

Maintenance and Service Guide

HP Compaq Pro 4300 Small Form Factor Business PC

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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.

<u>CAUTION</u>: 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.

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1 Product Features

Standard Configuration Features

The HP Compaq Small Form Factor features may vary depending on the model. For a complete listing of the hardware and software installed in the computer, run the diagnostic utility (included on some computer models only).

NOTE: The Small Form Factor computer can also be used in a tower orientation. For more information, see <u>Using the Small Form Factor Computer in a Tower Orientation on page 96</u> in this guide.

Figure 1-1 Small Form Factor Configuration



Front Panel Components

Drive configuration may vary by model. Some models have a bezel blank covering one or more drive bays.

Figure 1-2 Front Panel Components

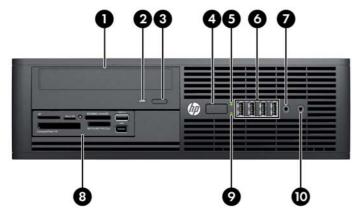


Table 1-1 Front Panel Components

1	5.25-inch Optical Drive	6	USB (Universal Serial Bus) Ports
2	Optical Drive Activity Light	7	Microphone Connector
3	Optical Drive Eject Button	8	3.5-inch Media Card Reader (optional)
4	Dual-State Power Button	9	Hard Drive Activity Light
5	Power On Light	10	Headphone Connector

NOTE: The Power On Light is normally green when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code.

Rear Panel Components

Figure 1-3 Rear Panel Components

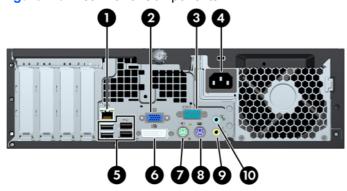


Table 1-2 Rear Panel Components

1	무무	RJ-45 Network Connector	6	₩.	DVI-D Connector
2		VGA Monitor Connector	7	è	PS/2 Mouse Connector (green)
3	IOIOIA	Serial Connector	8	<u> </u>	PS/2 Keyboard Connector (purple)
4		Power Cord Connector	9	←∫	Line-Out Connector for powered audio devices (green)
5	•	Universal Serial Bus (USB)	10	→ [Line-In Audio Connector (blue)

NOTE: An optional second serial port and an optional parallel port are available from HP.

The monitor connectors on the system board are inactive when a graphics card is installed in the computer.

If a graphics card is installed into one of the system board slots, the connectors on the graphics card and the system board may be used at the same time. Some settings may need to be changed in Computer Setup to use both connectors.

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 1-4 Serial Number and Product ID Location



2 Activating and Customizing the Software



NOTE: This chapter provides information for both Windows 7 and Windows 8.

Activating and customizing the software in Windows 7

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

CAUTION: Do not add optional hardware or third-party devices to the computer until the operating system is successfully activated. 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.

Activating the Windows operating system

The first time you turn on the computer, the operating system is set up and activated automatically. This process takes about 5 to 10 minutes. Carefully read and follow the instructions on the screen to complete the activation.

We recommend that you register your computer with HP during operating system setup so you can receive important software updates, facilitate support questions, and sign up for special offers.

CAUTION: After the activation process has begun, DO NOT TURN OFF THE COMPUTER UNTIL THE PROCESS IS COMPLETE. Turning off the computer during the activation 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 activation process could take up to 60 minutes.

Downloading Windows 7 updates

Microsoft may release updates to the operating system. To help keep the computer running optimally, HP recommends checking for the latest updates during the initial installation and periodically throughout the life of the computer.

- To set up your Internet connection, click Start > Internet Explorer and follow the instructions on the screen.
- After an Internet connection has been established, click the Start > All Programs > Windows Update.
- 3. Run Windows Update monthly thereafter.

Installing or upgrading device drivers

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

In Windows 7, if prompted for the i386 directory, replace the path specification with $C: \pm 386$, 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

If you wish, you can select or change the monitor refresh rates, screen resolution, color settings, font sizes, and power management settings.

For more information, refer to the online documentation provided with the graphics controller utility or the documentation that came with your monitor.

Right-click on the Windows desktop, then click **Personalize** to change display settings.

Activating and customizing the software in Windows 8

Additional information is available in online help after you activate the operating system.

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.

Activating the Windows Operating System

The first time you turn on the computer, the operating system is set up and activated automatically. This process takes about 5 to 10 minutes. Carefully read and follow the instructions on the screen to complete the activation.

We recommend that you register your computer with HP during operating system set up so you can receive important software updates, facilitate support questions, and sign up for special offers. You can also register your computer with HP using the **Register with HP** app on the Start screen.

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

Downloading Windows 8 updates

Microsoft may release updates to the operating system. To help keep the computer running optimally, HP recommends checking for the latest updates during the initial installation and periodically throughout the life of the computer.

Run Windows Update as soon as possible after you set up your computer.

- 1. Point to the upper-right or lower-right corner of the Start screen to display the charms.
- 2. Click Settings > Change PC Settings > Windows Update.
- 3. Run Windows Update monthly thereafter.

Customizing the monitor display

You can customize display settings for Windows 8 separately for the Start screen and the Desktop.

To customize the Start screen:

- 1. Point to the upper-right or lower-right corner of the Start screen to display the charms.
- Click Settings > Change PC Settings.
- 3. Click **Personalize** to change the display settings.

To customize the Desktop:

- 1. Click the Desktop app on the Start screen.
- 2. Right-click on the desktop, and then click **Personalize** to change display settings.

3 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, 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.

- 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 a USB device 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.
- Repeatedly press F10 when the monitor light turns green to access the utility.

You can also press Esc to a menu that allows you to access different options available at startup, including the Computer Setup utility.

- NOTE: If you do not press F10 at the appropriate time, you must restart the computer and again repeatedly press F10 when the monitor light turns green to access the utility.
- 3. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.
- 4. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, then press Enter. To return to the Computer Setup Utilities menu, press Esc.
- 5. To apply and save changes, select File > Save Changes and Exit.
 - If you have made changes that you do not want applied, select Ignore Changes and Exit.
 - To reset to factory settings or previously saved default settings (some models), select
 Apply Defaults and Exit. This option will restore the original factory system defaults.
- NOTE: Not all settings shown in the following sections are available for all models

Table 3-1 Computer Setup (F10) Utility

Heading	Table
File	Computer Setup—File on page 10
Storage	Computer Setup—Storage on page 11
Security	Computer Setup—Security on page 14
Power	Computer Setup—Power on page 18
Advanced	Computer Setup—Advanced on page 19

Computer Setup—File

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

Table 3-2 Computer Setup—File

Option	Description	
System Information	Lists:	
	Product name	
	SKU number	
	Processor type/speed/stepping	
	Cache size (L1/L2/L3) (dual core processors have this listed twice)	
	Installed memory size/speed, number of channels (single or dual) (if applicable)	
	Integrated MAC address for embedded, enabled NIC (if applicable)	
	System BIOS (includes family name and version)	
	Chassis serial number	
	Asset tracking number	
	ME firmware version	
	ME Management mode	
About	Displays copyright notice.	
Set Time and Date	Allows you to set system time and date.	
Flash System ROM	Allows you to update the system ROM with a BIOS image file located on removable media.	
Replicated Setup	Save to Removable Media	
	Saves system configuration to a formatted USB flash media device.	
	Restore from Removable Media	
	Restores system configuration from a USB flash media device.	
Default Setup	Save Current Settings as Default	
	Saves the current system configuration settings as the default.	
	Restore Factory Settings as Default	
	Restores the factory system configuration settings as the default.	
Apply Defaults and Exit	Applies the currently selected default settings and clears any established passwords.	
Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.	
Save Changes and Exit	Saves changes to system configuration 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 3-3 Computer Setup—Storage

Option Description

Device Configuration

Lists all installed BIOS-controlled storage devices.

When a device is selected, detailed information and options are displayed. The following options may be presented:

Hard Disk: Size, model, firmware version, serial number, connector color.

Translation mode (ATA disks only)

Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.

Available only when the drive translation mode is set to User, 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.

CAUTION: 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.

- CD-ROM: Model, firmware version, serial number, connector color (not included for USB CD-ROM).
- SSD Life Used

NOTE: Displays for solid-state drives.

- SMART (ATA disks only)
- Diskette: Model and firmware version.

NOTE: Displays for USB diskette drives.

Default Values (ATA disks only)

See Translation Mode above for details.

SATA Defaults

Table 3-3 Computer Setup—Storage (continued)

Storage Options

eSATA Port

Allows you to set a SATA port as an eSATA port for use with an external drive. Default is enabled.

This setting affects only the port with the black connector, labeled as eSATA on the system board. This port should have the eSATA back panel connector attached to use eSATA drives. For more information, see the eSATA white paper at www.hp.com.

SATA Emulation

Allows you to choose how the SATA controller and devices are accessed by the operating system. There are three supported options: IDE, RAID, and AHCI (default).

CAUTION: SATA emulation changes may prevent access to existing hard drive data and degrade or corrupt established volumes.

IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode.

RAID - Allows DOS and boot access to RAID volumes. Use this mode with the RAID device driver loaded in the operating system to take advantage of RAID features.

AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.

NOTE: The RAID/AHCI device driver must be installed prior to attempting to boot from a RAID/AHCI volume. If you attempt to boot from a RAID/AHCI volume without the required device driver installed, the system will crash (blue screen). RAID volumes may become corrupted if they are booted to after disabling RAID.

Removable Media Boot

Enables/disables ability to boot the system from removable media. Default is enabled.

Max eSATA Speed

Allows you to choose 1.5 Gbps or 3.0 Gpbs as the maximum eSATA speed. By default, the speed is limited to 1.5 Gbps for maximum reliability.

CAUTION: Consult your eSATA drive and cable manufacturer before enabling 3.0 Gpbs speed. Some drive and cable combinations may not run reliably at 3.0 Gpbs.

Table 3-3 Computer Setup—Storage (continued)

DPS Self-Test

Allows you to execute self-tests on ATA hard drives capable of performing the Drive Protection System (DPS) self-tests.

NOTE: This selection will only appear when at least one drive capable of performing the DPS self-tests is attached to the system.

Boot Order

Allows you to:

 EFI Boot Sources: Specify the order in which EFI boot sources (such as a internal hard drive, USB hard drive, USB optical drive, or internal optical drive) 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.

EFI boot sources always have precedence over legacy boot sources.

Legacy Boot Sources: Specify the order in which legacy boot sources (such as a network
interface card, internal hard drive, USB optical drive, or internal optical drive) 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.

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).

NOTE: To drag a device to a preferred place, press Enter. To remove the device from consideration as a bootable device, press F5.

You can use F5 to disable individual boot items, as well as disable EFI boot and/or legacy boot.

NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.

Shortcut to Temporarily Override Boot Order

To boot **one time** from a device other than the default device specified in Boot Order, restart the computer and press <code>Esc</code> (to access the boot menu) and then <code>F9</code> (Boot Order), or only <code>F9</code> (skipping the boot menu) 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 <code>Enter</code>. The computer then boots from the selected non-default device for this one time.

Computer Setup—Security

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

Table 3-4 Computer Setup—Security

Option	Description			
Setup Password	Allows you to set and enable a setup (administrator) password.			
	NOTE: If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.			
Power-On Password Allows you to set and enable a power-on password. The power-on password after a power cycle or reboot. If the user does not enter the correct power-or will not boot.				
Password Options	Allows you to enable/disable:			
(This selection appears only if a power-on	 Lock Legacy Resources (determines whether or not Windows Device Manager is allowed to change resource settings for serial and parallel ports). 			
password or setup password is set.)	 Setup Browse Mode (appears if a setup password is set) (allows viewing, but not changing, the F10 Setup Options without entering setup password). Default is enabled. 			
	 Password prompt on F9 & F12 (requires setup password to use these boot functions). Default is enabled. 			
	Network Server Mode. Default is disabled.			
Smart Cover	Allows you to:			
	Lock/unlock the Cover Lock.			
	Set the Cover Removal Sensor to Disable/Notify User/Setup Password.			
	NOTE: Notify User alerts the user that the sensor has detected that the cover has been removed. Setup Password requires that the setup password be entered to boot the computer if the sensor detects that the cover has been removed.			
Device Security	Allows you to set Device Available/Device Hidden (default is Device Available) for:			
	Embedded security device			
	System audio			
	USB controller (varies by model)			
	Network controller			
	NOTE: You must disable AMT before trying to hide the network controller.			
	Serial port			
	Parallel port			
	SATA ports (varies by model)			
USB Security	Allows you to set Enabled/Disabled (default is Enabled) for:			
	Front USB Ports			
	Rear USB Ports			
	Accessory USB Ports			

Table 3-4 Computer Setup—Security (continued)

Slot Security	Allows you to disable any PCI or PCI Express slot. Default is enabled.
Network Boot	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.) Default is enabled.
System IDs	Allows you to set:
	 Asset tag (18-byte identifier), a property identification number assigned by the company to the computer.
	Ownership tag (80-byte identifier) displayed during POST.
	 Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.)
	Keyboard locale setting for System ID entry.
Master Boot Record	Enables/disables Master Boot Record (MBR) security.
Security	The MBR contains information needed to successfully boot from a disk and to access the data stored on the disk. Master Boot Record Security may prevent unintentional or malicious changes to the MBR, such as those caused by some viruses or by the incorrect use of certain disk utilities It also allows you to recover the "last known good" MBR, should changes to the MBR be detected when the system is restarted.
	When MBR Security is enabled, the BIOS prevents any changes being made to the MBR of the current bootable disk while in MS-DOS or Windows Safe Mode.
	NOTE: Most operating systems control access to the MBR of the current bootable disk; the BIOS cannot prevent changes that may occur while the operating system is running.
	Restores the backup Master Boot Record to the current bootable disk. Default is disabled.
	Only appears if all of the following conditions are true:
	MBR security is enabled
	A backup copy of the MBR has been previously saved
	The current bootable disk is the same disk from which the backup copy was saved
	CAUTION: Restoring a previously saved MBR after a disk utility or operating system has modified the MBR, may cause the data on the disk to become inaccessible. Only restore a previously saved MBR if you are confident that the current bootable disk's MBR has been corrupted or infected with a virus.

Table 3-4 Computer Setup—Security (continued)

System Security (these options are hardware dependent)

Data Execution Prevention (enable/disable) - Helps prevent operating system security breaches. Default is enabled.

SVM CPU Virtualization (enable/disable). Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.

Virtualization Technology (VTx) (enable/disable) - Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.

Virtualization Technology Directed I/O (VTd) (enable/disable) - Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on. Default is disabled.

Trusted Execution Technology (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. Default is disabled. To enable this feature you must enable the following features:

- Embedded Security Device Support
- Virtualization Technology
- Virtualization Technology Directed I/O

Embedded Security Device (enable/disable) - Permits activation and deactivation of the Embedded Security Device.

NOTE: To configure the Embedded Security Device, a Setup password must be set.

- Reset to Factory Settings (Do not reset/Reset) Resetting to factory defaults will erase all security keys and leave the device in a disabled state. Changing this setting requires that you restart the computer. Default is Do not reset.
 - **CAUTION:** 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.
- Measure boot variables/devices to PCR1 Typically, the computer measures the boot path and saves collected metrics to PCR5 (a register in the Embedded Security Device). Bitlocker tracks changes to any of these metrics, and forces the user to re-authenticate if it detects any changes. Enabling this feature lets you set Bitlocker to ignore detected changes to boot path metrics, thereby avoiding re-authentication issues associated with USB keys inserted in a port. Default is enabled.

System Security (continued)

OS management of Embedded Security Device (enable/disable) - This option allows the user to limit OS control of the Embedded Security Device. Default is enabled. This option is automatically disabled if Trusted Execution Technology is enabled.

Reset of Embedded Security Device through OS (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. Default is disabled.

NOTE: To enable this option, a Setup password must be set.

- No PPI provisioning (Windows 8 only) This option lets you set Windows 8 to bypass the PPI (Physical Presence Interface) requirement and directly enable and take ownership of the TPM on first boot. You cannot change this setting after TPM is owned/initialized, unless the TPM is reset. Default is disabled for non-Windows 8 systems, and enabled for Windows 8.
- Allow PPI policy to be changed by OS. Enabling this option allows the operating system to execute TPM operations without Physical Presence Interface. Default is disabled.

NOTE: To enable this option, a Setup password must be set.

Table 3-4 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.

Secure Boot Configuration

This is a feature of Windows 8.

- Legacy Support—Enable/Disable. Allows you to turn off all legacy support on the computer, including booting to DOS, running legacy graphics cards, booting to legacy devices, and so on. If set to disable, legacy boot options in **Storage > Boot Order** are not displayed. Default is enabled.
- Secure Boot—Enable/Disable. Allows you to make sure an operating system is legitimate
 before booting to it, making Windows resistant to malicious modification from preboot to full
 OS booting, preventing firmware attacks. UEFI and Windows Secure Boot only allow code
 signed by pre-approved digital certificates to run during the firmware and OS boot process.
 Default is disabled, except for Windows 8 systems which have this setting enabled. Secure
 Boot enabled also sets Legacy Support to disabled.
- Key Management—This option lets you manage the custom key settings.
 - Clear Secure Boot Keys—Don't Clear/Clear. Allows you to delete any previously loaded custom boot keys. Default is Don't Clear.
 - Key Ownership—HP Keys/Custom Keys. Selecting Custom Mode allows you to modify the contents of the secure boot signature databases and the platform key (PK) that verifies kernels during system start up, allowing you to use alternative operating systems. Selecting HP Keys causes the computer boot using the preloaded HP-specific boot keys. Default is HP Keys.
- Fast Boot—Enable/Disable. Fast boot disables the ability to interrupt boot, such as pressing f
 keys to access items before the operating system loads. Default is disabled.

NOTE: If Windows 8 detects a serious error, it will interrupt the boot process automatically and display advanced boot options.

From Windows 8, you can press Shift and select **Restart** to access the screen that lets you boot to a device or troubleshoot your computer.

Computer Setup—Power

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

Table 3-5 Computer Setup—Power

Description Option **OS Power** Idle Power Savings—Extended/Normal. Allows certain operating systems to decrease the Management processors power consumption when the processor is idle. Default is extended. 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. Default is enabled. 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. Default is disabled. NOTE: For Windows 8 systems with Fast Boot support, a normal shutdown goes to the S4 state, not the S5 state. S0 (On) = Solid green LED. S3 (Stand By)= 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 3 blinks and a pause. S4 (Hibernation)= 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (green LED) — repeated cycles of 4 blinks and a pause. S5 (Soft Off) = LED is off. **Hardware Power** SATA Power Management – Enables or disables SATA bus and/or device power management. Management Default is enabled. S5 Maximum Power Savings - Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 0.5 Watt power usage. Default is disabled. PCI Express x16 Slot 1 – Sets Active State Power Management (ASPM) of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM Disabled. PCI Express x1 Slot 1 – Sets Active State Power Management (ASPM) of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM Disabled. Network Controller - Sets ASPM of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM Disabled. USB 3.0 Controller - Sets ASPM of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM Disabled. **Thermal** Fan idle mode—This bar graph controls the minimum permitted fan speed. NOTE: This setting only changes the minimum fan speed. The fans are still automatically controlled

Computer Setup—Advanced

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

Option	Heading
Power-On Options	Allows you to set:
	POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days).
	 QuickBoot (default) = Do not clear memory or perform a memory test.
	 FullBoot = Memory test (count) on cold boot. Clears memory on all boots.
	 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). Enabling this feature will cause the system to display POST error messages, which are error messages displayed on the monitor during the Powe On Self Test if the BIOS encounters some kind of problem while starting the PC. A POST error message will only display on screen if the computer is capable of booting this far. If the POST detects an error before this point, a beep code is generated instead. Default is disabled.
	 Press the ESC key for Startup Menu (Enable/Disable). This feature controls the display of the text "Press the ESC key for Startup Menu" during POST. This text does not display on Windows 8 systems with Fast Boot support. Other text also will not display (for example, Ownership Tag). Default is enabled.
	 Option ROM Prompt (enable/disable). Enabling this feature will cause the system to display a message before loading option ROMs. Default is enabled.
	After Power Loss (off/on/previous state). Default is Power off. Setting this option to:
	 Power off—causes the computer to remain powered off when power is restored.
	 Power 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 (in 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

delay also gives you more time to select F10 to enter Computer (F10) Setup. Default is None.

slowly, so slowly that they are not ready to boot by the time POST is finished. The POST

Remote Wakeup Boot Source (remote server/local hard drive). Default is Local hard drive.

- Factory Recovery Boot Support (Enable/Disable). Provides the ability for the BIOS to redirect the boot to the recovery partition on the user hard drive, if present. Some versions of the recovery software honor the F11 key press even when this feature is disabled by the BIOS. Default is disabled.
- Bypass F1 Prompt on Configuration Changes (Enable/Disable). Allows you to set the computer not to confirm when changes were made. Default is disabled.

Table 3-6 Computer Setup—Advanced (for advanced users) (continued)

BIOS Power-On	Allows you to set the computer to turn on automatically at a time you specify.		
Onboard Devices	Allows you to set resources for or disable Legacy devices. Select the Legacy device's IRQ, DMA, and I/O Range. The settings may not take effect for all operating systems. To hide a device from the operating system, see Security > Device Security.		
Bus Options	Allows you to enable or disable:		
	PCI SERR# Generation. Default is enabled.		
	 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. Default is disabled. 		
Device Options	Allows you to set:		
	 Printer mode (Bi-Directional, EPP + ECP, Output Only). ECP = Enhanced Capabilities Port, EPP = Enhanced Parallel Port. Default is EPP+ECP. 		
	Num Lock State at Power-On (off/on). Default is off.		
	 Integrated Video (enable/disable). Use this option to disable the integrated video controller when another video controller is present in the system. Default is enabled. 		
	 Integrated Graphics (Auto/Disable/Force) Use this option to manage integrated (UMA) graphics memory allocation. The value you choose is allocated permanently to graphics and is unavailable to the operating system. For example, if you set this value to 512M on a system with 2 GB of RAM, the system always allocates 512 MB for graphics and the other 1.5 GB for use by the BIOS and operating system. Default is Auto which sets memory allocation to 512 MB. 		
	If you select Force, the UMA Frame Buffer Size option displays, which lets you set the UMA memory size allocation between 32 MB and 1 GB.		
	Internal Speaker (does not affect external speakers). Default is enabled.		
	• NIC PXE Option ROM Download (PXE, iSCSI, disabled). 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. Default is PXE.		
	 SATA RAID Option ROM Download (enable/disable). The BIOS contains an embedded SATA RAID option ROM for RAID support. This can be temporarily disabled to save DCH space. Note that with the option ROM disabled, users will be unable to boot to hard drives in the system while running in RAID mode. Default is disabled. 		
	 Multi-Processor (enable/disable). Use this option to disable multi-processor support under the OS. Default is enabled. 		
	Hyper threading (enable/disable). Use this option to disable processor hyper-threading.		
	 Turbo Mode (enable/disable). Allows you to enable and disable the Intel Turbo Mode feature which allows one core of the system to run at a higher than standard frequency and power if other cores are idle. Default is enabled. 		

Table 3-6 Computer Setup—Advanced (for advanced users) (continued)				
VGA Configuration	Displayed only if there is an add-in video card in the system. Allows you to specify which VGA controller will be the "boot" or primary VGA controller.			
AMT Configuration	Allows you to set:			
	 AMT (enable/disable). Allows you to enable or disable functions of the embedded Management Engine (ME) such as Active Management Technology (AMT). If set to disable, the Management Engine is set to a temporarily disabled state and will not provide functions 			

beyond necessary system configuration. Default is enabled.

- Unconfigure AMT/ME (enable/disable). Allows you to unconfigure any provisioned management settings for AMT. The AMT settings are restored to factory defaults. This feature should be used with caution as AMT will not be able to provide any set AMT management functions once unconfigured. Default is disabled.
- Hide Unconfigure ME Confirmation Prompt (enable/disable). Allows you to set the system to not display the confirmation to unconfigure ME.
- Watchdog Timer (enable/disable). Allows you to set amount of time for a operating system and BIOS watchdog alert to be sent if the timers are not deactivated. BIOS watchdog is deactivated by BIOS and would indicate that a halt occurred during execution if the alert is sent to the management console. An operating system alert is deactivated by the operating system image and would indicate that a hang occurred during its initialization. Default is

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 Computer Setup—File on page 10 in the Computer Setup—File table.)

NOTE: It is recommended that you save any modified computer configuration settings to a USB flash media device and save the device for possible future use.

To restore the configuration, insert the USB flash media device with the saved configuration and perform the Restore from Removable Media command with the Computer Setup (F10) Utility. (See Computer Setup—File on page 10 in the Computer Setup—File table.)

4 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.

5 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.

Chassis Designations

Small Form Factor (SFF)

Figure 5-1 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.

	Relative Humidity		
Event	55%	40%	10%
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing 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



IOTE: 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 ± 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 ± 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 <u>General Cleaning Safety Precautions on page 28</u> 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 <u>General Cleaning Safety Precautions on page 28</u> before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in <u>Cleaning the Computer Case on page 28</u>.

When cleaning debris from under the keys, review all rules in <u>General Cleaning Safety Precautions</u> on page 28 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.
 - <u>CAUTION:</u> 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 28.

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 <u>Cleaning the Computer Case on page 28</u>.

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.

<u>CAUTION:</u> 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.

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 25
- 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.

MARNING! 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.

6 Illustrated parts catalog

This chapter provides parts information for the chassis.

Spare parts

Computer major components



ltem	Description	Spare part number
(1)	Access panel	636924-001
(2)	Front bezel	636920-001
(3)	Power supply	
	240W, 85% efficiency	613663-001
	240W, high voltage protection	613664-001
	240W	613763-001
(4)	Speaker, internal	636925-001
(5)	System board (includes replacement thermal material)	
	For use in models without Windows 8	676358-001
	For use in models with Windows 8 Standard	676358-501
	For use in models with Windows 8 Professional	676358-601
	For use in models with NetClone	699943-001
(6)	Chassis fan	636922-001
(7)	Baffle	636921-001
(8)	Heat sink (includes replacement thermal material)	636919-001
(9)	Front I/O and power switch assembly	636926-001
	Cables	
(10)	SATA power cable	636923-001
(11)	SATA cable, 1 straight end, 1 angled end (25 inch; 365 mm)	638814-001
(12)	SATA cable, 2 straight ends 19-inch; 483 mm)	638813-001
	SATA USB 3.0 SuperSpeed power extension cable, 20 in	663214-001
	SATA power extension cable, 20 in	633756-001
	HP DisplayPort cable	487562-001
	Adapter, DMS-59 to dual VGA	463023-001
	Adapter, DisplayPort (DP) to DVI	662723-001
	Adapter, DVI to VGA	657401-001
	Adapter, DisplayPort (DP) to HDMI	617450-001
	Adapter, DisplayPort (DP) to VGA	603250-001
	Memory modules (PC3-12800, 1666-MHz)	
	8-MB	689375-001
	4-GB	671613-001
	2-GB	671612-001
	Hard drives	
	1-TB	636930-001

Item	Description	Spare part number
	500-GB	636929-001
	500-GB, 2.5-inch, self-encrypting (SED)	696442-001
	250-GB	636927-001
	256-GB Solid-state drive (SSD), SATA 6.0	661842-001
		680020-001
	180-GB Solid-state drive (SSD), SATA 6.0	696622-001
	120-GB Solid-state drive (SSD), SATA 2.0	661841-001
	Optical drives	
	6X BD-Writer SuperMulti drive	656792-001
	16X DVD±RW SuperMulti drive	690418-001
		660408-001
	16X DVD-ROM drive	682550-001
	Expansion cards	
	For use in models without Windows 8	
	ATI Radeon HD7450, 1-GB PCle x16 graphics card, includes adapter	682411-001
	ATI Radeon HD6350, 512-MB PCIe x16 graphics card	637995-001
	AMD FirePro 2270 PCIe x16 graphics card, 512-MB	637213-001
	nVidia Quadro NVS310 PCIe x16 graphics card	680653-001
	nVidia Quadro NVS300 PCIe x16 graphics card	632486-001
	For use in models with Windows 8	
	ATI Radeon HD7450, 1-GB PCle x16 graphics card, includes adapter	702647-001
	ATI Radeon HD6350, 512-MB PCle x16 graphics card	697246-001
	nVidia Quadro NVS300 PCIe x16 graphics card	700578-001
	Other boards	
	HP FireWire / IEEE 1394a PCle x1 Card	637591-001
	 USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports and 2 internal ports 	663213-001
	USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports	608151-001
	HP WLAN 802.11 g/n 1x2 PCle NIC	538048-001
	Intel PRO/1000CT2 NIC, includes bracket	635523-001
	Keyboard	
	NOTE: For a list of supported countries and associated dash numbers, see <u>Sequential</u> part number listing on page 36.	
	PS/2 (non-Windows 8)	537745-xxx
	PS/2 (Windows 8)	701428-xxx

tem	Description	Spare part number
	USB (non-Windows 8)	537746-xxx
	USB (Windows 8)	701429-xxx
	USB SmartCard (non-Windows 8)	631411-xxx
	USB SmartCard (Windows 8)	701427-xxx
	Wireless (non-Windows 8)	674314-xxx
	Wireless (Windows 8)	701426-xxx
	Washable (non-Windows 8)	613125-xxx
	Washable (Windows 8)	700510-xxx
	Processors (include replacement thermal material)	
	Intel Core i7 3770s processor, 3.1 GHz	689370-001
	Intel Core i5 3570s processor, 3.1 GHz	695079-001
	Intel Core i5 3475s processor, 2.9 GHz	695078-001
	Intel Core i5 3470s processor, 2.9 GHz	695077-001
	Intel Core i3 3240 processor, 3.4 GHz	688951-001
	Intel Core i3 3225 processor, 3.3 GHz	689578-001
	Intel Core i3 3220 processor, 3.3 GHz	688950-001
	Intel Core i3 2130 processor, 3.4 GHz	665120-001
	Intel Core i3 2120 processor, 3.3 GHz	638629-001
	 Intel Pentium Dual-Core G2130 processor, 3.2 GHz 	715898-001
	Intel Pentium Dual-Core G2120 processor, 3.1 GHz	703282-001
	 Intel Pentium Dual-Core G2020 processor, 2.9 GHz 	715897-001
	 Intel Pentium Dual-Core G2010 processor, 2.8 GHz 	715896-001
	 Intel Pentium Dual-Core G870 processor, 3.1 GHz 	691936-001
	Intel Pentium Dual-Core G860 processor, 3.0 GHz	665123-001
	 Intel Pentium Dual-Core G645 processor, 2.9 GHz 	704228-001
	Intel Pentium Dual-Core G640 processor, 2.8 GHz	691935-001
	Intel Celeron G1620 processor, 2.7 GHz	715894-001
	Intel Celeron G1610 processor, 2.6 GHz	715893-001
	Intel Celeron G555 processor, 2.7 GHz	704227-001
	Intel Celeron G550 processor, 2.6 GHz	691934-001
	Intel Celeron G540 processor, 2.5 GHz	665119-001
	Intel Celeron G465 processor, 1.9 GHz	706883-001
	Intel Celeron G460 processor, 1.8 GHz	682410-001

tem	Description	Spare part number
	Wireless	674317-001
	USB, optical, black	537749-001
	USB, laser, black	570580-001
	Washable	619580-001
	Wireless keyboard/mouse transceiver	674319-001
	Bezel blank, 5.25-inch	570838-001
	Antenna for use with WLAN module 538048-001	583345-001
	Hard drive grommet	450712-001
	Hard drive adapter, 2.5 inch	586721-001
	Printer port kit	638817-001
	Serial port kit	638815-001
	Card reader, 22-in-1	636166-001
	USB speakers, external	636917-001
	USB webcam	674317-001
	Rubber Feet Kit	583654-001
	Chassis stand	688952-001
	HP Business Digital Headset	642738-001
	Hard drive conversion bracket	397117-001
	Screw Kit	393956-001

Sequential part number listing

Spare part number	Description
393956-001	Screw Kit
397117-001	Hard drive conversion bracket
450712-001	Hard drive grommet
463023-001	Adapter, DMS-59 to dual VGA
487562-001	HP DisplayPort cable
508987-001	Clamp Lock Kit, includes universal cable (plate not included)
537745-001	Keyboard, PS/2, the United States
537745-031	Keyboard, PS/2, non-Windows 8, the United Kingdom
537745-041	Keyboard, PS/2, non-Windows 8, Germany
537745-051	Keyboard, PS/2, non-Windows 8, France
537745-061	Keyboard, PS/2, non-Windows 8, Italy

537745-071 Keyboard, PS/Z, non-Windows 8, Spain 537745-081 Keyboard, PS/Z, non-Windows 8, Norway 537745-101 Keyboard, PS/Z, non-Windows 8, Sweden 537745-111 Keyboard, PS/Z, non-Windows 8, Switzerland 537745-121 Keyboard, PS/Z, non-Windows 8, French Canada 537745-131 Keyboard, PS/Z, non-Windows 8, Portugal 537745-131 Keyboard, PS/Z, non-Windows 8, Turkey 537745-131 Keyboard, PS/Z, non-Windows 8, Turkey 537745-131 Keyboard, PS/Z, non-Windows 8, Turkey 537745-161 Keyboard, PS/Z, non-Windows 8, Greece 537745-171 Keyboard, PS/Z, non-Windows 8, Belgium 537745-181 Keyboard, PS/Z, non-Windows 8, Belgium 537745-211 Keyboard, PS/Z, non-Windows 8, Hungary 537745-211 Keyboard, PS/Z, non-Windows 8, Bidyaria 537745-214 Keyboard, PS/Z, non-Windows 8, Bugaria 537745-215 Keyboard, PS/Z, non-Windows 8, Bugaria 537745-216 Keyboard, PS/Z, non-Windows 8, Bugaria 537745-217 Keyboard, PS/Z, non-Windows 8, Bugaria 537745-218 Keyboard, PS/Z, non-Windows 8, Bugaria 537745-219 Keyboard, PS/Z, non-Windows 8, Int	Spare part number	Description
537745-091 Keyboard, PS/2, non-Windows 8, Sweden 537745-111 Keyboard, PS/2, non-Windows 8, Switzerland 537745-121 Keyboard, PS/2, non-Windows 8, French Canada 537745-131 Keyboard, PS/2, non-Windows 8, Portugal 537745-141 Keyboard, PS/2, non-Windows 8, Turkey 537745-151 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-171 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-212 Keyboard, PS/2, non-Windows 8, Horeach Republic 537745-213 Keyboard, PS/2, non-Windows 8, Siovakia 537745-231 Keyboard, PS/2, non-Windows 8, Siovakia 537745-261 Keyboard, PS/2, non-Windows 8, Rosania 537745-271 Keyboard, PS/2, non-Windows 8, Balgaria 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, International 537745-381 Keyboard, PS/2, non-Windows 8, International 537745-381 Ke	537745-071	Keyboard, PS/2, non-Windows 8, Spain
537745-101 Keyboard, PS/2, non-Windows 8, Sweden 537745-111 Keyboard, PS/2, non-Windows 8, Switzerland 537745-121 Keyboard, PS/2, non-Windows 8, Portugal 537745-131 Keyboard, PS/2, non-Windows 8, Portugal 537745-141 Keyboard, PS/2, non-Windows 8, Turkey 537745-161 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-171 Keyboard, PS/2, non-Windows 8, Belgium 537745-181 Keyboard, PS/2, non-Windows 8, Brazil 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Belarus 537745-341 Keyboard, PS/2, non-Windows 8, International 537745-B81 Keyboard, PS/2, non-Windows 8, Talwan 537745-B81 Keyboard, PS/2, non-Windows 8, Brael 537745-B81 Keyboar	537745-081	Keyboard, PS/2, non-Windows 8, Denmark
537745-111 Keyboard, PS/2, non-Windows 8, Switzerland 537745-121 Keyboard, PS/2, non-Windows 8, French Canada 537745-131 Keyboard, PS/2, non-Windows 8, Portugal 537745-141 Keyboard, PS/2, non-Windows 8, Turkey 537745-151 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-171 Keyboard, PS/2, non-Windows 8, Belgium 537745-181 Keyboard, PS/2, non-Windows 8, Brazil 537745-201 Keyboard, PS/2, non-Windows 8, Hungary 537745-211 Keyboard, PS/2, non-Windows 8, He Czech Republic 537745-221 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Romania 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, International 537745-371 Keyboard, PS/2, non-Windows 8, International 537745-8B1 Keyboard, PS/2, non-Windows 8, Israel 537745-B1 Keyboard, PS/2, non-Windows 8, Israel 537745-B1 Keyboard, PS/2, non-Windows 8, Israel 537745-B1 Keyboard,	537745-091	Keyboard, PS/2, non-Windows 8, Norway
637745-121 Keyboard, PS/2, non-Windows 8, Prench Canada 637745-131 Keyboard, PS/2, non-Windows 8, Portugal 637745-141 Keyboard, PS/2, non-Windows 8, Turkey 637745-151 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Latin America 537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-181 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, Biovakia 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Romania 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Birternational 537745-371 Keyboard, PS/2, non-Windows 8, Birternational 537745-B81 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B81 Keyboard, PS/2, non-Windows 8, India 537745-B81 Keyboard, PS/2, non-Windows 8, India 537745-B81 Keyboard, PS	537745-101	Keyboard, PS/2, non-Windows 8, Sweden
537745-131 Keyboard, PS/2, non-Windows 8, Portugal 537745-141 Keyboard, PS/2, non-Windows 8, Turkey 537745-161 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Latin America 537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-181 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Berzil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, Stovakia 537745-231 Keyboard, PS/2, non-Windows 8, Russia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Russia 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, International 537745-371 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-BB1 Keyboard, PS/2, non-Windows 8, International 537745-BB1 Keyboard, PS/2, non-Windows 8, India 537745-DB1 Keyboard, PS/2, non-Windows 8, International 537745-DB1 Keyboard, PS/2, non-Windows 8, Huternational 537745-DB1 Keyboard, PS/2, non-Windows 8, Huternational 537745-DB1 Keyboard, PS/2, non-Windows 8, Huternational	537745-111	Keyboard, PS/2, non-Windows 8, Switzerland
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537745-151 Keyboard, PS/2, non-Windows 8, Greece 537745-161 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-181 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 637745-271 Keyboard, PS/2, non-Windows 8, Romania 637745-281 Keyboard, PS/2, non-Windows 8, Romania 637745-291 Keyboard, PS/2, non-Windows 8, Belarus 637745-291 Keyboard, PS/2, non-Windows 8, Japan 637745-371 Keyboard, PS/2, non-Windows 8, international 637745-AA1 Keyboard, PS/2, non-Windows 8, International 637745-BA1 Keyboard, PS/2, non-Windows 8, BHCSY 637745-BB1 Keyboard, PS/2, non-Windows 8, BHCSY 637745-BB1 Keyboard, PS/2, non-Windows 8, India 637745-DB1 Keyboard, PS/2, non-Windows 8, India 637745-DB1 Keyboard, PS/2, non-Windows 8, India 637745-DB1 Keyboard, PS/2, non-Windows 8, India 637745-L31 Keyboard, PS/2, non-Windows 8, South Korea 637745-L31 Keyboard, USB, non-Windows 8, the United States 637746-001 Keyboard, USB, non-Windows 8, the United Kingdom 637746-001 Keyboard, USB, non-Windows 8, Germany	537745-131	Keyboard, PS/2, non-Windows 8, Portugal
537745-161 Keyboard, PS/2, non-Windows 8, Latin America 537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-181 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, International 537745-374 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-B1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B2 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B1 Keyboard, PS/2, non-Windows 8, International 537745-D61 Keyboard, PS/2, non-Windows 8, South Korea 537745-D1 Keyboard, PS/2, non-Windows 8, the United States 537746-031	537745-141	Keyboard, PS/2, non-Windows 8, Turkey
537745-171 Keyboard, PS/2, non-Windows 8, Saudi Arabia 537745-181 Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, Slovakia 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-BB1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-DE1 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, India 537745-L31 Keyboard, PS/2, non-Windows 8, India 537745-L31 Keyboard, PS/2, non-Windows 8, India 537745-L31 Keyboard, PS/2, non-Windows 8, International 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United Kingdom 537746-001 Keyboard, USB, non-Windows 8, Germany	537745-151	Keyboard, PS/2, non-Windows 8, Greece
Keyboard, PS/2, non-Windows 8, Belgium 537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-221 Keyboard, PS/2, non-Windows 8, Slovakia 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-371 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-BA1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-DB1 Keyboard, PS/2, non-Windows 8, India 537745-DB1 Keyboard, PS/2, non-Windows 8, India 537745-DB1 Keyboard, PS/2, non-Windows 8, India 537745-BB1 Keyboard, PS/2, non-Windows 8, International 537745-BB1 Keyboard, PS/2, non-Windows 8, International 537745-BB1 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-161	Keyboard, PS/2, non-Windows 8, Latin America
537745-201 Keyboard, PS/2, non-Windows 8, Brazil 537745-211 Keyboard, PS/2, non-Windows 8, Hungary 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Romania 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-BB1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-DE1 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United Kingdom 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-171	Keyboard, PS/2, non-Windows 8, Saudi Arabia
537745-211 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-221 Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-261 Keyboard, PS/2, non-Windows 8, Romania 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-BB1 Keyboard, PS/2, non-Windows 8, HCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-DE1 Keyboard, PS/2, non-Windows 8, India 537745-BD1 Keyboard, PS/2, non-Windows 8, Arab 537745-L31 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-031 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-181	Keyboard, PS/2, non-Windows 8, Belgium
Keyboard, PS/2, non-Windows 8, the Czech Republic 537745-231 Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Belarus 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, International 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-BB1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, India 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-CD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-201	Keyboard, PS/2, non-Windows 8, Brazil
Keyboard, PS/2, non-Windows 8, Slovakia 537745-251 Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Romania 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-D61 Keyboard, PS/2, non-Windows 8, Arab 537745-L31 Keyboard, PS/2, non-Windows 8, South Korea 537746-01 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-211	Keyboard, PS/2, non-Windows 8, Hungary
Keyboard, PS/2, non-Windows 8, Russia 537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Romania 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-BB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-BB1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-CDE1 Keyboard, PS/2, non-Windows 8, Arab 537745-L31 Keyboard, PS/2, non-Windows 8, South Korea 537746-01 Keyboard, PS/2, non-Windows 8, International 537746-01 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-221	Keyboard, PS/2, non-Windows 8, the Czech Republic
537745-261 Keyboard, PS/2, non-Windows 8, Bulgaria 537745-271 Keyboard, PS/2, non-Windows 8, Romania 537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-371 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B1 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-D61 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-231	Keyboard, PS/2, non-Windows 8, Slovakia
Keyboard, PS/2, non-Windows 8, Romania Keyboard, PS/2, non-Windows 8, Belarus Keyboard, PS/2, non-Windows 8, Japan Keyboard, PS/2, non-Windows 8, Japan Keyboard, PS/2, non-Windows 8, international Keyboard, PS/2, non-Windows 8, Simplified Chinese Keyboard, PS/2, non-Windows 8, Taiwan Keyboard, PS/2, non-Windows 8, BHCSY Keyboard, PS/2, non-Windows 8, BHCSY Keyboard, PS/2, non-Windows 8, Israel Keyboard, PS/2, non-Windows 8, India Keyboard, PS/2, non-Windows 8, India Keyboard, PS/2, non-Windows 8, Arab Keyboard, PS/2, non-Windows 8, South Korea Keyboard, PS/2, non-Windows 8, International Keyboard, PS/2, non-Windows 8, International Keyboard, PS/2, non-Windows 8, the United States Keyboard, USB, non-Windows 8, the United Kingdom Keyboard, USB, non-Windows 8, Germany	537745-251	Keyboard, PS/2, non-Windows 8, Russia
537745-281 Keyboard, PS/2, non-Windows 8, Belarus 537745-291 Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-B81 Keyboard, PS/2, non-Windows 8, Israel 537745-B61 Keyboard, PS/2, non-Windows 8, India 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-261	Keyboard, PS/2, non-Windows 8, Bulgaria
Keyboard, PS/2, non-Windows 8, Japan 537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, Germany	537745-271	Keyboard, PS/2, non-Windows 8, Romania
537745-371 Keyboard, PS/2, non-Windows 8, international 537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-281	Keyboard, PS/2, non-Windows 8, Belarus
537745-AA1 Keyboard, PS/2, non-Windows 8, Simplified Chinese 537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-DE1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-291	Keyboard, PS/2, non-Windows 8, Japan
537745-AB1 Keyboard, PS/2, non-Windows 8, Taiwan 537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-371	Keyboard, PS/2, non-Windows 8, international
537745-B41 Keyboard, PS/2, non-Windows 8, BHCSY 537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-AA1	Keyboard, PS/2, non-Windows 8, Simplified Chinese
537745-BB1 Keyboard, PS/2, non-Windows 8, Israel 537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-AB1	Keyboard, PS/2, non-Windows 8, Taiwan
537745-D61 Keyboard, PS/2, non-Windows 8, India 537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-B41	Keyboard, PS/2, non-Windows 8, BHCSY
537745-DE1 Keyboard, PS/2, non-Windows 8, Arab 537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-BB1	Keyboard, PS/2, non-Windows 8, Israel
537745-KD1 Keyboard, PS/2, non-Windows 8, South Korea 537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-D61	Keyboard, PS/2, non-Windows 8, India
537745-L31 Keyboard, PS/2, non-Windows 8, International 537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-DE1	Keyboard, PS/2, non-Windows 8, Arab
537746-001 Keyboard, USB, non-Windows 8, the United States 537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-KD1	Keyboard, PS/2, non-Windows 8, South Korea
537746-031 Keyboard, USB, non-Windows 8, the United Kingdom 537746-041 Keyboard, USB, non-Windows 8, Germany	537745-L31	Keyboard, PS/2, non-Windows 8, International
537746-041 Keyboard, USB, non-Windows 8, Germany	537746-001	Keyboard, USB, non-Windows 8, the United States
	537746-031	Keyboard, USB, non-Windows 8, the United Kingdom
537746-051 Keyboard, USB, non-Windows 8, France	537746-041	Keyboard, USB, non-Windows 8, Germany
	537746-051	Keyboard, USB, non-Windows 8, France

Spare part number	Description
537746-061	Keyboard, USB, non-Windows 8, Italy
537746-071	Keyboard, USB, non-Windows 8, Spain
537746-081	Keyboard, USB, non-Windows 8, Denmark
537746-091	Keyboard, USB, non-Windows 8, Norway
537746-101	Keyboard, USB, non-Windows 8, Sweden
537746-111	Keyboard, USB, non-Windows 8, Switzerland
537746-121	Keyboard, USB, non-Windows 8, French Canada
537746-131	Keyboard, USB, non-Windows 8, Portugal
537746-141	Keyboard, USB, non-Windows 8, Turkey
537746-151	Keyboard, USB, non-Windows 8, Greece
537746-161	Keyboard, USB, non-Windows 8, Latin America
537746-171	Keyboard, USB, non-Windows 8, Saudi Arabia
537746-181	Keyboard, USB, non-Windows 8, Belgium
537746-201	Keyboard, USB, non-Windows 8, Brazil
537746-211	Keyboard, USB, non-Windows 8, Hungary
537746-221	Keyboard, USB, non-Windows 8, the Czech Republic
537746-231	Keyboard, USB, non-Windows 8, Slovakia
537746-251	Keyboard, USB, non-Windows 8, Russia
537746-281	Keyboard, USB, non-Windows 8, Belarus
537746-291	Keyboard, USB, non-Windows 8, Japan
537746-371	Keyboard, USB, non-Windows 8, international
537746-AA1	Keyboard, USB, non-Windows 8, Simplified Chinese
537746-AB1	Keyboard, USB, non-Windows 8, Taiwan
537746-B41	Keyboard, USB, non-Windows 8, BHCSY
537746-BB1	Keyboard, USB, non-Windows 8, Israel
537746-D61	Keyboard, USB, non-Windows 8, India
537746-DE1	Keyboard, USB, non-Windows 8, Arab
537746-KD1	Keyboard, USB, non-Windows 8, South Korea
537746-L31	Keyboard, USB, non-Windows 8, International
537749-001	Mouse, USB, optical, black
538048-001	HP WLAN 802.11 g/n 1x2 PCle NIC
570580-001	Mouse, USB
570838-001	Bezel blank, 5.25-inch
583654-001	Rubber Feet Kit

Spare part number	Description
603250-001	Adapter, DisplayPort (DP) to VGA
608151-001	USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports
613125-121	Keyboard, washable, French Canada
613125-001	Keyboard, washable, the United States
613663-001	Power supply, 240W, 85% efficiency
613664-001	Power supply, 240W, High Voltage protection
613763-001	Power supply, 240 W
617450-001	Adapter, DisplayPort (DP) to HDMI
619580-001	Mouse, washable
631411-004	Keyboard, SmartCard, non-Windows 8, the United States
631411-034	Keyboard, SmartCard, non-Windows 8, the United Kingdom
631411-044	Keyboard, USB, SmartCard, non-Windows 8, Germany
631411-054	Keyboard, USB, SmartCard, non-Windows 8, France
631411-064	Keyboard, USB, SmartCard, non-Windows 8, Italy
631411-074	Keyboard, USB, SmartCard, non-Windows 8, Spain
631411-084	Keyboard, USB, SmartCard, non-Windows 8, Denmark
631411-094	Keyboard, USB, SmartCard, non-Windows 8, Norway
631411-104	Keyboard, USB, SmartCard, non-Windows 8, Sweden
631411-114	Keyboard, USB, SmartCard, non-Windows 8, Switzerland
631411-124	Keyboard, USB, SmartCard, non-Windows 8, French Canada
631411-134	Keyboard, USB, SmartCard, non-Windows 8, Portugal
631411-144	Keyboard, USB, SmartCard, non-Windows 8, Turkey
631411-154	Keyboard, USB, SmartCard, non-Windows 8, Greece
631411-164	Keyboard, USB, SmartCard, non-Windows 8, Latin America
631411-174	Keyboard, USB, SmartCard, non-Windows 8, Saudi Arabia
631411-184	Keyboard, USB, SmartCard, non-Windows 8, Belgium
631411-204	Keyboard, USB, SmartCard, non-Windows 8, Brazil
631411-214	Keyboard, USB, SmartCard, non-Windows 8, Hungary
631411-224	Keyboard, USB, SmartCard, non-Windows 8, the Czech Republic
631411-234	Keyboard, USB, SmartCard, non-Windows 8, Slovakia
631411-254	Keyboard, USB, SmartCard, non-Windows 8, Russia
631411-264	Keyboard, USB, SmartCard, non-Windows 8, Bulgaria
631411-274	Keyboard, USB, SmartCard, non-Windows 8, Romania
631411-284	Keyboard, USB, SmartCard, non-Windows 8, Thailand

Spare part number	Description
631411-294	Keyboard, USB, SmartCard, non-Windows 8, Japan
631411-374	Keyboard, USB, SmartCard, non-Windows 8, international
631411-AA4	Keyboard, USB, SmartCard, non-Windows 8, Simplified Chinese
631411-AB4	Keyboard, USB, SmartCard, non-Windows 8, Taiwan
631411-B44	Keyboard, USB, SmartCard, non-Windows 8, International English
631411-BB4	Keyboard, USB, SmartCard, non-Windows 8, Israel
631411-DE4	Keyboard, USB, SmartCard, non-Windows 8, Arab
631411-KD4	Keyboard, USB, SmartCard, non-Windows 8, South Korea
631411-L34	Keyboard, USB, SmartCard, non-Windows 8, International
632486-001	nVidia Quadro NVS300 PCIe x16 graphics card
635523-001	Intel PRO/1000CT2 NIC, includes bracket
636166-001	Card reader, 22-in-1
636917-001	USB speakers, external
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
636929-001	500-GB hard drive
636930-001	1-TB hard drive
637213-001	AMD FirePro 2270 PCIe x16 graphics card, 512-MB
637591-001	HP FireWire / IEEE 1394a PCIe x1 Card
637995-001	ATI HD6350, 512-MB PCle x16 graphics card
638629-001	Intel Core i3 2120 processor, 3.3 GHz
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
638817-001	Printer port
642738-001	HP Business Digital Headset
656792-001	6X BD-Writer SuperMulti drive

Spare part number	Description
657401-001	Adapter, DVI to VGA
660408-001	16X DVD±RW SuperMulti drive
661841-001	120 GB Solid-state drive (SSD), SATA 2.0
661842-001	256 GB Solid-state drive (SSD), SATA 6.0
662723-001	Adapter, DisplayPort (DP) to DVI
663213-001	USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports and 2 internal ports
663214-001	SATA USB 3.0 SuperSpeed power extension cable, 20 in
665119-001	Intel Celeron G540 processor, 2.5 GHz
665120-001	Intel Core i3 2130 processor, 3.4 GHz
665123-001	Intel Pentium Dual-Core G860 processor, 3.0 GHz
671612-001	Memory module, 2-GB, PC3 12800, 1666-MHz
671613-001	Memory module, 4-GB, PC3 12800, 1666-MHz
674314-001	Keyboard, wireless, non-Windows 8, the United States
674314-031	Keyboard, wireless, non-Windows 8, the United Kingdom
674314-041	Keyboard, wireless, non-Windows 8, Germany
674314-051	Keyboard, wireless, non-Windows 8, France
674314-061	Keyboard, wireless, non-Windows 8, Italy
674314-071	Keyboard, wireless, non-Windows 8, Spain
674314-081	Keyboard, wireless, non-Windows 8, Denmark
674314-091	Keyboard, wireless, non-Windows 8, Norway
674314-101	Keyboard, wireless, non-Windows 8, Sweden
674314-111	Keyboard, wireless, non-Windows 8, Switzerland
674314-121	Keyboard, wireless, non-Windows 8, French Canada
674314-131	Keyboard, wireless, non-Windows 8, Portugal
674314-141	Keyboard, wireless, non-Windows 8, Turkey
674314-151	Keyboard, wireless, non-Windows 8, Greece
674314-161	Keyboard, wireless, non-Windows 8, Latin America
674314-171	Keyboard, wireless, non-Windows 8, Saudi Arabia
674314-181	Keyboard, wireless, non-Windows 8, Belgium
674314-201	Keyboard, wireless, non-Windows 8, Brazil
674314-211	Keyboard, wireless, non-Windows 8, Hungary
674314-221	Keyboard, wireless, non-Windows 8, the Czech Republic
674314-231	Keyboard, wireless, non-Windows 8, Slovakia
674314-251	Keyboard, wireless, non-Windows 8, Russia

Spare part number	Description
674314-281	Keyboard, wireless, non-Windows 8, Belarus
674314-291	Keyboard, wireless, non-Windows 8, Japan
674314-371	Keyboard, wireless, non-Windows 8, international
674314-AA1	Keyboard, wireless, non-Windows 8, Simplified Chinese
674314-AB1	Keyboard, wireless, non-Windows 8, Taiwan
674314-B41	Keyboard, wireless, non-Windows 8, BHCSY
674314-BB1	Keyboard, wireless, non-Windows 8, Israel
674314-D61	Keyboard, wireless, non-Windows 8, India
674314-DE1	Keyboard, wireless, non-Windows 8, Arab
674314-KD1	Keyboard, wireless, non-Windows 8, South Korea
674314-L31	Keyboard, wireless, non-Windows 8, International
682411-001	ATI Radeon HD7450 PCIe x16 graphics card, 1 GB (includes adapter)
695080-001	Front bezel
674314-121	Keyboard, wireless, for use in French Canada
674317-001	Mouse, wireless
674319-001	Wireless keyboard/mouse transceiver
676358-001	System board for use in models without Windows 8 (includes replacement thermal material)
676358-501	System board for use in models with Windows 8 Standard
676358-601	System board for use in models with Windows 8 Professional
680020-001	256 GB Solid-state drive (SSD)
680653-001	nVidia Quadro NVS310 PCIe x16 graphics card
682410-001	Intel Celeron G460 processor, 1.8 GHz
682550-001	16X DVD-ROM drive
688950-001	Intel Core i3 3220 processor, 3.3 GHz
688951-001	Intel Core i3 3240 processor, 3.4 GHz
688952-001	Chassis stand
689370-001	Intel Core i7 3770s processor, 3.1 GHz
689375-001	Memory module, 8-GB, PC3 12800, 1666-MHz
689578-001	Intel Core i3 3225 processor, 3.3 GHz
690418-001	16X DVD±RW SuperMulti drive
691934-001	Intel Celeron G550 processor, 2.6 GHz
691935-001	Intel Pentium Dual-Core G640 processor, 2.8 GHz
691936-001	Intel Pentium Dual-Core G870 processor, 3.1 GHz
695077-001	Intel Core i5 3470s processor, 2.9 GHz

Spare part number	Description
695078-001	Intel Core i5 3475s processor, 2.9 GHz
695079-001	Intel Core i5 3570s processor, 3.1 GHz
695080-001	Front bezel
696442-001	500 GB, 7200 rpm, 2.5-inch, self-encrypting (SED) hard drive
696622-001	180 GB Solid-state drive (SSD), SATA 6.0
697246-001	ATI Radeon HD6350, 512-MB PCIe x16 graphics card for use in models with Windows 8
699943-001	System board for use in models with NetClone
700510-001	Keyboard, washable, the United States
700510-121	Keyboard, washable, French Canada
700578-001	nVidia Quadro NVS300 PCIe x16 graphics card for use in models with Windows 8
701426-001	Keyboard, wireless, Windows 8, the United States
701426-031	Keyboard, wireless, Windows 8, the United Kingdom
701426-041	Keyboard, wireless, Windows 8, Germany
701426-051	Keyboard, wireless, Windows 8, France
701426-061	Keyboard, wireless, Windows 8, Italy
701426-071	Keyboard, wireless, Windows 8, Spain
701426-081	Keyboard, wireless, Windows 8, Denmark
701426-091	Keyboard, wireless, Windows 8, Norway
701426-101	Keyboard, wireless, Windows 8, Sweden
701426-111	Keyboard, wireless, Windows 8, Switzerland
701426-121	Keyboard, wireless, Windows 8, French Canada
701426-131	Keyboard, wireless, Windows 8, Portugal
701426-141	Keyboard, wireless, Windows 8, Turkey
701426-151	Keyboard, wireless, Greece
701426-161	Keyboard, wireless, Windows 8, Latin America
701426-171	Keyboard, wireless, Windows 8, Saudi Arabia
701426-181	Keyboard, wireless, Windows 8, Belgium
701426-201	Keyboard, wireless, Windows 8, Brazil
701426-211	Keyboard, wireless, Windows 8, Hungary
701426-221	Keyboard, wireless, Windows 8, the Czech Republic
701426-231	Keyboard, wireless, Windows 8, Slovakia
701426-251	Keyboard, wireless, Windows 8, Russia
701426-261	Keyboard, wireless, Windows 8, Bulgaria
701426-281	Keyboard, wireless, Windows 8, Belarus

Spare part number	Description
701426-291	Keyboard, wireless, Windows 8, Japan
701426-371	Keyboard, wireless, Windows 8, international
701426-AA1	Keyboard, wireless, Windows 8, Simplified Chinese
701426-AB1	Keyboard, wireless, Windows 8, Taiwan
701426-B41	Keyboard, wireless, Windows 8, BHCSY
701426-BB1	Keyboard, wireless, Windows 8, Israel
701426-D61	Keyboard, wireless, Windows 8, India
701426-DE1	Keyboard, wireless, Windows 8, Arab
701426-KD1	Keyboard, wireless, Windows 8, South Korea
701426-L31	Keyboard, wireless, Windows 8, International
701427-001	Keyboard, USB, Smart card, Windows 8, the United States
701427-031	Keyboard, USB, Smart card, Windows 8, the United Kingdom
701427-041	Keyboard, USB, Smart card, Windows 8, Germany
701427-051	Keyboard, USB, Smart card, Windows 8, France
701427-061	Keyboard, USB, Smart card, Windows 8, Italy
701427-071	Keyboard, USB, Smart card, Windows 8, Spain
701427-081	Keyboard, USB, Smart card, Windows 8, Denmark
701427-091	Keyboard, USB, Smart card, Windows 8, Norway
701427-101	Keyboard, USB, Smart card, Windows 8, Sweden
701427-111	Keyboard, USB, Smart card, Windows 8, Switzerland
701427-121	Keyboard, USB, Smart card, Windows 8, French Canada
701427-131	Keyboard, USB, Smart card, Windows 8, Portugal
701427-141	Keyboard, USB, Smart card, Windows 8, Turkey
701427-151	Keyboard, USB, Smart card, Greece
701427-161	Keyboard, USB, Smart card, Windows 8, Latin America
701427-171	Keyboard, USB, Smart card, Windows 8, Saudi Arabia
701427-181	Keyboard, USB, Smart card, Windows 8, Belgium
701427-201	Keyboard, USB, Smart card, Windows 8, Brazil
701427-211	Keyboard, USB, Smart card, Windows 8, Hungary
701427-221	Keyboard, USB, Smart card, Windows 8, the Czech Republic
701427-231	Keyboard, USB, Smart card, Windows 8, Slovakia
701427-251	Keyboard, USB, Smart card, Windows 8, Russia
701427-261	Keyboard, USB, Smart card, Windows 8, Bulgaria
701427-281	Keyboard, USB, Smart card, Windows 8, Belarus

Spare part number	Description
701427-291	Keyboard, USB, Smart card, Windows 8, Japan
701427-371	Keyboard, USB, Smart card, Windows 8, international
701427-AA1	Keyboard, USB, Smart card, Windows 8, Simplified Chinese
701427-AB1	Keyboard, USB, Smart card, Windows 8, Taiwan
701427-B41	Keyboard, USB, Smart card, Windows 8, BHCSY
701427-BB1	Keyboard, USB, Smart card, Windows 8, Israel
701427-D61	Keyboard, USB, Smart card, Windows 8, India
701427-DE1	Keyboard, USB, Smart card, Windows 8, Arab
701427-KD1	Keyboard, USB, Smart card, Windows 8, South Korea
701427-L31	Keyboard, USB, Smart card, Windows 8, International
701428-001	Keyboard, PS/2, Windows 8, the United States
701428-031	Keyboard, PS/2, Windows 8, the United Kingdom
701428-041	Keyboard, PS/2, Windows 8, Germany
701428-051	Keyboard, PS/2, Windows 8, France
701428-061	Keyboard, PS/2, Windows 8, Italy
701428-071	Keyboard, PS/2, Windows 8, Spain
701428-081	Keyboard, PS/2, Windows 8, Denmark
701428-091	Keyboard, PS/2, Windows 8, Norway
701428-101	Keyboard, PS/2, Windows 8, Sweden
701428-111	Keyboard, PS/2, Windows 8, Switzerland
701428-121	Keyboard, PS/2, Windows 8, French Canada
701428-131	Keyboard, PS/2, Windows 8, Portugal
701428-141	Keyboard, PS/2, Windows 8, Turkey
701428-151	Keyboard, PS/2, Windows 8, Greece
701428-161	Keyboard, PS/2, Windows 8, Latin America
701428-171	Keyboard, PS/2, Windows 8, Saudi Arabia
701428-181	Keyboard, PS/2, Windows 8, Belgium
701428-201	Keyboard, PS/2, Windows 8, Brazil
701428-211	Keyboard, PS/2, Windows 8, Hungary
701428-221	Keyboard, PS/2, Windows 8, the Czech Republic
701428-231	Keyboard, PS/2, Windows 8, Slovakia
701428-251	Keyboard, PS/2, Windows 8, Russia
701428-261	Keyboard, PS/2, Windows 8, Bulgaria
701428-281	Keyboard, PS/2, Windows 8, Belarus

Spare part number	Description
701428-291	Keyboard, PS/2, Windows 8, Japan
701428-371	Keyboard, PS/2, Windows 8, international
701428-AA1	Keyboard, PS/2, Windows 8, Simplified Chinese
701428-AB1	Keyboard, PS/2, Windows 8, Taiwan
701428-B41	Keyboard, PS/2, Windows 8, BHCSY
701428-BB1	Keyboard, PS/2, Windows 8, Israel
701428-D61	Keyboard, PS/2, Windows 8, India
701428-DE1	Keyboard, PS/2, Windows 8, Arab
701428-KD1	Keyboard, PS/2, Windows 8, South Korea
701428-L31	Keyboard, PS/2, Windows 8, International
701429-001	Keyboard, USB, Windows 8, the United States
701429-031	Keyboard, USB, Windows 8, the United Kingdom
701429-041	Keyboard, USB, Windows 8, Germany
701429-051	Keyboard, USB, Windows 8, France
701429-061	Keyboard, USB, Windows 8, Italy
701429-071	Keyboard, USB, Windows 8, Spain
701429-081	Keyboard, USB, Windows 8, Denmark
701429-091	Keyboard, USB, Windows 8, Norway
701429-101	Keyboard, USB, Windows 8, Sweden
701429-111	Keyboard, USB, Windows 8, Switzerland
701429-121	Keyboard, USB, Windows 8, French Canada
701429-131	Keyboard, USB, Windows 8, Portugal
701429-141	Keyboard, USB, Windows 8, Turkey
701429-151	Keyboard, USB, Greece
701429-161	Keyboard, USB, Windows 8, Latin America
701429-171	Keyboard, USB, Windows 8, Saudi Arabia
701429-181	Keyboard, USB, Windows 8, Belgium
701429-201	Keyboard, USB, Windows 8, Brazil
701429-211	Keyboard, USB, Windows 8, Hungary
701429-221	Keyboard, USB, Windows 8, the Czech Republic
701429-231	Keyboard, USB, Windows 8, Slovakia
701429-251	Keyboard, USB, Windows 8, Russia
701429-261	Keyboard, USB, Windows 8, Bulgaria
701429-281	Keyboard, USB, Windows 8, Belarus

Spare part number	Description
701429-291	Keyboard, USB, Windows 8, Japan
701429-371	Keyboard, USB, Windows 8, international
701429-AA1	Keyboard, USB, Windows 8, Simplified Chinese
701429-AB1	Keyboard, USB, Windows 8, Taiwan
701429-B41	Keyboard, USB, Windows 8, BHCSY
701429-BB1	Keyboard, USB, Windows 8, Israel
701429-D61	Keyboard, USB, Windows 8, India
701429-DE1	Keyboard, USB, Windows 8, Arab
701429-KD1	Keyboard, USB, Windows 8, South Korea
701429-L31	Keyboard, USB, Windows 8, International
702647-001	ATI Radeon HD7450, 1-GB PCle x16 graphics card, includes adapter for use in models with Windows 8
703282-001	Intel Pentium Dual-Core G2120 processor, 3.1 GHz
704227-001	Intel Celeron G555 processor, 2.7 GHz
704228-001	Intel Pentium Dual-Core G645 processor, 2.9 GHz
706883-001	Intel Celeron G465 processor, 1.9 GHz
715893-001	Intel Celeron G1610 processor, 2.6 GHz
715894-001	Intel Celeron G1620 processor, 2.7 GHz
715895-001	Intel Core i3-3210 processor, 3.2 GHz
715896-001	Intel Pentium Dual-Core G2010 processor, 2.8 GHz
715897-001	Intel Pentium Dual-Core G2020 processor, 2.9 GHz
715898-001	Intel Pentium Dual-Core G2130 processor, 3.2 GHz

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 7-1 Serial Number and Product ID Location



Preparation for Disassembly

See Identifying the Chassis, Routine Care, and Disassembly Preparation on page 24 for initial safety procedures.

- Remove/disengage any security devices that prohibit opening the computer (Installing a Security Lock on page 97).
- 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.
 - A 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.

Computer Access Panel

Description	Spare part number
Access panel	636924-001

- 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
- 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 7-2 Removing the Access Panel



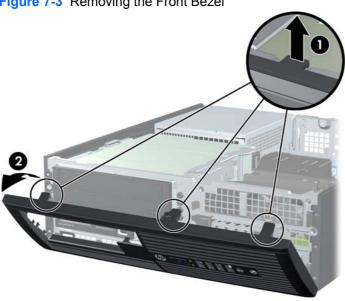
To install the access panel, reverse the removal procedure.

Front Bezel

Description	Spare part number
Front bezel	695080-001

- Prepare the computer for disassembly (Preparation for Disassembly on page 48). 1.
- Remove the access panel (Computer Access Panel on page 50). 2.
- Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2). 3.

Figure 7-3 Removing the Front Bezel



To install the front bezel, reverse the removal procedure.

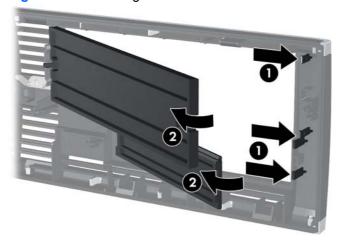
Bezel Blanks

Description	Spare part number
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 50).
- 2. Remove the front bezel (Front Bezel on page 51)..
- 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 7-4 Removing a Bezel Blank



Replace the front bezel.

System Board Connections

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

Figure 7-5 System Board Connections

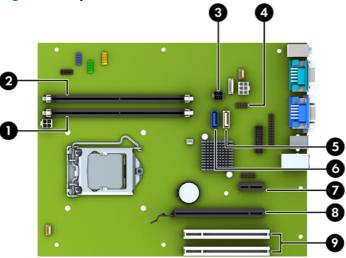


Table 7-1 System Board Connections

No.	System Board Connector	System Board Label	Color	Component
1	DIMM (Channel A)	XMM3	black	Memory Module
2	DIMM (Channel B)	XMM1	black	Memory Module
3	Power	SATAPWR1	black	SATA Drives
4	Media Card Reader	MEDIA1	black	Media Card Reader
5	SATA	SATA1	white	Optical Drive
6	SATA	SATA0	dark blue	Hard Drive
7	PCI Express x1	X1PCIEXP1	black	Expansion Card
8	PCI Express x16	X16PCIEXP	black	Expansion Card
9	PCI (2)	PCI1 and PCI2	white	Expansion Card

Installing Additional Memory

Description	Spare part number
8-GB, PC3-12800	689375-001
4-GB, PC3-12800	671613-001
2-GB, PC3-12800	671612-001

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:

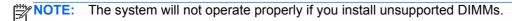
- industry-standard 240-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM DIMMs

The DDR3-SDRAM DIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 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



Populating DIMM Sockets

There are two DIMM sockets on the system board: XMM1 and XMM3 with one socket per Channel. XMM3 operates in memory channel A. XMM1 operates in memory Channel B.

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

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 (<u>Preparation for Disassembly on page 48</u>).
- 2. Remove the access panel (Computer Access Panel on page 50).

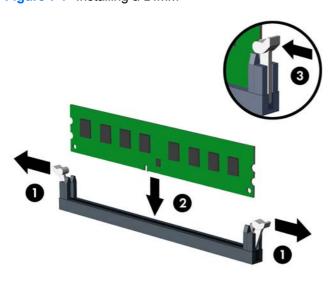
3. Rotate up the drive bay housing to access the memory module sockets on the system board.

Figure 7-6 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 7-7 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.

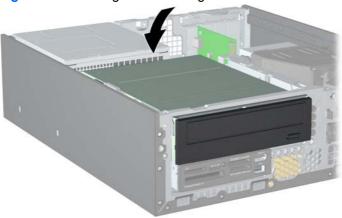
A DIMM must occupy the black XMM1 socket.

For maximum performance, populate the sockets so that the memory capacity is equal between Channel A and Channel B. Refer to <u>Populating DIMM Sockets on page 55</u> 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).

Rotate the drive cage back down to its normal position.

Figure 7-8 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.

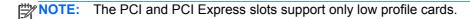
The computer should automatically recognize the additional memory the next time you turn on the computer.

Removing or Installing an Expansion Card

Description	Spare part number
Graphics cards for models without Windows 8	
ATI HD6350, 512-MB PCIe x16 graphics card	637995-001
nVidia Quadro NVS310 PCIe x16 graphics card	680653-001
nVidia Quadro NVS300 PCIe x16 graphics card	632486-001
ATI Radeon HD7450 PCIe x16 graphics card, 1 GB (includes adapter)	682411-001
AMD FirePro 2270 PCIe x16 graphics card, 512-MB	637213-001
Graphics cards for models with Windows 8	
ATI Radeon HD7450 PCIe x16 graphics card, 1 GB (includes adapter)	702647-001
ATI HD6350, 512-MB PCle x16 graphics card	697246-001
nVidia Quadro NVS300 PCIe x16 graphics card	700578-001
Other boards	
USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports and 2 internal ports	663213-001
USB 3.0 SuperSpeed PCI-3 x1 card, includes 2 external Type A ports	608151-001
HP WLAN 802.11 g/n 1x2 PCIe NIC	538048-001

Description	Spare part number
Intel PRO/1000CT2 NIC, includes bracket	635523-001
HP FireWire / IEEE 1394a PCIe x1 Card	637591-001
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.

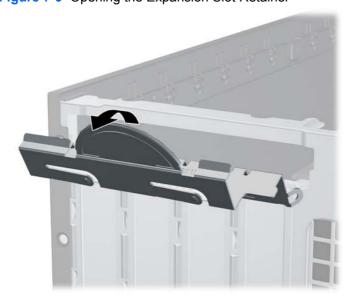


NOTE: You can install a PCI Express x1, x4, x8, or x16 expansion card in the PCI Express x16 slot.

To install an expansion card:

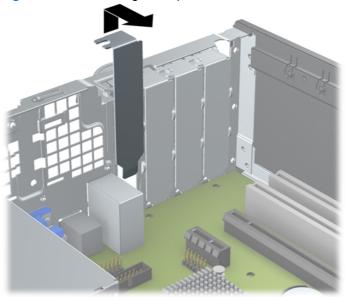
- 1. Prepare the computer for disassembly (<u>Preparation for Disassembly on page 48</u>).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Locate the correct vacant expansion socket on the system board and the corresponding expansion slot on the back of the computer chassis.
- 4. 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 7-9 Opening the Expansion Slot Retainer



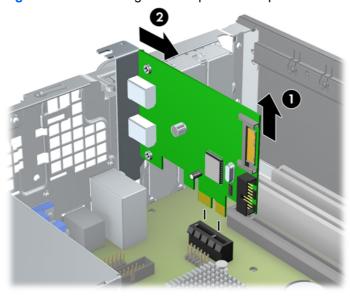
- Before installing an expansion card, remove the expansion slot cover or the existing expansion card.
 - a. If you are installing an expansion card in a vacant socket, remove the appropriate expansion slot cover on the back of the chassis. Pull the slot cover straight up then away from the inside of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

Figure 7-10 Removing an Expansion Slot Cover



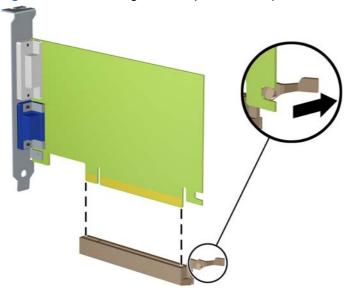
- b. If you are removing a standard PCI card or PCI Express x1 card, hold the card at each end, and carefully rock it back and forth until the connectors pull free from the socket. Pull the expansion card straight up from the socket (1) then away from the inside of the chassis to release it from the 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 7-11 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.

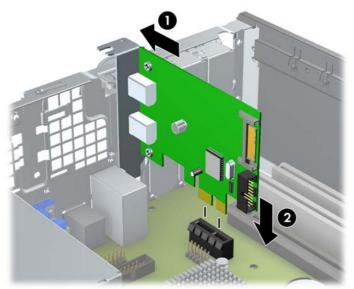
Figure 7-12 Removing a PCI Express x16 Expansion Card



- 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.
 - <u>CAUTION</u>: 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.

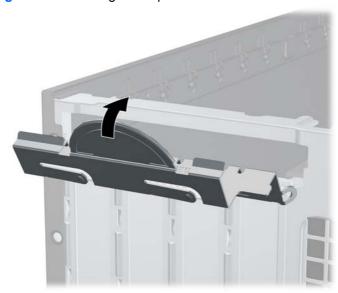
8. To install a new expansion card, hold the card just above the expansion socket on the system board then move the card toward the rear of the chassis (1) so that the bracket on the card is aligned with the open slot on the rear of the chassis. Press the card straight down into the expansion socket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

Figure 7-13 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 7-14 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:

- 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).
 - Always pull the connector NEVER pull on the cable. Pulling on the cable could damage the cable and result in a failed power supply.

Drives

Description	Spare part number
Optical drives:	
6X BD-Writer SuperMulti drive	656792-001
16X DVD±RW SuperMulti drive	690418-001
	660408-001
16X DVD-ROM drive	682550-001
Hard drives:	
1 TB hard drive	636930-001
500 GB hard drive	636929-001
500 GB, 2.5-inch, self-encrypting (SED) hard drive	696442-001
250 GB hard drive	636927-001
256 GB Solid-state drive (SSD), SATA 6.0	661842-001
	680020-001
180 GB Solid-state drive (SSD), SATA 6.0	696622-001
120 GB Solid-state drive (SSD), SATA 2.0	661841-001
Drive cables:	
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.

A 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 7-15 Drive Positions

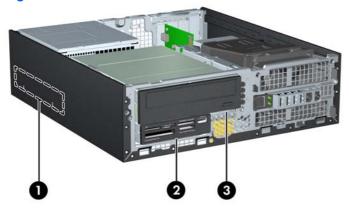


Table 7-2 Drive Positions

3.5-inch internal hard drive bay
 3.5-inch internal drive bay for optional drives (media card reader shown)
 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 <u>System Board Connections on page 53</u> 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 MEDIA1.
- 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.

Figure 7-16 Extra Mounting Screw Locations

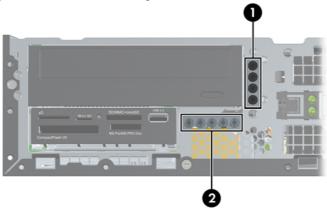


Table 7-3 Extra Mounting Screws

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 a 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 99 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."

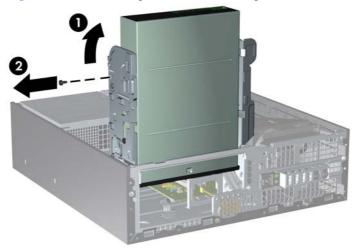
Removing an Internal 5.25-inch Drive

<u>CAUTION</u>: 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:

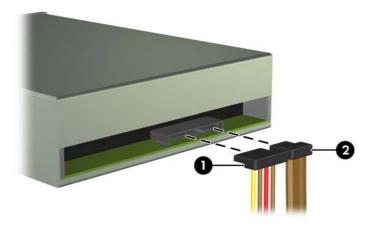
- 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Rotate the drive cage to its upright position (1) and remove the mounting screw on the back left side of the drive (2).

Figure 7-17 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 7-18 Disconnecting the Power and Data Cables



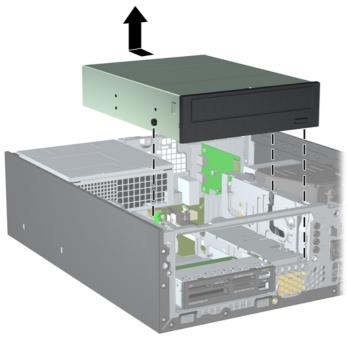
- 5. Rotate the drive cage back down to its normal position.
- <u>CAUTION</u>: Be careful not to pinch any cables or wires when rotating the drive cage down.

Figure 7-19 Rotating the Drive Cage Down



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

Figure 7-20 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:

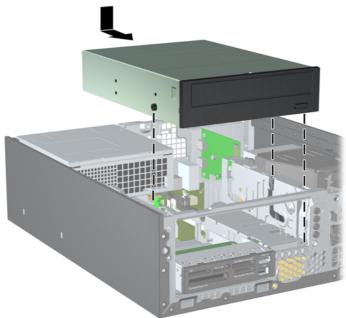
- 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See <u>Bezel Blanks on page 52</u> 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 <u>Installing and Removing Drives on page 66</u> for an illustration of the extra M3 metric mounting screws location.
 - <u>CAUTION</u>: 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 7-21 Installing Mounting Screws in the Optical Drive



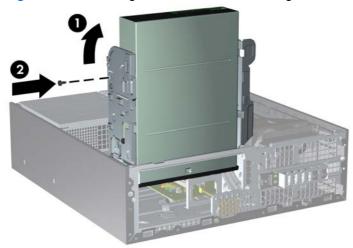
5. Position the mounting screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it stops.

Figure 7-22 Installing the Optical Drive



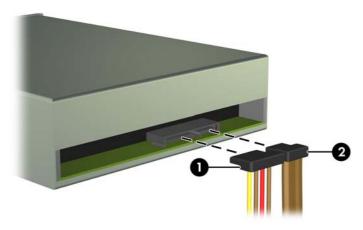
6. Rotate the drive cage to its upright position (1) and install an M3 mounting screw in the back left side of the drive (2) to secure the drive to the drive cage.

Figure 7-23 Securing the Drive in the Drive Cage



- 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.

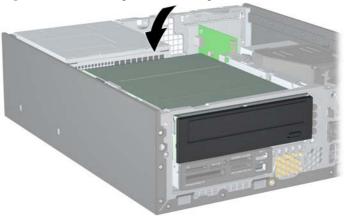
Figure 7-24 Connecting the Power and Data Cables



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

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

Figure 7-25 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.
- Lock any security devices that were disengaged when the access panel was removed.

The system automatically recognizes the drive and reconfigures the computer.

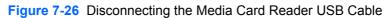
Removing an Internal 3.5-inch Drive

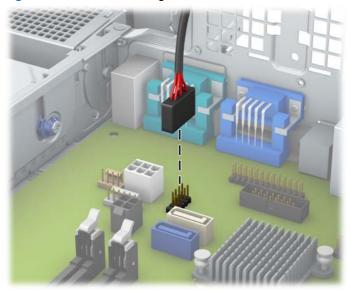
All removable media should be taken out of a drive before removing the drive from the computer.

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 <u>Removing an Internal 5.25-inch Drive on page 68</u> 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.

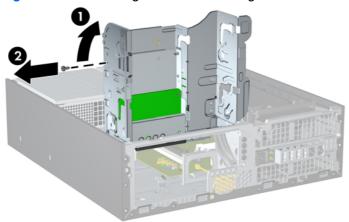
2. If you are removing a media card reader, disconnect the USB cable from the system board.





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 7-27 Removing the Drive Mounting Screw



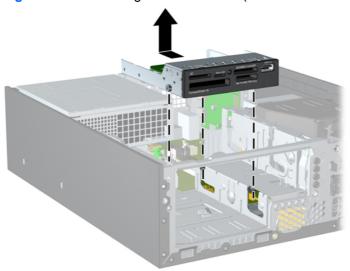
4. Rotate the drive cage back down to its normal position.

Figure 7-28 Rotating the Drive Cage Down



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

Figure 7-29 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:

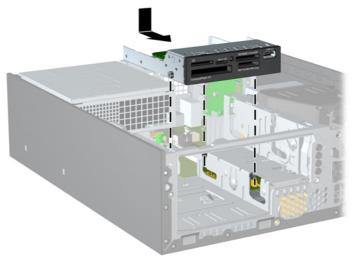
- 1. Follow the procedure in Removing an Internal 5.25-inch Drive on page 68 to remove the 5.25-inch drive and access the 3.5-inch drive bay.
- 2. If you are installing a drive in a bay covered by a bezel blank, remove the front bezel then remove the bezel blank. See <u>Bezel Blanks on page 52</u> for 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 66 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 7-30 Installing Mounting Screws in the Media Card Reader



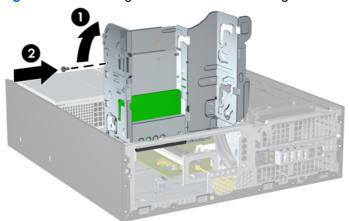
4. Position the mounting screws on the drive into the J-slots in the drive bay. Then slide the drive toward the front of the computer until it stops.

Figure 7-31 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 7-32 Securing the Drive in the Drive Cage



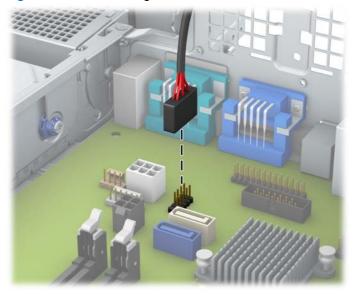
- 6. Rotate the drive cage back down to its normal position.
 - <u>CAUTION</u>: Be careful not to pinch any cables or wires when rotating the drive cage down.

Figure 7-33 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 MEDIA1.

Figure 7-34 Connecting the Media Card Reader USB Cable



- NOTE: Refer to System Board Connections on page 53 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 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Rotate the drive cage for internal drives to its upright position.

Figure 7-35 Rotating the Drive Cage Up



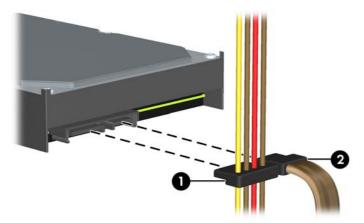
4. Rotate the power supply to its upright position. The hard drive is located beneath the power supply.

Figure 7-36 Raising the Power Supply



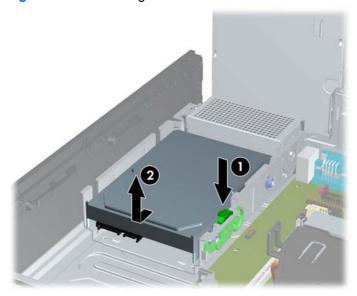
5. Press and hold down the latch to disconnect the power cable (1) and data cable (2) from the back of the hard drive.

Figure 7-37 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 7-38 Removing the Hard Drive



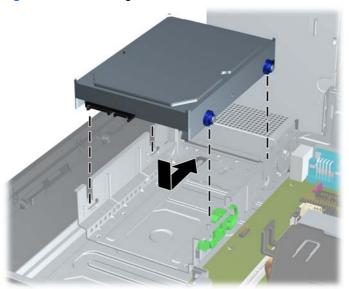
7. To install a hard drive, you must transfer the silver and blue isolation mounting screws from the old hard drive to the new hard drive.

Figure 7-39 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 7-40 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.

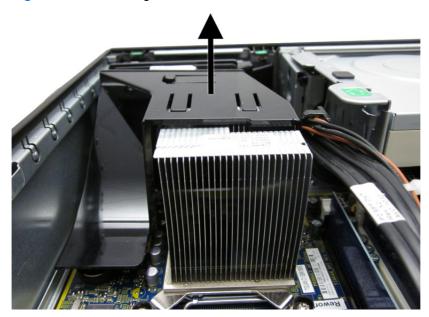
Baffle

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 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Remove the cables from the holder on the side of the baffle.
- 4. Lift the baffle straight up out of the chassis.

Figure 7-41 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 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Remove the front bezel (Front Bezel on page 51).
- 4. Remove the baffle (Baffle on page 80).
- 5. Disconnect the fan cable from the red/brown system board connector labeled CHFAN.
- **6.** Press the two tabs (left, bottom) that secure the fan assembly to the chassis front.

Figure 7-42 Front fan tab locations



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

Figure 7-43 Removing the front fan



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

Front I/O, Power Switch Assembly

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

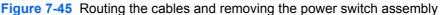
The front I/O and power switch/LEDs are one assembly, attached to the front of the chassis. Push the assembly into the chassis to remove.

- 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Remove the front bezel (Front Bezel on page 51).
- 4. Remove the chassis fan (Front Fan Assembly on page 81).
- Rotate the drive cage to its upright position.
- **6.** Disconnect the four cables from the system board as follows:
 - Yellow connector labeled FRONT USB1
 - Green connector labeled FRONT USB2
 - Blue connector labeled FRONT AUD
 - Black connector labeled PB/LED
- 7. Remove the screw that secures the assembly to the front of the chassis.

Figure 7-44 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.





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

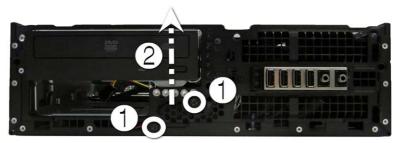
Description	Spare part number
Speaker	636925-001

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 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Remove the front bezel (Front Bezel on page 51).
- 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 7-46 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 (<u>Preparation for Disassembly on page 48</u>).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 3. Remove the baffle (Baffle on page 80).
- 4. Remove the chassis fan (Front Fan Assembly on page 81).

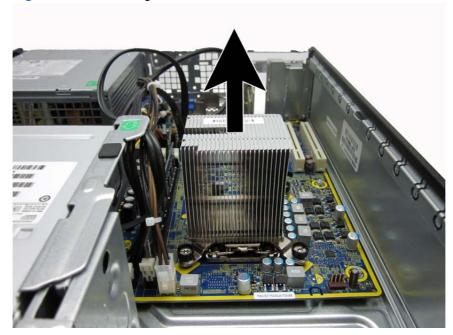
- Loosen the four captive screws that secure the heat sink to the system board tray.
 - CAUTION: Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor. This is especially important as the pins on the socket are very fragile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

Figure 7-47 Removing the heat sink screws



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 7-48 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.

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

Processor

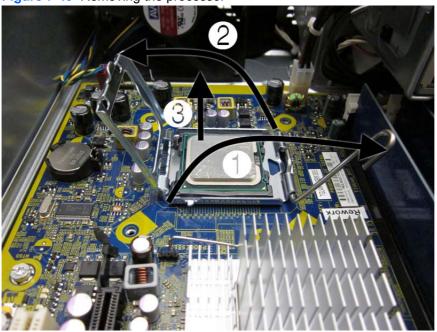
Description	Spare part number
Intel Core i7 3770s processor, 3.1 GHz	689370-001
Intel Core i5 3570s processor, 3.1 GHz	695079-001
Intel Core i5 3475s processor, 2.9 GHz	695078-001
Intel Core i5 3470s processor, 2.9 GHz	695077-001
Intel Core i3 3240 processor, 3.4 GHz	688951-001
Intel Core i3 3225 processor, 3.3 GHz	689578-001
Intel Core i3 3220 processor, 3.3 GHz	688950-001
Intel Core i3 3210 processor, 3.2 GHz	715895-001
Intel Core i3 2130 processor, 3.4 GHz	665120-001
Intel Core i3 2120 processor, 3.3 GHz	638629-001
Intel Pentium Dual-Core G870 processor, 3.1 GHz	691936-001
Intel Pentium Dual-Core G860 processor, 3.0 GHz	665123-001
Intel Pentium Dual-Core G640 processor, 2.8 GHz	691935-001
Intel Pentium Dual-Core G2130 processor, 3.2 GHz	715898-001
Intel Pentium Dual-Core G2120 processor, 3.1 GHz	703282-001
Intel Pentium Dual-Core G2020 processor, 2.9 GHz	715897-001
Intel Pentium Dual-Core G2010 processor, 2.8 GHz	715896-001
Intel Celeron G1620 processor, 2.7 GHz	715894-001
Intel Celeron G1610 processor, 2.6 GHz	715893-001
Intel Celeron G645 processor, 2.9 GHz	704228-001
Intel Celeron G555 processor, 2.7 GHz	704227-001
Intel Celeron G550 processor, 2.6 GHz	691934-001
Intel Celeron G540 processor, 2.5 GHz	665119-001
Intel Celeron G465 processor, 1.9 GHz	706883-001
Intel Celeron G460 processor, 1.8 GHz	682410-001

- Prepare the computer for disassembly (Preparation for Disassembly on page 48). 1.
- Remove the access panel (Computer Access Panel on page 50). 2.
- 3. Remove the baffle (Baffle on page 80).
- Remove the heat sink (<u>Heat sink on page 84</u>). 4.
- **5**. Rotate the locking lever to its full open position (1).
- 6. Raise and rotate the microprocessor retainer to its fully open position (2).

- Carefully lift the processor from the socket (3).
- <u>CAUTION</u>: 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 7-49 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.
- 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 48).
 - 2. Remove the access panel (Computer Access Panel on page 50).
 - 3. Rotate the drive cage up and disconnect the power cables from all of the drives.
 - Disconnect the power cables from the system board connectors labeled PWRCPU, PWR, and PWRCMD.
 - 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 7-50 Removing the power supply



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

Table 7-4 Power supply cable – system board connector

Power supply connector label	System board connector
P1	PWR
P2	PWRCMD
P3	PWRCPU

To install the power supply, reverse the removal procedure.

<u>CAUTION</u>: 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

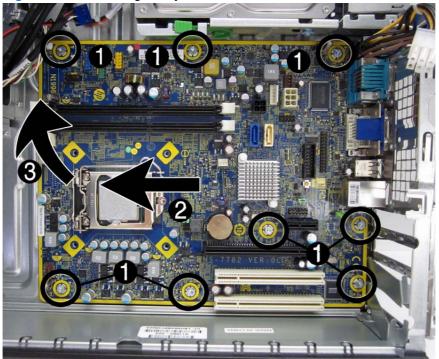
All system board spare part kits come with replacement thermal material.

Description	Spare part number
System board for use in models without Windows 8	676358-001
System board for use in models with Windows 8 Standard	676358-501
System board for use in models with Windows 8 Professional	676358-601
System board for use in models with NetClone	699943-001

- 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
- 2. Remove the access panel (Computer Access Panel on page 50).
- 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 (seeInstalling Additional Memory on page 54)
 - Expansion cards (Removing or Installing an Expansion Card on page 57)
 - Heat sink (Heat sink on page 84)
 - Processor (Processor on page 87)
- Remove the baffle from the chassis (Baffle on page 80). 4.
- 5. Remove the fan from the chassis (Front Fan Assembly on page 81).
- 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).





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.
- <u>MARNING!</u> 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.

- <u>∧ CAUTION:</u> 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.
- 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.
- - 1. Prepare the computer for disassembly (Preparation for Disassembly on page 48).
 - 2. Remove the access panel (Computer Access Panel on page 50).
 - 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 7-52 Removing the battery from a type 1 holder

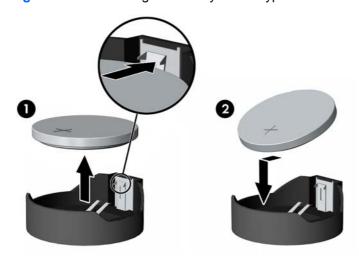


- 2. Slide the replacement battery into position, positive side up.
- 3. The battery holder automatically secures the battery in the proper position.
- 4. Replace the computer access panel.
- 5. Plug in the computer and turn on power to the computer.
- 6. Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to Computer Setup (F10) Utility on page 8.

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).
- 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 7-53 Removing the battery from a type 2 holder

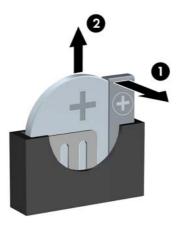


- **3.** Replace the computer access panel.
- 4. Plug in the computer and turn on power to the computer.
- **5.** Reset the date and time, your passwords, and any special system setups, using Computer Setup. Refer to Computer Setup (F10) Utility on page 8.

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 7-54 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 8.

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 (<u>Preparation for Disassembly on page 48</u>).
- Orient the computer so that its right side is facing down and place the computer in the optional stand.

Figure 7-55 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 7-56 Installing a Cable Lock



Padlock

Figure 7-57 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.
- Disconnect the power cord from the power outlet and disconnect any external devices.
- 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 7-58 Retrieving the Front Bezel Security Screw



Replace the front bezel.

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

Figure 7-59 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.

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:

- 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.
- 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.
- The diameter of the wire must be a minimum of 0.75 mm₂ 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.

NWARNING! 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.

A 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, 0.75mm₂ 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.
- 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 mm₂ conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

B 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.

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.



OTE: 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.



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

Table B-1 Numeric Codes and Text Messages

Control panel message	Description	Recommended action	
ERROR: No boot disk has been detected or the disk has failed.	The computer cannot read the boot sector of the boot disk.	Check drive data and power cables.	
		Use F10 Setup to make sure the first boot device is set to drive C or the primary hard drive.	
		The drive has failed due to mechanica or virus corruption. Replace the drive.	
Keyboard Error	Keyboard failure.	Reconnect keyboard with computer turned off.	
		Check connector for bent or missing pins.	
		Ensure that none of the keys are depressed.	
		4. Replace keyboard.	
		5. Replace the system board.	
511-CPU Fan not Detected	CPU fan is not connected or may have	Reseat CPU fan.	
	malfunctioned.	2. Reseat fan cable.	
		3. Replace CPU fan.	
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.)	Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under Storage > DPS Self-test.	
		 Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 	
		Back up contents and replace hard drive.	
Unsupported CPU	Recently installed processor is not supported by the system.	Install a processor supported by your system.	
Time & Date Not Set	Invalid time or date in configuration memory.	Reset the date and time under Control Panel (Computer Setup can also be used).	
	RTC (real-time clock) battery may need to be replaced.	If the problem persists, replace the RTC battery.	
	CMOS jumper may not be properly installed.	Check for proper placement of the CMOS jumper if applicable.	

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.

MARNING! 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 B-2 Diagnostic Front Panel LEDs and Audible Codes

Activity	Blinks	Possible Cause	Red	commended Action
Red Power LED flashes two times, once every	2	Processor thermal protection activated:	1.	Ensure that the computer air vents are not blocked and the processor cooling fan is running
second, followed by a two second pause. Beeps stop after fifth iteration but		A fan may be blocked or not turning.	2.	Open hood, press power button, and see if the processor fan spins. If the processor fan is not
LEDs continue until problem is solved.		OR		spinning, make sure the fan's cable is plugged onto the system board header.
		The heat sink/fan assembly is not properly attached to the processor.	3.	If fan is plugged in, but is not spinning, then replace heat sink/fan assembly.
		are processor.	4.	Contact an authorized reseller or service provider.
Red Power LED flashes three times, once every	3	Processor not installed (not an indicator of bad	1.	Check to see that the processor is present.
second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.		processor).	2.	Reseat the processor.

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

Activity	Blinks	Possible Cause	Rec	commended 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.	and will	Open the hood and ensure the 4 or 6-wire power supply cable is seated into the connector on the system board. 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. Replace the power supply. Replace the system board. USDT power supply adapter must be at 135W use the Smart ID technology before the system power up. Replace the power supply adapter with HP-supplied USDT power supply adapter.
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.	syst cord	JTION: To avoid damage to the DIMMs or the em board, you must unplug the computer power defere attempting to reseat, install, or remove a lM module. Reseat DIMMs. Replace DIMMs one at a time to isolate the faulty module. Replace third-party memory with HP memory. Replace the system board.
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.	1. 2. 3. For	systems with a graphics card: Reseat the graphics card. Replace the graphics card. Replace the system board. systems with integrated graphics, replace the em 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.	1.	Reflash the system ROM with the latest BIOS image. Replace the system board.

C Troubleshooting Without Diagnostics

This chapter provides information on how to identify and correct minor problems, such as USB devices, 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 Appendix A, POST Error Messages on page 103.

Safety and Comfort

Marning! 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. 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 Computer Setup (F10) Utility on page 8 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 Appendix A, POST Error Messages on page 103 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 <u>Helpful Hints on page 108</u> 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 System Software Requirement Disks (SSRD).
- <u>CAUTION</u>: 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 Appendix A, <u>POST Error</u>
 <u>Messages on page 103</u> 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 132 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 (CD/DVD 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.

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.

MARNING! 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.

Table C-1 Solving General Problems

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.	 Press and hold the power button for at least four seconds until the computer turns off.
	2. Disconnect the power cord from the electrical outlet.

Computer will not respond to keyboard or mouse.

Cause	Solution
Computer is in Sleep state.	To resume from Sleep state, press the power button.
	CAUTION: When attempting to resume from Sleep state, 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. NOTE: Connecting the computer to a live AC outlet prolongs the life of the RTC battery.	Reset the date and time under Control Panel (Computer Setup can also be used to update the RTC date and time). If the problem persists, replace the RTC battery. See the Removal and Replacement section for instructions on installing a new battery, or contact an authorized dealer or reseller for RTC battery replacement.	
	To access Control Panel in Windows 7, select Start , and then select Control Panel .	
	To access Control Panel in Windows 8, from the Start screen, type $_{\mathbb{C}}$, and then select Control Panel from the list of applications.	

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

Cause	Solution
The Num Lock key is turned on.	Press the Num Lock key. The Num Lock light must be off if you want to use the arrow keys on the keypad. You can also disable or enable the Num Lock key in Computer Setup at Advanced > Device Options.

There is no sound or sound volume is too low.

Cause	Solution
System volume may be set low or muted.	 Check the Computer Setup settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers).
	Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly.
	Use the system volume control available in the operating system to make sure the speakers are not muted or to increase the volume.

Cannot remove computer cover or access panel.

Cause	Solution
Smart Cover Lock, featured on some computers, is locked.	Unlock the Smart Cover Lock using Computer Setup.
	In case of forgotten password, power loss, or computer malfunction, you must manually disable the Smart Cover lock . A key to unlock the Smart Cover Lock is not available from HP. Keys are typically available from a hardware store.

Poor performance.

Cause	Solution
Processor is too hot.	 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.
	Make sure fans are connected and working properly (some fans only operate when needed).
	3. Make sure the processor heat sink is installed properly.
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.

Table C-1 Solving General Problems (continued)

Poor performance.

Cause	Solution		
Virus resident on the hard drive.	Run virus protection program.		
Too many applications running.	Windows 7:		
	Close unnecessary applications to free up memory.		
	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: 		
	In Windows 7:		
	a. Go to Start > All Programs > Accessories > Run		
	b. Type msconfig, and then press Enter.		
	c. On the Startup tab of the System Configuration Utility, clear applications that you do not want to launch automatically, and the click OK.		
	In Windows 8:		
	 a. On the Start screen, right-click, and then select the All apps icon. 		
	b. Under Windows System, click Run.		
	c. Type msconfig, and then press Enter.		
	d. On the Startup tab of the System Configuration Utility, clear applications that you do not want to launch automatically, and the click OK.		
Some software applications, especially games, are stressful on the graphics subsystem.	 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. 		
	2. Add more memory.		
	3. Upgrade the graphics solution.		
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).

Cause	So	lution
Processor thermal protection activated:	1.	Ensure that the computer air vents are not blocked and the processor cooling fan is running.
A fan may be blocked or not turning.		
OR	2.	Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If
The heat sink is not properly attached to the processor.	the fan does not spin, make sure the fan cable is plugged onto the system board header.	• •
	3.	If fan a plugged in and not spinning, replace it.

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

Cause	Solution
System unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns green, then:
	 If equipped with a voltage selector, check that the voltage selector (located on the rear of the power supply) is set to the appropriate voltage. Proper voltage setting depends on your region.
	Remove the expansion cards one at a time until the 5V_aux light on the system board turns on.
	3. Replace the system board.
	OR
	Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on green then:
	 Check that the unit is plugged into a working AC outlet.
	Open the access panel and check that the power button cable is properly connected to the system board.
	Check that the power supply cables are properly connected to the system board.
	 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 assembly.
	If the 5V_aux light on the system board is off, then replace the power supply.
	6. Replace the system board.

Solving Power Problems

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

Table C-2 Solving Power Problems

Power supply shuts down intermittently.

Cause	Solution
If equipped with a voltage selector, 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.	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	Sol	lution
Processor thermal protection activated:	1.	Ensure that the computer air vents are not blocked and the processor cooling fan is running.
A fan may be blocked or not turning.		
OR	2.	Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If
The heat sink is not properly attached to the processor.		the fan does not spin, make sure the fan cable is plugged onto the system board header.
	3.	If fan a plugged in and not spinning, replace it.

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).	 If equipped with a voltage selector, 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.
	2. Open the access panel and ensure the power supply cable is seated into the connector on the system board.
	3. Check if a device is causing the problem by removing ALL attached devices (such as hard drives or optical drives and expansion cards). Power on the system. If the system enters 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.
	4. Replace the power supply.
	5. Replace the system board.
The incorrect external power supply adapter is being used on the All-in One or USDT.	The power supply adapter must be at the correct power rating and use the Smart ID technology before the system will power up. Replace the power supply adapter with the HP-supplied power supply adapter.

Solving Hard Drive Problems

Table C-3 Solving Hard Drive Problems

Hard drive error occurs.

Cause	So	lution
Hard disk has bad sectors or has failed.	1.	In Windows 7, click Start , click Computer , and right- click on a drive. Select Properties , and then select the Tools tab. Under Error-checking click Check Now .
		In Windows 8, on the Start screen type e, and then select File Explorer from the list of applications. In the left column, expand Computer , right-click on a drive, select Properties , and then select the Tools tab. Under Error checking click Check .
	2.	Use a utility to locate and block usage of bad sectors. If necessary, reformat the hard disk.

Disk transaction problem.

Cause	Solution
Either the directory structure is bad or there is a problem with a file.	In Windows 7, click Start , expand Computer , and right-click on a drive. Select Properties , and then select the Tools tab. Under Error-checking click Check Now . In Windows 8, on the Start screen type e, and then click File Explorer from the list of applications. In the left column, expand Computer , right-click on a drive, select Properties , and then select the Tools tab. Under Error checking click Check .

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 Solving Hardware Installation Problems on page 132 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 Advanced > Power-On Options.
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On Options .

Nonsystem disk/NTLDR missing message.

Cause	Solution	
The system is trying to start from the hard drive but the hard drive may have been damaged.	 Perform Drive Protection System (DPS) testing in system ROM. 	
System files missing or not properly installed.	Insert bootable media and restart the computer.	
	Boot to the windows installation media and select the recovery option. If only a restore kit is available, then select the File Backup Program option, and then restore the system.	
	3. Install system files for the appropriate operating system.	
Hard drive boot has been disabled in Computer Setup.	Run the Computer Setup utility and enable the hard drive entry in the Storage > Boot Order 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 dark blue SATA connector.	
Bootable hard drive is not listed first in the Boot Order.	Run the Computer Setup utility and select Storage > Boot Order and ensure the bootable hard drive is listed immediately under the Hard Drive 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.	Check SATA cable connections.
	 Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security.
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .
Hard Drive's "Emulation Type" is set to "None." (some models)	Run the Computer Setup utility and change the "Emulation Type" to "Hard Disk" in the device's details under Storage > Device Configuration .
Hard drive is damaged.	Observe if the front panel Power LED is blinking RED and if any beeps are heard. See Appendix A, <u>POST Error Messages on page 103</u> 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.

Cause	Solution
Program in use has stopped responding to commands.	 Use the task manager to close programs that do not respond.
	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.

Solving Media Card Reader Problems

Table C-4 Solving Media Card Reader Problems

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

Cause	Solution
By default, Windows will format any media card with a capacity greater than 32MB with the FAT32 format. Some 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.

Cause	Solution
The computer's software is used to safely eject the card.	In Windows 7, click Start , select Computer , right-click on the corresponding drive icon, and then select Eject . Pull the card out of the slot.
	In Windows 8, on the Start screen, type e, and then click File Explorer from the list of applications. Expand Computer , right-click on the corresponding drive icon, and then select Eject . Pull the card out of the slot.
	NOTE: 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.

Cause	Solution
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 the media inserted in the reader.

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

Cause	Solution
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.
	During POST (Power On Self-Test), press F9 to modify the boot menu.
	3. Change the boot sequence in F10 Computer Setup.

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.

Table C-5 Solving Display Problems

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 type your password (if set).
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.
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 Sleep state.	Press the power button to resume from Sleep state.
	CAUTION: When attempting to resume from Sleep state, 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.	Systems may have a monitor connection on both the motherboard or an add-in card. Try moving the monitor connection to a different connector on the back of the computer
Monitor settings in the computer are not compatible with the monitor.	 In Control Panel, select Category from the View by list, then under Appearance and Personalization, select Adjust screen resolution.
	To access Control Panel in Windows 7, click Start , and then select Control Panel .
	To access Control Panel in Windows 8, from the Start screen, type $_{\mathbb{C}}$, and then select Control Panel from the list of applications.
	Expand the Resolution box, and then use the sliding control to reset the resolution.
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 onscreen controls and settings.

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.)

Cause	Sol	ution
Pre-video memory error.	1.	Reseat DIMMs. Power on the system.
	2.	Replace DIMMs one at a time to isolate the faulty module.
	3.	Replace third-party memory with HP memory.
	4.	Replace the system board.

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.)

Cause	Solution
Pre-video graphics error.	For systems with a graphics card:
	 Reseat the graphics card (if applicable). Power on the system.
	2. Replace the graphics card (if applicable).
	3. Replace the system board.
	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.)

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

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

Cause	Solution
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 (if applicable) or video connector 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.	Be sure the monitor cable is securely connected to computer.	the
	 In a two-monitor system or if another monitor is in proximity, be sure the monitors are not interfering each other's electromagnetic field by moving them apart. 	with
	3. Fluorescent lights or fans may be too close to the monitor.	
Monitor needs to be degaussed.	Degauss the monitor. Refer to the documentation that c with the monitor for instructions.	ame

Image is not centered.

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

"No Connection, Check Signal Cable" displays on screen.

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

"Out of Range" displays on screen.

Cause	Solution
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.
	To enter Safe Mode in Windows 7:
	1. Restart the computer.
	 Press and hold the F8 key as your computer restarts, before the Windows logo appears. If the Windows logo appears, you must restart the computer and try again.
	On the Advanced Boot Options screen, use the arrow keys to highlight the safe mode option you want, and then press Enter.
	 Log on to your computer with a user account that has administrator rights.
	When your computer is in safe mode, Safe Mode displays in the corners of your monitor. To exit safe mode, restart your computer and let Windows start normally.
	To enter Safe Mode in Windows 8:
	1. Press the Windows logo + I to open the Settings charm.
	Select Change PC Settings, select General, and then under Advanced startup, click Restart now.
	 Select Troubleshoot, select Advanced options, select Startup Settings, and then click Restart.
	 Use the function keys or number keys to select the safe mode option you want.
	When your computer is in safe mode, Safe Mode displays in the corners of your monitor. To exit safe mode, restart your computer and let Windows start normally.

High pitched noise coming from inside a flat panel monitor.

Cause	Solution
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).

Cause	Solution
Flat panel monitor's internal digital conversion circuits may be unable to correctly interpret the output synchronization of the graphics card.	Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu.
and graphilide dara.	2. Manually synchronize the Clock and Clock Phase on- screen display functions. To download a SoftPaq that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: http://www.hp.com/support
Graphics card is not seated properly or is bad (some	Reseat the graphics card.
models).	2. Replace the graphics card.

Certain typed symbols do not appear correct.

Cause	Solution
The font you are using does not support that particular symbol.	Use the Character Map to locate and select the appropriate symbol. You can copy the symbol from the Character Map into a document.
	In Windows 7, click Start , select All Programs , select Accessories , select System Tools , and then select Character Map .
	In Windows 8, on the Start screen, type ch, and then select Character Map from the list of applications.

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.

Table C-6 Solving Audio Problems

Sound cuts in and out.

Cause	Solution
Processor resources are being used by other open applications.	Shut down all open processor-intensive applications.

Sound does not come out of the speaker or headphones.

Cause	Solution
Software volume control is turned down or muted.	Double-click the Speaker icon on the taskbar, then make sure that Mute is not selected and use the volume slider to adjust the volume.
	NOTE: In Windows 8, the taskbar is available at the bottom of the Desktop screen.
Audio is hidden in Computer Setup.	Enable the audio in Computer Setup: Security > Device Security > System Audio.
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 rear audio jack output is the green receptacle The speakers should be plugged into the line-out jack and the headphones should be plugged into the 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. The rear audio jack output is the green receptacle.
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.
Computer is in Sleep state.	Press the power button to resume from Sleep state.
	CAUTION: When attempting to resume from Sleep state, 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 Advanced > Device Options > Internal Speaker.
The application is set to use a different audio device than speakers.	Some graphics cards support audio over the DisplayPort connection (if applicable), so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .

Table C-6 Solving Audio Problems (continued)

Sound does not come out of the speaker or headphones.

Cause	Solution
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.

Cause	Solution
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.

Cause	Solution
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.

Cause	Solution
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.

Cause	Solution
The application is set to use a different audio device than speakers.	Some graphics cards support audio over the DisplayPort connection (if applicable), so multiple audio devices may be listed in Device Manager. Make sure the correct device is being used.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .

Table C-6 Solving Audio Problems (continued)

There is no sound or sound volume is too low.

Cause	Solution
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.

Table C-7 Solving Printer Problems

Printer will not print.

Cause	Solution
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.	 Install the correct printer driver for the application. Try printing using the MS-DOS command:
	DIR C:\ > [printer port]
	where [printer port] is the address of the printer being used. If the printer works, reload the printer driver.
	To run MS-DOS commands, press the Windows key + r, type $_{\mbox{\footnotesize cmd}}$ in the $\mbox{\bf Open}$ box, and then click $\mbox{\bf OK}.$
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.

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

Printer prints garbled information.

Cause	Solution
The correct printer driver for the application is not installed.	Install the correct printer driver for the application.

Table C-7 Solving Printer Problems (continued)

Printer prints garbled information.

Cause	Solution
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 will not print.

Cause	Solution
The printer may be out of paper.	Check the paper tray and refill it if it is empty.

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.

Table C-8 Solving Keyboard Problems

A wireless keyboard/mouse is not working correctly. Symptoms include lagging mouse movement, jumpy mouse/ keyboard, or no function of mouse/keyboard and external drive.

Cause	Solution
If your computer is equipped with USB 3.0 ports, connected USB 3.0 devices can interfere with the wireless keyboard USB receiver.	Connect the wireless keyboard USB receiver to a USB 2.0 port that is separated from ports with USB 3.0 devices. If you still experience interference, you may have to place the connectors farther apart using an external USB hub.

Keyboard commands and typing are not recognized by the computer.

Cause	Solution
Keyboard connector is not properly connected.	Shut down the computer, reconnect the keyboard to the back of the computer, and then restart the computer.
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 Sleep state.	Press the power button to resume from Sleep state. CAUTION: When attempting to resume from Sleep date, 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 Num Lock key is on.	Press the Num Lock key. The Num Lock light should be off if you want to use the arrow keys on the keypad. You can disable or enable the Num Lock key in Computer Setup at Advanced > Device Options.

Table C-9 Solving Mouse Problems

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.	
	Windows 7:	
	Press the Ctrl and Esc keys at the same time (or press the Windows logo key) to display the Start menu.	
	Use the arrow keys to select Shut Down and then press Enter.	
	After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart.	
	Windows 8:	
	1. Press the Windows logo + I to open the Settings charm.	
	2. Use the arrow keys to select Power , and then press Enter.	
	Use the arrow keys to select Shut Down, and then press Enter.	
	 After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart. 	
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 Sleep state.	Press the power button to resume from Sleep state.	
	CAUTION: When attempting to resume from Sleep state, 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.

Cause	Solution
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.

To open the Add Hardware Wizard, open a Command Prompt and open hdwwiz.exe.

MARNING! 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.

Table C-10 Solving Hardware Installation Problems

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.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that Device available is selected for appropriate USB ports under Security > USB Security .

Computer will not start.

Cause	So	lution
Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	1.	Review the documentation that came with the system to determine if you are using the correct memory modules and to verify the proper installation.
		NOTE: DIMM1 or XMM1 must always be installed. On all computers except the USDT, DIMM1 must be installed before DIMM2, and DIMM3 must be installed before DIMM4.
	2.	Observe the beeps and LED lights on the front of the computer. Beeps and flashing LEDs are codes for specific problems.
	3.	If you still cannot resolve the issue, contact Customer Support.

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.	CAUTION: 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.
	1. Reseat DIMMs. Power on the system.
	Replace DIMMs one at a time to isolate the faulty module.
	NOTE: DIMM1 or XMM1 must always be installed. On all computers except the USDT, DIMM1 must be installed before DIMM2, and DIMM3 must be installed before DIMM4
	3. Replace third-party memory with HP memory.
	4. Replace the system board.

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 (some models) is not seated properly or is bad, or system board is bad.	For systems with a graphics card:
	1. Reseat the graphics card. Power on the system.
	2. Replace the graphics card.
	3. Replace the system board.
	For systems with integrated graphics, replace the system board.

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	Sol	lution
Bad option card.	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. Once bad card is identified, remove and replace bad
		option card.
	3.	Replace the system board.

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.

Table C-11 Solving Network Problems

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 Power > Hardware Power Management > S5 Maximum Power Savings.
S5 Wake on LAN is disabled (some models).	Enable the S5 Wake on LAN option in Computer Setup. Select Advanced > Device Options > S5 Wake on LAN.
Wake-on-LAN is not enabled.	To enable Wake-on-LAN in Windows 7:
	 Select Start > Control Panel > Network and Sharing Center.
	2. Under Tasks, select Manage network connections.
	3. Click Local Area Connection.
	4. Click the Properties button.
	5. Click the Configure button.
	Click the Power Management tab, then select Allow this device to wake the computer.
	To enable Wake-on-LAN in Windows 8:
	 From the Start screen, type c, and then select Control Panel from the list of applications.
	Select Network and Sharing Center, and then click the Ethernet link next to the connection.
	3. Click the Properties button.
	4. Click the Configure button.
	Click the Power Management tab, then enable the appropriate Wake-on LAN option.

Network driver does not detect network controller.

Cause	Solution
Network controller is disabled.	Run Computer Setup and enable network controller.
	Enable the network controller in the operating system using Device Manager.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .
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.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .
Network controller is disabled.	Run Computer Setup and enable network controller.
	Enable the network controller in the operating system using Device Manager.
	To access Device Manager in Windows 7, click Start , select Control Panel , and then select Device Manager .
	To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager .
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 Advanced 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.

Cause	Solution
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 Network and Sharing Center icon in the Control Panel and configure the network controller.
	To access Control Panel in Windows 7, click Start , and then select Control Panel .
	To access Control Panel in Windows 8, from the Start screen, type c, and then select Control Panel .

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

Cause	Solution
Network controller interrupt is shared with an expansion board.	Under the Computer Setup Advanced menu, change the resource settings for the board.
The network controller requires drivers.	Verify that the drivers were not accidentally deleted when the drivers for a new expansion board were installed.
The expansion board installed is a network card (NIC) and conflicts with the embedded NIC.	Under the Computer Setup Advanced menu, change the resource settings for the board.

Network controller stops working without apparent cause.

Cause	Solution
The files containing the network drivers are corrupted.	Reinstall the network drivers using the Recovery Disc Set in Windows 7 or Windows recovery tools in Windows 8.
	If necessary, download the softpaq from the web (from a different computer).

Table C-11 Solving Network Problems (continued)

Network controller stops working without apparent cause.

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 network controller is defective.	Contact an authorized service provider.

New network card will not boot.

Cause	Solution
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.

Cause	Solution
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 memory 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 dualchannel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), thirdparty data storage, and other management functions.

Table C-12 Solving Memory Problems

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

Cause	Solution
A memory module is not installed in the DIMM1 or XMM1 socket.	Ensure that a memory module is installed in the DIMM1 or XMM1 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
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.

Cause	Solution
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.)

Cause	Solution	
Memory is installed incorrectly or is bad.	1.	Reseat DIMMs. Power on the system.
	2.	Replace DIMMs one at a time to isolate the faulty module.
	3.	Replace third-party memory with HP memory.
	4.	Replace the system board.

Solving Processor Problems

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

Table C-13 Solving Processor Problems

Poor performance is experienced.

Cause	Solution	
Processor is hot.	Make sure the airflow to the computer is not blocked.	
	Make sure the fans are connected and working properly (some fans only operate when needed).	
	Make sure the processor heat sink is installed properly.	

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.	Check to see that the processor is present.	
	2. Reseat the processor.	

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.	1.	Install a TXT (Trusted Execution Technology) capable processor.	
	2.	Disable TXT in the Computer Setup (F10) utility.	
	3.	Reinstall the original processor.	

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.

Table C-14 Solving CD-ROM and DVD Problems

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 Device Available is selected for the device's SATA port in Security > Device Security .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage Options . Ensure CD-ROM is enabled in Storage > Boot Order .

Table C-14 Solving CD-ROM and DVD Problems (continued)

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

Cause	Solution
Network Boot is enabled in Computer Setup.	Run the Computer Setup utility and disable Network Boot in Security > Network Boot .
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 Storage > Boot Order .

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 Solving Hardware Installation Problems on page 132 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 Advanced > Power-On Options.
The device is attached to a SATA port that has been hidden in Computer Setup.	Run the Computer Setup utility and ensure Device Available is selected for the device's SATA port in Security > Device Security .
Drive responds slowly immediately after power-up.	Run Computer Setup and increase the POST Delay in Advanced > Power-On Options.

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.

Cause	Solution
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).

Cause	Solution
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.

Cause	Solution
Media is corrupt.	Try different media to confirm whether media is valid.
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.	1. Use Device Manager to remove or uninstall the device. To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager. To access Device Manager in Windows 8, from the Start screen, type c, select Control Panel from the list of applications, and then select Device Manager. 2. Restart the computer and let Windows detect the CD or
	Restart the computer and let Windows detect the CD or DVD driver.

Recording or copying CDs is difficult or impossible.

Cause	Solution
Wrong or poor quality media type.	Try using a slower speed when recording.
	2. Verify that you are using the correct media for the drive.
	Try a different brand of media. Quality varies widely between manufacturers.

Solving USB Flash Drive Problems

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

Table C-15 Solving USB Flash Drive Problems

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

Cause	Solution
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).

Cause	Solution
The device is attached to a USB port that has been hidden in Computer Setup.	Run the Computer Setup utility and enable USB ports in Security > USB Security .
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.

Cause	Solution
Boot order is not correct.	Run the Computer Setup utility and change boot sequence in Storage > Boot Order .
Removable Media Boot is disabled in the Computer Setup utility.	Run the Computer Setup utility and enable booting to removable media in Storage > Storage Options . Ensure USB is enabled in Storage > Boot Order .

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

Cause	Solution
Flash drive is bootable.	Install the flash drive only after the operating system boots.
Flash drive is defective.	Try a different flash drive.

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.	1. Turn off the computer.
	Reconnect the device to the front of the computer and restart the computer.
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.	Install the correct driver for the device.
	2. You might need to reboot the computer.
The cable from the device to the computer does not work.	If possible, replace the cable.
	2. Restart the computer.
The device is not working.	1. Replace the device.
	2. Restart the computer.
USB ports on the computer are disabled in Computer Setup.	Run the Computer Setup utility and ensure that the USB ports are set to Enabled in Security > USB Security .

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.
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.)	Windows 7:	
	1. Select Start > Control Panel.	
	2. Click Internet Options.	
	In the Browsing history section on the General tab, click the Delete button.	
	 Select the Cookies check box and click the Delete button. 	
	Windows 8:	
	 From the Start screen, type c, and then select Control Panel from the list of applications 	
	2. Click Internet Options.	
	In the Browsing history section on the General tab, click the Delete button.	
	 Select the Cookies check box and click the Delete button. 	

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.

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 the HP logo does not display.

Cause	Solution
ROM issue - POST error has occurred.	Observe the beeps and LED lights on the front of the computer. See Appendix A, <u>POST Error Messages</u> on page 103 to determine possible causes.
	See the Worldwide Limited Warranty for terms and conditions.

Computer will not continue after HP logo screen displays.

Cause	Solution	
System files may be damaged.	In Windows 7, use recovery media to scan hard drive for errors, or use Windows Startup Repair to fix problems that might prevent Windows from starting correctly. Windows Startup Repair is one of the recovery tools in the System Recovery Options menu. You can also create a system repair disc that contains the System Recovery Options menu. If the problem is severe enough that Startup Repair doesn't start on its own and you can't access the System Recovery Options menu on your computer's hard disk, you can get to the menu and start Startup Repair by using the Windows installation disc or a system repair disc that you created earlier.	
	In Windows 8, use Automatic Repair to fix problems that might prevent Windows from starting correctly. To access Automatic Repair:	
	1. Press the Windows logo + I to open the Settings charm.	
	Select Change PC Settings, select General, and then under Advanced startup, click Restart now.	
	Select Troubleshoot, select Advanced options, and then select Automatic Repair.	
	Windows starts Automatic Repair.	
	 Select the account to use to begin Automatic Repair, and type the password for the account. 	
	Windows diagnoses the computer and attempts the repair it.	

"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.

HP PC Hardware Diagnostics

Use the UEFI-based hardware diagnostic solution that HP includes on all products to diagnose hardware issues. You can use this tool even if the computer will not boot to the operating system. This tool also works with components not diagnosed in HPSA.

Why run HP PC Hardware Diagnostics

The HP PC Hardware Diagnostic tools simplify the process of diagnosing hardware issues and expedite the support process when issues are found. The tools save time by pinpointing the component that needs to be replaced.

- **Isolate true hardware failures**: The diagnostics run outside of the operating system so they effectively isolate hardware failures from issues that may be caused by the operating system or other software components.
- Failure ID: When a failure is detected that requires hardware replacement, a 24-digit Failure ID is generated. This ID can then be provided to the call agent, who will either schedule support or provide replacement parts.

How to access and run HP PC Hardware Diagnostics

You can run the diagnostics from one of three places, depending on your preference and the health of the computer.

- Turn on the computer and press Esc repeatedly until the BIOS Boot Menu appears.
- Press F2 or select **Diagnostics (F2)**.

Pressing F2 signals the system to search for the diagnostics in the following locations:

- A connected USB drive (to download the diagnostics tools to a USB drive, see the instructions in Downloading HP PC Hardware Diagnostics to a USB device on page 150)
- b. The hard disk drive
- c. A core set of diagnostics in the BIOS (for memory and hard disk drive) that are accessible only if the USB or hard disk drive versions are not detected

Downloading HP PC Hardware Diagnostics to a USB device

- Go to http://www.hp.com.
- Click the **Support & Drivers** link.
- 3. Select the **Drivers & Software** tab.
- Enter the product name in the text box and click **Search**.
- 5. Select your specific computer model.
- 6. Select your operating system.
- In the Diagnostic section, click the HP UEFI Support Environment link. This link provides additional information.
 - or -

Click the **Download** button and select **Run**. The download includes instructions (in English) on how to install the tools on the USB device.

NOTE: HP diagnostic solutions are developed to test components typically included on HP products. They may not diagnose all third-party accessories that can be added to the system.

Backup and Recovery

Restoring and recovering in Windows 7

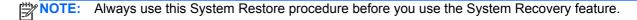
To protect from loss or damage, back up your personal data files. Refer to the operating system or backup utility documentation for instructions on making backup copies of your data files.

To protect the software from loss or damage, keep a backup copy of all system software, applications, and related files stored on the hard drive.

If you cannot create system recovery CDs or DVDs, you can order a recovery disk set from support. To obtain the support telephone number for your region, see http://www.hp.com/support/contactHP.

System Restore

If you have a problem that might be due to software that you installed on your computer, use System Restore to return the computer to a previous restore point. You can also set restore points manually.



NOTE: Some features might not be available on systems that are shipped without a Windows operating system.

To start System Restore:

- Close all open programs.
- 2. Click the **Start** button, right-click **Computer**, and then click **Properties**.
- Click System protection, System Restore, click Next, and then follow the on-screen instructions.

To add restore points manually:

- Close all open programs.
- Click the Start button, right-click Computer, click Properties, and then click System protection.
- Under **Protection Settings**, select the disk for which you want to create a restore point.
- Click **Create**, and then follow the on-screen instructions.

System Recovery

MARNING! This procedure will delete all user information. To prevent loss of information, be sure to back up all user information so you can restore it after recovery.

System Recovery completely erases and reformats the hard disk drive, deleting all data files that 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. See System Restore on page 151.
- NOTE: Some features might not be available on systems that are shipped without a Windows operating system.

You must choose one of the following methods to perform a System Recovery:

- Recovery image Run 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 when Windows is responding on page 152 or System Recovery when Windows is not responding on page 153.
- Recovery media Run System Recovery from recovery media that you have created from files stored on your hard disk drive or purchased separately. To create recovery media, see System recovery using recovery media on page 153.

System Recovery when Windows is responding

- ↑ CAUTION: System Recovery deletes all data and programs you created or installed. Before you begin, back up any important data to a CD or DVD or to a USB flash drive.
- NOTE: In some cases, you must use recovery media for this procedure. To create this media, follow the instructions in Creating recovery media on page 154.

If the computer is working and Windows 7 is responding, use these steps to perform a System Recovery.

- 1. Turn off the computer.
- Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.
- Turn on the computer.
- When Windows has loaded, click the Start button, click All Programs, click Security and Protection, click Recovery Manager, and then click Recovery Manager. If prompted, click Yes to allow the program to continue.
- Under I need help immediately, click System Recovery.
- Select **Yes**, and then click **Next**. Your computer restarts.
- NOTE: If your system does not detect a recovery partition, it prompts you to insert recovery media that you have created. Insert the first disc or the USB flash drive, select Yes, and then click **Next** to restart the computer. If you are using discs, insert the next disc when prompted.
- When the computer restarts, you will see the Recovery Manager welcome screen again. Under I need help immediately, click System Recovery. If you are prompted to back up your files, and you have not done so, select Back up your files first (recommended), and then click Next. Otherwise, select Recover without backing up your files, and then click Next.

- System Recovery begins. After System Recovery is complete, click Finish to restart the 8. computer.
- When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System Recovery when Windows is not responding

↑ CAUTION: System Recovery deletes all data and programs you created or installed.

If Windows 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 monitor, keyboard, and mouse.
- 3. Press the power button to turn on the computer.
- As soon as you see the HP logo screen, repeatedly press the F11 key on your keyboard until the Windows is Loading Files... message appears on the screen.
- Under I need help immediately, click System Recovery.
- If you are prompted to back up your files, and you have not done so, select Back up your files first (recommended), and then click Next. Otherwise, select Recover without backing up your files, and then click Next.
- System Recovery begins. After System Recovery is complete, click **Finish** to restart the computer.
- When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System recovery using recovery media

You should create a set of recovery media, either a set of DVDs or a 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 media for your computer, and the media can be used only with this computer. Store the recovery media in a safe place.

- NOTE: Some features might not be available on systems that are shipped without a Windows operating system.
 - To create recovery discs, your computer must have a DVD writer, and you must use only highquality blank DVD+R or DVD-R discs.
 - NOTE: You cannot use 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 USB drive.

- If you are creating recovery discs, be sure to use high-quality discs. It is normal for the system to reject defective discs. 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 to 6 DVDs). 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 media is lengthy. You can guit the process at any time. The next time you initiate the process, it resumes where it left off.

Creating recovery media

To create recovery discs:

- Close all open programs.
- Click the Start button, click All Programs, click Security and Protection, and then click HP **Recovery Media Creation**. If prompted, click **Yes** to allow the program to continue.
- Click Create recovery media using blank DVD(s), and then click Next.
- Follow the on-screen instructions. Label each disc as you make it (for example, Recovery 1, Recovery 2), and then store the discs in a secure place.

To create a recovery USB flash drive:

NOTE: You must use a flash drive with a capacity of at least 8 GB.

- Close all open programs.
- Insert the USB flash drive into a USB port on the computer.
- Click the Start button, click All Programs, click Security and Protection, and then click **Recovery Media Creation.**
- Click Create recovery media with a USB flash drive, and then click Next. 4.
- 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, it will appear grayed out, and you must replace it with a larger USB flash drive. Click Next.
- NOTE: Recovery Media Creation formats the flash drive, deleting any files on it.
- Follow the on-screen instructions. When the process is complete, 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.

Using recovery media

↑ CAUTION: System Recovery deletes all data and programs you have created or installed. Back up any important data to a CD or DVD or to a USB flash drive.

To create recovery media, see System recovery using recovery media on page 153.

To perform a System Recovery using recovery media:

- If using a set of DVDs, insert the first recovery disc into the DVD drive tray, and close the tray. If you are using a recovery USB flash drive, insert it into a USB port.
- If the computer is not responding, press and hold the power button for approximately 5 seconds or until the computer turns off.

or

Click the Start button, and then click Shut Down.

- Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse. 3.
- 4. Press the power button to turn on the computer.
- Press Esc as the computer is powering on to see the startup menu. Use the arrow keys to select the boot menu and press Enter. Use the arrow keys to select the location where the recovery media is inserted (USB or DVD). Press Enter to boot from that device.
- If 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, click Factory Reset.
- If you are prompted to back up your files, and you have not done so, select Back up your files first (recommended), and then click Next. Otherwise, select Recover without backing up your files, and then click Next.
- If you are prompted to insert the next recovery disc, do so.
- When Recovery Manager is finished, remove the recovery disc or the recovery USB flash drive from the system.
- **10.** Click **Finish** to restart the computer.

Backup and recovery in Windows 8

To protect your information, use Windows Backup and Restore to back up individual files and folders, back up your entire hard drive, create system repair media, or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

From the Start screen, type restore, click Settings, and then select from the list of displayed options.

NOTE: For detailed instructions on various backup and restore options, perform a search for these topics in Help and Support. From the Start screen, type h, and then select **Help and Support**.

In case of system instability, HP recommends that you print the recovery procedures and save them for later use.

NOTE: Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support for more information. From the Start screen, type h, and then select Help and Support.

Backing up your information

Recovery after a system failure is as good as your most recent backup. You should create system repair media and your initial backup immediately after initial system setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup. The system repair media is used to start up (boot) the computer and repair the operating system in case of system instability or failure. Your initial and subsequent backups allow you to restore your data and settings if a failure occurs.

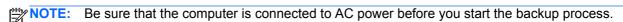
Type backup on the Start screen, click Settings, and then select Save backup copies of your files with File History.

You can back up your information to an optional external hard drive, or a network drive.

Note the following when backing up:

- Store personal files in the Documents library, and back it up regularly.
- Back up templates that are stored in their associated programs.
- Save customized settings that appear in a window, toolbar, or menu bar by taking a screen shot of your settings. The screen shot can be a time-saver if you have to reset your preferences.

To create a backup using Backup and Restore:



NOTE: The backup process may take over an hour, depending on file size and the speed of the computer.

- From the Start screen, type backup, click Settings, and then select from the list of displayed options.
- Follow the on-screen instructions to set up your backup, create a system image, or create system repair media.

Performing a system recovery

In case of system failure or instability, the computer provides the following tools to recover your files:

- Windows recovery tools: You can use Windows Backup and Restore to recover information you have previously backed up. You can also use Windows Automatic Repair to fix problems that might prevent Windows from starting correctly.
- f11 recovery tools: You can use the f11 recovery tools to recover your original hard drive image. The image includes the Windows operating system and software programs installed at the factory.
- MOTE: If you are unable to boot (start up) your computer and you cannot use the system repair media you previously created, you must purchase Windows 8 operating system media to reboot the computer and repair the operating system. For additional information, see Using Windows 8 operating system media (purchased separately) on page 158.

Using the Windows recovery tools

To recover information you previously backed up:

From the Start screen, type h, and then select **Help and Support**.

To recover your information using Automatic Repair, follow these steps:

- A CAUTION: Some Automatic Repair options will completely erase and reformat the hard drive. For additional information go to Help and Support. From the Start screen, type h, and then select Help and Support.
 - If possible, back up all personal files.
 - 2. If possible, check for the presence of the HP Recovery partition and the Windows partition:

From the Start screen, type e, and then click **Windows Explorer**.

- or -

From the Start screen, type c, and then select **Computer**.

- NOTE: If the Windows partition and the HP Recovery partition are not listed, you must recover your operating system and programs using the Windows 8 operating system media and the Driver Recovery media (both purchased separately). For additional information, see Using Windows 8 operating system media (purchased separately) on page 158.
- If the Windows partition and the HP Recovery partition are listed, restart the computer after Windows has loaded, and then press and hold Shift while clicking Restart.
- NOTE: If the computer fails to boot to Windows after several attempts, the system will boot to the Windows Recovery Environment by default.
- Select Troubleshoot, select Advanced Options, and then select Automatic Repair.
- Follow the on-screen instructions.
- NOTE: For additional information on recovering information using the Windows tools, perform a search for these topics in Help and Support. From the Start screen, type h, and then select Help and Support.

Using f11 recovery tools

↑ CAUTION: Using f11 completely erases hard drive contents and reformats the hard drive. All files that you have created and any software that you have installed on the computer are permanently removed. The f11 recovery tool reinstalls the operating system and HP programs and drivers that were installed at the factory. Software not installed at the factory must be reinstalled.

To recover the original hard drive image using f11:

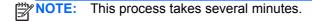
- If possible, back up all personal files.
- 2. If possible, check for the presence of the HP Recovery partition: From the Start screen, type C, and then select Computer.
 - NOTE: If the HP Recovery partition is not listed, you must recover your operating system and programs using the Windows 8 operating system media, and the Driver Recovery media (both purchased separately). For additional information, see Using Windows 8 operating system media (purchased separately) on page 158.
- If the HP Recovery partition is listed, restart the computer, and then press esc while the company logo is displayed. The computer Startup Menu displays.
- 4. Press f11 to select the System Recovery option.
- Follow the on-screen instructions.

Using Windows 8 operating system media (purchased separately)

To order Windows 8 operating system media, go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions. You can also order the media by calling support.

A CAUTION: Using Windows 8 operating system media completely erases hard drive contents and reformats the hard drive. All files that you have created and any software that you have installed on the computer are permanently removed. When reformatting is complete, the recovery process helps you restore the operating system, as well as drivers, software, and utilities.

To initiate recovery using Windows 8 operating system media:



- If possible, back up all personal files.
- Restart the computer, and then follow the instructions provided with the Windows 8 operating system media to install the operating system.
- When prompted, press any keyboard key.
- Follow the on-screen instructions.

After the repair is completed:

- Remove the Windows 8 operating system media, and then insert the *Driver Recovery* media. 1.
- Install the Hardware Enabling Drivers first, and then install Recommended Applications.

F 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:

- Shut down the operating system properly, then turn off the computer and any external devices, and disconnect the power cord from the power outlet.
- With the power cord disconnected, press the power button again to drain the system of any residual power.
- MARNING! 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 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 Regulatory, Safety and Environmental Notices guide for more information.

- Remove the computer cover or access panel.
- 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.
- 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.
- Plug in the computer and turn on power. Allow the operating system to start. This clears the current passwords and disables the password features.
- 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

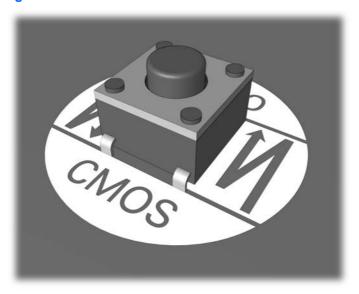
The computer's configuration memory (CMOS) stores information about the computer's configuration.

- Turn off the computer and any external devices, and disconnect the power cord from the power outlet.
- Disconnect the keyboard, monitor, and any other external equipment connected to the computer.
- MARNING! 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 Regulatory, Safety and Environmental Notices guide for more information.

- Remove the computer cover or access panel.
 - A 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.
- 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 F-1 CMOS button



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

G 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.
- 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**.

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.

H Specifications

Table H-1 Specifications

Table 11-1 Opecifications		
Desktop Dimensions (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
Approximate Weight	16.72 lb	7.6 kg
Weight Supported (maximum distributed load in desktop position)	77 lb	35 kg
Temperature Range		
Operating	50° to 95°F	10° to 35°C
Nonoperating	-22° to 140°F	-30° to 60°C
NOTE: 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.		
Relative Humidity (noncondensing)		
Operating	10-90%	10-90%
Nonoperating (38.7°C max wet bulb)	5-95%	5-95%
Maximum Altitude (unpressurized)		
Operating	10,000 ft	3048 m
Nonoperating	30,000 ft	9144 m
Heat Dissipation		
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
Typical EPA 87/89/85% @ 20/50/100% load PS idle	ION RIO/UL	зо кg-саі/пг

Table H-1 Specifications (continued)

Power Supply	115V	230V
Power Output	240W	240W
Rated Input Current (maximum) ¹	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 μΑ	275 μΑ
Power Supply Fan	92mm variable speed	92mm variable speed

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.

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