



Maintenance & Service Guide

HP EliteOne 800 G1 All-in-One

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Maintenance & Service Guide

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Product notice

This guide describes features that are common to most models. Some features may not be available on your computer.

Not all features are available in all editions of Windows 8. Your computer may require upgraded and/or separately purchased hardware, drivers, and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com> for details.

This computer may require upgraded and/or separately purchased hardware and/or a DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See <http://windows.microsoft.com/en-us/windows7/get-know-windows-7> for details.

About This Book

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

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

 **NOTE:** Text set off in this manner provides important supplemental information.

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1 Product features

Overview

Figure 1-1 HP EliteOne 800 G1 All-in-One

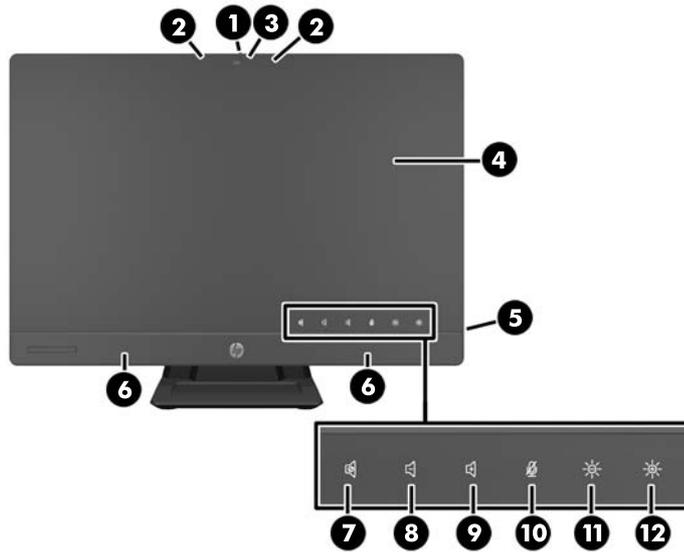


The HP EliteOne 800 G1 All-in-One offers the following features:

- Integrated All-in-One form factor
- Full HD IPS, LCD display (1920 x 1080) with LED backlighting
 - 58.4-cm (23-inch) diagonal, capacitive touch optional
- Swivel pad under base of stand
- Stand can be configured to height-adjustable and reclining stand, basic stand, or no stand
- Removable panel on the back of the computer allows users or technicians to easily and efficiently service the PC
- VESA mounting holes (100 mm x 100 mm)
- 4th generation Intel® Core™ processors
- Up to 1 TB Hard Drive, 160 GB Solid State Drive, 256 GB Self-encrypting Solid State Drive, 500 GB Self-encrypting Drive, or 1 TB Solid State Hard Drive

- Optional Tray-load HP SuperMulti DVD+/-RW SATA Optical Disc Drive, DVD-ROM disc drive, or Slim BDXL Blu-ray Writer
- Intel Q87 Express chipset – Intel vPro
- Two SODIMM slots with up to 16 GB of DDR3 SDRAM memory and dual channel memory support
- Intel integrated graphics
- DisplayPort video out (with audio) for second display support
- Optional MXM graphics card
- DP audio, DP to VGA/DVI/HDMI dongle support
- Integrated Gigabit Ethernet (Intel i217LM GbE LOM)
- Wireless connectivity (optional):
 - Intel Advanced-N 6205 WLAN 802.11 a/b/g/n
 - WLAN and Bluetooth Combo Card, 802.11 a/b/g/n Bluetooth® 4.0
- Optional integrated full HD webcam and dual microphone array
- Premium stereo speakers
- Optional 6-in-1 media card reader
- 6 USB 3.0 ports
- Choice of wired or wireless keyboard and mouse
 - Wired USB keyboard and mouse
 - Wired PS/2 keyboard and mouse
 - Wireless keyboard and mouse
- Windows® 7 Professional 32-bit or 64-bit or Windows® 8 Professional 64-bit operating system
- 92-percent energy-efficient power supply
- ENERGY STAR® qualified, EPEAT® Gold+ registered

Front components



Component	Component
1 Webcam (optional) with privacy shutter	7 Mute speaker
2 Dual microphone array (optional)	8 Reduce volume
3 Webcam activity LED (with optional webcam)	9 Increase volume
4 16:9 widescreen LED-backlit LCD display	10 Mute microphone
5 Power LED	11 Decrease brightness
6 High-performance stereo speakers	12 Increase brightness

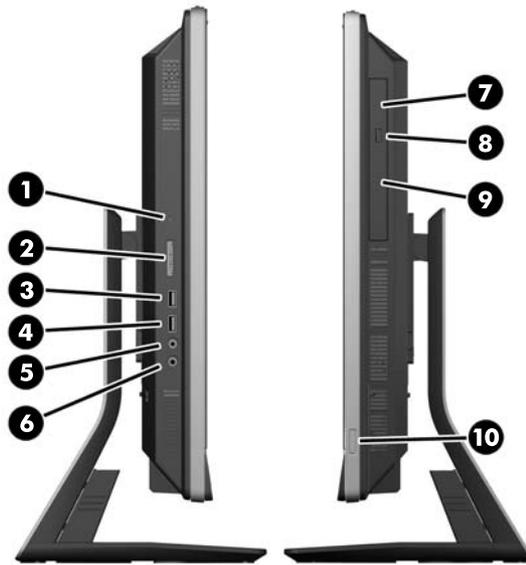
Touch the icon area (7–12 above) to cause the icons to illuminate, then touch an icon to activate it.

To change the volume or brightness, touch and hold the appropriate icon or touch it and repeat until the volume or brightness has reached the desired level.

To mute the speaker or microphone, just touch the appropriate icon. The icon remains illuminated until you touch it again to reactivate the speaker or microphone. You cannot disable only the microphone; you can disable the entire audio system using F10 Setup. See [Computer Setup—Security on page 111](#) for more information.

You can disable the webcam in F10 Setup by disabling accessory USB port 5. See [Computer Setup—Security on page 111](#) for more information.

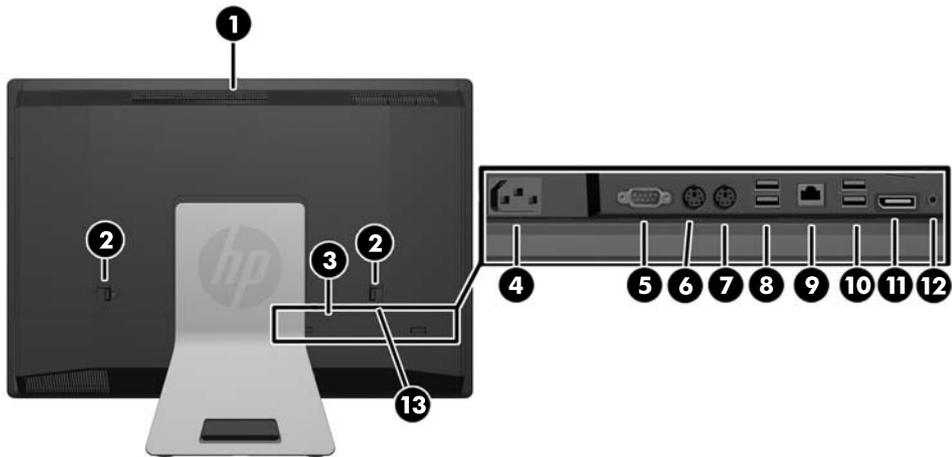
Side components



Component		Component	
1	Hard disc drive activity LED	6	Headset/line out jack
2	HP media card reader (optional)	7	Tray-load optical disc drive
3	USB 3.0 port, fast-charging	8	Optical disc drive eject button
4	USB 3.0 port	9	Optical disc drive activity LED
5	Microphone/line in jack*	10	Power button

* To disable the microphone, you must disable the entire audio system using F10 Setup. See [Computer Setup—Security on page 111](#) for more information.

Rear components

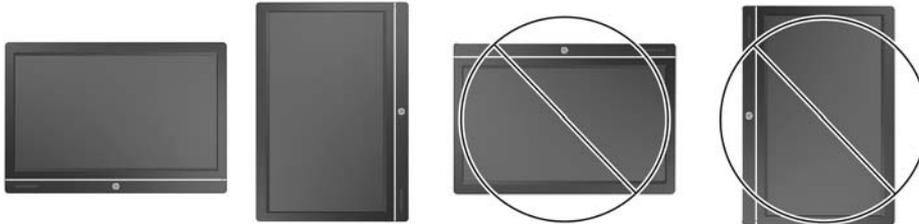


Component		Component	
1	Access panel	8	(2) USB 3.0 ports
2	Access panel latches	9	RJ-45 Gigabit Ethernet port
3	Security lock slot	10	(2) USB 3.0 ports
4	Power connector	11	DisplayPort connector
5	Serial port	12	Stereo audio line out
6	PS/2 mouse connector	13	Access panel and rear port cover security screw
7	PS/2 keyboard connector		

Positioning the computer

This computer may be shipped with no stand, with a height-adjustable stand, or a tilt/swivel stand. The computer may be placed in the landscape position with the HP logo on the bottom bezel or it may be placed in the portrait position with the HP logo on the right side, as you face the computer.

Figure 1-2 Supported and unsupported positions



CAUTION: Positioning the computer with the HP logo on the top or on the left is not supported.

Adjusting the height-adjustable/recline stand (optional)

This stand allows you to:

- adjust the computer height 110 mm (4.3 inches)
- rotate the computer position from landscape to portrait
- recline the computer backward up to +60 degrees
- tilt the computer to 30 degrees from the desktop
- swivel the computer up to 360 degrees right or left

To rotate the computer:

1. Grasp the computer by the sides and lift it straight up (1) to its highest position.



2. Press the top of the computer backwards (2).

CAUTION: The computer must be raised and tilted to provide clearance for rotating it.

3. Grasp the top right and bottom left of the computer and carefully turn it counterclockwise (3) until it is in the portrait position (4).

⚠ WARNING! If the height-adjustable/recline stand is installed, before laying the computer down for service, first grasp the sides of the display and raise the display to the highest position.

Do not lay the computer down with the sliding stand in the low position. The stand may suddenly release, which could cause injury or damage to equipment.



Adjusting the tilt/swivel stand (optional)

This stand allows you to tilt the computer forward up to -5 degrees or backward up to +30 degrees to set it to a comfortable eye level.



The tilt/swivel stand has a swivel pad on the underside that allows you to swivel the computer up to 360 degrees left or right for the best viewing angle.



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.

1. To set up your Internet connection, click **Start > Internet Explorer** and follow the instructions on the screen.
2. 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:\i386`, or use the **Browse** button in the dialog box to locate the i386 folder. This action points the operating system to the appropriate drivers.

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

Customizing the monitor display

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.
2. 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.

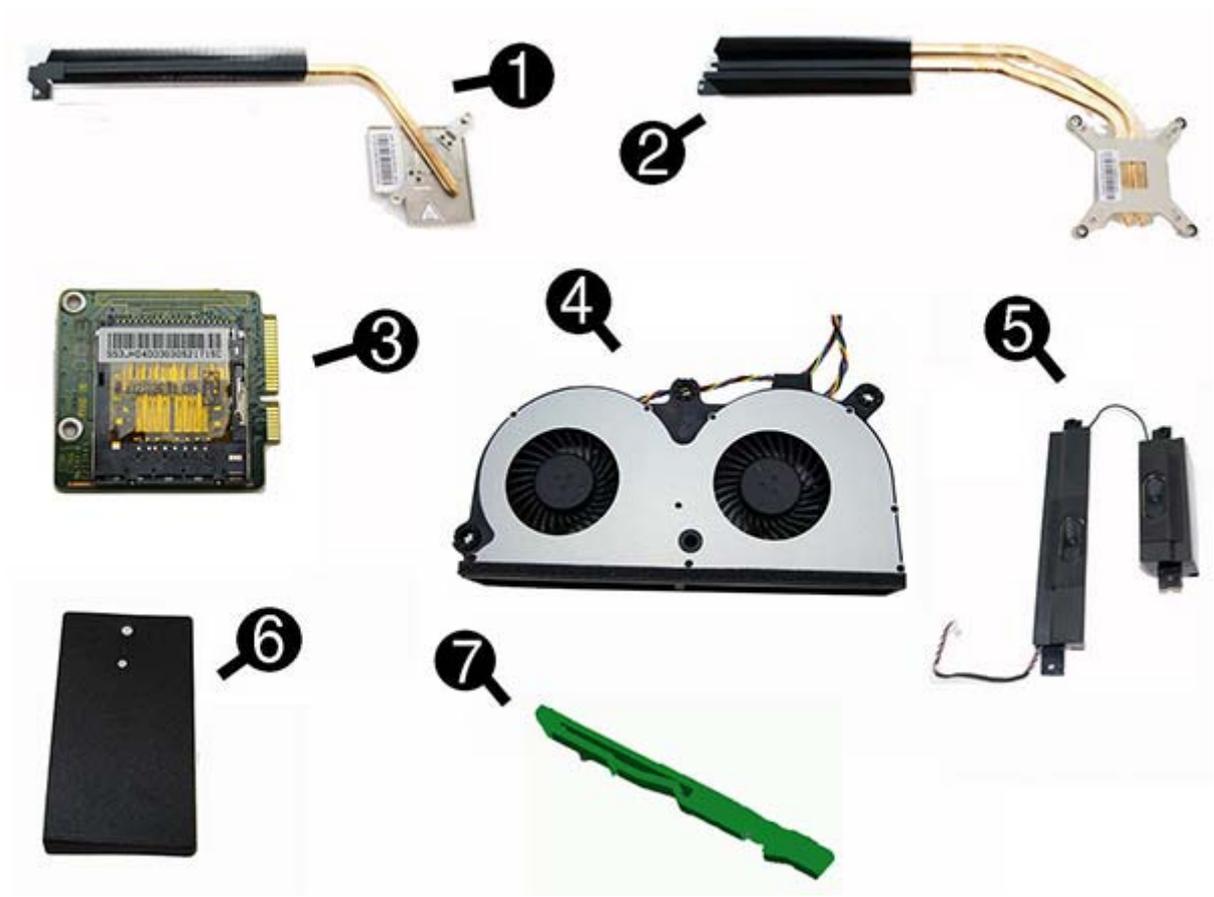
3 Illustrated parts catalog

System parts



Item	Description	Spare part number
(1)	Front bezel	733500-001
(2)	Power supply , 200W	733490-001
(3)	Left I/O panel	733501-001
(4)	Right panel	733505-001
(5)	Standard stand assembly	732509-001
(6)	Upper rear access panel	733502-001
(7)	Rear I/O cover	733504-001
(8)	Height adjustment stand	698226-001
(9)	Lower rear access panel	733503-001
(10)	Top rear trim	733506-001
	Display panel (not illustrated)	
	Touch panel kit, with integrated touch glass	735208-001
	Non-touch screen	735207-001
	Plastic frame for models with a webcam (does not include glass)	733507-001

Misc parts



Item	Description	Spare part number
	Heat sink (thermal module) (includes replacement thermal material)	
(1)	For use with the graphics card	733488-001
(2)	For use with the processor	733487-001
(3)	Card reader	732504-001
(4)	Fan	733489-001
(5)	Speakers (left and right)	733514-001
(6)	Mylar cover (power button board)	733513-001
(7)	Optical drive latch	733509-001
	Optical drive insert	733508-001
	HP ultraslim keyed cable lock	703372-001
	HP Business Digital Headset	642738-001
	Assembly kit for non-touchscreen models without a webcam (includes webcam cover for bezel)	733510-001

Item	Description	Spare part number
	Assembly kit for touchscreen models without a webcam (includes webcam cover for bezel)	733511-001
	Antenna kit	733499-001

Keyboards and mice

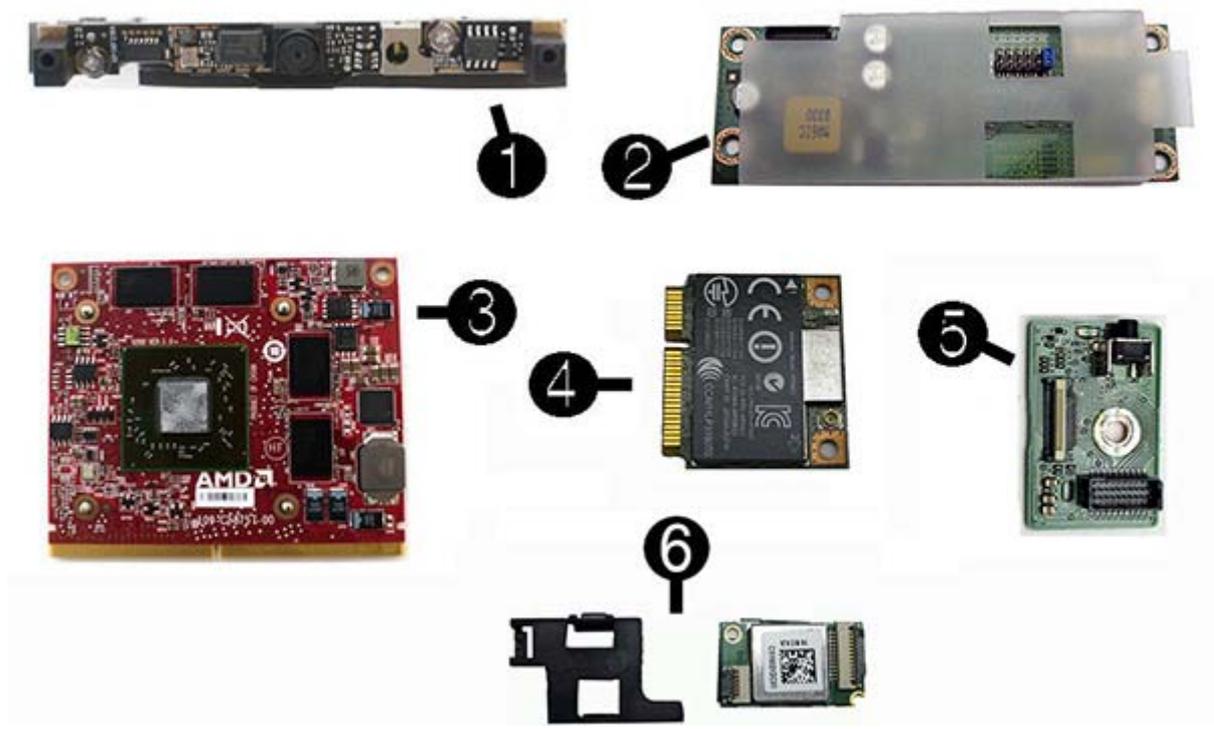
Description	Spare part number
Keyboard (not illustrated)	
PS/2	724718-xx1
USB	724720-xx1
Wireless with dongle	724722-xx1
Smartcard	700510-xx1
Washable	701427-xx1
Mouse (not illustrated)	
PS2, optical	674315-001
Washable	724795-001
Wireless	674317-001
USB, optical	674316-xx1
USB, laser	674318-xx1

Mass storage devices

Description	Spare part number
Optical drive (does not include bezel)	
Blu-ray writer (BD-RE) drive	719157-001
DVD±RW drive	657958-001
DVD-ROM drive	608394-001
Hard drive (not illustrated)	
1 TB, hybrid SSD drive	724937-001
500 GB, hybrid SSD drive	724938-001
500 GB, 7200 rpm hard drive, self-encrypting (SED)	696442-001
500 GB, 7200 rpm hard drive	686217-001

Description	Spare part number
320 GB, 7200 rpm hard drive	639135-001
256 GB Solid State Drive (SSD), self-encrypting (SED)	680020-001
160-GB solid-state drive	646809-001
128-GB solid-state drive	728559-001
120-GB solid-state drive	661841-001
32-GB mSATA drive	719566-001
	686616-001

Boards



Item	Description	Spare part number
(1) Webcam module	For use in non-touchscreen models	732510-001
	For use in touchscreen models	736499-001
(2) Converter board		732493-001
(3) AMD Radeon HD 7650A 2-GB MXM discrete graphics board		708866-001
(4) WLAN modules		
	HP WLAN 802.11 a/g/n, 2x2	701398-001

Item	Description	Spare part number
	HP WLAN 802.11 a/b/g/n, 2x2	695915-001
(5)	Power button board	732490-001
(6)	Near field communication (NFC) NXP controller (use with NFC assembly kit, spare part number 732502-001)	732503-001
	Sensor board assembly	733486-001
	System board (not illustrated)	
	For use in non-Windows 8 models	700624-001
	For use in models with Windows 8 Standard	700624-501
	For use in models with Windows 8 Professional	700624-601
	For use in models with NetClone	727718-001
	System board (C2)	
	NOTE: System boards labeled as "C2" must be replaced with "C2" system boards.	
	If the system board is not labeled as "C2", use the default spare part number (700624-xx1)	
	For use in non-Windows 8 models	739680-001
	For use in models with Windows 8 Standard	739680-501
	For use in models with Windows 8 Professional	739680-601
	Memory modules (PC3-10600, 1333-MHz; not illustrated)	
	8-GB	689374-001
	4-GB	689373-001
	2-GB	689372-001
	Processors (include replacement thermal material; not illustrated)	
	Intel Core i7-4770s (3.1-GHz, 8-MB L3 cache)	732507-001
	Intel Core i5-4670s (3.1-GHz, 6-MB L3 cache)	732506-001
	Intel Core i5-4570s (2.9-GHz, 6-MB L3 cache)	732505-001

Cables

Description	Spare part number
Power button board cable	698208-001
Backlight cable	
For use with LG and BOE display panels	733495-001
For use with Samsung display panels	733496-001

Description	Spare part number
Optical drive cable (data and power assembly)	733492-001
Hard drive cable (data and power assembly)	733491-001
Touch control cable	733497-001
Touch drive reverse cable	733498-001
Converter board cable	733493-001
LVDS (display) reverse cable	733494-001
Capacitive strip sensor cable	698210-001
Webcam cable	698211-001
Adapter, DisplayPort to VGA	632484-001
Adapter, DisplayPort to DVI	662723-001
Adapter, DisplayPort to HDMI	617450-001
DisplayPort cable	487562-001

Sequential part number listing

Spare part number	Description
487562-001	DisplayPort cable
608394-001	DVD-ROM drive
617450-001	Adapter, DisplayPort to HDMI
632484-001	Adapter, DisplayPort to VGA
639135-001	320 GB, 7200 rpm hard drive
642738-001	HP Business Digital Headset
646809-001	160 GB Solid State Drive (SSD)
657958-001	Keyboard, USB hub
661841-001	120 GB Solid State Drive (SSD)
662723-001	Adapter, DisplayPort to DVI
674315-001	Mouse, PS2, optical
674316-001	Mouse, USB, optical
674317-001	Mouse, wireless
674318-001	Mouse, USB, laser
680020-001	256 GB Solid State Drive (SSD), self-encrypting (SED)

Spare part number	Description
686217-001	500 GB, 7200 rpm hard drive
686616-001	32-GB mSATA drive
689372-001	4-GB memory module (PC3-10600, 1600-MHz)
689373-001	2-GB memory module (PC3-10600, 1600-MHz)
689374-001	8-GB memory module (PC3-10600, 1600-MHz)
695915-001	HP WLAN 802.11 a/b/g/n, 2x2
696442-001	500 GB, 7200 rpm hard drive, self-encrypting (SED)
698208-001	Power button board cable
698210-001	Capacitive strip sensor cable
698211-001	Webcam cable
698226-001	Height adjustment stand
700510-001	Keyboard, washable, for use in the United States
700510-121	Keyboard, washable, for use in French Canada
700510-161	Keyboard, washable, for use in Latin America
700510-201	Keyboard, washable, for use in Brazil
700624-001	System board for use in models without Windows 8
700624-501	System board for use in models with Windows 8 Standard
700624-601	System board for use in models with Windows 8 Professional
701398-001	HP WLAN 802.11 a/g/n, 2x2
701427-001	Keyboard, USB, Smartcard, for use in the United States
701427-031	Keyboard, USB, Smartcard, for use in the United Kingdom
701427-041	Keyboard, USB, Smartcard, for use in Germany
701427-051	Keyboard, USB, Smartcard, for use in France
701427-061	Keyboard, USB, Smartcard, for use in Italy
701427-071	Keyboard, USB, Smartcard, for use in Spain
701427-081	Keyboard, USB, Smartcard, for use in Denmark
701427-091	Keyboard, USB, Smartcard, for use in Norway
701427-101	Keyboard, USB, Smartcard, for use in Switzerland
701427-111	Keyboard, USB, Smartcard, for use in Sweden
701427-121	Keyboard, USB, Smartcard, for use in French Canada
701427-131	Keyboard, USB, Smartcard, for use in Portugal
701427-141	Keyboard, USB, Smartcard, for use in Turkey

Spare part number	Description
701427-151	Keyboard, USB, Smartcard, for use in Greece
701427-161	Keyboard, USB, Smartcard, for use in Latin America
701427-171	Keyboard, USB, Smartcard, for use in Saudi Arabia
701427-181	Keyboard, USB, Smartcard, for use in Belgium
701427-201	Keyboard, USB, Smartcard, for use in Brazil
701427-211	Keyboard, USB, Smartcard, for use in Hungary
701427-221	Keyboard, USB, Smartcard, for use in the Czech Republic and Slovakia
701427-231	Keyboard, USB, Smartcard, for use in Slovenia
701427-251	Keyboard, USB, Smartcard, for use in Russia
701427-261	Keyboard, USB, Smartcard, for use in Bulgaria
701427-271	Keyboard, USB, Smartcard, for use in Romania
701427-281	Keyboard, USB, Smartcard, for use in Thailand
701427-291	Keyboard, USB, Smartcard, for use in Japan
701427-371	Keyboard, USB, Smartcard, for use internationally
701427-AA1	Keyboard, USB, Smartcard, for use in the People's Republic of China
701427-AB1	Keyboard, USB, Smartcard, for use in Taiwan
701427-B41	Keyboard, USB, Smartcard, for use in BHCSY
701427-BB1	Keyboard, USB, Smartcard, for use in Israel
701427-DE1	Keyboard, USB, Smartcard, for use in French Arabia
701427-KD1	Keyboard, USB, Smartcard, for use in South Korea
701427-L31	Keyboard, USB, Smartcard, for use with international English
703372-001	HP ultraslim keyed cable lock
708866-001	AMD Radeon HD 7650A 2-GB MXM discrete graphics board
719157-001	Blu-ray writer (BD-RE) drive
719566-001	32-GB mSATA drive
724718-001	Keyboard, PS/2, for use in the United States
724718-031	Keyboard, PS/2, for use in the United Kingdom
724718-041	Keyboard, PS/2, for use in Germany
724718-051	Keyboard, PS/2, for use in France
724718-061	Keyboard, PS/2, for use in Italy
724718-071	Keyboard, PS/2, for use in Spain
724718-081	Keyboard, PS/2, for use in Denmark

Spare part number	Description
724718-091	Keyboard, PS/2, for use in Norway
724718-101	Keyboard, PS/2, for use in Switzerland
724718-111	Keyboard, PS/2, for use in Sweden
724718-121	Keyboard, PS/2, for use in French Canada
724718-131	Keyboard, PS/2, for use in Portugal
724718-141	Keyboard, PS/2, for use in Turkey
724718-151	Keyboard, PS/2, for use in Greece
724718-161	Keyboard, PS/2, for use in Latin America
724718-171	Keyboard, PS/2, for use in Saudi Arabia
724718-181	Keyboard, PS/2, for use in Belgium
724718-201	Keyboard, PS/2, for use in Brazil
724718-211	Keyboard, PS/2, for use in Hungary
724718-221	Keyboard, PS/2, for use in the Czech Republic and Slovakia
724718-231	Keyboard, PS/2, for use in Slovenia
724718-251	Keyboard, PS/2, for use in Russia
724718-261	Keyboard, PS/2, for use in Bulgaria
724718-271	Keyboard, PS/2, for use in Romania
724718-281	Keyboard, PS/2, for use in Thailand
724718-291	Keyboard, PS/2, for use in Japan
724718-AA1	Keyboard, PS/2, for use in the People's Republic of China
724718-AB1	Keyboard, PS/2, for use in Taiwan
724718-B41	Keyboard, PS/2, for use in BHCSY
724718-BB1	Keyboard, PS/2, for use in Israel
724718-D61	Keyboard, PS/2, for use in India
724718-DE1	Keyboard, PS/2, for use in French Arabia
724718-KD1	Keyboard, PS/2, for use in South Korea
724718-L31	Keyboard, PS/2, for use with International English
724720-001	Keyboard, USB for use in the United States
724720-031	Keyboard, USB, for use in the United Kingdom
724720-041	Keyboard, USB, for use in Germany
724720-051	Keyboard, USB, for use in France
724720-061	Keyboard, USB, for use in Italy

Spare part number	Description
724720-071	Keyboard, USB, for use in Spain
724720-081	Keyboard, USB, for use in Denmark
724720-091	Keyboard, USB, for use in Norway
724720-101	Keyboard, USB, for use in Switzerland
724720-111	Keyboard, USB, for use in Sweden
724720-121	Keyboard, USB, for use in French Canada
724720-131	Keyboard, USB, for use in Portugal
724720-141	Keyboard, USB, for use in Turkey
724720-151	Keyboard, USB, for use in Greece
724720-161	Keyboard, USB, for use in Latin America
724720-171	Keyboard, USB, for use in Saudi Arabia
724720-181	Keyboard, USB, for use in Belgium
724720-201	Keyboard, USB, for use in Brazil
724720-211	Keyboard, USB, for use in Hungary
724720-221	Keyboard, USB, for use in the Czech Republic and Slovakia
724720-231	Keyboard, USB, for use in Slovenia
724720-251	Keyboard, USB, for use in Russia
724720-261	Keyboard, USB, for use in Bulgaria
724720-271	Keyboard, USB, for use in Romania
724720-281	Keyboard, USB, for use in Thailand
724720-291	Keyboard, USB, for use in Japan
724720-AA1	Keyboard, USB, for use in the People's Republic of China
724720-AB1	Keyboard, USB, for use in Taiwan
724720-B41	Keyboard, USB, for use in BHCSY
724720-BB1	Keyboard, USB, for use in Israel
724720-D61	Keyboard, USB, for use in India
724720-DE1	Keyboard, PS/2, for use in French Arabia
724720-KD1	Keyboard, USB, for use in South Korea
724720-L31	Keyboard, USB, for use with International English
724722-001	Keyboard, wireless with dongle, for use in the United States
724795-001	Mouse, washable
724937-001	1 TB, hybrid SSD drive

Spare part number	Description
724938-001	500 GB, hybrid SSD drive
727718-001	System board for use in models with NetClone
728559-001	128 GB Solid State Drive (SSD)
732490-001	Power button board
732493-001	Converter board
732503-001	Near field communication (NFC) NXP controller (use with NFC assembly kit, spare part number 733512-001)
732504-001	Card reader
732505-001	Intel Core i5, 4570s processor (3.4-GHz, 8-MB L3 cache)
732506-001	Intel Core i5, 4670s processor (3.3-GHz, 6-MB L3 cache)
732507-001	Intel Core i7, 4770s processor (3.1-GHz, 6-MB L3 cache)
732509-001	Standard stand assembly
732510-001	Webcam module for use in non-touchscreen models
733486-001	Sensor board assembly
733487-001	Heat sink (thermal module) for use with the processor (includes replacement thermal material)
733488-001	Heat sink (thermal module) for use with a discrete graphics board (includes replacement thermal material)
733489-001	Fan
733490-001	Power supply, 200W
733491-001	Hard drive cable (data and power assembly)
733492-001	Optical drive cable (data and power assembly)
733493-001	Converter board cable
733494-001	LVDS (display) reverse cable
733495-001	Backlight cable for use with LG and BOE display panels
733496-001	Backlight cable for use with Samsung display panels
733497-001	Touch control cable
733498-001	Touch drive reverse cable
733499-001	Antenna kit
733500-001	Front bezel
733501-001	Left I/O panel
733502-001	Upper rear access panel
733503-001	Lower rear access panel
733504-001	Rear I/O cover
733505-001	Right panel

Spare part number	Description
733506-001	Top rear trim
733507-001	Plastic frame for models with a webcam (does not include glass)
733508-001	Optical drive insert
733510-001	Assembly kit for non-touchscreen models without a webcam (includes webcam cover for bezel)
733511-001	Assembly kit for touchscreen models without a webcam (includes webcam cover for bezel)
733512-001	NFC assembly kit (holder, cable, antenna) for use with NFC controller, spare part number 732503-001
733513-001	Mylar cover (power button board)
733514-001	Speakers (left and right)
735207-001	Display panel, non-touchscreen models
735208-001	Touch panel kit, with integrated touch glass
736499-001	Webcam module for use in touchscreen models
739680-001	System board (C2) for use in models without Windows 8
739680-501	System board (C2) for use in models with Windows 8 Standard
739680-601	System board (C2) for use in models with Windows 8 Professional

4 Routine care, SATA drive guidelines, and disassembly preparation

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

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

Electrostatic discharge information

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

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

Generating static

The following table shows that:

- Different activities generate different amounts of static electricity.
- Static electricity increases as humidity decreases.

Event	Relative Humidity		
	55%	40%	10%
Walking across carpet	7,500 V	15,000 V	35,000 V
Walking across vinyl floor	3,000 V	5,000 V	12,000 V
Motions of bench worker	400 V	800 V	6,000 V
Removing DIPs from plastic tube	400 V	700 V	2,000 V
Removing DIPs from vinyl tray	2,000 V	4,000 V	11,500 V
Removing DIPs from Styrofoam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V

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



NOTE: 700 volts can degrade a product.

Preventing electrostatic damage to equipment

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

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.
- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.
- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.
- Place items on a grounded surface before removing them from their container.
- Always be properly grounded when touching a sensitive component or assembly.
- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal grounding methods and equipment

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

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

Static Shielding Protection Levels	
Method	Voltage
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

To prevent static damage at the work area, use the following precautions:

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

Recommended materials and equipment

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

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids

- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance
- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one-megohm +/- 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

Operating guidelines

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

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.
- Keep liquids away from the computer and keyboard.

- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including sleep states.

Routine care

General cleaning safety precautions

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

Cleaning the Computer Case

Follow all safety precautions in [General cleaning safety precautions on page 29](#) before cleaning the computer.

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

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed as the alcohol will evaporate quickly and not leave a residue.
- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the computer. Lint and other foreign matter can block the vents and limit the airflow.

Cleaning the keyboard

Follow all safety precautions in [General cleaning safety precautions on page 29](#) before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in [Cleaning the Computer Case on page 29](#).

When cleaning debris from under the keys, review all rules in [General cleaning safety precautions on page 29](#) before following these procedures:

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

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.
- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.

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

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

Cleaning the monitor

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid may seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body follow the procedures in [Cleaning the Computer Case on page 29](#).

Cleaning the mouse

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

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in [Cleaning the Computer Case on page 29](#).

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
- 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
- Tamper-resistant T-15 wrench

Screws

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

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

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

Cables and connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

⚠ CAUTION: When servicing this computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

Hard Drives

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

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package "Fragile: Handle With Care."
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the CPU.
- Avoid dropping drives from any height onto any surface.

- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.
- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector. For more information about preventing electrostatic damage, refer to [Electrostatic discharge information on page 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.

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

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

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.

Cable management

Always 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 sliding or moveable parts to prevent them from being cut or crimped when the parts are moved.
- 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.

5 Removal and Replacement Procedures All-in One (AIO) Chassis

The following sections provide information about disassembling various components of the computer.

Preparing to disassemble the computer

To avoid injury and equipment damage, always complete the following steps in order, when opening the HP Pro All-in-One.

1. Remove all media from the computer.
2. Shut down the computer.
3. After the system has completely shut down, disconnect the power adapter from the back of the computer.
4. If a cable lock is installed on the rear of the unit, remove the lock.
5. Disconnect all other attached cables from the back of the computer.
6. If the height adjustable/recline stand is installed, before laying the computer down for service, position the computer vertically by grasping the sides of the display, and then raise the display to the highest position.

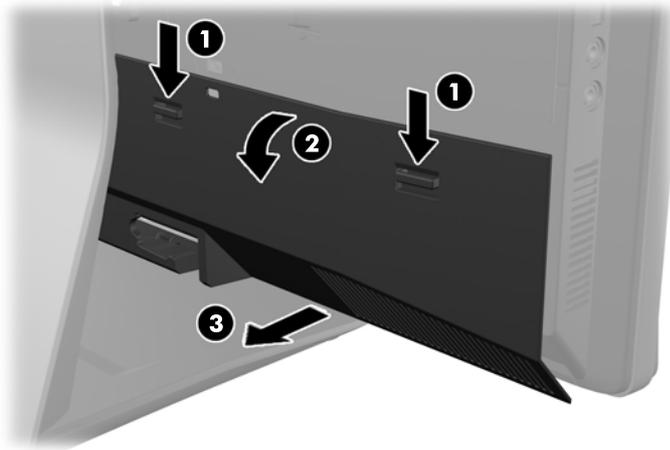
Place the computer face down on a soft flat surface. HP recommends that you set down a blanket, towel, or other soft cloth to protect the screen surface from scratches or other damage.

 **WARNING!** Beware of sharp edges inside the chassis.

Removing the rear I/O cover

Description	Spare part number
Rear I/O cover	733504-001

- ▲ Push the two tabs down, then rotate and lift the cover off the computer.



Stand

Description	Spare part number
Tilt/swivel stand	732509-001
Height adjustment stand	698226-001

Two stands are available for the computer:

- Height-adjustable/recline stand
- Tilt/swivel stand

Height-adjustable/recline stand (optional)

To remove the stand:

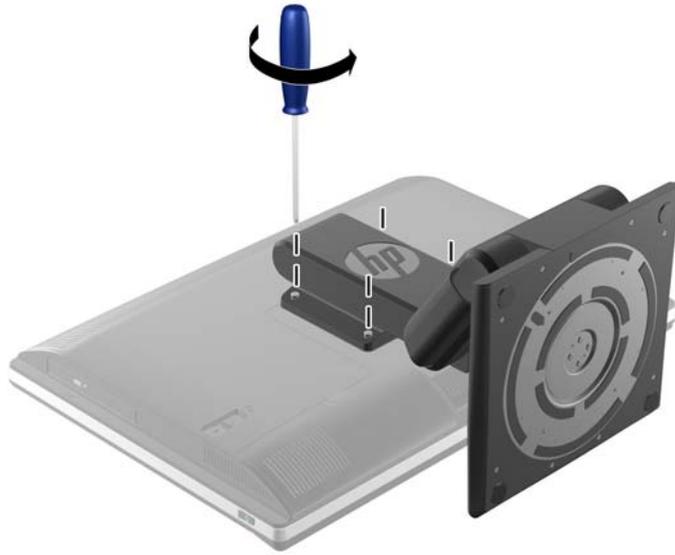
1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Place the computer face down on a soft flat surface. HP recommends that you set down a blanket, towel, or other soft cloth to protect the bezel and screen surface from scratches or other damage.

⚠ WARNING! Before laying the computer down for service, first grasp the sides of the display and raise the display to the highest position.

Do not lay the computer down with the sliding stand in the low position. The stand may suddenly release, which could cause injury or damage to equipment.



3. Push the base of the stand down (1), and loosen the captive screws securing the stand to the unit (2).



4. Lift the stand up and off the computer.



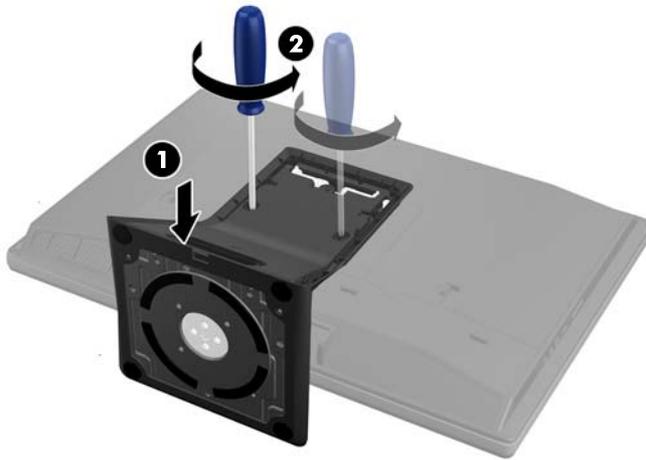
Tilt/swivel stand (optional)

To remove the stand:

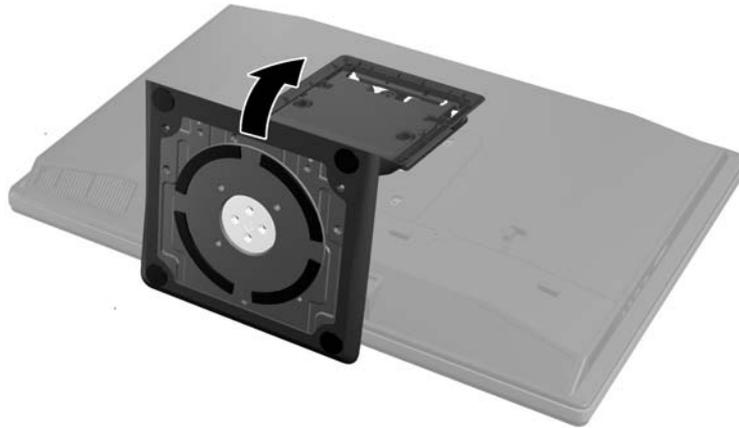
1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Push the release button (1) on the bottom of the stand and pull the back of the stand off (2) the computer.



3. Push the base of the stand down (1), and loosen the captive screws securing the stand to the unit (2).

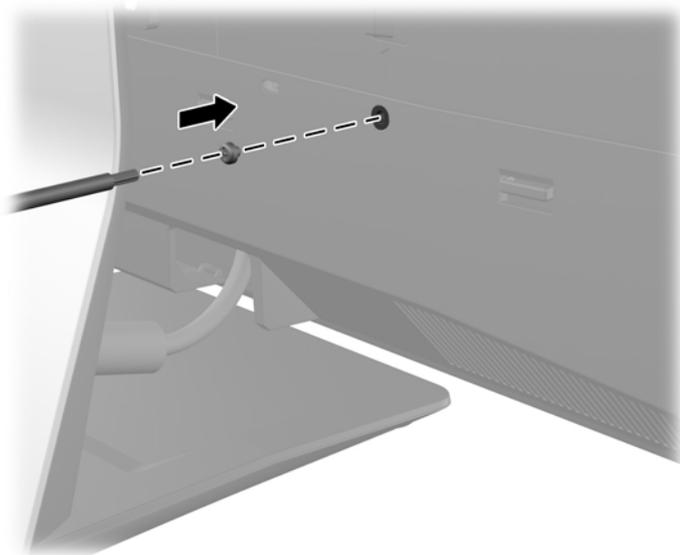


4. Lift the stand up and off the computer.



Installing an access panel security screw

You may prevent access to internal components and ports by securing the access panel and rear port cover. Screw a T15 tamper-resistant Torx screw through the rear port cover and the access panel to prevent removal of either.



Access panel

Description	Spare part number
Upper rear access panel	733502-001

The access panel is located on the rear of the computer.

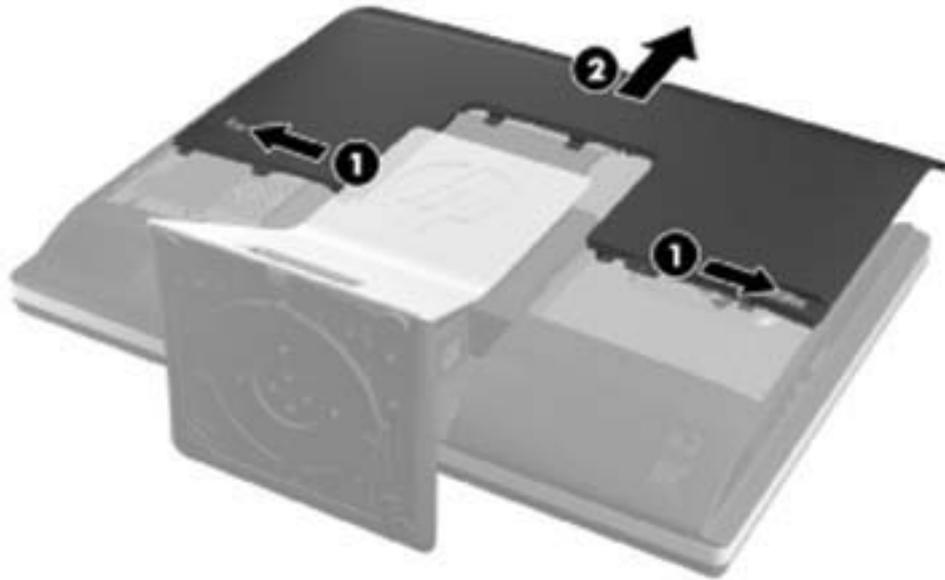


The computer has one main rear access panel that allows access to internal components.

To remove the access panel:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).

2. Slide the access panel latches toward the edges of the unit, then slide the access panel toward the top of the computer until it slides off the unit.



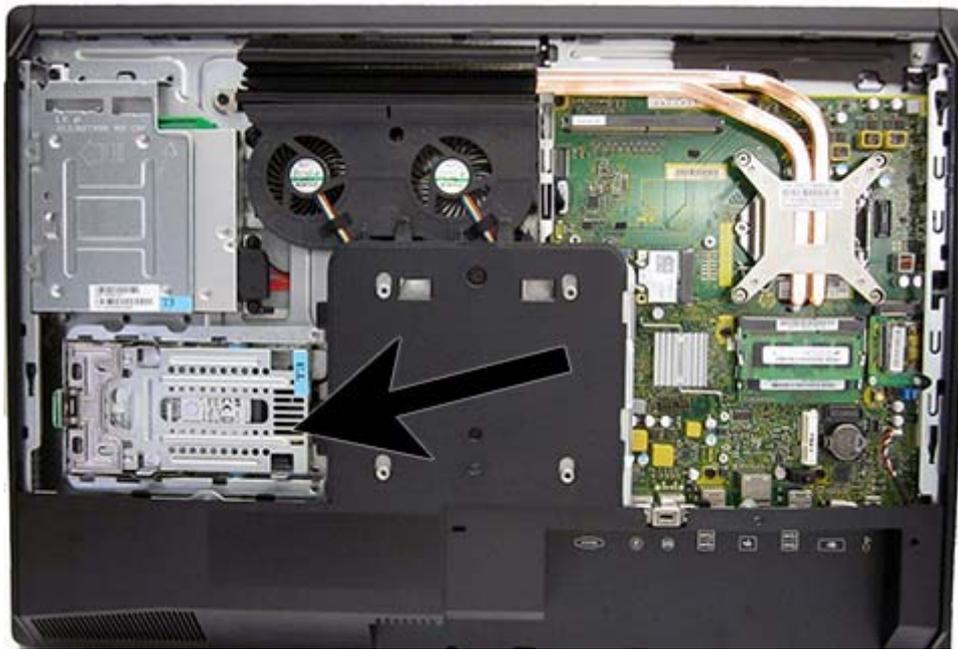
To replace the access panel, reverse the removal procedures.

Drives

Replacing a hard disc drive

Description	Spare part number
Optical drives	
DVD±RW drive	657958-001
DVD-ROM drive	608394-001
Blu-ray BD-RW SuperMulti XL Drive	719157-001
Hard drives	
1 TB hard drive, hybrid SSD	724937-001
500 GB, 7200 rpm, 2.5-inch hard drive, self-encrypting (SED)	696442-001
500 GB, 7200 rpm hard drive	686217-001
500 GB hard drive, hybrid SSD	724938-001
320 GB, 7200 rpm hard drive	639135-001
256 GB Solid State Drive (SSD), self-encrypting (SED)	680020-001
160 GB Solid State Drive (SSD)	646809-001
128 GB Solid State Drive (SSD)	728559-001
120 GB Solid State Drive (SSD)	661841-001
32-GB mSATA drive	719566-001
	686616-001

The hard disc drive is located behind the access panel on the lower left side of the computer (when viewed from behind). The drive is housed in a removable cage.



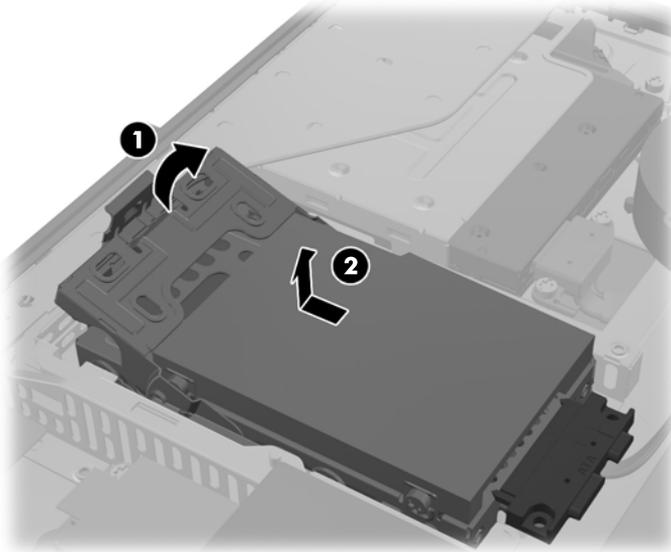
One or two 2.5-inch solid state drives (SSDs) or self-encrypting drives (SEDs) may be installed in the computer. If a single drive is installed, it must be installed in the primary (lower) position.

- [Removing a 2.5-inch hard disc drive](#)
- [Installing a 2.5-inch hard disc drive](#)

Removing a 2.5-inch hard disc drive

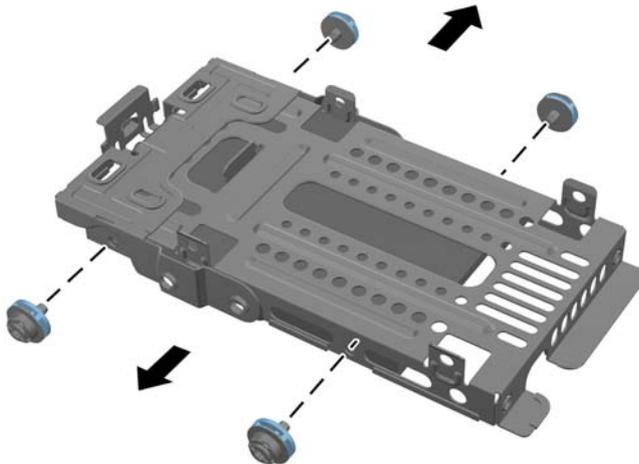
1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).

3. Pull the latch next to the lower side of the 2.5-inch hard disc drive cage away from the cage to release it, then slide the cage toward the edge of the chassis and lift it out.



4. If there is a second disc drive in the 2.5-inch cage, disconnect both cables from it.
5. Remove the four mounting screws from each 2.5-inch hard disc drive to be removed. Be sure to keep the screws together with the blue rubber grommets to use to install a replacement drive.

 **NOTE:** The primary drive is the lower position in the drive cage. If only one drive is to be installed, it must occupy this position.



6. Remove the 2.5-inch hard disc drive(s) from the cage.

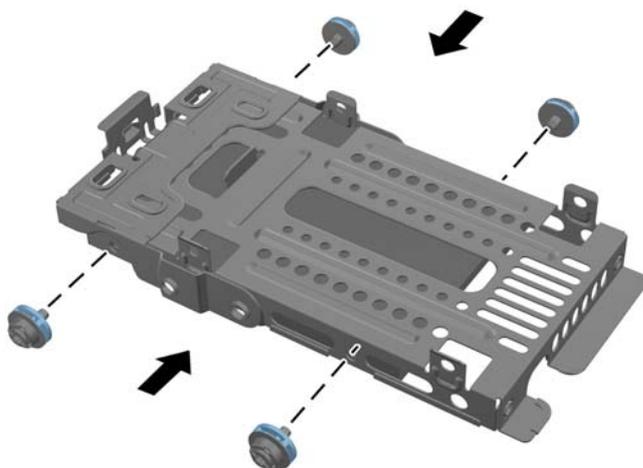
For instructions on installing a hard disc drive, see [Installing a 2.5-inch hard disc drive on page 45](#).

Installing a 2.5-inch hard disc drive

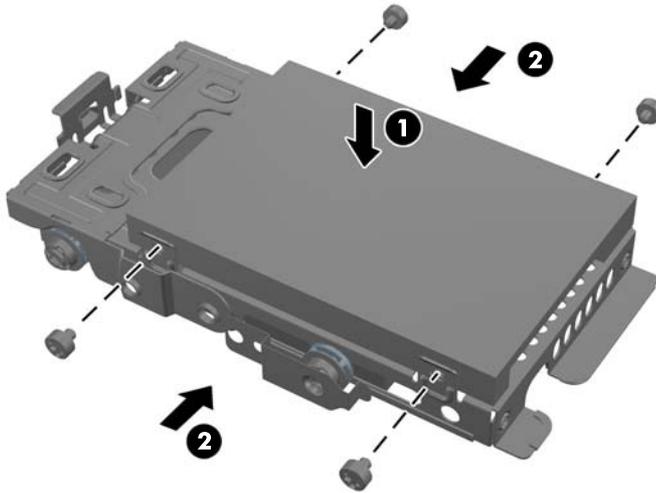
1. Insert the 2.5-inch hard disc drive into the drive cage.
 - To install a primary hard disc drive, insert the drive into the lower position in the drive cage. Be sure to insert the end with the connectors first.

 **NOTE:** The primary drive is the lower position in the drive cage. If only one drive is to be installed, it must occupy this position.

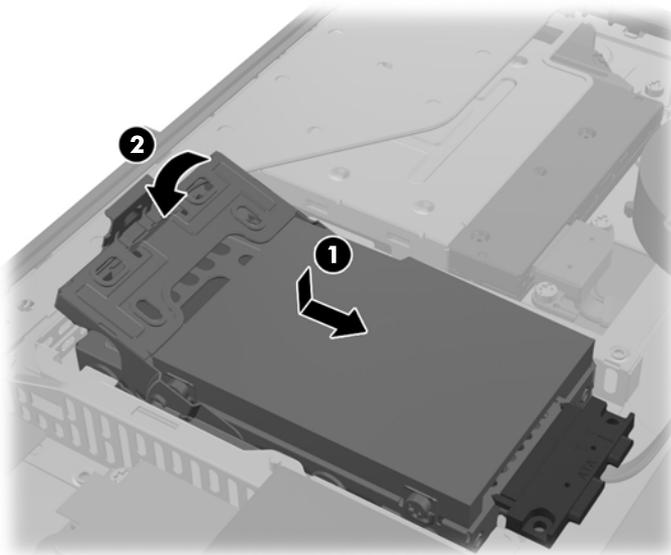
 - To install a secondary hard disc drive, set the drive into the upper tray of the drive cage. Be sure the connectors are facing the same direction as the connectors of the primary hard disc drive.
2. Fasten the lower 2.5-inch hard disc drive securely into the drive cage with four mounting screws with grommets.



3. Fasten an upper 2.5-inch hard disc drive securely in place with the four standard screws that shipped with the drive.

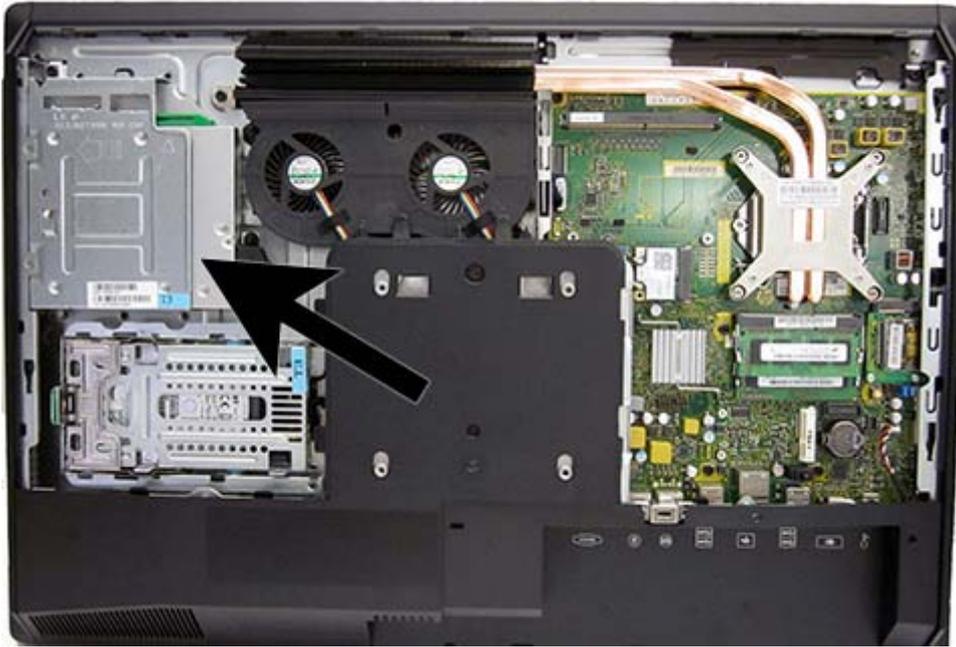


4. Position the 2.5-inch drive cage above its final site with the hard disc drive connectors facing toward the center of the chassis. If the drive cage contains a secondary (upper) drive, locate the power and data cables next to the drive cage and connect them to the secondary drive.
5. Place the 2.5-inch hard disc drive cage into the chassis and slide it toward the center until it snaps into place.

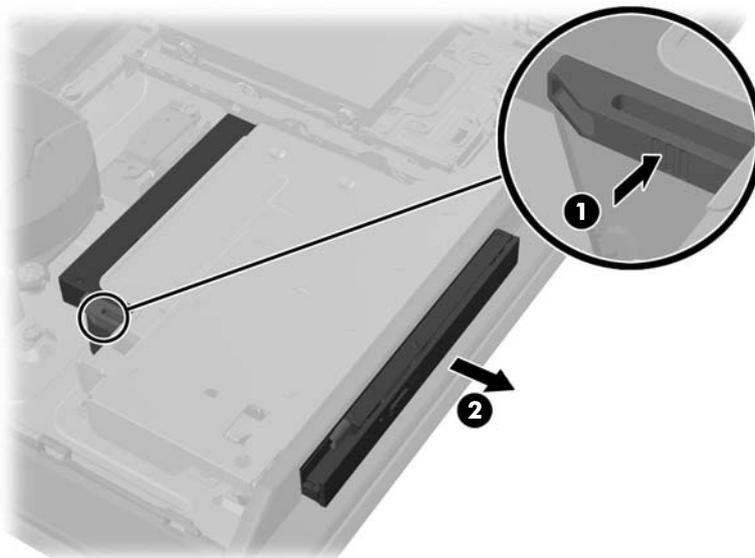


Replacing the optical disc drive

The optical disc drive is located above the hard disc drive on the left side of the computer (when viewed from behind).



1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Push and hold the tab (1) at the back of the optical disc drive enclosure while sliding the drive (2) out of the chassis.



4. Pull the latch off the optical disc drive.



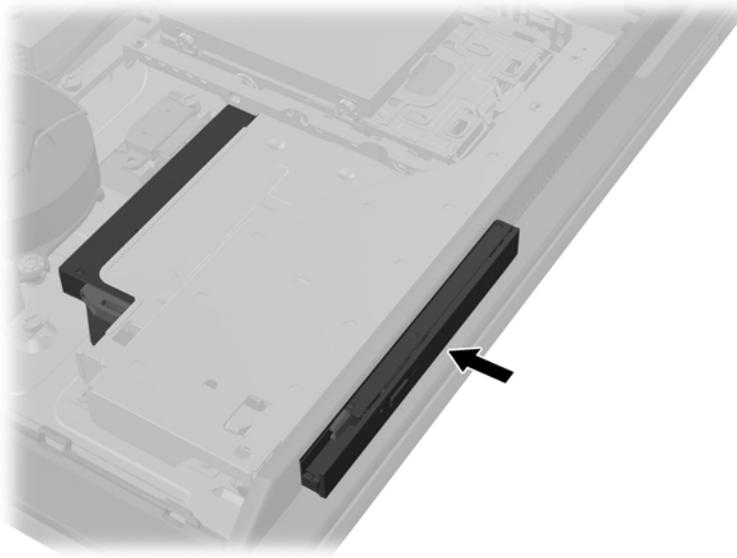
5. Remove the cover from the adhesive strip on the new latch. Align the two pins on the latch with the holes in the new optical disc drive and press the latch onto the drive firmly.

 **NOTE:** You may reuse the latch removed from the old optical disc drive.



6. Align the new optical disc drive with the opening in the side of the computer. Push the drive in firmly until it snaps into place.

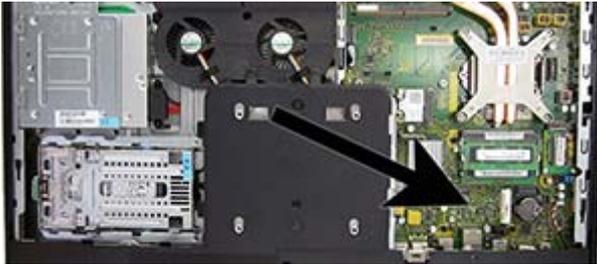
 **NOTE:** The optical disc drive can be installed in only one way.



mSATA Solid-State Drive

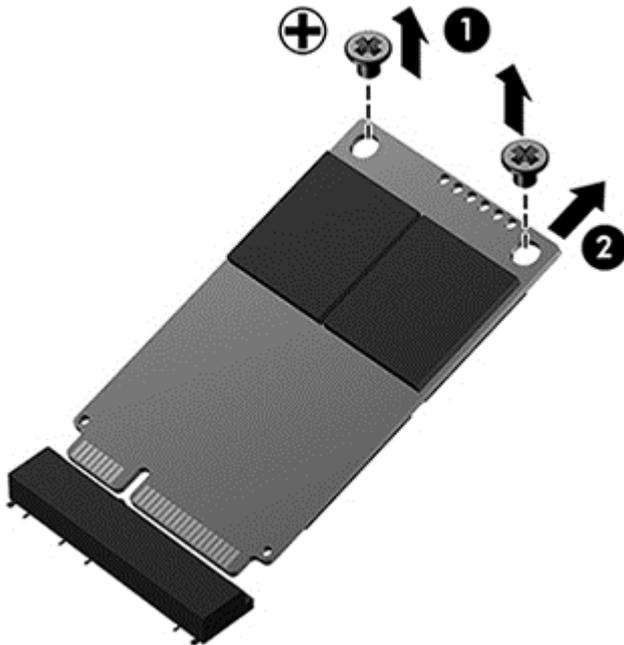
The mSATA SSD is located near the bottom of the system board. The drive is secured with two Phillips screws.

 **NOTE:** In the following image, the mSATA SSD is not shown.



To remove the mSATA SSD:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the two Phillips screws **(1)** that secure the SSD to the computer.
4. Lift the SSD to a 45-degree angle, and then pull it away to remove it from the socket **(2)**.



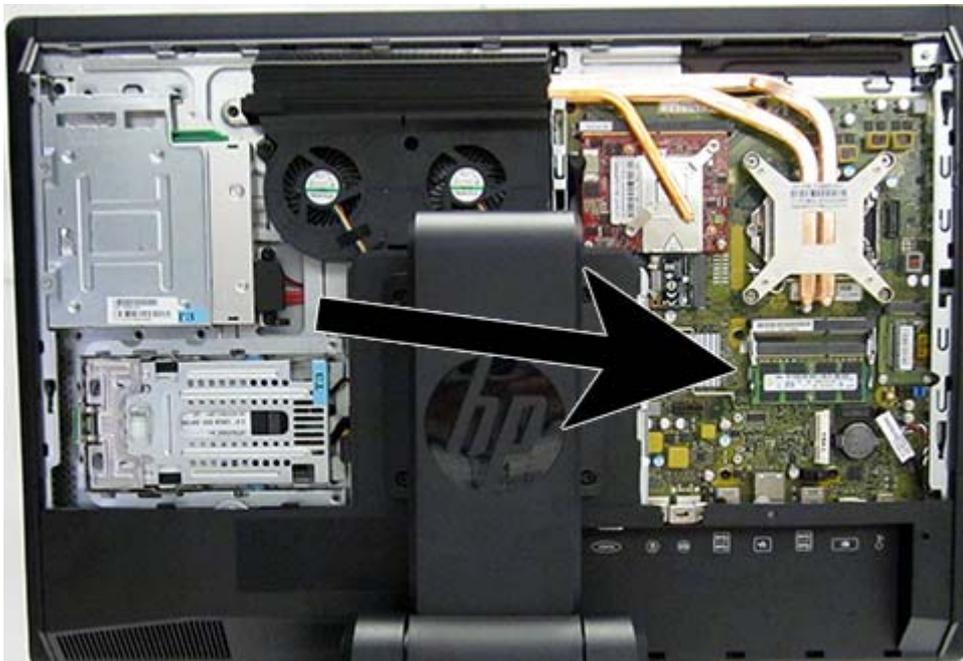
To install the mSATA SSD, reverse the removal procedures.

 **NOTE:** mSATA SSD are designed with a notch to prevent incorrect insertion.

Memory

Description	Spare part number
8-GB	689374-001
4-GB	689373-001
2-GB	689372-001

Memory modules are located on the right side of the computer (viewed from behind). The computer has two memory slots that can be populated with up to two industry-standard SODIMMs. These memory sockets are populated with at least one preinstalled SODIMM. To achieve the maximum memory support, you can populate the system board with up to 16 GB of memory.



For proper system operation, the SODIMMs must be:

- industry-standard 204-pin
- unbuffered non-ECC PC3-10600 DDR3-1600 MHz-compliant
- 1.5 volt DDR3-SDRAM SODIMMs

The DDR3-SDRAM SODIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory Joint Electronic Device Engineering Council (JEDEC) specification

In addition, the computer supports:

- 1-Gbit, 2-Gbit, and 4-Gbit non-ECC memory technologies
- single-sided and double-sided SODIMMS
- SODIMMs constructed with x8 and x16 SDRAMs; SODIMMs constructed with x4 SDRAMs are not supported



NOTE: The system will not operate properly if you install unsupported SODIMM memory.

HP offers upgrade memory for this computer and advises that the consumer purchase it to avoid compatibility issues with unsupported third-party memory.

Location	System Board Label	Channel
Lower Socket	SODIMM1	Channel A
Upper Socket	SODIMM3	Channel B

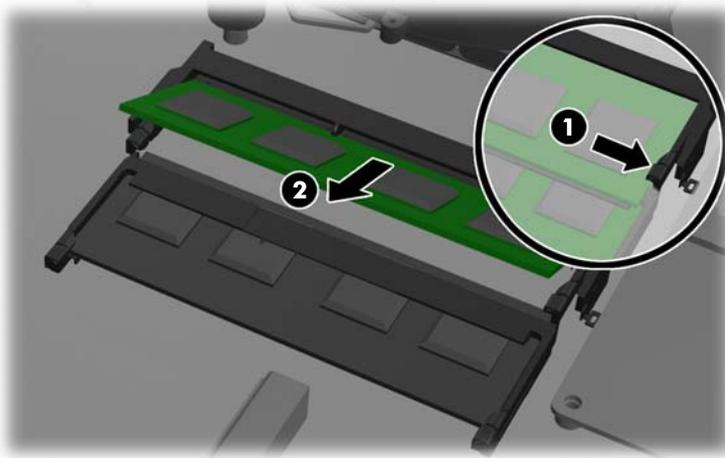
- The system will operate in single channel mode if the SODIMM sockets are populated in one channel only.
- The system will operate in flex mode if the memory capacity of the SODIMM in Channel A is not equal to the memory capacity of the SODIMM in Channel B. In flex mode, the channel populated with the 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.
- The system will operate in a higher-performing dual channel mode if the memory capacity of the SODIMM in Channel A is equal to the memory capacity of the SODIMM in Channel B.
- In any mode, the maximum operational speed is determined by the slowest SODIMM in the system.

There are two memory sockets on the system board located behind the memory access panel. To remove or install memory modules:

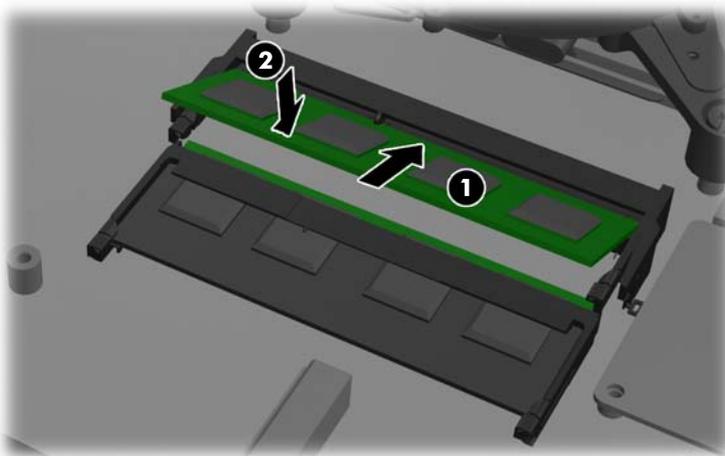
To remove a memory module:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Place the computer face down on a soft flat surface. HP recommends that you set down a blanket, towel, or other soft cloth to protect the screen surface from scratches or other damage.
3. Remove the access panel (see [Access panel on page 40](#)).

4. To remove a memory module, press outward on the two latches on each side of the SODIMM (1), then pull the SODIMM out of the socket (2).



5. To install a memory module, slide the SODIMM into the socket at approximately a 30° angle (1), then press the SODIMM down (2) so that the latches lock it in place.

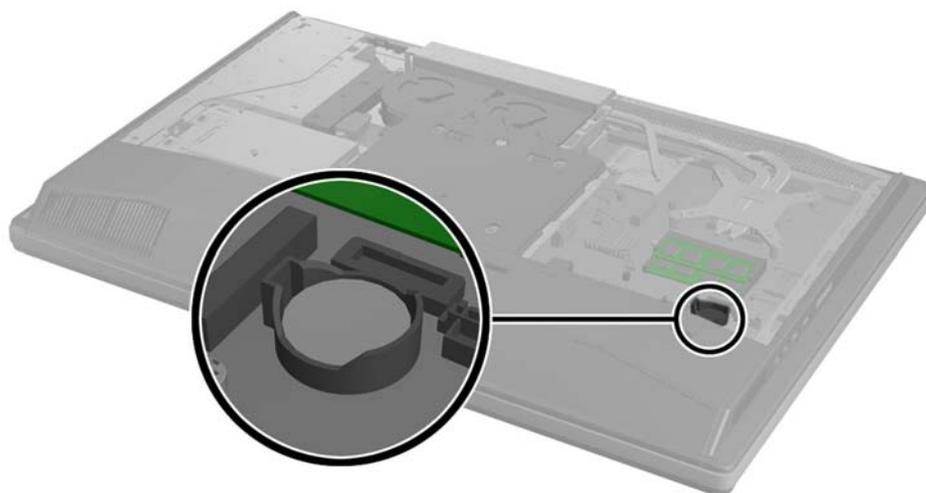


 **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

The computer automatically recognizes the additional memory when you turn on the computer.

Battery

The RTC battery is located to the lower right of the fan.



The battery is located in the memory compartment. The battery that comes with the computer provides power to the real-time clock. When replacing the battery, use a battery equivalent to the battery originally installed in the computer. The computer comes with a 3-volt lithium coin cell battery.

WARNING! The 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 60° C (140° F).

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

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

CAUTION: Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared.

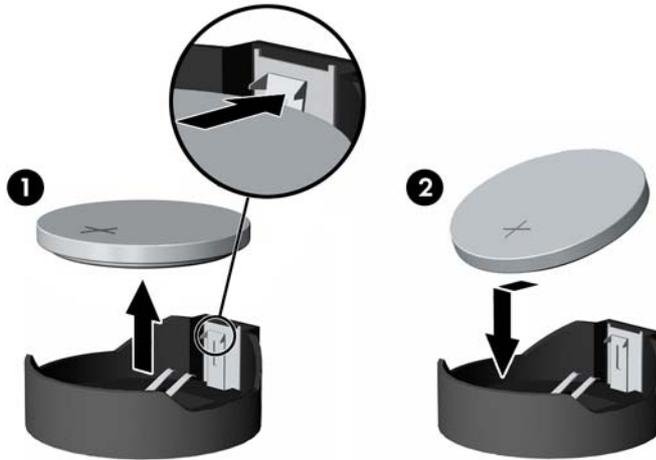
Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object.

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.

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 (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).

3. 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)**.
4. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up. Push the other edge down until the clamp snaps over the other edge of the battery **(2)**.



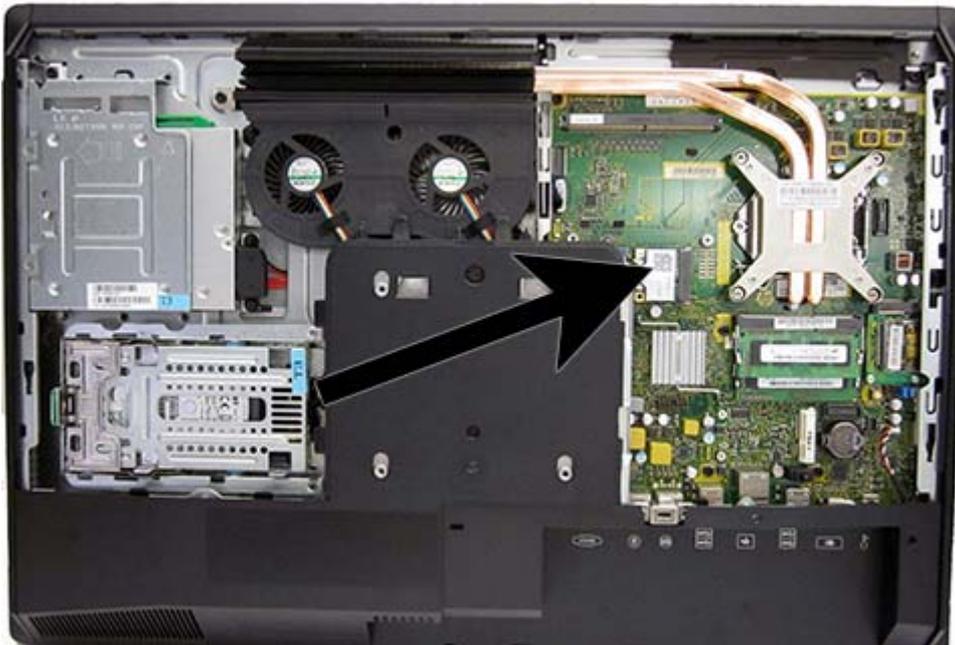
WLAN module

Description	Spare part number
HP WLAN 802.11 a/g/n, 2x2	701398-001
HP WLAN 802.11 a/b/g/n, 2x2	695915-001

The WLAN module is located on the left side of the system board. The module is secured with one Phillips screw and has two connected antennas.

 **NOTE:** The procedure to replace the WLAN module must be performed by an HP technician.

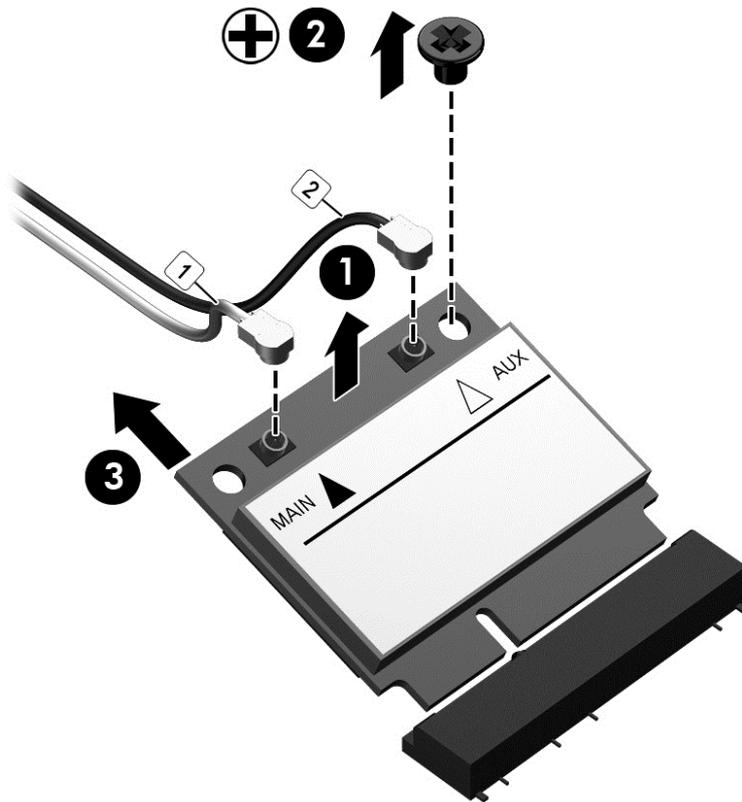
 **NOTE:** WLAN module appearance may vary.



To remove the WLAN module:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Disconnect the antenna cables from the module **(1)**.
4. Remove the Phillips screw **(2)** that secures the module to the computer.

5. Lift the module to a 45-degree angle, and then pull it away to remove it from the socket **(3)**.



To install the WLAN module, reverse the removal procedures.

When connecting the antennas cables, connect the cable labeled "1" to the MAIN connector on the module and the cable labeled "2" to the AUX connector on the module.

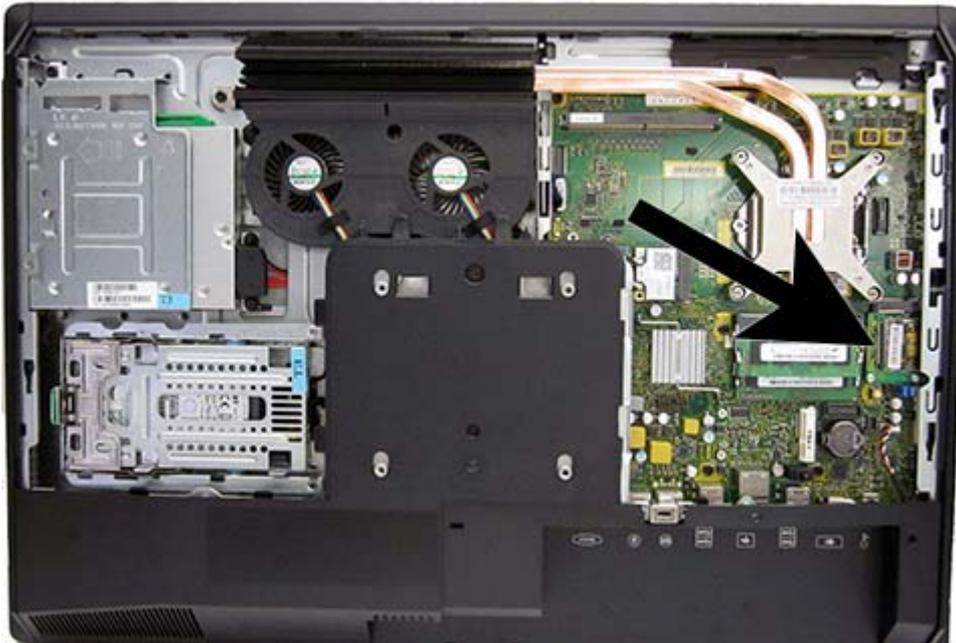


NOTE: WLAN modules are designed with a notch to prevent incorrect insertion.

Card reader board

Description	Spare part number
Card reader board	732504-001

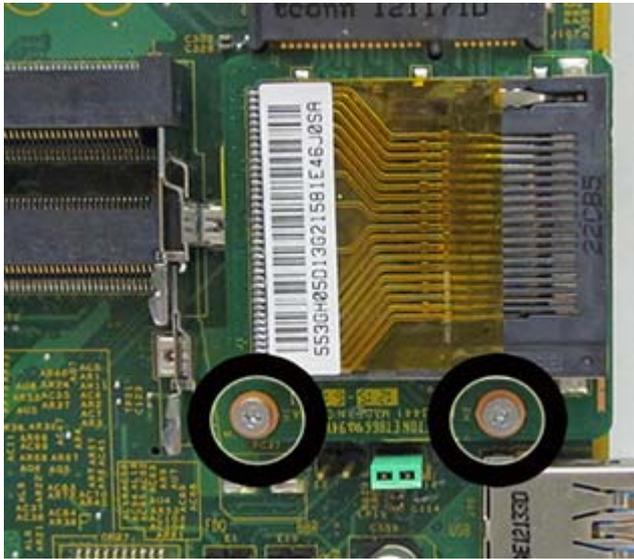
The card reader board is located on the right side of the system board. You must remove the system board before you can remove the card reader board. The card reader board is secured with two screws.



To remove the card reader board:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).

3. Remove the two Phillips screws **(1)** that secure the board to the system board.



4. Lift the board to a 45-degree angle **(1)**, and then pull it away to remove it from the socket **(2)**.

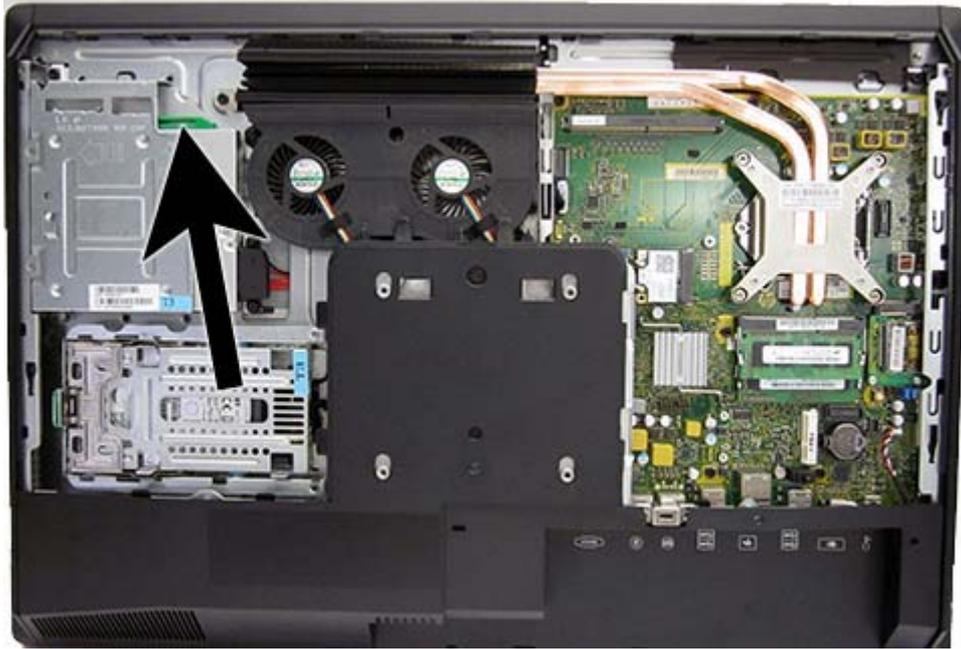


To install the card reader board, reverse the removal procedures.

Optical drive latch

Description	Spare part number
Optical drive latch	733509-001

The optical drive latch is green and located next to the optical drive bay.



To remove the optical drive latch:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).

3. Pull the latch off the side of the optical drive. Two pins secure the latch to the drive.



To install the optical drive latch, reverse the removal procedures.

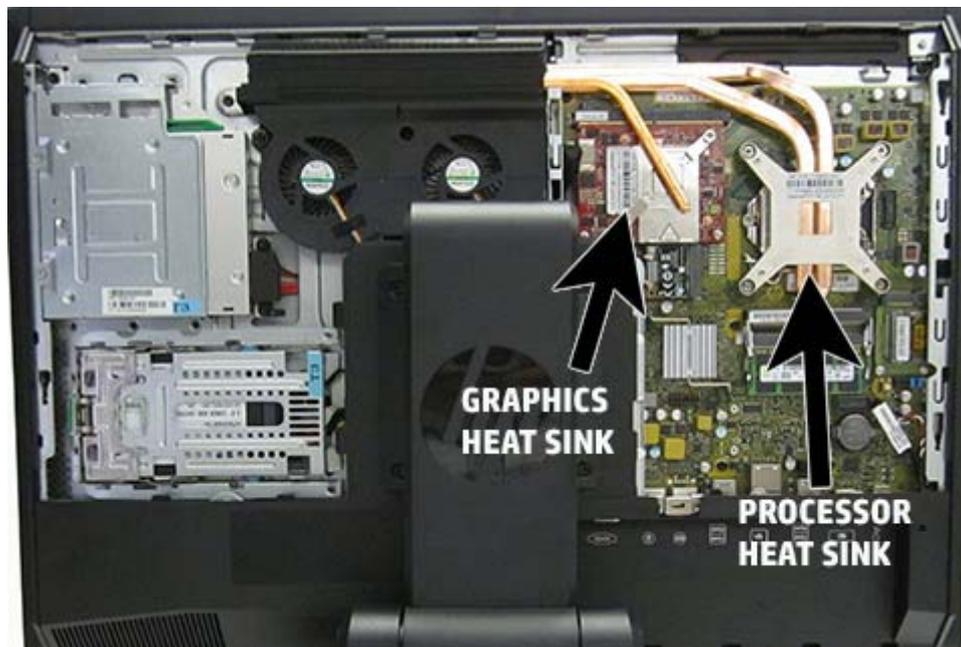
Heat sink – Graphics board and processor

Description	Spare part number
Heat sink for use with graphics board	733488-001
Heat sink for use with processor	733487-001

Separate heat sinks cool the discrete graphic board (select models only) and the processor. If installed, you must remove the smaller graphics heat sink before you can remove the larger processor heat sink.

The graphics heat sink is secured with three Torx screws – two captured, one not captured. The heat sinks share the one non-captured screw.

The processor heat sink is secured with five Torx screws – four captured, one shared, not captured.

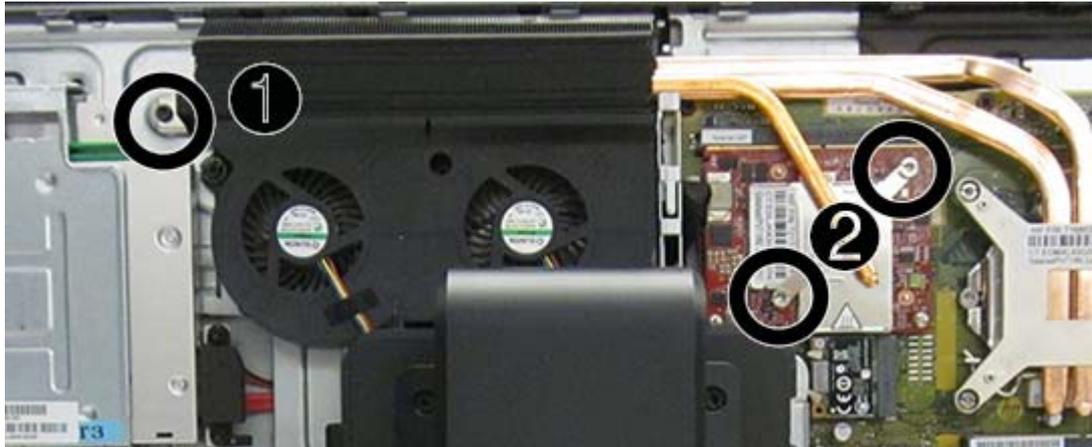


Graphics heat sink

To remove the heat sink:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the black Torx screw from the top of the heat sink **(1)**.

4. Loosen the two silver captive Torx screws on the heat sink **(2)**, and then lift the heat sink out of the computer.



To replace the heat sink, reverse the removal procedures.

Processor heat sink

To remove the heat sink:

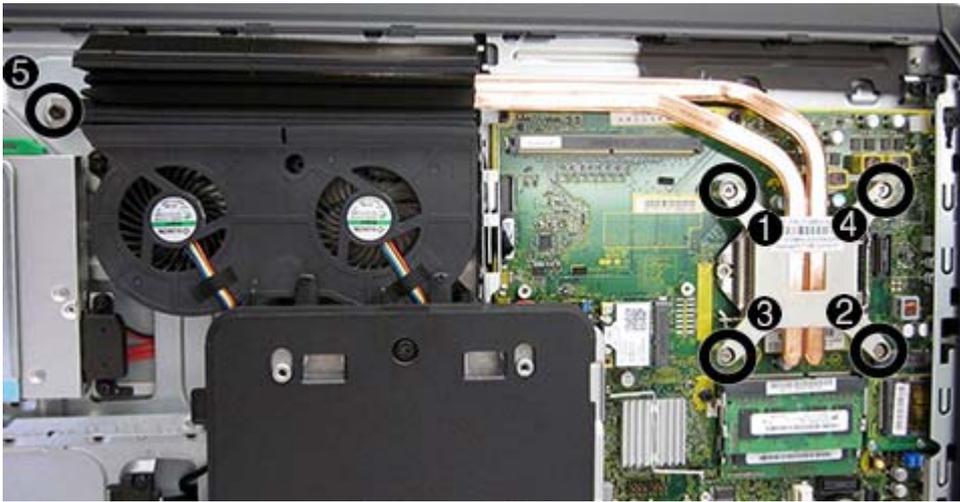
1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. If installed, remove the graphics heat sink (see [Graphics heat sink on page 62](#)).
4. In the order indicated on the heat sink, loosen the four silver captive Torx screws **(1) – (4)**.

⚠ CAUTION: Remove heat sink retaining screws 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.

5. If still installed, remove the Torx screw on the left part of the heat sink **(5)**.

6. Lift the heat sink out of the computer.

⚠ CAUTION: To reduce a degradation in thermal performance, be sure not to touch the thermal grease on the surface of the processor or the heat sink.



To replace the heat sink, reverse the removal procedures.

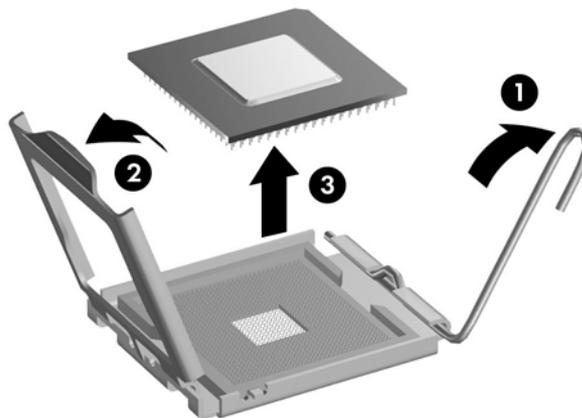
Processor

Description	Spare part number
Intel Core i7-4770s (3.1-GHz, 8-MB L3 cache)	732507-001
Intel Core i5-4670s (3.1-GHz, 6-MB L3 cache)	732506-001
Intel Core i5-4570s (2.9-GHz, 6-MB L3 cache)	732505-001

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. If installed, remove the graphics heat sink (see [Graphics heat sink on page 62](#)).
4. Remove the processor heat sink (see [Processor heat sink on page 63](#)).
5. Rotate the locking lever to its full open position **(1)**.
6. Raise and rotate the microprocessor retainer to its fully open position **(2)**.
7. Carefully lift the processor from the socket **(3)**.

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

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

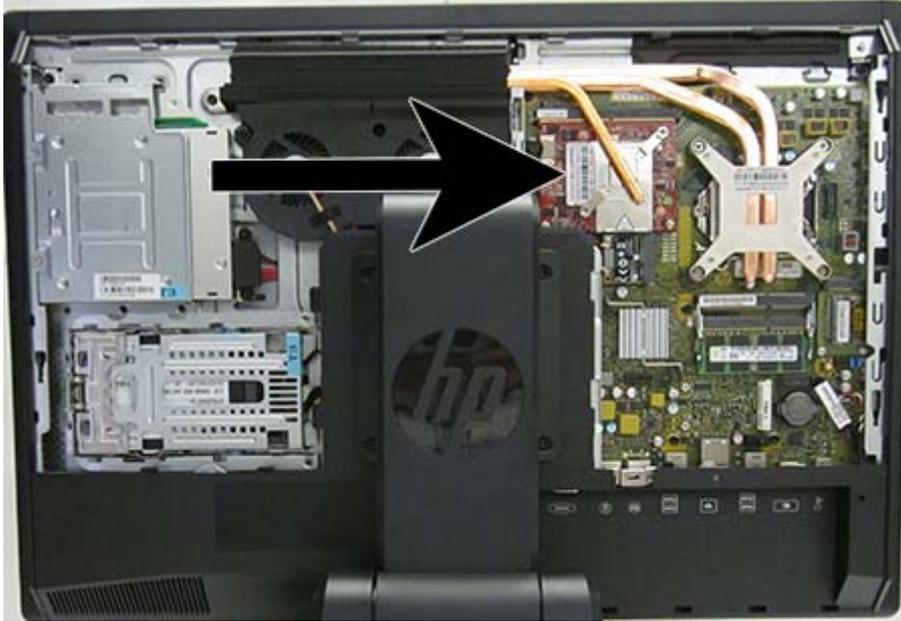


📝 NOTE: After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. The latest system BIOS can be found on the Web at: <http://h18000.www.hp.com/support>.

Graphics board

Description	Spare part number
AMD Radeon HD 7650A 2-GB MXM discrete graphics board	708866-001

The graphics board is secured with two Torx screws. Removing it allows access to the webcam and allows you to remove the main rear cover.



To remove the graphics board:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the graphics heat sink (see [Graphics heat sink on page 62](#)).

4. Remove the two Phillips screws that secure the board to the system board.



5. Rotate the board upward (1), and then pull it up and away from the connector to remove it from the system board (2).

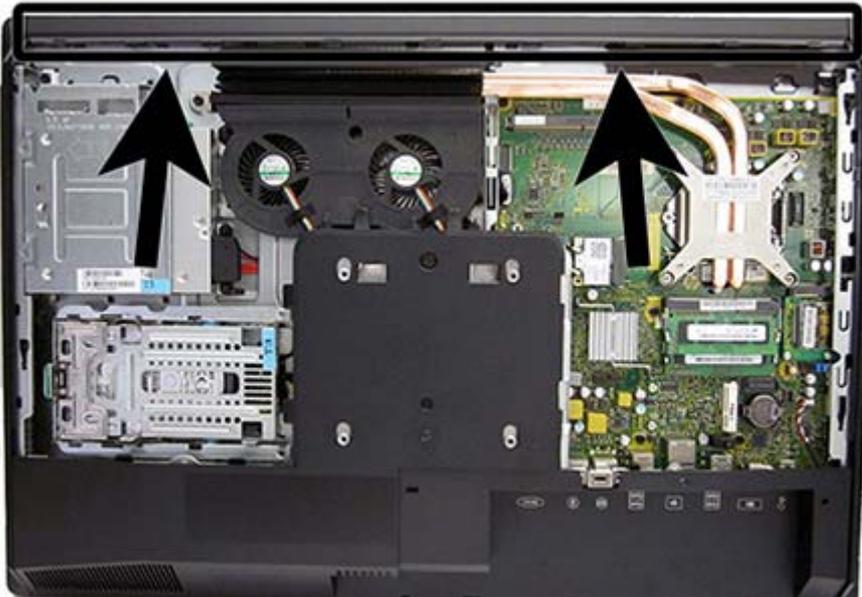


To replace the graphics board, reverse the removal procedures.

Top rear trim

Description	Spare part number
Top rear trim	733506-001

The top rear trim is located along the top of the back of the computer.



To remove the top rear trim:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Rotate the bottom of the trim up and off the computer. When installed, the trim snaps in to place.



To install the top rear trim, reverse the removal procedures.

Webcam module

You can disable the webcam in F10 Setup by disabling accessory USB port 5. See [Computer Setup—Security on page 111](#) for more information.

Description	Spare part number
Webcam module for use in non-touchscreen models	732510-001
Webcam module for use in touchscreen models	736499-001

On products that ship with a webcam module, the module is located at the top of the computer beneath the top rear trim. It is housed in a metal bracket that is secured with two Phillips screws. The webcam module has one connector.

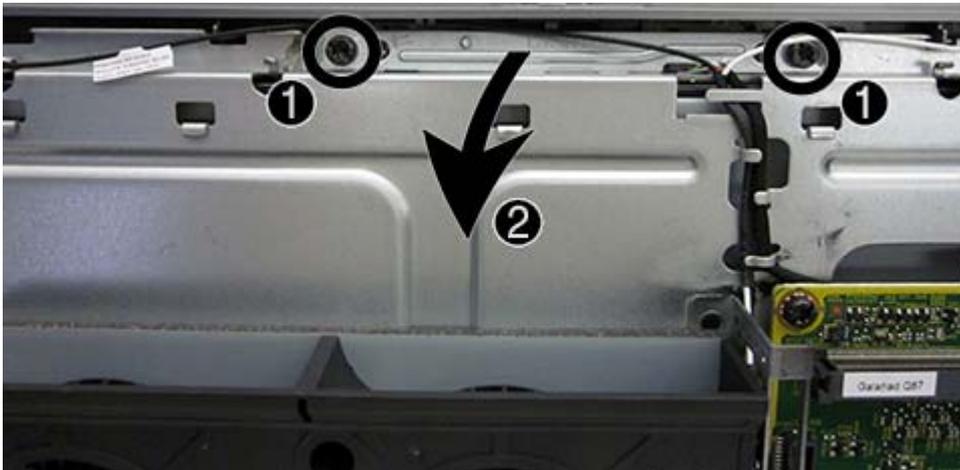
The webcam module is optional.



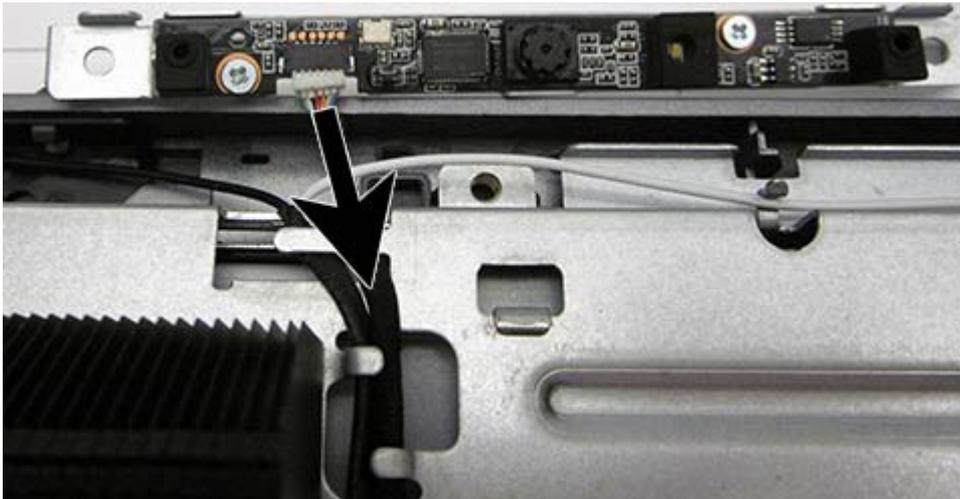
To remove the webcam module:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the top rear trim (see [Top rear trim on page 68](#)).

4. Remove the two Torx screws that secure the webcam module bracket to the computer.



5. Rotate the assembly to gain access to the connector on the module, and then disconnect the cable from the module.



6. To remove the module from the bracket, remove the two Phillips screws that secure the module, and then separate the module from the bracket.



To install a webcam module, reverse the removal procedures.

Antenna

Description	Spare part number
Antenna kit	733499-001

The antenna route from the WLAN card to transceivers at the top of the computer (transceivers shown in following image).



To remove the antenna:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the heat sink (see [Heat sink – Graphics board and processor on page 62](#)).
4. Remove the top rear trim (see [Top rear trim on page 68](#)).

5. Remove the Torx screws that secures each antenna transceiver to the frame, and then lift the transceivers off the frame.



6. Note the routing path for each antenna for replacement.



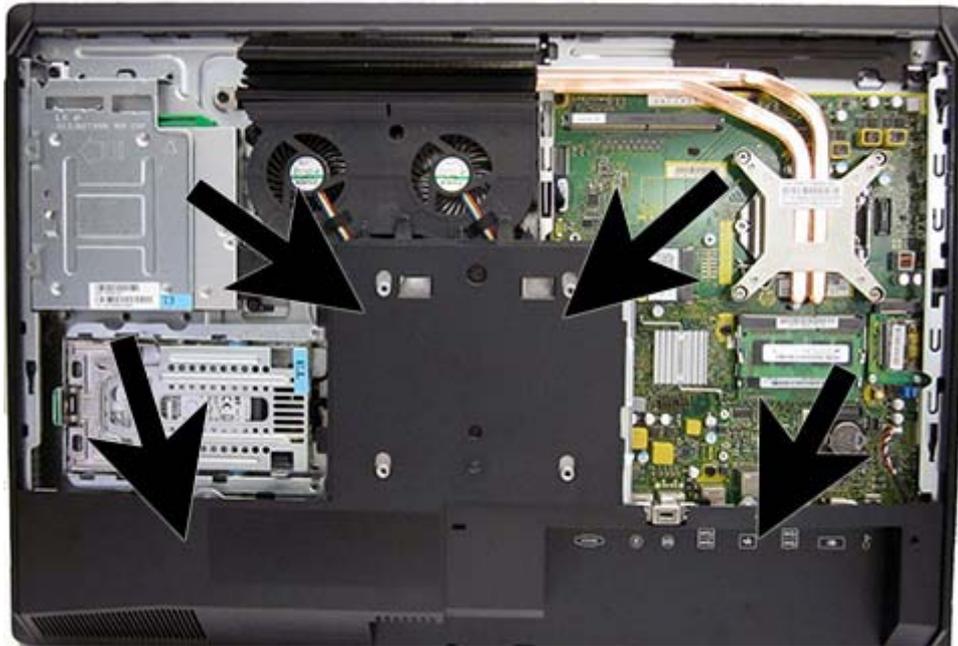
To install the antenna, reverse the removal procedures.

 **NOTE:** When connecting the antennas cables, connect the cable labeled “1” to the MAIN connector on the module and the cable labeled “2” to the AUX connector on the module.

Lower rear panel

Description	Spare part number
Lower rear panel	733503-001

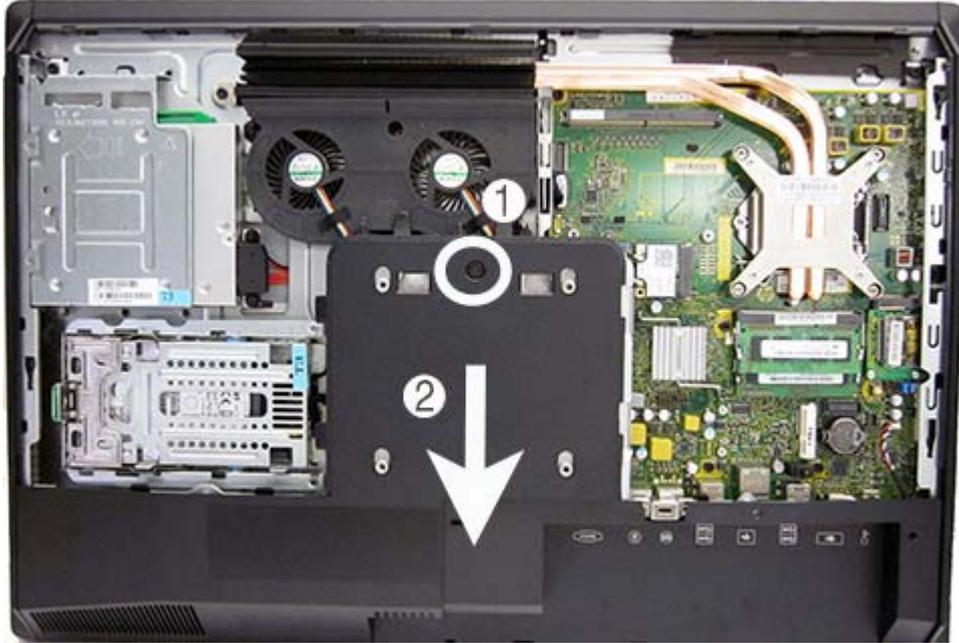
The lower rear panel is located under the stand and on the bottom rear of the computer. It is secured with one screw.



To remove the lower rear panel:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the stand (see [Stand on page 36](#)).

4. Remove the screw **(1)** in the middle of the lower rear panel, and slide the panel downward to detach it from the chassis **(2)**.



To replace the lower rear panel, reverse the removal procedures.

Fan assembly

Description	Spare part number
Fan assembly	733489-001

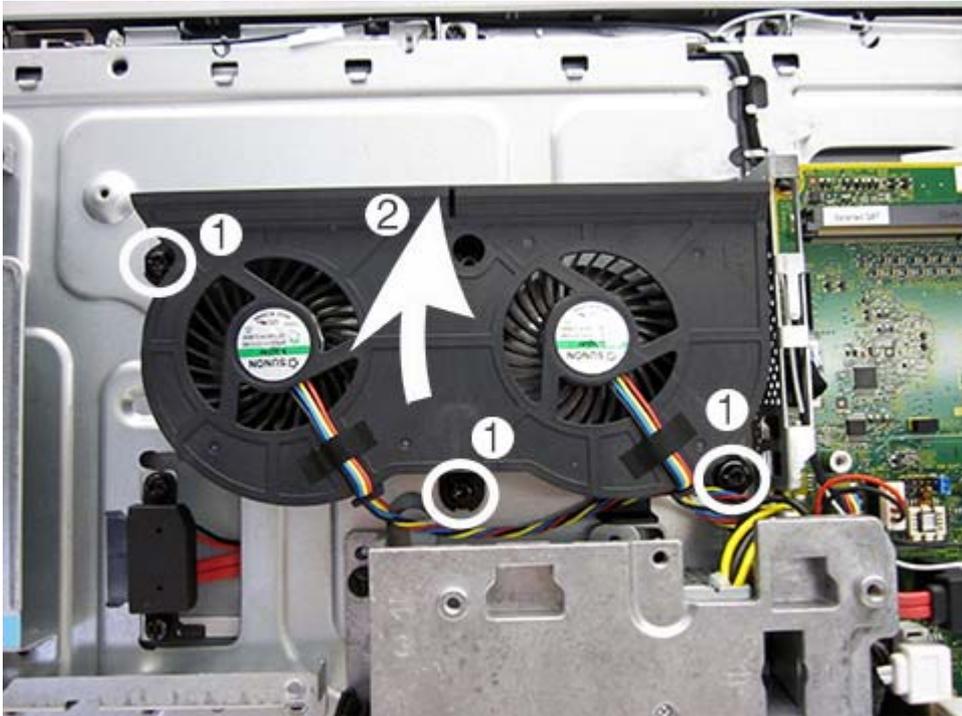
The fan assembly is located near the middle of the computer and is secured with three Torx screws.



To remove the fan assembly:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower rear panel (see [Lower rear panel on page 73](#)).
5. Disconnect the two fan cables from the system board.
6. Remove the three Torx screws that secure the fan assembly to the computer **(1)**.

7. Remove the fan assembly from the computer **(2)**.



To install the fan assembly, reverse the removal procedures.

Speakers

Description	Spare part number
Speakers	733514-001

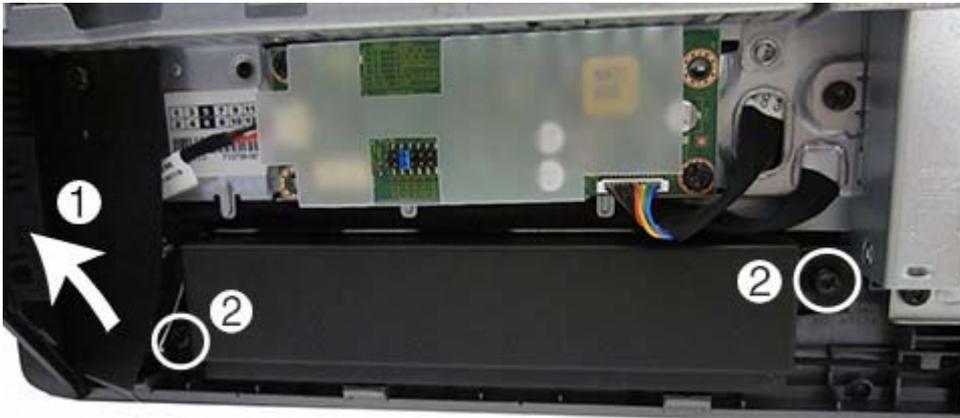
The speakers are located at the bottom of the computer. Two separate speakers are each secured by two Torx screws. To remove the left speaker you have to lift or remove the Mylar cover.



To remove the speakers:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the access panel (see [Access panel on page 40](#)).
3. Remove the stand (see [Stand on page 36](#)).
4. Remove the lower panel (see [Lower rear panel on page 73](#)).
5. Lift up the Mylar piece that covers the left speaker **(1)**.

6. Remove two Torx screws **(2)** that secure the left speaker to the computer.



7. Remove two Torx screws **(3)** that secure the right speaker to the computer, and then disconnect the speaker cable from the system board connector labeled SPKR **(4)**.



8. Remove the speakers from the computer.

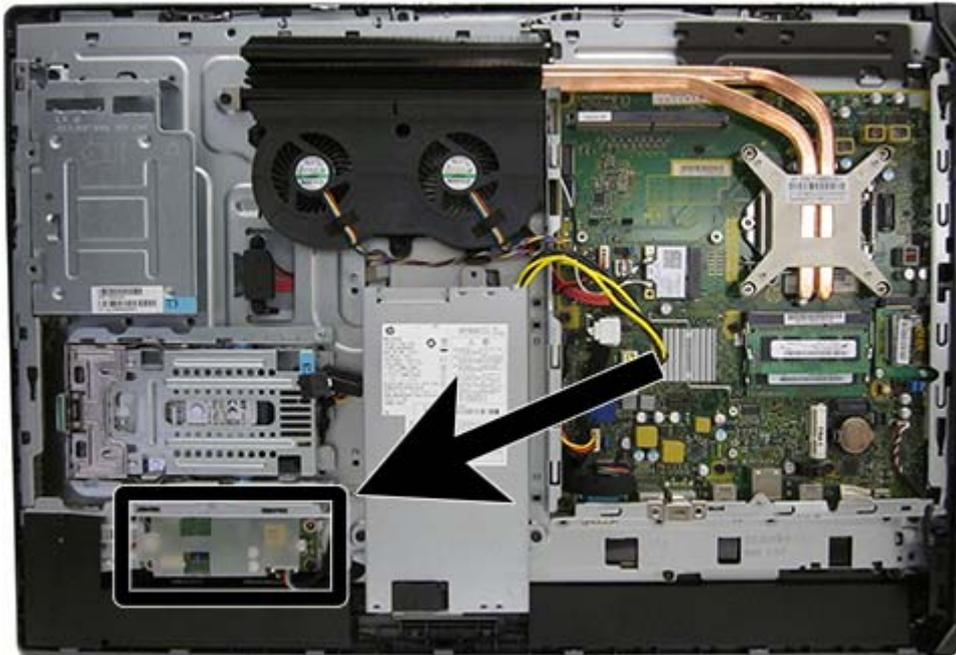
To install the speakers, reverse the removal procedures.

Converter board

Description	Spare part number
Converter board	732493-001

The converter board is located on the left side of the computer (viewed from behind) under the main rear cover. It is secured with two Torx screws and has two connectors.

Use the same converter spare part for all display panels; however, you must change jumper settings on the board based on the display panel.



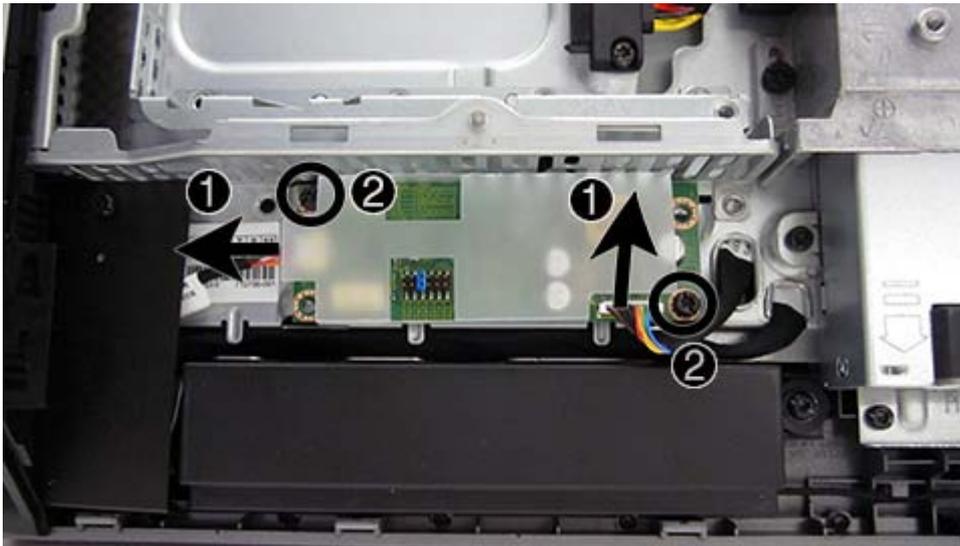
To remove the converter board:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower access panel (see [Lower rear panel on page 73](#)).
5. Disconnect the two cables from the board **(1)**.

 **NOTE:** Be careful not to damage the cables when disconnecting them from the board. Do not pull on the wires.

6. Remove the two black Torx screws (2) that secure the board to the computer.

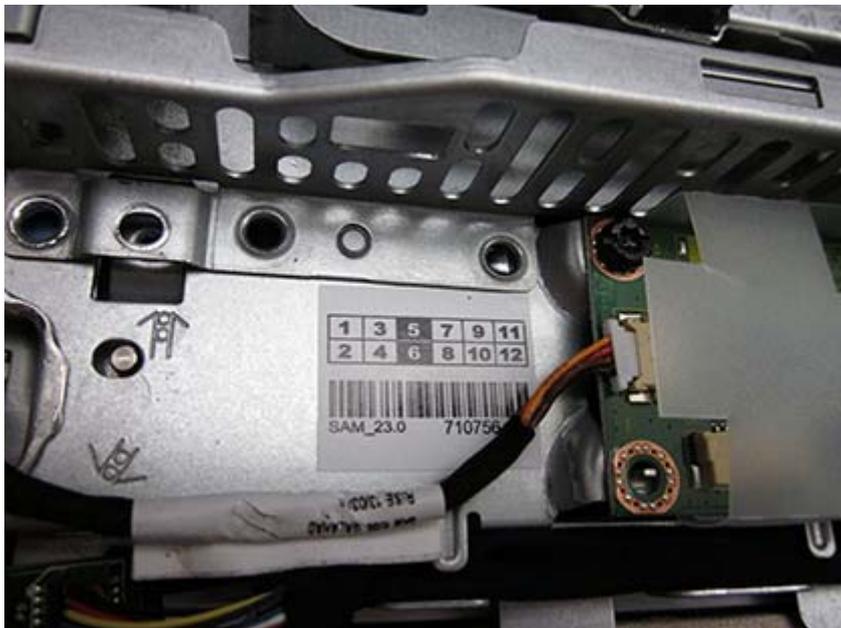
Be sure to correctly position the jumpers on the converter board for the installed display panel. Refer to the label in the chassis for jumper settings.



7. Lift the converter board from the computer.

To install the converter board, reverse the removal procedures.

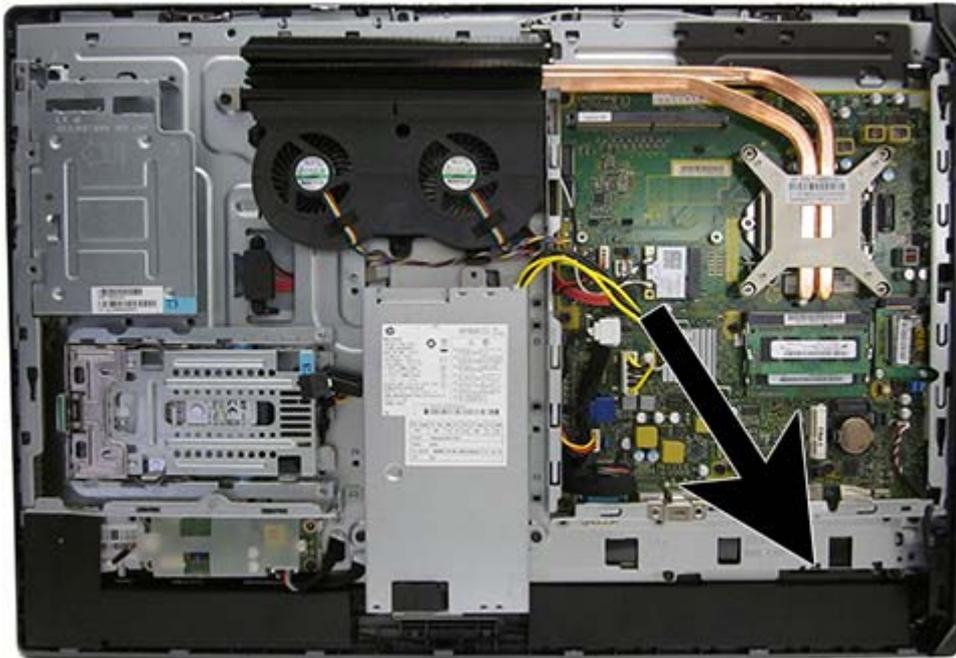
Be sure to correctly position the jumpers on the converter board for the installed display panel. The jumper settings are shown on a label near the converter board.



NFC sensor board

Description	Spare part number
NFC sensor board	732503-001

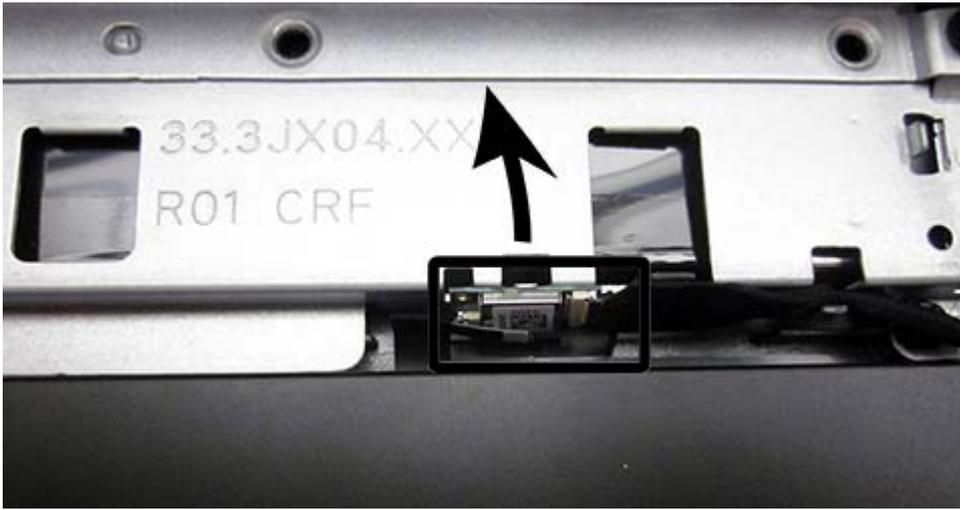
The NFC sensor board is located just above the right speaker (when viewed from behind). It sits inside of a plastic holder and has two small cables connected to it. The location of the board and an image of the board housed in its holder is shown in the following images.



To remove the NFC sensor board:

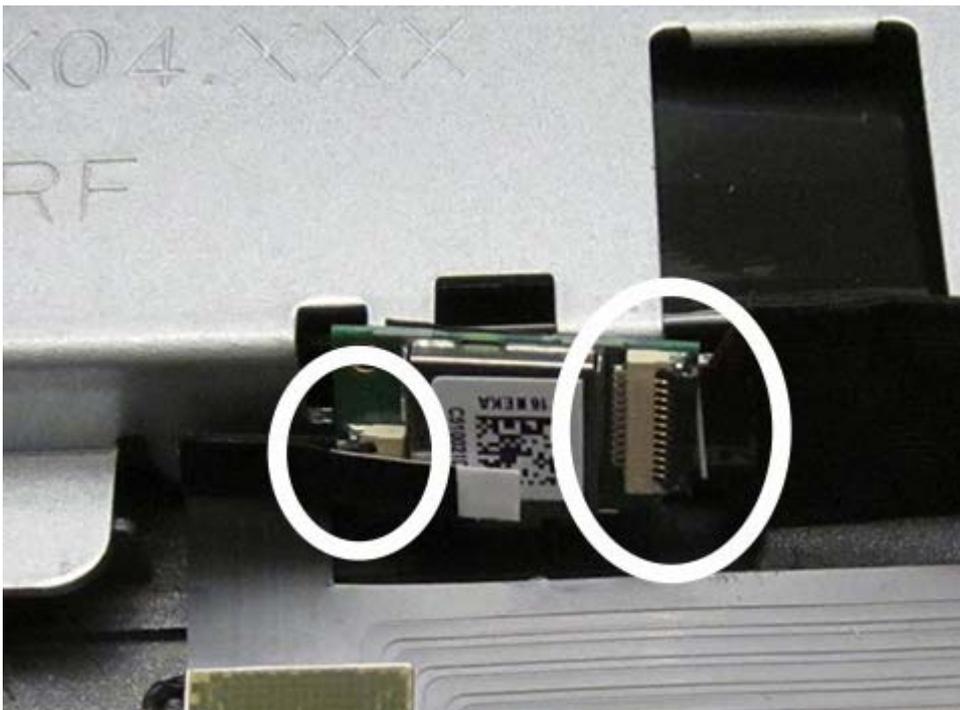
1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower rear panel (see [Lower rear panel on page 73](#)).

5. While the board/holder assembly is installed, remove the plastic holder from the board.
6. Lift the board enough to gain access to the connectors.



7. Disconnect the cables from the board.

 **NOTE:** The cables and connectors on this board are small and fragile. Use care when disconnecting/connecting the cables to avoid breaking the connectors on the board, .



To install the NFC sensor board, reverse the removal procedures.

VESA mounting plate

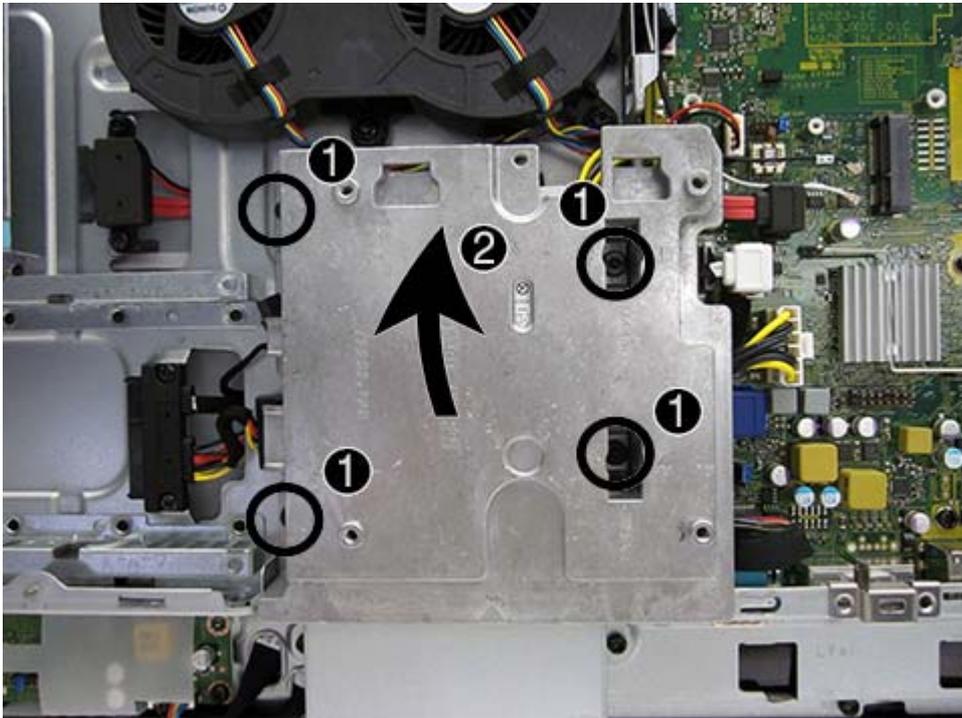
The VESA mounting plate is located under the stand and under the lower rear panel.



To remove the VESA mounting plate:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower rear panel (see [Lower rear panel on page 73](#)).
5. Remove the four Torx screws **(1)** securing the plate to the chassis.

6. Lift the plate left straight up and off the computer **(2)**.



To replace the VESA mounting plate, reverse the removal procedures.

Power supply

Description	Spare part number
Power supply, 200W	733490-001

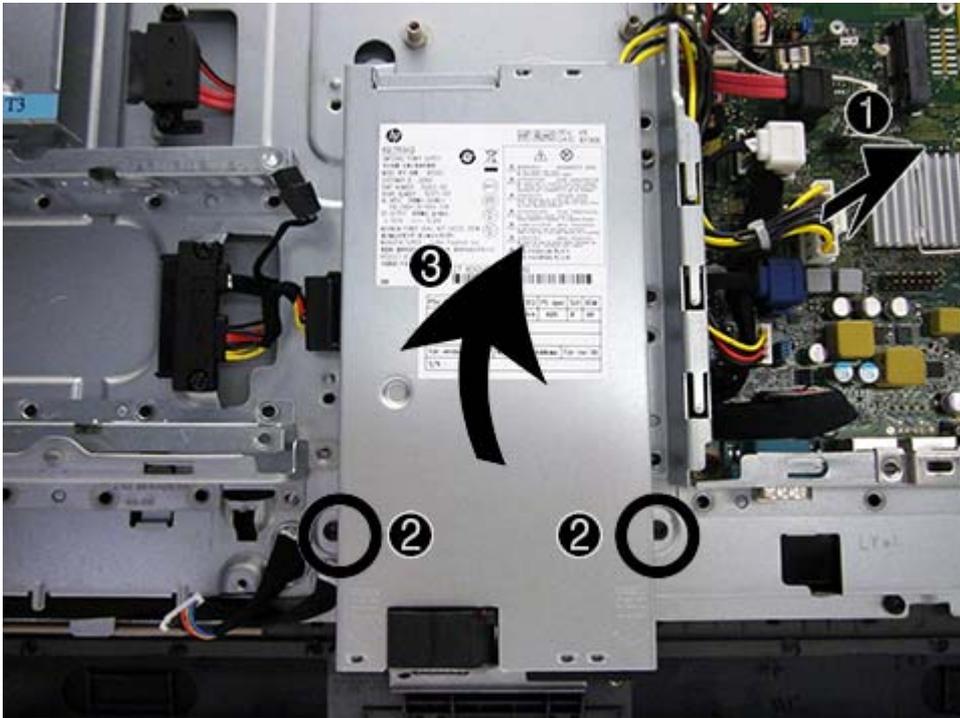
The power supply is located in the middle of the computer under the VESA mounting plate. It is secured with two Torx screws and has one connector routed to the system board.



To remove the power supply:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower rear panel (see [Lower rear panel on page 73](#)).
5. Disconnect the cable from the system board connector **(1)**.
6. Remove the two Torx screws **(2)** that secure the power supply to the computer.

7. Lift the power supply from the computer **(3)**.



To install the power supply, reverse the removal procedures.

System board

Description	Spare part number
System board	
For use in models without Windows 8	700624-001
For use in models with Windows 8 Standard	700624-501
For use in models with Windows 8 Professional	700624-601
For use in models with NetClone	727718-001
System board (C2)*	
For use in models without Windows 8	739680-001
For use in models with Windows 8 Standard	739680-501
For use in models with Windows 8 Professional	739680-601

*System boards labeled as "C2" must be replaced with "C2" system boards.

The system board is located on the right side of the computer (viewed from the rear). It is secured with ten Torx screws, two of which also secure the removable outside bracket.



 **IMPORTANT:** *System boards labeled as "C2" must be replaced with "C2" system boards.

If the system board is not labeled as "C2", use the default spare part number (700624-xx1)

To remove the system board:

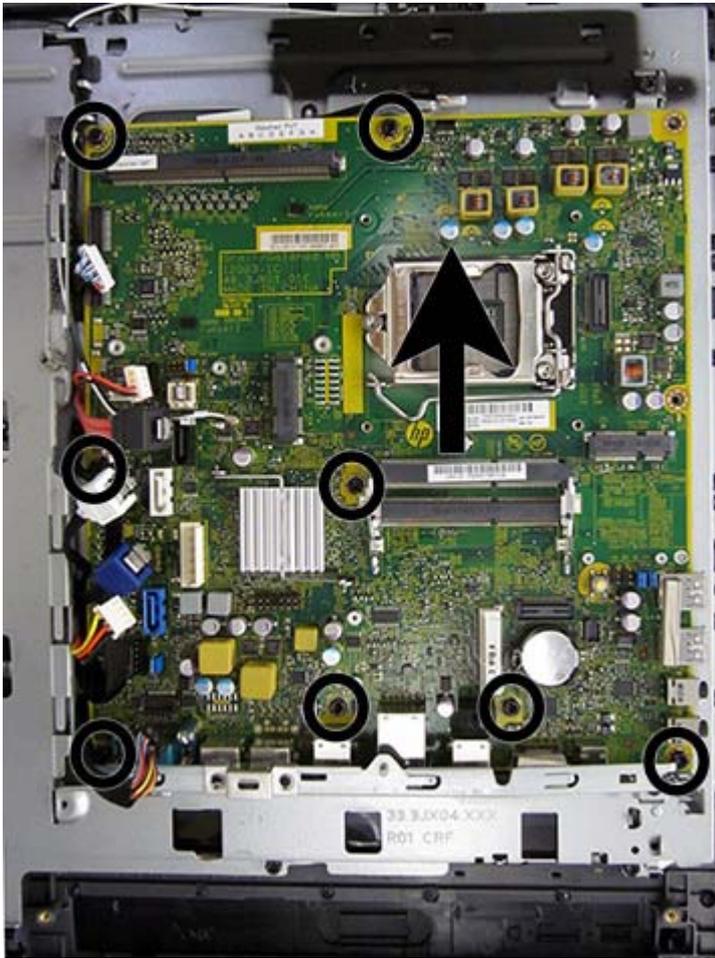
- 1.** Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
- 2.** Remove the stand (see [Stand on page 36](#)).
- 3.** Remove the access panel (see [Access panel on page 40](#)).
- 4.** Remove the lower rear panel (see [Lower rear panel on page 73](#)).
- 5.** Remove the VESA mounting plate (see [VESA mounting plate on page 83](#)).
- 6.** Remove the memory modules (see [Memory on page 51](#)).
- 7.** Remove the graphics heat sink (see [Graphics heat sink on page 62](#)).
- 8.** Remove the processor heat sink (see [Processor heat sink on page 63](#)).
- 9.** Remove the processor (see [Processor on page 65](#)).
- 10.** Remove the graphics board (see [Graphics board on page 66](#)).
- 11.** Remove the WLAN module (see [WLAN module on page 56](#)).
- 12.** Disconnect all cables from the system board, noting their location for reinstallation.

13. Remove the side bracket by removing the two Torx screws **(1)**, and then rotating the bracket to remove it **(2)**.



14. Remove the eight remaining Torx screws that secure the system board to the computer.
15. Position the cables on the side of the board out of the way so you can freely slide the board out of the computer.

16. Slide the system board toward the top of the computer, and then lift it out of the computer.



To install the system board, reverse the removal procedures.

Replace the thermal pad below the system board.

Updating the display panel manufacturer setting in BIOS

After replacing the system board, make sure the display panel manufacturer setting is correct in BIOS. If the incorrect panel manufacturer is set in BIOS, the display panel may function incorrectly.

The display panel manufacturer is identified on the jumper setting label on the base pan.

After confirming the manufacturer of the display panel on the computer, go into BIOS and make sure the **LVDS Panel Select** setting is correct.

To update BIOS with display panel model information:

1. Boot the computer.
2. Repeatedly press **F10** when the monitor light turns green to access the F10 Setup utility.

3. Select **Advanced**, select **Device Options**, select **LVDS Panel Select**, and then select the manufacturer for the new display panel.
4. Save your settings, exit F10 Setup, and allow the computer to continue to the operating system.

When you change the LVDS setting to the installed panel type, the BIOS reprograms the EDID with the correct data. You must set the panel before the Auto-select setting functions correctly.

Updating SMBIOS Information

When replacing the system board, you must reprogram the SMBIOS information on the affected computer. Failure to reprogram the board will result in eventual failure, such as an activation failure (need to reactivate the system) or a system recovery failure.

To update SMBIOS information in Computer Setup:

1. Turn on or restart the computer.
2. Press **Esc** while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.



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

3. Press **F10** to enter Computer Setup.
4. Go to **Security > System ID's**.
5. If necessary, press **Ctrl+A** to initiate edit mode.
6. Edit the fields listed. If the feature byte has data or is not editable, then it was not cleared and cannot be edited.

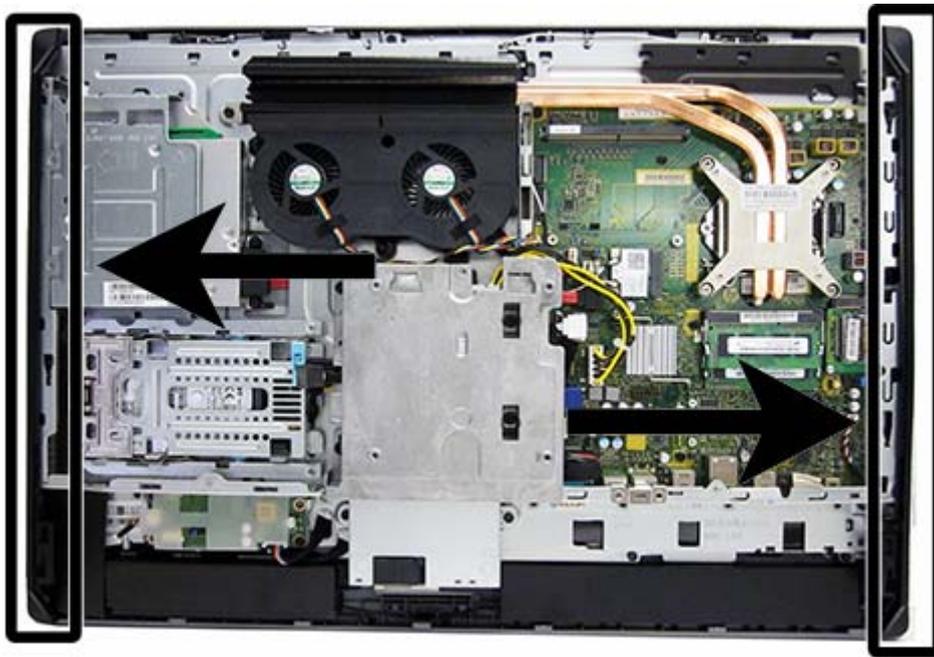
System ID Setup Page

Setup Field Name	Comment	Label
Product Name	Enter the Model name/number or marketing name.	Flexbuild
Serial Number	Enter the Serial Number of Unit.	Support
SKU Number	Enter the SKU or Product Number including Localization Code.	Support
Asset Tag	Enter the 18-byte identifier assigned to the computer.	Support
Feature Byte	Enter the Feature Byte string. The feature byte string is case sensitive. The label includes spaces after every four characters. You can enter or ignore these spaces – their only purpose is to help with data entry. There is a character limitation of 40 bytes per line. When you reach this limit, go to the next line to continue data entry. BIOS ignores the spaces and lines. If you make an error during data entry, the data will not validate, and the computer asks you to correct your data input.	Flexbuild
Build ID	The Build ID of the unit.	Flexbuild

Side panels

Description	Spare part number
Left I/O panel	733501-001
Right panel	733505-001

The side panels are located one each side of the computer. They are secured with tabs, and the removal procedures are similar for both panels.



To remove the side panels:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the optical drive (see [Replacing the optical disc drive on page 47](#)).
5. Remove the top rear trim (see [Top rear trim on page 68](#)).
6. Remove the lower rear panel (see [Lower rear panel on page 73](#)).

7. Two tabs secure both the left and right side panels to the computer. Press both tabs to disengage the panel, and rotate the panel off the computer.

 **NOTE:** The removal and replacement procedures are similar for both panels. Right panel (when viewed from behind) shown in the following images.



To install the side panels, reverse the removal procedures.

Power button board

Description	Spare part number
Power button board	732490-001
Mylar cover (power button board)	733513-001

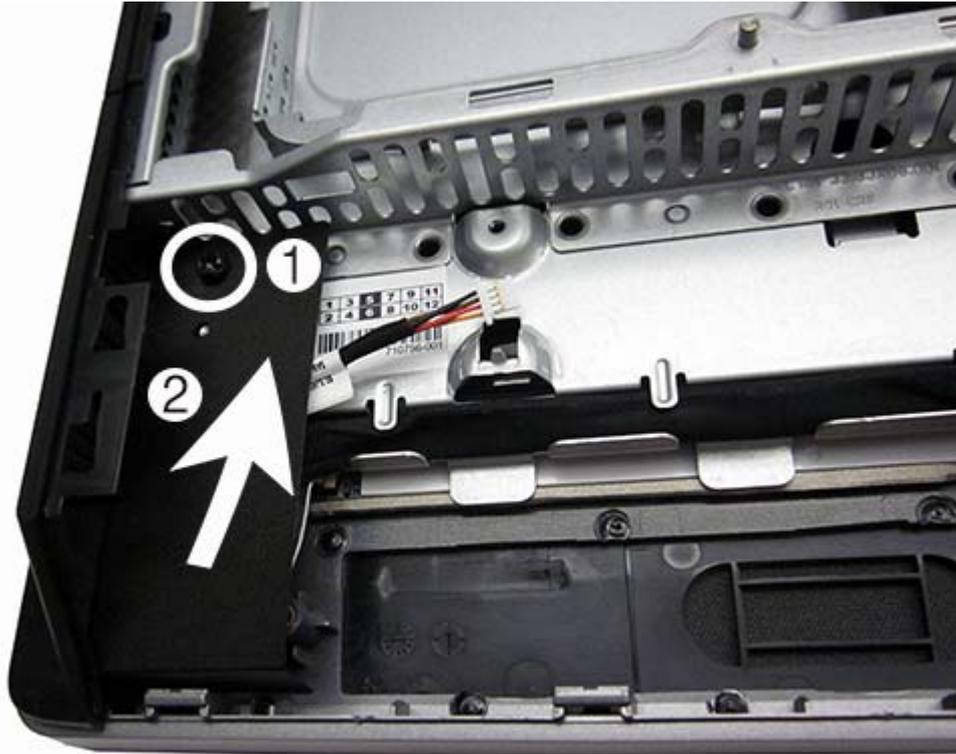
The power button board is located on the bottom left corner of the computer under the lower rear panel. It is under a Mylar cover and has two connectors and one screw.



To remove the power button board:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the optical drive (see [Replacing the optical disc drive on page 47](#)).
5. Remove the lower rear panel (see [Lower rear panel on page 73](#)).

6. Remove the Torx screw **(1)** that secures the Mylar that covers the power button board, and then lift the Mylar from the computer **(2)**.



7. Disconnect the two cables **(1)** from the board, and then remove the Torx screw that secures the board to the computer **(2)**.



8. Remove the power button board from the computer.

To install the power button board, reverse the removal procedures.

Front bezel and display panel

Description	Spare part number
Front bezel	733500-001
Assembly kit for non-touchscreen models without a webcam (includes webcam cover for bezel)	733510-001
Assembly kit for touchscreen models without a webcam (includes webcam cover for bezel)	733511-001
Touch panel kit, with integrated touch glass	735208-001
Display panel – non-touchscreen models	735207-001
Plastic frame for models with a webcam (does not include glass)	733507-001

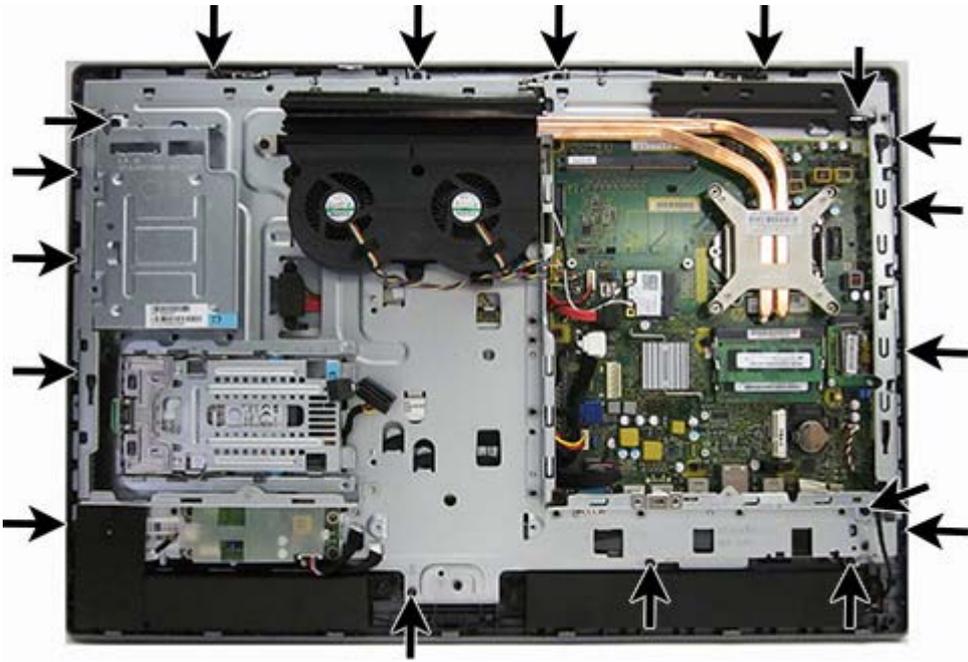
The front bezel is located on the front of the computer and is secured to the main system frame with 18 Torx screws.

Replacement bezels include the webcam shutter and capacitive sensor board. On models that do not include a webcam, you must remove the shutter and install the webcam cover (Assembly kit) into the slot in which the webcam would be installed.

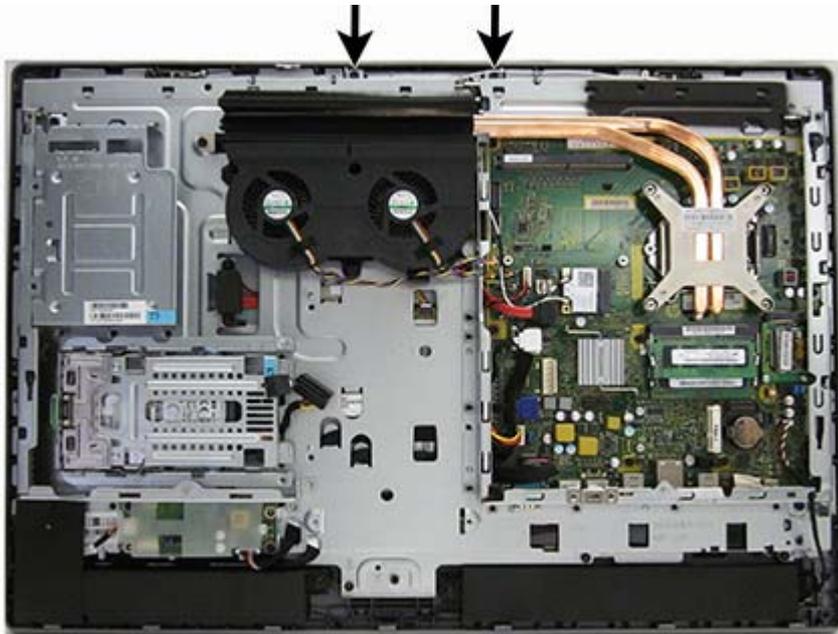
Display panels require a backlight cable specific to the manufacturer. Make sure you use the backlight cable packaged with the display panel.

To remove the front bezel:

1. Remove the stand (see [Stand on page 36](#)).
2. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the optical drive (see [Replacing the optical disc drive on page 47](#)).
5. Remove the top rear trim (see [Top rear trim on page 68](#)).
6. Remove the lower rear panel (see [Lower rear panel on page 73](#)).
7. Remove the side panels (see [Side panels on page 92](#)).
8. Remove the speakers (see [Speakers on page 77](#)).
9. Remove the power button board (see [Power button board on page 94](#)).
10. Remove the Torx screws that secure the bezel to the main system frame assembly, as follows:
 - 18 total screws:
 - Left: 5 screws
 - Top: 5 screws
 - Right: 5 screws
 - Bottom: 3 screw



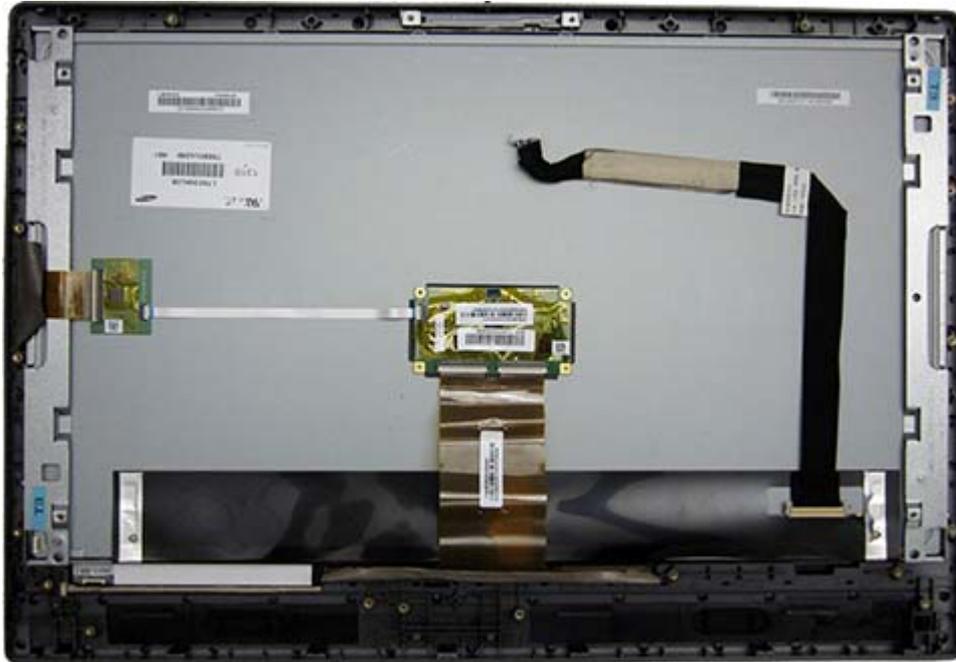
 **NOTE:** The two top, middle screws also secure the webcam.



11. Lift the frame from the display panel and bezel.

 **NOTE:** On touch models, the frame may be attached to the bezel/display with tape, so after you have removed the screws, the frame may stick to the bezel/display.

The following image illustrates a touch model with the frame removed from the display/bezel.



The following image illustrates a non-touch model with the frame removed from the display/bezel.



12. Disconnect the backlight cable from the display panel.

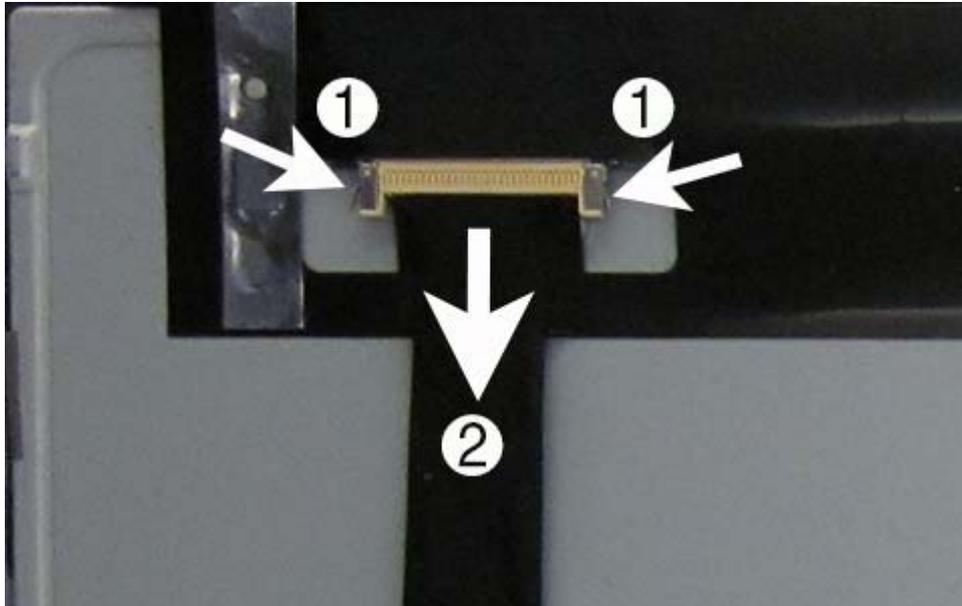
 **NOTE:** Replace the backlight cable with the new backlight cable that comes with the new display panel kit.

Remove the backlight cable from the defective panel before sending the panel back to the supplier.



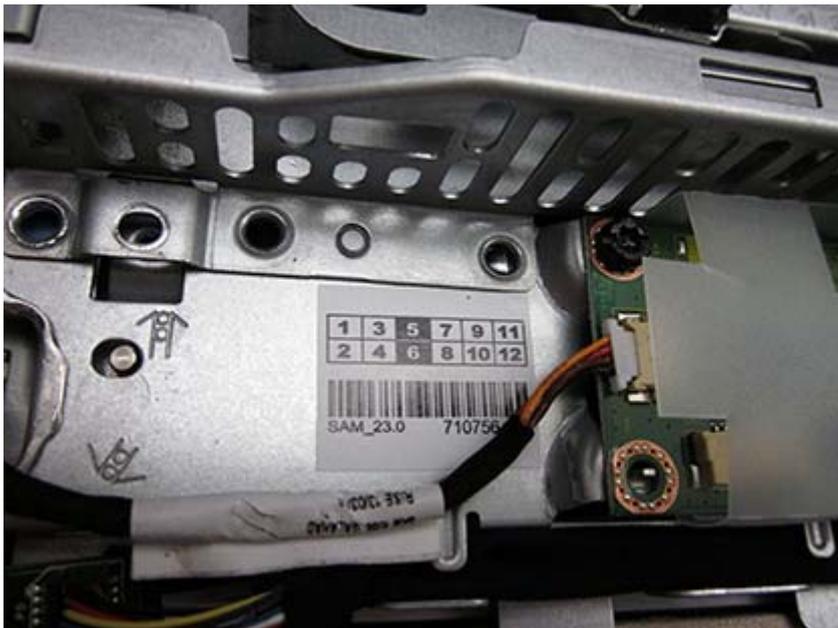
13. Separate the display panel from the bezel.

14. If disassembling a non-touch model, the display panel cable is connected to the bottom of the panel. After lifting the panel up from the bezel, look underneath to see the connected display panel cable. Lift the cable from the bottom of the panel to disengage it from the adhesive that secures it to the panel, and then disconnect the display cable from the display panel by pressing in on the tabs **(1)** on the side of the connector, and then pulling the cable from the connector **(2)**.



To install the front bezel, reverse the removal procedures.

Be sure to correctly position the jumpers on the converter board for the installed display panel. The jumper settings are shown on a label near the converter board.



CAUTION: Incorrect jumper placement can result in damage to the converter board and display panel.

To install a display panel, reverse the removal procedures.

Updating BIOS with new display panel information

If you install a display panel from a different manufacturer than what was previously installed (for example, replace an LG panel with a Samsung panel), you need to update BIOS with the new panel information. Failure to do so may cause the new panel to function incorrectly.

To update BIOS with the new panel model information:

1. Boot the computer.
2. Repeatedly press **F10** when the monitor light turns green to access the F10 Setup utility.
3. Select **Advanced**, select **Device Options**, select **LVDS Panel Select**, and then select the manufacturer for the new display panel.
4. Save your settings, exit F10 Setup, and allow the computer to continue to the operating system.

When you change the LVDS setting to the installed panel type, the BIOS reprograms the EDID with the correct data. You must set the panel before the Auto-select setting functions correctly.

Hard drive and optical drive cables and connectors

Description	Spare part number
Optical drive cable (data and power assembly)	733492-001
Hard drive cable (data and power assembly)	733491-001

The hard drive and optical drive connectors are located near the middle of the computer, partially under the main frame. Each connector is secured with two Torx screws and has two cables that connect to the system board.

To remove the hard drive or optical drive connector:

1. Prepare the computer for disassembly (see [Preparing to disassemble the computer on page 34](#)).
2. Remove the stand (see [Stand on page 36](#)).
3. Remove the access panel (see [Access panel on page 40](#)).
4. Remove the lower rear panel (see [Lower rear panel on page 73](#)).
5. Remove the side panels (see [Side panels on page 92](#)).
6. Remove the VESA mounting plate (see [VESA mounting plate on page 83](#)).
7. Remove the power supply (see [Power supply on page 85](#)).
8. Remove the system board (see [System board on page 87](#)).
9. Remove the front bezel and display panel (see [Front bezel and display panel on page 97](#)).
10. Remove two Torx screws that secure the hard drive connector or the optical drive connector to the computer.
11. Remove the cables from the metal clips built into the computer.
12. Disconnect the hard drive cables or the optical drive cables from the system board.



NOTE: Be careful not to damage the cable when disconnecting it from the board. Do not pull on the wires.

13. Remove the connector from the computer.



To install the hard drive or optical drive connector, reverse the removal procedures.

6 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.
2. 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

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

Computer Setup—File

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

Table 6-1 Computer Setup—File

Option	Description
System Information	Lists: <ul style="list-style-type: none">• Product name• Manufacturer• SKU number• Processor type/speed/stepping• Installed memory size/speed, number of channels (single or dual) (if applicable)• Integrated MAC address for embedded, enabled NIC (if applicable)• Chassis serial number• Asset tracking number• System Board ID• System BIOS (includes family name and version)• ME firmware version
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 or on a network.
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 6-2 Computer Setup—Storage

Option	Description
Device Configuration	<p>Lists all installed BIOS-controlled storage devices.</p> <p>When a device is selected, detailed information and options are displayed. The following options may be presented:</p> <ul style="list-style-type: none">• Hard Disk: Size, model, firmware version, serial number, connector color. <p>Translation mode (ATA disks only)</p> <p>Lets you select the translation mode to be used for the device. This enables the BIOS to access disks partitioned and formatted on other systems and may be necessary for users of older versions of UNIX (e.g., SCO UNIX version 3.2). Options are Automatic, Bit-Shift, LBA Assisted, User, and Off.</p> <p>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.</p> <p>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.</p> <ul style="list-style-type: none">• CD-ROM: Model, firmware version, serial number, connector color (not included for USB CD-ROM).• SSD Life Used <p>NOTE: Displays for solid-state drives.</p> <ul style="list-style-type: none">• SMART (ATA disks only)• Diskette: Model and firmware version. <p>NOTE: Displays for USB diskette drives.</p> <ul style="list-style-type: none">• Default Values (ATA disks only) <p>See Translation Mode above for details.</p> <p>SATA Defaults</p>

Table 6-2 Computer Setup—Storage (continued)

Storage Options	eSATA Port
	<p data-bbox="531 268 1445 291">Allows you to set a SATA port as an eSATA port for use with an external drive. Default is enabled.</p> <p data-bbox="531 321 1437 405">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.</p> <p data-bbox="531 434 707 457">SATA Emulation</p> <p data-bbox="531 487 1442 541">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).</p> <p data-bbox="531 571 1382 625">CAUTION: SATA emulation changes may prevent access to existing hard drive data and degrade or corrupt established volumes.</p> <p data-bbox="531 655 1442 709">IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode.</p> <p data-bbox="531 739 1430 793">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.</p> <p data-bbox="531 823 1361 877">AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller.</p> <p data-bbox="531 907 1442 1012">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.</p> <p data-bbox="531 1041 791 1064">Removable Media Boot</p> <p data-bbox="531 1094 1334 1117">Enables/disables ability to boot the system from removable media. Default is enabled.</p> <p data-bbox="531 1146 735 1169">Max eSATA Speed</p> <p data-bbox="531 1199 1449 1253">Allows you to choose 1.5 Gbps or 3.0 Gbps as the maximum eSATA speed. By default, the speed is limited to 1.5 Gbps for maximum reliability.</p> <p data-bbox="531 1283 1453 1337">CAUTION: Consult your eSATA drive and cable manufacturer before enabling 3.0 Gbps speed. Some drive and cable combinations may not run reliably at 3.0 Gbps.</p>

Table 6-2 Computer Setup—Storage (continued)

DPS Self-Test	<p>Allows you to execute self-tests on ATA hard drives capable of performing the Drive Protection System (DPS) self-tests.</p> <p>NOTE: This selection will only appear when at least one drive capable of performing the DPS self-tests is attached to the system.</p>
Boot Order	<p>Allows you to:</p> <ul style="list-style-type: none">• UEFI Boot Sources: Specify the order in which UEFI 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. <p>UEFI boot sources always have precedence over legacy boot sources.</p> <ul style="list-style-type: none">• 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. <p>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).</p> <p>NOTE: To drag a device to a preferred place, press Enter. To remove the device from consideration as a bootable device, press F5.</p> <p>You can use F5 to disable individual boot items, as well as disable UEFI boot and/or legacy boot.</p> <p>NOTE: MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started.</p> <p>Shortcut to Temporarily Override Boot Order</p> <p>To boot one time from a device other than the default device specified in Boot Order, restart the computer and press Esc (to access the boot menu) and then F9 (Boot Order), or only F9 (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 Enter. The computer then boots from the selected non-default device for this one time.</p>

Computer Setup—Security



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

Table 6-3 Computer Setup—Security

Option	Description
Setup Password	<p>Allows you to set and enable a setup (administrator) password.</p> <p>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.</p>
Power-On Password	<p>Allows you to set and enable a power-on password. The power-on password prompt appears after a power cycle or reboot. If the user does not enter the correct power-on password, the unit will not boot.</p>
Password Options	<p>Allows you to enable/disable:</p> <p>(This selection appears only if a power-on password or setup password is set.)</p> <ul style="list-style-type: none">• Lock Legacy Resources (determines whether or not Windows Device Manager is allowed to change resource settings for serial and parallel ports).• Stringent security (enabling the stringent password disables the ability to reset the password by moving the jumper on the system board). Default is disabled. <p>CAUTION: If you enable the stringent security feature and you forget the setup password or the power-on password, the computer is inaccessible and can no longer be used.</p> <p>If you lose or forget the password, the system board must be replaced. This scenario is not covered under warranty.</p> <p>To prevent the computer from becoming permanently unusable, record your configured setup password or power-on password in a safe place away from your computer. Without these passwords, the computer cannot be unlocked.</p> <ul style="list-style-type: none">• 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	<p>Allows you to:</p> <ul style="list-style-type: none">• Lock/unlock the Cover Lock.• Set the Cover Removal Sensor to Disable/Notify User/Setup Password. <p>NOTE: <i>Notify User</i> alerts the user that the sensor has detected that the cover has been removed. <i>Setup Password</i> requires that the setup password be entered to boot the computer if the sensor detects that the cover has been removed.</p>

Table 6-3 Computer Setup—Security (continued)

Device Security	Allows you to set Device Available/Device Hidden (default is Device Available) for: <ul style="list-style-type: none">• Embedded security device• System audio <p>NOTE: Set this value to 'Device hidden' to disable all system volume.</p> <ul style="list-style-type: none">• USB controller (varies by model)• Network controller <p>NOTE: You must disable AMT before trying to hide the network controller.</p> <ul style="list-style-type: none">• Serial port• Parallel port• SATA ports (varies by model)
USB Security	Allows you to set Enabled/Disabled (default is Enabled) for: <ul style="list-style-type: none">• Front USB Ports• Rear USB Ports• Accessory USB Ports <p>NOTE: The webcam is connected to accessory USB port 5. To disable the webcam, set USB Port 5 to 'Disabled'.</p>
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: <ul style="list-style-type: none">• 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.

Table 6-3 Computer Setup—Security (continued)

Master Boot Record Security

Enables/disables Master Boot Record (MBR) 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 6-3 Computer Setup—Security (continued)

System Security (these options are hardware dependent)	<p>Data Execution Prevention (enable/disable) - Helps prevent operating system security breaches. Default is enabled.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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:</p> <ul style="list-style-type: none">• Embedded Security Device Support• Virtualization Technology• Virtualization Technology Directed I/O <p>Embedded Security Device (enable/disable) - Permits activation and deactivation of the Embedded Security Device.</p> <p>NOTE: To configure the Embedded Security Device, a Setup password must be set.</p> <ul style="list-style-type: none">• 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. <p>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.</p> <ul style="list-style-type: none">• 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.
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Table 6-3 Computer Setup—Security (continued)

System Security (continued)	<p>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.</p> <ul style="list-style-type: none">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. <p>NOTE: To enable this option, a Setup password must be set.</p> <ul style="list-style-type: none">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. <p>NOTE: To enable this option, a Setup password must be set.</p>
DriveLock Security	<p>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.</p> <p>NOTE: This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.</p>
Secure Boot Configuration	<p>This is a feature of Windows 8.</p> <ul style="list-style-type: none">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.<ul style="list-style-type: none">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.

Table 6-3 Computer Setup—Security (continued)

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 6-4 Computer Setup—Power

Option	Description
OS Power Management	<ul style="list-style-type: none">• 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.• Idle Power Savings—Extended/Normal. Allows certain operating systems to decrease the processors power consumption when the processor is idle. Default is extended.• 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. <p>NOTE: For Windows 8 systems with Fast Boot support, a normal shutdown goes to the S4 state, not the S5 state.</p> <ul style="list-style-type: none">◦ S0 (On) = Solid white LED.◦ S3 (Stand By)= 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (white 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 (white LED) — repeated cycles of 4 blinks and a pause.◦ S5 (Soft Off) = LED is off.

Table 6-4 Computer Setup—Power (continued)

Hardware Power Management	<p>SATA Power Management – Enables or disables SATA bus and/or device power management. Default is enabled.</p> <p>PCI Express Power Management – Enables or disables Active State Power Management (ASPM) of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Default is ASPM Disabled.</p> <p>S5 Maximum Power Savings – Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 0.5 Watt power usage. Default is disabled.</p> <p>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.</p> <p>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.</p>
Thermal	<p>Fan idle mode—This bar graph controls the minimum permitted fan speed.</p> <p>NOTE: This setting only changes the minimum fan speed. The fans are still automatically controlled.</p>

Computer Setup—Advanced

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

Table 6-5 Computer Setup—Advanced (for advanced users)

Option	Heading
Power-On Options	<p>Allows you to set:</p> <ul style="list-style-type: none">• POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days).<ul style="list-style-type: none">◦ 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 Power 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:<ul style="list-style-type: none">◦ 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. <p>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.</p> <ul style="list-style-type: none">• 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 slowly, so slowly that they are not ready to boot by the time POST is finished. The POST delay also gives you more time to select F10 to enter Computer (F10) Setup. Default is None.• 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 6-5 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: <ul style="list-style-type: none">• 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.

Table 6-5 Computer Setup—Advanced (for advanced users) (continued)

Device Options	<p>Allows you to set:</p> <ul style="list-style-type: none">• 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.• 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.• LVDS Panel Select (Auto-select, LG, Samsung). Use this option to select the display panel manufacturer. When you change the LVDS setting to the installed panel type, the BIOS reprograms the EDID with the correct data. You must set the panel before the Auto-select setting functions correctly.• 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 1 MB 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.• USB Charging Port (enable/disable). Use this option to disable the USB charging port.
VGA Configuration	<p>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.</p>

Table 6-5 Computer Setup—Advanced (for advanced users) (continued)

Management Operations	Allows you to set: <ul style="list-style-type: none">• 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 enabled.
Option ROM Launch Policy	(Windows 8 only). Windows 8 installs as a UEFI operating system (as opposed to 'legacy'), and ships with the 'Legacy Support' setting off in the BIOS. When 'Legacy Support' is off, the Option ROM Launch Policies are set to 'UEFI Only'. These policies control whether the Legacy Option ROM or the UEFI driver is loaded for the following features: <ul style="list-style-type: none">• PXE Option ROMs (UEFI Only/Do Not Launch). Specifies whether the legacy option ROM or the UEFI driver in the BIOS is used to provide PXE services.• Storage Option ROMs (UEFI Only/Do Not Launch). Specifies whether the legacy option ROM or the UEFI driver in the BIOS is used to provide RAID setup and support.• Video Option ROMs (UEFI Only/Do Not Launch). Specifies whether the legacy VBIOS or the UEFI driver in the BIOS is used to provide graphics setup and support.
Connected BIOS	Enables or disables the feature that updates the BIOS using the network. <ul style="list-style-type: none">• Connected BIOS (Enabled/Disabled). Enables or disables BIOS network support. Default is enabled.• Use Proxy (Enabled/Disabled). When enabled, displays Proxy Address field to configure the URL of the proxy server. Default is disabled.

Table 6-5 Computer Setup—Advanced (for advanced users) (continued)

Update BIOS via Network	<p>Allows you to use F10 Setup to check for BIOS updates from hp.com and apply them using either a manual selection or an automatically scheduled check on boot-up.</p> <p>NOTE: If Windows BitLocker Drive Encryption (BDE) is enabled, HP requires that BDE be suspended temporarily before the BIOS is flashed. You must get the BDE recovery password and PIN before suspending BDE. After updating the BIOS, you can resume BDE.</p> <ul style="list-style-type: none">• Update BIOS via Network (Enabled/Disabled). Enables or disables BIOS network support. Default is enabled.• Update Source (HP/Custom). Selects hp.com or a locally managed custom address to serve BIOS updates. Default is HP. <p>Update Address. If Custom is selected for Update Source, the URL of the locally managed server.</p> <ul style="list-style-type: none">• Automatic BIOS Update Setting (Disabled, Check and install all updates automatically, Check and install only important updates automatically, Check for updates but let me decide whether to install them). Enables or disables the network BIOS update scheduler. Default is disabled. <p>Automatic Update Frequency (Daily, Weekly, Monthly). Sets the frequency of checks to the BIOS update server. If a newer version of BIOS is available on the network server, the system will prompt to update the BIOS. Default is Monthly.</p> <p>Force Check on Next Reboot (Disabled/Enabled). During the next boot, checks whether an updated BIOS is available. This value is independent of the Automatic Update Frequency setting. Default is disabled.</p>
Ethernet Connection	Provides information about the network connection.

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 106](#) 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 106](#) in the Computer Setup—File table.)

7 HP PC Hardware Diagnostics

To help troubleshoot and diagnose failures, use the UEFI-based hardware diagnostic solution that HP includes on all products. This tool can even be used if the computer will not boot to the operating system.

Why run HP PC Hardware Diagnostics – UEFI

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.

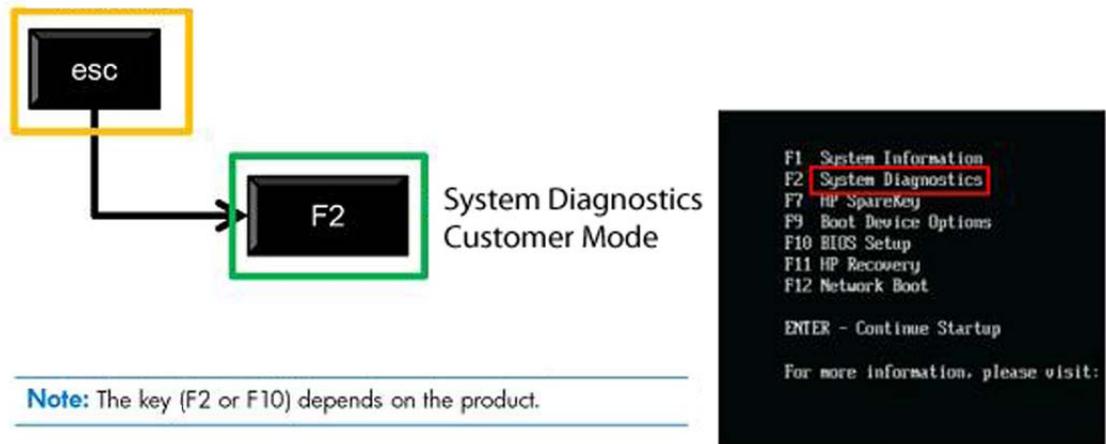
- **Isolate true hardware failures:** The diagnostics run outside of the operating system so they effectively isolate hardware failures from issues that may be caused by the operating system or other software components.
- **Failure ID:** When a failure is detected that requires hardware replacement, 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 – UEFI

To access the UEFI diagnostics:

1. Restart or turn on the computer and press **Esc** repeatedly until the BIOS boot menu appears.
2. Press **F2** or select **Diagnostics (F2)**.

How to access and run UEFI diagnostics



Note: The key (F2 or F10) depends on the product.

After pressing **F2**, the BIOS sequentially searches three places for the system diagnostics:

- a. **First** – 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 124](#)).
- b. **Second** – the hard disk drive.
- c. **Third** – in the BIOS, a core set of diagnostics (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

1. Go to <http://www.hp.com>.
2. Click the **Support & Drivers** link.
3. Select the **Drivers & Software** tab.
4. Enter the product name in the text box and click **Search**.
5. Select your specific computer model.
6. Select your operating system.
7. 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.

8 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 179](#).

Safety and comfort

 **WARNING!** Misuse of the computer or failure to establish a safe and comfortable work environment may result in discomfort or serious injury. Refer to the *Safety & Comfort Guide* at <http://www.hp.com/ergo> for more information on choosing a workspace and creating a safe and comfortable work environment. 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 105](#) 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 179](#) for more information.
- If the screen is blank, plug the monitor into a different video port on the computer if one is available. Or, replace the monitor with a monitor that you know is functioning properly.
- If you are working on a network, plug another computer with a different cable into the network connection. There may be a problem with the network plug or cable.
- If you recently added new hardware, remove the hardware and see if the computer functions properly.

- If you recently installed new software, uninstall the software and see if the computer functions properly.
- Boot the computer to the Safe Mode to see if it will boot without all of the drivers loaded. When booting the operating system, use “Last Known Configuration.”
- Refer to the comprehensive online technical support at <http://www.hp.com/support>.
- Refer to [Helpful hints on page 126](#) 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).

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

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

Helpful hints

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

- Check that the computer and monitor are plugged into a working electrical outlet.
- Check that the voltage select switch (some models) is set to the appropriate voltage for your region (115V or 230V).
- Check that the computer is turned on and the white 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, [POST error messages on page 179](#) 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 149](#) 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.

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

Solving general problems

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

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

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

Cause	Solution
Software control of the power switch is not functional.	<ol style="list-style-type: none">1. 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 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.	<ol style="list-style-type: none">1. Check the Computer Setup settings to make sure the internal system speaker is not muted (this setting does not affect the external speakers).2. Make sure the external speakers are properly connected and powered on and that the speakers' volume control is set correctly.3. 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.	<ol style="list-style-type: none">1. Make sure airflow to the computer is not blocked. Leave a 10.2-cm (4-inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.2. 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.

Poor performance.

Cause	Solution
Hard drive fragmented.	Defragment hard drive.
Program previously accessed did not release reserved memory back to the system.	Restart the computer.
Virus resident on the hard drive.	Run virus protection program.
Too many applications running.	<p>Windows 7:</p> <ol style="list-style-type: none">1. Close unnecessary applications to free up memory.2. Add more memory.3. 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: <p>In Windows 7:</p> <ol style="list-style-type: none">a. Go to Start > All Programs > Accessories > Runb. Type <code>msconfig</code>, 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 then click OK. <p>In Windows 8:</p> <ol style="list-style-type: none">a. On the Start screen, right-click, and then select the All apps icon.b. Under Windows System, click Run.c. Type <code>msconfig</code>, 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 then click OK.
Some software applications, especially games, are stressful on the graphics subsystem.	<ol style="list-style-type: none">1. Lower the display resolution for the current application or consult the documentation that came with the application for suggestions on how to improve performance by adjusting parameters in the application.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	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	<ol style="list-style-type: none">1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.2. Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If the fan does not spin, make sure the fan cable is plugged onto the system board header.3. If fan is 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.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns white, then:</p> <ol style="list-style-type: none">1. 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.2. Remove the expansion cards one at a time until the 5V_aux light on the system board turns on.3. Replace the system board. <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on white then:</p> <ol style="list-style-type: none">1. Check that the unit is plugged into a working AC outlet.2. Open the access panel and check that the power button cable is properly connected to the system board.3. Check that the power supply cables are properly connected to the system board.4. Check to see if the 5V_aux light on the system board is turned on. If it is turned on, then replace the power button assembly.5. 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.

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	Solution
Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink is not properly attached to the processor.	<ol style="list-style-type: none">1. Ensure that the computer air vents are not blocked and the processor cooling fan is running.2. Open the access panel, press the power button, and see if the processor fan (or other system fan) spins. If 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).	<ol style="list-style-type: none">1. 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.

Solving hard drive problems

Hard drive error occurs.

Cause	Solution
Hard disk has bad sectors or has failed.	<ol style="list-style-type: none">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 149 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.	<ol style="list-style-type: none">1. Perform Drive Protection System (DPS) testing in system ROM.
System files missing or not properly installed.	<ol style="list-style-type: none">1. Insert bootable media and restart the computer.2. 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.

Nonsystem disk/NTLDR missing message.

Cause	Solution
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.	<ol style="list-style-type: none">1. Check SATA cable connections.2. 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, POST error messages on page 179 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.	<ol style="list-style-type: none">1. Use the task manager to close programs that do not respond.2. 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

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.	<p>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.</p> <p>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.</p> <p>NOTE: Never remove the card when the green LED is flashing</p>

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.	<ol style="list-style-type: none">1. 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.2. 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.

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.

Blank screen (no video).

Cause	Solution
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.	<ol style="list-style-type: none">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 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 on-screen 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	Solution
Pre-video memory error.	<ol style="list-style-type: none">Reseat DIMMs. Power on the system.Replace DIMMs one at a time to isolate the faulty module.Replace third-party memory with HP memory.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: <ol style="list-style-type: none">1. 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.	<ol style="list-style-type: none">1. Be sure the monitor cable is securely connected to the computer.2. In a two-monitor system or if another monitor is in close proximity, be sure the monitors are not interfering with each other's electromagnetic field by moving them apart.3. Fluorescent lights or fans may be too close to the monitor.
Monitor needs to be degaussed.	Degauss the monitor. Refer to the documentation that came with the monitor for instructions.

Image is not centered.

Cause	Solution
Position may need adjustment.	Press the monitor's Menu button to access the OSD menu. Select 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.	<p>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.</p> <p>To enter Safe Mode in Windows 7:</p> <ol style="list-style-type: none">1. Restart the computer.2. 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.3. On the Advanced Boot Options screen, use the arrow keys to highlight the safe mode option you want, and then press Enter.4. Log on to your computer with a user account that has administrator rights. <p>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.</p> <p>To enter Safe Mode in Windows 8:</p> <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Select Change PC Settings, select General, and then under Advanced startup, click Restart now.3. Select Troubleshoot, select Advanced options, select Startup Settings, and then click Restart.4. Use the function keys or number keys to select the safe mode option you want. <p>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.</p>

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.	<ol style="list-style-type: none">1. Select the monitor's Auto-Adjustment option in the monitor's on-screen display menu.2. Manually synchronize the Clock and Clock Phase on-screen display functions. To download a SoftPak that will assist you with the synchronization, go to the following Web site, select the appropriate monitor, and download either SP32347 or SP32202: http://www.hp.com/support
Graphics card is not seated properly or is bad (some models).	<ol style="list-style-type: none">1. Reseat the graphics card.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.	<p>Use the Character Map to locate and select the appropriate symbol. You can copy the symbol from the Character Map into a document.</p> <p>In Windows 7, click Start, select All Programs, select Accessories, select System Tools, and then select Character Map.</p> <p>In Windows 8, on the Start screen, type ch, and then select Character Map from the list of applications.</p>

Solving audio problems

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

Sound cuts in and out.

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

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 .

Sound does not come out of the speaker or headphones.

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 .
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.	<p>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.</p> <p>To access Device Manager in Windows 7, click Start, select Control Panel, and then select Device Manager.</p> <p>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.</p>
Some applications can select which audio output device is used.	Make sure the application has selected the correct audio device.
The operating system controls may be set to use a different audio device as the default output device than what is expected.	Set the operating system to use the correct audio device.

Solving printer problems

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

Printer will not print.

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.	<ol style="list-style-type: none">1. Install the correct printer driver for the application.2. Try printing using the MS-DOS command: <pre>DIR C:\ > [printer port]</pre>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 cmd in the Open box, and then click 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.
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.

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 commands and typing are not recognized by the computer.

Cause	Solution
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 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.

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 .

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: <ol style="list-style-type: none">1. Press the Ctrl and Esc keys at the same time (or press the Windows logo key) to display the Start menu.2. Use the arrow keys to select Shut Down and then press Enter.3. After the shutdown is complete, plug the mouse connector into the back of the computer (or the keyboard) and restart. Windows 8: <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Use the arrow keys to select Power, and then press Enter.3. Use the arrow keys to select Shut Down, and then press Enter.4. 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 does not respond to movement or is too slow.

Cause	Solution
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.

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

Table 8-1 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	Solution
Wrong memory modules were used in the upgrade or memory modules were installed in the wrong location.	<ol style="list-style-type: none">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. 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.	<p>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.</p> <ol style="list-style-type: none">1. Reseat DIMMs. Power on the system.2. Replace DIMMs one at a time to isolate the faulty module. NOTE: DIMM1 or XMM1 must always be installed. DIMM1 must be installed before DIMM2, and DIMM3 must be installed before DIMM43. 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.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none">1. Reseat the graphics card. Power on the system.2. Replace the graphics card.3. Replace the system board. <p>For systems with integrated graphics, replace the system board.</p>

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

Cause	Solution
Bad option card.	<ol style="list-style-type: none">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.2. 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 8-2 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 .

Table 8-2 Solving Network Problems (continued)

Wake-on-LAN feature is not functioning.

Cause	Solution
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: <ol style="list-style-type: none">1. 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.6. Click the Power Management tab, then select Allow this device to wake the computer. To enable Wake-on-LAN in Windows 8: <ol style="list-style-type: none">1. From the Start screen, type c, and then select Control Panel from the list of applications.2. 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.5. 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.	<ol style="list-style-type: none">1. Run Computer Setup and enable network controller.2. 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.	<ol style="list-style-type: none">1. Run Computer Setup and enable network controller.2. 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).
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 dual-channel mode to download, decompress, and execute the ME firmware for Out-of-Band (OOB), third-party data storage, and other management functions.

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

Cause

Solution

A memory module is not installed in the 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.	<ol style="list-style-type: none">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.

Poor performance is experienced.

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

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 .
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 149 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.	<ol style="list-style-type: none">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 DVD driver.

Recording or copying CDs is difficult or impossible.

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

Solving USB flash drive problems

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

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

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.	<ol style="list-style-type: none">1. Turn off the computer.2. 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.	<ol style="list-style-type: none">1. 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.	<ol style="list-style-type: none">1. If possible, replace the cable.2. Restart the computer.
The device is not working.	<ol style="list-style-type: none">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 .

Need to disable the webcam.

Cause	Solution
The webcam is enabled in F10 Setup.	You can disable the webcam in F10 Setup by disabling accessory USB port 5. Go to F10 Setup, then navigate to Security > USB Security > Accessory USB Ports . Set the value for USB Port 5 to Disabled . See Computer Setup —Security on page 111 for more information.

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.

Unable to connect to the Internet.

Cause	Solution
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 computer's RJ-45 connector. (If the connection is good, the "PC" LED light on the front of the cable/DSL modem will be on.)
IP address is not configured properly.	Contact 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: <ol style="list-style-type: none">1. Select Start > Control Panel.2. Click Internet Options.3. In the Browsing history section on the General tab, click the Delete button.4. Select the Cookies check box and click the Delete button. Windows 8: <ol style="list-style-type: none">1. From the Start screen, type c, and then select Control Panel from the list of applications..2. Click Internet Options.3. In the Browsing history section on the General tab, click the Delete button.4. 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, POST error messages on page 179 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.	<p>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.</p> <p>In Windows 8, use Automatic Repair to fix problems that might prevent Windows from starting correctly.</p> <p>To access Automatic Repair:</p> <ol style="list-style-type: none">1. Press the Windows logo + I to open the Settings charm.2. Select Change PC Settings, select General, and then under Advanced startup, click Restart now.3. Select Troubleshoot, select Advanced options, and then select Automatic Repair. <p>Windows starts Automatic Repair.</p> <ol style="list-style-type: none">4. Select the account to use to begin Automatic Repair, and type the password for the account. <p>Windows diagnoses the computer and attempts the repair it.</p>

"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.

9 System backup and recovery

Backing up, restoring, and recovering in Windows 8

Your computer includes tools provided by HP and Windows to help you safeguard your information and retrieve it if you ever need to. These tools will help you return your computer to a proper working state or even back to the original factory state, all with simple steps.

This section provides information about the following processes:

- Creating recovery media and backups
- Restoring and recovering your system

 **NOTE:** This section describes an overview of backing up, restoring, and recovering options. For more details about the tools provided, see Help and Support. From the Start screen, type **h**, and then select **Help and Support**.

Creating recovery media and backups

Recovery after a system failure is only as good as your most recent backup.

1. After you successfully set up the computer, create recovery media. This step creates a backup of the recovery partition on the computer. The backup can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced.

You will use a USB flash drive to create a bootable recovery drive that can be used to troubleshoot a Windows 8 computer that is unable to start. The USB flash drive can be used to reinstall the original operating system and the programs that were installed at the factory.

 **NOTE:** Any information on the USB flash drive will be erased before the recovery media is created.

To create the recovery media, from the Start screen, type `recovery drive`, and then click on **Settings**, then click on **Create a recovery drive**. Follow the on-screen instructions to continue.

2. As you add hardware and software programs, create system restore points. A system restore point is a snapshot of certain hard drive contents saved by Windows System Restore at a specific time. A system restore point contains information that Windows uses, such as registry settings. Windows creates a system restore point for you automatically during a Windows update and during other system maintenance (such as a software update, security scanning, or system diagnostics). You can also manually create a system restore point at any time. For more information and steps for creating specific system restore points, see Windows Help and Support. From the Start screen, type `h`, and then select **Help and Support**.
3. As you add photos, video, music, and other personal files, create a backup of your personal information. Windows File History can be set to regularly and automatically back up files from libraries, desktop, contacts, and favorites. If files are accidentally deleted from the hard drive and they can no longer be restored from the Recycle Bin, or if files become corrupted, you can restore the files that you backed up using File History. Restoring files is also useful if you ever choose to reset the computer by reinstalling Windows.

 **NOTE:** File History is not enabled by default, so you must turn it on.

For more information and steps for enabling Windows File History, see Windows Help and Support. From the Start screen, type `h`, and then select **Help and Support**.

Restoring and recovering using Windows 8 tools

Windows recovery tools provide access to several options for recovering your system. Choose the method that best matches your situation and level of expertise:

- If you need to restore your personal files and data, you can use Windows File History to restore your information from the backups you created. For more information and steps for using File History, see Windows Help and Support. From the Start screen, type **h**, and then select **Help and Support**.
- If you want to restore the system to a previous state without losing any personal information, Windows System Restore is an option. System Restore allows you to restore without the requirements of Windows Refresh or a reinstallation. Windows creates system restore points automatically during a Windows update and other system maintenance events. Even if you did not manually create a restore point, you can choose to restore to an automatically created restore point. For more information and steps for using Windows System Restore, see Windows Help and Support. From the Start screen, type **h**, and then select **Help and Support**.
- If you want a quick and easy way to recover the system without losing your personal information, settings, or apps that came preinstalled on your computer or were purchased from the Windows Store, Windows Refresh is an option. This method does not require backing up data to another drive. See [Using Windows 8 Refresh on page 167](#).
- If you want to reset your computer to its original state, Windows Reset provides an easy way to remove all personal data, apps, and settings, and reinstall Windows. The Reset 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. Any personal files must be restored from backups you made. See [Using Windows 8 Reset on page 168](#).
- If the computer is unable to start, you can use the Windows recovery USB flash drive you created to recover the system. See [Recovery using the Windows 8 recovery USB flash drive on page 169](#).
- If the computer is unable to start and you did not create a recovery USB flash drive or the one you created does not work, see [Recovery using Windows 8 operating system media \(purchased separately\) on page 170](#).

Using Windows 8 Refresh

 **NOTE:** You may be prompted for your permission or password when using Refresh. See Windows Help and Support for more information. From the Start screen, type **h**, and then select **Help and Support**.

 **IMPORTANT:** Refresh removes any traditional applications that were not originally installed on the system at the factory.

 **NOTE:** During Refresh, a list of removed traditional applications will be saved so that you have a quick way to see what you might need to reinstall. See Help and Support for instructions on reinstalling traditional applications. From the Start screen, type **h**, and then select **Help and Support**.

If Windows is responding, use these steps to start Refresh:

1. On the Start screen, point to the far-right upper or lower corner of the screen to display the charms.
2. Click **Settings**.
3. Click **Change PC settings** in the bottom-right corner of the screen, and then select **General** from the PC settings screen.
4. Under **Refresh your PC without affecting your files**, select **Get started**, and follow the on-screen instructions.

If Windows is not responding, use these steps to start Refresh:

1. 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, or you cannot check for its presence, you must recover using the recovery media you created; see [Recovery using the Windows 8 recovery USB flash drive on page 169](#). Or you must use the Windows 8 operating system media and the *Driver Recovery* media (purchased separately); see [Recovery using Windows 8 operating system media \(purchased separately\) on page 170](#)

3. 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.
5. Choose your keyboard layout.
6. Select **Troubleshoot**.
7. Select **Refresh**.
8. Follow the on-screen instructions to continue.

Using Windows 8 Reset

 **NOTE:** You may be prompted for your permission or password when using Reset. See Windows Help and Support for more information. From the Start screen, type `h`, and then select **Help and Support**.

 **IMPORTANT:** Reset does not provide backups of your information. Before using Reset, back up any personal information you wish to retain.

If Windows is responding, use these steps to start Reset:

1. On the Start screen, point to the far-right upper or lower corner of the screen to display the charms.
2. Click **Settings**.

3. Click **Change PC settings** in the bottom-right corner of the screen, and then select **General** from the PC settings screen.
4. Under **Remove everything and reinstall Windows**, select **Get started**, and follow the on-screen instructions.

If Windows is not responding, use these steps to start Reset:

1. 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, or you cannot check for its presence, you must recover using the recovery media you created; see [Recovery using the Windows 8 recovery USB flash drive on page 169](#). Or you must use the Windows 8 operating system media and the *Driver Recovery media* (purchased separately); see [Recovery using Windows 8 operating system media \(purchased separately\) on page 170](#).

3. 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.
5. Choose your keyboard layout.
6. Select **Troubleshoot**.
7. Select **Reset**.
8. Follow the on-screen instructions to continue.

Recovery using the Windows 8 recovery USB flash drive

To recover your system using the recovery USB flash drive you previously created:

 **NOTE:** If you did not create a recovery USB flash drive or the one you created does not work, see [Recovery using Windows 8 operating system media \(purchased separately\) on page 170](#).

1. If possible, back up all personal files.
2. Insert the recovery USB flash drive you created into a USB port on your computer.
3. Restart the computer and as soon as you see the HP logo screen, press *f9* to display a list of boot devices. Use the arrow keys to select your USB flash drive from the UEFI Boot Sources list. Press *Enter* to boot from that device.
4. Choose your keyboard layout.
5. Select **Troubleshoot**.
6. Select **Refresh your PC**.
7. Follow the on-screen instructions.

Recovery using Windows 8 operating system media (purchased separately)

This recovery process requires Windows 8 operating system media, which can be ordered from the support website. For U.S. support, go to <http://www.hp.com/support>. For worldwide support, go to http://welcome.hp.com/country/us/en/wwcontact_us.html. You can also order the media by calling support. For contact information, see the *Worldwide Telephone Numbers* booklet included with the computer.

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:

 **NOTE:** This process takes several minutes.

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

After the repair is completed and the Windows 8 desktop appears:

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

Backing up, restoring, and recovering in Windows 7

Your computer includes tools provided by HP and Windows to help you safeguard your information and retrieve it if you ever need to. These tools will help you return your computer to a proper working state or even back to the original factory state, all with simple steps.

This section provides information about the following processes:

- Creating recovery media and backups
- Restoring and recovering your system

 **NOTE:** This section describes an overview of backing up, restoring, and recovering options. For more details about the Windows Backup and Restore tools provided, see Help and Support. To access Help and Support, select **Start > Help and Support**.

Recovery after a system failure is only as good as your most recent backup.

1. After you successfully set up the computer, create recovery media. This media can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced. See [Creating recovery media on page 171](#).
2. As you add hardware and software programs, create system restore points. A system restore point is a snapshot of certain hard drive contents saved by Windows System Restore at a specific time. A system restore point contains information that Windows uses, such as registry settings. Windows creates a system restore point for you automatically during a Windows update and during other system maintenance (such as a software update, security scanning, or system diagnostics). You can also manually create a system restore point at any time. For more information and steps for creating specific system restore points, see Help and Support. To access Help and Support, select **Start > Help and Support**.
3. As you add photos, video, music, and other personal files, create a backup of your personal information. If files are accidentally deleted from the hard drive and they can no longer be restored from the Recycle Bin, or if files become corrupted, you can restore the files that you backed up. In case of system failure, you can use the backup files to restore the contents of your computer. See [Backing up your information on page 174](#).

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

Creating recovery media

After you successfully set up the computer, create recovery media. The media can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced.

There are two types of recovery media. To determine which steps to follow for your computer:

1. Click the **Start** button.
2. Click **All Programs**.
 - If **Security and Protection** is listed, continue with the steps in [Creating recovery media using HP Recovery Manager \(select models only\) on page 172](#).
 - If **Productivity and Tools** is listed, continue with the steps in [Creating recovery discs with HP Recovery Disc Creator \(select models only\) on page 173](#).

Creating recovery media using HP Recovery Manager (select models only)

- To create recovery discs, your computer must have a DVD writer. Use DVD+R or DVD-R discs (purchased separately). The discs you use will depend on the type of optical drive you are using.

 **NOTE:** DVD+R DL, DVD-R DL, or DVD±RW disc are not supported.

- 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 quit the process at any time. The next time you initiate the process, it resumes where it left off.

 **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.

To create recovery discs:

1. Close all open programs.
2. Click the **Start** button, click **All Programs**, click **Security and Protection**, click **Recovery Manager**, and then click **HP Recovery Media Creation**. If prompted, click **Yes** to allow the program to continue.
3. Click **Create recovery media using blank DVD(s)**, and then click **Next**.
4. Follow the on-screen instructions. Label each disc after 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 USB flash drive with a capacity of at least 8 GB.

1. Close all open programs.
2. Insert the USB flash drive into a USB port on the computer.
3. Click the **Start** button, click **All Programs**, click **Security and Protection**, click **Recovery Manager**, and then click **Recovery Media Creation**.
4. Click **Create recovery media with a USB flash drive**, and then click **Next**.
5. Select the USB flash drive from the list of media. The program will let you know how much storage is required to create the recovery drive. If the USB flash drive does not have enough storage capacity, it will appear grayed out, and you must replace it with a larger USB flash drive. Click **Next**.



NOTE: Recovery Media Creation formats the USB flash drive, deleting any files on it.

6. Follow the on-screen instructions. When the process is complete, label the USB flash drive and store it in a secure place.

Creating recovery discs with HP Recovery Disc Creator (select models only)

HP Recovery Disc Creator is a software program that offers an alternative way to create recovery discs on select models. After you successfully set up the computer, you can create recovery discs using HP Recovery Disc Creator. The recovery discs allows you to reinstall your original operating system as well as select drivers and applications if the hard drive becomes corrupted. HP Recovery Disc Creator creates two kinds of recovery discs:

- Windows 7 operating system DVD—Installs the operating system without additional drivers or applications.
- *Driver Recovery DVD*—Installs specific drivers and applications only, in the same way that the HP Software Setup utility installs drivers and applications.

To create recovery discs, your computer must have a DVD writer. Use any of the following types of discs (purchased separately): DVD+R, DVD+R DL, DVD-R, DVD-R DL, or DVD±RW. The discs you use will depend on the type of optical drive you are using.

Creating recovery discs



NOTE: The Windows 7 operating system DVD can be created only once. Thereafter, the option to create that media will not be available after you create a Windows DVD.

To create the Windows DVD:

1. Select **Start > All Programs > Productivity and Tools > HP Recovery Disc Creator**.
2. Select **Windows disk**.
3. From the drop-down menu, select the drive for burning the recovery media.
4. Click the **Create** button to start the burning process. Label the disc after you create it, and store it in a secure place.

After the Windows 7 operating system DVD has been created, create the *Driver Recovery* DVD:

1. Select **Start > All Programs > Productivity and Tools > HP Recovery Disc Creator**.
2. Select **Driver disk**.
3. From the drop-down menu, select the drive for burning the recovery media.
4. Click the **Create** button to start the burning process. Label the disc after you create it, and store it in a secure place.

Backing up your information

You should create 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. Your initial and subsequent backups allow you to restore your data and settings if a failure occurs.

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

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 directories.
- 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.
- When backing up to discs, number each disc after removing it from the drive.

 **NOTE:** For detailed instructions on various backup and restore options, perform a search for these topics in Help and Support. To access Help and Support, select **Start > Help and Support**.

 **NOTE:** Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password. Refer to Help and Support. To access Help and Support, select **Start > Help and Support**.

To create a backup using Windows Backup and Restore:

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

1. Select **Start > All Programs > Maintenance > Backup and Restore**.
2. Follow the on-screen instructions to set up your backup.

System Restore

If you have a problem that might be due to software that you installed on your computer, or if you want to restore the system to a previous state without losing any personal information, use System Restore to return the computer to a previous restore point.

 **NOTE:** Always use this System Restore procedure before you use the System Recovery feature.

To start System Restore:

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

System Recovery

 **WARNING!** 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. Any personal files must be restored from backups you made.

If you were not able to create system recovery DVDs or USB flash drive, you can order a recovery disc set from support. For U.S. support, go to <http://www.hp.com/support>. For worldwide support, go to http://welcome.hp.com/country/us/en/wwcontact_us.html. You can also order the recovery disc set by calling support. For contact information, see the *Worldwide Telephone Numbers* booklet included with the computer.

 **NOTE:** Always use the System Restore procedure before you use the System Recovery program. See [System Restore on page 174](#).

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 175](#) or [System Recovery when Windows is not responding on page 176](#).
- Recovery media — Run System Recovery from recovery media that you have created from files stored on your hard disk drive or purchased separately. See [System Recovery using recovery media \(select models only\) on page 176](#).

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. If you have not already created this media, follow the instructions in [Creating recovery media on page 171](#).

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

1. Turn off the computer.
2. Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.

3. Turn on the computer.
4. When Windows has loaded, click the **Start** button, click **All Programs**.
is listed, follow the steps in [System Recovery when Windows is not responding on page 176](#).
 - If **Security and Protection** is listed, continue with step [5](#).
 - If **Productivity and Tools** is listed, follow the steps in [System Recovery when Windows is not responding on page 176](#).
5. Click **Security and Protection**, click **Recovery Manager**, and then click **Recovery Manager**. If prompted, click **Yes** to allow the program to continue.
6. Under **I need help immediately**, click **System Recovery**.
7. Select **Yes**, and then click **Next**. Your computer restarts.
8. 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**.
9. System Recovery begins. After System Recovery is complete, click **Finish** to restart the computer.
10. 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.
4. 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.
5. At the HP Recovery Manager screen, follow the on-screen instructions to continue.
6. When Windows has loaded, shut down the computer, reconnect all peripheral devices, and then turn the computer back on.

System Recovery using recovery media (select models only)

Use the steps provided in this section if you created recovery media using [Creating recovery media using HP Recovery Manager \(select models only\) on page 172](#). If you used HP Recovery Disc Creator to create a Windows 7 operating system DVD and a *Driver Recovery* DVD, use the steps in [Using HP Recovery Disc operating system discs \(select models only\) on page 177](#).

⚠ 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 perform a System Recovery using recovery media:

1. 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.

2. Click the **Start** button, and then click **Shut Down**.

or

If the computer is not responding, press and hold the power button for approximately 5 seconds or until the computer turns off.

3. Disconnect all peripheral devices from the computer except the monitor, keyboard, and mouse.

4. Press the power button to turn on the computer, and press **Esc** as the computer is powering on to display the startup menu.

5. 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.

6. 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**.

7. 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**.

8. If you are prompted to insert the next recovery disc, do so.

9. 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.

Using HP Recovery Disc operating system discs (select models only)

Use the steps provided in this section if you used HP Recovery Disc Creator to create a Windows 7 operating system DVD and a *Driver Recovery* DVD. If you created recovery media using [Creating recovery media using HP Recovery Manager \(select models only\) on page 172](#), use the steps in [System Recovery using recovery media \(select models only\) on page 176](#).

If you cannot use the recovery discs you previously created using the HP Recovery Disc Creator (select models only), you must purchase a Windows 7 operating system DVD to reboot the computer and repair the operating system.

To order a Windows 7 operating system DVD and *Driver Recovery* DVD, go to the HP website. For U.S. support, go to <http://www.hp.com/support>. For worldwide support, go to http://welcome.hp.com/country/us/en/wwcontact_us.html. You can also order the DVDs by calling support. For contact information, see the *Worldwide Telephone Numbers* booklet included with the computer.

 **CAUTION:** Using a Windows 7 operating system DVD 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 a Windows 7 operating system DVD:

 **NOTE:** This process takes several minutes.

1. If possible, back up all personal files.
2. Restart the computer, and then insert the Windows 7 operating system DVD into the optical drive before the Windows operating system loads.

 **NOTE:** If the computer does not boot to the DVD, restart the computer and 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 DVD is inserted. Press **Enter** to boot from that device.

3. When prompted, press any keyboard key.
4. Follow the on-screen instructions.
5. Click **Next**.
6. Select **Install now**.
7. Follow the on-screen instructions.

After the repair is completed:

1. Eject the Windows 7 operating system DVD and then insert the *Driver Recovery* DVD.
2. Follow the on-screen instructions to install the Hardware Enabling Drivers first, and then install Recommended Applications.

10 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.

POST numeric codes and text messages

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



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

Control panel message	Description	Recommended action
101-Option ROM Checksum Error	System ROM checksum.	<ol style="list-style-type: none">1. Verify the correct ROM.2. Flash the ROM if needed.3. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.)4. Replace the system board.
103-System Board Failure	DMA or timers.	<ol style="list-style-type: none">1. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.)2. Replace the system board.
162-System Options Not Set	Configuration incorrect. RTC (real-time clock) battery may need to be replaced.	Run Computer Setup and check the configuration in Advanced > Onboard Devices . Reset the date and time under Control Panel . 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.
163-Time & Date Not Set	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced.	Reset the date and time under Control Panel (Computer Setup can also be used). 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.
163-Time & Date Not Set	CMOS jumper may not be properly installed.	Check for proper placement of the CMOS jumper if applicable.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the F1 key to save the memory changes.

Control panel message	Description	Recommended action
164-MemorySize Error	Memory configuration incorrect.	<ol style="list-style-type: none"> 1. Run Computer Setup or Windows utilities. 2. Make sure the memory module(s) are installed properly. 3. If third-party memory has been added, test using HP-only memory. 4. Verify proper memory module type.
201-Memory Error	RAM failure.	<ol style="list-style-type: none"> 1. Ensure memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory module(s). 4. If the error persists after replacing memory modules, replace the system board.
213-Incompatible Memory Module in Memory Socket(s) X, X, ...	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	<ol style="list-style-type: none"> 1. Verify proper memory module type. 2. Try another memory socket. 3. Replace DIMM with a module conforming to the SPD standard.
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
219-ECC Memory Module Detected ECC Modules not supported on this Platform	Recently added memory module(s) support ECC memory error correction.	<ol style="list-style-type: none"> 1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.
301-Keyboard Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
303-Keyboard Controller Error	I/O board keyboard controller.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Replace the system board.

Control panel message	Description	Recommended action
304-Keyboard or System Unit Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect the keyboard with computer turned off. 2. Ensure that none of the keys are depressed. 3. Replace the keyboard. 4. Replace the system board.
501-Display Adapter Failure	Graphics display controller.	<ol style="list-style-type: none"> 1. Reseat the graphics card (if applicable). 2. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.) 3. Verify monitor is attached and turned on. 4. Replace the graphics card (if possible).
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.
511-CPU, CPUA, or CPUB Fan not Detected	CPU fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU fan. 2. Reseat fan cable. 3. Replace CPU fan.
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
513-Front Chassis fan not detected	Front chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat front chassis fan. 2. Reseat fan cable. 3. Replace front chassis fan.
514-CPU or Chassis Fan not Detected	CPU or chassis fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat CPU or chassis fan. 2. Reseat fan cable. 3. Replace CPU or chassis fan.
515-Power Supply fan not detected	Power supply fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat power supply fan. 2. Reseat fan cable. 3. Replace power supply fan.
660-Display cache is detected unreliable	Integrated graphics controller display cache is not working properly and will be disabled.	Replace system board if minimal graphics degrading is an issue.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.

Control panel message	Description	Recommended action
917-Front Audio Not Connected	Front audio connector has been detached or unseated from motherboard.	Reconnect or replace front audio cable.
918-Front USB Not Connected	Front USB harness has been detached or unseated from motherboard.	Reconnect or replace front USB harness.
1151-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to COM1.	<ol style="list-style-type: none"> 1. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.) 2. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1152-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to COM2.	<ol style="list-style-type: none"> 1. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.) 2. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1155-Serial Port Address Conflict Detected	Both external and internal serial ports are assigned to same IRQ.	<ol style="list-style-type: none"> 1. Clear CMOS. (See Appendix B, Password security and resetting CMOS on page 191.) 2. Reconfigure card resources and/or run Computer Setup or Windows utilities.
1720-SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"> 1. Determine if hard drive is giving correct error message. Enter Computer Setup and run the Drive Protection System test under Storage > DPS Self-test. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
1796-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 connectors must be used before SATA 2.	Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA 1, and SATA 2.
1797-SATA Drivelock is not supported in RAID mode.	Drivelock is enabled on one or more SATA hard drives, and they cannot be accessed while the system is configured for RAID mode.	Either remove the Drivelocked SATA device or disable the Drivelock feature. To disable the Drivelock feature, enter Computer Setup, change Storage > Storage Options > SATA Emulation to IDE , and select File > Save Changes and Exit . Reenter Computer Setup and select Security > Drivelock Security . For each listed Drivelock-capable SATA device, ensure Drivelock is Disabled . Lastly, change Storage > Storage Options > SATA Emulation back to RAID and select File > Save Changes and Exit .

Control panel message	Description	Recommended action
1801-Microcode Patch Error	Processor is not supported by ROM BIOS.	<ol style="list-style-type: none"> 1. Upgrade BIOS to proper version. 2. Change the processor.
2200-PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the computer, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2201-MEBx Module did not checksum correctly	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2202-PMM Deallocation Error during MEBx cleanup	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.
2203-Setup error during MEBx execution	MEBx selection or exit resulted in a setup failure.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. Unplug the power cord, re-seat the memory modules, and reboot the computer. 3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer. 4. If the error persists, replace the system board.

Control panel message	Description	Recommended action
2204-Inventory error during MEBx execution	BIOS information passed to the MEBx resulted in a failure.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
2205-Interface error during MEBx execution	MEBx operation experienced a hardware error during communication with ME.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
2211-Memory not configured correctly for proper MEBx execution.	DIMM1 or XMM1 is not installed.	Make sure there is a memory module in the black DIMM1 socket and that it is properly seated.
2212-USB Key Provisioning failure writing to device	USB device used for USB key provisioning will not allow BIOS to update provision file properly.	<ol style="list-style-type: none"> 1. Try a different USB key device for provisioning. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2217-ME Firmware Version request failure	ME firmware is not properly responding to BIOS query for version information.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2218-ME Firmware Version should be updated	ME firmware must be updated to match current functionality contained in the system BIOS.	<ol style="list-style-type: none"> 1. Update to the latest ME firmware version. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. 3. If the error still persists, replace the system board.
2219-USB Key Provisioning file has invalid header identifier	Provisioning file contained on the USB key has been corrupted or is not a valid version for the current ME firmware.	<ol style="list-style-type: none"> 1. Recreate the provisioning file using third party management console software. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. Otherwise, update the ME firmware version. 3. If the error still persists, replace the system board.

Control panel message	Description	Recommended action
2220-USB Key Provisioning file has mismatch version	Provisioning file contained on the USB key is not a valid version for the current ME firmware.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists and system BIOS has been recently updated, restore previous system BIOS version. Otherwise, update the ME firmware version. 3. If the error still persists, replace the system board.
2230-General error during MEBx execution	Error occurred during MEBx execution which fails into the "General" grouping. Status information displayed along with the error provides further clarity into the failure. MEBx handles transference of information between the system BIOS and ME firmware.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2231-ME error during MEBx execution	Error occurred during MEBx execution which fails into "ME" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2232-AMT error during MEBx execution	Error occurred during MEBx execution which fails into "AMT" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2233-HECI error during MEBx execution	Error occurred during MEBx execution which fails into "MEI or HECI" grouping.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2239-ME image lock failure	Special system configurations with reduced ME firmware image require BIOS control of ME firmware upgrading. A failure has occurred after the ME firmware update process in which the BIOS could not relock the ME firmware region.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
2240-ME image unlock failure	Special system configurations with reduced ME firmware image require BIOS control of ME firmware upgrading. A failure has occurred prior to the ME firmware update process in which the BIOS could not unlock the ME firmware region.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version and ME firmware version. 3. If the error still persists, replace the system board.
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.

Control panel message	Description	Recommended action
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	<ol style="list-style-type: none">1. Reconnect keyboard with computer turned off.2. Check connector for bent or missing pins.3. Ensure that none of the keys are depressed.4. Replace keyboard.
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

Interpreting POST diagnostic front panel LEDs

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

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

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

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

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

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

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded).	<ol style="list-style-type: none"> 1. Open the hood and ensure the 4 or 6-wire power supply cable is seated into the connector on the system board. 2. Check if a device is causing the problem by removing ALL attached devices. Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. 3. Replace the power supply. 4. Replace the system board.
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	<p>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.</p> <ol style="list-style-type: none"> 1. Reseat DIMMs. 2. Replace DIMMs one at a time to isolate the faulty module. 3. Replace third-party memory with HP memory. 4. Replace the system board.
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	<p>For systems with a graphics card:</p> <ol style="list-style-type: none"> 1. Reseat the graphics card. 2. Replace the graphics card. 3. Replace the system board. <p>For systems with integrated graphics, replace the system board.</p>
Red Power LED flashes seven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	7	System board failure (ROM detected failure prior to video).	Replace the system board.
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	<ol style="list-style-type: none"> 1. Reflash the system ROM with the latest BIOS image. 2. Replace the system board.

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes nine times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	9	System powers on but is unable to boot.	<ol style="list-style-type: none"> 1. Unplug the AC power cord from the computer, wait 30 seconds, then plug the power cord back in to the computer. 2. Replace the system board. 3. Replace the processor.
Red Power LED flashes eleven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	11	The current processor does not support a feature previously enabled on this system.	<ol style="list-style-type: none"> 1. Install a TXT capable processor. 2. Disable TXT in the Computer Setup (F10) utility. 3. Reinstall the original processor.
Red Power LED flashes eleven times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	12	MXM thermal shutdown.	<ol style="list-style-type: none"> 1. Clean the MXM graphics card heat sink. 2. Replace the MXM graphics card heat sink. 3. Replace the MXM graphic card.
System does not power on and LEDs are not flashing.	None	System unable to power on.	<p>Press and hold the power button for less than 4 seconds. If the hard drive LED turns white, the power button is working correctly. Try the following:</p> <ol style="list-style-type: none"> 1. Replace the system board. <p>OR</p> <p>Press and hold the power button for less than 4 seconds. If the hard drive LED does not turn on white then:</p> <ol style="list-style-type: none"> 1. Check that the unit is plugged into a working AC outlet. 2. Open rear cover and check that the power button cable is properly connected to the system board. 3. 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 board and cable. If the problem persists, replace the system board. 4. Replace the AC adapter.

11 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 [Computer Setup \(F10\) Utility on page 105](#) for information.

CAUTION: If you enable the stringent security feature in Computer Setup and you forget the setup password or the power-on password, the computer is inaccessible and can no longer be used.

Enabling the stringent password disables the ability to reset the password by moving the jumper on the system board.

If you lose or forget the password, the system board must be replaced. This scenario is not covered under warranty.

To prevent the computer from becoming permanently unusable, record your configured setup password or power-on password in a safe place away from your computer. Without these passwords, the computer cannot be unlocked.

Establishing a setup or power-on password

To establish the power-on or setup password features, complete the following steps:

1. Turn on or restart the computer.
2. As soon as the computer turns on, press the **Esc** key while “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
3. Press the **F10** key to enter Computer Setup.
4. To establish Setup password, select **Security > Setup Password** and follow the instructions.

– or –

To establish a Power-On password, select **Security > Power-On Password** and follow the instructions on the screen

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

Resetting the setup and power-on password

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

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

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

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

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

3. Remove the access panel.
4. Locate the header and jumper labeled PSWD.

 **NOTE:** The password jumper is blue 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). The IPSM can be downloaded from <http://www.hp.com/support>.

5. Remove the jumper.

6. Replace the jumper.
7. Replace the access panel.
8. Reconnect the external equipment.
9. Plug in the computer and turn on power. Allow the operating system to start. This clears the current passwords and disables the password features.
10. Establish the new passwords in Computer Setup. See [Computer Setup \(F10\) Utility on page 105](#) for information.

Clearing and resetting the CMOS

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

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

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

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

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

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

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

3. Remove the computer cover or access panel.

⚠ CAUTION: Pushing the CMOS button will reset CMOS values to factory defaults. It is important to back up the computer CMOS settings before resetting them in case they are needed later. Back up is easily done through Computer Setup. See [Computer Setup \(F10\) Utility on page 105](#) for information on backing up the CMOS settings.

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

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



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

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

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

For instructions on Computer Setup, see [Computer Setup \(F10\) Utility on page 105](#).

A Power cord set requirements

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

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

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

General requirements

The requirements listed below are applicable to all countries:

1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 or 250 volts AC, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 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.

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

Japanese power cord requirements

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

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

Country-specific requirements

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

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

1. The flexible cord must be Type HO5VV-F, 3-conductor, 0.75mm² 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.
3. Appliance coupler, flexible cord, and wall plug must bear a "T" mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 0.75 mm² conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

B Specifications

Dimensions (with stand)		
Height	16.8 in	42.6 cm
Width	20.5 in	52.2 cm
Depth	7.7 in	19.6 cm
<hr/>		
Approximate Weight (with stand)		
	19.5 lb – 22.2 lbs	8.83 kg – 10.08 kg
<hr/>		
Temperature Range		
Operating	50° to 95°F	10° to 35°C
Nonoperating	-22° to 140°F	-30° to 60°C
<hr/>		
Relative Humidity (non-condensing)		
	10-90% at ambient	10-90% at ambient
Operating	5-95% at ambient	5-95% at ambient
Non-operating		
<hr/>		
Maximum Altitude (unpressurized)		
Operating	0 - 10,000 ft	0 - 3,048 m
Non-operating	0 - 30,000 ft	9,144 m
<hr/>		
Power Supply		
Rated Voltage Range		100-240 V
Rated Line Frequency		50-60 Hz
<hr/>		
Max Operating Power		180 W

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