</li></ol>
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.

Cause	Solution
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The cable is attached to the incorrect connector.	Ensure 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.	Ensure 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 <b>Advanced</b> menu, change the resource settings for the board.
The network controller is defective.	Contact an authorized service provider.

---

**Diagnostics passes, but the computer does not communicate with the network.**

---

<b>Cause</b>	<b>Solution</b>
Network drivers are not loaded, or driver parameters do not match current configuration.	Make sure the network drivers are loaded and that the driver parameters match the configuration of the network controller.  Make sure the correct network client and protocol is installed.
The network controller is not configured for this computer.	Select the <b>Network</b> icon in the <b>Control Panel</b> and configure the network controller.

---

---

**Network controller stopped working when an expansion board was added to the computer.**

---

<b>Cause</b>	<b>Solution</b>
Network controller interrupt is shared with an expansion board.	Under the Computer Setup <b>Advanced</b> 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 <b>Advanced</b> menu, change the resource settings for the board.

---

---

**Network controller stops working without apparent cause.**

---

<b>Cause</b>	<b>Solution</b>
The files containing the network drivers are corrupted.	Reinstall the network drivers, using the Recovery Disc Set created from the hard drive's Recovery Partition.
The cable is not securely connected.	Ensure that the cable is securely attached to the network connector and that the other end of the cable is securely attached to the correct device.
The network controller is defective.	Contact an authorized service provider.

---

---

**New network card will not boot.**

---

<b>Cause</b>	<b>Solution</b>
New network card may be defective or may 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.**

---

<b>Cause</b>	<b>Solution</b>
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.**

Cause	Solution
Unprogrammed EEPROM.	Contact an authorized service provider.

## Solving Memory Problems

If you encounter memory problems, some common causes and solutions are listed in the following table.

- △ **CAUTION:** Power may still be supplied to the DIMMs when the computer is turned off (depending on the Management Engine (ME) settings). To avoid damage to the DIMMs or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a DIMM module.

For those systems that support ECC memory, HP does not support mixing ECC and non-ECC memory. Otherwise, the computer will not boot the operating system.

- 📖 **NOTE:** The memory count will be affected by configurations with the Management Engine (ME) enabled. The ME uses 8MB of system memory in single channel mode or 16MB of memory in dual-channel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), third-party data storage, and other management functions.

**System will not boot or does not function properly after installing additional memory modules.**

Cause	Solution
A memory module is not installed in the XMM1 (or DIMM1) socket.	Ensure that a memory module is installed in the black XMM1 (or DIMM1) socket on the system board. This socket must be populated with a memory module.
Memory module is not the correct type or speed grade for the system or the new memory module is not seated properly.	Replace module with the correct industry-standard device for the computer. On some models, ECC and non-ECC memory modules cannot be mixed.

**Out of memory error.**

Cause	Solution
Memory configuration may 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.**

Cause	Solution
The memory modules may not be installed correctly.	Check that the memory modules have been installed correctly and that proper modules are used.
Integrated graphics may use system memory.	No action required.

**Insufficient memory error during operation.**

<b>Cause</b>	<b>Solution</b>
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 computer.

**Power LED flashes Red five times, once every second, followed by a two second pause, and the computer beeps five times. (Beeps stop after fifth iteration but LEDs continue flashing.)**

<b>Cause</b>	<b>Solution</b>
Memory is installed incorrectly or is bad.	<ol style="list-style-type: none"><li>1. Reseat DIMMs. Power on the system.</li><li>2. Replace DIMMs one at a time to isolate the faulty module.</li><li>3. Replace third-party memory with HP memory.</li><li>4. Replace the system board.</li></ol>

# Solving Processor Problems

If you encounter processor problems, common causes and solutions are listed in the following table.

## Poor performance is experienced.

Cause	Solution
Processor is hot.	<ol style="list-style-type: none"><li>1. Make sure the airflow to the computer is not blocked.</li><li>2. Make sure the fans are connected and working properly (some fans only operate when needed).</li><li>3. Make sure the processor heat sink is installed properly.</li></ol>

## Power LED flashes Red three times, once every second, followed by a two second pause.

Cause	Solution
Processor is not seated properly or not installed.	<ol style="list-style-type: none"><li>1. Check to see that the processor is present.</li><li>2. Reseat the processor.</li></ol>

## Power LED flashes Red eleven times, once every second, followed by a two second pause.

Cause	Solution
The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none"><li>1. Install a TXT capable processor.</li><li>2. Disable TXT in the Computer Setup (F10) utility.</li><li>3. Reinstall the original processor.</li></ol>

# Solving CD-ROM and DVD Problems

If you encounter CD-ROM or DVD problems, see the common causes and solutions listed in the following table or to the documentation that came with the optional device.

## System will not boot from CD-ROM or DVD drive.

Cause	Solution
The device is attached to a SATA port that has been hidden in the Computer Setup utility.	Run the Computer Setup utility and ensure <b>Device Available</b> is selected for the device's SATA port in <b>Security &gt; Device Security</b> .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in <b>Storage &gt; Storage Options</b> . Ensure CD-ROM is enabled in <b>Storage &gt; Boot Order</b> .
Network Server Mode is enabled in Computer Setup.	Run the Computer Setup utility and disable Network Server Mode in <b>Security &gt; Password Options</b> .
Non-bootable CD in drive.	Try a bootable CD in the drive.
Boot order not correct.	Run the Computer Setup utility and change boot sequence in <b>Storage &gt; Boot Order</b> .

## Drive not found (identified).

Cause	Solution
Cable could be loose.	Check cable connections.
The system may not have automatically recognized a newly installed device.	See reconfiguration directions in the <a href="#">Solving Hardware Installation Problems on page 140</a> section. 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.  If this is a newly installed drive, run the Computer Setup utility and try adding a POST delay under <b>Advanced &gt; Power-On Options</b> .
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure <b>Device Available</b> is selected for the device's SATA port in <b>Security &gt; Device Security</b> .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in <b>Advanced &gt; Power-On Options</b> .

## CD-ROM or DVD devices are not detected or driver is not loaded.

Cause	Solution
Drive is not connected properly or not properly configured.	See the documentation that came with the optional device.

---

**Movie will not play in the DVD drive.**

---

<b>Cause</b>	<b>Solution</b>
Movie may be regionalized for a different country.	See the documentation that came with the DVD drive.
Decoder software is not installed.	Install decoder software.
Damaged media.	Replace media.
Movie rating locked out by parental lock.	Use DVD software to remove parental lock.
Media installed upside down.	Reinstall media.

---

---

**Cannot eject compact disc (tray-load unit).**

---

<b>Cause</b>	<b>Solution</b>
Disc not properly seated in the drive.	Turn off the computer and insert a thin metal rod into the emergency eject hole and push firmly. 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.**

---

<b>Cause</b>	<b>Solution</b>
Media has been inserted upside down.	Re-insert the media 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, available from most computer stores.
Windows does not detect the CD-ROM or DVD-ROM drive.	<ol style="list-style-type: none"><li>1. Use Device Manager to remove or uninstall the device.</li><li>2. Restart the computer and let Windows detect the CD or DVD driver.</li></ol>

---

---

**Recording or copying CDs is difficult or impossible.**

---

<b>Cause</b>	<b>Solution</b>
Wrong or poor quality media type.	<ol style="list-style-type: none"><li>1. Try using a slower speed when recording.</li><li>2. Verify that you are using the correct media for the drive.</li><li>3. Try a different brand of media. Quality varies widely between manufacturers.</li></ol>

---

**USDT computer boots too slow after removing a CD-ROM or DVD drive.**

<b>Cause</b>	<b>Solution</b>
The system is searching for the drive during boot because the drive cable is still attached to the system board.	Disconnect the drive cable from the system board.

## Solving USB Flash Drive Problems

If you encounter USB flash drive problems, common causes and solutions are listed in the following table.

**USB flash drive is not seen as a drive letter in Windows.**

<b>Cause</b>	<b>Solution</b>
The drive letter after the last physical drive is not available.	Change the default drive letter for the flash drive in Windows.

**USB flash drive not found (identified).**

<b>Cause</b>	<b>Solution</b>
The device is attached to a USB port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure that "Device available" is selected for "Front USB Ports" and "Rear USB Ports" under <b>Security &gt; Device Security</b> .
The device was not properly seated before power-up.	Ensure the device is fully inserted into the USB port before applying power to the system

**System will not boot from USB flash drive.**

<b>Cause</b>	<b>Solution</b>
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in <b>Storage &gt; Boot Order</b> .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in <b>Storage &gt; Storage Options</b> . Ensure USB is enabled in <b>Storage &gt; Boot Order</b> .
The image on the device is not bootable.	Follow the procedures described in the "ROM Flash: Replicating the Setup: Creating a Bootable Device: Supported USB Flash Media Device" section of the <i>Service Reference Guide</i> .

**The computer boots to DOS after making a bootable flash drive.**

<b>Cause</b>	<b>Solution</b>
Flash drive is bootable.	Install the flash drive only after the operating system boots.

# Solving Front Panel Component Problems

If you encounter problems with devices connected to the front panel, refer to the common causes and solutions listed in the following table.

## A USB device, headphone, or microphone is not recognized by the computer.

Cause	Solution
Device is not properly connected.	<ol style="list-style-type: none"><li>1. Turn off the computer.</li><li>2. Reconnect the device to the front of the computer and restart the computer.</li></ol>
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.	<ol style="list-style-type: none"><li>1. Install the correct driver for the device.</li><li>2. You might need to reboot the computer.</li></ol>
The cable from the device to the computer does not work.	<ol style="list-style-type: none"><li>1. If possible, replace the cable.</li><li>2. Restart the computer.</li></ol>
The device is not working.	<ol style="list-style-type: none"><li>1. Replace the device.</li><li>2. Restart the computer.</li></ol>
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that <b>Device available</b> is selected for appropriate USB ports under <b>Security &gt; Device Security</b> .

# Solving Internet Access Problems

If you encounter Internet access problems, consult your Internet Service Provider (ISP) or refer to the common causes and solutions listed in the following table.

## Unable to connect to the Internet.

Cause	Solution
Internet Service Provider (ISP) account is not set up properly.	Verify Internet settings or contact your 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 UTP cable is disconnected.	Connect the CAT5 UTP cable between the cable modem and the computers's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)

### Unable to connect to the Internet.

Cause	Solution
IP address is not configured properly.	Contact your ISP for the correct IP address.
Cookies are corrupted. (A "cookie" is a small piece of information that a Web server can store temporarily with the Web browser. This is useful for having the browser remember some specific information that the Web server can later retrieve.)	<p><b>Windows Vista</b></p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Click <b>Network and Internet</b>.</li><li>3. Click <b>Internet Options</b>.</li><li>4. In the <b>Browsing history</b> section on the <b>General</b> tab, click the <b>Delete</b> button.</li><li>5. Click the <b>Delete cookies</b> button.</li></ol> <p><b>Windows XP</b></p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Double-click <b>Internet Options</b>.</li><li>3. On the <b>General</b> tab, click the <b>Delete Cookies</b> button.</li></ol> <p><b>Windows 7</b></p> <ol style="list-style-type: none"><li>1. Select <b>Start &gt; Control Panel</b>.</li><li>2. Click <b>Internet Options</b>.</li><li>3. In the <b>Browsing history</b> section on the <b>General</b> tab, click the <b>Delete</b> button.</li><li>4. Click the <b>Delete cookies</b> button.</li></ol>

### Cannot automatically launch Internet programs.

Cause	Solution
You must log on to your ISP before some programs will start.	Log on to your ISP and launch the desired program.

**Internet takes too long to download Web sites.**

---

**Cause**

Modem is not set up properly.

**Solution**

Verify that the modem is connected and communicating properly.

**Windows XP**

1. Select **Start > Control Panel**.
2. Double-click **System**.
3. Click the **Hardware** tab.
4. In the **Device Manager** area, click the **Device Manager** button.
5. Double-click **Modems**.
6. Double-click **Agere Systems PCI-SV92PP Soft Modem**.
7. On the **General** tab, click **Diagnostics**.
8. Click **Query Modem**. A "Success" response indicates the modem is connected and working properly.

**Windows Vista**

1. Select **Start > Control Panel**.
2. Click on **System and Maintenance**.
3. Click on **System**.
4. In the **Tasks** list, select **Device Manager**.
5. Double-click **Modems**.
6. Double-click **Agere Systems PCI-SV92PP Soft Modem**.
7. On the **General** tab, click **Diagnostics**.
8. Click **Query Modem**. A "Success" response indicates the modem is connected and working properly.

**Windows 7**

1. Select **Start > Control Panel**.
  2. Click on **System**.
  3. In the **Tasks** list, select **Device Manager**.
  4. Double-click **Modems**.
  5. Double-click **Agere Systems PCI-SV92PP Soft Modem**.
  6. On the **General** tab, click **Diagnostics**.
  7. Click **Query Modem**. A "Success" response indicates the modem is connected and working properly.
-

# Solving Software Problems

Most software problems occur as a result of the following:

- The application was not installed or configured correctly.
- There is insufficient memory available to run the application.
- There is a conflict between applications.
- Be sure that all the needed device drivers have been installed.
- If you have installed an operating system other than the factory-installed operating system, check to be sure it is supported on the system.

If you encounter software problems, see the applicable solutions listed in the following table.

## Computer will not continue and no HP logo screen has appeared.

Cause	Solution
POST error has occurred.	Observe the beeps and LED lights on the front of the computer. See <a href="#">POST Error Messages on page 102</a> to determine possible causes.  See the Restore Kit or the Worldwide Limited Warranty for terms and conditions.

## Computer will not continue after HP logo screen has appeared.

Cause	Solution
System files may be damaged.	Use recovery diskette to scan hard drive for errors.

## “Illegal Operation has Occurred” error message is displayed.

Cause	Solution
Software being used is not Microsoft-certified for your version of Windows.	Verify that the software is certified by Microsoft for your version of Windows (see program packaging for this information).
Configuration files are corrupt.	If possible, save all data, close all programs, and restart the computer.

## Contacting Customer Support

For help and service, contact an authorized reseller or dealer. To locate a reseller or dealer near you, visit <http://www.hp.com>.

---

 **NOTE:** If you take the computer to an authorized reseller, dealer, or service provider for service, remember to provide the setup and power-on passwords if they are set.

Refer to the number listed in the warranty or in the *Support Telephone Numbers* guide for technical assistance.

---

---

# E Password Security and Resetting CMOS

This computer supports security password features, which can be established through the Computer Setup Utilities menu.

This computer supports two security password features that are established through the Computer Setup Utilities menu: setup password and power-on password. When you establish only a setup password, any user can access all the information on the computer except Computer Setup. When you establish only a power-on password, the power-on password is required to access Computer Setup and any other information on the computer. 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 computer. This is a useful feature for a network administrator.

If you forget the password for the computer, you can clear that password so you can gain access to the information on the computer by resetting the password jumper.

- 
- △ **CAUTION:** Pushing the CMOS button will reset CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup. See the *Computer Setup (F10) Utility Guide* for information on backing up the CMOS settings.
-

# Resetting the Password Jumper

To disable the power-on or setup password features, or to clear the power-on or setup passwords, complete the following steps:

1. Shut down the operating system properly, then turn off the computer and any external devices, and disconnect the power cord from the power outlet.
2. With the power cord disconnected, press the power button again to drain the system of any residual power.

---

⚠ **WARNING!** To reduce the risk of personal injury from electrical shock and/or 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 computer 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.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

---

3. Remove the computer cover or access panel.
4. Locate the header and jumper.

---

 **NOTE:** The password jumper is green so that it can be easily identified. For assistance locating the password jumper and other system board components, see the Illustrated Parts & Service Map (IPSM) for that particular system. The IPSM can be downloaded from <http://www.hp.com/support>.

---

5. Remove the jumper from pins 1 and 2. Place the jumper on either pin 1 or 2, but not both, so that it does not get lost.
6. Replace the access panel.
7. Reconnect the external equipment.
8. Plug in the computer and turn on 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 pins 1 and 2, then repeat steps 6 through 8. Establish the new passwords in Computer Setup.

# Clearing and Resetting the CMOS

The computer's configuration memory (CMOS) stores information about the computer's configuration.

The CMOS button resets CMOS but does not clear the power-on and setup passwords.

Clearing CMOS will clear the Active Management Technology (AMT) settings in the Management Engine BIOS Extension (MEBx), including the password. The password will default to "admin" and will need to be reset. The AMT settings will also need to be reset. To access the MEBx, press **Ctrl+P** during POST.

1. Turn off the computer and any external devices, and disconnect the power cord from the power outlet.
2. Disconnect the keyboard, monitor, and any other external equipment connected to the computer.

---

⚠ **WARNING!** To reduce the risk of personal injury from electrical shock and/or 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 computer 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.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See the *Safety & Regulatory Information* guide for more information.

---

3. Remove the computer cover or access panel.

---

⚠ **CAUTION:** Pushing the CMOS button will reset CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup.

---

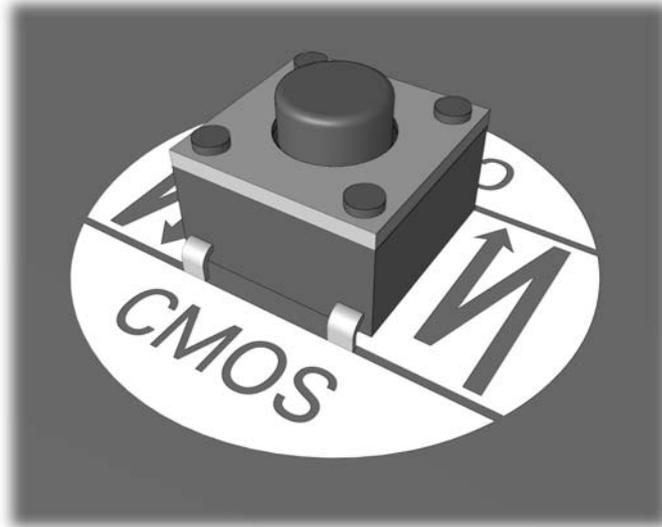
4. Locate, press, and hold the CMOS button in for five seconds.

---

 **NOTE:** Make sure you have disconnected the AC power cord from the wall outlet. The CMOS button will not clear CMOS if the power cord is connected.

---

**Figure E-1** CMOS button



---

 **NOTE:** For assistance locating the CMOS button and other system board components, see the Illustrated Parts & Service Map (IPSM).

---

5. Replace the computer cover or access panel.
6. Reconnect the external devices.
7. Plug in the computer and turn on power.

---

 **NOTE:** You will receive POST error messages after clearing CMOS and rebooting advising you that configuration changes have occurred. Use Computer Setup to reset any special system setups along with the date and time.

---

---

## F Drive Protection System (DPS)

The Drive Protection System (DPS) is a diagnostic tool built into the hard drives installed in some computers. DPS is designed to help diagnose problems that might result in unwarranted hard drive replacement.

When these systems 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. Your service provider can use this information to help diagnose conditions that caused you to run the DPS software.

Running DPS will not affect any programs or data stored on the hard drive. The test resides in the hard drive firmware and can be executed even if the computer will not boot to an operating system. The time required to execute the test depends on the manufacturer and size of the hard drive; in most cases, the test will take approximately two minutes per gigabyte.

Use DPS when you suspect a hard drive problem. If the computer reports a SMART Hard Drive Detect Imminent Failure message, there is no need to run DPS; instead, back up the information on the hard drive and contact a service provider for a replacement hard drive.

# Accessing DPS Through Computer Setup

When the computer does not power on properly you should use Computer Setup to access the DPS program. To access DPS, perform the following steps:

1. Turn on or restart the computer.
2. When the F10 Setup message appears in the lower-right corner of the screen, press the **F10** key.

---

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

---

A choice of five headings appears in the Computer Setup Utilities menu: **File**, **Storage**, **Security**, **Power**, and **Advanced**.

3. Select **Storage** > **DPS Self-Test**.

The screen will display the list of DPS-capable hard drives that are installed on the computer.

---

 **NOTE:** If no DPS-capable hard drives are installed, the **DPS Self-Test** option will not appear on the screen.

---

4. Select the hard drive to be tested and follow the screen prompts to complete the testing process.

When the test has been completed, one of three messages will be displayed:

- Test Succeeded. Completion Code 0.
- Test Aborted. Completion Code 1 or 2.
- Test Failed. Drive Replacement Recommended. Completion Code 3 through 14.

If the test failed, the completion code should be recorded and reported to your service provider for help in diagnosing the computer problem.

---

# G Computer Diagnostic Features

## Hewlett-Packard Vision Diagnostics

 **NOTE:** HP Vision Diagnostics is included on CD with some computer models only.

---

The Hewlett-Packard Vision Diagnostics utility allows you to view information about the hardware configuration of the computer and perform hardware diagnostic tests on the subsystems of the computer. The utility simplifies the process of effectively identifying, diagnosing, and isolating hardware issues.

The Survey tab is displayed when you invoke HP Vision Diagnostics. This tab shows the current configuration of the computer. From the Survey tab, there is access to several categories of information about the computer. Other tabs provide additional information, including diagnostic test options and test results. The information in each screen of the utility can be saved as an html file and stored on a USB flash drive.

Use HP Vision Diagnostics to determine if all the devices installed on the computer are recognized by the system and functioning properly. Running tests is optional but recommended after installing or connecting a new device.

You should run tests, save the test results, and print them so that you have printed reports available before placing a call to the Customer Support Center.

 **NOTE:** Third party devices may not be detected by HP Vision Diagnostics.

---

## Accessing HP Vision Diagnostics

To access HP Vision Diagnostics, you must create a Recovery Disc Set then boot to the CD containing the utility. It can also be downloaded from <http://www.hp.com> and either burned to CD or installed to a USB flash drive. See [Downloading the Latest Version of HP Vision Diagnostics on page 167](#) for more information.

 **NOTE:** HP Vision Diagnostics is included as part of the Recovery Disk Set with some computer models only.

If you have already downloaded HP Vision Diagnostics to either CD or USB Flash drive, then begin the following procedure at step 2.

---

1. In Windows Explorer, go to **C:\SWSetup\ISOs** and burn the file **Vision Diagnostics.ISO** to a CD or copy it to a USB flash drive.
2. While the computer is on, insert the CD in the Optical Drive or USB flash drive in a USB port on the computer.

3. Shut down the operating system and turn off the computer.
4. Turn on the computer. The system will boot into HP Vision Diagnostics.

---

 **NOTE:** If the system does not boot to the CD in the optical drive or to the USB flash drive, you may need to change the boot order in the Computer Setup (F10) utility. Refer to the *Computer Setup (F10) Utility Guide* for more information.

---

5. At the boot menu, select either the **HP Vision Diagnostics** utility to test the various hardware components in the computer or the **HP Memory Test** utility to test memory only.

---

 **NOTE:** The HP Memory Test is a comprehensive memory diagnostic utility that is run as a stand-alone application, outside of HP Vision Diagnostics.

---

6. If running **HP Vision Diagnostics**, select the appropriate language and click **Continue**.
7. In the End User License Agreement page, select **Agree** if you agree with the terms. The HP Vision Diagnostics utility launches with the Survey tab displayed.

## Survey Tab

The Survey tab displays important system configuration information.

In the **View level** field, you can select the **Summary** view to see limited configuration data or select the **Advanced** view to see all the data in the selected category. By default, the View Level is set to **Overview** which displays general information about all of the component categories.

In the **Category** field, you can select the following categories of information to display:

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

**Architecture**—Provides system BIOS and PCI device information.

**Asset Control**—Shows product name, system serial number, asset tag and universal unique ID information.

**Audio**—Displays information about the audio controllers present in the system, including PCI audio cards.

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

**Graphics**—Shows information about the graphics controller of the computer.

**Input Devices**—Shows information about the keyboard, mouse, and other input devices connected to the computer.

**Memory**—Shows information about all memory in the computer. This includes memory slots on the system board and any memory modules installed.

**Processors**—Shows information about the processor(s) installed in the computer, including clock speeds and cache sizes.

**Storage**—Shows information about storage media connected to the computer. This list includes all hard drives and optical drives.

**System**—Shows information about the computer model, internal fans, chassis, and BIOS.

## Test Tab

The Test tab allows you to choose various parts of the system to test. You can also choose the type of test and testing mode.

There are three types of tests to choose from:

- **Quick Test**—Provides a predetermined script where a sample of each hardware component is exercised. You may further modify which of the Quick tests are executed by selecting or deselecting individual tests in the hardware component check list.
- **Complete Test**—Provides a predetermined script where each hardware component is fully tested. You may further modify which of the Complete tests are executed by selecting or deselecting individual tests in the hardware component check list.
- **Custom Test**—Provides the most flexibility in controlling the testing of a system. The Custom Test mode allows you to specifically select which devices, tests, and test parameters are run.

By default, the three test modes do not display prompts and require no interaction. If errors are found, they are displayed when testing is complete.

However, for each test type, you may also optionally add interactive tests by clicking the **Include interactive tests** box under **Test mode**. Selecting interactive tests provides the maximum control over the testing process. The diagnostic software will prompt you for input during tests.

---

 **NOTE:** Memory can not be tested from within the HP Vision Diagnostics application. To test the memory in your computer, you must exit HP Vision Diagnostics, boot to either the CD or USB flash drive and select **HP Memory Test** from the boot menu.

---

To begin testing:

1. Select the Test tab.
2. Select the type of tests you want to run: **Quick**, **Complete**, or **Custom**.
3. Include optional interactive tests by selecting **Include interactive tests**.
4. Choose how you want the test to be executed, either **Number of Loops** or **Total Test Time**. When choosing to run the test over a specified number of loops, enter the number of loops to perform. If you want the diagnostic test for a specified time period, enter the amount of time in minutes.
5. Click the **Start Test** button to start the testing. The Status tab, which allows you to monitor the progress of the tests, is automatically displayed during the testing process. When the tests are complete, the Status tab shows whether the devices passed or failed.
6. If errors are found, go to the Errors tab to display detailed information and recommended actions.

## Status Tab

The Status tab displays the status of the selected tests. The main progress bar displays the percent complete of the current set of tests. While testing is in progress, a **Cancel Testing** button is displayed for use if you want to cancel the test.

The Status tab also shows:

- The devices being tested
- The test status (running, waiting, passed, or failed) of each device being tested
- The overall test progress of all devices being tested
- The test progress for each device being tested
- The elapsed test times for each device being tested

## History Tab

The History tab contains information on past test executions.

The History Log displays all tests that have been executed, the number of times of execution, the number of times failed, the date each test was executed, and the time it took to complete each test. The **Clear History** button will clear the contents of the History Log.

The contents of the History Log may be saved as a HTML file to USB flash drive by clicking the **Save** button.

## Errors Tab

The Errors tab displays detailed information about any errors found, as well as any recommended actions.

The Error Log displays the tests for devices that have failed during the diagnostic testing and includes the following columns of information.

- The **Device** section displays the device tested.
- The **Test** section displays the type of test run.
- The **Times Failed** is the number of times the device has failed a test.
- The **Defect Code** provides a numerical code for the failure. The error codes are defined in the Help tab.
- The **Description** section describes the error that the diagnostic test found.
- The **Reason** section describes the likely cause of the error.
- The **Recommended Repair** will give a recommended action that should be performed to resolve the failed hardware.
- The **Warranty ID** is a unique error code associated with the specific error on your computer. When contacting the HP Support Center for assistance with a hardware failure, please be prepared to provide the Warranty ID.

The **Clear Errors** button will clear the contents of the Error Log.

The contents of the Error Log may be saved as a HTML file to USB flash drive by clicking the **Save** button.

## Help Tab

The Help tab contains a **Vision Help** section, and a **Test Components** section. This tab includes search and index features. You may also review the HP End User License Agreement (EULA), as well as the HP Vision Diagnostic application version information on this tab.

The **Vision Help** section contains information on the major functions of Hewlett-Packard Vision Diagnostics.

The **Test Components** section provides a description of each test, as well as the parameters that may be adjusted when running in Custom test mode.

The **Defect codes** section contains information on the numerical error code that may appear in the Errors tab.

The **Memory test tab** section provides information on the **HP Memory Test** application that may be launched from the boot menu.

The **HP Support** section provides information on obtaining technical support from HP.

## Saving and Printing Information in HP Vision Diagnostics

You can save the information displayed in the HP Vision Diagnostics **Survey**, **History** and **Errors** tabs to a USB flash drive. You can not save to the hard drive. The system will automatically create an html file that has the same appearance as the information displayed on the screen.

1. Insert a USB flash drive if running HP Vision Diagnostics from CD.
2. Click **Save** in the bottom on any of the **Survey**, **History** or **Errors** tabs. All three log files will be saved regardless of from which tab the Save button was clicked.
3. Select the drive onto which you will save the log files and click the **Save** button. Three html files will be saved to the inserted USB flash drive.

---

 **NOTE:** Do not remove the USB flash drive until you see a message indicating that the html files have been written to the media.

---

4. Print the desired information from the storage device used to save it.

---

 **NOTE:** To exit HP Vision Diagnostics, click the **Exit Diagnostics** button at the bottom of the screen. Be sure to remove the USB flash drive or CD from the optical drive.

---

## Downloading the Latest Version of HP Vision Diagnostics

1. Go to <http://www.hp.com>.
2. Click the **Software & Drivers** link.
3. Select **Download drivers and software (and firmware)**.

4. Enter your product name in the text box and press the [Enter](#) key.
5. Select your specific computer model.
6. Select your OS.
7. Click the **Diagnostic** link.
8. Click the **Hewlett-Packard Vision Diagnostics** link.
9. Click the **Download** button.

---

 **NOTE:** The download includes instructions on how to create the bootable CD or the bootable USB flash drive.

---

## Protecting the Software

To protect software from loss or damage, you should 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.

---

# H System Recovery

System Recovery completely erases and reformats the hard disk drive, deleting all data files you have created, and then reinstalls the operating system, programs, and drivers. However, you must reinstall any software that was not installed on the computer at the factory. This includes software that came on media included in the computer accessory box, and any software programs you installed after purchase.

---

 **NOTE:** Always use the System Restore procedure before you use the System Recovery program.

**NOTE:** Some features might not be available on systems that are shipped without a version of Microsoft Windows.

---

You must choose one of the following methods to perform a System Recovery:

- Recovery Image — Run the System Recovery from a recovery image stored on your hard disk drive. The recovery image is a file that contains a copy of the original factory-shipped software. To perform a System Recovery from a recovery image, see [System Recovery from the Windows 7 Start Menu on page 170](#).

---

 **NOTE:** The recovery image uses a portion of the hard disk drive that cannot be used for data storage.

---

- Recovery Media — Run the System Recovery from recovery media, that you created from files stored on your hard disk drive, or purchased separately. To create recovery media, see [Recovery media on page 172](#).

# System Recovery options

You should attempt a System Recovery in the following order:

1. Through the hard disk drive, from the Windows 7 Start menu.
2. Through the hard disk drive, by pressing the F11 key on the keyboard during system startup.
3. Through recovery media that you create.
4. Through recovery discs purchased from HP Support. To purchase recovery discs, visit [www.hp.com/support](http://www.hp.com/support).

## System Recovery from the Windows 7 Start Menu

---

△ **CAUTION:** System Recovery deletes all data and programs you created or installed. Back up any important data to a removable disc or USB flash drive.

---

If the computer is working and Windows 7 is responding, use these steps to perform a System Recovery.

1. Turn off the computer.
2. Disconnect all peripheral devices from the computer except the keyboard and mouse.
3. Turn on the computer.
4. Tap the **Start** button, tap **All Programs**, tap **Recovery Manager**, and then tap **Recovery Manager**. If prompted, tap **Yes** to allow the program to continue.
5. Under **I need help immediately**, tap **System Recovery**.
6. Tap **Yes**, and then tap **Next**. Your computer restarts.

---

 **NOTE:** If your system does not detect a recovery partition, it prompts you to insert recovery media. Insert the disc, or USB flash drive, tap **Yes**, and then tap **Next** to restart the computer and run Recovery Manager from the recovery disc, or the recovery USB flash drive. If using discs, insert the next system-recovery disc when prompted.

---

7. When the computer restarts, you will see the Recovery Manager welcome screen again. Under **I need help immediately**, tap **System Recovery**. If you are prompted to back up your files, and you have not done so, tap **Back up your files first (recommended)**, and then tap **Next**. Otherwise, tap **Recover without backing up your files**, and then tap **Next**.
8. System Recovery begins. After System Recovery is complete, tap **Finish** to restart the computer.
9. Complete the registration process, and wait until you see the desktop.
10. Turn off the computer, reconnect all peripheral devices, and turn the computer back on.

## System Recovery at system startup

---

△ **CAUTION:** System Recovery deletes all data and programs you created or installed. Back up any important data to a removable disc.

---

If Windows 7 is not responding, but the computer is working, follow these steps to perform a System Recovery.

1. Turn off the computer. If necessary, press and hold the Power button until the computer turns off.
2. Disconnect all peripheral devices from the computer, except the keyboard and mouse.
3. Press the Power button to turn on the computer.
4. As soon as you see the initial company logo screen appear, repeatedly press the F11 key on your keyboard until the Windows is Loading Files... message appears on the screen.
5. Under **I need help immediately**, tap **System Recovery**.
6. If you are prompted to back up your files, and you have not done so, tap **Back up your files first (recommended)**, and then tap **Next**. Otherwise, tap **Recover without backing up your files**, and then tap **Next**.
7. System Recovery begins. After System Recovery is complete, tap **Finish** to restart the computer.
8. Complete the registration process, and wait until you see the desktop.
9. Turn off the computer, reconnect all peripheral devices, and turn the computer back on.

## System Recovery from recovery media

△ **CAUTION:** System Recovery deletes all data and programs you created or installed. Back up any important data to a removable disc, or USB flash drive.

To create recovery media, see [Recovery media on page 172](#).

To perform a System Recovery using recovery media:

1. If the computer is working, create a backup DVD, or backup USB flash drive, containing all the data files you want to save, and then remove the backup media from the computer.
2. Insert recovery disc #1 into the DVD drive tray, and close the tray; or if using a recovery USB flash drive, insert it into a USB port.
3. If the computer works, tap the **Start** button, and then tap **Shut Down**. Or, if the computer is not responding, press and hold the Power button for approximately 5 seconds, or until the computer turns off.
4. Disconnect all peripheral devices from the computer except the keyboard and mouse.
5. Press the Power button to turn on the computer. If you are using a recovery DVD, the computer will automatically run Recovery Manager from the disc. Skip to step 7.
6. If you are running System Recovery from a USB flash drive, press the **Esc** key as the computer is powering on to bring up the boot menu. Use the arrow keys to select the USB device and press **Enter** to boot from that device.
7. If the Recovery Manager asks if you want to run System Recovery from Media or Hard Drive, select **Media**. On the Welcome screen, under **I need help immediately**, tap **Factory Reset**.

8. If you are prompted to back up your files, and you have not done so, tap **Back up your files first (recommended)**, and then tap **Next**. Otherwise, tap **Recover without backing up your files**, and then tap **Next**.
9. If you are prompted to insert the next recovery disc, do so.
10. When the Recovery Manager is finished, remove all recovery discs, or the recovery USB flash drive, from the system.
11. Tap **Finish** to restart the computer.

## Recovery media

You should create a set of recovery discs, or a recovery USB flash drive, from the recovery image stored on your hard disk drive. This image contains the operating system and software program files that were originally installed on your computer at the factory. You can create only one set of recovery discs, or one recovery USB flash drive, for your computer; the recovery discs, or the recovery drive, can be used only with this computer. Store the recovery discs, or the recovery USB flash drive, in a safe place.

---

 **NOTE:** Some features might not be available on systems that are shipped without a version of Microsoft Windows.

---

## Choosing recovery media

- To create recovery discs, your computer must have a DVD writer, and you must use only high-quality blank DVD+R or DVD-R discs.
- 
-  **NOTE:** You cannot use CDs or DVD+RW, DVD-RW, DVD+RW DL, DVD-RW DL, DVD+R DL, or DVD-R DL discs to create recovery discs.
- 
- You have the option of creating a recovery USB flash drive instead, using a high-quality blank USB drive.
  - If you are creating recovery discs, be sure to use high-quality discs. It is normal for discs to be rejected if they are not defect-free. You will be prompted to insert a new blank disc to try again.
  - The number of discs in the recovery-disc set depends on your computer model (typically 3–6 DVD discs). The Recovery Media Creation program tells you the specific number of blank discs needed to make the set. If you are using a USB flash drive, the program will tell you the size of the drive required to store all the data (minimum of 8 GB).

---

 **NOTE:** The process of creating recovery discs, or a recovery USB drive, takes some time to verify that the information written on the disc, or USB flash drive, is correct. You can quit the process at any time. The next time you run the program, it resumes where it left off.

---

## Creating recovery media

To create recovery discs:

1. Close all open programs.
2. Tap the **Start** button, tap **All Programs**, tap **Recovery Manager**, and then tap **Recovery Media Creation**. If prompted, tap **Yes** to allow the program to continue.
3. Tap **Create recovery media using blank DVD(s)**, and then tap **Next**.
4. Follow the on-screen instructions. Label each disc as you make it (for example, Recovery 1, Recovery 2).

To create a recovery USB flash drive:

1. Close all open programs.
2. Insert the USB flash drive into a USB port on the computer.
3. Tap the **Start** button, tap **All Programs**, tap **Recovery Manager**, and then tap **Recovery Media Creation**.
4. Tap **Create recovery media with a USB flash drive**, and then tap **Next**.
5. Select the USB flash drive from the list of media. The program will let you know how much storage is required to create the recovery drive. If the USB flash drive does not have enough storage capacity (8 GB is the minimum), it will be grayed out on the screen. Tap **Next**.

---

 **NOTE:** Recovery Media Creation formats the flash drive and deletes all on files on it.

---

6. Follow the on-screen instructions. Make sure to label the USB flash drive and store it in a secure place.

---

 **NOTE:** Do not use media cards for creating recovery media. The system may not be able to boot up from a media card and you may not be able to run system recovery.

---

# I Specifications

**Table I-1 Specifications**

<b>Desktop Dimensions</b> (in the desktop position)		
Height	3.95 in	10.0 cm
Width	13.3 in	33.8 cm
Depth	14.9 in	37.8 cm
<b>Approximate Weight</b>	16.72 lb	7.6 kg
<b>Weight Supported</b> (maximum distributed load in desktop position)	77 lb	35 kg
<b>Temperature Range</b>		
Operating	50° to 95°F	10° to 35°C
Nonoperating	-22° to 140°F	-30° to 60°C
<b>NOTE:</b> Operating temperature is derated 1.0° C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10° C/Hr. The upper limit may be limited by the type and number of options installed.		
<b>Relative Humidity (noncondensing)</b>		
Operating	10-90%	10-90%
Nonoperating (38.7°C max wet bulb)	5-95%	5-95%
<b>Maximum Altitude (unpressurized)</b>		
Operating	10,000 ft	3048 m
Nonoperating	30,000 ft	9144 m
<b>Heat Dissipation</b>		
Max STD PS	1063 BTU/hr	268 kg-cal/hr
Typical STD PS idle	198 BTU/hr	50 kg-cal/hr
Max EPA 87/89/85% @ 20/50/100% load PS	941 BTU/hr	237 kg-cal/hr
Typical EPA 87/89/85% @ 20/50/100% load PS idle	150 BTU/hr	38 kg-cal/hr

**Table I-1 Specifications (continued)**

<b>Power Supply</b>	115V	230V
Power Output	240W	240W
Rated Input Current (maximum) <sup>1</sup>	4A @ 100 VAC	2A @ 230 VAC
Rated Line Frequency	50/60 Hz	50/60 Hz
Operating Line Frequency Range	47-63 Hz	47-63 Hz
Max Allowable Leakage Current	275 $\mu$ A	275 $\mu$ A
Power Supply Fan	92mm variable speed	92mm variable speed

<sup>1</sup> This system utilizes an active power factor corrected power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor corrected power supply also has the added benefit of not requiring an input voltage range select switch.

# Index

## Symbols/Numerics

- 4-pin power pin assignments 96
- 6-pin power pin assignments 96

## A

- access panel
  - spare part number 31, 41
- access panel, locked 116
- audible codes 108
- audio problems 134

## B

- baffle
  - removal and replacement 71
  - spare part number 31, 38, 71
- battery
  - disposal 29
  - removal and replacement 84
- beep codes 108
- bezel blank
  - spare part number 32, 36
- boot problems 150
- booting options
  - Full Boot 102
  - Quick Boot 102

## C

- cable connections
  - SFF 55
- cable management
  - SFF 54
- cable pinouts
  - SATA data 20
- cables
  - spare part numbers 31
- cautions
  - AC power 22
  - cables 28
  - cooling fan 28
  - electrostatic discharge 23

- keyboard cleaning 27
  - keyboard keys 27
  - CD-ROM or DVD problems 148
  - chassis types, illustrated 22
  - chassis
    - illustrated 22
  - chassis fan
    - spare part number 38
  - chassis fan,
    - spare part number 31
  - cleaning
    - computer 26
    - mouse 27
    - safety precautions 26
  - CMOS
    - backing up 157
    - clearing and resetting 159
  - computer
    - specifications 174
  - computer access panel
    - removing 41
  - computer cleaning 26
  - connecting drive cables 57
  - connections
    - SFF system board 55
  - connector pin assignments 92
  - country power cord set requirements 101
  - Customer Support 112, 156
- ## D
- diagnostics utility 163
  - DIMMs. See memory
  - disassembly preparation 40
  - diskette problems 121
  - Drive Protection System (DPS) 161
  - drives
    - connecting cables 57

- installing 57
- locations 57
- removing 57
- SFF removal and replacement 56
- DVI pin assignments 95

## E

- electrostatic discharge (ESD)
  - preventing damage 23
- error
  - codes 102, 108
  - messages 103
- ethernet
  - RJ-45 pin assignments 93
- expansion card
  - installing 49
  - removing 49
- expansion slot cover
  - removing 50
  - replacing 52

## F

- fan
  - spare part number 31, 38
- fan, power supply 28
- flash drive problems 150
- flashing LEDs 108
- front bezel
  - removing 42
  - removing blanks 43
  - security 90
  - spare part number 31, 38, 42, 43
- front fan
  - removal and replacement 72
- front fan assembly
  - spare part number 72

front I/O and power switch assembly  
    spare part number 38, 74  
front I/O, power switch assembly  
    removal and replacement 74  
front panel problems 151

## G

general problems 115  
grounding methods 24

## H

hard drive  
    installing 68  
    proper handling 29  
    removing 68  
    SATA characteristics 20  
    spare part number 38, 56  
    spare part numbers 31, 38  
hard drive problems 124  
hardware installation  
    problems 140  
headphone pin assignments 94  
heat sink  
    removal and replacement 76  
    spare part number 31, 38, 76  
helpful hints 113  
hood sensor  
    removal and replacement 73  
    spare part number 38, 73

## I

installing  
    drive cables 57  
    expansion card 49  
    hard drive 68  
    media card reader 65  
    memory 45  
    mounting screws 57  
    optical drive 61  
Internet access problems 152

## K

keyboard  
    cleaning 27  
    pin assignments 92  
    spare part  
        numbers 32, 33, 34, 36  
keyboard problems 138

## L

LEDs  
    blinking power 0  
    blinking PS/2 keyboard 108  
line-in audio pin assignments 94  
line-out audio pin  
    assignments 94  
locks  
    cable lock 88  
    front bezel 90  
    padlock 89

## M

media card reader  
    installing 65  
    removing 63  
Media Card Reader  
    problems 127  
memory  
    installing 45  
    populating sockets 46  
    specifications 45  
memory module  
    spare part number 45  
memory modules  
    spare part number 31, 36, 38  
memory problems 145  
microphone pin assignments 94  
monitor  
    pin assignments 95  
monitor problems 129  
mounting screws 57  
mouse  
    cleaning 27  
    pin assignments 92  
mouse problems 138  
mouse, spare part number  
    spare part number 32, 36

## N

network problems 142  
numeric error codes 103

## O

operating guidelines 25  
optical drive  
    installing 61  
    removing 59  
    spare part number 36, 56  
    spare part numbers 31  
optical drive problems 148

overheating, prevention 25

## P

password  
    clearing 157  
    power-on 157  
    setup 157  
PCI card 51  
PCI Express card 52  
PCI Express pin assignments 98  
POST error messages 102  
power cord set requirements  
    country specific 101  
power problems 119  
power supply  
    fan 28  
    removal and replacement 80  
    spare part number 31, 36, 80  
power switch/LED assembly  
    spare part number 31  
power-on password 157  
printer problems 136  
problems  
    audio 134  
    CD-ROM or DVD 148  
    diskette 121  
    flash drive 150  
    front panel 151  
    general 115  
    hard drive 124  
    hardware installation 140  
    Internet access 152  
    keyboard 138  
    Media Card Reader 127  
    memory 145  
    monitor 129  
    mouse 138  
    network 142  
    power 119  
    printer 136  
    processor 147  
    software 155  
processor  
    removal and replacement 78  
    spare part number 32  
processor problems 147  
product ID location 39

## R

### removal and replacement

- baffle 71
- battery 84
- front fan 72
- front I/O, power switch assembly 74
- heat sink 76
- hood sensor 73
- power supply 80
- processor 78
- SFF drives 56
- speaker 75
- system board 82

### removing

- bezel blanks 43
- computer access panel 41
- expansion card 49
- expansion slot cover 50
- front bezel 42
- hard drive 68
- media card reader 63
- optical drive 59
- PCI card 51
- PCI Express card 52

### resetting

- CMOS 157
- password jumper 157

## S

### safety and comfort 112

### safety precautions

- cleaning 26

### SATA

- connectors on system board 20
- data cable pinouts 20
- hard drive characteristics 20
- pin assignments 97

### SATA cable

- spare part number 31, 38

### SATA hard drive cable

- spare part number 38

### SATA optical drive cable

- spare part number 31

### screws, correct size 28

### security

- cable lock 88
- front bezel 90
- padlock 89

### serial interface pin

- assignments 93

### serial number location 39

### service considerations 27

### setup password 157

### SFF

- cable connections 55
- cable management 54
- drives removal and replacement 56
- system board connections 55

### software

- backing up 168
- problems 155
- servicing computer 28

### spare part number

- tamper-resistant wrench 28
- Torx T-15 screwdriver 28

### speaker

- removal and replacement 75
- spare part number 75

### specifications

- computer 174

### static electricity 23

### system board

- removal and replacement 82
- SATA connectors 20
- spare part number 31, 36, 82
- system board connections 44

## T

### tamper-proof screws

- tool 28

### temperature control 25

### tools, servicing 28

### Torx T15 screwdriver 28

### tower orientation 87

## U

### USB pin assignments 93

## V

### ventilation, proper 25

### Vision Diagnostics 163

## W

### Wake-on-LAN feature 142