HP ZBook 17 G2 Mobile Workstation

Maintenance and Service Guide

Second Edition: July 2015

First Edition: September 2014

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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.

Important Notice about Customer Self-Repair Parts

⚠ **CAUTION:** The computer includes Customer Self-Repair parts and parts that should only be accessed by an authorized service provider. See Chapter 5, "Removal and replacement procedures for Customer Self-Repair parts," for details. Accessing parts described in Chapter 6, "Removal and replacement procedures for Authorized Service Provider only parts," can damage the computer or void the computer warranty.

Safety warning notice

⚠ **WARNING!** To reduce the possibility of heat-related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to contact the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user-accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950).

Table of contents

1 Product description

Category	Description
Product Name	HP ZBook 17 G2 Mobile Workstation
Processors	• Intel® Core™ i7-4940MX 3.10-GHz (SC turbo up to 4.00-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 57-W) • Intel Core i7-4910MQ 2.90-GHz (SC turbo up to 3.90-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 47-W) • Intel Core i7-4810MQ 2.80-GHz (SC turbo up to 3.80-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W) • Intel Core i7-4710MQ 2.50-GHz (SC turbo up to 3.50-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W) • Intel Core i7-4610M 3.00-GHz (SC turbo up to 3.70-GHz) processor (1600-MHz FSB, 4.0-MB L3 cache, dual core, 4 threads, 37-W) • Intel Core i5-4340M 2.90-GHz (SC turbo up to 3.60-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W) • Intel Core i5-4210M 2.60-GHz (SC turbo up to 3.20-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W)
Chipset	Mobile Intel QM87 chipset
Graphics	Support for the following graphics subsystem boards (all feature OpenGL driver support, hybrid (switchable) graphics, DisplayPort 1.2, up to 4 total displays (through APR), and NVIDIA Mosaic Technology): • NVIDIA Quadro K610M, N15E-Q2, 1 GB dedicated GDDR5 video memory • NVIDIA Quadro K3100M, N15E-Q1, 4 GB dedicated GDDR5 video memory • NVIDIA Quadro K4100M, N15E-Q3, 4 GB dedicated GDDR5 video memory • NVIDIA Quadro K5100M, N15E-Q5, 8 GB dedicated GDDR5 video memory
Display	All displays are 16:9 aspect ratio, 7.2-mm, wedge design, low-voltage differential signalling (LVDS) panels • 17.3-in, high definition plus (HD+), 1600×900, Anti-Glare (AG), light-emitting diode (LED), SVA, with or without webcam • 17.3-in, full high definition (FHD), 1920×1080, AG, LED, WVA, with or without webcam
Memory	4 customer-accessible/upgradable memory module slots
	Supports dual-channel memory
	Supports up to 32,768 MB of system RAM
	DDR3L 1600-MHz PC3-12800 SODIMMs
	Supports the following configurations: • 32768 MB total system memory (8192 x 4); only available on computer models equipped with a quad-core processor • 16384 MB total system memory (8192 x 2) • 16384 MB total system memory (4096 x 4); only available on computer models equipped with a quad-core processor

Category	Description
Memory *(continued)*	Supports the following configurations: • 12288 MB total system memory (8192 + 4096) • 8192 MB total system memory (8192 × 1) • 8192 MB total system memory (4096 × 2) • 4096 MB total system memory (4096 × 1) • 4096 MB total system memory (2048 × 2) • 2048 MB total system memory (2048 × 1)
Mini card SSD	128 GB
Primary storage	Supports **7.0 mm** (0.28 in) or **9.5 mm** (0.37 in), **6.35 cm** (2.5 in) hard drives and **6.35 cm** (2.5 in) solid-state drive for primary and secondary storage.
	Supports 3D DriveGuard
	Supports toolless remove mechanism
	Supports the following Serial ATA (SATA) drives: • 1-TB, 7200-RPM, SATA, 9.5-mm • 1-TB, 5400-RPM, SATA, 7.0-mm • 750-GB, 7200-RPM, SATA, 7.0-mm • 500-GB, 7200-RPM, SATA, 7.0-mm • 500-GB, 7200-RPM, self-encrypting drive (SED), 7.0-mm • 500-GB, 5400-RPM, SATA, FIPS, 7.0-mm
	Supports the following **6.35 cm** (2.5 in), solid-state drives (SSD): • 512 GB, SATA-3 • 256 GB, SATA-3, SED, Opal2 • 256 GB, SATA-3, SED, Opal1 • 256 GB, SATA-3 • 240 GB, SATA-3 • 180 GB, SATA-3 • 128 GB, SATA-3
Secondary storage	Supports **7.0 mm** (0.28 in) or **9.5 mm** (0.37 in), **6.35 cm** (2.5 in) hard drives and **6.35 cm** (2.5 in) solid-state drive for primary and secondary storage.
	Supports the following SATA drives: • 1-TB, 7200-RPM, SATA, 9.5-mm • 1-TB, 5400-RPM, SATA, 7.0-mm • 750-GB, 7200-RPM, SATA, 7.0-mm • 500-GB, 7200-RPM, SATA, 7.0-mm • 500-GB, 7200-RPM, SED, 7.0-mm • 500-GB, 5400-RPM, SATA, FIPS, 7.0-mm
	Supports the following **6.35 cm** (2.5 in), solid-state drives (SSD):

Category	Description
Secondary storage *(continued)*	• 512 GB, SATA-3 • 256 GB, SATA-3, SED, Opal2 • 256 GB, SATA-3, SED, Opal1 • 256 GB, SATA-3 • 240 GB, SATA-3 • 180 GB, SATA-3 • 128 GB, SATA-3
Upgrade bay	Support for RAID 0/1/5
	Supports **7.0 mm** (0.28 in) or **9.5 mm** (0.37 in) hard drives: • 750 GB, 5400 rpm • 512 GB SATA III SSD • 256 GB SATA III SSD, SED
	Supports the following **9.5 mm** (0.37 in) SATA optical drives: • Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive • Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive • DVD±RW SuperMulti Double-Layer Drive
	Supports no drive option
Audio and video	Integrated dual-array microphone
	High-definition (HD) audio with DTS Studio Sound
	2 stereo speakers
	Integrated 720p HD webcam
	Supports no camera option
Ethernet	Intel I217-LM Gigabit Network Connection
	Power optimizer support
	Intel Stable Image Platform Program (SIPP)
	Ethernet cable not included
Wireless	**Integrated wireless local area network (WLAN) options by way of the following wireless modules:** • WLAN Intel Dual Band Wireless-AC 7260 802.11 ac 2×2 WiFi + Bluetooth 4.0 Combo Adapter • WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter • WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter • WLAN Intel Dual Band Wireless-N 7260NB 802.11 a/b/g/n 2×2 WiFi adapter
	WLAN antennas (2) built into display assembly
	Support for no WLAN option
	Integrated wireless wide area network (WWAN) options by way of the following wireless modules: (not available on computer models with Dream Color displays) • HP lt4211 LTE/EV-DO/HSPA+ 4G Module

Category	Description
Wireless *(continued)*	• HP lt4112 LTE/HSPA+ Mobile Broadband Module • HP hs3110 HSPA+ Mobile Broadband Module
	WWAN antennas (2) built into display assembly
	Support for no WWAN option
	Security provided by subscriber identify module (SIM) card
External media card	One ExpressCard slot, 54 mm
	Integrated SD UHS-II flash media slot
	Supports next generation SD (Secure Digital). Backward compatible with SDHC, SDXC.
Ports	Multi-pin AC port Combo mic-in/Stereo headphone jack DisplayPort 1.2 Mini DisplayPort with pass through DP 1.2 support Docking connector Secondary battery connector RJ-45 (Ethernet, includes link and activity lights) USB 3.0 (3) USB 2.0 (1) USB 3.0 charging port (1) VGA (Dsub 15-pin) supporting 1920 × 1200 external resolution at 75 GHz (hot plug/unplug with auto-detect)
Docking	Supports the following docking stations: • HP Docking Station • HP Advanced Docking Station
Keyboard/pointing devices	Full sized, backlit or non-backlit, chiclet (island-style) keyboard with separate numeric keypad:
	Spill-resistant with drain
	Dura Keys
	Touchpad includes DuraPad coating; glass with chemical etched surface; image sensor
	Gestures enabled by default - 2 finger scrolling, 2 finger zoom (pinch)
	Touchpad supports two-way scroll with legend
	Taps enabled as default
Power requirements	Supports the following AC adapters with localized cable plug support: • 230W HP Smart AC adapter • 200W HP Smart AC adapter • 3-wire plug (with ground pin)
	Support for the following batteries:

Category	Description
Power requirements *(continued)*	• 8-cell, 2.80-AHr, 83-WHr, Li-ion battery • 8-cell, 2.80-AHr, 75-WHr, Li-ion battery
Security	Integrated fingerprint reader Integrated Smart Card reader Preboot authentication (password, Smart Card) Supports security lock Trusted platform module (TPM) v.1.2 and TPM enhanced drive lock
Operating system	**Preinstalled operating systems** **Windows 10:** • Windows 10 Home 64-bit Chinese Market CPPP • Windows 10 Home 64-bit High-End • Windows 10 Home 64-bit High-End Single Language • Windows 10 Home 64-bit High-End Chinese Market (supported in the People's Republic of China) • Windows 10 Professional 64-bit • Windows 10 Professional 64-bit downgradable to Windows 7 64-bit **Windows 8** • Windows 8.1 Professional 64-bit DPK with Windows 7 Professional 64-bit image • Windows 8.1 Professional 64-bit DPK with Windows 7 Professional 64-bit image MSNA • Windows 8.1 Professional 64-bit • Windows 8.1 Professional 64-bit MSNA • Windows 8.1 Professional 64-bit for Education • Windows 8.1 Emerging Markets 64-bit (not available on computer models equipped with an Intel i7 processor and more than 4.0-GB system memory or on computer models equipped with an FHD display assembly and more than or equal to 8.0-GB system memory) • Windows 8.1 Multilanguage 64-bit (not available on computer models equipped with an Intel i7 processor and more than 4.0-GB system memory or on computer models equipped with an FHD display assembly and more than or equal to 8.0-GB system memory) • Windows 8.1 Chinese 64-bit (supported only in the People's Republic of China; not available on computer models equipped with an Intel i7 processor and more than 4.0-GB system memory or on computer models equipped with an FHD display assembly and more than or equal to 8.0-GB system memory) • Windows 8.1 Chinese 64-bit CPPP (supported only in the People's Republic of China) • Windows 8.1 Emerging Marketing 64-bit Home High End (available only on computer models equipped with an Intel i7 processor and more than 4.0-GB system memory or on computer models equipped with an FHD display assembly and more than or equal to 8.0-GB system memory) • Windows 8.1 Multilanguage 64-bit Home High End (available only on computer models equipped with an Intel i7 processor and more than 4.0-GB system memory or on computer models equipped with an FHD display assembly and more than or equal to 8.0-GB system memory) **Windows 7** • Windows 7 Professional 64-bit • Windows 7 Professional 64-bit MSNA

Category	Description
Operating system *(continued)*	**Preinstalled operating systems** *(continued)* **Non-Windows operating systems** • FreeDOS 2.0 • Novell™: SuSE Linux™ – SLED 11, 64-bit, SP2 (not available in models with WWAN or Blu ray drives) **Restore media:** DRDVD: • DRDVD Windows 10 (available with any Windows 10 loc, required with any Windows 10 Professional downgrade OS) • DRDVD Windows 8.1 (available with any Windows 8.1 loc, required with any Windows 8.1 Professional downgrade OS) • DRDVD Windows 7, Service Pack 1 (available with any Windows 10, Windows 8.1, or Windows 7 Professional downgrade loc) • SRDVD (available with Unbuntu Linux operating system) OSDVD: • Windows 8.1 64-bit (for service only) • Windows 8.1 Country-specific 64-bit (for service only) • Windows 8.1 Emerging Market 64-bit (for service only) • Windows 8.1 Professional 64-bit (only available and required with Windows 8.1 downgrade operating system, not available in Asia Pacific countries or regions and the People's Republic of China) • Windows 7 Professional 64-bit, Service Pack 1 (available with any Windows 10, Windows 8.1, or Windows 7 Professional Downgrade, except in Asia Pacific countries or regions and the People's Republic of China) **Certified:** Microsoft WHQL **Web-only support:** • Windows 10 Enterprise • Windows 8.1 Enterprise 64-bit • Windows 7 Ultimate 64-bit, Service Pack 1 • Windows 7 Ultimate 32-bit, Service Pack 1 • Windows 7 Enterprise 64-bit, Service Pack 1 • Windows 7 Enterprise 32-bit, Service Pack 1 • Windows 7 Professional 32-bit, Service Pack 1
Serviceability	End-user replaceable parts: • Memory module • Optical drive • Hard drive/SSD • Battery • AC adapter
Serviceability *(continued)*	• Keyboard • WLAN module

Category	Description
	• WWAN module • mSATA

2 External component identification

Display

Component		Description
(1)	WLAN antennas (2)* (select models only)	Send and receive wireless signals to communicate with WLANs.
(2)	WWAN antennas (2)* (select Windows models only)	Send and receive wireless signals to communicate with WWANs.
(3)	Internal microphones (2)	Record sound.
(4)	Webcam light (select models only)	On: The webcam is in use.
(5)	Webcam (select models only)	Records video and captures still photographs. For information on using the webcam: • **Windows 10** – Type `camera` in the taskbar search box, and then select **Camera**. • **Windows 8** – Access HP Support Assistant. To access HP Support Assistant on the Start screen, select the **HP Support Assistant** app. • **Windows 7** – Select **Start > All Programs > Communication and Chat > HP WebCam**.
(6)	Internal display switch	Turns off the display or initiates Sleep (Windows)/Suspend (Linux) if the display is closed while the power is on.

Component	Description
	NOTE: The display switch is not visible on the outside of the computer.

*The antennas are not visible on the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions.

For wireless regulatory notices, see the section of the *Regulatory, Safety, and Environmental Notices* that applies to your country or region.

To access this guide:

Windows 10:

1. Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

   – or –

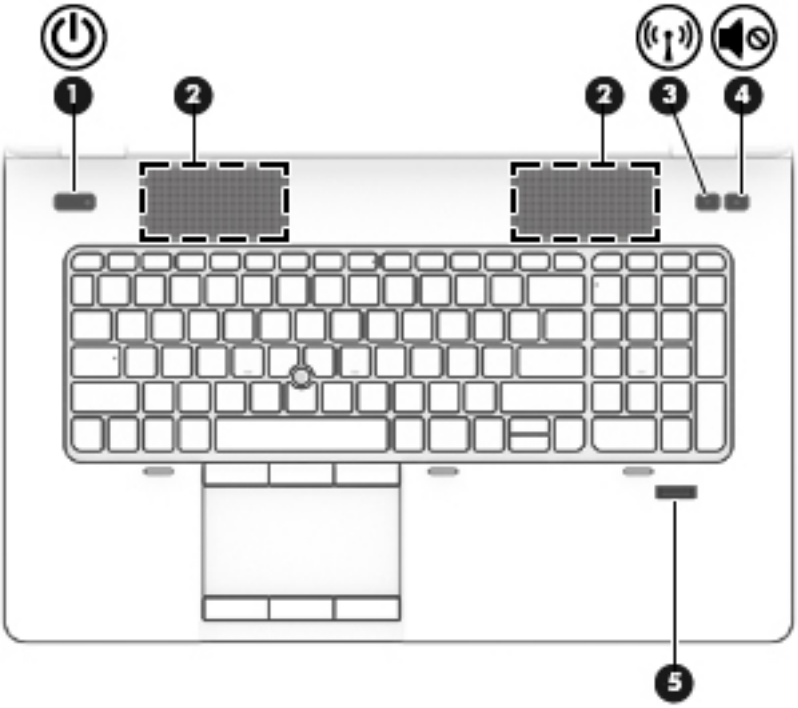
   Click the question mark icon in the taskbar.

2. Select **My PC**, select the **Specifications** tab, and then select **User Guides**.

Windows 8 or **Windows 7:**

- Select the **HP Support Assistant** app on the Start screen, select **My computer**, and then select **User guides**.

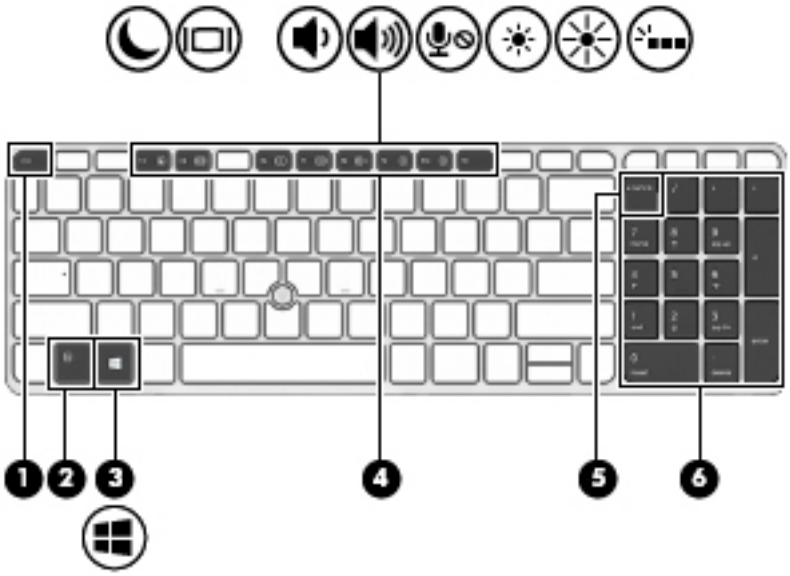
Buttons and speakers



Component		Description
(1)	Power button	• When the computer is off, press the button to turn on the computer. • When the computer is on, press the button briefly to initiate Sleep (Windows)/Suspend (Linux).

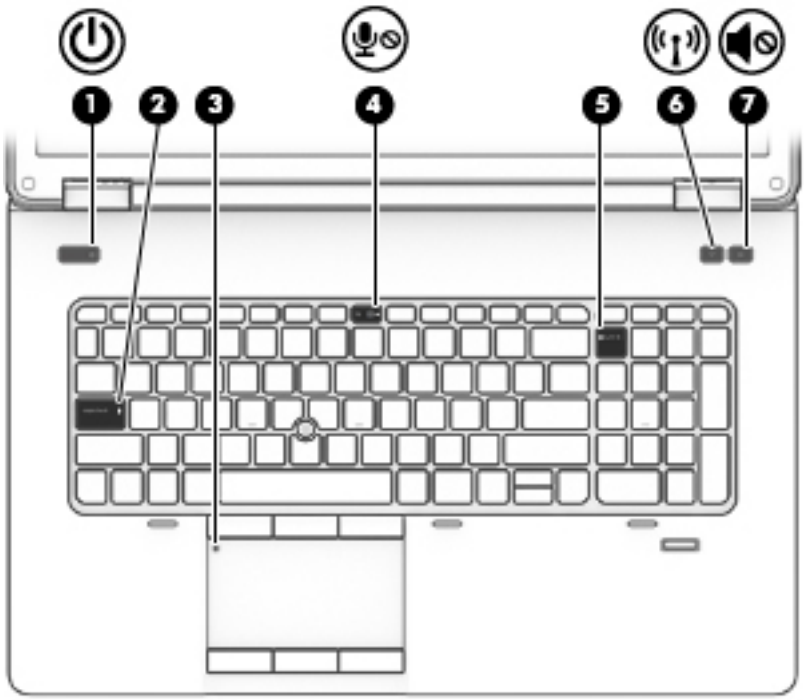
Component		Description
		• When the computer is in the Sleep state, press the button briefly to exit Sleep (Windows)/Suspend (Linux). • When the computer is in Hibernation, press the button briefly to exit Hibernation. **CAUTION:** Pressing and holding down the power button will result in the loss of unsaved information. If the computer has stopped responding and operating system shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer. To learn more about your power settings: **Windows 10:** Type `power` in the taskbar search box, and then select **Power and sleep settings**. – or – Right-click the **Start** button, and then select **Power Options**. **Windows 8:** See your power options. From the Start screen, type `power`, select **Settings**, and then select **Power Options**. **Windows 7:** See your power options. Select **Start > Control Panel > System and Settings > Power Options**. **Linux:** 1. Select **Computer > Control Center**. 2. In the left pane, click **System**, and then click **Power Management** in the right pane.
(2)	Speakers (2)	Produce sound.
(3)	Wireless button	Turns the wireless feature on or off but does not establish a wireless connection.
(4)	Volume mute button	Mutes and restores speaker sound.
(5)	Fingerprint reader	Allows a fingerprint logon to the operating system, instead of a password logon.

Keys



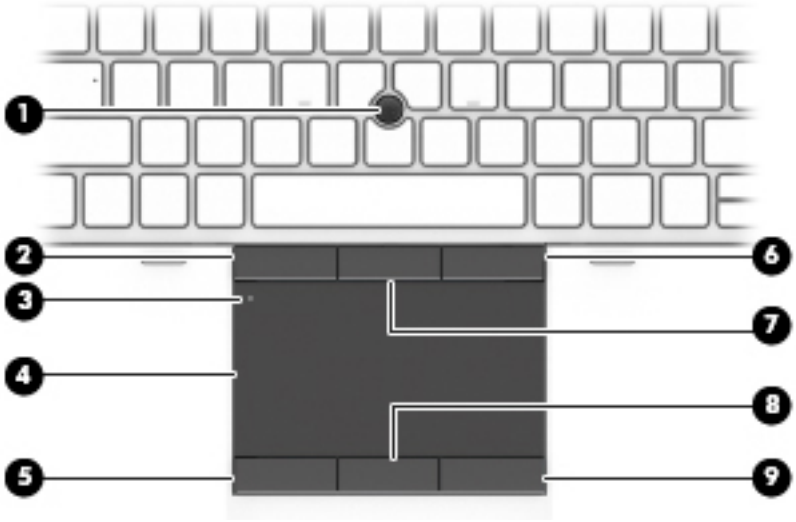
Component		Description
(1)	esc key **NOTE:** Windows models only.	Displays system information when pressed in combination with the fn key.
(2)	fn key	Executes frequently used system functions when pressed in combination with a function key, the num lk key, the esc key, or the b key.
(3)	Windows key **NOTE:** Windows 10 models only.	Opens the **Start** menu. **NOTE:** Pressing the Windows key again will close the **Start** menu.
(3)	Windows button **NOTE:** Windows 8 and Windows 7 models only.	**Windows 8:** Returns you to the **Start** screen from an open app or the Windows desktop. **NOTE:** Pressing the Windows button again will return you to the previous screen. **Windows 7:** Displays the Windows **Start** menu.
(4)	Function keys	Execute frequently used system functions when pressed in combination with the fn key.
(5)	num lk key	**Windows 10 and Windows 8:** Turns the embedded numeric keypad on and off when pressed in combination with the fn key. Alternates between the navigational and numeric functions on the integrated numeric keypad. **Windows 7 and Linux:** Alternates between the navigational and numeric functions on the integrated numeric keypad.
(6)	Integrated numeric keypad	When num lk has been enabled, it can be used like an external numeric keypad.

Lights



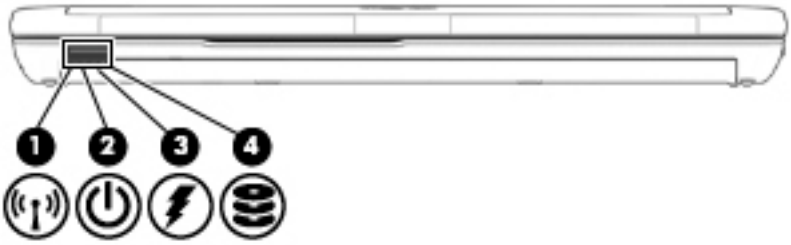
Component		Description
(1)	Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state (Windows) or Suspend state (Linux). • Off: The computer is off.
(2)	Caps lock light	On: Caps lock is on.
(3)	TouchPad light	• Amber: The TouchPad is off. • Off: The TouchPad is on.
(4)	Microphone mute light	• Amber: microphone sound is off. • Off: microphone sound is on.
(5)	Num lock light	On: Num lock is on.
(6)	Wireless light	• White: An integrated wireless device, such as a WLAN device and/or a Bluetooth device, is on. • Amber: All wireless devices are off.
(7)	Mute light	• Amber: Computer sound is off. • Off: Computer sound is on.

TouchPad



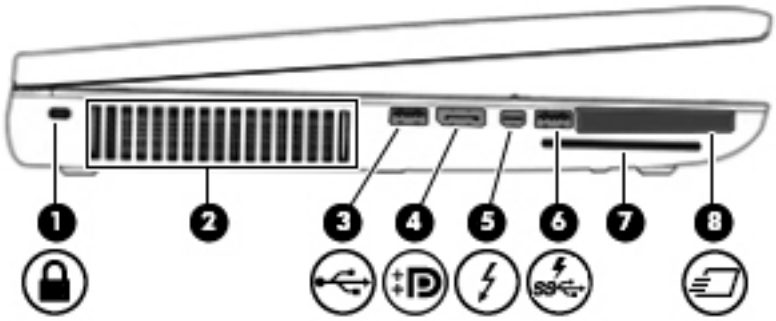
Component		Description
(1)	Pointing stick	Moves the pointer and selects or activates items on the screen.
(2)	Left pointing stick button	Functions like the left button on an external mouse.
(3)	Touchpad on/off button	Turns the Touchpad on and off.
(4)	Touchpad zone	Moves the pointer and selects or activates items on the screen.
(5)	Left TouchPad button	Functions like the left button on an external mouse.
(6)	Right pointing stick button	Functions like the right button on an external mouse.
(7)	Center pointing stick button	Functions like the center button on an external mouse.
(8)	Center TouchPad button	Functions like the center button on an external mouse
(9)	Right TouchPad button	Functions like the right button on an external mouse.

Front



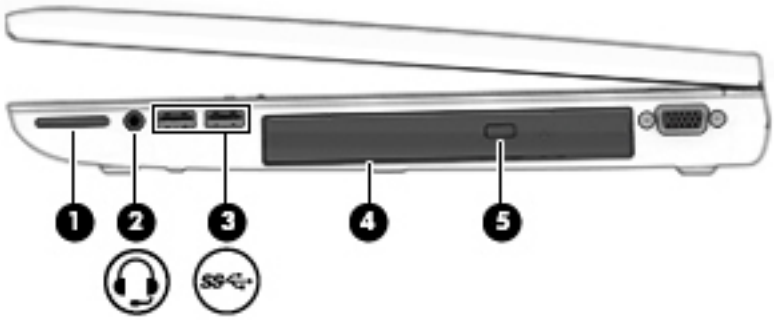
Component		Description
(1)	Wireless light	• White: An integrated device, such as a WLAN device and/or a Bluetooth device, is on. • Amber: All wireless devices are off.
(2)	Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state. • Off: The computer is off.
(3)	AC adapter/Battery light	• White: The computer is connected to external power and the battery is charged from 90 to 99 percent. • Amber: The computer is connected to external power and the battery is charged from 0 to 90 percent. • Blinking amber: A battery that is the only available power source has reached a low battery level. When the battery reaches a critical battery level, the battery light begins blinking rapidly. • Off: The battery is fully charged.
(4)	Hard drive light	• Blinking white: The hard drive is being accessed. • Amber: HP 3D DriveGuard has temporarily parked the hard drive.

Left



Component		Description
(1)	Security cable slot	Attaches an optional security cable to the computer. **NOTE:** The security cable is designed to act as a deterrent, but it may not prevent the computer from being mishandled or stolen.
(2)	Vent	Enables airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3)	USB 2.0 port	Connects an optional USB device.
(4)	DisplayPort	Connects an optional digital display device, such as a high-performance monitor or projector.
(5)	Thunderbolt port **NOTE:** Windows models only.	Connects an optional high-resolution display device or a high-performance data device. **NOTE:** Thunderbolt is new technology. Install all the latest drivers for your Thunderbolt device before connecting the device to the Thunderbolt port. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see https://thunderbolttechnology.net/products.
(6)	USB 3.0 charging port	Connects optional USB 3.0 devices and provides enhanced USB power performance. The USB charging port can also charge select models of cell phones and MP3 players, even when the computer is off.
(7)	Smart card	Support optional smart cards.
(8)	ExpressCard slot or smart card reader (depending on the configuration)	Supports optional ExpressCards or smart cards.

Right

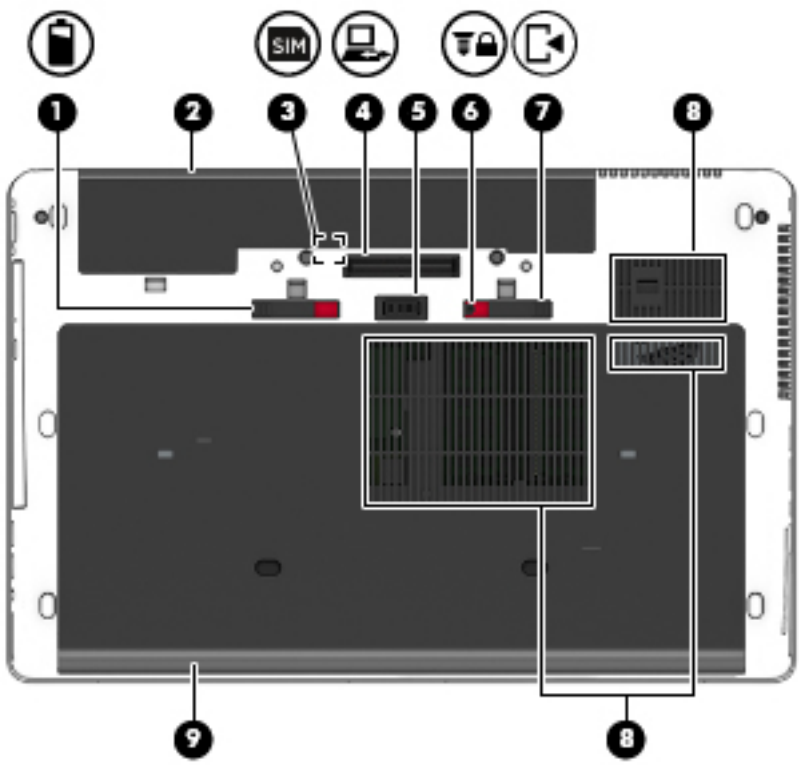


Component		Description
(1)	Memory card reader	Reads data from and writes data to memory cards such as Secure Digital (SD).
(2)	Audio-out (headphone) jack/Audio-in (microphone) jack	Produces sound when connected to optional powered stereo speakers, headphones, earbuds, a headset, or television audio. Also connects an optional headset microphone. **WARNING!** To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, see the *Regulatory, Safety, and Environmental Notices*. To access the user guides in Windows 8, select the **HP Support Assistant** app on the Start screen, select **My computer**, and then select **User guides**. To access the user guides in Windows 7, select the **HP Support Assistant** app on the Start screen, select **My computer**, and then select **User guides**. **NOTE:** When a device is connected to the jack, the computer speakers are disabled. **NOTE:** Be sure that the device cable has a 4-conductor connector that supports both audio-out (headphone) and audio-in (microphone).
(3)	USB 3.0 ports (2)	Connect optional USB 3.0 devices and provide enhanced USB power performance.
(4)	Optical drive (select models only)	Reads and/or writes, depending on your computer model, to an optical disc.
(5)	Optical drive eject button (select models only)	Releases the optical drive disc tray.

Rear

Component		Description
(1)	RJ-45 (network) jack	Connects a network cable.
(2)	Vents (2)	Enable airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3)	Power connector	Connects an AC adapter.
(4)	AC adapter lights	• White: The computer is connected to external power. • Off: The computer is not connected to external power.

Bottom



Component		Description
(1)	Battery release latch	Releases the battery.
(2)	Battery bay	Holds the battery.
(3)	SIM slot **NOTE:** Select Windows models only.	Supports a wireless subscriber identity module (SIM). The SIM slot is located inside the battery bay.
(4)	Docking connector	Connects an optional docking device.
(5)	Accessory battery connector	Connects an optional accessory battery.
(6)	Service cover release lock	Locks service cover.
(7)	Service cover release latch	Releases the service cover on the computer.
(8)	Vents (3)	Enable airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(9)	Service cover	Provides access to the hard drive bay, the WLAN module slot, the WWAN module slot, and the memory module slots.

Component	Description
	CAUTION: To prevent an unresponsive system, replace the wireless module only with a wireless module authorized for use in the computer by the governmental agency that regulates wireless devices in your country or region. If you replace the module and then receive a warning message, remove the module to restore computer functionality, and then contact support through HP Support Assistant. To access HP Support Assistant in Windows 8, on the Start screen, select the **HP Support Assistant** app. To access Help and Support in Windows 7, select **Start > Help and Support**.

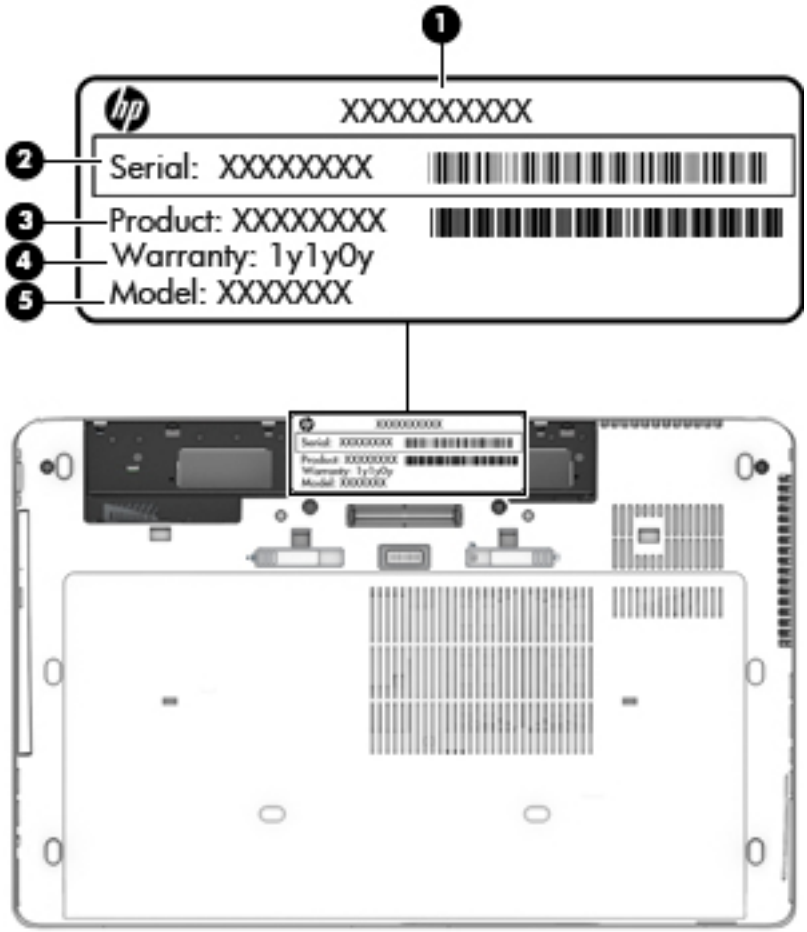
3 Illustrated parts catalog

NOTE: HP continually improves and changes product parts. For complete and current information on supported parts for your computer, go to http://partsurfer.hp.com, select your country or region, and then follow the on-screen instructions.

Service tag

When ordering parts or requesting information, provide the computer serial number and model number provided on the service tag.

NOTE: The computer service labels will resemble one of the examples shown in this section. Refer to the illustration that most closely matches the service label on the computer.



Item	Component	Description
(1)	Product name	This is the product name affixed to the front of the computer.
(2)	Serial number (s/n)	This is an alphanumeric identifier that is unique to each product.

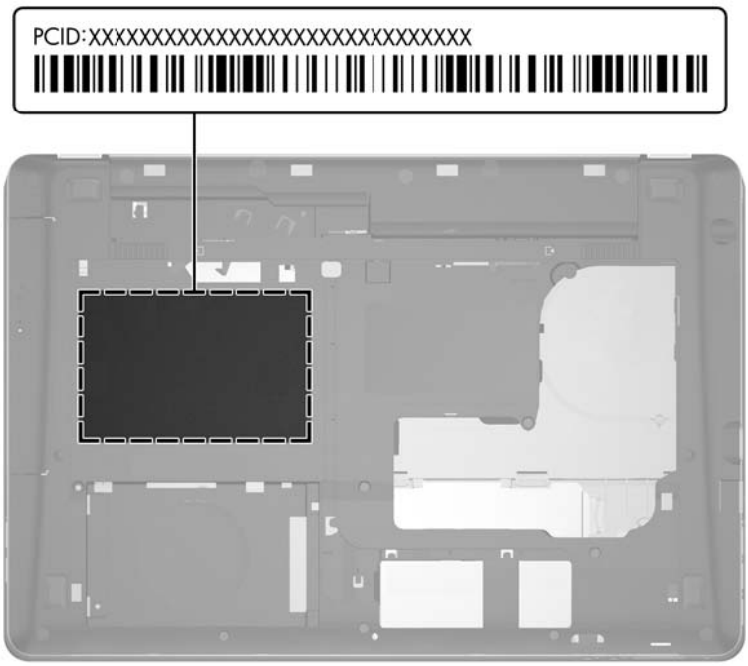
Item	Component	Description
(3)	Product number (p/n)	This number provides specific information about the product's hardware components. The part number helps a service technician determine what components and parts are needed.
(4)	Warranty period	This number describes the duration of the warranty period for the computer.
(5)	Model number (select models only)	This is the alphanumeric identifier needed to locate documents, drivers, and support for the computer.

PCID label

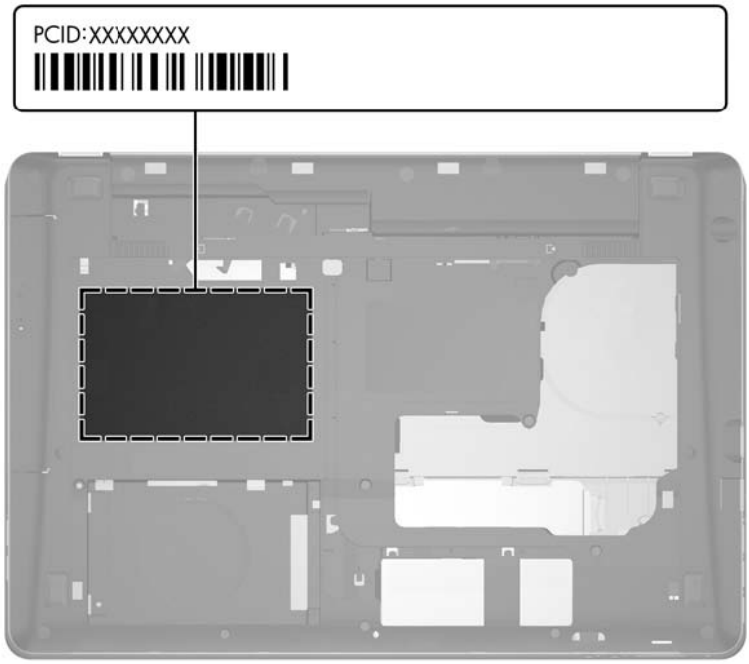
The PCID label provides the information required to properly reset the notebook firmware (BIOS) back to factory shipped specifications when replacing the system board. The label may have a different number of characters depending on the operating system on the computer.

NOTE: Computer details may vary from images.

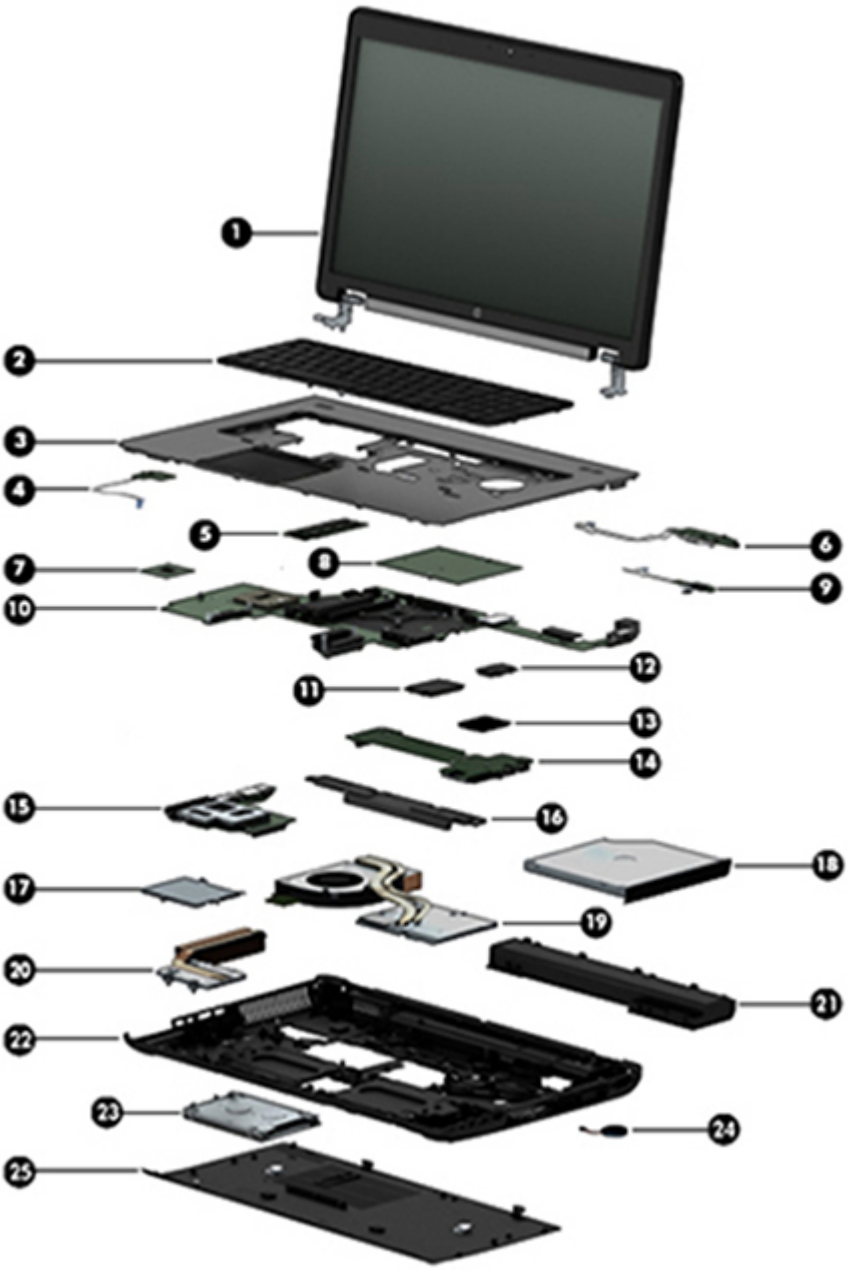
Windows 8 models



Non-Windows 8 models



Computer major components



Item	Description	Spare part number
(1)	**Display assembly** (includes microphone and wireless antenna cables):	
	17.3-in, AG, FHD, LED, UWVA display assembly for use on computer models equipped with a webcam	784207-001
	17.3-in, AG, FHD, LED, UWVA display assembly for use on computer models not equipped with a webcam	784206-001
	NOTE: See Display assembly components on page 29 for more display component information and spare part numbers.	

Item	Description	Spare part number
(2)	**Keyboard** with backlight, pointing stick, and TouchPad (includes backlight, keyboard, pointing stick, and TouchPad cables):	
	For use in Belgium	733688-A41
	For use in Brazil	733688-201
	For use in Bulgaria	733688-261
	For use in Canada	733688-DB1
	For use in the Czech Republic and Slovakia	733688-FL1
	For use in Denmark	733688-081
	For use in France	733688-051
	For use in Germany	733688-041
	For use in Greece	733688-151
	For use in Hungary	733688-211
	For use in Iceland	733688-DD1
	For use in India	733688-D61
	For use in Israel	733688-BB1
	For use in Italy	733688-061
	For use in Japan	733688-291
	For use in Latin America	733688-161
	For use in the Netherlands	733688-B31
	For use in Northwest Africa	733688-FP1
	For use in Norway	733688-091
	For use in Portugal	733688-131
	For use in Romania	733688-271
	For use in Russia	733688-251
	For use in Saudi Arabia	733688-171
	For use in Slovenia	733688-BA1
	For use in South Korea	733688-AD1
	For use in Spain	733688-071
	For use in Sweden and Finland	733688-B71
	For use in Switzerland	733688-BG1
	For use in Taiwan	733688-AB1
	For use in Thailand	733688-281
	For use in Turkey	733688-141
	For use in the United Kingdom and Singapore	733688-031
	For use in the United States	733688-001

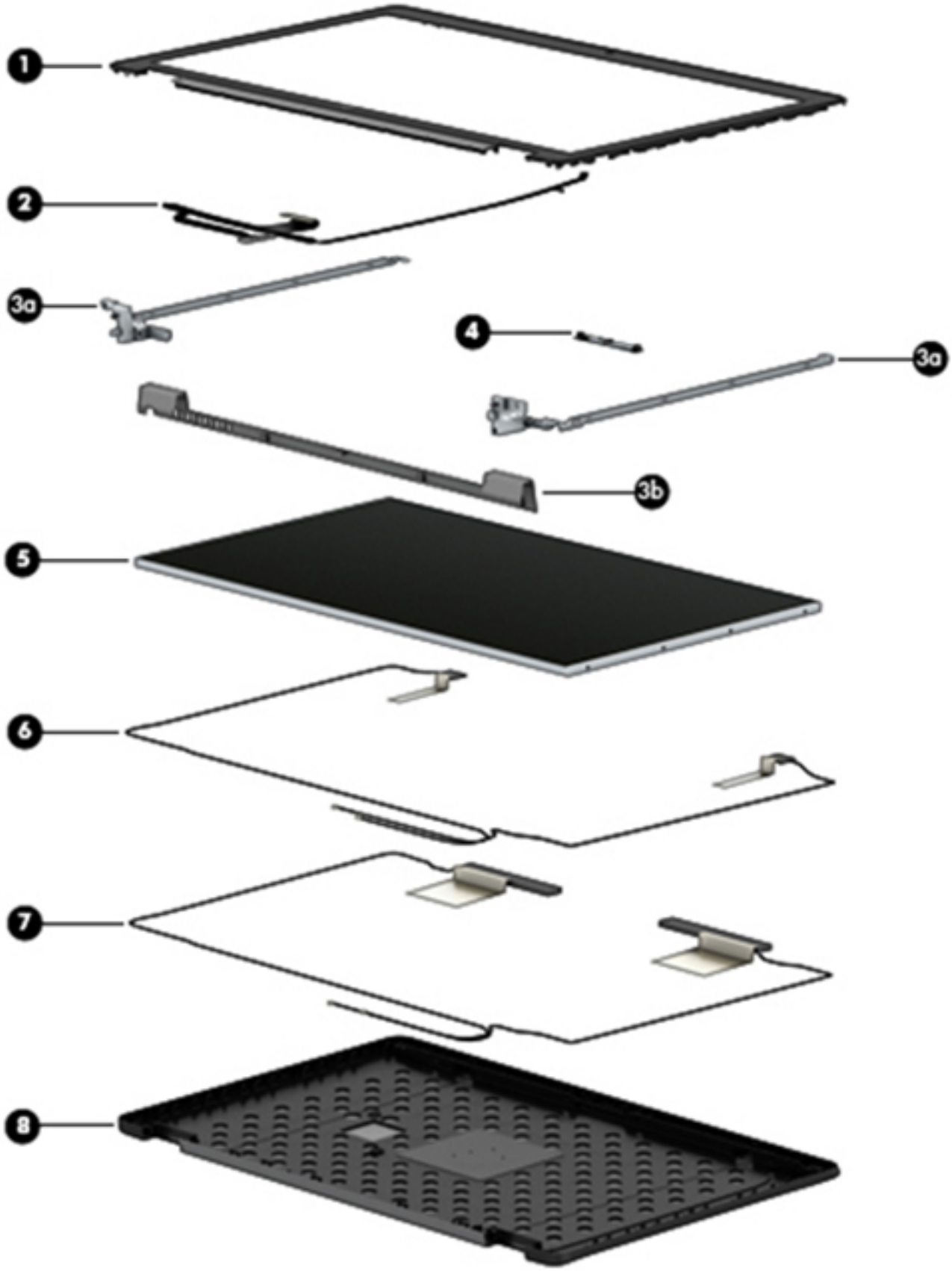
Item	Description	Spare part number
	Keyboard with pointing stick and TouchPad (includes keyboard, pointing stick, and TouchPad cables):	
	For use in Belgium	745663-A41
	For use in Brazil	745663-201
	For use in Bulgaria	745663-261
	For use in Canada	745663-DB1
	For use in the Czech Republic and Slovakia	745663-FL1
	For use in Denmark	745663-081
	For use in France	745663-051
	For use in Germany	745663-041
	For use in Greece	745663-151
	For use in Hungary	745663-211
	For use in Iceland	745663-DD1
	For use in India	745663-D61
	For use in Israel	745663-BB1
	For use in Italy	745663-061
	For use in Japan	745663-291
	For use in Latin America	745663-161
	For use in the Netherlands	745663-B31
	For use in Northwest Africa	745663-FP1
	For use in Norway	745663-091
	For use in Portugal	745663-131
	For use in Romania	745663-271
	For use in Russia	745663-251
	For use in Saudi Arabia	745663-171
	For use in Slovenia	745663-BA1
	For use in South Korea	745663-AD1
	For use in Spain	745663-071
	For use in Sweden and Finland	745663-B71
	For use in Switzerland	745663-BG1
	For use in Taiwan	745663-AB1
	For use in Thailand	745663-281
	For use in Turkey	745663-141
	For use in Turkey, F-type keyboard	745663-541
	For use in the United Kingdom and Singapore	745663-031

Item	Description	Spare part number
	For use in the United States	745663-001
(3)	**Top cover**	735587-001
(4)	**Power button board** (includes cable)	733636-001
(5)	**Memory modules** (PC3L-12800, 1600-MHz, DDR3L):	
	8.0-GB	693374-001
	4.0-GB	691740-001
(6)	**Fingerprint reader board** (includes cable) **NOTE:** The fingerprint reader board spare part kit does not include the fingerprint reader board bracket. The fingerprint reader board bracket is included in the Bracket Kit, spare part number 733637-001.	737730-001
(7)	**Processor** (includes replacement thermal material):	
	Intel Core i7-4940MX 3.10-GHz (SC turbo up to 4.00-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 57-W)	778694-001
	Intel Core i7-4910MQ 2.90-GHz (SC turbo up to 3.90-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 47-W)	778693-001
	Intel Core i7-4810MQ 2.80-GHz (SC turbo up to 3.80-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W)	778692-001
	Intel Core i7-4710MQ 2.50-GHz (SC turbo up to 3.50-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W)	773212-001
	Intel Core i7-4610M 3.00-GHz (SC turbo up to 3.70-GHz) processor (1600-MHz FSB, 4.0-MB L3 cache, dual core, 4 threads, 37-W)	765141-001
	Intel Core i5-4340M 2.90-GHz (SC turbo up to 3.60-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W)	765142-001
	Intel Core i5-4210M 2.60-GHz (SC turbo up to 3.20-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W)	768420-001
(8)	**Graphics board** (includes replacement thermal material):	
	AMD FirePro W6170M	786689-001
	NVIDIA K1100M N15P-Q1	785214-001
	NVIDIA Quadro K5100M	781701-001
	NVIDIA Quadro K4100M	781702-001
	NVIDIA Quadro K3100M	781703-001
	NVIDIA Quadro K2200M	786688-001
(9)	**Multifunction board** (includes LED light pipe)	733639-001
(10)	**System board** (includes replacement thermal material):	
	For use only on computer models equipped with a quad core processor and the Windows 10 or Windows 8 Professional operating systems	784213-601
	For use only on computer models equipped with a quad core processor and the Windows 10 or Windows 8 Standard operating systems	784213-501
	For use only on computer models equipped with a quad core processor and a non-Windows 10 or non-Windows 8 operating systems	784213-001

Item	Description	Spare part number
	For use only on computer models equipped with a dual core processor and the Windows 10 or Windows 8 Professional operating systems	784212-601
	For use only on computer models equipped with a dual core processor and the Windows 10 or Windows 8 Standard operating systems	784212-501
	For use only on computer models equipped with a dual core processor and a non-Windows 10 or non-Windows 8 operating systems	784212-001
(11)	**Solid-state drive:**	
	512 GB, SATA-3	795969-001
	512 GB, SATA-3, SED, Opal2	815841-001
	512 GB, Z Turbo Drive PCIe	815840-001
	256 GB, SATA-3	795966-001
	256 GB, M2, PCIe-2×2	794731-001
	256 GB, SATA-3, Locked	806895-001
	256 GB, SATA-3, SED, Opal2	795968-001
	256 GB, Opal2, Locked	830147-001
	240 GB, SATA-3	795965-001
	180 GB, SATA-3	795964-001
	128 GB, SATA-3	795963-001
	128 GB, Z Turbo Drive PCIe	815839-001
(12)	**WWAN module:**	
	HP lt4211 LTE/EV-DO/HSPA+ 4G Module	793116-001
	HP lt4112 LTE/HSPA+ Mobile Broadband Module	740011-001
	HP hs3110 HSPA+ Mobile Broadband Module	748599-001
(13)	**WLAN module:**	
	WLAN Intel Dual Band Wireless-AC 7260 802.11 ac 2×2 WiFi + Bluetooth 4.0 Combo Adapter	710663-001
	WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter	717379-001
	WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter	747833-001
	WLAN Intel Dual Band Wireless-N 7260NB 802.11 a/b/g/n 2×2 WiFi adapter	717380-001
(14)	**Audio/USB board** (includes audio jack and USB port)	737732-001
(15)	**ExpressCard assembly**	794578-001
(16)	**Speakers** (include left and right speakers and cables)	733638-001
(17)	**Smart Card reader** (includes cable)	742159-001
(18)	**Optical drive** for use in Upgrade Bay (includes bezel and bracket):	
	Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	735600-001

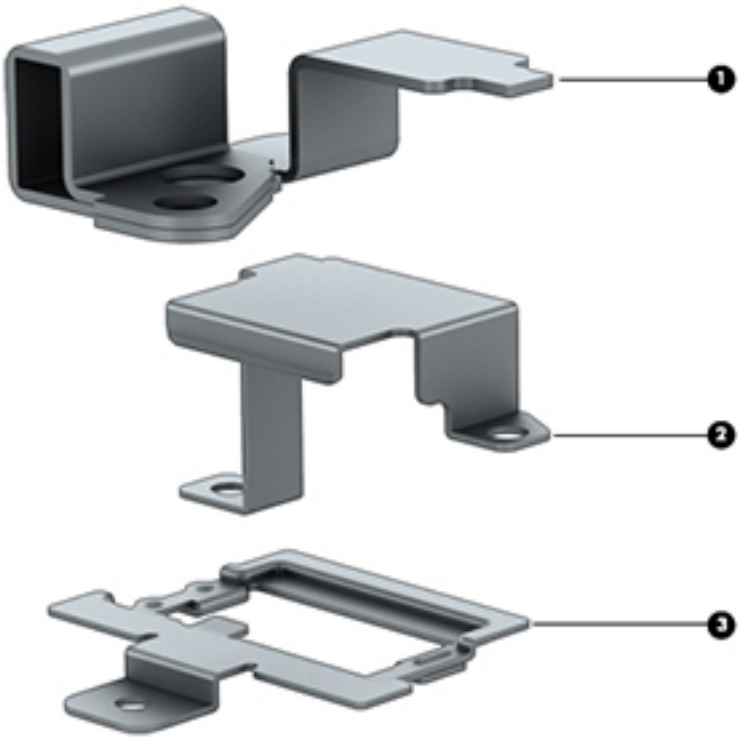
Item	Description	Spare part number
	Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	735599-001
	DVD±RW SuperMulti Double-Layer Drive	735602-001
	Upgrade Bay hard drive carrier	734298-001
(19)	**Graphics subsystem heat sink** (includes replacement thermal material):	
	For use only on computer models equipped with the NVIDIA Quadro K5100M graphics board	735373-001
	For use only on computer models equipped with the NVIDIA Quadro K4100M or K3100M graphics board	735374-001
	For use only on computer models equipped with the MXM-Emerald graphics board	786687-001
	For use only on computer models equipped with the MXM-N15P-15 graphics board	786686-001
	For use only on computer models equipped with the MXM-N15P-Q1 graphics board (includes fan)	768730-001
(20)	**Processor heat sink** (includes replacement thermal material):	
	For use only on computer models equipped with a quad core processor	735372-001
	For use only on computer models equipped with a dual core processor	735371-001
(21)	**Battery:**	
	8-cell, 2.80-AHr, 83-WHr, Li-ion	708456-001
	8-cell, 2.80-AHr, 75-WHr, Li-ion	708455-001
(22)	**Base enclosure** (includes latches)	785211-001
(23)	**Hard drive:** **NOTE:** The hard drive spare part kit does not include the hard drive bracket, cover, or screws. The hard drive bracket, cover, and screws are included in the Hard Drive Hardware Kit, spare part number 734280-001.	
	1-TB, 7200-RPM, SATA, 9.5-mm	766644-001
	1-TB, 5400-RPM, SATA, 7.0-mm	778192-001
	750-GB, 7200-RPM, SATA, 7.0-mm	778191-001
	500-GB, 7200-RPM, SATA, 7.0-mm	703267-001
	500-GB, 7200-RPM, SED, 7.0-mm	703268-001
	500-GB, 5400-RPM, SATA, FIPS, 7.0-mm	730946-001
(24)	**RTC battery** (includes cable and double-sided adhesive)	734300-001
(25)	**Service cover**	733635-001

Display assembly components



Item	Description	Spare part number
(1)	**Display bezel:**	
	For use only on computer models equipped with a webcam	733633-001
	For use only on computer models not equipped a webcam	735589-001
(2)	**Display panel cable**: Included in the Cable Kit, spare part number 785212-001 (includes webcam module cable)	
	Display Hinge Kit, includes:	733634-001
(3a)	Left and right hinges	
(3b)	Hinge cover	
	Hinge brackets (not illustrated)	
(4)	**Webcam/microphone module**	784208-001
	Microphone module (not illustrated)	735370-001
(5)	**Display panel:**	
	17.3-in, FHD, AG, LED, WVA display panel	735367-001
	17.3-in, HD, AG, LED, WVA display panel	735366-001
	Display Panel Support Kit, includes:	784211-001
(6)	WLAN antenna cables and transceivers	
(7)	WWAN antenna cables and transceivers	
(8)	Display enclosure (also available using spare part number 740477-001)	
	Low-voltage differential signalling board (not illustrated)	741282-001

Bracket Kit

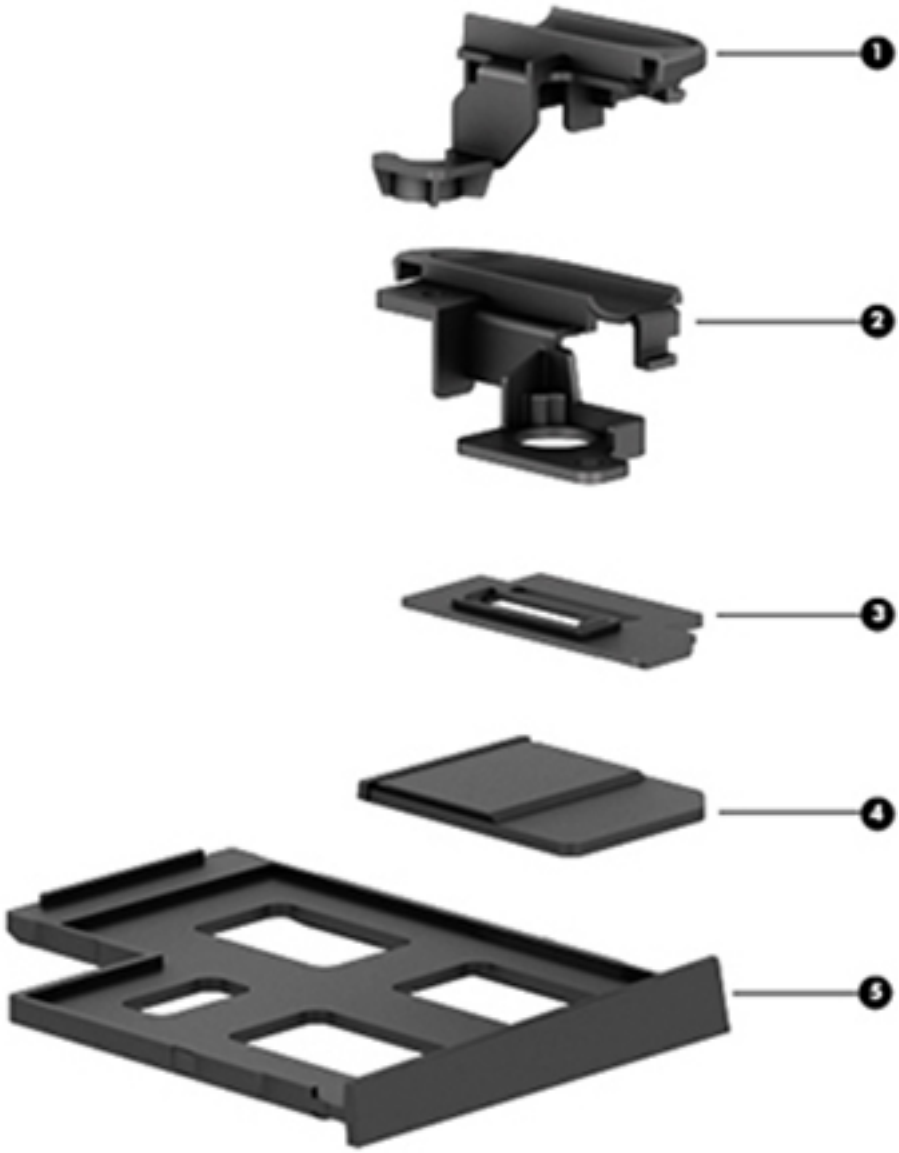


Item	Description	Spare part number
	Bracket Kit	737734-001
(1)	Power connector/security lock bracket	
(2)	RJ-45 bracket	
(3)	Fingerprint reader bracket	

Cable Kit

Item	Description	Spare part number
	Cable Kit	785212-001
(1)	Display panel cable (includes webcam/microphone module cable)	
(2)	Low-voltage differential signalling board cable	
(3)	Power connector cable	

Plastics Kit



Item	Description	Spare part number
	Plastics Kit	733637-001
(1)	Rear corner cover/right	
(2)	Rear corner cover/left	
(3)	Fingerprint reader bezel	
(4)	SD Card reader bezel	
(5)	ExpressCard bezel	
	Fingerprint reader cover (not illustrated)	

Mass storage devices

Item	Description	Spare part number
(1)	**Solid-state drive:**	
	512 GB, SATA-3	795969-001
	256 GB, SATA-3, SED, Opal2	795968-001
	256 GB, SATA-3, SED, Opal1	795967-001
	256 GB, SATA-3	795966-001
	240 GB, SATA-3	795965-001
	180 GB, SATA-3	795964-001
	128 GB, SATA-3	795963-001
(2a)	**Hard Drive Hardware Kit** (includes hard drive bracket, cover, and screws)	734280-001
(2b)	**Hard drive:** **NOTE:** The hard drive spare part kit does not include the hard drive bracket, cover, or screws. The hard drive bracket, cover, and screws are included in the Hard Drive Hardware Kit, spare part number 734280-001.	
	1-TB, 7200-RPM, SATA, 9.5-mm	766644-001
	1-TB, 5400-RPM, SATA, 7.0-mm	778192-001
	750-GB, 7200-RPM, SATA, 7.0-mm	778191-001
	500-GB, 7200-RPM, SATA, 7.0-mm	703267-001

Item	Description	Spare part number
	500-GB, 7200-RPM, SED, 7.0-mm	703268-001
	500-GB, 5400-RPM, SATA, FIPS, 7.0-mm	730946-001
(3)	**Optical drive** for use in Upgrade Bay (includes bezel and bracket):	
	Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	735600-001
	Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	735599-001
	DVD±RW SuperMulti Double-Layer Drive	735602-001
	Upgrade Bay hard drive carrier (not illustrated)	734298-001

Miscellaneous parts

Description	Spare part number
AC Adapter:	
230-W HP Smart AC adapter (PFC)	693706-001
200-W HP Smart AC adapter (PFC)	693708-001
HP professional slim top-load carrying case	703888-001
HP DisplayPort-to-HDMI adapter	749288-001
Upgrade Bay hard drive carrier	734298-001
HP cable lock for use on the docking station	575921-001
HP Ultraslim keyed cable lock	703372-001
HP USB laser mouse	674318-001
Power cord (3-pin, black,1.83-m):	
For use in Argentina	491683-D01
For use in Australia	491683-011
For use in Belgium	491683-A41
For use in Brazil	491683-202
For use in the Czech Republic and Slovakia	491683-221
For use in Denmark	491683-081
For use in Europe	491683-021
For use in France	491683-051
For use in Germany	491683-041
For use in Greece	491683-151
For use in India	491683-D61
For use in Israel	491683-BB1
For use in Italy	491683-061

Description	Spare part number
For use in Japan	491683-291
For use in North America	491683-001
For use in the Netherlands	491683-B91
For use in North Africa	491683-DE1
For use in Norway	491683-091
For use in Portugal	491683-131
For use in the People's Republic of China	491683-AA1
For use in Saudi Arabia	491683-171
For use in South Korea	491683-AD1
For use in Sweden and Finland	491683-101
For use in Switzerland	491683-111
For use in Taiwan	491683-AB1
For use in Thailand	491683-201
For use in Turkey	491683-141
For use in the United Kingdom	491683-031
Screw Kit	741619-001

4 Removal and replacement procedures preliminary requirements

Tools required

You will need the following tools to complete the removal and replacement procedures:

- Flat-bladed screwdriver
- Magnetic screwdriver
- Phillips P0 and P1 screwdrivers
- Torx T8 screwdriver
- 5.0 mm hex socket driver

Service considerations

The following sections include some of the considerations that you must keep in mind during disassembly and assembly procedures.

NOTE: As you remove each subassembly from the computer, place the subassembly (and all accompanying screws) away from the work area to prevent damage.

Plastic parts

Using excessive force during disassembly and reassembly can damage plastic parts. Use care when handling the plastic parts. Apply pressure only at the points designated in the maintenance instructions.

Cables and and pointing stick connectors

CAUTION: When servicing the computer, be sure that cables are placed in their proper locations during the reassembly process. Improper cable placement can damage the computer.

Cables must be handled with extreme care to avoid damage. Apply only the tension required to unseat or seat the cables during removal and insertion. Handle cables by the connector whenever possible. In all cases, avoid bending, twisting, or tearing cables. Be sure that cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced. Handle flex cables with extreme care; these cables tear easily.

Drive handling

⚠ **CAUTION:** Drives are fragile components that must be handled with care. To prevent damage to the computer, damage to a drive, or loss of information, observe these precautions:

Before removing or inserting a hard drive, shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.

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

Before removing a diskette drive or optical drive, be sure that a diskette or disc is not in the drive and be sure that the optical drive tray is closed.

Handle drives on surfaces covered with at least one inch of shock-proof foam.

Avoid dropping drives from any height onto any surface.

After removing a hard drive, an optical drive, or a diskette drive, place it in a static-proof bag.

Avoid exposing a hard drive to products that have magnetic fields, such as monitors or speakers.

Avoid exposing a drive to temperature extremes or liquids.

If a drive must be mailed, place the drive in a bubble pack mailer or other suitable form of protective packaging and label the package “FRAGILE.”

Grounding guidelines

Electrostatic discharge damage

Electronic components are sensitive to electrostatic discharge (ESD). Circuitry design and structure determine the degree of sensitivity. Networks built into many integrated and pointing stick circuits provide some protection, but in many cases, ESD contains enough power to alter device parameters or melt silicon junctions.

A discharge of static electricity from a finger or other conductor can destroy static-sensitive devices or microcircuitry. Even if the spark is neither felt nor heard, damage may have occurred.

An electronic device exposed to ESD may not be affected at all and and pointing stick can work perfectly throughout a normal cycle. Or the device may function normally for a while, then degrade in the internal layers, reducing its life expectancy.

⚠ **CAUTION:** To prevent damage to the computer when you are removing or installing internal components, observe these precautions:

Keep components in their electrostatic-safe containers until you area ready to install them.

Use nonmagnetic tools.

Before touching an electronic component, discharge static electricity by using the guidelines described in this section.

Avoid touching pins, leads, and pointing stick circuitry. Handle electronic components as little as possible.

If you remove a component, place it in an electrostatic-safe container.

The following table shows how humidity affects the electrostatic voltage levels generated by different activities.

⚠ **CAUTION:** A product can be degraded by as little as 700 V.

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

Packaging and transporting guidelines

Follow these grounding guidelines when packaging and transporting equipment:

- To avoid hand and pointing stick contact, transport products in static-safe tubes, bags, or boxes.
- Protect ESD-sensitive parts and assemblies with conductive or approved and pointing stick containers or packaging.
- Keep ESD-sensitive parts in their containers until the parts arrive at static-free workstations.
- Place items on a grounded surface before removing items from their containers.
- Always be properly grounded when touching a component or assembly.
- Store reusable ESD-sensitive parts from assemblies in protective packaging or nonconductive foam.
- Use transporters and pointing stick conveyors made of antistatic belts and roller bushings. Be sure that mechanized equipment used for moving materials is wired to ground and that proper materials are selected to avoid static charging. When grounding is not possible, use an ionizer to dissipate electric charges.

Workstation guidelines

Follow these grounding workstation guidelines:

- Cover the workstation with approved static-shielding material.
- Use a wrist strap connected to a properly grounded work surface and use properly grounded tools and equipment.
- Use conductive field service tools, such as cutters, screwdrivers, and vacuums.
- When fixtures must directly contact dissipative surfaces, use fixtures made only of static-safe materials.
- Keep the work area free of non conductive materials, such as ordinary plastic assembly aids and Styrofoam.
- Handle ESD-sensitive components, parts, and assemblies by the case or PCM laminate. Handle these items only at static-free workstations.

- Avoid and pointing stick contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting or removing connectors or test equipment.

Equipment guidelines

Grounding equipment must include either a wrist strap or a foot strap at a grounded workstation.

- When seated, wear a wrist strap connected to a grounded system. Wrist straps are flexible straps with a minimum of one megohm ±10% resistance in the ground and pointing stick cords. To provide proper ground, wear a strap snugly against the skin at all times. On grounded mats with banana-plug connectors, use alligator clips to connect a wrist strap.
- When standing, use foot straps and a grounded floor mat. Foot straps (heel, toe, or 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 foot straps on both feet with a minimum of one megohm resistance between the operator and ground. To be effective, the conductive strips must be worn in contact with the skin.

The following grounding equipment is recommended to prevent electrostatic damage:

- Antistatic tape
- Antistatic smocks, aprons, and sleeve protectors
- Conductive bins and other assembly or soldering aids
- Nonconductive foam
- Conductive tabletop workstations with ground and pointing stick cords of one megohm resistance
- Static-dissipative tables or floor mats with hard ties to the ground
- Field service kits
- Static awareness labels
- Material-handling packages
- Non conductive plastic bags, tubes, or boxes
- Metal tote boxes
- Electrostatic voltage levels and protective materials

The following table lists the shielding protection provided by antistatic bags and floor mats.

Material	Use	Voltage protection level
Antistatic plastic	Bags	1,500 V
Carbon-loaded plastic	Floor mats	7,500 V
Metallized laminate	Floor mats	5,000 V

5 Removal and replacement procedures for Customer Self-Repair parts

⚠ **CAUTION:** The Customer Self-Repair program is not available in all locations. Installing a part not supported by the Customer Self-Repair program may void your warranty. Check your warranty to determine if Customer Self-Repair is supported in your location.

Component replacement procedures

This chapter provides removal and replacement procedures for Customer Self-Repair parts.

There are as many as 29 screws that must be removed, replaced, or loosened when servicing Customer Self-Repair parts. Make special note of each screw size and location during removal and replacement.

Battery

Description	Spare part number
8-cell, 2.80-AHr, 83-WHr, Li-ion battery	708456-001
8-cell, 2.80-AHr, 75-WHr, Li-ion battery	708455-001

Before disassembling the computer, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.

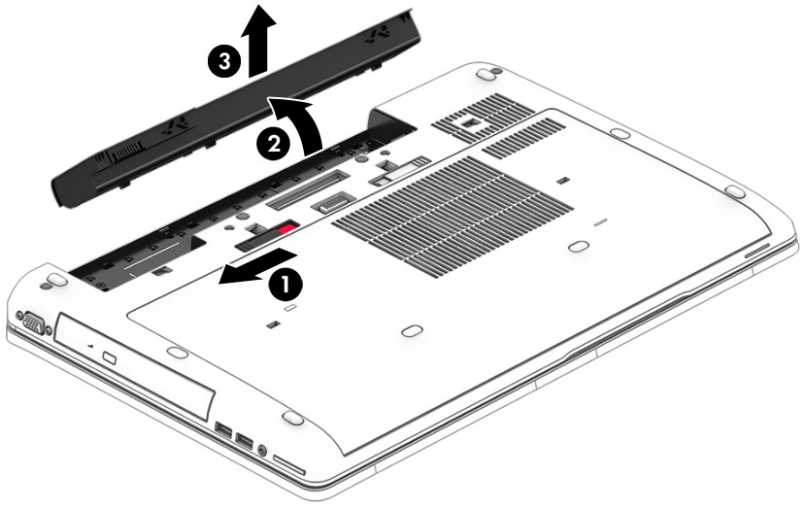
⚠ **WARNING!** To reduce potential safety issues, use only the battery provided with the tablet, a replacement battery provided by HP, or a compatible battery purchased from HP.

⚠ **CAUTION:** Removing a battery that is the sole power source for the tablet can cause loss of information. To prevent loss of information, save your work or shut down the tablet through Windows before removing the battery.

Remove the battery:

1. Position the computer upside down on a flat surface, with the front toward you.
2. Slide the battery release latch **(1)** to release the battery.

3. Rotate the battery at an angle **(2)**, and then remove the battery from the computer **(3)**.



Install the battery by inserting it into the battery bay until you hear a click.

SIM card

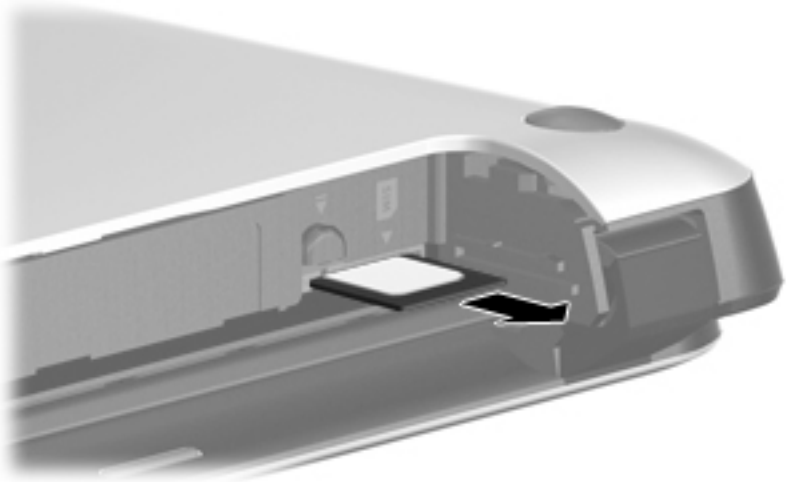
A SIM card slot is located in the battery bay.

Before removing the SIM card, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).

Remove the SIM card:

▲ To remove a SIM card, press in on the SIM card, and then remove it from the slot.



Install the SIM card by inserting it into the SIM card slot until you hear a click.

Service cover

Description	Spare part number
Service cover	733635-001

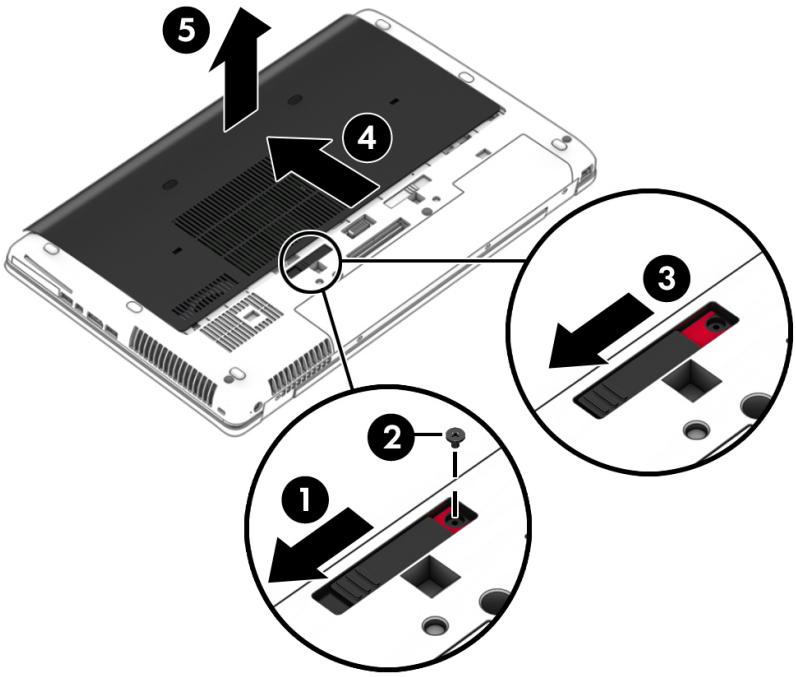
Before removing the service cover, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).

Remove the service cover:

1. Position the computer upside down on a flat surface with the front toward you.
2. With the battery bay toward you, slide the service cover release latch to the left **(1)**, and then remove the optional screw **(2)**.
3. Slide the service cover release latch to the left again **(3)**, slide the service cover forward **(4)**, and then lift to remove the service cover **(5)**.

NOTE: If you do not want to use the optional screw, you can store it inside the service cover.



Reverse this procedure to install the service cover.

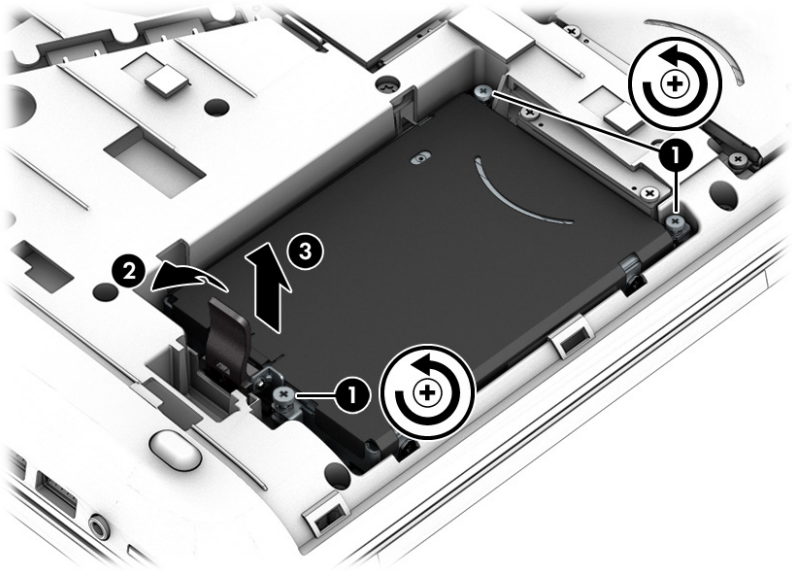
Hard drives, primary and secondary

NOTE: The hard drive spare part kit does not include the hard drive bracket, cover, or screws. The hard drive bracket, cover, and screws are included in the Hard Drive Hardware Kit, spare part number 734280-001.

Description	Spare part number
1-TB, 7200-RPM, SATA, 9.5-mm	766644-001
1-TB, 5400-RPM, SATA, 7.0-mm	778192-001
750-GB, 7200-RPM, SATA, 7.0-mm	778191-001
500-GB, 7200-RPM, SATA, 7.0-mm	703267-001
500-GB, 7200-RPM, SED, 7.0-mm	703268-001
500-GB, 5400-RPM, SATA, FIPS, 7.0-mm	730946-001

Before removing the primary hard drive, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Position the computer upside down on a flat surface.
5. Remove the battery (see Battery on page 41).
6. Remove the service cover (see Service cover on page 43).
7. Loosen the 3 captive hard drive screws **(1)** that secure the hard drive to the computer.
8. Release the hard drive latch **(2)**.
9. Grasp the latch and remove the hard drive **(3)** from the hard drive bay.

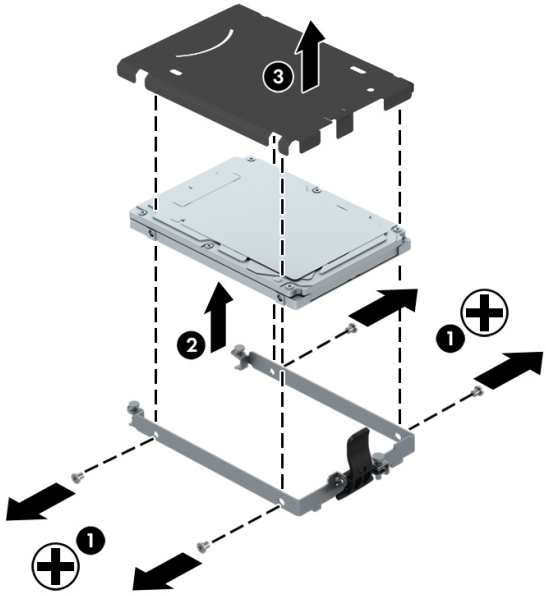


10. If it is necessary to remove the hard drive cover and bracket, follow these steps:

    a. Remove the four Phillips M3.0×3.0 screws **(1)** that secure the hard drive cover and bracket to the hard drive.

    b. Remove the hard drive and cover from the bracket **(2)**.

    c. Remove the hard drive cover from the hard drive **(3)**.



Reverse this procedure to reassemble and install the hard drive.

Solid-state drive

Description	Spare part number
512 GB, SATA-3	795969-001
512 GB, SATA-3, SED, Opal2	815841-001
512 GB, Z Turbo Drive PCIe	815840-001
256 GB, SATA-3	795966-001
256 GB, M2, PCIe-2×2	794731-001
256 GB, SATA-3, Locked	806895-001
256 GB, SATA-3, SED, Opal2	795968-001
256 GB, Opal2, Locked	830147-001
240 GB, SATA-3	795965-001
180 GB, SATA-3	795964-001
128 GB, SATA-3	795963-001
128 GB, Z Turbo Drive PCIe	815839-001

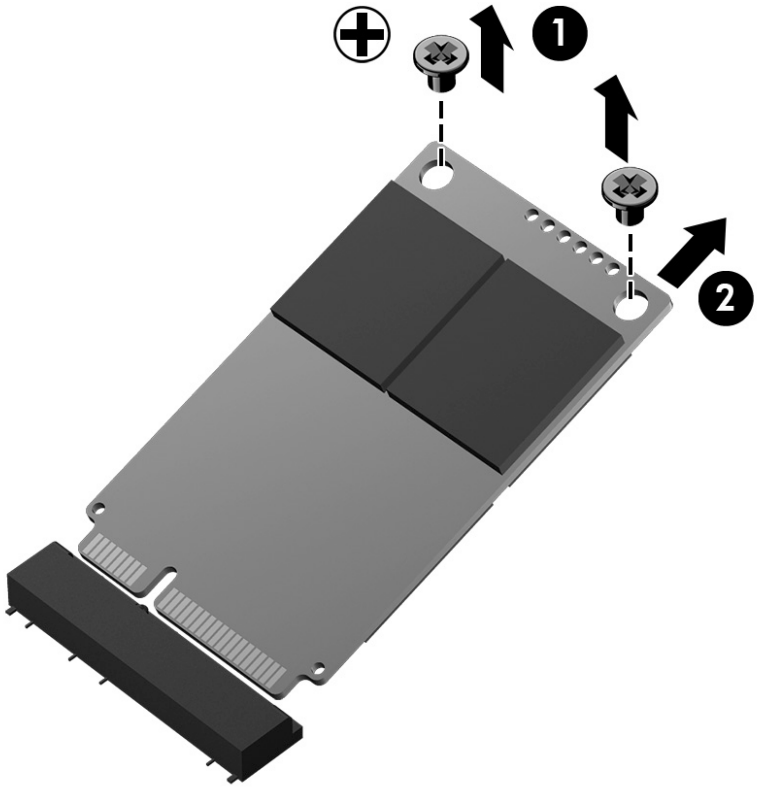
Before removing the solid-state drive, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove the solid-state drive:

1. Remove the two Phillips PM2.0×3.0 screws **(1)** that secure the solid-state drive to the computer. (The solid-state drive tilts up.)

2. Slide the solid-state drive away to remove it from the socket **(2)**.



Reverse this procedure to install the solid-state drive.

WLAN module

Description	Spare part number
WLAN Intel Dual Band Wireless-AC 7260 802.11 ac 2×2 WiFi + Bluetooth 4.0 Combo Adapter	710663-001
WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter	717379-001
WLAN Intel Dual Band Wireless-N 7260AN 802.11 a/b/g/n 2×2 WiFi + Bluetooth 4.0 Combo Adapter	747833-001
WLAN Intel Dual Band Wireless-N 7260NB 802.11 a/b/g/n 2×2 WiFi adapter	717380-001

⚠ **CAUTION:** The WLAN module and the WWAN module are not interchangeable.

To prevent an unresponsive system, replace the wireless module only with a wireless module authorized for use in the computer by the governmental agency that regulates wireless devices in your country or region. If you replace the module and then receive a warning message, remove the module to restore device functionality, and then contact technical support.

Before removing the WLAN module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.

3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

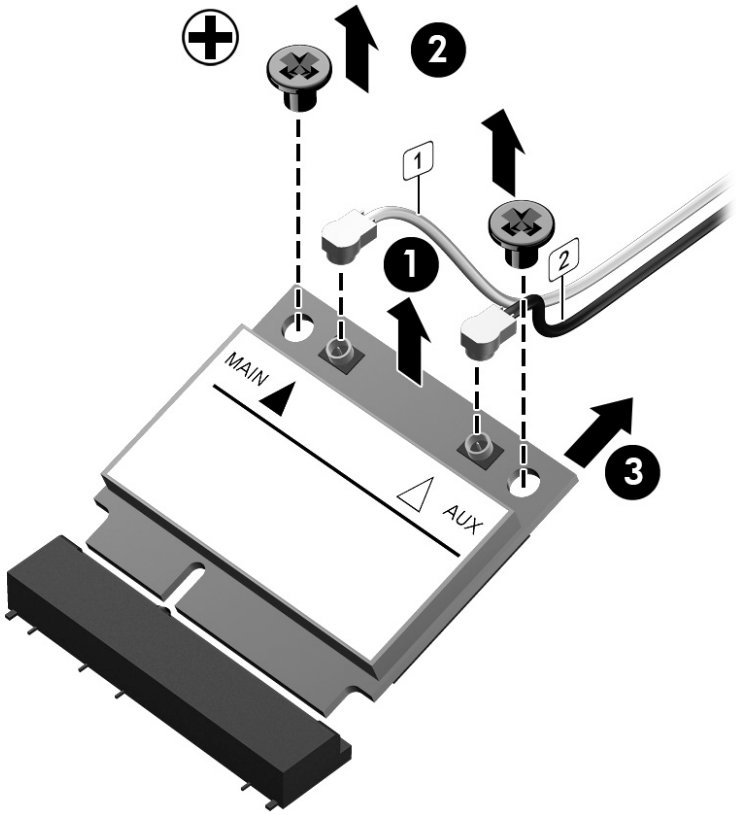
Remove the WLAN module:

1. Position the computer with the front toward you.
2. Disconnect the WLAN antenna cables **(1)** from the terminals on the WLAN module.

NOTE: The WLAN antenna cable labeled "1/Main" connects to the WLAN module "1/Main" terminal. The WLAN antenna cable labeled "2/Aux" connects to the WLAN module "2/Aux" terminal.

3. Remove the two Phillips PM2.0×3.0 screws **(2)** that secure the WLAN module to the system board. (The WLAN module tilts up.)
4. Remove the WLAN module **(3)** by pulling the module away from the slot at an angle.

NOTE: WLAN modules are designed with a notch to prevent incorrect insertion of the WLAN module into the WLAN module slot.



Reverse this procedure to install the WLAN module.

WWAN module

Description	Spare part number
HP lt4211 LTE/EV-DO/HSPA+ 4G Module	793116-001
HP lt4112 LTE/HSPA+ Mobile Broadband Module	740011-001
HP hs3110 HSPA+ Mobile Broadband Module	748599-001

CAUTION: The WWAN module and the WLAN module are not interchangeable.

To prevent an unresponsive system, replace the wireless module only with a wireless module authorized for use in the computer by the governmental agency that regulates wireless devices in your country or region. If you replace the module and then receive a warning message, remove the module to restore device functionality, and then contact technical support.

Before removing the WWAN module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove the WWAN module:

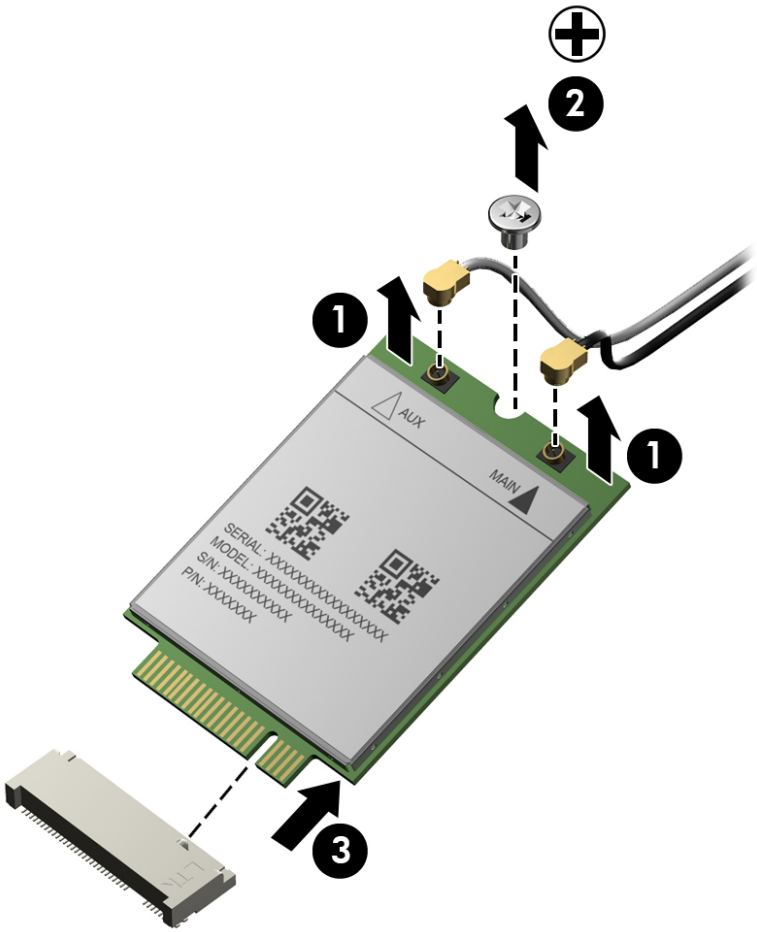
1. Disconnect the WWAN antenna cables **(1)** from the terminals on the WWAN module.

NOTE: The red WWAN antenna cable connects to the WWAN module “5/Main” terminal. The blue WWAN antenna cable connects to the WWAN module “6/Aux” terminal.

2. Remove the Phillips PM2.0×3.0 screw **(2)** that secures the WWAN module to the system board. (The WWAN module tilts up.)

3. Remove the WWAN module **(3)** by pulling the module away from the slot at an angle.

NOTE: WWAN modules are designed with a notch to prevent incorrect insertion of the WWAN module into the WWAN module slot.



Reverse this procedure to install the WWAN module.

RTC battery

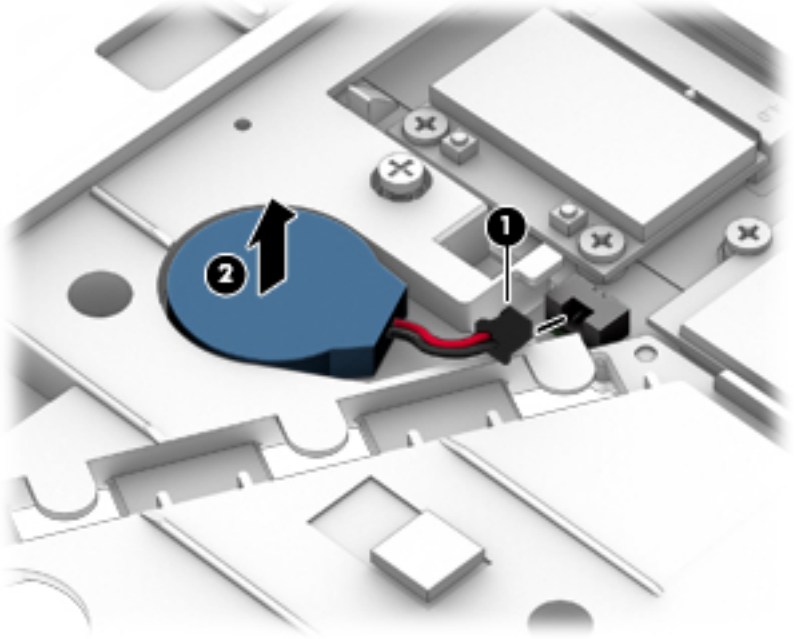
Description	Spare part number
RTC battery (includes cable and double-sided adhesive)	734300-001

Before removing the RTC battery, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove the RTC battery:

1. Disconnect the RTC battery cable **(1)** from the system board.
2. Detach the RTC battery **(2)** from the base enclosure. (The RTC battery is attached to the base enclosure with double-sided adhesive.)



3. Remove the RTC battery.

Reverse this procedure to install the RTC battery.

Optical drive

NOTE: The Upgrade Bay supports both optical drives and hard drives. If you switch from a hard drive to an optical drive in the Upgrade Bay, you will need to remove four additional screws that secure the hard drive carrier.

NOTE: All optical drive spare part kits include bezel, bracket, and screws.

Description	Spare part number
Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	735600-001
Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	735599-001
DVD±RW SuperMulti Double-Layer Drive	735602-001

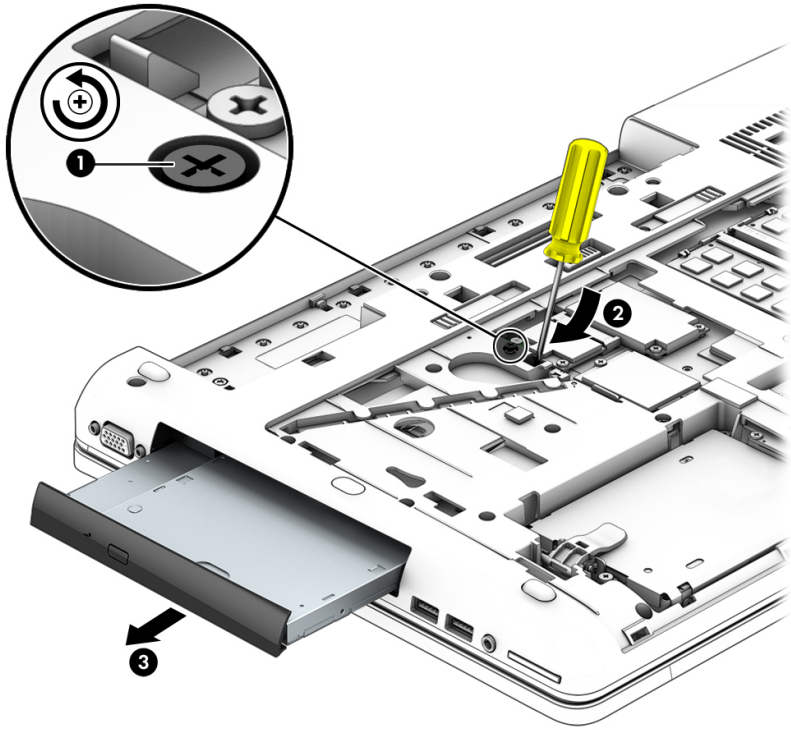
Before removing the optical drive, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove the optical drive:

1. Position the computer with the front toward you.
2. Loosen the Phillips captive screw **(1)** that secures the optical drive to the computer.
3. Insert a flat-bladed screwdriver or similar tool into the optical drive tab access **(2)** and press the tab to the left to release the optical drive from the computer.

4. Remove the optical drive **(3)**.

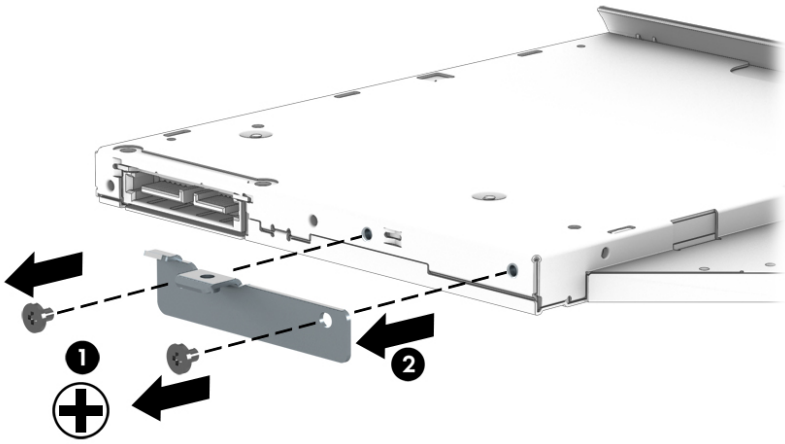


5. If it is necessary to replace the optical drive bracket:

   a. Position the optical drive with the rear toward you.

   b. Remove the two Phillips M2.0×3.0 screws **(1)** that secure the optical drive bracket to the optical drive.

   c. Remove the optical drive bracket **(2)**.



Reverse this procedure to reassemble and install the optical drive.

Upgrade Bay hard drive

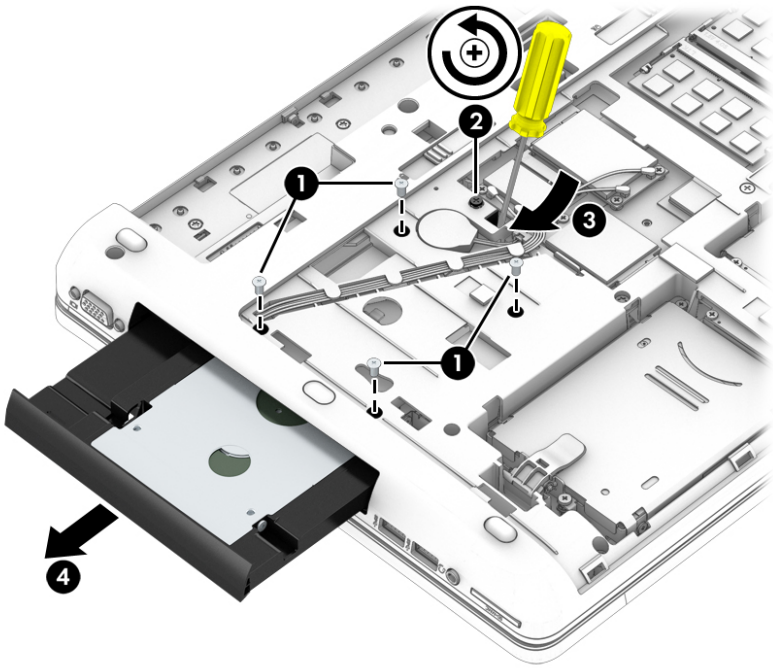
NOTE: The Upgrade Bay hard drive must be installed in the Upgrade Bay hard drive carrier before it can be installed in the computer. The Upgrade Bay hard drive carrier is available using spare part number 734298-001.

Before removing the Upgrade Bay hard drive, follow these steps:

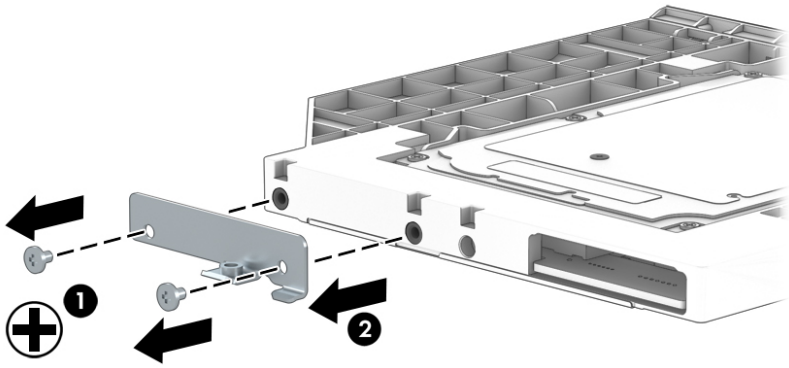
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove the Upgrade Bay hard drive:

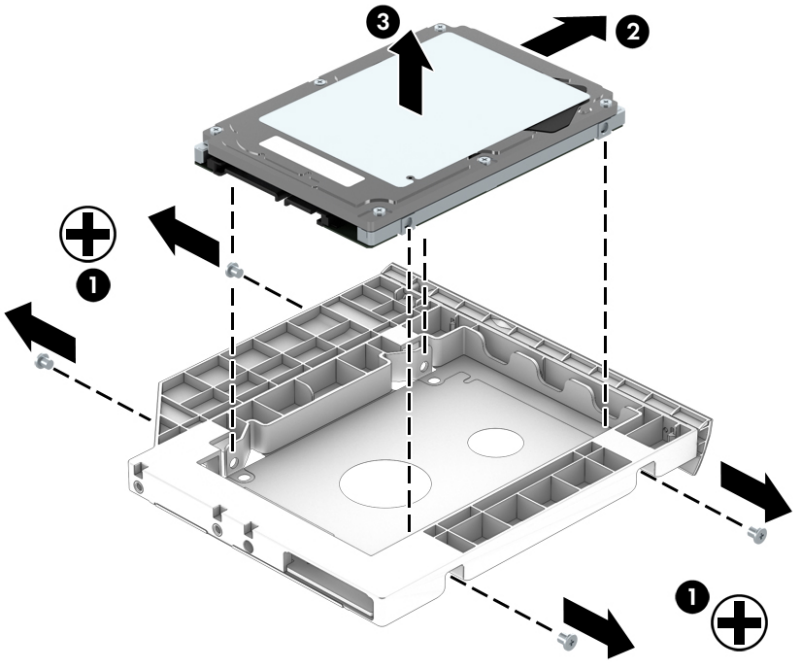
1. Position the computer with the front toward you.
2. Remove the four Phillips PM3.0×5.0 screws **(1)** that secure the Upgrade Bay hard drive carrier to the computer.
3. Loosen the captive Phillips screw **(2)** that secures the Upgrade Bay hard drive carrier to the computer, and then insert a flat-bladed screwdriver or similar tool into the Upgrade Bay hard drive tab access **(3)** and press the tab to the left to release the Upgrade Bay hard drive carrier from the computer **(4)**.



4. Remove the two Phillips PM2.0×5.0 screws **(1)** that secure the top bracket to the hard drive carrier, and then remove the bracket from the carrier **(2)**.



5. Remove the four Phillips PM2.5×3.0 screws **(1)** that secure the hard drive to the carrier, and then pull the hard drive away from the connector **(2)** to disengage it.
6. Remove the hard drive **(3)**.



Reverse this procedure to reassemble and install the Upgrade Bay hard drive and Upgrade Bay hard drive carrier.

Expansion memory module

NOTE: The computer has four memory slots. Expansion memory slots are located in a compartment on the bottom of the computer. Primary memory slots are located under the keyboard.

When you add or replace memory modules, slot 1 must be populated before slot 2 is populated.

Description	Spare part number
8.0-MB memory module (PC3L-12800, 1600 MHz, DDR3L)	693374-001
4.0-MB memory module (PC3L-12800, 1600 MHz, DDR3L)	691740-001

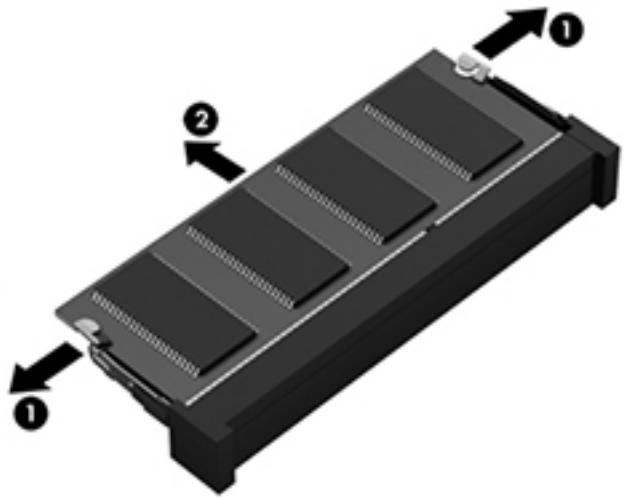
Before removing an expansion memory module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).

Remove an expansion memory module:

1. Spread the retention tabs **(1)** on each side of the expansion memory module slot to release the expansion memory module. (The edge of the module opposite the slot rises away from the computer.)
2. Remove the expansion memory module **(2)** by pulling the module away from the slot at an angle.

NOTE: Memory modules are designed with a notch to prevent incorrect installation into the expansion memory module slots.



Reverse this procedure to install an expansion memory module.

Keyboard

NOTE: The keyboard spare part kit includes a backlight and cable, pointing stick and cable, TouchPad and cable, and the keyboard cable.

For use in country or region	Spare part number	For use in country or region	Spare part number
Keyboard with backlight, pointing stick and TouchPad (includes backlight, keyboard, pointing stick, and TouchPad cables):		For use in the Netherlands	733688-B31
For use in Belgium	733688-A41	For use in Northwest Africa	733688-FP1
For use in Brazil	733688-201	For use in Norway	733688-091
For use in Bulgaria	733688-261	For use in Portugal	733688-131
For use in Canada	733688-DB1	For use in Romania	733688-271
For use in the Czech Republic and Slovakia	733688-FL1	For use in Russia	733688-251
For use in Denmark	733688-081	For use in Saudi Arabia	733688-171
For use in France	733688-051	For use in Slovenia	733688-BA1
For use in Germany	733688-041	For use in South Korea	733688-AD1
For use in Greece	733688-151	For use in Spain	733688-071
For use in Hungary	733688-211	For use in Sweden and Finland	733688-B71
For use in Iceland	733688-DD1	For use in Switzerland	733688-BG1
For use in India	733688-D61	For use in Taiwan	733688-AB1
For use in Israel	733688-BB1	For use in Thailand	733688-281
For use in Italy	733688-061	For use in Turkey	733688-141
For use in Japan	733688-291	For use in the United Kingdom and Singapore	733688-031
For use in Latin America	733688-161	For use in the United States	733688-001
Keyboard with pointing stick and TouchPad (includes keyboard, pointing stick, and TouchPad cables):			
For use in Belgium	745663-A41	For use in Northwest Africa	745663-FP1
For use in Brazil	745663-201	For use in Norway	745663-091
For use in Bulgaria	745663-261	For use in Portugal	745663-131
For use in Canada	745663-DB1	For use in Romania	745663-271
For use in the Czech Republic and Slovakia	745663-FL1	For use in Russia	745663-251
For use in Denmark	745663-081	For use in Saudi Arabia	745663-171
For use in France	745663-051	For use in Slovenia	745663-BA1
For use in Germany	745663-041	For use in South Korea	745663-AD1
For use in Greece	745663-151	For use in Spain	745663-071
For use in Hungary	745663-211	For use in Sweden and Finland	745663-B71
For use in Iceland	745663-DD1	For use in Switzerland	745663-BG1
For use in India	745663-D61	For use in Taiwan	745663-AB1

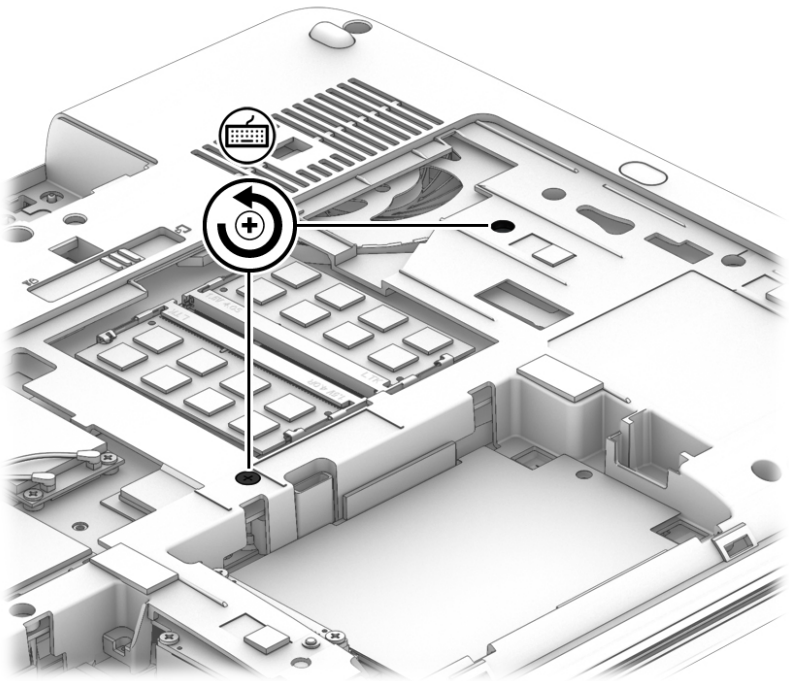
For use in country or region	Spare part number	For use in country or region	Spare part number
For use in Israel	745663-BB1	For use in Thailand	745663-281
For use in Italy	745663-061	For use in Turkey	745663-141
For use in Japan	745663-291	For use in Turkey, F-type keyboard	745663-541
For use in Latin America	745663-161	For use in the United Kingdom and Singapore	745663-031
For use in the Netherlands	745663-B31	For use in the United States	745663-001

Before removing the keyboard, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or Upgrade Bay hard drive (see Upgrade Bay hard drive on page 54).

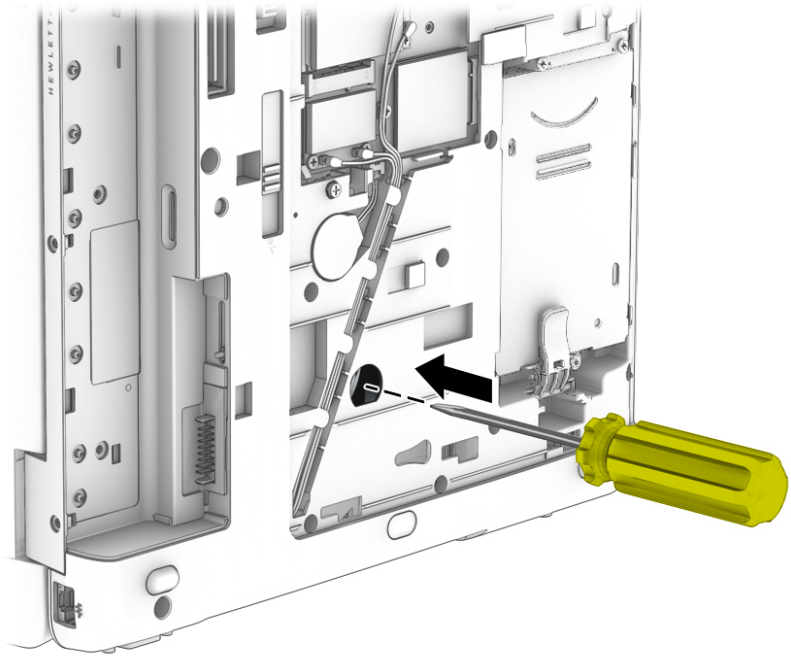
Remove the keyboard:

1. Turn the computer upside down the front toward you.
2. Loosen the two Phillips captive screws that secure the keyboard to the computer.



3. Position the computer on its side with the display open at a 90-degree angle.

4. Insert a screw driver or similar thin tool into the keyboard release opening in the optical drive bay, and then press on the back of the keyboard until the keyboard disengages from the computer.



5. Turn the computer right side up with the front toward you.
6. Open the computer as far as it will open.
7. Lift the rear edge of the keyboard, and then swing it up and forward until it rests upside down on the palm rest.

8. Release the zero insertion force (ZIF) connector **(1)** to which the keyboard cable is attached, and then disconnect the keyboard cable from the system board.
9. Release the ZIF connector **(2)** to which the pointing stick cable is attached, and then disconnect the pointing stick cable **(2)** from the system board.

10. Remove the keyboard **(3)**.

Reverse this procedure to install the keyboard.

Primary memory module

NOTE: The computer has four memory slots. Expansion memory slots are located in a compartment on the bottom of the computer. Primary memory slots are located under the keyboard.

When you add or replace the primary memory modules, populate the bottom slot before the top slot.

Description	Spare part number
8.0-MB memory module (PC3L-12800, 1600 MHz, DDR3L)	693374-001
4.0-MB memory module (PC3L-12800, 1600 MHz, DDR3L)	691740-001

Before removing a primary memory module, follow these steps:

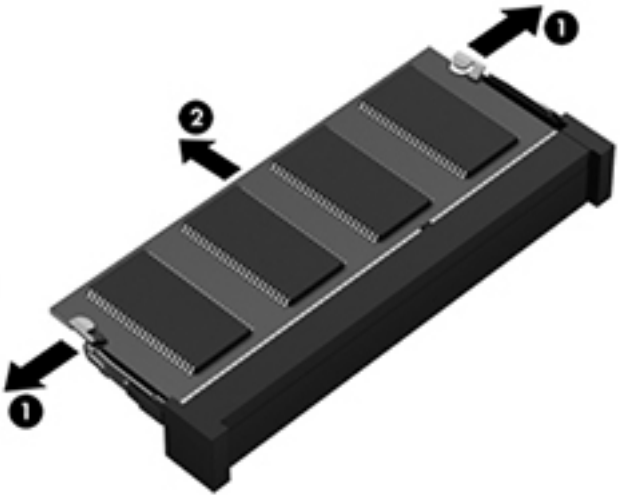
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43)

6. Remove the optical drive (see Optical drive on page 52) or Upgrade Bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).

Remove the primary memory module:

1. Spread the retetntion tabs **(1)** on each side of the primary memory module slot to release the primary memory module. (The edge of the module opposite the slot rises away from the computer.)
2. Remove the primary memory module **(2)** by pulling the module away from the slot at an angle.

NOTE: Memory modules are designed with a notch to prevent incorrect installation into the primary memory module slots.



Reverse this procedure to install a primary memory module.

6 Removal and replacement procedures for Authorized Service Provider parts

CAUTION: Components described in this chapter should only be accessed by an authorized service provider. Accessing these parts can damage the computer or void the warranty.

Component replacement procedures

This chapter provides removal and replacement procedures for Authorized Service Provider only parts.

There are as many as 91 screws that must be removed, replaced, or loosened when servicing Authorized Service Provider only parts. Make special note of each screw size and location during removal and replacement.

Display bezel

NOTE: The display bezel, webcam/microphone module, microphone module, and display panel can be removed without removing the display assembly from the computer.

Description	Spare part number
For use only on computer models equipped with a webcam	733633-001
For use only on computer models not equipped a webcam	735589-001

Before removing the display bezel, follow these steps:

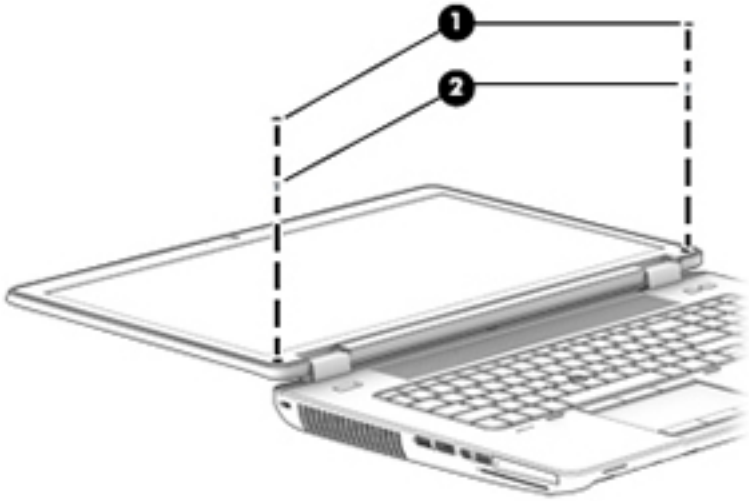
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).

Remove the display bezel:

1. Turn the computer right side up with the front toward you.
2. Open the computer as far as it will open.

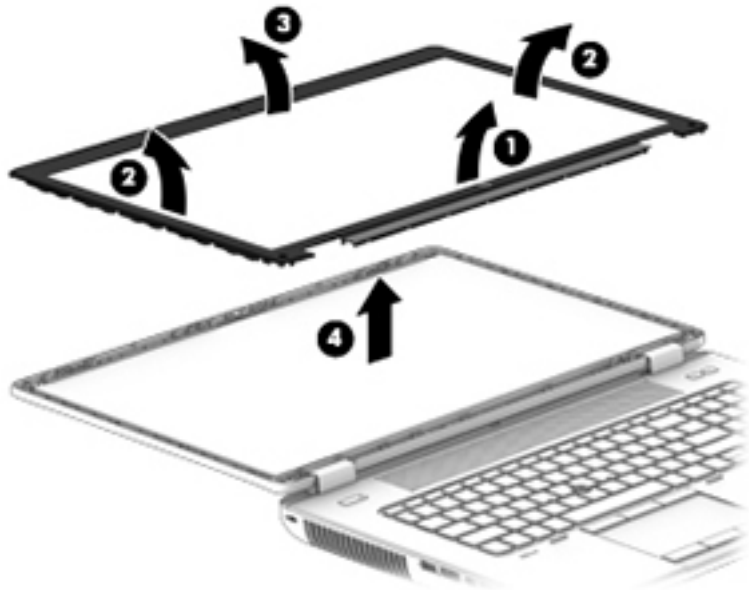
3. Remove the screw covers **(1)** and the two Phillips PM2.0x7.0 screws **(2)** that secure the display bezel to the display enclosure.

   The screw covers are available in the Display Panel Support Kit, spare part number 784211-001.



4. Flex the inside edges of the bottom edge **(1)**, the left and right sides **(2)**, and the top edge **(3)** of the display bezel until the bezel disengages from the display enclosure and then remove the bezel **(4)**.

NOTE: The top edge of the display bezel contains double-sided adhesive. Additional pressure may be needed to detach the top edge of the display bezel from the display enclosure.



Reverse this procedure to install the display bezel.

Display panel

Description	Spare part number
17.3-in, FHD, AG, LED, WVA display panel	735367-001
17.3-in, HD, AG, LED, WVA display panel	735366-001

Before removing the display panel, follow these steps:

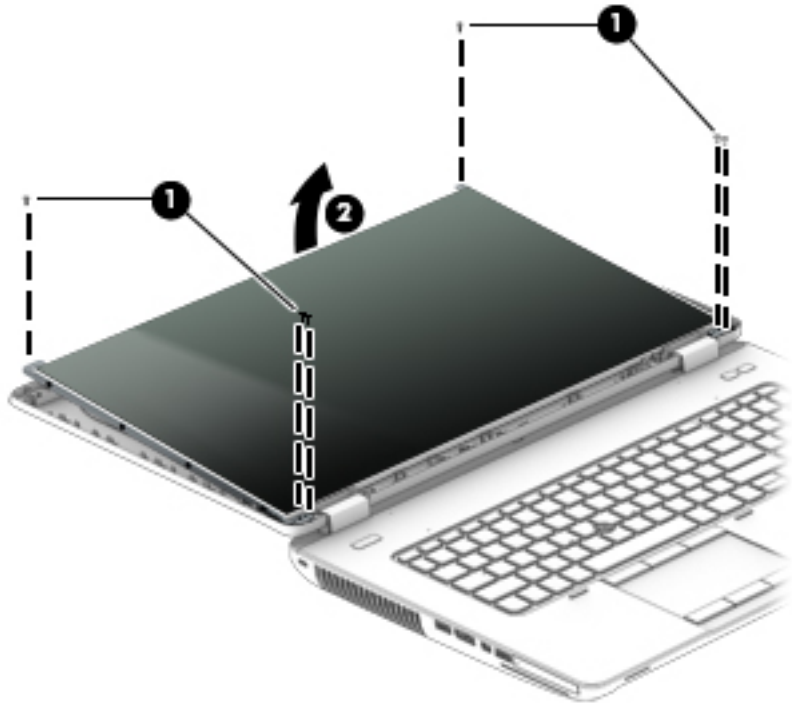
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the display bezel (see Display bezel on page 62).

Remove the display panel:

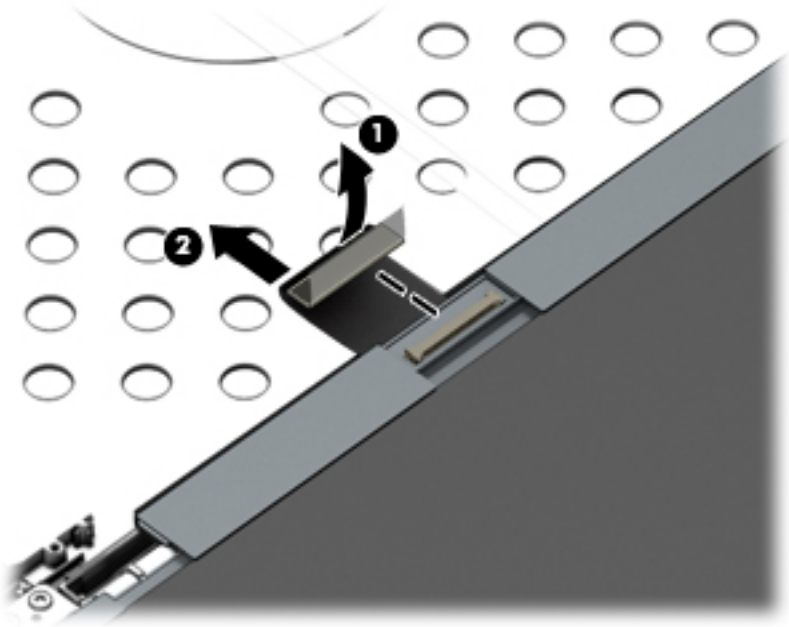
1. Release the top edge of the display panel from the display enclosure **(1)**.

NOTE: If grounding tape secures the top edge of the display panel to the display enclosure, release the tape to disengage the panel from the enclosure.

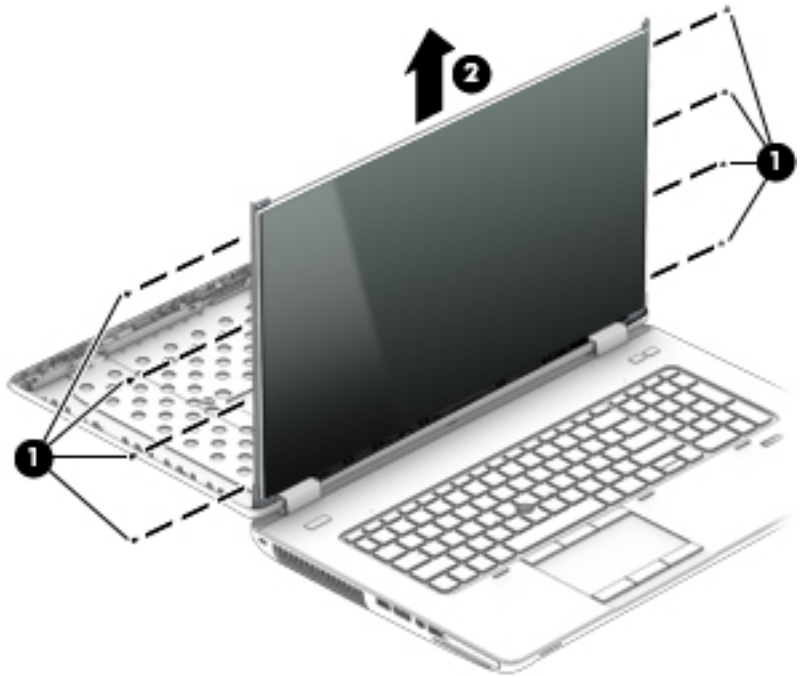
2. Remove the six Torx T8M2.5×7.0 screws **(2)** that secure the display panel to the display enclosure.



3. Lift the tape that covers the connector on the back of display panel **(1)**, and then disconnect the display panel cable **(2)**.



4. Remove the eight Phillips PM2.0×3.0 screws **(1)** that secure the display panel to the display hinge brackets.
5. Slide the display panel up and out of the display hinge brackets **(2)**.



To replace the remaining display assembly components, remove the display assembly from the computer.

Reverse this procedure to install the display panel. For more information, see Display assembly on page 77.

Webcam/microphone module

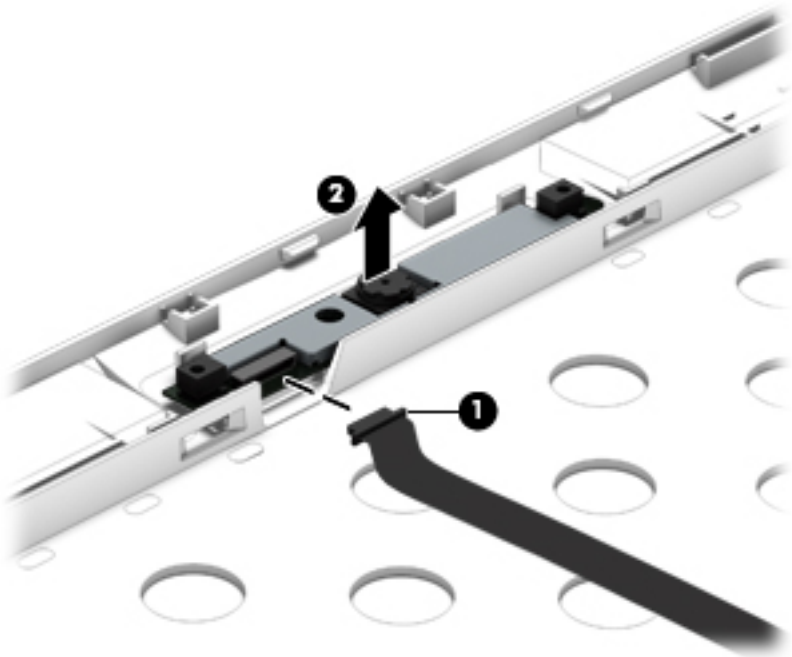
Description	Spare part number
Webcam/microphone module (includes double-sided adhesive)	784208-001
Microphone module (includes double-sided adhesive)	735370-001

Before removing the webcam/microphone module, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the display bezel (see Display bezel on page 62).
6. Remove the display panel (see Display panel on page 64).

Remove the webcam/microphone module:

1. Disconnect the cable from the webcam/microphone module **(1)**.
2. Detach the webcam/microphone module **(2)** from the display enclosure. (The webcam/microphone module is attached to the display enclosure with double-sided tape.)



Reverse this procedure to install the webcam/microphone module.

Top cover

Description	Spare part number
Top cover	735587-001

Before removing the top cover, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).

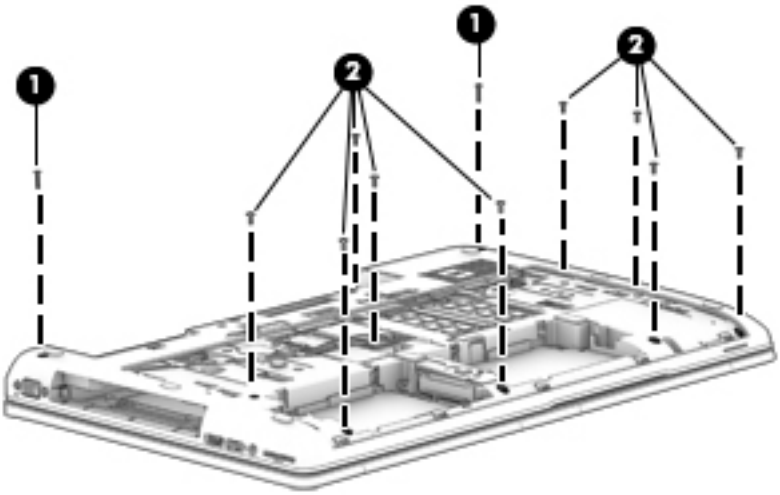
NOTE: When replacing the top cover, be sure that the following components are removed from the defective top cover and installed on the replacement top cover:

- Multifunction board (see Multifunction board on page 71)
- Speakers (see Speakers on page 73)
- Fingerprint reader (see Fingerprint reader on page 74)
- Power button board (see Power button board on page 75)

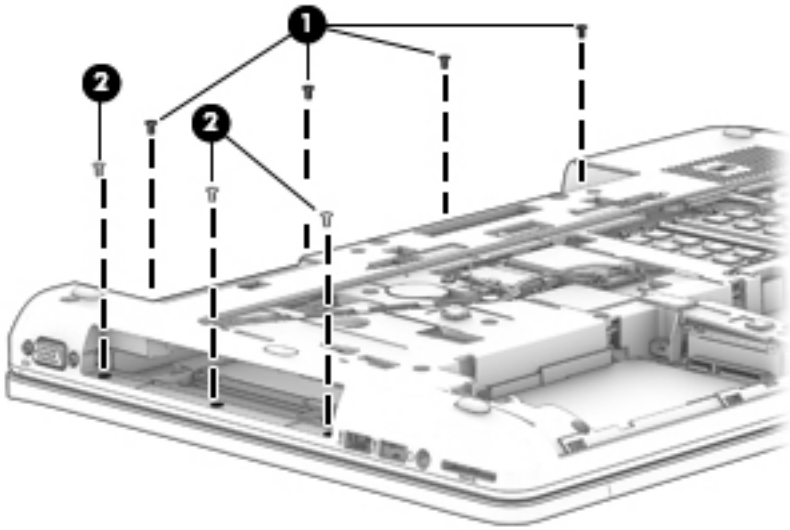
Remove the top cover:

1. Close the computer.
2. Turn the computer upside with the front toward you.

3. Remove the two Torx T8M2.5x11.0 screws **(1)** and the nine Torx T8M2.5x6.0 screws **(2)** that secure the base enclosure to the top cover.



4. Remove the four Torx T8M2.5x5.0 screws inside the battery bay **(1)** and the three Torx T8M2.5x5.0 screws in the optical drive/upgrade drive bay **(2)**.



5. Turn the computer right side up with the front toward you.
6. Open the computer as far as it will open.

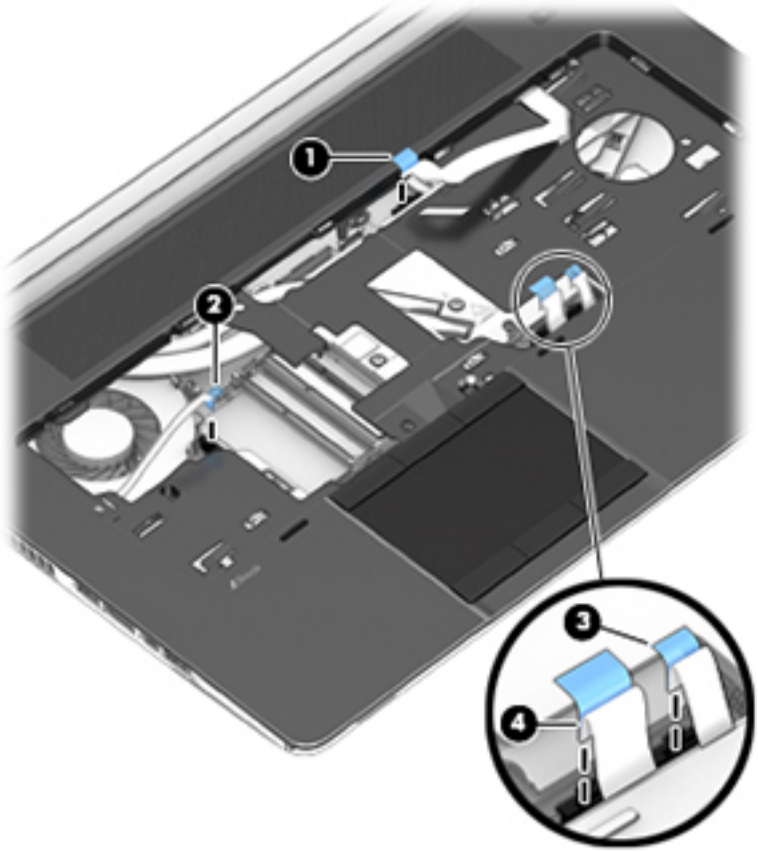
7. Disconnect the following cables:

   (1) Function board ZIF connector cable

   (2) Power button board ZIF connector cable

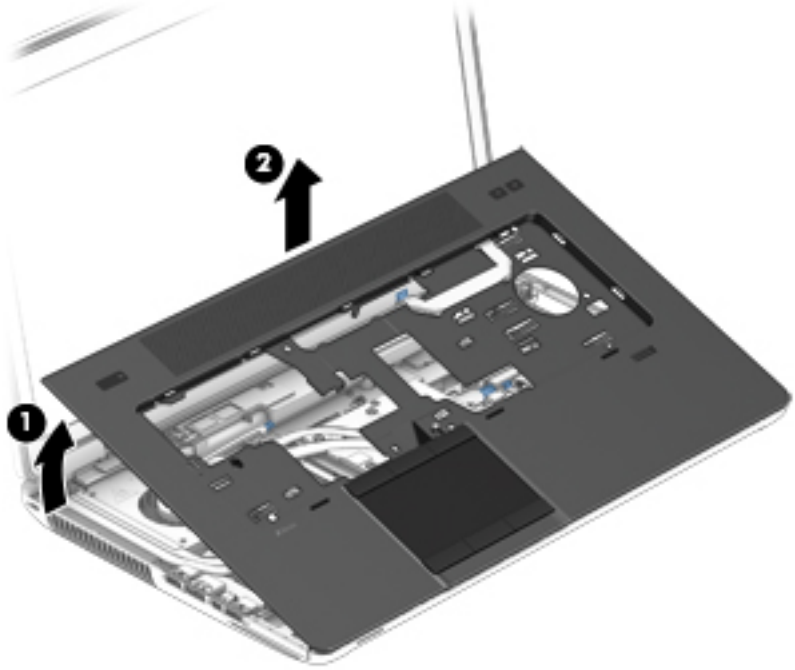
   (3) TouchPad ZIF connector cable

   (4) Fingerprint reader board ZIF connector cable



8. Starting at the top right, release the top cover from the base enclosure **(1)**.

9. Remove the top cover from the base enclosure **(2)**.



Reverse this procedure to install the top cover.

Multifunction board

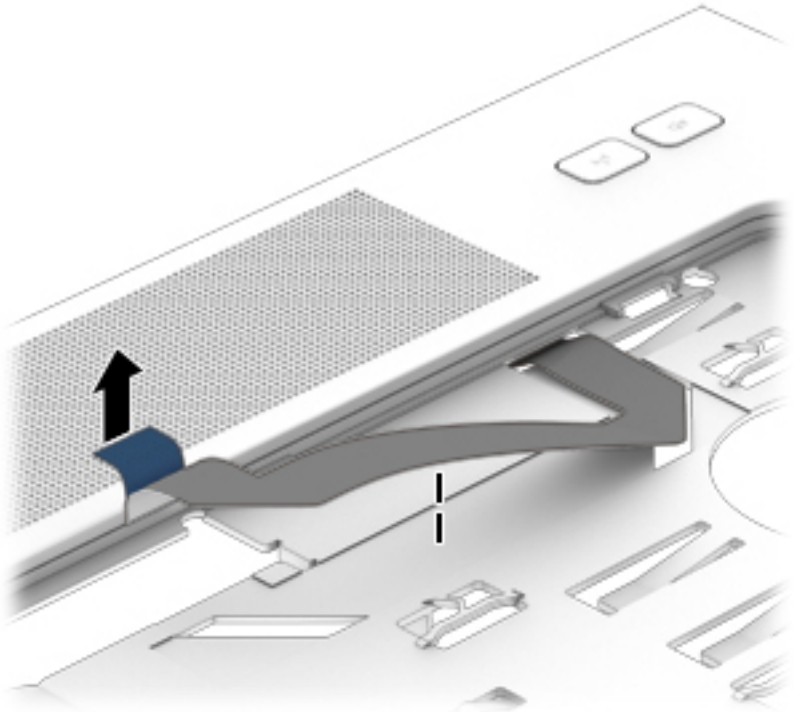
Description	Spare part number
Multifunction board (includes LED light pipe)	733639-001

Before removing the multifunction board, follow these steps:

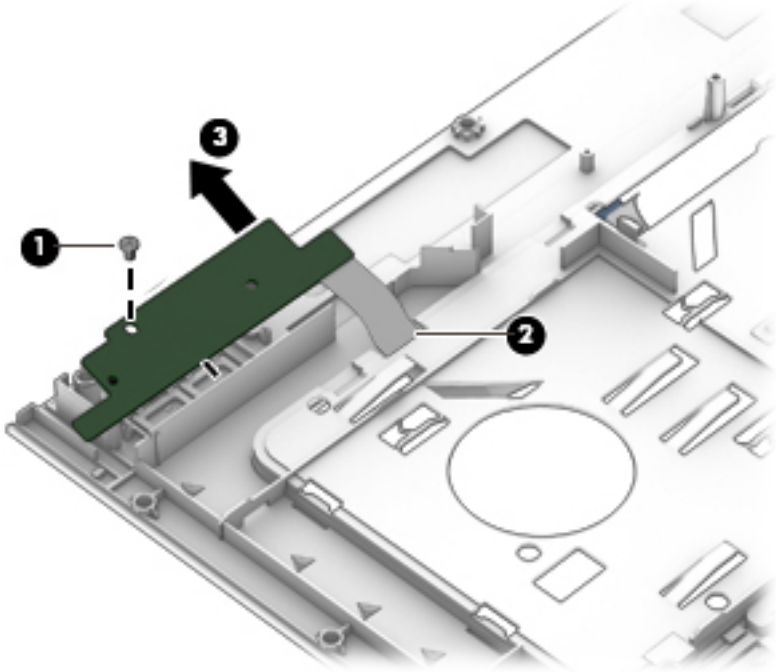
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the multifunction board:

1. Turn the top cover right side up with the front toward you.
2. Detach the multifunction board cable **(2)** from the top cover. (The multifunction board cable is attached to the top cover with double-sided tape.)



3. Turn the top cover upside down with the front toward you.
4. Remove the Phillips PM2.0×3.0 screw **(1)** that secures the multifunction board to the top cover.
5. Slide the multifunction board cable through the opening in top cover **(2)**.
6. Remove the multifunction board and cable **(3)**.



Reverse this procedure to install the multifunction board.

Speakers

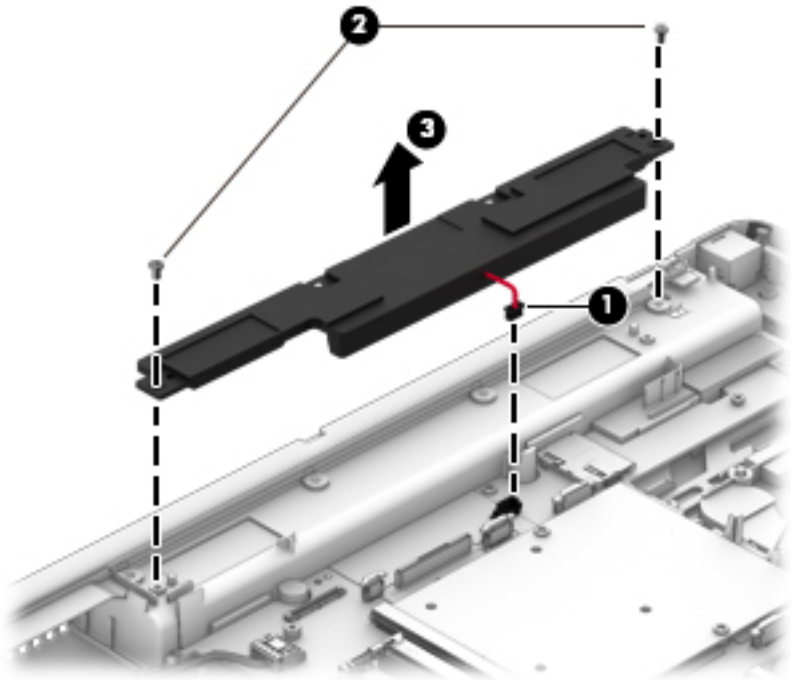
Description	Spare part number
Speakers	733638-001

Before removing the speaker assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the speakers:

1. Disconnect the speaker cable from the system board **(1)**.
2. Remove the two Torx T8M2.5×4.0 screws **(2)** that secure the speakers to the base enclosure.
3. Remove the speakers **(3)**.



Reverse this procedure to install the speakers.

Fingerprint reader

Description	Spare part number
Fingerprint reader (includes cable)	737730-001

Before removing the fingerprint reader, follow these steps:

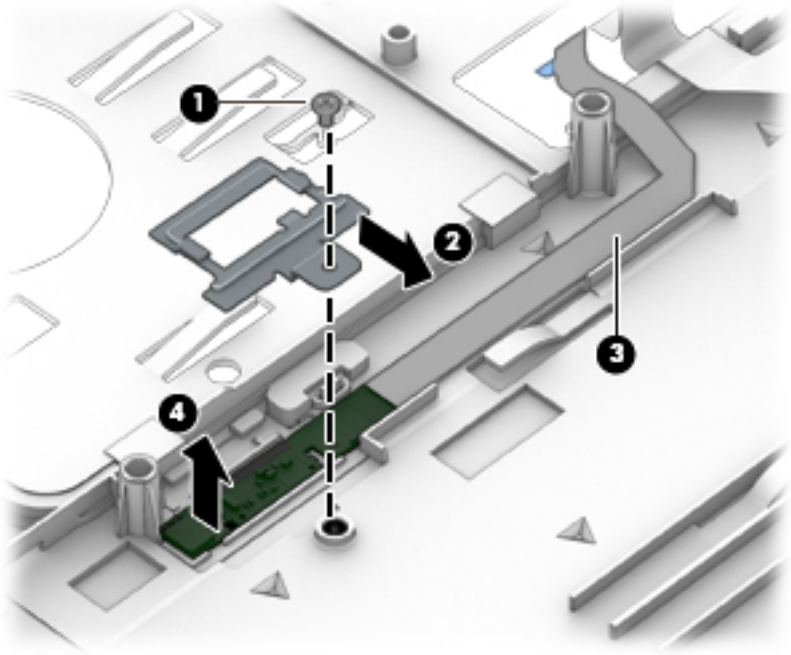
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41)
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the fingerprint reader:

1. Turn the top cover upside down with the front toward you.
2. Remove the Phillips PM2.0×3.0 screw **(1)** that secures the fingerprint reader to the top cover.
3. Remove the fingerprint reader bracket **(2)**.

   The fingerprint reader bracket is available in the Bracket Kit using spare part number 733637-001.
4. Detach the fingerprint reader cable **(3)** from the top cover. (The fingerprint reader cable is attached to the top cover with double-sided tape.)

5. Remove the fingerprint reader **(4)**.



Reverse this procedure to install the fingerprint reader.

Power button board

Description	Spare part number
Power button board (includes cable)	733636-001

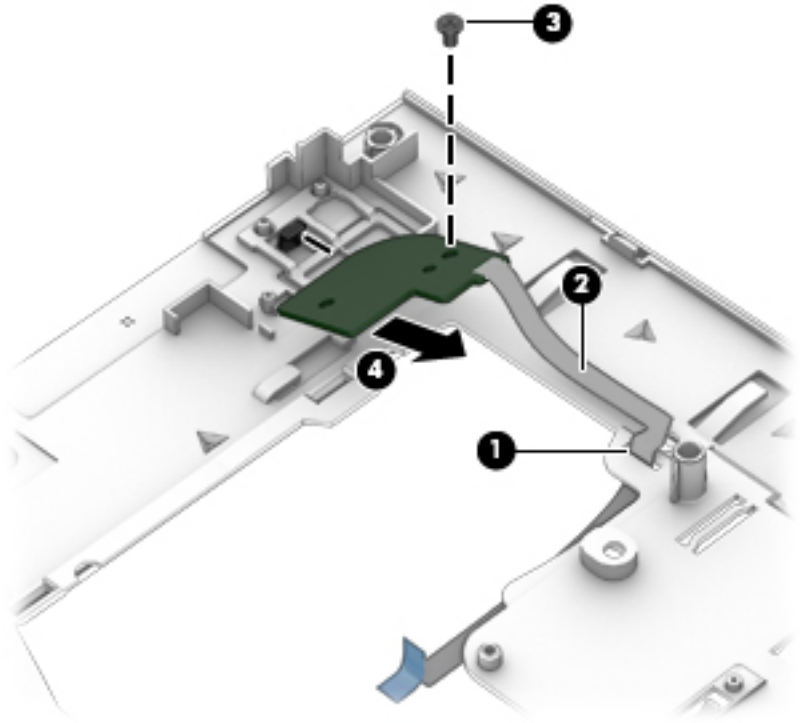
Before removing the power button board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41)
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the power button board:

1. Turn the top cover upside down with the front toward you.
2. Release the power button board cable through the opening in top cover **(1)**.

3. Detach the power button board cable **(2)** from the top cover. (The power button board cable is attached to the top cover with double-sided tape.)
4. Remove the Phillips PM2.0×3.0 screw **(3)** that secures the power button board to the top cover.
5. Lift the bottom edge of the power button board, and then remove the power button board by sliding it up and away at an angle from the tab that secures it in place **(4)**.



Reverse this procedure to install the power button board.

Display assembly

The display bezel, webcam/microphone module, microphone module, and display panel can be removed without removing the entire display assembly. See Display bezel on page 62, Webcam/microphone module on page 66, and Display panel on page 64 for more information.

Description	Spare part number
17.3-in, AG, FHD, LED, UWVA display assembly for use on computer models equipped with a webcam	784207-001
17.3-in, AG, FHD, LED, UWVA display assembly for use on computer models not equipped with a webcam	784206-001

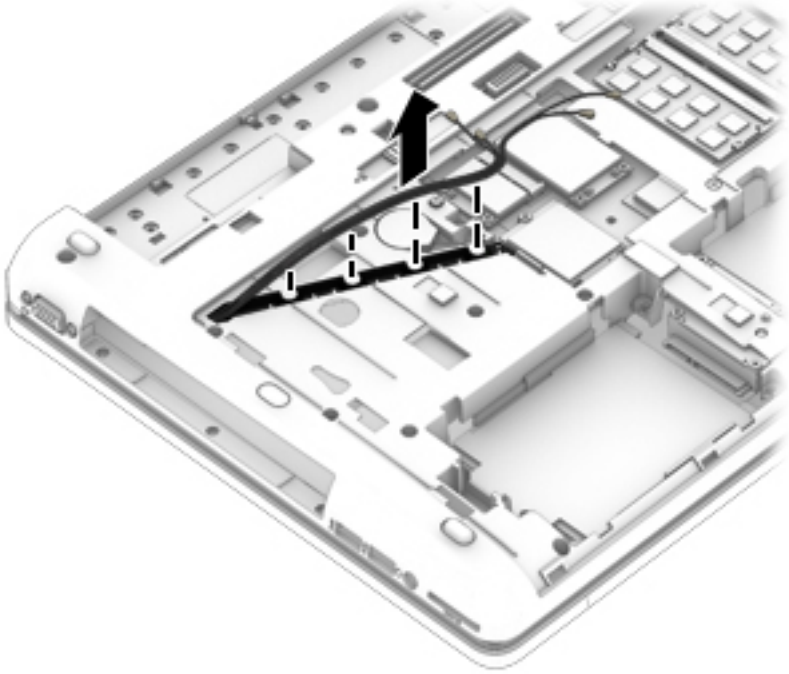
Before removing the display assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

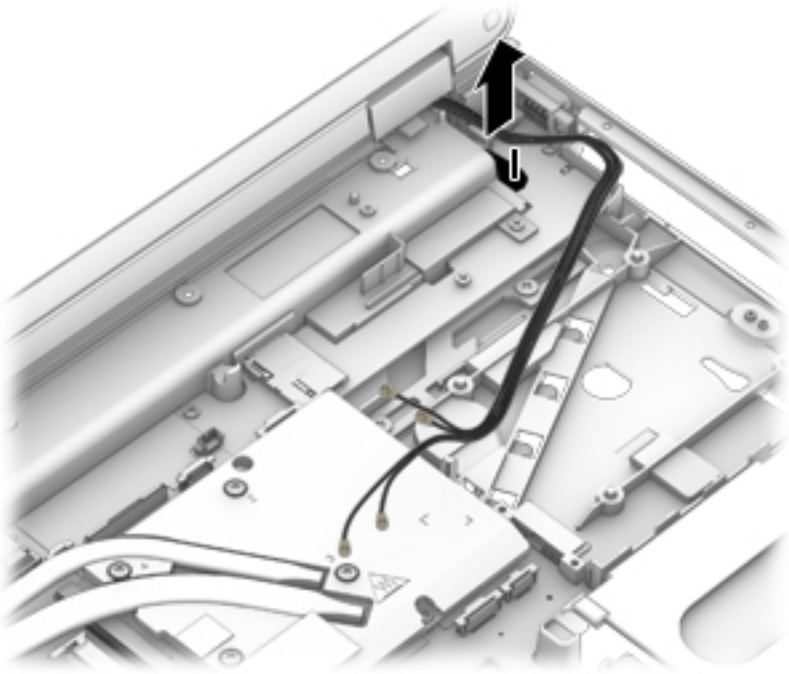
Remove the display assembly:

1. Turn the computer upside down with the front toward you.

2. Release the WLAN and WWAN antenna cables from the routing channel built into the base enclosure.



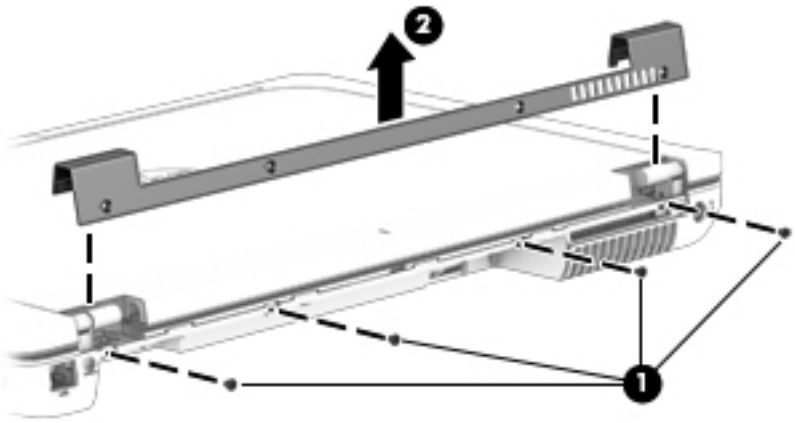
3. Turn the computer right side up with the front toward you.
4. Open the computer as far as it will open.
5. Release the WLAN and WWAN antenna cables through the opening in the base enclosure.



6. Close the computer.
7. Position the computer with the rear toward you.
8. Remove the four Torx T8M2.5×3.0 screws **(1)** that secure the hinge cover to the computer.

9. Remove the hinge cover **(2)**.

   The hinge cover is available using spare part number 733634-001.



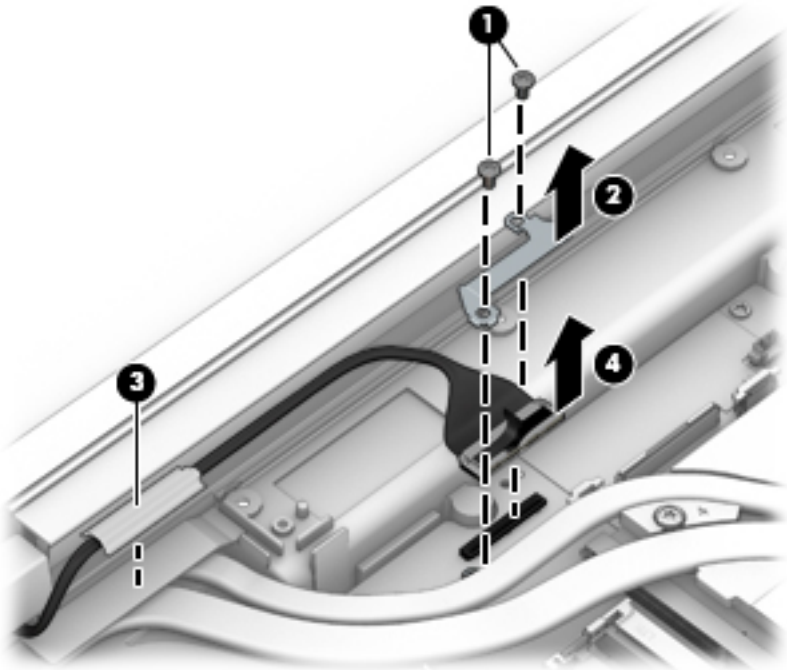
10. Remove the two Torx T8M2.5×7.0 screws that secure the display assembly to the computer.

11. Position the computer with the front toward you.
12. Open the computer as far as it will open.

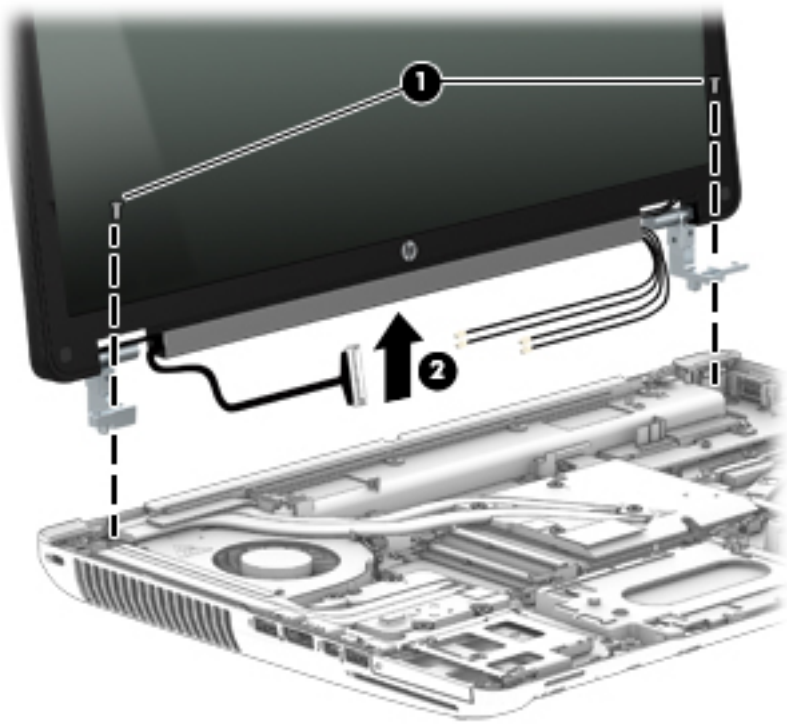
⚠ **CAUTION:** Support the display assembly when removing the display assembly screws in the following steps. Failure to support the display assembly can result in damage to the display assembly and other components.

13. Remove the two Torx T8M2.0×5.0 screws **(1)** that secure the display panel cable to the system board.
14. Remove the display panel cable bracket **(2)**.
15. Detach the display panel cable **(3)** from the base enclosure. (The display panel cable is attached to the base enclosure with double-sided tape.)

16. Disconnect the display panel cable from the system board **(4)**.



17. Remove the two Torx T8M2.5×7.0 screws **(1)** that secure the display assembly to the computer.
18. Remove the display assembly **(2)**.

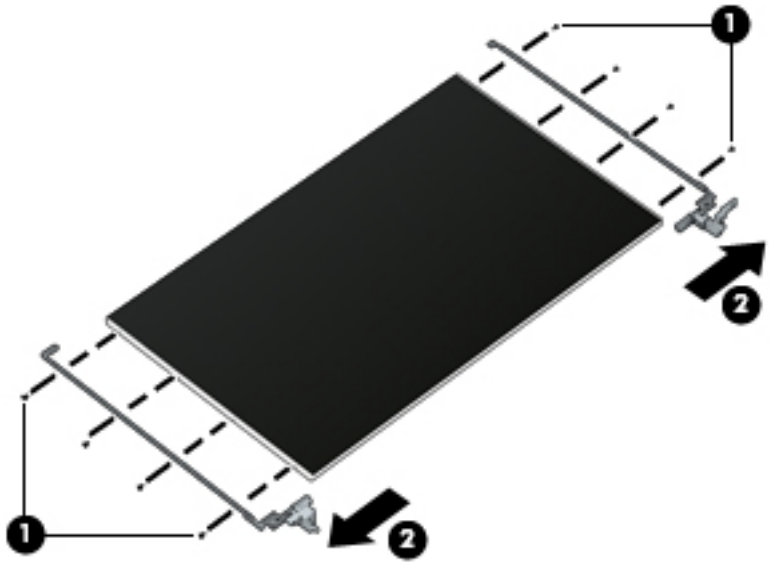


19. If it is necessary to replace the display hinges:
    - Remove the display bezel (see Display bezel on page 62)
    - Remove the display panel (see Display panel on page 64)

a. Remove the eight Phillips PM2.0×3.0 screws **(1)** that secure the hinge assemblies to the display panel.

b. Remove the hinge assemblies **(2)**.

The hinge assemblies are available in the Display Hinge Kit using spare part number 733634-001.

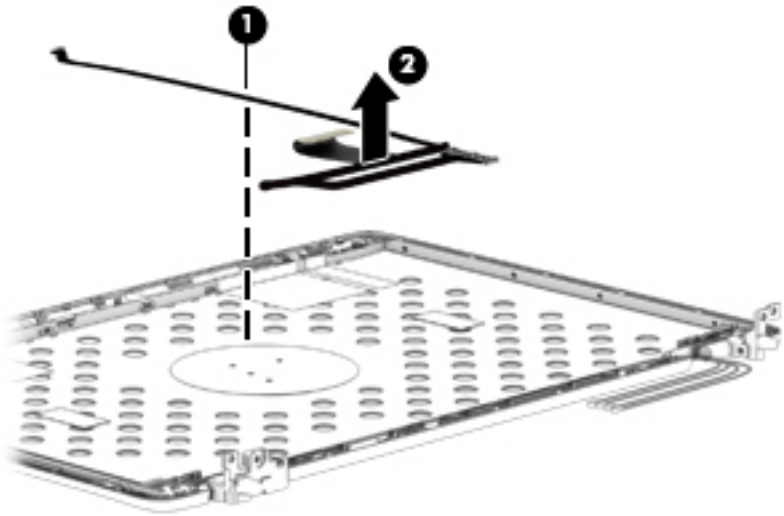


20. If it is necessary to replace the display panel cable:

a. Detach the display panel cable **(2)** from the display enclosure. (The display panel cable is attached to the display enclosure with double-sided tape.)

b. Remove the display panel cable **(2)**.

The display panel cable is available in the Cable Kit, 785212-001.



Reverse this procedure to install the display assembly.

ExpressCard assembly

Description	Spare part number
ExpressCard assembly	794578-001

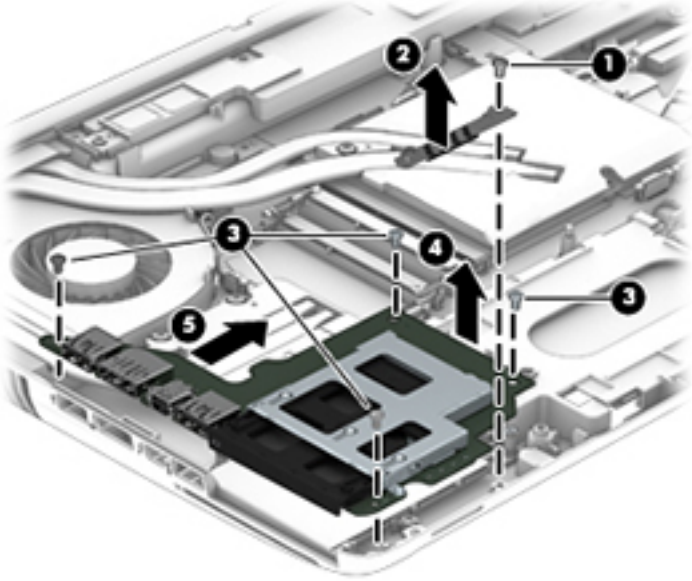
Before removing the ExpressCard assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the ExpressCard assembly:

1. Remove the Torx T8M2.5×4.0 screw **(1)** that secures the light pipe to the computer.
2. Remove the light pipe **(2)**.
3. Remove the four Torx T8M2.5×4.0 screws **(3)** that secure the ExpressCard assembly to the system board.
4. Lift up on the right side **(4)** of the ExpressCard assembly to disconnect it from the system board connector.

5. Remove the ExpressCard assembly **(5)** by sliding it up and to the right at an angle.



Reverse this procedure to install the ExpressCard assembly.

Smart Card reader

Description	Spare part number
Smart Card reader (includes cable)	742159-001

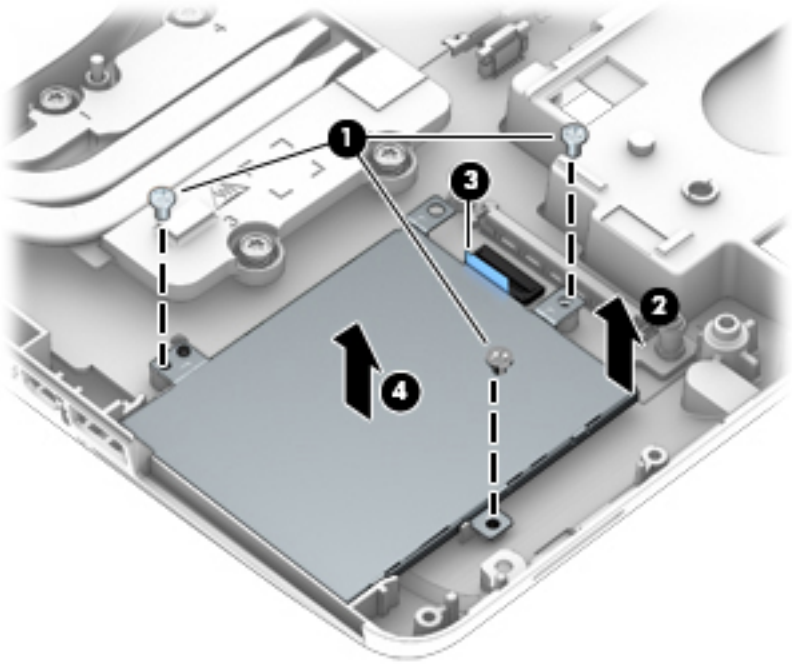
Before removing the Smart Card reader, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).
9. Remove the ExpressCard assembly (see ExpressCard assembly on page 82).

Remove the Smart Card:

1. Remove the three Phillips PM2.5×4.0 screws **(1)** that secure the Smart Card reader to the system board.
2. Lift the Smart Card reader slightly upward and toward the left **(2)**.

3. Release the ZIF connector **(3)** to which the Smart Card reader cable is attached, and then disconnect the Smart Card reader cable from the system board.
4. Remove the Smart Card reader **(4)**.



Reverse this procedure to install the Smart Card reader.

Audio/USB board

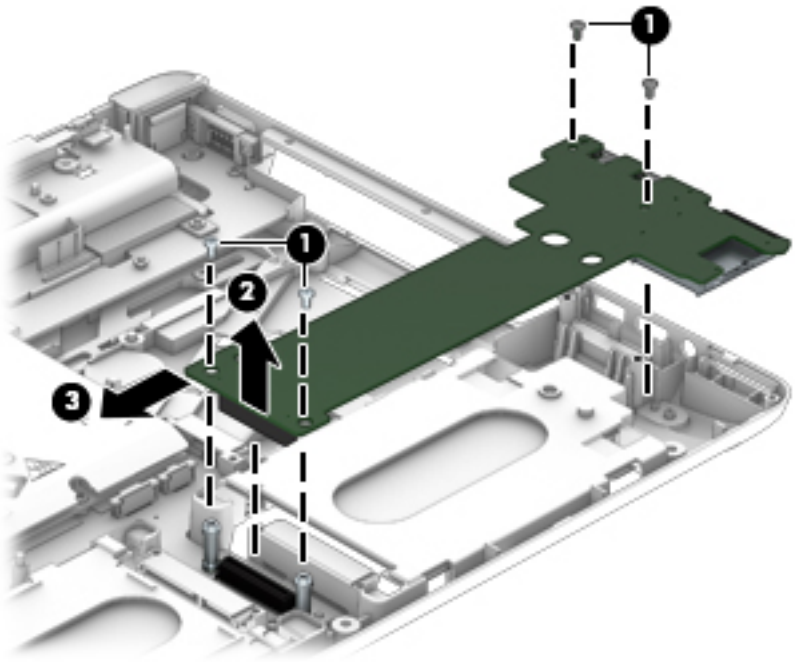
Description	Spare part number
Audio/USB board (includes audio jack and USB port)	737732-001

Before removing the audio/USB board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41),
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

Remove the audio/USB board:

1. Remove the four Phillips M2.5×4.0 screws **(1)** that secure the audio/USB board to the base enclosure.
2. Lift up on the left side of the board to disconnect it from the system board connector **(2)**.
3. Remove the audio/USB board **(3)** by sliding it up and to the left at an angle.



Reverse this procedure to install the audio/USB board.

Processor heat sink

Description	Spare part number
For use only with computer models equipped with quad-core processors	735372-001
For use only with computer models equipped with dual-core processors	735371-001

Before removing the processor heat sink, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41)
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).

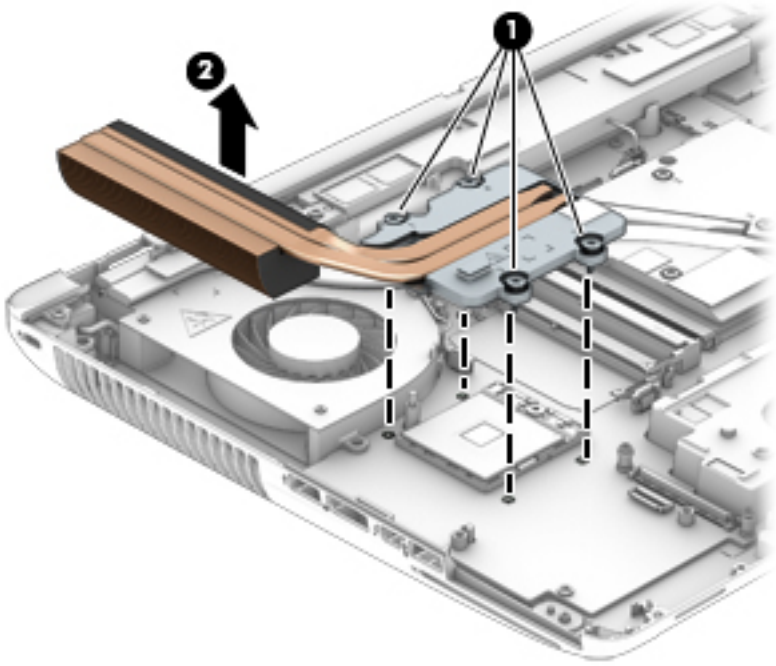
Remove the processor heat sink:

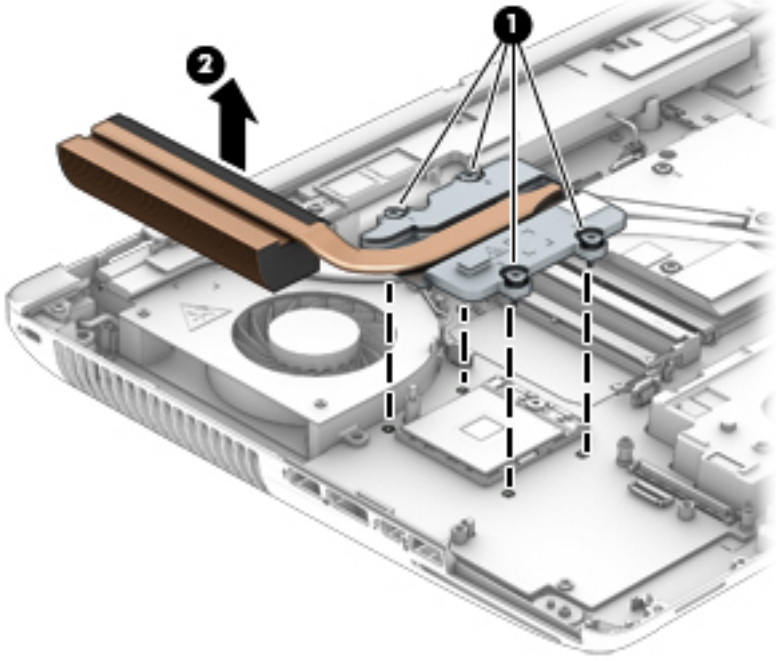
1. Following the sequence stamped into the processor heat sink, loosen the four Phillips captive screws **(1)** that secure the processor heat sink to the system board.

NOTE: If there is Mylar tape that secures the heat sink to the fan, release the tape to disengage the heat sink.

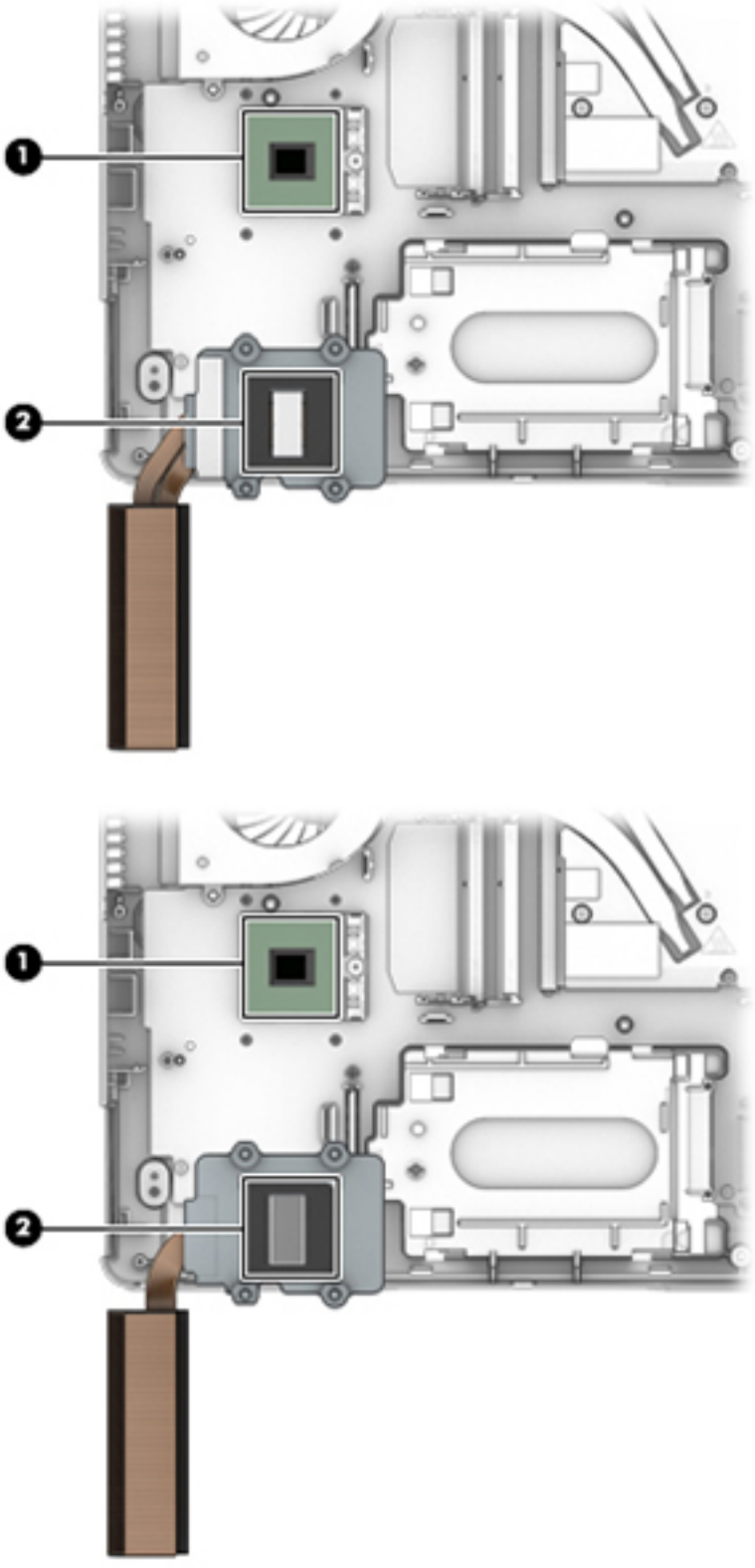
2. Remove the heat sink **(2)**.

NOTE: Use the image below that best matches your model.





NOTE: Thermal paste located on the surfaces of the processor **(1)** and the processor heat sink **(2)**. Replacement thermal paste and pads are included in the processor heat sink and processor spare part kits.



Reverse this procedure to install the processor heat sink.

Processor

NOTE: The processor spare part kit includes replacement thermal material.

Description	Spare part number
Intel Core i7-4940MX 3.10-GHz (SC turbo up to 4.00-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 57-W)	778694-001
Intel Core i7-4910MQ 2.90-GHz (SC turbo up to 3.90-GHz) processor (1600-MHz FSB, 8.0-MB L3 cache, quad core, 8 threads, 47-W)	778693-001
Intel Core i7-4810MQ 2.80-GHz (SC turbo up to 3.80-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W)	778692-001
Intel Core i7-4710MQ 2.50-GHz (SC turbo up to 3.50-GHz) processor (1600-MHz FSB, 6.0-MB L3 cache, quad core, 8 threads, 47-W)	773212-001
Intel Core i7-4610M 3.00-GHz (SC turbo up to 3.70-GHz) processor (1600-MHz FSB, 4.0-MB L3 cache, dual core, 4 threads, 37-W)	765141-001
Intel Core i5-4340M 2.90-GHz (SC turbo up to 3.60-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W)	765142-001
Intel Core i5-4210M 2.60-GHz (SC turbo up to 3.20-GHz) processor (1600-MHz FSB, 3.0-MB L3 cache, dual core, 4 threads, 37-W)	768420-001

Before removing the processor, follow these steps:

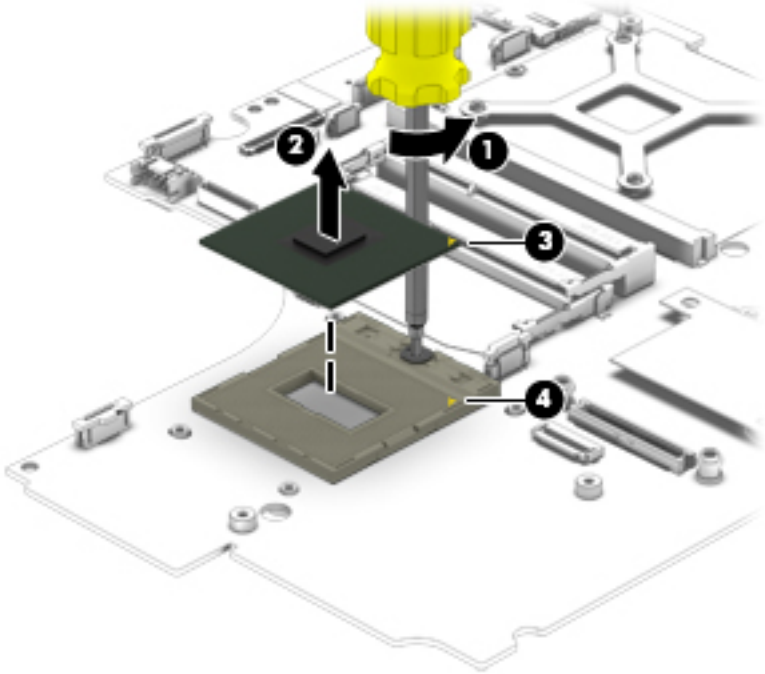
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41)
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).
9. Remove the processor heat sink (see Processor heat sink on page 86).

Remove the processor:

1. Use a Torx T8 screwdriver to turn the processor locking screw **(1)** one-half turn counterclockwise, until you hear a click.

2. Lift the processor **(2)** straight up and remove it.

NOTE: When installing the processor, the gold triangle **(3)** on the processor must be aligned with the triangle **(4)** embossed on the processor socket.



Reverse this procedure to install the processor.

Graphics subsystem heat sink

NOTE: The graphics subsystem heat sink includes a fan and replacement thermal material.

Description	Spare part number
For use only on computer models equipped with the NVIDIA Quadro K5100M graphics board	735373-001
For use only on computer models equipped with the NVIDIA Quadro K4100M or K3100M graphics board	735374-001
For use only on computer models equipped with the MXM-Emerald graphics board	786687-001
For use only on computer models equipped with the MXM-N15P-15 graphics board	786686-001
For use only on computer models equipped with the MXM-N15P-Q1 graphics board (includes fan)	768730-001

NOTE: To properly ventilate the computer, allow at least a 7.6-cm (3-inch) clearance on the left side of the computer. The computer uses an electric fan for ventilation. The fan is controlled by a temperature sensor and is designed to turn on automatically when high temperature conditions exist. These conditions are affected by high external temperatures, system power consumption, power management/battery conservation configurations, battery fast charging, and software requirements. Exhaust air is displaced through the ventilation grill located on the left side of the computer.

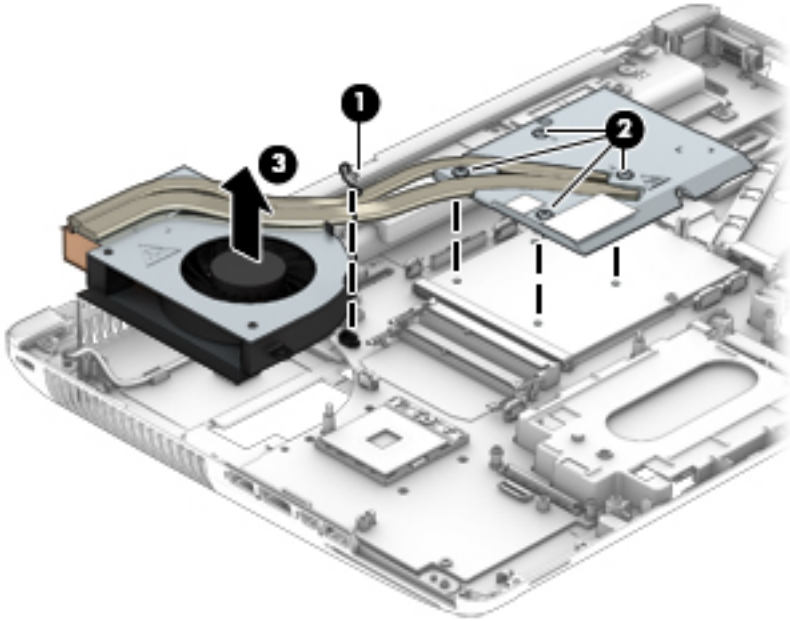
Before removing the graphics subsystem heat sink, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see service cover).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67)

Remove the graphics subsystem heat sink:

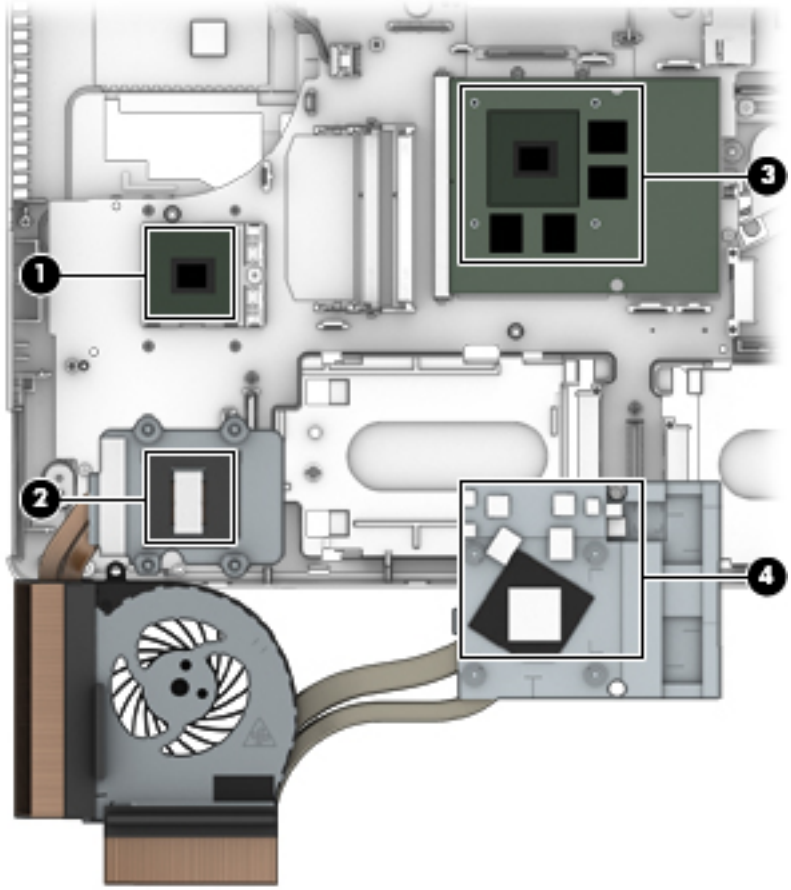
1. If present, release the tape that promotes airflow between the fan and the processor heat sink.
2. Disconnect the fan cable from the system board **(1)**.
3. Following the sequence stamped into the graphics subsystem heat sink, loosen the four captive Torx screws **(2)** that secure the graphics subsystem heat sink to the system board.

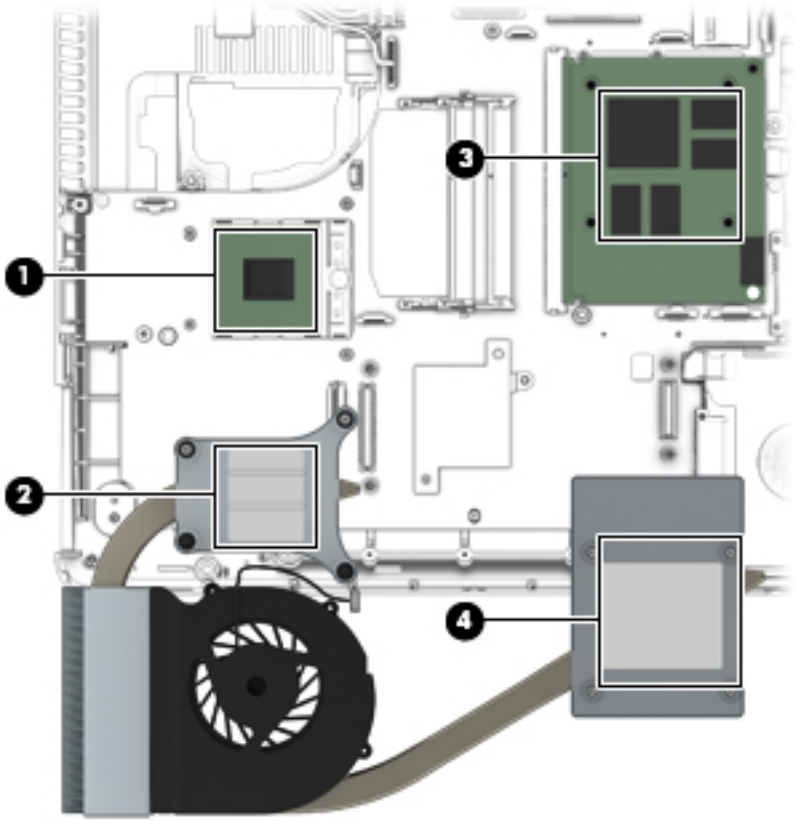
4. Remove the graphics subsystem heat sink **(3)**.



NOTE: The thermal material must be thoroughly cleaned from the surfaces of the graphics subsystem heat sink and the graphics board each time the graphics subsystem heat sink is removed. Thermal material is used on the system board component closest to the fan **(1)** and the heat sink component that services it **(2)**, as well as on the graphics board **(3)** and various locations on the graphics subsystem heat sink section **(4)** that services it.

Use the image below that matches the computer's thermal pad configuration.


1
2
3
4



Reverse this procedure to install the graphics subsystem heat sink.

Graphics board

NOTE: The graphics board spare part kit includes replacement thermal material.

Description	Spare part number
AMD FirePro W6170M	786689-001
NVIDIA K1100M N15P-Q1	785214-001
NVIDIA Quadro K5100M	781701-001
NVIDIA Quadro K4100M	781702-001
NVIDIA Quadro K3100M	781703-001
NVIDIA Quadro K2200M	786688-001

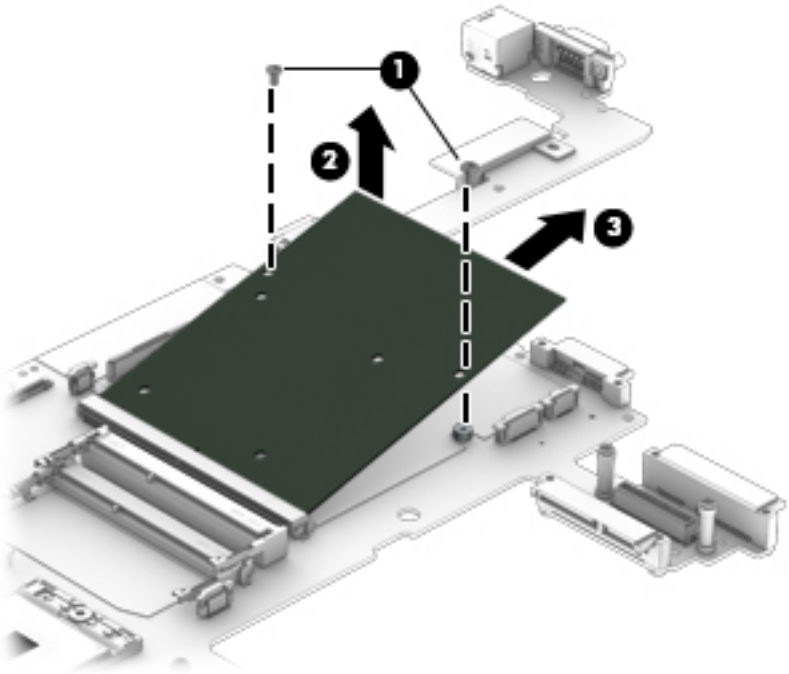
Before removing the graphics board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.

4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).
9. Remove the graphics board fan/heat sink assembly (see Graphics subsystem heat sink on page 91).

Remove the graphics board:

1. Remove the two Torx T8M2.5×4.0 screws **(1)** that secure the graphics board to the system board.
2. Lift the right edge of the graphics board until it rests at an angle **(2)**, and then remove it from the connector **(3)**.



Reverse this procedure to install the graphics board.

Power connector cable

NOTE: The power connector cable is included in the Cable Kit, spare part number 785212-001.

Before removing the power connector cable, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).
9. Remove the display assembly (see Display assembly on page 77).
10. Remove the graphics subsystem heat sink (see Graphics subsystem heat sink on page 91).

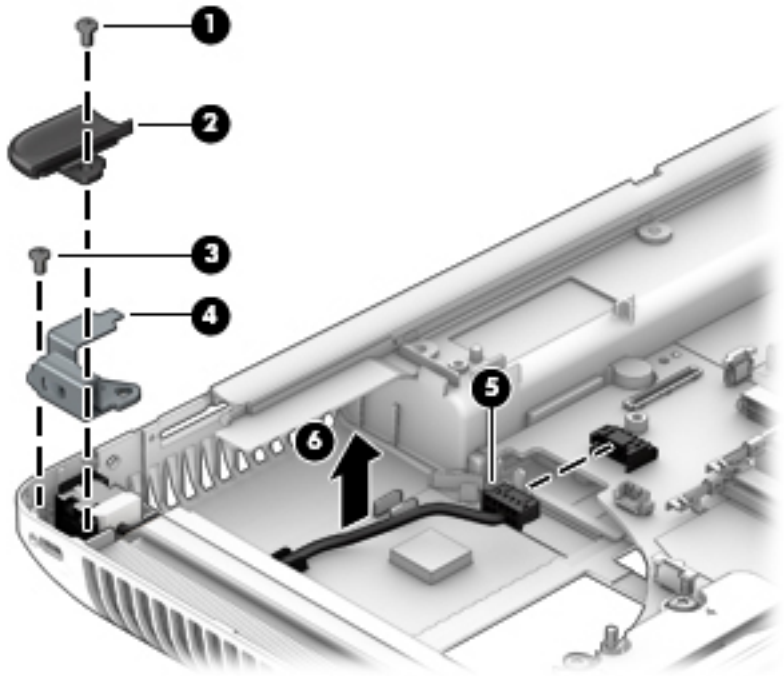
Remove the power connector cable:

1. Remove the Torx T8M2.5×7.0 screw **(1)** that secures to the rear corner cover/left to the base enclosure.
2. Remove the rear corner cover/left **(2)**.

   The rear corner cover/left is available in the Plastics Kit, 733637-001.
3. Remove the Torx T8M2.5×4.0 screw **(3)** that secures to the power connector bracket.
4. Remove the power connector bracket **(4)**.

   The power connector bracket is available in the Bracket Kit, spare part number 737734-001.
5. Disconnect the power connector cable from the system board **(5)**.

6. Remove the power connector cable **(6)**.



Reverse this procedure to install the power connector cable.

System board

NOTE: All system board spare part kits include replacement thermal material.

Description	Spare part number
For use only on computer models equipped with a quad core processor and the Windows 10 or Windows 8 Professional operating system	784213-601
For use only on computer models equipped with a quad core processor and the Windows 10 or Windows 8 Standard operating system	784213-501
For use only on computer models equipped with a quad core processor and a non-Windows 8 operating system	784213-001
For use only on computer models equipped with a dual core processor and the Windows 10 or Windows 8 Professional operating system	784212-601
For use only on computer models equipped with a dual core processor and the Windows 10 or Windows 8 Standard operating system	784212-501
For use only on computer models equipped with a dual core processor and a non-Windows 8 operating system	784212-001

Before removing the system board, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.

3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see Battery on page 41).
5. Remove the service cover (see Service cover on page 43).
6. Remove the optical drive (see Optical drive on page 52) or upgrade bay hard drive (see Upgrade Bay hard drive on page 54).
7. Remove the keyboard (see Keyboard on page 57).
8. Remove the top cover (see Top cover on page 67).
9. Remove the display assembly (see Display assembly on page 77).
10. Remove the graphics board fan/heat sink (see Graphics subsystem heat sink on page 91).
11. Remove the processor heat sink (see Processor heat sink on page 86).
12. Remove the audio/USB board (see Audio/USB board on page 84).
13. Remove the Smart Card reader (see Smart Card reader on page 83).
14. Remove the Expresscard assembly (see ExpressCard assembly on page 82).

When replacing the system board, be sure that the following additional components are removed from the defective system board and installed on the replacement system board:

- SIM (see SIM card on page 42)
- WLAN module (see WLAN module on page 47)
- WWAN module (see WWAN module on page 49)
- Solid-state drive (see Solid-state drive on page 46)
- Hard drives (see Hard drives, primary and secondary on page 44)
- Primary memory modules (see Primary memory module on page 60)
- Expansion memory modules (see Expansion memory module on page 56)
- Graphics board (see Graphics board on page 94)
- Processor (see Processor on page 89)

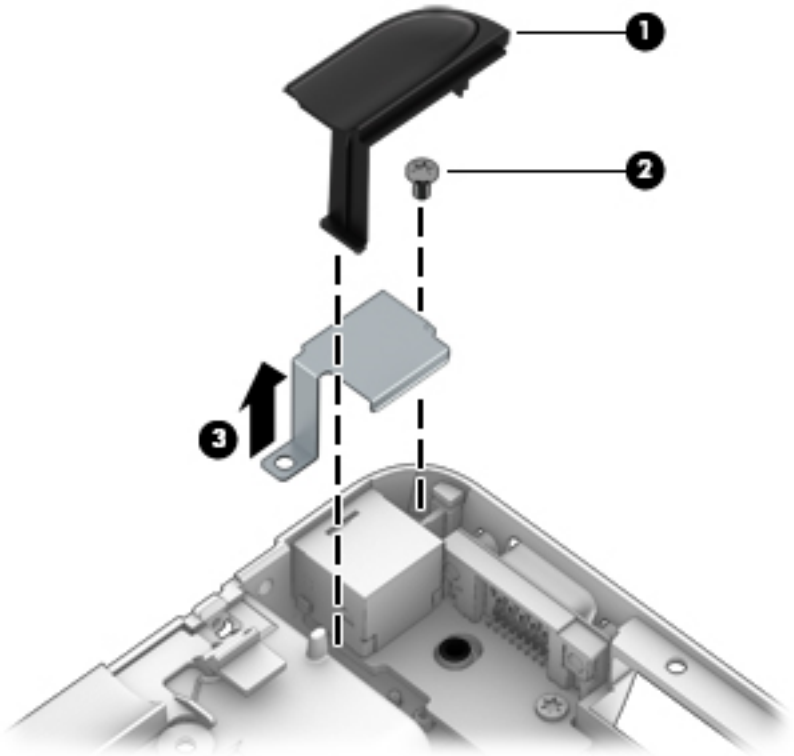
Remove the system board:

1. Remove the rear corner cover/right **(1)**.

   The rear corner cover/right is available in the Plastics Kit, 733637-001.
2. Remove the Torx T8M2.5×4.0 screw that secures the RJ-45 connector bracket **(2)**.

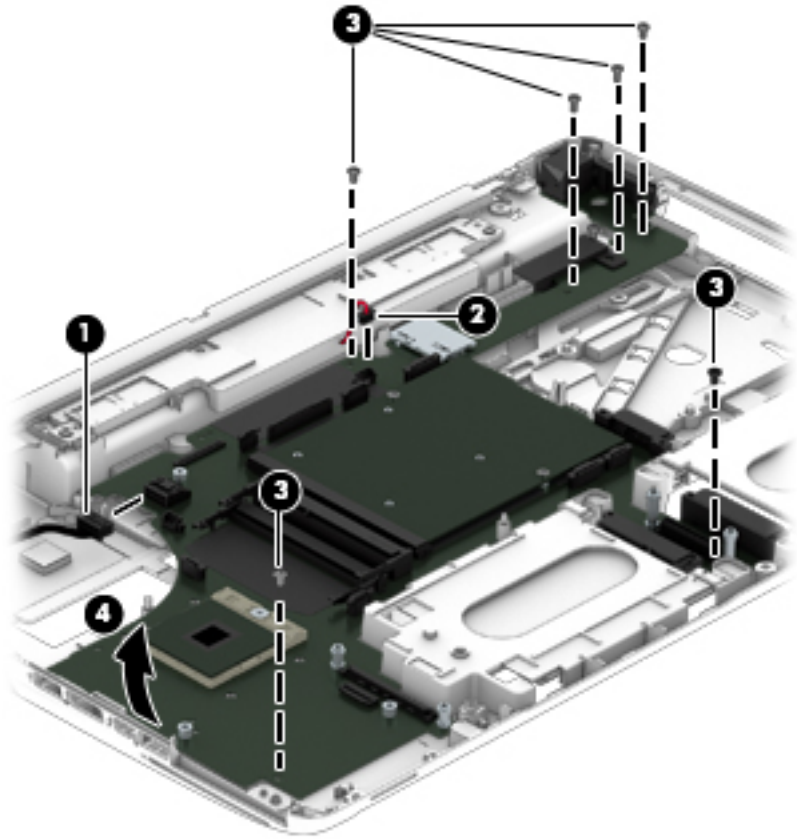
3. Remove the RJ-45 connector bracket **(3)**.

   The RJ-45 connector bracket is available in the Bracket Kit, spare part number 737734-001.

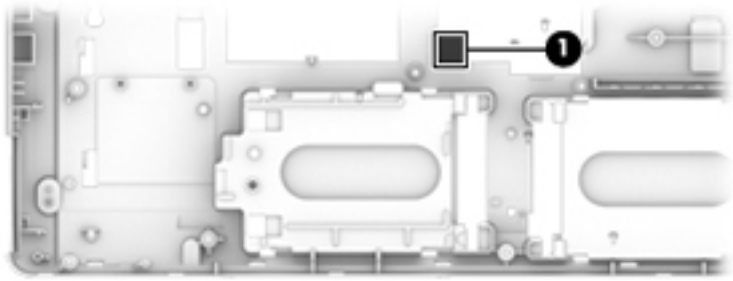


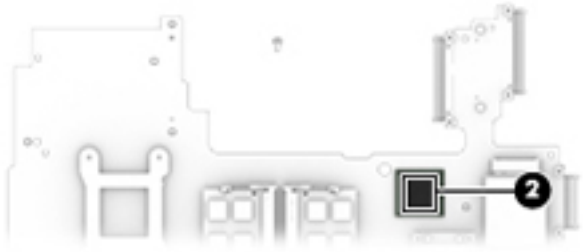
4. Disconnect the power connector cable **(1)** and the speaker cable **(2)** from the system board.
5. Remove the six Torx T8M2.5×4.0 screws **(3)** that secure the system board to the base enclosure.

6. Lift up on the left side of the system board **(4)** until it rests at an angle, and then remove it by sliding it up and to the left at an angle.



When replacing the system board, note the location of the thermal material on the system board **(1)** and the base enclosure **(2)**.





Reverse this procedure to install the system board.

7 Computer Setup (BIOS), TPM, and HP Sure Start – Windows 10

Using Computer Setup

Computer Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Computer Setup includes settings for the types of devices installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Computer Setup. Errors can prevent the computer from operating properly.

Starting Computer Setup

NOTE: An external keyboard or mouse connected to a USB port can be used with Computer Setup only if USB legacy support is enabled.

To start Computer Setup, follow these steps:

▲ Start Computer Setup.

- Computers or tablets with keyboards:

  ▲ Turn on or restart the computer, and when the HP logo appears, press f10 to enter Computer Setup.

- Tablets without keyboards:

  ▲ Turn off the tablet. Press the power button in combination with the volume down button until the Startup menu is displayed, and then tap F10 to enter Computer Setup.

Navigating and selecting in Computer Setup

- To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to select the item.

NOTE: On tablets without keyboards, you can use your finger to make selections.

- To scroll up and down, select the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.
- To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

To exit Computer Setup menus, choose one of the following methods:

- To exit Computer Setup menus without saving your changes:

  Select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Ignore Changes and Exit**, and then press enter.

- To save your changes and exit Computer Setup menus:

  Select the Save icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Restoring factory settings in Computer Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Computer Setup to the values that were set at the factory, follow these steps:

1. Start Computer Setup. See Starting Computer Setup on page 101.
2. Select **Main**, and then select **Apply Factory Defaults and Exit**.

   NOTE: On select products, the selections may display **Restore Defaults** instead of **Apply Factory Defaults and Exit**.

3. Follow the on-screen instructions.
4. To save your changes and exit, select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

NOTE: Your password settings and security settings are not changed when you restore the factory settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP website.

Most BIOS updates on the HP website are packaged in compressed files called SoftPaqs.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS

To decide whether you need to update Computer Setup (BIOS), first determine the BIOS version on your computer.

BIOS version information (also known as *ROM date* and *System BIOS*) can be accessed by pressing fn+esc (if you are already in Windows) or by using Computer Setup.

1. Start Computer Setup. See Starting Computer Setup on page 101.
2. Select **Main**, and then select **System Information**.
3. To exit Computer Setup without saving your changes, select the Exit icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Select **Main**, select **Ignore Changes and Exit**, and then press enter.

To check for later BIOS versions, see Downloading a BIOS update on page 103.

Downloading a BIOS update

⚠ **CAUTION:** To reduce the risk of damage to the computer or an unsuccessful installation, download and install a BIOS update only when the computer is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the computer is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power on the computer by unplugging the power cord from the AC outlet.

Do not shut down the computer or initiate Sleep.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

   – or –

   Select the question mark icon in the taskbar.
2. Select **Updates**, and then select **Check for updates and messages**.
3. Follow the on-screen instructions.
4. At the download area, follow these steps:

   a. Identify the most recent BIOS update and compare it to the BIOS version currently installed on your computer. Make a note of the date, name, or other identifier. You may need this information to locate the update later, after it has been downloaded to your hard drive.

   b. Follow the on-screen instructions to download your selection to the hard drive.

   Make a note of the path to the location on your hard drive where the BIOS update is downloaded. You will need to access this path when you are ready to install the update.

NOTE: If you connect your computer to a network, consult the network administrator before installing any software updates, especially system BIOS updates.

BIOS installation procedures vary. Follow any instructions that are revealed on the screen after the download is complete. If no instructions are revealed, follow these steps:

1. Type `file` in the taskbar search box, and then select **File Explorer**.
2. Select your hard drive designation. The hard drive designation is typically Local Disk (C:).
3. Using the hard drive path you recorded earlier, open the folder that contains the update.
4. Double-click the file that has an .exe extension (for example, *filename*.exe).

   The BIOS installation begins.
5. Complete the installation by following the on-screen instructions.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Changing the boot order using the f9 prompt

To dynamically choose a boot device for the current startup sequence, follow these steps:

1. Access the Boot Device Options menu:
   - Computers or tablets with keyboards:

     ▲ Turn on or restart the computer, and when the HP logo appears, press f9 to enter the Boot Device Options menu.
   - Tablets without keyboards:

     ▲ Turn off the tablet. Press the power button in combination with the volume down button until the Startup menu is displayed, and then tap F9 to enter the Boot Device Options menu.
2. Select a boot device, then press enter.

TPM BIOS settings (select products only)

IMPORTANT: Before enabling Trusted Platform Module (TPM) functionality on this system, you must ensure that your intended use of TPM complies with relevant local laws, regulations and policies, and approvals or licenses must be obtained if applicable. For any compliance issues arising from your operation/usage of TPM which violates the above mentioned requirement, you shall bear all the liabilities wholly and solely. HP will not be responsible for any related liabilities.

TPM provides additional security for your computer. You can modify the TPM settings in Computer Setup (BIOS).

NOTE: If you change the TPM setting to Hidden, TPM is not visible in the operating system.

To access TPM settings in Computer Setup:

1. Start Computer Setup. See Starting Computer Setup on page 101.
2. Select **Security**, select **TPM Embedded Security**, and then follow the on-screen instructions.

Using HP Sure Start (select products only)

Select computer models are configured with HP Sure Start, a technology that continuously monitors the computer's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start automatically restores the BIOS to its previously safe state, without user intervention.

HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then follow the on-screen instructions.

8 HP PC Hardware Diagnostics (UEFI) – Windows 10

HP PC Hardware Diagnostics is a Unified Extensible Firmware Interface (UEFI) that allows you to run diagnostic tests to determine whether the computer hardware is functioning properly. The tool runs outside the operating system so that it can isolate hardware failures from issues that are caused by the operating system or other software components.

NOTE: To start BIOS on a convertible computer, your computer must be in notebook mode and you must use the keyboard attached to your tablet. The on-screen keyboard, which displays in tablet mode, cannot access BIOS.

To start HP PC Hardware Diagnostics UEFI:

1. Start BIOS:
   - Computers or tablets with keyboards:

     ▲ Turn on or restart the computer, quickly press esc.
   - Tablets without keyboards:

     ▲ Turn on or restart the tablet, and then quickly hold down the volume down button.

     – or –

     Turn on or restart the tablet, and then quickly hold down the Windows button.
2. Press or tap f2.

   The BIOS searches three places for the diagnostic tools, in the following order:

   a. Connected USB drive

   NOTE: To download the HP PC Hardware Diagnostics (UEFI) tool to a USB drive, see Downloading HP PC Hardware Diagnostics (UEFI) to a USB device on page 107.

   b. Hard drive

   c. BIOS
3. When the diagnostic tool opens, select the type of diagnostic test you want to run, and then follow the on-screen instructions. On a tablet, press the volume down button to stop a diagnostic test.

NOTE: If you need to stop a diagnostic test on computers or tablets with a keyboard, press esc.

Downloading HP PC Hardware Diagnostics (UEFI) to a USB device

There are two options to download HP PC Hardware Diagnostics to a USB device:

Download the latest UEFI version:

1. Go to http://www.hp.com/go/techcenter/pcdiags. The HP PC Diagnostics home page is displayed.
2. In the HP PC Hardware Diagnostics section, click the **Download** link, and then select **Run**.

Download any version of UEFI for a specific product:

1. Go to http://www.hp.com/support, and then select your country. The HP Support page is displayed.
2. Click **Drivers & Downloads**.
3. In the text box, enter the product name, and then click **Go**.

   – or –

   Click **Find Now** to let HP automatically detect your product.
4. Select your computer, and then select your operating system.
5. In the **Diagnostic** section, follow the on-screen instructions to select and download the UEFI version you want.

9 Computer Setup (BIOS), MultiBoot, and System Diagnostics – Windows 8

Using Computer Setup

Computer Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Computer Setup includes settings for the types of devices installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Computer Setup. Errors can prevent the computer from operating properly.

Starting Computer Setup

NOTE: An external keyboard or mouse connected to a USB port can be used with Computer Setup only if USB legacy support is enabled.

To start Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.

Navigating and selecting in Computer Setup

To navigate and select in Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   NOTE: You can use either a pointing device (TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make selections in Computer Setup.

2. Press f10 to enter Computer Setup.
   - To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to click the item.
   - To scroll up and down, click the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.
   - To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

To exit Computer Setup menus, choose one of the following methods:

- To exit Computer Setup menus without saving your changes:

  Click the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

- To save your changes and exit Computer Setup menus:

  Click the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Use the tab key and the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Restoring default settings in Computer Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Computer Setup to the values that were set at the factory, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select **File > Restore Defaults**.
4. Follow the on-screen instructions.
5. To save your changes and exit, click the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

NOTE: Your password settings and security settings are not changed when you restore the default settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP website.

Most BIOS updates on the HP website are packaged in compressed files called *SoftPaqs*.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS version

To determine whether available BIOS updates contain later BIOS versions than those currently installed on the computer, you need to know the version of the system BIOS currently installed.

BIOS version information (also known as *ROM date* and *System BIOS*) can be displayed by pressing fn+esc (if you are already in Windows) or by using Computer Setup.

1. Start Computer Setup.
2. Use a pointing device or the arrow keys to select **File > System Information**.
3. To exit Computer Setup without saving your changes, click the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

Downloading a BIOS update

⚠ **CAUTION:** To reduce the risk of damage to the computer or an unsuccessful installation, download and install a BIOS update only when the computer is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the computer is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power on the computer by unplugging the power cord from the AC outlet.

Do not shut down the computer or initiate Sleep.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. From the Start screen, select the HP Support Assistant app.
2. Select **Updates and tune-ups**, and then select **Check for HP updates now**.
3. At the download area, follow these steps:

   a. Identify the most recent BIOS update and compare it to the BIOS version currently installed on your computer. Make a note of the date, name, or other identifier. You may need this information to locate the update later, after it has been downloaded to your hard drive.

   b. Follow the on-screen instructions to download your selection to the hard drive.

   If the update is more recent than your BIOS, make a note of the path to the location on your hard drive where the BIOS update is downloaded. You will need to access this path when you are ready to install the update.

NOTE: If you connect your computer to a network, consult the network administrator before installing any software updates, especially system BIOS updates.

BIOS installation procedures vary. Follow any instructions that are displayed on the screen after the download is complete. If no instructions are displayed, follow these steps:

1. From the Start screen, type e, and then click **File Explorer**.
2. Click your hard drive designation. The hard drive designation is typically Local Disk (C:).
3. Using the hard drive path you recorded earlier, open the folder on your hard drive that contains the update.
4. Double-click the file that has an .exe extension (for example, *filename*.exe).

   The BIOS installation begins.
5. Complete the installation by following the on-screen instructions.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Using MultiBoot

About the boot device order

As the computer starts, the system attempts to boot from enabled devices. The MultiBoot utility, which is enabled at the factory, controls the order in which the system selects a boot device. Boot devices can include optical drives, diskette drives, a network interface card (NIC), hard drives, and USB devices. Boot devices contain bootable media or files that the computer needs to start and operate properly.

NOTE: Some boot devices must be enabled in Computer Setup before they can be included in the boot order.

You can change the order in which the computer searches for a boot device by changing the boot order in Computer Setup. You can also press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen, and then press f9. Pressing f9 displays a menu that shows the current boot devices and allows you to select a boot device. Or, you can use MultiBoot Express to set the computer to prompt you for a boot location each time the computer turns on or restarts.

Choosing MultiBoot preferences

You can use MultiBoot in the following ways:

- To set a new boot order that the computer uses each time it is turned on, by changing the boot order in Computer Setup.
- To dynamically choose the boot device, by pressing esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen, and then pressing f9 to enter the Boot Device Options menu.
- To use MultiBoot Express to set variable boot orders. This feature prompts you for a boot device each time the computer is turned on or restarted.

Setting a new boot order in Computer Setup

To start Computer Setup and set a boot device order that the computer uses each time it is turned on or restarted, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select the **Legacy Boot Order** list, and then press enter.
4. To move the device up in the boot order, use a pointing device to click the up arrow, or press the + key.

   – or –

   To move the device down in the boot order, use a pointing device to click the down arrow, or press the - key.
5. To save your changes and exit Computer Setup, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Dynamically choosing a boot device using the f9 prompt

To dynamically choose a boot device for the current startup sequence, follow these steps:

1. Open the Select Boot Device menu by turning on or restarting the computer, and then pressing esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f9.
3. Use a pointing device or the arrow keys to select a boot device, then press enter.

Setting a MultiBoot Express prompt

To start Computer Setup and set the computer to display the MultiBoot startup location menu each time the computer is started or restarted, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select **System Configuration > Boot Options**, and then press enter.
4. In the **MultiBoot Express Popup Delay (Sec)** field, enter the length of time in seconds that you want the computer to display the startup location menu before it defaults to the current MultiBoot setting. (When 0 is selected, the Express Boot startup location menu is not displayed.)
5. To save your changes and exit Computer Setup, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Entering MultiBoot Express preferences

When the Express Boot menu is displayed during startup, you have the following choices:

- To specify a boot device from the Express Boot menu, select your preference within the allotted time, and then press enter.
- To prevent the computer from defaulting to the current MultiBoot setting, press any key before the allotted time expires. The computer will not start until you select a boot device and press enter.
- To allow the computer to start according to the current MultiBoot settings, wait for the allotted time to expire.

Using System Diagnostics

System Diagnostics allows you to run diagnostic tests to determine if the computer hardware is functioning properly. The following diagnostic tests may be available in System Diagnostics:

- System Tune-Up—This group of additional tests checks your computer to make sure that the main components are functioning correctly. System Tune-Up runs longer and more comprehensive tests on memory modules, hard drive SMART attributes, the hard drive surface, the battery (and battery calibration), video memory, and the WLAN module status.
- Start-up test—This test analyzes the main computer components that are required to start the computer.
- Run-in test—This test repeats the start-up test and checks for intermittent problems that the start-up test does not detect.
- Hard disk test—This test analyzes the physical condition of the hard drive, and then checks all data in every sector of the hard drive. If the test detects a damaged sector, it attempts to move the data to a good sector.
- Memory test—This test analyzes the physical condition of the memory modules. If it reports an error, replace the memory modules immediately.
- Battery test—This test analyzes the condition of the battery and calibrates the battery if necessary. If the battery fails the test, contact HP support to report the issue and purchase a replacement battery.
- BIOS Management—You can update or rollback the version of the BIOS on the system. Do not shut down or remove external power during the process. You will be given a confirmation screen before your BIOS is modified. Select **BIOS update**, **BIOS Rollback**, or **Back to main menu**.

You can view system information and error logs or select languages in the System Diagnostics window.

To start System Diagnostics:

1. Turn on or restart the computer. While the “Press the ESC key for Startup Menu” message is displayed in the lower-left corner of the screen, press esc. When the Startup Menu is displayed, press f2.
2. Click the diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: If you need to stop a diagnostics test while it is running, press esc.

10 Computer Setup (BIOS), MultiBoot, and UEFI – Windows 7

Using Computer Setup

Computer Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Computer Setup includes settings for the types of devices installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Computer Setup. Errors can prevent the computer from operating properly.

Starting Computer Setup

NOTE: An external keyboard or mouse connected to a USB port can be used with Computer Setup only if USB legacy support is enabled.

To start Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.

Navigating and selecting in Computer Setup

To navigate and select in Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

   NOTE: You can use either a pointing device (TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make selections in Computer Setup.

2. Press f10 to enter Computer Setup.
   - To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to click the item.
   - To scroll up and down, click the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key on the keyboard.
   - To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

To exit Computer Setup menus, choose one of the following methods:

- To exit Computer Setup menus without saving your changes:

  Click the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

- To save your changes and exit Computer Setup menus:

  Click the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

  – or –

  Use the tab key and the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Restoring default settings in Computer Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Computer Setup to the values that were set at the factory, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select **File > Restore Defaults**.
4. Follow the on-screen instructions.
5. To save your changes and exit, click the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

NOTE: Your password settings and security settings are not changed when you restore the default settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP website.

Most BIOS updates on the HP website are packaged in compressed files called *SoftPaqs*.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS version

To determine whether available BIOS updates contain later BIOS versions than those currently installed on the computer, you need to know the version of the system BIOS currently installed.

BIOS version information (also known as *ROM date* and *System BIOS*) can be displayed by pressing fn+esc (if you are already in Windows) or by using Computer Setup.

1. Start Computer Setup.
2. Use a pointing device or the arrow keys to select **File > System Information**.
3. To exit Computer Setup without saving your changes, click the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

Downloading a BIOS update

⚠ **CAUTION:** To reduce the risk of damage to the computer or an unsuccessful installation, download and install a BIOS update only when the computer is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the computer is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power on the computer by unplugging the power cord from the AC outlet.

Do not shut down the computer or initiate Sleep.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. Access Help and Support by selecting **Start > Help and Support**.
2. Select **Updates and tune-ups**, and then select **Check for HP updates now**.
3. At the download area, follow these steps:

   a. Identify the most recent BIOS update and compare it to the BIOS version currently installed on your computer. Make a note of the date, name, or other identifier. You may need this information to locate the update later, after it has been downloaded to your hard drive.

   b. Follow the on-screen instructions to download your selection to the hard drive.

   If the update is more recent than your BIOS, make a note of the path to the location on your hard drive where the BIOS update is downloaded. You will need to access this path when you are ready to install the update.

NOTE: If you connect your computer to a network, consult the network administrator before installing any software updates, especially system BIOS updates.

BIOS installation procedures vary. Follow any instructions that are displayed on the screen after the download is complete. If no instructions are displayed, follow these steps:

1. Select **Start > Computer**.
2. Click your hard drive designation. The hard drive designation is typically Local Disk (C:).
3. Using the hard drive path you recorded earlier, open the folder on your hard drive that contains the update.

4. Double-click the file that has an .exe extension (for example, *filename*.exe).

   The BIOS installation begins.

5. Complete the installation by following the on-screen instructions.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Using MultiBoot

About the boot device order

As the computer starts, the system attempts to boot from enabled devices. The MultiBoot utility, which is enabled at the factory, controls the order in which the system selects a boot device. Boot devices can include optical drives, diskette drives, a network interface card (NIC), hard drives, and USB devices. Boot devices contain bootable media or files that the computer needs to start and operate properly.

NOTE: Some boot devices must be enabled in Computer Setup before they can be included in the boot order.

You can change the order in which the computer searches for a boot device by changing the boot order in Computer Setup. You can also press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen, and then press f9. Pressing f9 displays a menu that shows the current boot devices and allows you to select a boot device. Or, you can use MultiBoot Express to set the computer to prompt you for a boot location each time the computer turns on or restarts.

Choosing MultiBoot preferences

You can use MultiBoot in the following ways:

- To set a new boot order that the computer uses each time it is turned on, by changing the boot order in Computer Setup.
- To dynamically choose the boot device, by pressing esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen, and then pressing f9 to enter the Boot Device Options menu.
- To use MultiBoot Express to set variable boot orders. This feature prompts you for a boot device each time the computer is turned on or restarted.

Setting a new boot order in Computer Setup

To start Computer Setup and set a boot device order that the computer uses each time it is turned on or restarted, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select the **Legacy Boot Order** list, and then press enter.
4. To move the device up in the boot order, use a pointing device to click the up arrow, or press the + key.

   – or –

   To move the device down in the boot order, use a pointing device to click the down arrow, or press the - key.
5. To save your changes and exit Computer Setup, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Dynamically choosing a boot device using the f9 prompt

To dynamically choose a boot device for the current startup sequence, follow these steps:

1. Open the Select Boot Device menu by turning on or restarting the computer, and then pressing esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f9.
3. Use a pointing device or the arrow keys to select a boot device, then press enter.

Setting a MultiBoot Express prompt

To start Computer Setup and set the computer to display the MultiBoot startup location menu each time the computer is started or restarted, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select **System Configuration > Boot Options**, and then press enter.
4. In the **MultiBoot Express Popup Delay (Sec)** field, enter the length of time in seconds that you want the computer to display the startup location menu before it defaults to the current MultiBoot setting. (When 0 is selected, the Express Boot startup location menu is not displayed.)
5. To save your changes and exit Computer Setup, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Entering MultiBoot Express preferences

When the Express Boot menu is displayed during startup, you have the following choices:

- To specify a boot device from the Express Boot menu, select your preference within the allotted time, and then press enter.
- To prevent the computer from defaulting to the current MultiBoot setting, press any key before the allotted time expires. The computer will not start until you select a boot device and press enter.
- To allow the computer to start according to the current MultiBoot settings, wait for the allotted time to expire.

Using HP PC Hardware Diagnostics (UEFI) (select models only)

HP PC Hardware Diagnostics is a Unified Extensible Firmware Interface (UEFI) that allows you to run diagnostic tests to determine if the computer hardware is functioning properly. The tool runs outside of the operating system to isolate hardware failures from issues that may be caused by the operating system or other software components.

To start HP PC Hardware Diagnostics UEFI:

1. Turn on or restart the computer, quickly press esc, and then press f2.

   After pressing f2, the BIOS searches three places for the HP PC Hardware Diagnostics (UEFI) tools in the following order:

   a. Connected USB drive

   NOTE: To download the HP PC Hardware Diagnostics (UEFI) tool to a USB drive, see Downloading HP PC Hardware Diagnostics (UEFI) to a USB device on page 120.

   b. Hard drive

   c. BIOS

2. Click the type of diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: If you need to stop a diagnostic test while it is running, press esc.

Downloading HP PC Hardware Diagnostics (UEFI) to a USB device

NOTE: The HP PC Hardware Diagnostics (UEFI) download instructions are provided in English only.

1. Go to http://www.hp.com.
2. Click **Support & Drivers**, and then click the **Drivers & Software** tab.
3. Enter the product name in the text box, and then click **Search**.
4. Select your computer model, and then select your operating system.
5. In the Diagnostic section, click **HP UEFI Support Environment**.

   – or –

   Click **Download**, and then select **Run**.

11 Computer Setup (BIOS) and Advanced System Diagnostics – SUSE Linux

Computer Setup, or Basic Input/Output System (BIOS), controls communication between all the input and output devices on the system (such as disk drives, display, keyboard, mouse, and printer). Computer Setup includes settings for the types of peripherals installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: Use extreme care when making changes in Computer Setup. Errors can prevent the computer from operating properly.

Starting Computer Setup

NOTE: An external keyboard or mouse connected to a USB port can be used with Computer Setup only if USB legacy support is enabled.

To start Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.

Using Computer Setup

Navigating and selecting in Computer Setup

To navigate and select in Computer Setup, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
   - To select a menu or a menu item, use the tab key and the keyboard arrow keys and then press enter, or use a pointing device to click the item.
   - To scroll up and down, click the up arrow or the down arrow in the upper-right corner of the screen, or use the up arrow key or the down arrow key.
   - To close open dialog boxes and return to the main Computer Setup screen, press esc, and then follow the on-screen instructions.

   NOTE: You can use either a pointing device (TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make selections in Computer Setup.
2. Press f10 to enter Computer Setup.

To exit Computer Setup menus, choose one of the following methods:

- To exit Computer Setup menus without saving your changes, click the **Exit** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

  – or –

Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

– or –

- To save your changes and exit Computer Setup menus, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

  – or –

  Use the tab key and the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

Restoring default settings in Computer Setup

NOTE: Restoring defaults will not change the hard drive mode.

To return all settings in Computer Setup to the values that were set at the factory, follow these steps:

1. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
2. Press f10 to enter Computer Setup.
3. Use a pointing device or the arrow keys to select **File > Restore Defaults**.
4. Follow the on-screen instructions.
5. To save your changes and exit, click the **Save** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

Your changes go into effect when the computer restarts.

NOTE: Your password settings and security settings are not changed when you restore the default settings.

Updating the BIOS

Updated versions of the BIOS may be available on the HP Web site.

Most BIOS updates on the HP Web site are packaged in compressed files called *SoftPaqs*.

Some download packages contain a file named Readme.txt, which contains information regarding installing and troubleshooting the file.

Determining the BIOS version

To determine whether available BIOS updates contain later BIOS versions than those currently installed on the computer, you need to know the version of the system BIOS currently installed.

BIOS version information (also known as *ROM date* and *System BIOS*) can be displayed as follows:

1. Start Computer Setup.
2. Use a pointing device or the arrow keys to select **File > System Information**.
3. To exit Computer Setup without saving your changes, click the **Exit** icon in the lower-left corner of the screen, and then follow the on-screen instructions.

   – or –

   Use the tab key and the arrow keys to select **File > Ignore Changes and Exit**, and then press enter.

NOTE: You can also determine the BIOS version by turning on or restarting the computer, pressing the esc key while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen, and then pressing the f1 key. Follow the on-screen instructions to exit this screen.

Downloading a BIOS update

CAUTION: To reduce the risk of damage to the computer or an unsuccessful installation, download and install a BIOS update only when the computer is connected to reliable external power using the AC adapter. Do not download or install a BIOS update while the computer is running on battery power, docked in an optional docking device, or connected to an optional power source. During the download and installation, follow these instructions:

Do not disconnect power from the computer by unplugging the power cord from the AC outlet.

Do not shut down the computer or initiate Suspend or Hibernation.

Do not insert, remove, connect, or disconnect any device, cable, or cord.

1. Open your web browser. For U.S. support, go to http://www.hp.com/go/contactHP. For worldwide support, go to http://welcome.hp.com/country/us/en/wwcontact_us.html.
2. Follow the on-screen instructions to identify your computer and access the BIOS update you want to download.
3. Click the option for software and driver downloads, type your computer model number in the product box, and then press enter. Follow the on-screen instructions to identify your computer and access the BIOS update you want to download.
4. Click your specific product from the models listed.
5. Click the appropriate operating system.
6. Go to the BIOS section and download the BIOS software package.
7. Follow the installation instructions as provided with the downloaded BIOS software package.

NOTE: After a message on the screen reports a successful installation, you can delete the downloaded file from your hard drive.

Using Advanced System Diagnostics

Advanced System Diagnostics allows you to run diagnostic tests to determine if the computer hardware is functioning properly. The following diagnostic tests are available in Advanced System Diagnostics:

- Start-up test—This test analyzes the main computer components that are required to start the computer.
- Run-in test—This test repeats the start-up test and checks for intermittent problems that the start-up test does not detect.
- Hard disk test—This test analyzes the physical condition of the hard drive, and then checks all data in every sector of the hard drive. If the test detects a damaged sector, it attempts to move the data to a good sector.
- Memory test—This test analyzes the physical condition of the memory modules. If it reports an error, replace the memory modules immediately.
- Battery test—This test analyzes the condition of the battery and calibrates the battery if necessary. If the battery fails the test, contact support to report the issue and purchase a replacement battery.
- System Tune-Up—This group of additional tests checks your computer to make sure that the main components are functioning correctly. System Tune-Up runs longer and more comprehensive tests on memory modules, hard drive SMART attributes, the hard drive surface, the battery (and battery calibration), video memory, and the WLAN module status.

You can view system information and error logs in the Advanced System Diagnostics window.

To start Advanced System Diagnostics:

1. Turn on or restart the computer. While the “Press the ESC key for Startup Menu” message is displayed in the lower-left corner of the screen, press esc. When the Startup Menu is displayed, press f2.
2. Click the diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: If you need to stop a diagnostics test while it is running, press esc.

12 Specifications

Computer specifications

	Metric	U.S.
Dimensions		
Width	**41.60 cm**	16.37 in
Depth	**27.20 cm**	10.70 in
Height (front to back)	**3.40 cm to 4.00 cm**	1.33 in to 1.57 in
Weight	**3.48 kg**	7.67 lbs
Input power		
Operating voltage and current	19.5 V dc @ 10.25 A — 200 W 19.5 V dc @ 11.79 A — 230 W	
NOTE: This product is designed for IT power systems in Norway with phase-to-phase voltage not exceeding 240 V rms. **NOTE:** The computer operating voltage and current can be found on the system regulatory label.		
Temperature		
Operating	**5°C to 35°C**	41°F to 95°F
Nonoperating	**-20°C to 60°C**	-4°F to 140°F
Relative humidity (noncondensing)		
Operating	10% to 90%	10% to 90%
Nonoperating	5% to 95%	5% to 95%
Maximum altitude (unpressurized)		
Operating	**-15 m to 3,048 m**	-50 ft to 10,000 ft
Nonoperating	**-15 m to 12,192 m**	-50 ft to 40,000 ft
Shock		
Operating	125 g, 2 ms, half-sine	
Nonoperating	200 g, 2 ms, half-sine	
Random vibration		
Operating	0.75 g zero-to-peak, 10 Hz to 500 Hz, 0.25 oct/min sweep rate	
Nonoperating	1.50 g zero-to-peak, 10 Hz to 500 Hz, 0.5 oct/min sweep rate	
NOTE: Applicable product safety standards specify thermal limits for plastic surfaces. The computer operates well within this range of temperatures.		

13 Backup and recovery – Windows 10

This chapter provides information about the following processes. The information in the chapter is standard procedure for most products.

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

For additional information, refer to the HP support assistant app.

▲ Type `support` in the taskbar search box, and then select the **HP Support Assistant** app.

– or –

Click the question mark icon in the taskbar.

IMPORTANT: If you will be performing recovery procedures on a tablet, the tablet battery must be at least 70% charged before you start the recovery process.

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning any recovery process.

Creating recovery media and backups

The following methods of creating recovery media and backups are available on select products only. Choose the available method according to your computer model.

- Use HP Recovery Manager to create HP Recovery media after you successfully set up the computer. This step creates a backup of the HP 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. For information on creating recovery media, see Creating HP Recovery media (select products only) on page 127. For information on the recovery options that are available using the recovery media, see Using Windows Tools on page 128.
- Use Windows tools to create system restore points and create backups of personal information.

  For more information, see Recovering using HP Recovery Manager on page 129.

NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

Creating HP Recovery media (select products only)

If possible, check for the presence of the Recovery partition and the Windows partition. From the **Start** menu, select **File Explorer**, and then select **This PC**.

- If your computer does not list the Windows partition and the Recovery partition, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

  You can use Windows tools to create system restore points and create backups of personal information, see *Using Windows tools on page 61*.

- If your computer does list the Recovery partition and the Windows partition, you can use HP Recovery Manager to create recovery media after you successfully set up the computer. HP Recovery media can be used to perform system recovery if the hard drive becomes corrupted. System recovery reinstalls the original operating system and software programs that were installed at the factory and then configures the settings for the programs. HP Recovery media can also be used to customize the system or restore the factory image if you replace the hard drive.

  - Only one set of recovery media can be created. Handle these recovery tools carefully, and keep them in a safe place.
  - HP Recovery Manager examines the computer and determines the required storage capacity for the media that will be required.
  - To create recovery discs, your computer must have an optical drive with DVD writer capability, and you must use only high-quality blank DVD-R, DVD+R, DVD-R DL, or DVD+R DL discs. Do not use rewritable discs such as CD±RW, DVD±RW, double-layer DVD±RW, or BD-RE (rewritable Blu-ray) discs; they are not compatible with HP Recovery Manager software. Or, instead, you can use a high-quality blank USB flash drive.
  - If your computer does not include an integrated optical drive with DVD writer capability, but you would like to create DVD recovery media, you can use an external optical drive (purchased separately) to create recovery discs. If you use an external optical drive, it must be connected directly to a USB port on the computer; the drive cannot be connected to a USB port on an external device, such as a USB hub. If you cannot create DVD media yourself, you can obtain recovery discs for your computer from HP. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information on the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.
  - Be sure that the computer is connected to AC power before you begin creating the recovery media.
  - The creation process can take an hour or more. Do not interrupt the creation process.
  - If necessary, you can exit the program before you have finished creating all of the recovery DVDs. HP Recovery Manager will finish burning the current DVD. The next time you start HP Recovery Manager, you will be prompted to continue.

To create HP Recovery media:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps.

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Create recovery media**, and then follow the on-screen instructions.

If you ever need to recover the system, see Recovering using HP Recovery Manager on page 129.

Using Windows Tools

You can create recovery media, system restore points, and backups of personal information using Windows tools.

NOTE: If storage is 32 GB or less, Microsoft System Restore is disabled by default.

For more information and steps, see the Get started app.

▲ Select the **Start** button, and then select the **Get started** app.

Restore and recovery

There are several options for recovering your system. Choose the method that best matches your situation and level of expertise:

IMPORTANT: Not all methods are available on all products.

- Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state. For more information see the Get started app.

  ▲ Select the **Start** button, and then select the **Get started** app.

- If you need to correct a problem with a preinstalled application or driver, use the Reinstall drivers and/or applications option (select products only) of HP Recovery Manager to reinstall the individual application or driver.

  ▲ Type `recovery` in the taskbar search box, select **HP Recovery Manager**, select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.

- If you want to recover the Windows partition to original factory content, you can choose the System Recovery option from the HP Recovery partition (select products only) or use the HP Recovery media. For more information, see Recovering using Recovering using HP Recovery Manager on page 129. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 127.

- On select products, if you want to recover the computer's original factory partition and content, or if you have replaced the hard drive, you can use the Factory Reset option of HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 129.

- On select products, if you want to remove the recovery partition to reclaim hard drive space, HP Recovery Manager offers the Remove Recovery Partition option.

For more information, see Removing the Removing the HP Recovery partition (select products only) on page 131.

Recovering using HP Recovery Manager

HP Recovery Manager software allows you to recover the computer to its original factory state by using the HP Recovery media that you either created or that you obtained from HP, or by using the HP Recovery partition (select products only). If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 127.

What you need to know before you get started

- HP Recovery Manager recovers only software that was installed at the factory. For software not provided with this computer, you must either download the software from the manufacturer's website or reinstall the software from the media provided by the manufacturer.

IMPORTANT: Recovery through HP Recovery Manager should be used as a final attempt to correct computer issues.

- To use the Factory Reset option (select products only), you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 127.
- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, you can obtain recovery media for your system from support. See the *Worldwide Telephone Numbers* booklet included with the computer. You can also find contact information from the HP website. Go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data you want to retain.

Using HP Recovery media, you can choose from one of the following recovery options:

NOTE: Only the options available for your computer display when you start the recovery process.

- System Recovery—Reinstalls the original operating system, and then configures the settings for the programs that were installed at the factory.
- Factory Reset—Restores the computer to its original factory state by deleting all information from the hard drive and re-creating the partitions. Then it reinstalls the operating system and the software that was installed at the factory.

The HP Recovery partition (select products only) allows System Recovery only.

Using the HP Recovery partition (select products only)

The HP Recovery partition allows you to perform a system recovery without the need for recovery discs or a recovery USB flash drive. This type of recovery can be used only if the hard drive is still working.

To start HP Recovery Manager from the HP Recovery partition:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps (select products only).

1. Type `recovery` in the taskbar search box, select **Recovery Manager**, and then select **HP Recovery Environment**.

   – or –

   For computers or tablets with keyboards attached, press f11 while the computer boots, or press and hold f11 as you press the power button.

   For tablets without keyboards:

   Turn on or restart the tablet, and then quickly hold down the volume down button; then select f11.

   – or –

   Turn on or restart the tablet, and then quickly hold down the Windows button; then select f11.

2. Select **Troubleshoot** from the boot options menu.
3. Select **Recovery Manager**, and then follow the on-screen instructions.

Using HP Recovery media to recover

You can use HP Recovery media to recover the original system. This method can be used if your system does not have an HP Recovery partition or if the hard drive is not working properly.

1. If possible, back up all personal files.
2. Insert the HP Recovery media, and then restart the computer.

   NOTE: If the computer does not automatically restart in HP Recovery Manager, change the computer boot order. See Changing the computer boot order on page 131.

3. Follow the on-screen instructions.

Changing the computer boot order

If your computer does not restart in HP Recovery Manager, you can change the computer boot order, which is the order of devices listed in BIOS where the computer looks for startup information. You can change the selection to an optical drive or a USB flash drive.

To change the boot order:

IMPORTANT: For a tablet with a detachable keyboard, connect the keyboard to the keyboard dock before beginning these steps.

1. Insert the HP Recovery media.
2. Access BIOS:

   For computers or tablets with keyboards attached:

   ▲ Turn on or restart the computer or tablet, quickly press esc, and then press f9 for boot options.

   For tablets without keyboards:

   ▲ Turn on or restart the tablet, and then quickly hold down the volume down button; then select f9.

   – or –

   Turn on or restart the tablet, and then quickly hold down the Windows button; then select f9.
3. Select the optical drive or USB flash drive from which you want to boot.
4. Follow the on-screen instructions.

Removing the HP Recovery partition (select products only)

HP Recovery Manager software allows you to remove the HP Recovery partition to free up hard drive space.

IMPORTANT: After you remove the HP Recovery partition, you will not be able to perform System Recovery or create HP recovery media from the HP Recovery partition. So before you remove the Recovery partition, create HP Recovery media; see Creating HP Recovery media (select products only) on page 127.

NOTE: The Remove Recovery Partition option is only available on products that support this function.

Follow these steps to remove the HP Recovery partition:

1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
2. Select **Remove Recovery Partition**, and then follow the on-screen instructions.

14 Backup and recovery – Windows 8

To protect your information, use Windows backup and restore utilities to back up individual files and folders, back up your entire hard drive, create system repair media (select models only) by using the installed optical drive (select models only) or an optional external optical drive, or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

In Windows 8, from the Start screen, type `restore`, click **Settings**, and then select from the list of displayed options.

- or -

In Windows 8.1, from the Start screen, type `restore`, and then select from the list of displayed options.

NOTE: For detailed instructions on various backup and restore options, perform a search for these topics in HP Support Assistant. To access HP Support Assistant on the Start screen, select the **HP Support Assistant** app.

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

NOTE: Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. Refer to HP Support Assistant. To access HP Support Assistant on the Start screen, select the **HP Support Assistant** app.

Backing up your information

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

On Start screen, type `backup`, click **Settings**, and then select **Save backup copies of your files with File History**.

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

Note the following when backing up:

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

To create a backup using Backup and Restore in Windows 8.0:

NOTE: Be sure that the computer is connected to AC power before you start the backup process.

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

1. From the Start screen, type `backup`, and then click **Settings**.
2. Click **Save backup copy of your files with file history**.

   File History windows are launched.
3. Follow the on-screen instructions to use file history to backup files.

   - or -

   Click **recovery** to create a recovery drive using a USB flash drive.

   - or -

   Click **Windows 7 file recovery**, and then click **create a system image** to create a system image.

To create a backup using Backup and Restore in Windows 8.1:

NOTE: Be sure that the computer is connected to AC power before you start the backup process.

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

1. From the Start screen, type `backup`.
2. Click **Save backup copy of your files with file history**.

   File History windows are launched.
3. Follow the on-screen instructions to use file history to backup files.

   - or -

   Click **recovery** to create a recovery drive using a USB flash drive.

   - or -

   Click **System Image Backup** to create a system image.

Performing a system recovery

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

- Windows recovery tools: You can use Windows Backup and Restore to recover information you have previously backed up. You can also use Windows Automatic Repair to fix problems that might prevent Windows from starting correctly.
- f11 recovery tools: You can use the f11 recovery tools to recover your original hard drive image. The image includes the Windows operating system and software programs installed at the factory.

NOTE: If you are unable to boot (start up) your computer and you cannot use the system repair media you previously created (select models only), you must purchase Windows 8 operating system media to reboot the computer and repair the operating system.

Using f11 recovery tools

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

To recover the original hard drive image using f11:

1. If possible, back up all personal files.
2. If possible, check for the presence of the Recovery Image partition: From the Start screen, type c, and then select **Computer**.

   NOTE: If the Recovery Image partition is not listed, you must recover your operating system and programs using the Windows 8 operating system media and the *Driver Recovery* media (both purchased separately).
3. If the Recovery Image partition is listed, restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.
4. Press f11 while the “Press <F11> for recovery” message is displayed on the screen.
5. Choose your language.
6. Choose your keyboard layout.
7. Select **Troubleshoot** from the boot options menu.
8. Select **Reset your PC**, and follow the on-screen instructions.

Using Windows 8 operating system media (purchased separately)

To order a Windows 8 operating system DVD, go to http://www.hp.com/support, select your country or region, and follow the on-screen instructions. You can also order the DVD by calling support. For contact information, see the *Worldwide Telephone Numbers* booklet included with the computer.

CAUTION: Using a 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 a Windows 8 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 8 operating system DVD into the optical drive before the Windows operating system loads.
3. Power off the computer.
4. Power on the computer, and then press F9 to show the BIOS boot menu.
5. When the DVD is booting, select the DVD from the **UEFI Boot Sources**.
6. When prompted, press any keyboard key.
7. Follow the on-screen instructions.

After the installation is completed:

1. Eject 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.

Using Windows Refresh for quick and easy recovery

When your computer is not working properly and you need to regain system stability, the Windows Refresh option allows you to start fresh and keep what is important to you.

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 HP Support Assistant for instructions on reinstalling traditional applications. To access HP Support Assistant on the Start screen, select the **HP Support Assistant** app.

NOTE: You may be prompted for your permission or password when using Refresh. See HP Support Assistant for more information. To access HP Support Assistant on the Start screen, select the **HP Support Assistant** app.

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.
4. In Windows 8.0, select **General** from the PC settings screen.

   - or -

   In Windows 8.1, select **Update and Recovery** , and then select **Recovery**.
5. Scroll the right-side choices down to display **Refresh your PC without affecting your files**.
6. Under **Refresh your PC without affecting your files**, select **Get started**, and follow the on-screen instructions.

Remove everything and reinstall Windows

Sometimes you want to perform detailed reformatting of your computer, or you want to remove personal information before you give away or recycle your computer. The process described in this section provides a speedy, simple way to return the computer to its original state. This option removes all personal data, apps, and settings from your computer, and reinstalls Windows.

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

You can initiate this option by using the f11 key or from the Start screen.

To use the f11 key:

1. Press f11 while the computer boots.

   – or –

   Press and hold f11 as you press the power button.
2. Choose your language.
3. Choose your keyboard layout.
4. Select **Troubleshoot** from the boot options menu.
5. Select **Reset your PC**, and follow the on-screen instructions.

To use the Start screen:

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.
4. In Windows 8.0, select **General** from the PC settings screen.

   - or -

   In Windows 8.1, select **Update and Recovery** , and then select **Recovery**.
5. Scroll the right-side choices down to display **Remove everything and reinstall Windows**.
6. Under **Remove everything and reinstall Windows**, select **Get started**, and follow the on-screen instructions.

Using HP Software Setup

HP Software Setup can be used to reinstall drivers or select software that has been corrupted or deleted from the system.

1. From the Start screen, type `HP Software Setup`, and select **Apps**.
2. Open HP Software Setup.
3. Follow the on-screen directions to reinstall drivers or select software.

15 Backup and recovery – Windows 7

Your computer includes HP and Windows tools 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, all with simple steps. This section provides information about the following processes:

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

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 HP Recovery media. This step creates a Windows 7 operating system DVD and a *Driver Recovery* DVD. The Windows DVD can be used to reinstall the original operating system in cases where the hard drive is corrupted or has been replaced. The *Driver Recovery* DVD installs specific drivers and applications. See Creating recovery media with HP Recovery Disc Creator on page 139.
2. Use Windows Backup and Recovery tools to perform the following:
   - Back up individual files and folders
   - Back up your entire hard drive (select models only)
   - Create system repair discs (select models only) with the installed optical drive (select models only) or an optional external optical drive
   - Create system restore points

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

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

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 140.

Guidelines

- When creating recovery media or backing up to discs, 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.
- Be sure that the computer is connected to AC power before you start the recovery media creation process or the backup process.

Creating recovery media with HP Recovery Disc Creator

HP Recovery Disc Creator is a software program that offers an alternative way to create recovery media. After you successfully set up the computer, you can create recovery media using HP Recovery Disc Creator. This recovery media 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 can create two kinds of recovery DVDs:

- 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.

Creating recovery media

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 system repair media and your initial backup immediately after initial system setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup. You should also create Windows system repair media (select models only) which can be used to start up (boot) the computer and repair the operating system in case of system instability or failure. Your initial and subsequent backups allow you to restore your data and settings if a failure occurs.

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 for tasks such as installing software, running utilities, or changing Windows settings. 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, create a system image (select models only), or create system repair media (select models only).

Performing a system recovery

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

- Windows recovery tools: You can use Windows Backup and Restore to recover information you have previously backed up. You can also use Windows Startup Repair to fix problems that might prevent Windows from starting correctly.
- f11 recovery tools (select models only): You can use the f11 recovery tools to recover your original hard drive image. The image includes the Windows operating system and software programs installed at the factory.

NOTE: If you are unable to boot (start up) your computer and you cannot use the system repair media you previously created (select models only), you must purchase Windows 7 operating system media to reboot the computer and repair the operating system.

Using the Windows recovery tools

Using the Windows recovery tools, you can:

- Recover individual files
- Restore the computer to a previous system restore point
- Recover information using recovery tools

NOTE: For detailed instructions on various recovery 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 for tasks such as installing software, running utilities, or changing Windows settings. Refer to Help and Support. To access Help and Support, select **Start > Help and Support**.

To recover information you previously backed up:

1. Select **Start > All Programs > Maintenance > Backup and Restore**.
2. Follow the on-screen instructions to recover your system settings, your computer (select models only), or your files.

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

CAUTION: Some Startup Repair options will completely erase and reformat the hard drive. All files you have created and any software installed on the computer are permanently removed. When reformatting is complete, the recovery process restores the operating system, as well as the drivers, software, and utilities from the backup used for recovery.

1. If possible, back up all personal files.
2. If possible, check for the presence of the Recovery Image partition and the Windows partition.

   To check for the Windows partition, select **Start > Computer**.

   NOTE: If the Windows partition and the Recovery Image partition is not listed, you must recover your operating system and programs using the Windows 7 operating system DVD and the *Driver Recovery* media.

3. If the Windows partition is listed, restart the computer, and then press f8 before the Windows operating system loads.
4. Select **Startup Repair**.
5. Follow the on-screen instructions.

NOTE: For additional information on recovering information using the Windows tools, select **Start > Help and Support**.

Using f11 recovery tools (select models only)

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

To recover the original hard drive image using f11:

1. If possible, back up all personal files.
2. If possible, check for the presence of the Recovery Image partition: click **Start**, right-click **Computer**, click **Manage**, and then click **Disk Management**.

   NOTE: If the Recovery Image partition is not listed, you must recover your operating system and programs using the Windows 7 operating system media and the *Driver Recovery* media.

3. If the Recovery Image partition is listed, restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.
4. Press f11 while the "Press <F11> for recovery" message is displayed on the screen.
5. Follow the on-screen instructions.

Using Windows 7 operating system media

If you cannot use the recovery media 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, 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 DVD 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.
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 installation is completed:

1. Eject the Windows 7 operating system DVD and then insert the *Driver Recovery* DVD.
2. Install the Hardware Enabling Drivers first, and then install Recommended Applications.

16 Backup and Recovery – SUSE Linux

Recovery after a system failure is as good as your most recent backup. 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 computer includes tools provided by HP to help you safeguard your information and retrieve it if ever needed.

Creating backups

1. Create restore media immediately after you set up the computer.
2. As you add files, routinely create a backup of your system and personal information.

Creating restore media

You can create an HP Factory Image, using an installed or an external DVD±RW optical drive or a USB drive. The HP Factory Image can be used to perform system recovery in the event of a system failure. The recovery tool reinstalls the original operating system and HP programs and drivers that were installed at the factory.

To create the restore media:

1. Select **Computer > More Applications**.
2. In the left pane, click **Tools**, and then click **Create HP Factory Image** in the right pane.
3. Follow the on-screen instructions to create an image file to burn a recovery disc.

NOTE: The image produced by HP Create Factory Image can be written to a USB disk on key or a DVD. If you are writing to a DVD, follow the on-screen instructions. To write the image to a USB disk on key:

To write the image to a USB disk on key:

a. Insert the USB disk on key in a USB port.

b. To transfer the image to a USB disk on key, use the **dd** command.

Backing up your information

You should back up your computer files on a regular schedule to maintain a current backup. You can manually back up your information to an optional external drive, a network drive, or discs. Back up your system at the following times:

- At regularly scheduled times
- Before the computer is repaired or restored
- Before you add or modify hardware or software

To back up your home directory files using **Backup Manager Settings**:

1. Select **Computer > More Applications > Tools > Backup Manager Settings**, and click **Backup my home directory**.
2. Click **Storage Destination Location**, and then select a location to back up your information.

3. Click **Schedule**, and then select a time schedule to perform backups at a regularly scheduled time.

   To immediately back up your information, click the **Backup Now** check box.

NOTE: Before you back up your information, be sure you have designated a location to save the backup files.

4. Click **Save and Backup** to start the backup and to save the backup settings.

To restore backup files:

1. Select **Computer > More Applications > Tools > Backup Manager Restore**.
2. Click **Backup Source**, and then select the location of the backup files.
3. Click **Restore Destination**, and then select the destination to restore the files.
4. To restore all files from the selected location, click **Restore all files**. To restore select files only, click **Restore selected files**, click **Select Files** and then select the files to be restored.
5. Under **Restore Point**, click the time and date of the backup.

NOTE: If multiple backups have been performed, click **Use the latest version** to restore the latest version.

6. Click **Restore** to start restoring the files, or click **Cancel** to cancel the operation.

Performing a system recovery

Recovery allows you to repair or restore the computer to its original factory state.

CAUTION: Using Recovery completely erases hard drive contents and reformats the hard drive. All files you have created and any software installed on the computer are permanently removed. The recovery tool reinstalls the original operating system and HP programs and drivers that were installed at the factory. Software, drivers, and updates not installed by HP must be manually reinstalled. Personal files must be restored from a backup.

To restore the computer using the HP Factory Image, you must first create the recovery media. If you have not already created it, see Creating restore media on page 144.

To restore the computer from the recovery disc, follow these steps:

1. If possible, back up all personal files.
2. Insert the HP Factory Image into the optical drive or insert the USB disk on key into the USB port, and restart the computer.
3. As the computer is restarting, press f9 to open the Computer Setup boot option menu and select the option for the optical drive, if you are using a DVD to restore. If you are using a USB disk to key, select USB disk on key.
4. Press the down arrow to select **Restore SLED HP-BNB preload image** from the **Linux boot** menu, and then press enter.
5. Using the arrow keys, select **Yes** when prompted: **Do you want to start the System-Restore?**
6. Follow the on-screen instructions.

NOTE: The image produced by the Create Factory Image utility may be written to either a USB disk on a key or a DVD. To write the image to a disk, use the dd command to transfer the image to a USB disk on a key. The USB disk on a key may be inserted in a USB port.

Remove everything and reinstall SLED

Sometimes you want to perform detailed reformatting of your computer, or you want to remove personal information before you give away or recycle your computer. The process described in this section provides a speedy, simple way to return the computer to its original state. This option removes all personal data, applications, and settings from your computer, and reinstalls the Linux operating system.

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

You can initiate this option by using the f11 key.

To use the f11 key:

Press f11 while the computer boots.

– or –

Press and hold f11 as you press the power button.

The following options are available:

- Cancel/Reboot—Reboots the system. No recovery or restore activity is performed.
- Recover/Repair System—This option repairs a system that is not working properly and preserves user data.
- Restore Factory System—This option restores the system back to the original factory state. User data is not preserved.

Select an option and follow the on-screen instructions.

17 Statement of memory volatility

The purpose of this chapter is to provide general information regarding nonvolatile memory in HP Business Notebook PCs. This chapter also provides general instructions for restoring nonvolatile memory that can contain personal data after the system has been powered off and the hard drive has been removed.

HP Business Notebook PC products that use Intel®-based or AMD®-based system boards contain volatile DDR memory. The amount of nonvolatile memory present in the system depends upon the system configuration. Intel-based and AMD-based system boards contain nonvolatile memory subcomponents as originally shipped from HP, assuming that no subsequent modifications have been made to the system and assuming that no applications, features, or functionality have been added to or installed on the system.

Following system shutdown and removal of all power sources from an HP Business Notebook PC system, personal data can remain on volatile system memory (DIMMs) for a finite period of time and will also remain in nonvolatile memory. Use the steps below to remove personal data from the notebook PC, including the nonvolatile memory found in Intel-based and AMD-based system boards.

NOTE: If your tablet has a keyboard base, connect to the keyboard base before beginning steps in this chapter.

1. Follow steps (a) through (j) below to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.

   a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

      NOTE: If the system has a BIOS administrator password, enter the password at the prompt.

   b. Select **Main**, select **Restore Defaults**, and then select **Yes** to load defaults.

   c. Select the **Security** menu, select **Restore Security Level Defaults**, and then select **Yes** to restore security level defaults.

   d. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

   e. If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Tools** under the **Utilities** menu. **Select Hard Drive Tools**, select **DriveLock**, then uncheck the checkbox for **DriveLock password on restart**. Select **OK** to proceed.

   f. If an Automatic DriveLock password is set, select the **Security** menu, scroll down to **Hard Drive Tools** under the **Utilities** menu. Select **Hard Drive Tools**, scroll down to **Automatic DriveLock**, then select the desired hard drive and disable protection. At the automatic drive lock warning screen, select **Yes** to continue. Repeat this procedure if more than one hard drive has an Automatic DriveLock password.

   g. Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message.

   h. Select the **Main** menu, select **Save Changes and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

i. Reboot the system. If the system has a Trusted Platform Module (TPM) and/or fingerprint reader, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor; press or tap F1 to accept or F2 to reject.

j. Remove all power and system batteries for at least 24 hours.

2. Complete one of the following:

- Remove and retain the storage drive.

  – or –

- Clear the drive contents by using a third party utility designed to erase data from an SSD.

  – or –

- Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

IMPORTANT: If you clear data using Secure Erase, it cannot be recovered.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select the **Security** menu and scroll down to the Utilities menu.

c. Select **Hard Drive Tools**.

d. Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.

– or –

- Clear the contents of the drive by using the following Disk Sanitizer command steps:

IMPORTANT: If you clear data using Disk Sanitizer, it cannot be recovered.

NOTE: The amount of time it takes for Disk Sanitizer to run can take several hours. Plug the computer into an AC outlet before starting.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select the **Security** menu and scroll down to the **Utilities** menu.

c. Select **Hard Drive Tools**.

d. Under **Utilities**, select **Disk Sanitizer**, select the hard drive holding the data you want to clear, and then follow the on-screen instructions to continue.

Nonvolatile memory usage

Non Volatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write protected?
HP Sure Start flash (select models only)	2 MBytes	No	Yes	Provides protected backup of critical System BIOS code, EC	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.

Non Volatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write protected?
				firmware, and critical PC configuration data for select platforms that support HP Sure Start.		
Real Time Clock (RTC) battery backed-up CMOS configuration memory (CMOS)	256 bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using the Computer Setup (BIOS), or changing the Microsoft Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KBytes (not customer accessible)	No	Yes	Store NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility is required to write data to this memory and is available from NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 bytes per memory module, 128 bytes programmable (not customer accessible)	No	Yes	Stores memory module information.	DIMM SPD is programmed by the memory vendor.	Data cannot be written to this memory when the module is installed in a PC. The specific write-protection method varies by memory vendor.
System BIOS	4 to 5 MBytes	Yes	Yes	Store system BIOS code and PC configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are input using the Computer Setup (BIOS) or a custom utility.	A utility is required for writing data to this memory and is available on the HP website; go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then follow the on-screen instructions. **NOTE:** Writing data to this ROM in an inappropriate manner can render the PC non-functional.
Intel Management Engine Firmware (present in only specific ZBook and EliteBook models. For more information, go to http://www.hp.com/support, and select your country. Select	1.5 MBytes or 5 MBytes	Yes	Yes	Stores Management Engine Code, Settings, Provisioning Data and iAMT third-party data store.	Management Engine Code is programmed at the factory. Code is updated via Intel secure firmware update utility. Unique Provisioning Data can be entered at the factory or by an administrator using the Management Engine (MEBx) setup utility. The third party data store contents can be populated by a remote	The Intel chipset is configured to enforce hardware protection to block all direct read/write access to this area. An Intel utility is required for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.

Non Volatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write protected?
Drivers & Downloads, and then follow the on-screen instructions.)					management console or local applications that have been registered by an administrator to have access to the space.	
Bluetooth flash	2Mbit	No	Yes	Stores Bluetooth configuration and firmware.	Bluetooth flash is programmed at the factory. Tools for writing data to this memory are not publicly available but can be obtained from the silicon vendor.	A utility is required for writing data to this memory and is made available through newer versions of the driver whenever the flash requires an upgrade.
802.11 WLAN EEPROM	4 Kbit to 8 Kbit	No	Yes	Stores configuration and calibration data.	802.11 WLAN EEPROM is programmed at the factory. Tools for writing data to this memory are not made public.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Webcam	64K bit	No	Yes	Store webcam configuration and firmware.	Webcam memory is programmed using a utility from the device manufacturer that can be run from Windows.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Fingerprint Reader	512 KByte flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	Only a digitally signed application can make the call to write to the flash.

Questions and answers

1. **How can the BIOS settings be restored (returned to factory settings)?**

IMPORTANT: Restore defaults does not securely erase any data on your hard drive. See question and answer 6 for steps to securely erase data.

Restore defaults does not reset the Customer Secure Boot key. See question and answer 7 for information about resetting the key.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select **Main**, and then select **Restore defaults**.

The Unified Extensible Firmware Interface (UEFI) BIOS an industry-standard software interface between the platform firmware and an operating system (OS). It is a replacement for the older BIOS architecture, but supports much of the legacy BIOS functionality.

Like the legacy BIOS, the UEFI BIOS provides an interface display the system information, configuration settings, and change the configuration of your computer before an OS is loaded. BIOS is provides a secure run-time environment that supports a Graphic User Interface (GUI). In this environment, you can use either a pointing device (Touchscreen, TouchPad, pointing stick, or USB mouse) or the keyboard to navigate and make menu and configuration selections. The UEFI BIOS also contains basic system diagnostics.

The UEFI BIOS provides functionality beyond that of the legacy BIOS. In addition the UEFI BIOS works to initialize the computer’s hardware before loading and executing the OS, the run-time environment allows the loading and execution of software programs from storage devices to provide more functionality, such as advanced hardware diagnostics (with the ability to display more detailed system information) and advanced firmware management and recovery software.

c. Follow the on-screen instructions.

The UEFI BIOS resides on a flash memory chip. A utility is required to write to the chip.

d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

2. **What is a UEFI BIOS, and how is it different from a legacy BIOS?**

3. **Where does the UEFI BIOS reside?**

4. **What kind of configuration data is stored on the DIMM Serial Presence Detect (SPD) memory module? How would this data be written?**

The DIMM SPD memory contains information about the memory module, such as size, serial number, data width, speed/timing, voltage, and thermal information. This information is written by the module manufacturer and stored on an EEPROM. This EEPROM cannot be written to when the memory module is installed in a PC. Third-party tools do exist that can write to the EEPROM when the memory module is not installed in a PC. Various third-party tools are available to read SPD memory.

5. **What is meant by “Restore the nonvolatile memory found in Intel-based system boards”?**

This message relates to clearing the Real Time Clock (RTC) CMOS memory that contains PC configuration data.

6. **How can the BIOS security be reset to factory defaults and data erased?**

IMPORTANT: Resetting will result in the loss of information. These steps will not reset a Customer Secure Boot Key.

See question and answer 7 for information about resetting the key.

a. Turn on or restart the computer, and then press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

b. Select **Main**, and then select **Reset BIOS Security to Factory Default**.

c. Follow the on-screen instructions.

d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

7. **How can the Customer Secure Boot Key be reset?**

   Secure Boot is a feature to ensure that only authenticated code can start on a platform. If you enabled Secure Boot and created a Customer Secure Boot Key, simply disabling Secure Boot will not clear the keys. You must also select to clear the Secure Boot Keys. Use the same procedure you used to create the Secure Boot Keys, but make the selection to clear or delete all Secure Boot Keys.

Using HP Sure Start (select models only)

Select computer models are configured with HP Sure Start, a technology that continuously monitors your computer's BIOS for attacks or corruption. If the BIOS becomes corrupted or is attacked, HP Sure Start restores the BIOS to its previously safe state, without user intervention. Those select computer models ship with HP Sure Start configured and enabled. HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. The default configuration can be customized by advanced users.

To access the latest documentation on HP Sure Start, go to http://www.hp.com/support, and select your country. Select **Drivers & Downloads**, and then follow the on-screen instructions.

18 Power cord set requirements

The wide-range input feature of the computer permits it to operate from any line voltage from 100 to 120 volts AC, or from 220 to 240 volts AC.

The 3-conductor power cord set included with the computer meets the requirements for use in the country or region where the equipment is purchased.

Power cord sets for use in other countries and regions must meet the requirements of the country or region where the computer is used.

Requirements for all countries

The following requirements are applicable to all countries and regions:

- The length of the power cord set must be at least **1.0m** (3.3t) and no more than **2.0 m** (6.5 ft).
- All power cord sets must be approved by an acceptable accredited agency responsible for evaluation in the country or region where the power cord set will be used.
- The power cord sets must have a minimum current capacity of 10 amps and a nominal voltage rating of 125 or 250 V AC, as required by the power system of each country or region.
- The appliance coupler must meet the mechanical configuration of an EN 60 320/IEC 320 Standard Sheet C13 connector for mating with the appliance inlet on the back of the computer.

Requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Australia	EANSW	1
Austria	OVE	1
Belgium	CEBC	1
Canada	CSA	2
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1
Italy	IMQ	1
Japan	METI	3
The Netherlands	KEMA	1
Norway	NEMKO	1
The People's Republic of China	COC	5
South Korea	EK	4

Country/region	Accredited agency	Applicable note number
Sweden	SEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	4
The United Kingdom	BSI	1
The United States	UL	2

1. The flexible cord must be Type HO5VV-F, 3-conductor, 1.0-mm² 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 or region where it will be used.
2. The flexible cord must be Type SPT-3 or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
3. The appliance coupler, flexible cord, and wall plug must bear a “T” mark and registration number in accordance with the Japanese Dentori Law. The flexible cord must be Type VCT or VCTF, 3-conductor, 1.00-mm² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V) configuration.
4. The flexible cord must be Type RVV, 3-conductor, 0.75-mm² 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 or region where it will be used.
5. The flexible cord must be Type VCTF, 3-conductor, 0.75-mm² 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 or region where it will be used.

19 Recycling

When a non-rechargeable or rechargeable battery has reached the end of its useful life, do not dispose of the battery in general household waste. Follow the local laws and regulations in your area for battery disposal.

HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, see the HP Web site at http://www.hp.com/recycle.

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