



HP EliteBook 8770w Mobile Workstation

Maintenance and Service Guide

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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).

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1 Product description

Category	Description
Product Name	HP EliteBook 8770w Mobile Workstation
Processors	<p>Next Generation Intel® Core™ i7 processors, (support Intel Turbo Boost Technology):</p> <ul style="list-style-type: none">• i7-3520M, 2.90 GHz (Turbo up to 3.60 GHz), 1600 MHz, 4 MB L3 Cache, 4 threads, 35W• i7-3610QM, 2.30 GHz (Turbo up to 3.30 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W• i7-3720QM, 2.60 GHz (Turbo up to 3.60 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W• i7-2820QM, 2.3 GHz (turbo up to 3.4 GHz) quad-core processor, 8 MB L3 cache, 8 threads, 45W• i7-3820QM, 2.70 GHz (Turbo up to 3.70 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 45W <p>Next Generation Intel® Core™ i5 processors, (support Intel Turbo Boost Technology Technology):</p> <ul style="list-style-type: none">• i5-3320M, 2.60 GHz (Turbo up to 3.30 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W• i5-3360M, 2.80 GHz (Turbo up to 3.50 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W
Chipset	Mobile Intel QM77
Graphics	<p>Support for the following graphics subsystem graphics boards (all feature OpenGL driver support):</p> <ul style="list-style-type: none">• AMD FirePro M5950 XT-GL 1GB GDDR5 (DP 1.2 and Eyefinity Plus support)• NVIDIA Quadro 3000M, N14E-Q1 2 GB dedicated GDDR5 video memory• NVIDIA Quadro 4000M, N14E-Q3 2 GB dedicated GDDR5 video memory• NVIDIA Quadro 5010M, N14E-Q5 4 GB dedicated GDDR5 video memory
Display	<ul style="list-style-type: none">• Display panel, 43.9 cm (17.3 in), High Definition Plus (HD+) Anti-Glare (AG) LED WVA without webcam• Display panel, 43.9 cm (17.3 in), FHD AG LED WVA• Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color with webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)• Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color without webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)
Memory	<p>4 customer-accessible/upgradable memory module slots</p> <p>Supports dual-channel memory</p> <p>Supports up to 32,768 GB of system RAM</p> <p>DDR3 1600MHz PC3-12800 SODIMMS</p>

Category	Description
	<p>Supports the following configurations:</p> <ul style="list-style-type: none"> • 2048 MB total system memory (2048 × 1) • 4096 MB total system memory (4096 × 1) • 4096 MB total system memory (2048 × 2) • 8192 MB total system memory (8192 × 1) • 8192 MB total system memory (4096 × 2) • 8192 MB total system memory (2048 × 4); only available on computer models equipped with a quad-core processor • 12288MB Total System Memory (4096MB x 3) • 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 • 32768 MB total system memory (8192 x 4); only available on computer models equipped with a quad-core processor
Primary and secondary storage	<p>Supports 7.0 mm (0.28 in), 9.5 mm (0.37 in) or 12.7 mm (0.5 in) hard drives and 6.35 cm (2.5 in) solid-state drive for primary and secondary storage.</p> <p>Support for RAID 0/1/5</p> <p>Supports the following Serial ATA (SATA), 7200-rpm drives:</p> <ul style="list-style-type: none"> • 750 GB • 500 GB • 320 GB • 500 GB self encrypting drive (SED) <p>Supports the following 6.35 cm (2.5 in), solid-state drives (SSD):</p> <ul style="list-style-type: none"> • 256 GB Self Encrypting Drive (SED) • 128 GB • 160 GB • 180 GB • 24 GB
Upgrade bay	<p>Supports the following 12.7 mm 6.35 cm (0.5 in) tray load SATA optical drives:</p> <ul style="list-style-type: none"> • Blu-ray R/RE DVD±RW SuperMulti Double-Layer (DL) Drive • ±RW SuperMulti Double-Layer Drive • DVD±RW SuperMulti Double-Layer Drive • DVD-ROM Drive (defeatured combo) <p>Supports a 7.0 mm, 9.5 mm, or 12.7 mm 500 GB hard drive, 7200 rpm</p> <p>Supports "No Drive" option</p>
Audio and video	<p>Integrated dual-array microphone</p> <p>High-definition (HD) audio with SRS premium sound</p>

Category	Description
	2 stereo speakers
	Integrated 720p HD webcam
Modem	56K V.92 data/fax modem
	Supports “no modem” option
	Modem cable not included
Ethernet	Intel® 82579LM Gigabit Network Connection
	S3/S4/S5 wake on LAN
	NIC power-down technology
	Ethernet cable not included
Wireless	Integrated wireless local area network (WLAN) options by way of the following wireless modules:
	<ul style="list-style-type: none"> • Intel® Centrino™ Advanced-N 6205, 802.11a/b/g/n WLAN module • Intel Centrino Ultimate-N 6300, 802.11a/b/g/n WLAN module • Broadcom 802.11a/b/g/n 2x2WiFi Adapter
	Three WLAN antennas (3) 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)
	<ul style="list-style-type: none"> • HP hs2340 HSPA+ Mobile Broadband Module • HP un2430 EV-DO/HSPA Mobile Broadband Module
	WWAN antennas (2) built into display assembly (worldwide, 5-band)
	Support for “no WWAN” option
	Security provided by subscriber identify module (SIM) located inside battery bay
	HP Integrated Module with Bluetooth 4.0
	Support for “no WPAN” option
External media card	One ExpressCard slot, supporting 16-bit and 32-bit (Cardbus) ExpressCard modules
	Digital Media Card reader, supporting the following formats: <ul style="list-style-type: none"> • MultiMediaCard (MMC) • MultiMediaCard Plus (MMC+) • Secure Digital (SD) Memory Card • Secure Digital High-Capacity (SDHC) Memory Card • Secure Digital Extended Capacity (SDXC) Memory Card

Category	Description
Ports	<ul style="list-style-type: none"> • 1394a (1) • Multi-pin AC port • Audio in (mono microphone) • Microphone input (stereo) • Audio-out (stereo headphone) • Display port (1.1a for NVIDIA, 1.2 for AMD) • Docking connector • eSATA/USB 2.0 combo • RJ-11 (modem) • RJ-45 (Ethernet, includes link and activity lights) • USB 3.0 (2) • USB 2.0 (2) 1 port with USB charging support • VGA (Dsub 15-pin) supporting 1600 × 1200 external resolution at 75 GHz (hot plug/unplug with auto-detect)
Docking	<p>Supports the following docking stations:</p> <ul style="list-style-type: none"> • HP 230W Docking Station • HP 230W Advanced Docking Station • HP USB 2.0 Docking Station • HP Essential USB 2.0 Port Replicator • HP LAN and USB Travel Hub
Keyboard/pointing devices	<p>36.5 cm (14.4 in) full-size keyboard with separate numeric keypad, Dual Point (3 pointing stick buttons and 3 TouchPad buttons) without backlight</p> <hr/> <p>36.5 cm (14.4 in) full-size keyboard with separate numeric keypad, Dual Point (3 pointing stick buttons and 3 TouchPad buttons) with backlight (not supported in Japan or Brazil)</p> <hr/> <p>Spill-resistant DuraKeys coating</p> <hr/> <p>Spill-resistant DuraPad coating on TouchPad</p> <hr/> <p>Gestures enabled by default - 2 finger scrolling, 2 finger zoom (pinch)</p> <hr/> <p>TouchPad supports vertical scroll zone</p> <hr/> <p>Taps enabled as default</p>
Power requirements	<p>Supports the following AC adapters with localized cable plug support:</p> <ul style="list-style-type: none"> • 200W Slim Smart AC adapter • 230W Slim Smart AC adapter • 230W Smart AC adapter • 3-wire plug (with ground pin)

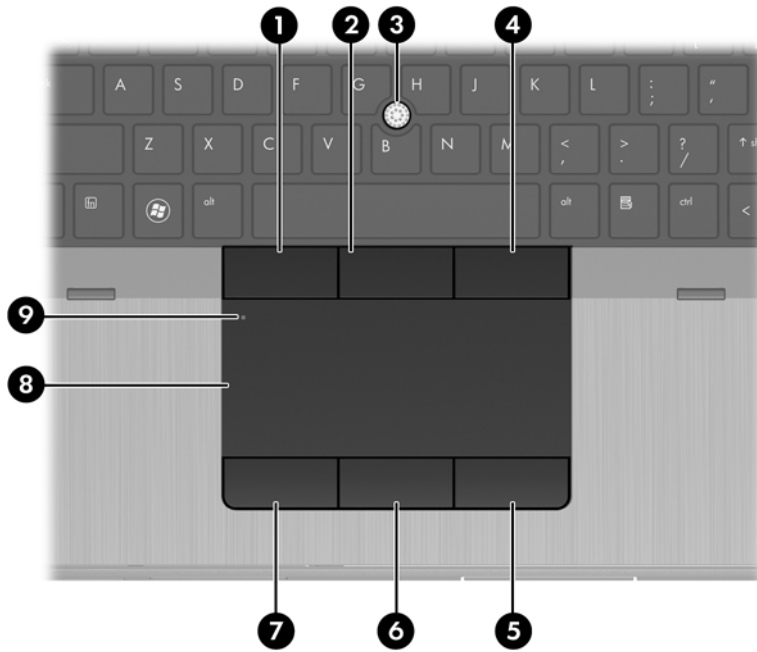
Category	Description
	<p>Support for the following batteries:</p> <ul style="list-style-type: none"> • 8-cell, 2.8 Ah (83 WHr) Li-ion battery • 8-cell, 2.8 Ah (75 WHr) Li-ion battery (available with 3 year warranty only) • Supports 9-cell (73 WHr) polymer, HP ST09 Extended Life Battery (does not support HP Fast Charge) • Supports 9-cell 3.0 Ah (100 WHr) cylindrical battery, HP BB09 Ultra-Capacity Extended Life Battery (does not support HP Fast Charge)
	HP Fast Charge Technology
Security	<p>Integrated fingerprint reader</p> <p>Integrated Smart Card reader</p> <p>Preboot authentication (password, Smart Card)</p> <p>Supports security lock</p> <p>Trusted platform module (TPM) v.1.2 and TPM enhanced drive lock</p> <p>Full volume encryption</p>
Operating system	<p>Preinstalled operating systems:</p> <ul style="list-style-type: none"> • Windows® 7 Home Premium 64 (select models only) • Windows 7 Professional 64 (select models only) • Windows 7 Professional 32 (select models only) • FreeDOS <p>Operating system and Microsoft® Office preinstalled (not supported in Japan):</p> <ul style="list-style-type: none"> • Windows 7 Professional 64 with Office 2010 Starter (select models only) • Windows 7 Professional 32 with Office 2010 Starter (select models only) <p>Restore media:</p> <ul style="list-style-type: none"> • Windows 7 Professional 64 (select models only) • Windows 7 Professional 32 (select models only) • Windows 7 Home Premium 64 (select models only) • Windows 7 DRDVD (select models only) • Windows XP Professional 64 (service only) <p>Certified:</p> <ul style="list-style-type: none"> • Microsoft WHQL • Novell • SuSE Linux

Category	Description
	Web-only support: <ul style="list-style-type: none">• Windows XP Professional 64 (select models only)• Windows XP Professional 32 (select models only)• Windows 7 Ultimate 64 (select models only)• Windows 7 Ultimate 32 (select models only)• Windows 7 Enterprise 64 (select models only)• Windows 7 Enterprise 32 (select models only)
Serviceability	End-user replaceable parts: <ul style="list-style-type: none">• Memory module• Optical drive• SIM• WLAN module• WWAN module

2 External component identification

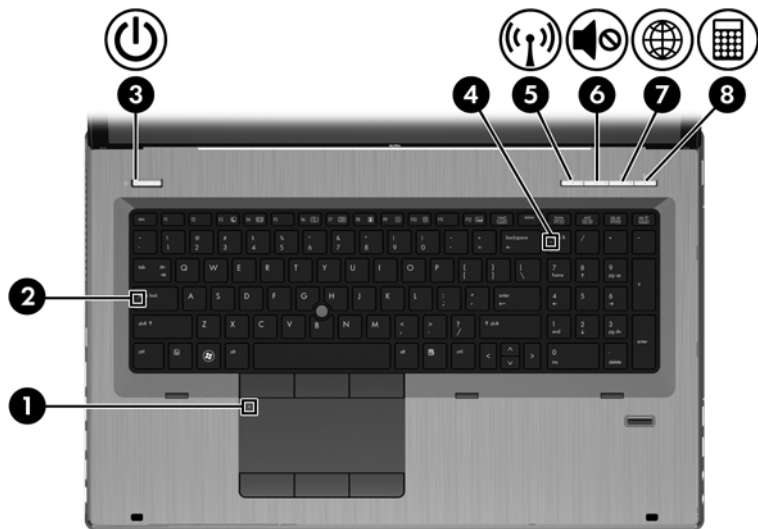
Top






TouchPad



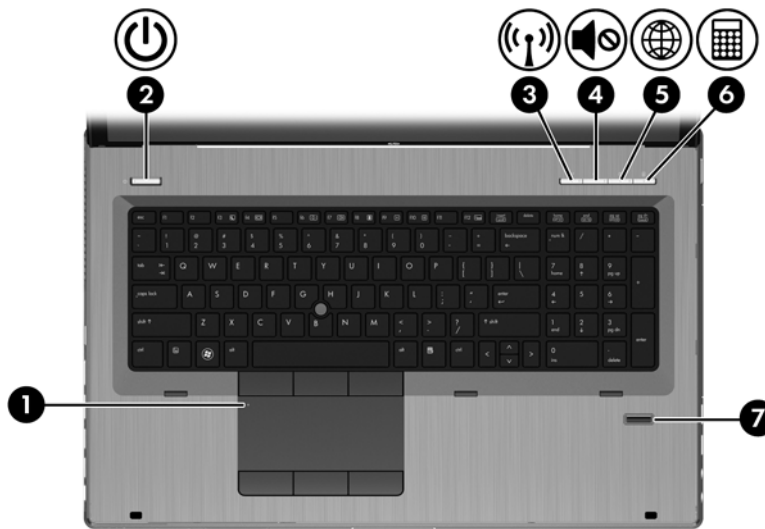
Component	Description	
(1)	Left pointing stick button	Can be used with the pointing stick and functions like the left button on an external mouse.
(2)	Center pointing stick button	Can be used with the pointing stick and functions like the center button on an external mouse.
(3)	Pointing stick	Moves the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







Lights



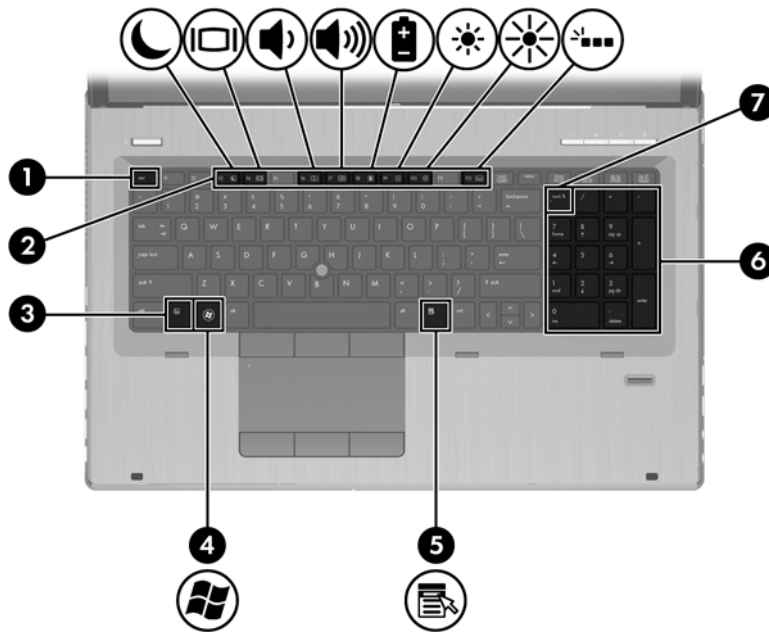
Component	Description
(1) TouchPad on/off light	<ul style="list-style-type: none"> Off: The TouchPad is on. Amber: The TouchPad is off.
(2) Caps lock light	On: Caps lock is on.
(3)  Power light	<ul style="list-style-type: none"> On: The computer is on. Blinking: The computer is in the Sleep state. Off: The computer is off or in Hibernation.
(4) Num lock light	On: Num lock is on.
(5)  Wireless light	<ul style="list-style-type: none"> White: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. Amber: All wireless devices are off.
(6)  Mute light	<ul style="list-style-type: none"> Amber: Computer sound is off. White: Computer sound is on.
(7)  Web browser light	<ul style="list-style-type: none"> On: The computer is on. Off: The computer is off or in Hibernation.
(8)  Calculator light	<ul style="list-style-type: none"> On: The Windows® calculator function is on. Blinking: The calculator has been activated.



Buttons and fingerprint reader (select models only)



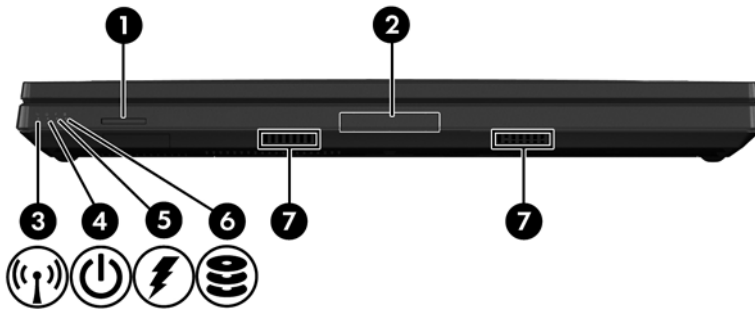
Component	Description
(1) 	Turns the TouchPad on and off.
(2) 	<ul style="list-style-type: none"> • When the computer is off, press the button to turn on the computer. • When the computer is on, press the button briefly to initiate Sleep. • When the computer is in the Sleep state, press the button briefly to exit Sleep. • When the computer is in Hibernation, press the button briefly to exit Hibernation. <p>If the computer has stopped responding and Windows shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer.</p> <p>To learn more about your power settings:</p> <ul style="list-style-type: none"> • Windows 7—Select Start > Control Panel > System and Security > Power Options. • Or refer to the <i>HP Notebook Reference Guide</i>.
(3) 	Turns the wireless feature on or off but does not establish a wireless connection.
(4) 	Mutes and restores speaker sound.
(5) 	When Windows is running, press the button to open the default Web browser.
(6) 	Opens the Windows calculator function.
(7)	Allows a fingerprint logon to Windows, instead of a password logon.

Keys



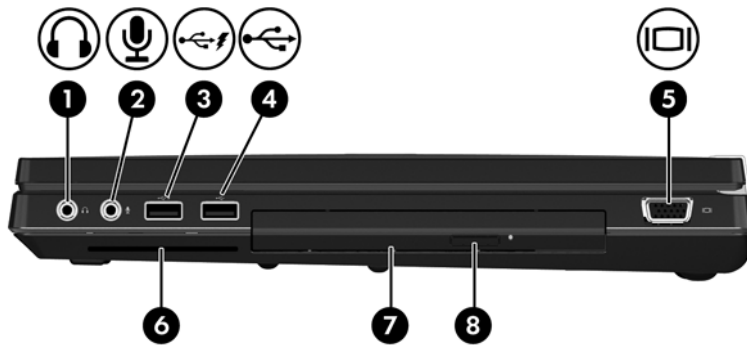
Component	Description
(1) <code>esc</code> key	Displays system information when pressed in coMBination with the <code>fn</code> key.
(2) Function keys	Execute frequently used system functions when pressed in coMBination with the <code>fn</code> key.
(3) <code>fn</code> key	Executes frequently used system functions when pressed in coMBination with a function key or the <code>esc</code> key.
(4)  Windows logo key	Displays the Windows Start menu.
(5)  Windows applications key	Displays a shortcut menu for items beneath the pointer.
(6) Integrated numeric keypad	When the keypad has been enabled, the keys can be used like an external numeric keypad.
(7) <code>num lk</code> key	Enables/disables the integrated numeric keypad when pressed.






Front



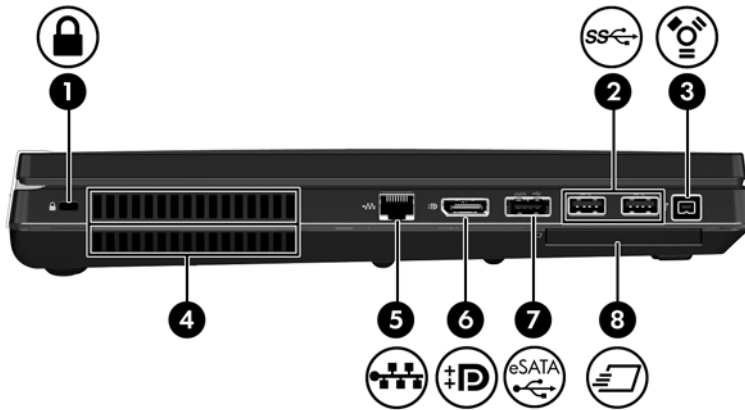
Component	Description
(1) Media Card reader	<p>Supports the following digital card formats:</p> <ul style="list-style-type: none"> Secure Digital (SD) Card Secure Digital HC (SDHC) Card Secure Digital XC (SDXC) Card MultiMediaCard (MMC) MultiMediaCardplus (MMC+)
(2) Display release latch	Opens the computer.
(3) Wireless light	<ul style="list-style-type: none"> White: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. Amber: All wireless devices are off.
(4) Power light	<ul style="list-style-type: none"> On: The computer is on. Blinking: The computer is in the Sleep state. Off: The computer is off or in Hibernation.
(5) AC adapter/Battery light	<ul style="list-style-type: none"> Amber: The computer is connected to external power and the battery is charged from 0 – 90%. White: The computer is connected to external power and the battery is charged from 90 – 99%. 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.
(6) Hard drive light	<ul style="list-style-type: none"> Blinking white: The hard drive is being accessed. Amber: HP 3D DriveGuard has temporarily parked the hard drive. <p>NOTE: For information on HP 3D DriveGuard, see the <i>HP Notebook Reference Guide</i>.</p>
(7) Speakers (2)	<p>Produce sound.</p> <p>NOTE: To use the SRS Premium Sound software, select Start > All Programs > SRS Premium Sound.</p>



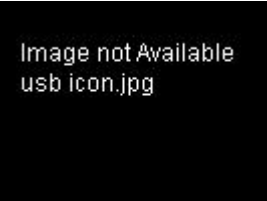





Right



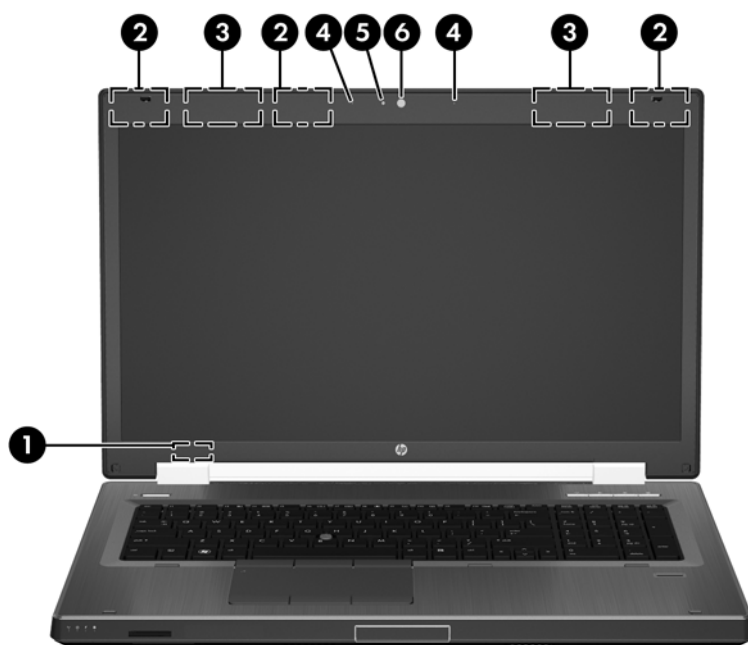
Component	Description
(1)  Audio-out (headphone) jack	<p>Produces sound when connected to optional powered stereo speakers, headphones, ear buds, a headset, or television audio.</p> <p>WARNING! To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, refer to the <i>Regulatory, Safety and Environmental Notices</i>.</p> <p>NOTE: When a device is connected to the headphone jack, the computer speakers are disabled.</p>
(2)  Audio in (microphone) jack	Connects an optional computer headset microphone, stereo array microphone, or monaural microphone.
(3)  USB charging port	Connects an optional USB device. The USB 2.0 charging port can also charge select models of cell phones and MP3 players, even when the computer is off. For more information about USB devices, see the <i>HP Notebook Reference Guide</i> .
(4)  USB 2.0 port	Connects optional USB devices.
(5)  External monitor port	Connects an external VGA monitor or projector.
(6) Smart Card reader	Supports optional Smart Cards.
(7) Upgrade bay (optical drive shown)	<p>The upgrade bay can hold a weight-saver option, a hard drive, or an optical drive that reads an optical disc.</p> <p>NOTE: On select models, the optical drive also writes to an optical disc.</p>
(8) Optical drive eject button	Releases the disc tray.

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)  USB 3.0 ports (2)	Connect optional USB 3.0 devices and provide enhanced USB power performance. 
(3)  1394 port	Connects an optional IEEE 1394 or 1394a device, such as a camcorder.
(4) 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.
(5)  RJ-45 (network) jack	Connects a network cable.
(6)  DisplayPort	Connects an optional digital display device, such as a high-performance monitor or projector.
(7)  eSATA/USB 2.0 combo port	Connects a high-performance eSATA component, such as an eSATA external hard drive, or connects an optional USB device.
(8)  ExpressCard slot	Supports optional ExpressCards.

Display





Component	Description
(1) Internal display switch	Turns off the display or initiates Sleep if the display is closed while the power is on. NOTE: The display switch is not visible from the outside of the computer.
(2) WLAN antennas (3)*	Send and receive wireless signals to communicate with wireless local area networks (WLAN).
(3) WWAN antennas (2)* (select models only)	Send and receive wireless signals to communicate with wireless wide area networks (WWAN).
(4) Internal microphones (2)	Record sound.
(5) Webcam light	On: The webcam is in use.
(6) Webcam	Records video and captures still photographs. To use the webcam, select Start > All Programs > Communication and Chat > HP Webcam .

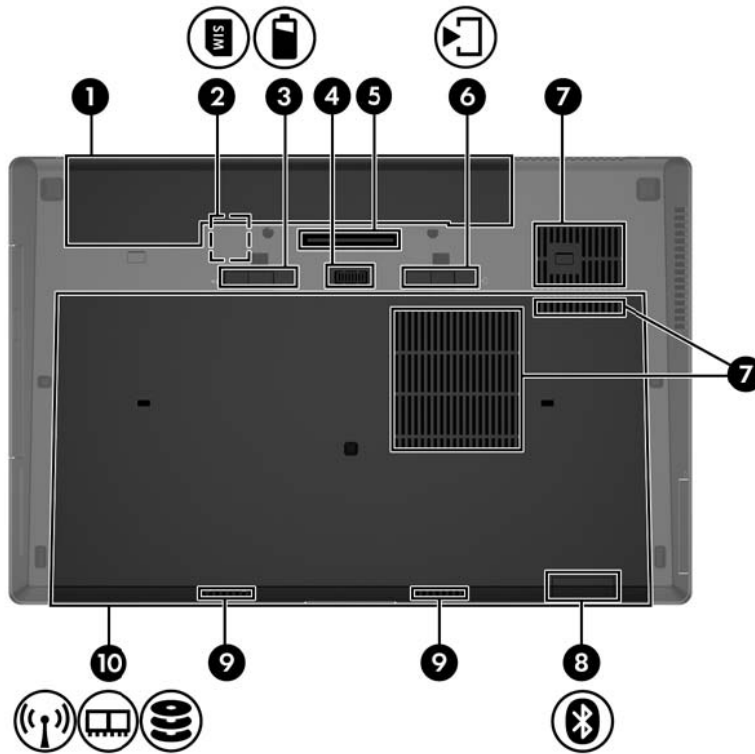
*The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions. To see wireless regulatory notices, see the section of the *Regulatory, Safety, and Environmental Notices* that applies to your country or region. These notices are located in Help and Support.





Rear

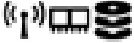


Component	Description
(1) 	RJ-11 (modem) jack Connects a modem cable.
(2)	Vents (2) Enable airflow to cool internal components. NOTE: The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(3) 	Power connector Connects an AC adapter.

Bottom

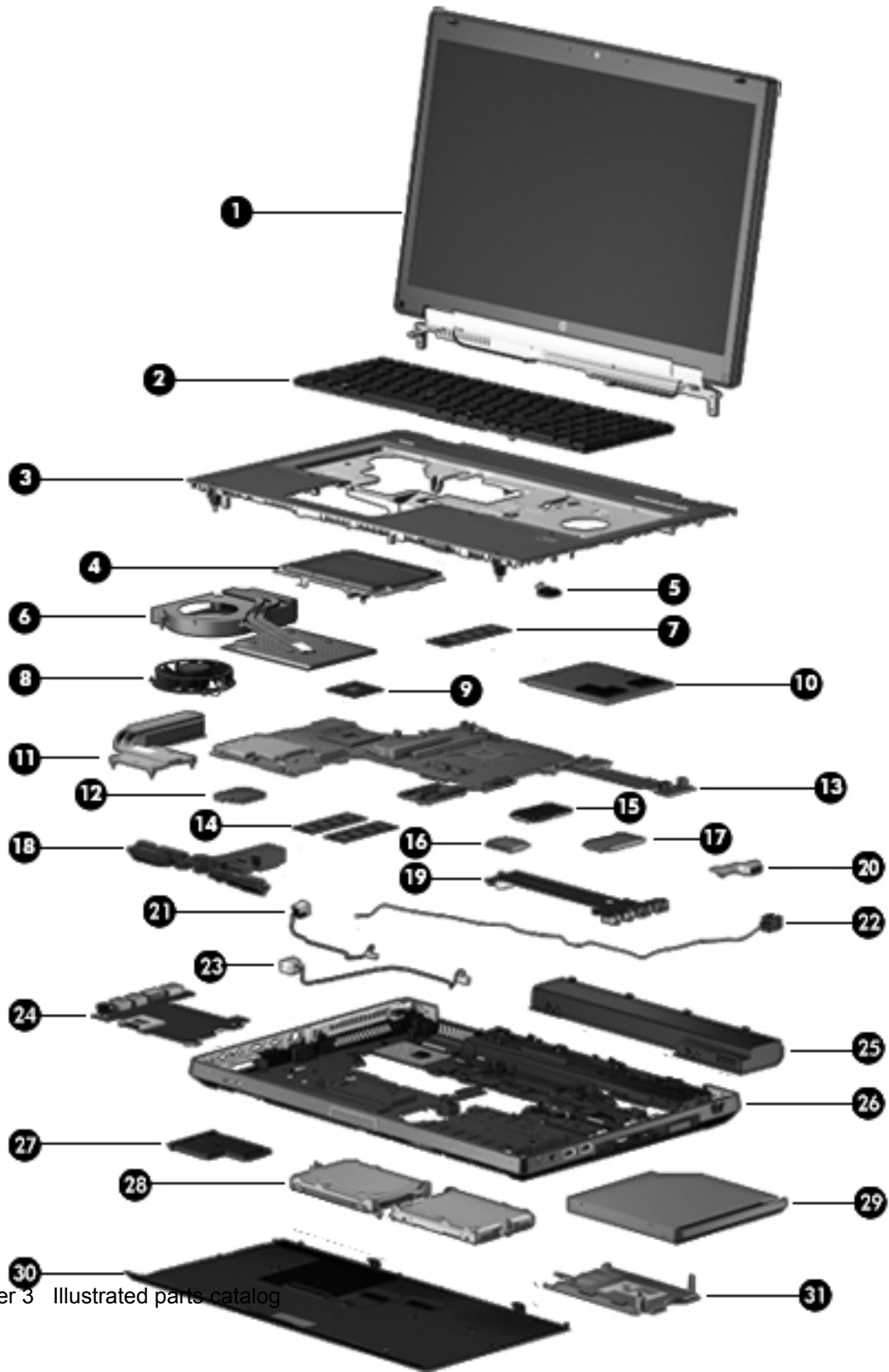


Component	Description
(1)	Battery bay Holds the battery.
(2) 	SIM slot Supports a wireless subscriber identity module (SIM). The SIM slot is located inside the battery bay.
(3) 	Battery release latch Releases the battery.
(4)	Accessory battery connector Connects an optional accessory battery.
(5)	Docking connector Connects an optional docking device.
(6) 	Service door release latch Releases the service door from the computer.
(7)	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.
(8) 	Bluetooth compartment Contains a Bluetooth device (select models only).

Component	Description
(9) Speakers (2)	Produce sound. NOTE: To use the SRS Premium Sound software, select Start > All Programs > SRS Premium Sound .
(10)  Service door	Provides access to the hard drive bay, the wireless LAN (WLAN) module slot, the WWAN module slot, and the memory module slots. NOTE: 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 technical support through Help and Support.

3 Illustrated parts catalog

Computer major components



Item	Description	Spare part number
(1)	Display	
	Display panel, 43.9 cm (17.3 in), High Definition Plus (HD+) Anti-Glare (AG) WVA	691223-001
	Display panel, 43.9 cm (17.3 in), FHD AG LED WVA	691224-001
	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVWA Dream Color with webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)	688736-001
	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVWA Dream Color without webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)	688735-001
	NOTE: See Display components on page 24 for more display component information and spare part numbers.	
(2)	Keyboard (includes keyboard cable, pointing stick and pointing stick cable):	
	Without backlight, for use in Belgium	688737-A41
	With backlight, for use in Belgium	688738-A41
	Without backlight, for use in Brazil	688737-201
	Without backlight, for use in Canada	688737-DB1
	With backlight for use in Canada	688738-DB1
	Without backlight, for use in Bulgaria	688737-261
	Without backlight, for use in Taiwan	688737-AB1
	With backlight, for use in Taiwan	688738-AB1
	Without backlight, for use in Denmark	688737-081
	With backlight, for use in Denmark	688738-081
	Without backlight, for use in Finland and Sweden	688737-B71
	With backlight, for use in Finland and Sweden	688738-B71
	Without backlight, for use in France	688737-051
	With backlight, for use in France	688738-051
	Without backlight, for use in Romania	688737-271
	Without backlight, for use in Germany	688737-041
	With backlight, for use in Germany	688738-041
	Without backlight, for use in Czechoslovakia	688737-FL1
	With backlight, for use in Czechoslovakia	688738-FL1
	Without backlight, for use in Hungary	688737-211
	Without backlight, for use in Iceland	688737-DD1
	Without backlight, for use in Israel	688737-BB1
	Without backlight, for use in Italy	688737-061
	With backlight, for use in Italy	688738-061
	Without backlight, for use in Japan	688737-291

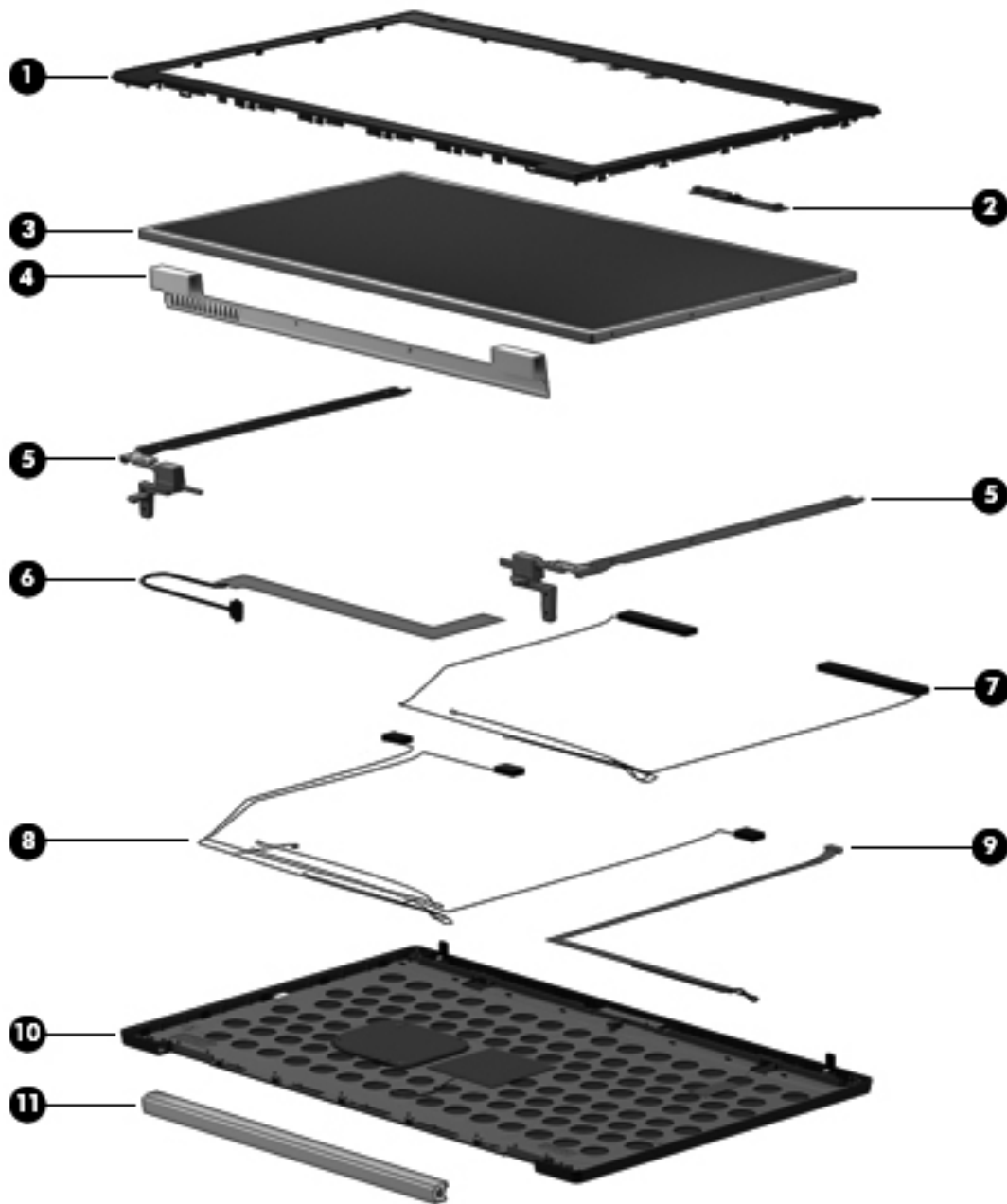
Item	Description	Spare part number
	Without backlight, for use in Latin America	688737-161
	With backlight, for use in Latin America	688738-161
	Without backlight, for international use	688737-B31
	With backlight, for international use	688738-B31
	Without backlight, for use in Northwest Africa	688737-FP1
	Without backlight, for use in Norway	688737-091
	With backlight, for use in Norway	688738-091
	Without backlight, for use in Portugal	688737-131
	Without backlight, for use in Russia	688737-251
	With backlight, for use in Russia	688738-251
	Without backlight, for use in Saudi Arabia	688737-171
	Without backlight, for use in Slovenia	688737-BA1
	Without backlight, for use in South Korea	688737-AD1
	With backlight, for use in South Korea	688738-AD1
	Without backlight, for use in Spain	688737-071
	Without backlight, for use in Switzerland	688737-BG1
	With backlight, for use in Switzerland	688738-BG1
	Without backlight, for use in Greece	688737-151
	Without backlight, for use in Thailand	688737-281
	With backlight, for use in Thailand	688738-281
	Without backlight, for use in Turkey	688737-141
	Without backlight, for use in the United Kingdom and Singapore	688737-031
	With backlight, for use in the United Kingdom and Singapore	688738-031
	Without backlight, for use in the United States	688737-001
	With backlight, for use in the United States	688738-001
	Without backlight for use in India	688737-D61
	With backlight for use in India	688738-D61
(3)	Top cover (includes TouchPad)	688747-001
(4)	TouchPad (included with top cover)	
(5)	RTC battery	651948-001
(6)	Fan/graphics board heat sink assembly (includes replacement thermal material):	
	For use with AMD graphics subsystem	688733-001
	For use with NVIDIA graphics subsystem	696435-001
(7)	Primary memory modules (PC3-10600, 1333 MHz, shared):	

Item	Description	Spare part number
	2 GB — 2048 MB memory module (PC3-12800, 1600 MHz, DDR3)	652792-001
	4 GB — 4096 MB memory module (PC3-12800, 1600 MHz, DDR3)	641369-001
	8 GB — 8192 MB memory module (PC3-12800, 1600 MHz, DDR3)	670034-001
(8)	Fan/heat sink assembly (includes replacement thermal material):	653629-001 688762-001
(9)	Processor (includes replacement thermal material):	
	Next Generation Intel® Core™ processors (support Intel Turbo Boost Technology):	
	i7-3520M, 2.90 GHz (Turbo up to 3.60 GHz), 1600 MHz, 4 MB L3 Cache, 4 threads, 35W	681954-001
	i7-3610QM, 2.30 GHz (Turbo up to 3.30 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W	680646-001
	i7-3720QM, 2.60 GHz (Turbo up to 3.60 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W	681283-001
	i7-3820QM, 2.70 GHz (Turbo up to 3.70 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 45W	681284-001
	i7-3920XM, 2.90 GHz (Turbo up to 3.80 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 55W55W	691351-001
	Next Generation Intel® Core™ i5 processors (support Intel Turbo Boost Technology):	
	i5-3320M, 2.60 GHz (Turbo up to 3.30 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W	681952-001
	i5-3360M, 2.80 GHz (Turbo up to 3.50 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W	681953-001
(10)	Graphics board (includes replacement thermal material):	
	AMD FirePro M5950 XT-GL 1GB GDDR5 (DP 1.2 and Eyefinity Plus support)	689279-001
	NVIDIA Quadro 3000M, N14E-Q1 2 GB dedicated GDDR5 video memory	689280-001
	NVIDIA Quadro 4000M, N14E-Q3 2 GB dedicated GDDR5 video memory	689281-001
	NVIDIA Quadro 5010M, N14E-Q5 4 GB dedicated GDDR5 video memory	689282-001
(11)	Processor heat sink	
	For use only with computer models equipped with dual-core processors	652542-001
	For use only with computer models equipped with quad-core processors	653629-001
(12)	Modem module 56K V.92 data/fax modem	628824-001
	NOTE: The modem module spare part kit does not include a modem module cable. The modem module cable is included in the Cable Kit, spare part number 652545-001.	
(13)	System board (includes replacement thermal material)	
	For use in all countries and regions except the People's Republic of China:	
	• For use with computer models equipped with Intel quad-core processors	688746-001
	• For use with computer models equipped with Intel dual-core processors	688745-001
	For use only in the People's Republic of China:	
	• For use with computer models equipped with Intel quad-core processors	690035-001
	• For use with computer models equipped with Intel dual-core processors	690034-001
(14)	Expansion memory modules (PC3-10600, 1333 MHz, shared):	

Item	Description	Spare part number
	2 GB	652972-001
	4 GB	641369-001
	8 GB	670034-001
(15)	Solid-state drive (includes bracket and screws)	
	<ul style="list-style-type: none"> 256 GB solid-state drive Self-Encrypting drive (SED) 	688767-001
	<ul style="list-style-type: none"> 128 GB solid-state drive 	688766-001
	<ul style="list-style-type: none"> 160 GB solid-state drive 	688768-001
	<ul style="list-style-type: none"> 180 GB solid-state drive 	700373-001
(16)	WLAN module:	
	Intel® Centrino™ Advanced-N 6205, 802.11a/b/g/n WLAN module	695915-001
	Intel Centrino Ultimate-N 6300, 802.11a/b/g/n WLAN module	698588-001
	Broadcom 802.11a/b/g/n 2x2WiFi Adapter	669832-001
(17)	WWAN module:	
	HP un 2430 EV-DO/HSPA Mobile Broadband Module	634400-001
	HP hs2340 HSPA+ Mobile Broadband Module	668969-001
(18)	Speaker assembly	652540-001
(19)	Audio/USB 2.0 board	689284-001
(20)	Display (VGA) port	696435-001
(21)	Power connector cable	
	NOTE: The power connector cable is included in the Cable Kit, spare part number 652545-001.	
(22)	Modem cable	628824-001
(23)	Network cable (includes RJ-45 jack)	652545-001
	NOTE: The network cable is included in the Cable Kit, spare part number 652545-001.	
(24)	USB 3.0 board	689283-001
(25)	Battery:	
	9-cell, Li-ion, 2.2 Ah (73 WHr)	634089-001
	9-cell, Li-ion, 3.0 Ah (100 WHr)	634087-001
	8-cell, Li-ion, 2.8 Ah (75 WHr)	632425-001
	8-cell, Li-ion, 2.8 Ah (83 WHr)	632427-001
(26)	Base enclosure (includes computer feet)	688765-001
(27)	ExpressCard (plastic insert)	689283-001
(28)	Mass storage device	

Item	Description	Spare part number
	Supports 7.0 mm (0.28 in), 9.5 mm (0.37 in) or 12.7 mm (0.5 in) hard drives and 6.35 cm (2.5 in) solid-state drive for primary and secondary storage: NOTE: The hard drive bracket and screws are included in the Hard Drive Hardware Kit, spare part number 642774-001.	
	<ul style="list-style-type: none"> 750 GB, SATA, 7200-rpm 	633252-001
	<ul style="list-style-type: none"> 500 GB, SATA, 7200-rpm 	634925-001
	<ul style="list-style-type: none"> 320 GB, SATA, 7200-rpm 	634862-001
	<ul style="list-style-type: none"> 500 GB SATA SED (Self-Encrypting Drive), 7200-rpm 	683801-001
(29)	Optical drive (includes bezel and bracket) supported in upgrade bay	
	Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	688772-001
	Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	688771-001
	DVD±RW SuperMulti Double-Layer Drive	688770-001
	DVD-ROM Drive	688769-001
	Also supported in upgrade bay:	
	500 GB, 7200 rpm hard drive	634925-001
(30)	Service access cover	698410-001 699467-001 (RCTO)
(31)	Smart Card reader (includes cable)	688742-001

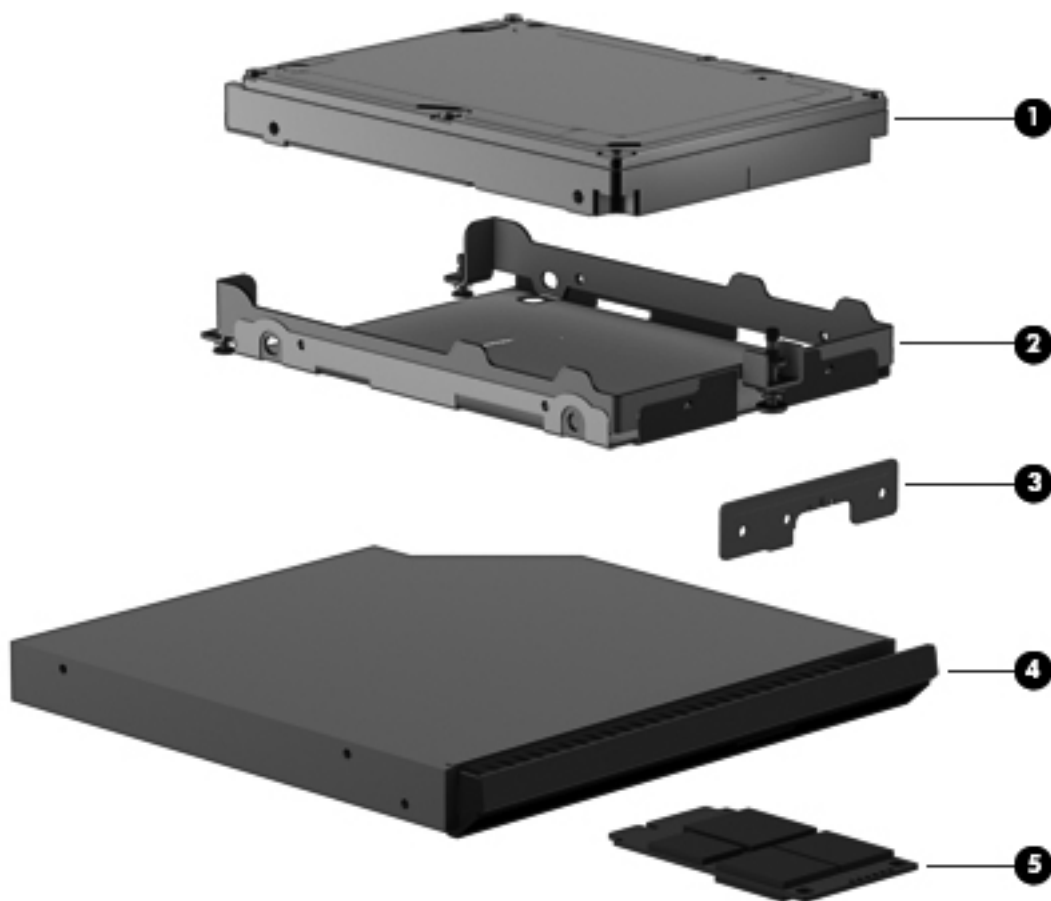
Display components



Item	Description	Spare part number
(1)	Display bezel	
	Display bezel	688763-001
(2)	Webcam module	688752-001
(3)	Display	
	Display panel, 43.9 cm (17.3 in), FHD AG WVA	691224-001
	Display panel, 43.9 cm (17.3 in), HD+ AG WVA	691223-001

Item	Description	Spare part number
	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVWA Dream Color with webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)	688736-001
	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVWA Dream Color without webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)	688735-001
(4)	Display hinge cover	652529-001
(5)	Display Hinge Brackets (included in Display Hinge Kit, left and right hinges and brackets)	652528-001
(6)	WWAN antenna and cables (included in the Antenna Kit, spare part number 652530-001)	
(7)	WLAN antenna and cables (included in the Antenna Kit, spare part number 652530-001)	
(8)	Display panel cable (includes webcam module cable)	688761-001
(9)	Webcam cable	652527-001
(10)	Display enclosure	652524-001
(11)	Hinge Pipe (included in Display Hinge Kit)	652528-001
	Antenna Kit (includes WLAN and WWAN antennas) (not illustrated)	652530-001
	Microphone (not illustrated)	655312-001
	CRT board (not illustrated)	688741-001

Mass storage devices



Item	Description	Spare part number
(1)	7.0 mm (0.28 in), 9.5 mm (0.37 in), or 12.7 mm (0.5 in) hard drive: NOTE: The hard drive bracket is included in the Hard Drive Hardware Kit, spare part number 642774-001.	
	• 750 GB, 7200-rpm	633252-001
	• 500 GB, 7200-rpm	634925-001
	• 320 GB, 7200-rpm	634862-001
	• 320 GB, 7200-rpm SATA SED (Self-Encrypting Drive)	683801-001
(2)	Hard drive bracket (Included only with solid-state drives. See spare part numbers below in this table.)	
(3)	Optical drive bracket (Included with optical drive. See spare part numbers below in this table.)	688769-001
(4)	Optical drive (includes bezel and bracket)	
	Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	688772-001
	DVD±RW SuperMulti Double-Layer Drive	688771-001
	Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	688770-001

Item	Description	Spare part number
	DVD-ROM Drive	688769-001
(5)	6.35 cm (2.50 in) Solid-state drive (includes bracket):	
	• 256 GB solid-state drive Self-Encrypting drive (SED)	688767-001
	• 128 GB solid-state drive	688766-001
	• 160 GB solid-state drive	688768-001
	• 180 GB solid-state drive	700373-001
	• 24 GB solid-state drive	701479-001

Miscellaneous parts

Description	Spare part number
AC Adapter	
230W PFC Slim AC Smart Adapter	693706-001
200W PFC Slim AC Smart Adapter	693708-001
230W PFC AC Smart Adapter	693714-001
Power cord (3 conductor, black, 1.83 m):	
For use in Argentina	491683-D01
For use in Australia	491683-011
For use in Brazil	491683-202
For use in Denmark	491683-081
For use in Europe, the Middle East, and Africa	491683-021
For use in India	491683-D61
For use in Israel	491683-BB1
For use in Saudi Arabia	491683-171
For use in Japan	491683-291
For use in North America	491683-001
For use in the People's Republic of China	491683-AA1
For use in South Africa	491683-AR1
For use in South Korea	491683-AD1
For use in Switzerland	491683-111
For use in Taiwan	491683-AB1
For use in Thailand	491683-201
For use in the United Kingdom and Singapore	491683-031
Hard Drive Hardware Kit (includes hard drive bracket and screws)	642774-001
Hard drive upgrade bay	655547-001
Screw Kit	
ExpressCard socket	652547-001

Sequential part number listing

Spare part number	Description
390632-001	Optical USB/PS2, 2 button mouse
434594-001	Optical USB travel mouse
491683-001	Power cord for use in North America (3 conductor, black, 1.83 m)
491683-011	Power cord for use in Australia (3 conductor, black, 1.83 m)
491683-021	Power cord for use in Europe, the Middle East, and Africa (3 conductor, black, 1.83 m)
491683-031	Power cord for use in Singapore and the United Kingdom (3 conductor, black, 1.83 m)
491683-081	Power cord for use in Denmark (3 conductor, black, 1.83 m)
491683-111	Power cord for use in Switzerland (3 conductor, black, 1.83 m)
491683-171	Power cord for use in Saudi Arabia (3 conductor, black, 1.83 m)
491683-201	Power cord for use in Thailand (3 conductor, black, 1.83 m)
491683-202	Power cord for use in Brazil (3 conductor, black, 1.83 m)
491683-291	Power cord for use in Japan (3 conductor, black, 1.83 m)
491683-AA1	Power cord for use in the People's Republic of China (3 conductor, black, 1.83 m)
491683-AB1	Power cord for use in Taiwan (3 conductor, black, 1.83 m)
491683-AD1	Power cord for use in South Korea (3 conductor, black, 1.83 m)
491683-AR1	Power cord for use in South Africa (3 conductor, black, 1.83 m)
491683-BB1	Power cord for use in Israel (3 conductor, black, 1.83 m)
491683-D01	Power cord for use in Argentina (3 conductor, black, 1.83 m)
491683-D61	Power cord for use in India (3 conductor, black, 1.83 m)
572511-001	WLAN, Intel Centrino Ultimate-N 6300 802.11 a/b/g/n
591699-001	Notebook combination lock
592923-001	Professional Slim Top Load notebook case
626729-002	Keyed cable lock
628824-001	Modem, 56K V.92 data/fax modem
631954-001	WLAN, Intel® Centrino™ Advanced-N 6205, 802.11a/b/g/n
632425-001	Battery, 8-cell, Li-ion, 2.8 Ah (75 WHr)
632427-001	Battery, 8-cell, Li-ion, 2.8 Ah (83 WHr)
633252-001	Hard drive, 750GB 7200-RPM SATA
634087-001	Battery, 9-cell, Li-ion, 3.0 Ah (100 WHr)
634089-001	Battery, 9-cell, Li-ion, 2.2 Ah (73 WHr)
634400-001	WWAN, HP un2430 EV-DO/HSPA Mobile Broadband Module
634862-001	Hard drive, 320 GB, 7200-rpm SATA

Spare part number	Description
634925-001	Hard drive, 500GB, 7200-rpm SATA
641369-001	Memory module, 4GB (PC3-12800, 1600 MHz)
642774-001	Hard Drive Hardware Kit (includes hard drive bracket and screws)
651948-001	RTC battery
652524-001	Display enclosure
652527-001	Webcam cable
652528-001	Display Hinge Kit (includes left and right hinges, hinge pipe, and brackets)
652529-001	Display hinge covers
652530-001	Antenna Kit (includes WLAN antenna and cables and WWAN antenna and cables)
652532-001	Display Rubber Kit (includes 2 bezel rubber bumpers and 8 rubber screw covers)
652533-001	Display Miscellaneous Kit
652540-001	Speaker assembly
652542-001	Processor heat sink for use only with computer models equipped with dual-core processors (includes replacement thermal material)
652545-001	Cable Kit (includes DC-jack cable, RJ-45 cable, modem module cable, Bluetooth cable)
652546-001	Smart Card cover
652547-001	ExpressCard socket
652972-001	Memory module, 2 GB (PC3-12800, 1600 MHz)
653629-001	Processor heat sink for use only with computer models equipped with quad-core processors (includes replacement thermal material)
655312-001	Microphone
655546-001	Plastics Kit (includes optical drive compartment cover, RJ-11 (modem) jack cover, SD Card cover, and Express Card slot cover)
655547-001	Upgrade bay hard drive
655792-001	Bluetooth module, HP Integrated Module with Bluetooth 4.0+ ENH Data Rate Wireless Technology
	NOTE: The Bluetooth module spare part kit does not include a Bluetooth module cable. The Bluetooth module cable is included in the Cable Kit, spare part number 652545-001.
656840-001	Wireless mouse 2.4-GHZ
658265-001	Display Panel Support Kit (includes display enclosure, WLAN antenna cables, WWAN antenna cables, and webcam cable)
660578-001	Upgrade bay bezel 15/17W
668969-001	WWAN, HP hs2340 HSPA+ Mobile Broadband Module
669832-001	Broadcom 802.11 a/b/g/n 2x2WiFi Adapter
670034-001	Memory module, 8 GB (PC3-12800, 1600 MHz)
680646-001	Next Generation Intel® Core™ i7 Processor i7-3610QM, 2.30 GHz (Turbo up to 3.30 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W

Spare part number	Description
681283-001	Next Generation Intel® Core™ i7 Processor, i7-3720QM, 2.60 GHz (Turbo up to 3.60 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W
681284-001	Next Generation Intel® Core™ i7 Processor, i7-3820QM, 2.70 GHz (Turbo up to 3.70 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 45W
681952-001	Next Generation Intel® Core™ i5 Processor, i5-3320M, 2.60 GHz (Turbo up to 3.30 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W
681953-001	Next Generation Intel® Core™ i5 Processor, i5-3360M, 2.80 GHz (Turbo up to 3.50 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W
681954-001	Next Generation Intel® Core™ i7 Processor, i7-3520M, 2.90 GHz (Turbo up to 3.60 GHz), 1600 MHz, 4 MB L3 Cache, 4 threads, 35W
683801-001	Hard drive, 500 GB, 7200-rpm SATA SED (Self-Encrypting Drive)
688169-001	Docking station/Expansion base
688733-001	Fan/graphics board heat sink assembly for use only with computer models equipped with AMD graphics subsystems (includes replacement thermal material)
688735-001	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color without webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)
688736-001	Display assembly, 43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color with webcam (not available with HP Mobile Broadband) (includes display panel cable, 3 WLAN antenna and cables, and 2 WWAN antenna and cables)
688737-001	Keyboard without backlight for use in the United States (includes keyboard cable, pointing stick and pointing stick cable)
688737-031	Keyboard without backlight for use in Singapore and the United Kingdom (includes keyboard cable, pointing stick and pointing stick cable)
688737-041	Keyboard without backlight for use in Germany (includes keyboard cable, pointing stick and pointing stick cable)
688737-051	Keyboard without backlight for use in France (includes keyboard cable, pointing stick and pointing stick cable)
688737-061	Keyboard without backlight for use in Italy (includes keyboard cable, pointing stick and pointing stick cable)
688737-071	Keyboard without backlight for use in Spain (includes keyboard cable, pointing stick and pointing stick cable)
688737-081	Keyboard without backlight for use in Denmark (includes keyboard cable, pointing stick and pointing stick cable)
688737-091	Keyboard without backlight for use in Norway (includes keyboard cable, pointing stick and pointing stick cable)
688737-131	Keyboard without backlight for use in Portugal (includes keyboard cable, pointing stick and pointing stick cable)
688737-141	Keyboard without backlight for use in Turkey (includes keyboard cable, pointing stick and pointing stick cable)
688737-151	Keyboard without backlight for use in Greece (includes keyboard cable, pointing stick and pointing stick cable)
688737-161	Keyboard without backlight for use in Latin America (includes keyboard cable, pointing stick and pointing stick cable)

Spare part number	Description
688737-171	Keyboard without backlight for use in Saudi Arabia (includes keyboard cable, pointing stick and pointing stick cable)
688737-201	Keyboard without backlight for use in Brazil (includes keyboard cable, pointing stick and pointing stick cable)
688737-211	Keyboard without backlight for use in Hungary (includes keyboard cable, pointing stick and pointing stick cable)
688737-251	Keyboard without backlight for use in Russia (includes keyboard cable, pointing stick and pointing stick cable)
688737-261	Keyboard without backlight for use in Bulgaria (includes keyboard cable, pointing stick and pointing stick cable)
688737-271	Keyboard without backlight for use in Romania (includes keyboard cable, pointing stick and pointing stick cable)
688737-281	Keyboard without backlight for use in Thailand (includes keyboard cable, pointing stick and pointing stick cable)
688737-291	Keyboard without backlight for use in Japan (includes keyboard cable, pointing stick and pointing stick cable)
688737-A41	Keyboard without backlight for use in Belgium (includes keyboard cable, pointing stick and pointing stick cable)
688737-AB1	Keyboard without backlight for use in the Czech Republic and Slovakia (includes keyboard cable, pointing stick and pointing stick cable)
688737-AD1	Keyboard without backlight for use in South Korea (includes keyboard cable, pointing stick and pointing stick cable)
688737-B31	Keyboard without backlight for international use (includes keyboard cable, pointing stick and pointing stick cable)
688737-B71	Keyboard without backlight for use in Finland and Sweden (includes keyboard cable, pointing stick and pointing stick cable)
688737-BA1	Keyboard without backlight for use in Slovenia (includes keyboard cable, pointing stick and pointing stick cable)
688737-BB1	Keyboard without backlight for use in Israel (includes keyboard cable, pointing stick and pointing stick cable)
688737-BG1	Keyboard without backlight for use in Switzerland (includes keyboard cable, pointing stick and pointing stick cable)
688737-D61	Keyboard without backlight for use in India (includes keyboard cable, pointing stick and pointing stick cable)
688737-DB1	Keyboard without backlight for use in Canada (includes keyboard cable, pointing stick and pointing stick cable)
688737-DD1	Keyboard without backlight for use in Iceland (includes keyboard cable, pointing stick and pointing stick cable)
688737-FL1	Keyboard without backlight for use in Czechoslovakia (includes keyboard cable, pointing stick and pointing stick cable)
688737-FP1	Keyboard without backlight for use in Northwest Africa (includes keyboard cable, pointing stick and pointing stick cable)
688738-001	Keyboard with backlight for use in the United States (includes keyboard cable, pointing stick and pointing stick cable)

Spare part number	Description
688738-031	Keyboard with backlight for use in the United Kingdom (includes keyboard cable, pointing stick and pointing stick cable)
688738-041	Keyboard with backlight for use in Germany (includes keyboard cable, pointing stick and pointing stick cable)
688738-051	Keyboard with backlight for use in France (includes keyboard cable, pointing stick and pointing stick cable)
688738-061	Keyboard with backlight for use in Italy (includes keyboard cable, pointing stick and pointing stick cable)
688738-081	Keyboard with backlight for use in Denmark (includes keyboard cable, pointing stick and pointing stick cable)
688738-091	Keyboard with backlight for use in Norway (includes keyboard cable, pointing stick and pointing stick cable)
688738-161	Keyboard with backlight for use in Latin America (includes keyboard cable, pointing stick and pointing stick cable)
688738-251	Keyboard with backlight for use in Russia (includes keyboard cable, pointing stick and pointing stick cable)
688738-281	Keyboard with backlight for use in Thailand (includes keyboard cable, pointing stick and pointing stick cable)
688738-A41	Keyboard with backlight for use in Belgium (includes keyboard cable, pointing stick and pointing stick cable)
688738-AB1	Keyboard with backlight for use in Taiwan (includes keyboard cable, pointing stick and pointing stick cable)
688738-AD1	Keyboard with backlight for use in South Korea (includes keyboard cable, pointing stick and pointing stick cable)
688738-B31	Keyboard with backlight for use in Europe (includes keyboard cable, pointing stick and pointing stick cable)
688738-B71	Keyboard with backlight for use in Finland and Sweden (includes keyboard cable, pointing stick and pointing stick cable)
688738-BG1	Keyboard with backlight for use in Switzerland (includes keyboard cable, pointing stick and pointing stick cable)
688738-D61	Keyboard with backlight for use in India (includes keyboard cable, pointing stick and pointing stick cable)
688738-DB1	Keyboard with backlight for use in Canada (includes keyboard cable, pointing stick and pointing stick cable)
688738-FL1	Keyboard with backlight for use in Czechoslovakia (includes keyboard cable, pointing stick and pointing stick cable)
688741-001	CRT board
688742-001	Smart Card (includes cable)
688743-001	Fingerprint reader (includes cable)
688744-001	Screw Kit
688745-001	System board for use with computer models equipped with Intel quad-core processors in all countries and regions except the People's Republic of China (includes replacement thermal material)

Spare part number	Description
688746-001	System board for use with computer models equipped with Intel quad-core processors in all countries and regions except the People's Republic of China (includes replacement thermal material)
688747-001	Top cover (includes TouchPad)
688749-001	Power button board
688752-001	Webcam module with microphone
688760-001	Latch kit (includes door and battery latches)
688761-001	Display panel cable (includes webcam module cable)
688762-001	Fan
688763-001	Display bezel
688765-001	Base enclosure (includes computer feet)
688766-001	128 GB solid-state drive (includes bracket)
688767-001	256 GB solid-state drive (includes bracket)
688768-001	160 GB solid-state drive (includes bracket)
688769-001	DVD-ROM Drive
688770-001	Optical drive, DVD±RW SuperMulti Double-Layer Drive
688771-001	Optical drive, Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive
688772-001	Optical drive, Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive
689279-001	Graphics board, AMD Firepro M2 XT GL
689280-001	Graphics board, NVIDIA Quadro 3000M, N14E-Q1 2 GB dedicated GDDR5 video memory
689281-001	Graphics board, NVIDIA Quadro 4000M, N14E-Q3 2 GB dedicated GDDR5 video memory
689282-001	Graphics board, NVIDIA Quadro 5010M, N14E-Q5 4 GB dedicated GDDR5 video memory
689283-001	USB 3.0 board (includes cable)
689284-001	Audio/USB 2.0 board
690034-001	System board for use with computer models equipped with Intel quad-core processors in the People's Republic of China (includes replacement thermal material)
690035-001	System board for use with computer models equipped with Intel quad-core processors in the People's Republic of China (includes replacement thermal material)
691223-001	Display panel, 43.9 cm (17.3 in), HD+ AG WVA
691224-001	Display panel, 43.9 cm (17.3 in), FHD AG WVA
691351-001	Next Generation Intel® Core i7-3920XM, 2.90 GHz (Turbo up to 3.80 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 55W
693706-001	AC adapter, 230 W PFC Slim AC Smart adapter
693708-001	AC adapter, 200 W PFC Slim AC Smart adapter

Spare part number	Description
693714-001	AC adapter, 230 W PFC AC Smart adapter
696435-001	Fan/graphics board heat sink assembly, for use only with computer models equipped with NVIDIA Quadro graphics subsystems (includes replacement thermal material)
696901-001	Application board
698410-001	Service access door
699467-001	Service access door (RCTO)
700373-001	180 GB solid-state drive (includes bracket)
701479-001	24 GB solid-state drive (includes bracket)

4 Removal and replacement procedures

Preliminary replacement 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 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 are 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			
Event	Relative humidity		
	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 $\pm 10\%$ 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

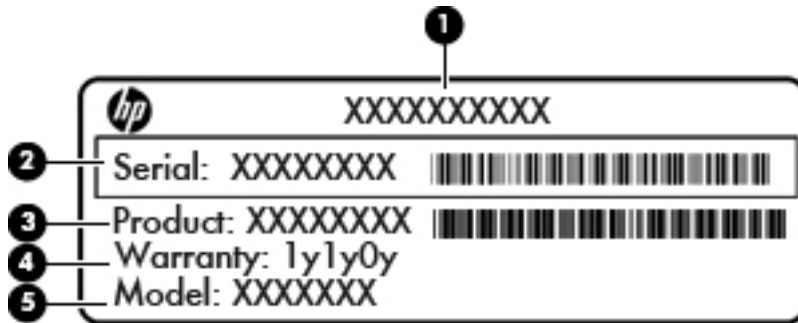
Component replacement procedures

This chapter provides removal and replacement procedures.

There are as many as 98 screws and screw locks that must be removed, replaced, or loosened when servicing the computer. Make special note of each screw and screw lock size and location during removal and replacement.

Service tag

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



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.
(3)	Part number/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.

Computer feet

The computer feet (not illustrated) are adhesive-backed rubber pads. The feet are included in the base enclosure spare part kit, spare part number 688765-001. The rubber feet that attach to the base enclosure in the locations illustrated below.

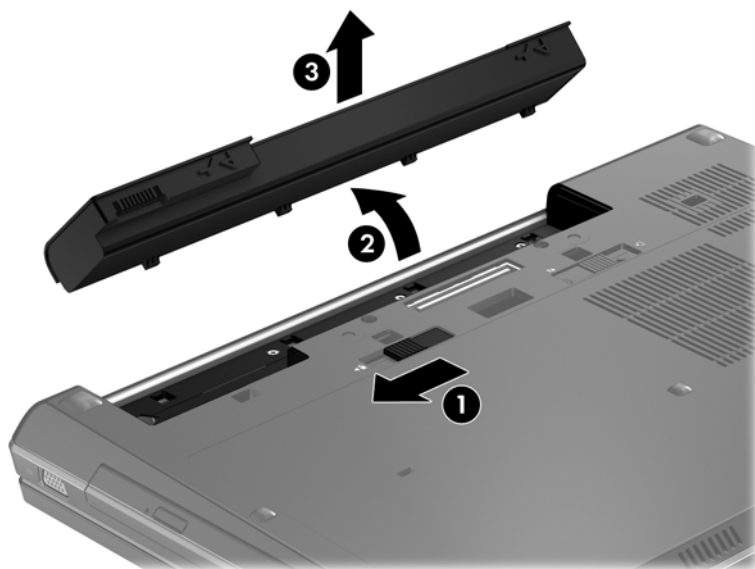
Battery

Description	Spare part number
8-cell, Li-ion 2.8 Ah (75 WHr)	632425-001
8-cell, Li-ion 2.8 Ah (83 WHr)	632427-001
9-cell, Li-ion 3.0 Ah (100 WHr)	634087-001
9-cell, Li-ion 2.2 Ah (73 WHr)	634089-001

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.

Remove the battery:

1. Position the computer upside down on a flat surface, with the front toward you.
2. Slide the battery release latch to the left **(1)** to release the battery.
3. Pivot the battery **(2)** upward and lift it out of the computer **(3)**.



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

Before disassembling the computer, follow these steps:

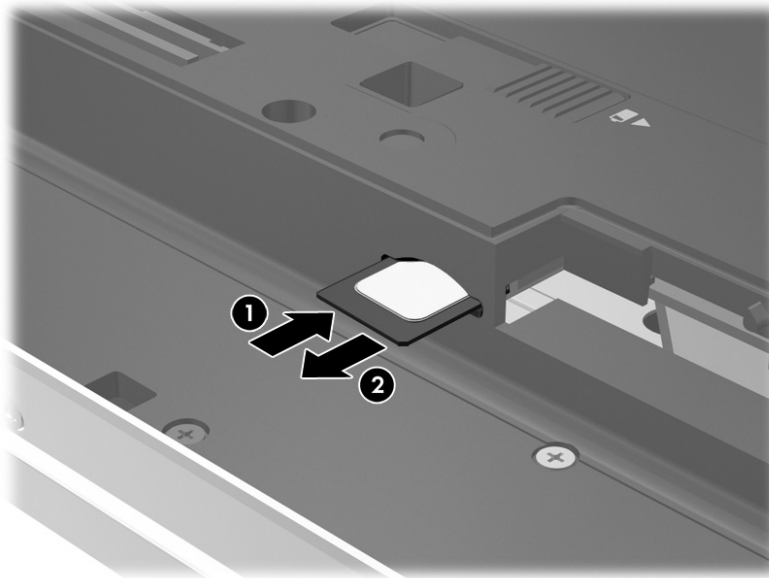
SIM

Before removing the SIM, 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 42](#)).

Remove the SIM:

1. Press in on the SIM **(1)** to release it from the SIM slot.
2. Remove the SIM **(2)** from the SIM slot.



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

Service access cover

Description	Spare part number
Service access cover	698410-001
Service access cover (RCTO)	699467-001

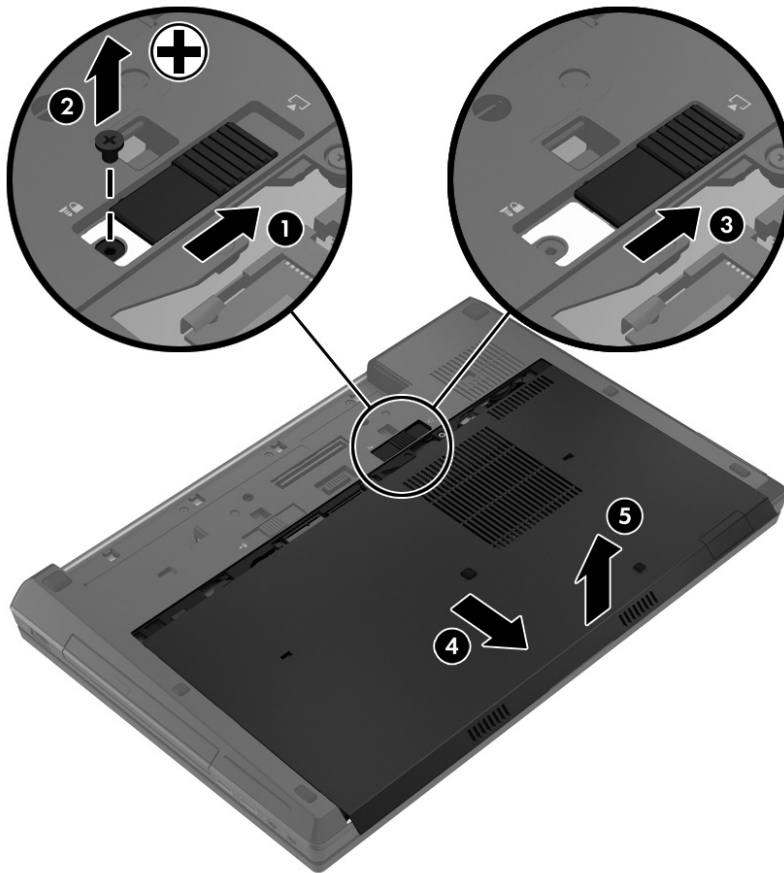
Before removing the service access cover, follow these steps:

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.

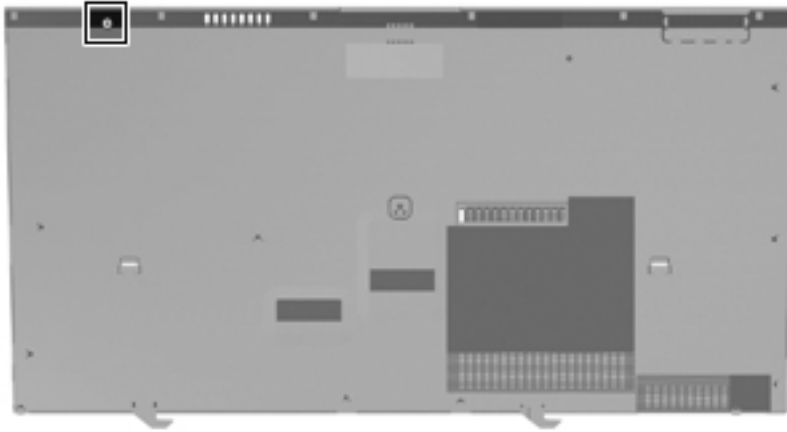
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#)).

Remove the service access cover:

1. Position the computer upside down on a flat surface, with the front toward you.
2. Slide the service cover release latch to the right (1), and remove the single security screw (2), if it has been installed.
3. Slide the service access cover release latch to the right (3) to release the service access cover.
4. Slide the service access cover toward the front of the computer (4) and then remove the cover (5).



Reverse this procedure to reassemble and install the service cover. When reinstalling the service cover, install the security screw in the area that is adjacent to the service cover release latch. The security screw is located on the service cover.



Primary hard drive



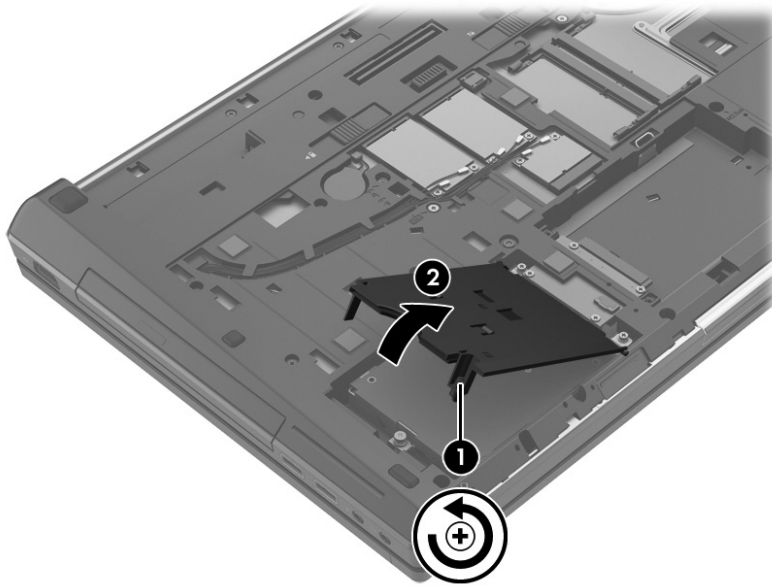
NOTE: The hard drive bracket is included in the Hard Drive Hardware Kit, spare part number 642774-001.

Description	Spare part number
750 GB, 7200-rpm SATA hard drive	633252-001
500 GB, 7200-rpm SATA hard drive	634925-001
320 GB, 7200-rpm SATA hard drive	638801-001
500 GB, 7200-rpm SATA SED hard drive	634862-001
256 GB solid-state drive (includes bracket and screws)	655027-001
128 GB solid-state drive (includes bracket and screws)	655026-001
24 GB solid-state drive (includes bracket and screws)	701479-001

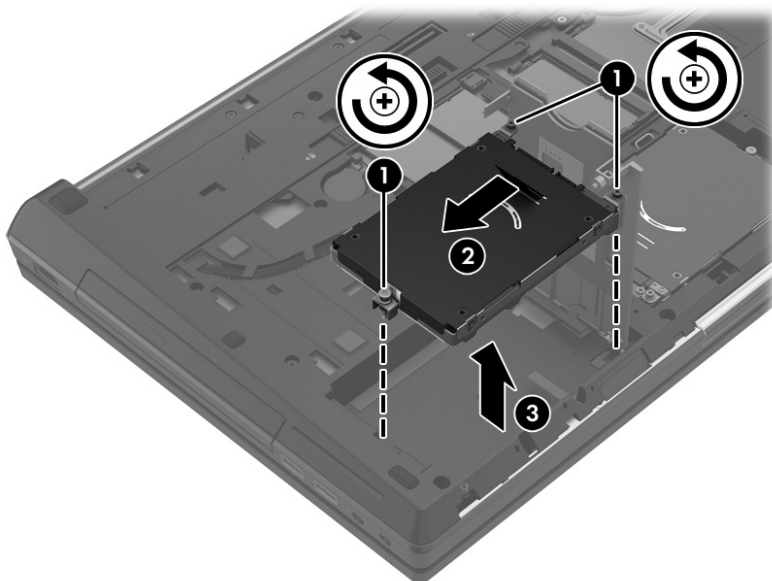
Before removing the primary hard drive, follow these steps:

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. Remove the battery (see [Battery on page 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Position the computer with the front toward you.
7. Loosen the captive screw on the Smart Card reader **(1)**.

8. Lift the Smart Card reader to the upright position (2).

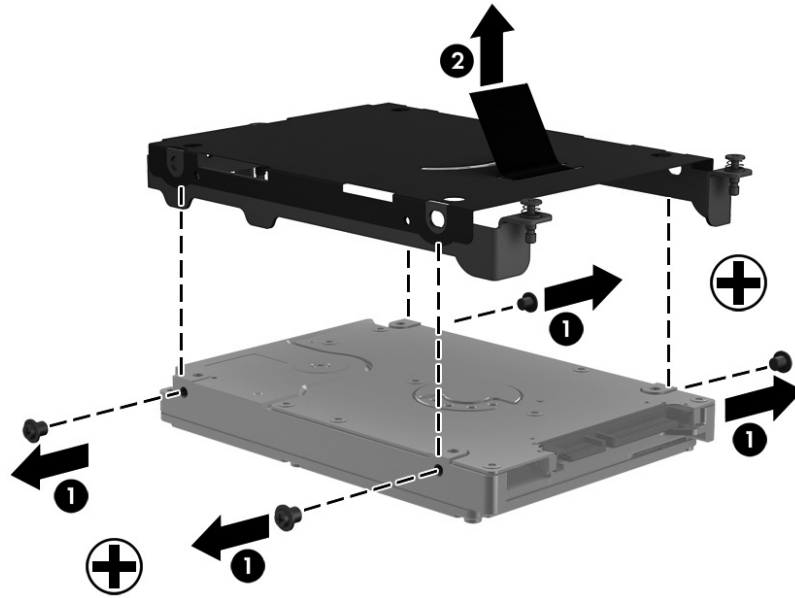


9. Loosen the Phillips M2.5x10.5 captive screws (1) that secure the hard drive to the computer.
10. Grasp the tab on the hard drive and slide the hard drive (2) to disconnect it from the system board.
11. Lift the left side of the hard drive and remove the hard drive at an angle from the hard drive bay (3).




12. If it is necessary to remove the hard drive bracket, follow these steps:
 - a. Remove the four Phillips M3.0x3.0 screws (1) that secure the hard drive bracket to the hard drive.

- b. Lift the bracket (2) straight up to remove it from the hard drive.



Reverse this procedure to reassemble and install the hard drive.

Secondary hard drive

 **NOTE:** The hard drive bracket is included in the Hard Drive Hardware Kit, spare part number 642774-001.

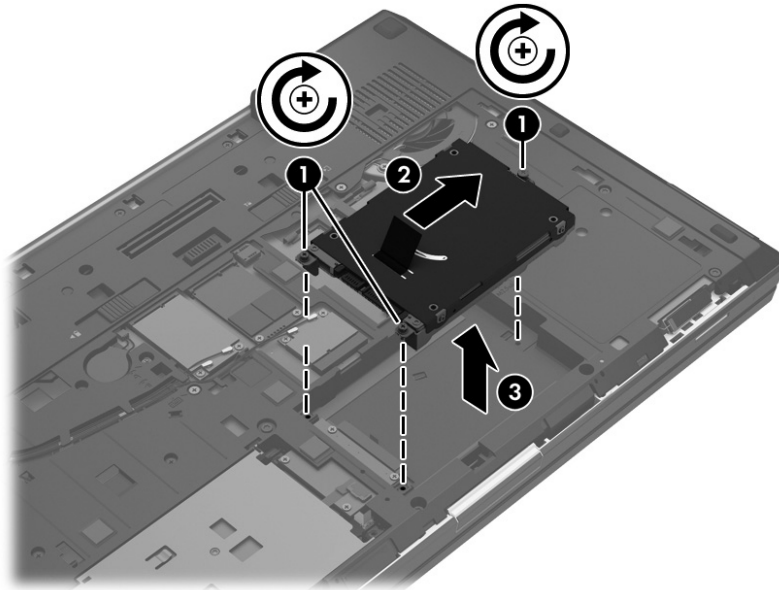
Description	Spare part number
750 GB, 7200-rpm SATA hard drive	633252-001
500 GB, 7200-rpm SATA hard drive	634925-001
320 GB, 7200-rpm SATA hard drive	634862-001
320 GB, 7200-rpm SATA SED hard drive	626978-001
256 GB solid-state drive (includes bracket and screws)	655027-001
128 GB solid-state drive (includes bracket and screws)	655026-001
24 GB solid-state drive (includes bracket and screws)	701479-001

Before removing the secondary hard drive, follow these steps:

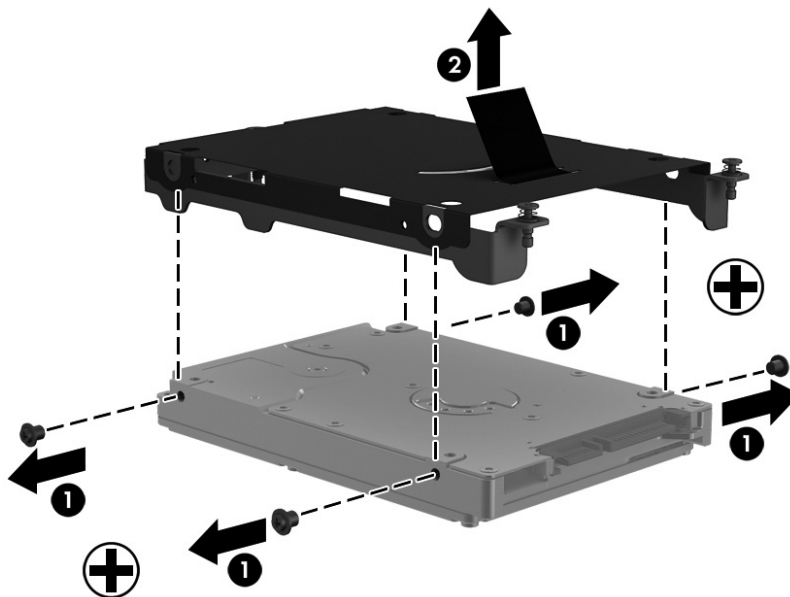
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

Remove the secondary hard drive:

1. Position the computer with the front toward you.
2. Loosen the Phillips M2.5x10.5 captive screws (1) that secure the hard drive to the computer.
3. Grasp the tab and slide the hard drive (2) to the right. Lift the hard drive up to remove it from the hard drive bay (3).



4. If it is necessary to remove the hard drive bracket, follow these steps:
 - a. Remove the four Phillips M3.0x3.0 screws (1) that secure the hard drive bracket to the hard drive.
 - b. Lift the bracket (2) straight up to remove it.



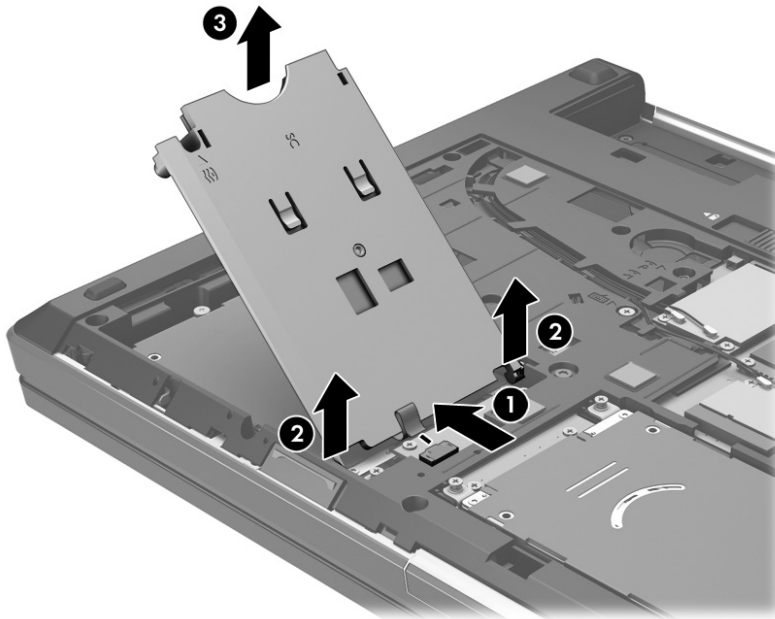
Reverse this procedure to reassemble and install the secondary hard drive.

Smart Card reader

Description	Spare part number
Smart Card reader (with cable)	688742-001
Smart Card reader cover	652546-001

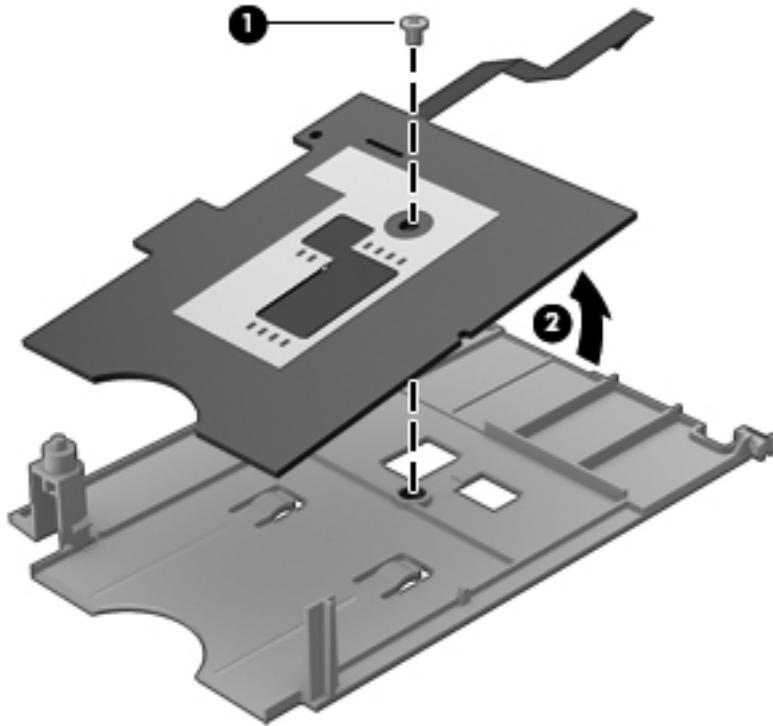
Before removing the Smart Card reader, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Position the computer with the front toward you.
7. Disconnect the zero insertion force (ZIF) connector (1), lift up the smart card reader until it is almost vertical (2), and then remove the smart card reader (3).




8. Remove the Phillips M3.0x2.5 screw (1) that secures the Smart Card reader board to the Smart Card reader cover.

- Slide the Smart Card reader back toward the hinges on the Smart Card reader cover, and remove the Smart Card reader board (2).



Reverse this procedure to reassemble and install the Smart Card reader.

Bluetooth module

 **NOTE:** The Bluetooth module spare part kit does not include a Bluetooth module cable. The Bluetooth module cable is included in the Cable Kit, spare part number 652545-001. See [Bluetooth module cable on page 92](#) for information on replacing the Bluetooth module cable.

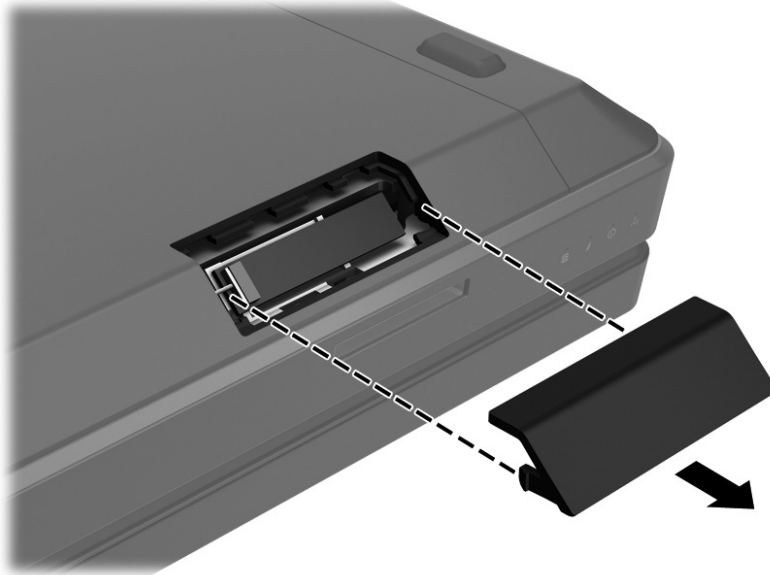
Description	Spare part number
Bluetooth module	655792-001

Before removing the Bluetooth module, follow these steps:

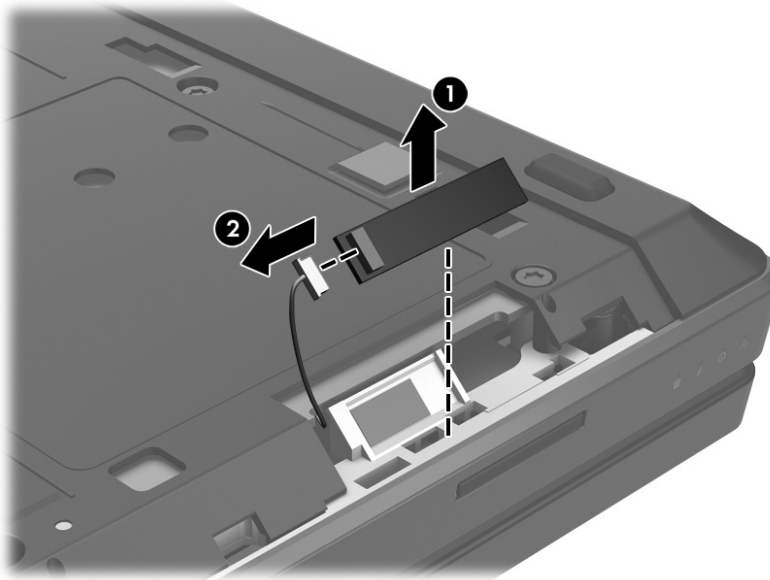
- Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
- Disconnect all external devices connected to the computer.
- Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
- Remove the battery (see [Battery on page 42](#)).
- Remove the service access cover (see [Service access cover on page 43](#)).

Remove the Bluetooth module:

1. Remove the Bluetooth module cover.



2. Gently pry the Bluetooth module away from the adhesive in the base enclosure and lift the Bluetooth module (1).
3. Disconnect the Bluetooth module from the Bluetooth cable (2), and remove the module.



Reverse this procedure to install the Bluetooth module.

WLAN module

Description	Spare part number
Intel® Centrino™ Advanced-N 6205, 802.11a/b/g/n WLAN module	695915-001

Description	Spare part number
Intel Centrino Ultimate-N 6300, 802.11a/b/g/n WLAN module	698588-001
Broadcom 802.11a/b/g/n 2x2WiFi Adapter	669832-001

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

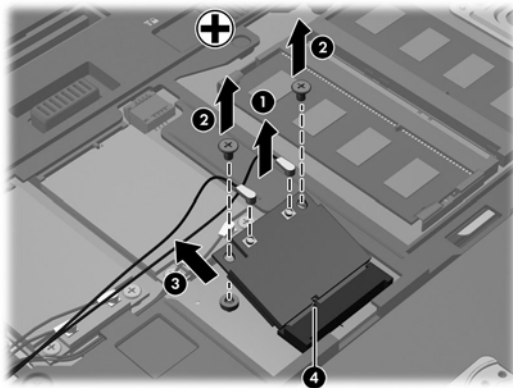
Remove the WLAN module:

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 cables are numbered and connect from left to right on the WLAN module.

3. Remove the two Phillips M2.0×2.0 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 **(4)** 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 un2430 EV-DO/HSPA Mobile Broadband Module	634400-001
HP hs2340 HSPA+ Mobile Broadband Module	668969-001

⚠ 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:

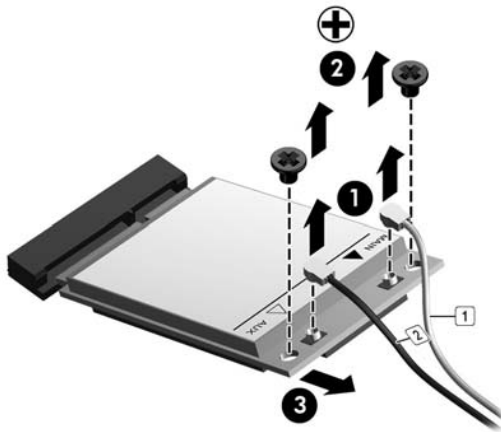
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#)).
5. Remove the service access cover (see [Service access 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 is connected to the WWAN module “Main” terminal. The blue WWAN antenna cable is connected to the WWAN module “Aux” terminal.

2. Remove the two Phillips M2.0×2.0 screws (2) that secure 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.



Reverse this procedure to install the WWAN module.

RTC battery


Description	Spare part number
RTC battery	651948-001

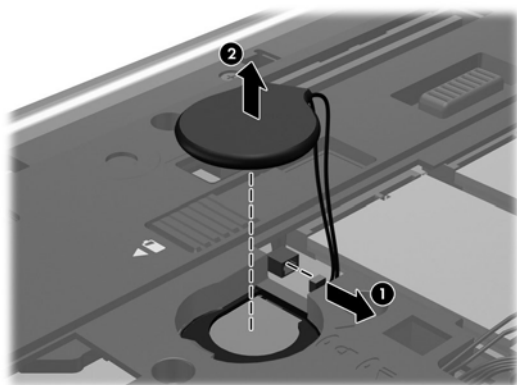
Before removing the RTC battery, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

Remove the RTC battery:


- ▲ Disconnect the RTC battery cable (1) from the system board and remove the RTC battery (2).

 **NOTE:** You may need to remove some double-sided adhesive.



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.

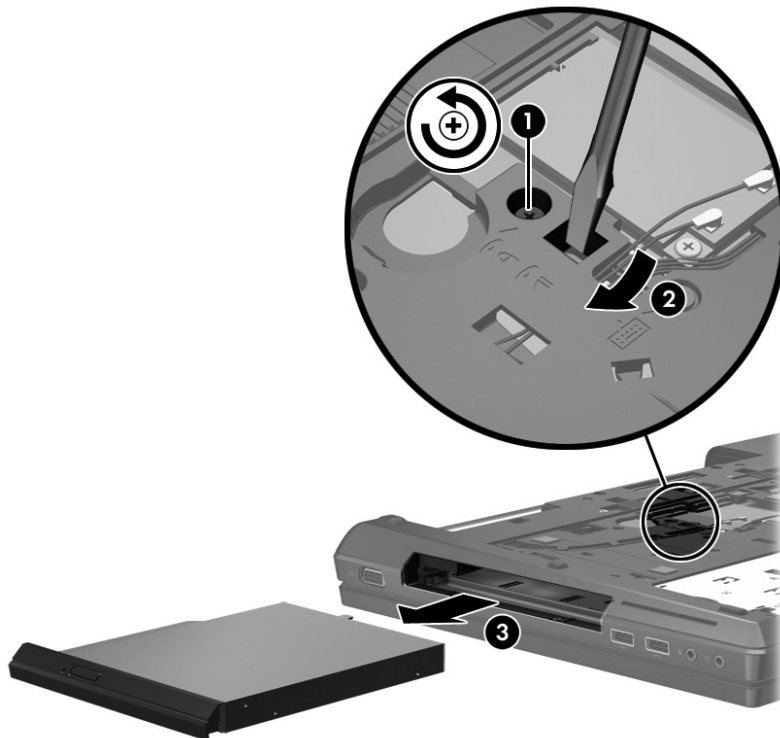
Description	Spare part number
Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive	688772-001
DVD±RW SuperMulti Double-Layer Drive	688770-001
Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive	688771-001
DVD-ROM Drive	688769-001

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 42](#)).
5. Remove the service access cover (see [Service access 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 three Phillips M2.0×3.0 screws (1) that secure the optical drive bracket to the optical drive.

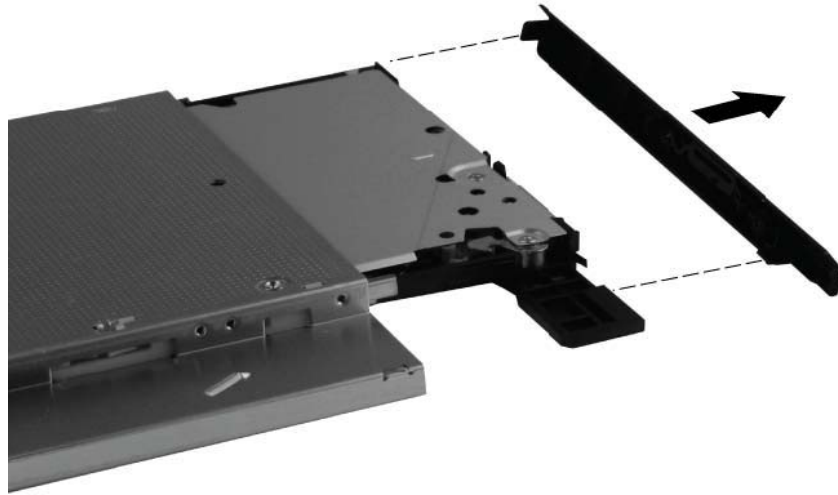
- c. Remove the optical drive bracket (2).



6. If it is necessary to remove the optical drive bezel:
- Insert the end of a paper clip into the release access hole (1) in the optical drive bezel. Press in gently until the tray is released.
 - Firmly pull outward on the open tray (2) until the optical drive slides out.



- c. Firmly pull outward on the bezel to remove the bezel from the optical drive tray.



Reverse this procedure to reassemble and install the optical drive.

Upgrade bay hard drive



NOTE: The hard drive bracket is included in the Hard Drive Hardware Kit, spare part number 642774-001.

Description	Spare part number
7.0 mm, 9.5 mm, or 12.7 mm 500 GB hard drive, 7200 rpm	634925-001

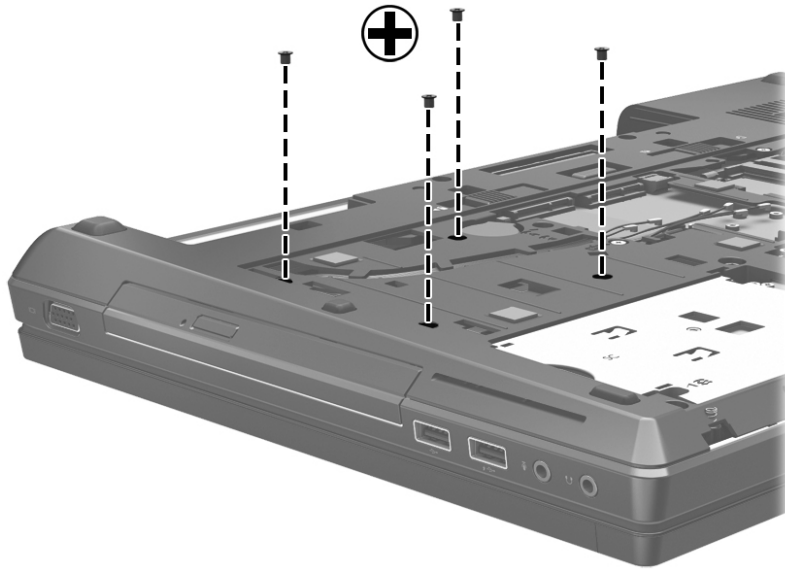
Before removing the upgrade bay hard drive, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

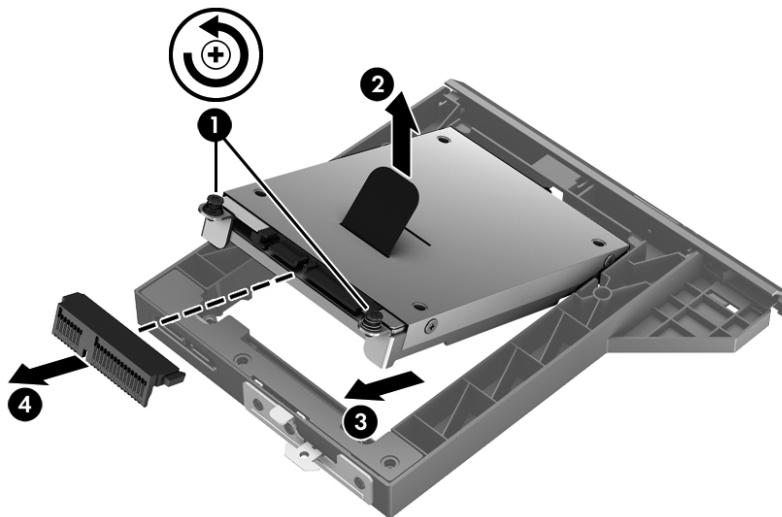
Remove the upgrade bay hard drive:

1. Position the computer with the front toward you.

2. Remove the four Phillips PM3.0×3.0 screws that secure the upgrade bay hard drive carrier to the computer.




3. Loosen the 2 Phillips captive screws (1) that secure the hard drive to the carrier.
4. Insert a flat-bladed screwdriver or similar tool into the upgrade bay hard drive tab access (2) and press the tab to the left to release the upgrade bay hard drive from the computer.
5. Lift and remove the upgrade bay hard drive (3), and then remove the hard disk drive interface connector (4).



Reverse this procedure to reassemble and install the upgrade bay hard drive and upgrade bay hard drive carrier.


Primary memory module

 **NOTE:** Primary memory is installed under the keyboard.

A computer having a system board with spare part number 690034-001 or 688745-001 has two memory slots (primary memory slots). When adding or replacing memory modules, slot 1 must be populated before slot 2 is populated.

A computer having a system board with spare part number 688746-001 or 690035-001 has four memory slots (expansion memory slots) (on the bottom of the computer) and the primary memory slots (under the keyboard). Slot 2 cannot be populated if slot 1 is not populated.

Description	Spare part number
8192 MB memory module (PC3-12800, 1600 MHz, DDR3)	670034-001
4096 MB memory module (PC3-12800, 1600 MHz, DDR3)	641369-001
2048 MB memory module (PC3-12800, 1600 MHz, DDR3)	652972-001


 **NOTE:** A memory module must be installed in the bottom primary memory module slot before a memory module is installed in the top primary memory module slot.

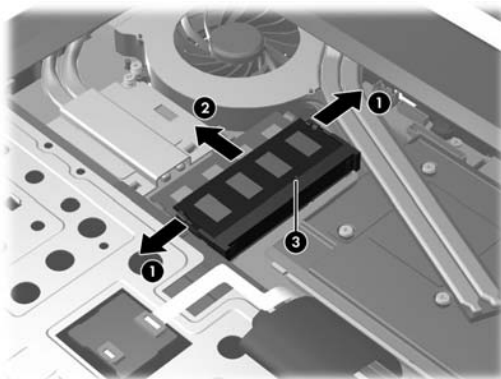
Before removing a primary memory module, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the hard drive (see [Primary hard drive on page 45](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).

Remove the primary memory module:

1. Spread the retaining 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 **(3)** to prevent incorrect installation into the primary memory module slots.



Reverse this procedure to install a primary memory module.

Expansion memory module



NOTE: Expansion memory slots are located in a compartment on the bottom of the computer.

A computer having a system board with spare part number 690034-001 or 688745-001 has two memory slots, which are called primary memory slots in this MSG. When you add or replace memory modules, slot 1 must be populated before slot 2 is populated.

A computer having a system board with spare part number 688746-001 or 690035-001 has four memory slots. On these computers, in both the expansion memory slots (on the bottom of the computer) and the primary memory slots (under the keyboard), slot 1 must be populated before slot 2 is populated.

Description	Spare part number
8192 MB memory module (PC3-12800, 1600 MHz, DDR3)	670034-001
4096 MB memory module (PC3-12800, 1600 MHz, DDR3)	641369-001
2048 MB memory module (PC3-12800, 1600 MHz, DDR3)	652972-001



NOTE: A memory module must be installed in the right expansion memory module slot before a memory module is installed in the left expansion memory module slot.


Before removing an expansion memory module, follow these steps:

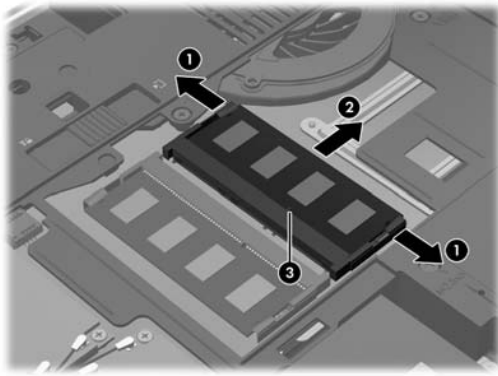
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

Remove an expansion memory module:

1. Spread the retaining 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 (3) to prevent incorrect installation into the expansion memory module slots.




Reverse this procedure to install an expansion memory module.

Keyboard

For use in:	Spare part number	For use in:	Spare part number
Keyboard with backlight (includes keyboard cable, pointing stick and pointing stick cable):			
Belgium	688738-A41	Norway	688738-091
Denmark	688738-081	Russia	688738-251
Finland and Sweden	688738-B71	France	688738-051
Germany	688738-041	South Korea	688738-AD1
Thailand	688738-281	Switzerland	688738-BG1
International	688738-B31	Taiwan	688738-AB1
The United States	688738-001	The United Kingdom and Singapore	688738-031
Italy	688738-061	Latin America	688738-161
India	688738-D61	Canada	688738-DB1
Czechoslovakia	688738FL1	701977-001	
Keyboard without backlight (includes keyboard cable, pointing stick and pointing stick cable):			
Belgium	688737-A41	Greece	688737-151
Brazil	688737-201	Norway	688737-091
Bulgaria	688737-261	Portugal	688737-131
Taiwan	688737-AB1	Russia	688737-251
Denmark	688737-081	Saudi Arabia	688737-171
Finland and Sweden	688737-B71	Slovenia	688737-BA1
France	688737-051	South Korea	688737-AD1
Latin America	688737-161	Spain	688737-071
Germany	688737-041	Switzerland	688737-BG1
Romania	688737-271	Northwest Africa	688737-FP1
Hungary	688737-211	Thailand	688737-281
Iceland	688737-DD1	Turkey	688737-141
International	688737-B31	The United Kingdom and Singapore	688737-031
Israel	688737-BB1	The United States	688737-001
Italy	688737-061	India	688737-D61
Japan	688737-291	Canada	688737-DB1
Czechoslovakia	688737-FL1		

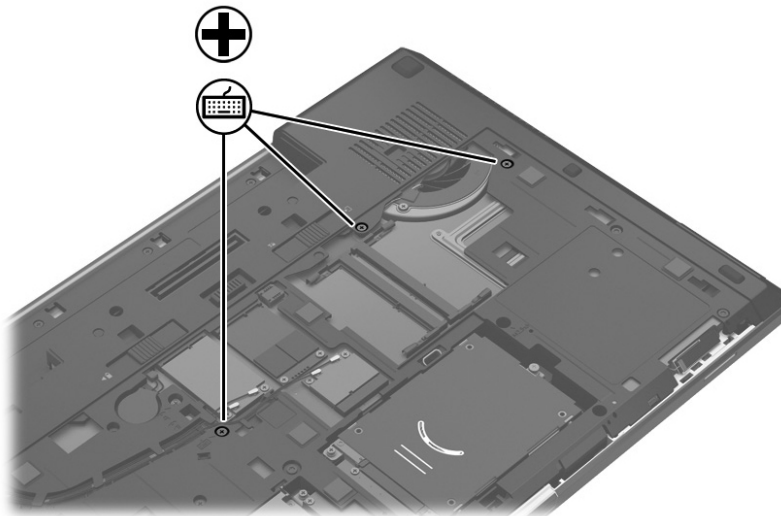
Before removing the keyboard, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).

 **NOTE:** The optical drive or hard drive carrier in the upgrade bay must be removed in order to remove the keyboard.


Remove the keyboard:

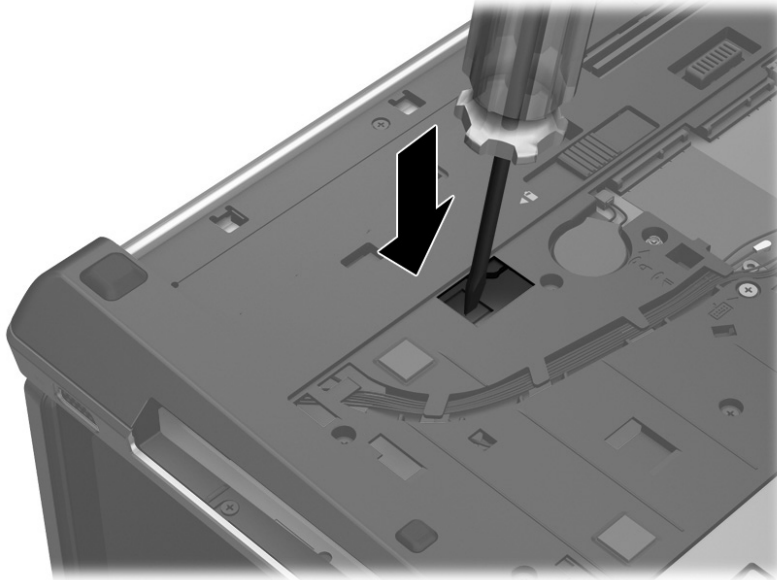
1. Position the computer with the front toward you.
2. Loosen the three Phillips captive screws that secure the keyboard to the computer.



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

4. Insert a small tool at an angle through the hole in the optical drive bay at an angle to push out the top edge of the keyboard. This gives you access to the back of the keyboard and releases the top edge of the keyboard.

 **NOTE:** Make sure that the optical drive or upgrade hard drive have been removed before performing this procedure.

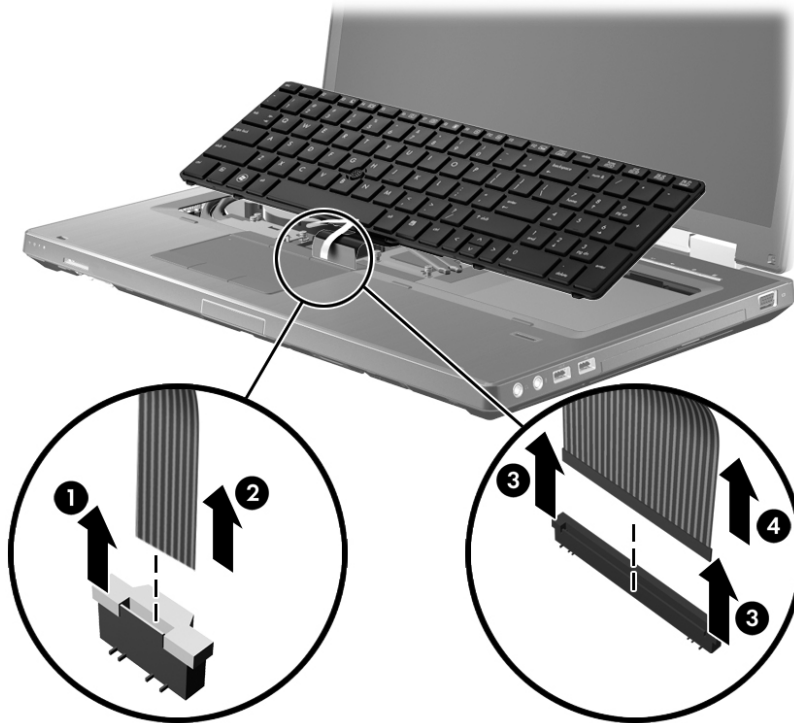


5. Turn the computer right-side up, with the front toward you.
6. Open the display as far as it will open.
7. Lift the top edge (1) of the keyboard until it rests at an angle.
8. Slide the keyboard back toward the display (2).




9. Release the keyboard ZIF connector (1) and lift the keyboard cable (2) to release it.

- Release the pointing stick ZIF connector (3) and lift the cable (4) to release it.




Reverse this procedure to install the keyboard.

Fan/graphics board heat sink assembly

 **NOTE:** The fan/graphics board heat sink assemblies include replacement thermal material.

Description	Spare part number
For use only with computer models equipped with AMD graphics subsystems	688733-001
For use only with computer models equipped with NVIDIA graphics subsystems	696435-001

 **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 board heat sink, follow these steps:

- 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.
- Disconnect all external devices connected to the computer.
- 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.
- Remove the battery (see [Battery on page 42](#)).

5. Remove the service access cover (see [Service access cover](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the display assembly (see [Display assembly on page 78](#)).


Remove the fan/graphics board heat sink assembly:

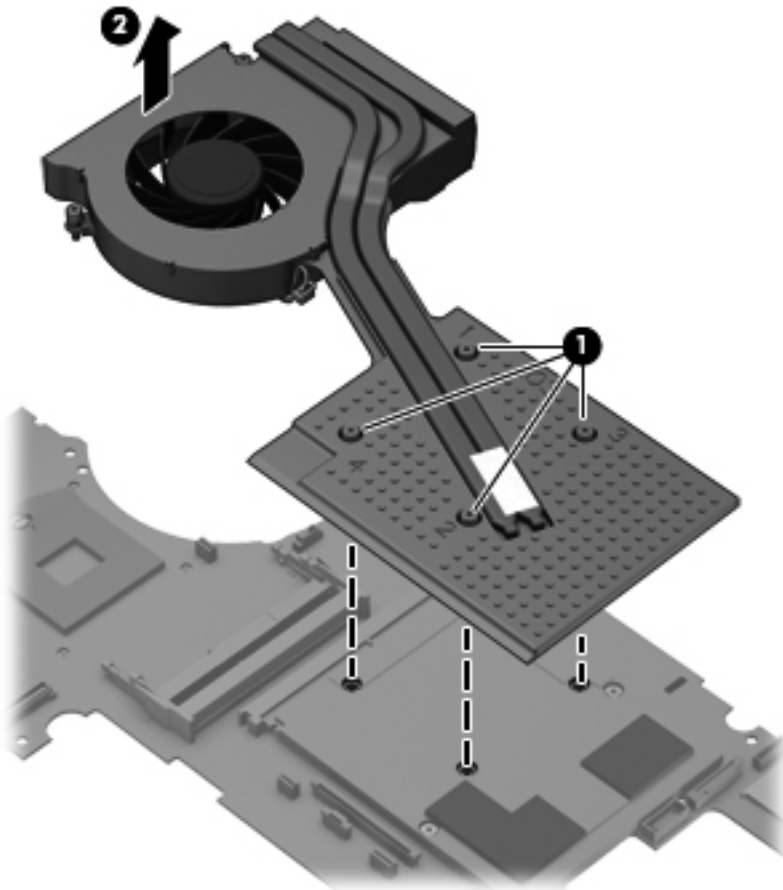



NOTE: Before proceeding, make sure you disconnect the power button board cable and the RJ-45 cable.

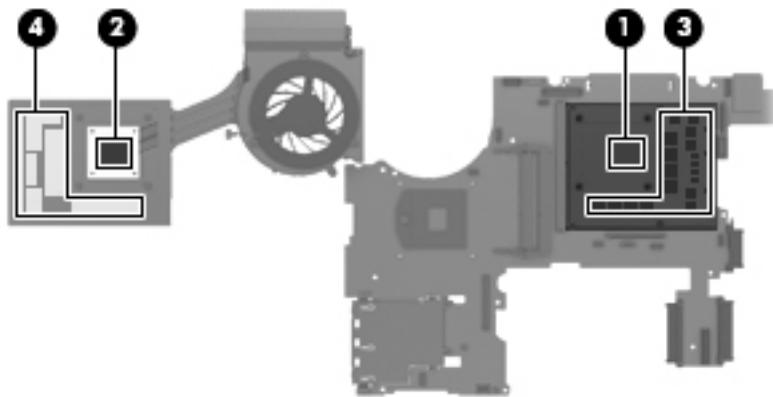
1. Following the sequence stamped into the graphics board heat sink, loosen the 4 Phillips captive screws **(1)** that secure the graphics board heat sink/fan assembly to the system board.

2. Lift the heat sink/fan assembly (2) straight up to remove it.

 **NOTE:** Due to the adhesive quality of the thermal material located between the fan/graphics board heat sink assembly and graphics board components, it may be necessary to move the graphics board heat sink from side to side to detach it from the system board.



 **NOTE:** The thermal material must be thoroughly cleaned from the surfaces of the graphics board heat sink and the graphics board each time the graphics board heat sink is removed: Thermal paste is used on the largest component (1) on the graphics board and the graphics board heat sink section (2) that services it.



Reverse this procedure to install the fan/graphics board heat sink assembly.

Display bezel

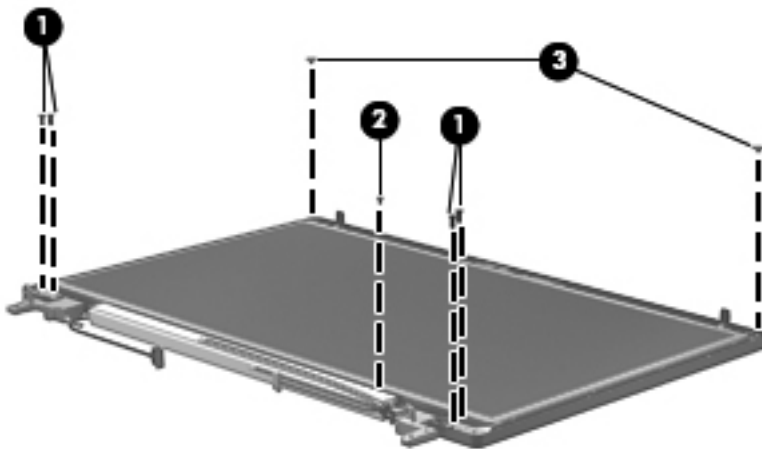
Description	Spare part number
Display bezel for use with computer models without a webcam	688763-001

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 display assembly (see [Display assembly on page 78](#)).

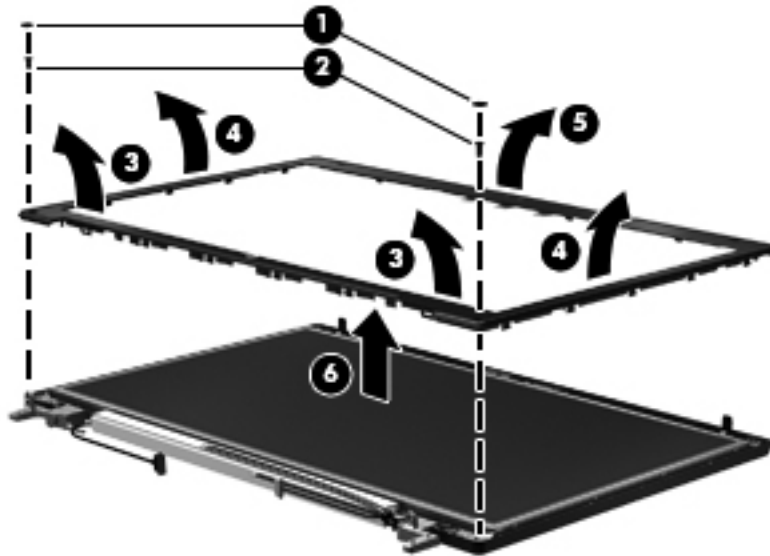
Remove the display bezel:

1. Remove the screw covers (1), the captive screw (2), and the two screws (3) that secure the display bezel to the display enclosure.



2. Remove the screw covers securing the bezel to the display panel (1), and then remove the screws (2).

3. Flex the inside edges of the top edge (3), the left and right sides (4), and the bottom edge (5) of the display bezel until the bezel disengages from the display enclosure and then remove the bezel.



Reverse this procedure to install the display bezel.

Display panel

Description	Spare part number
43.9 cm (17.3 in), HD+ AG LED WVA	691223-001
43.9 cm (17.3 in), FHD AG WVA	691224-001

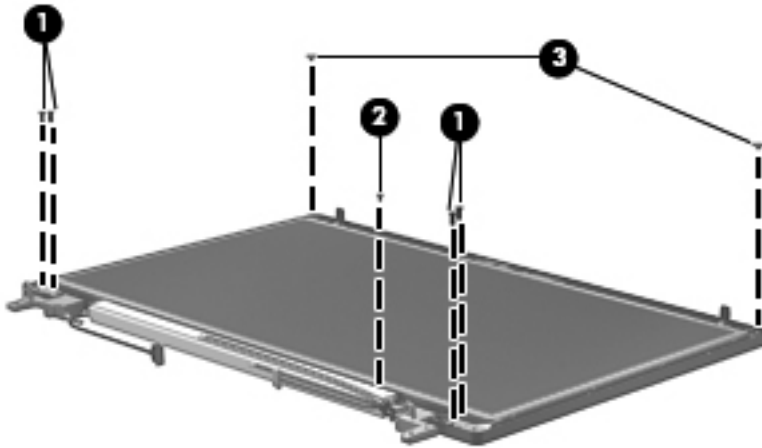
Before removing the display panel, follow these steps:

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 display assembly (see [Display assembly on page 78](#)).
5. Remove the display bezel (see [Display bezel on page 68](#)).


Remove the display panel:

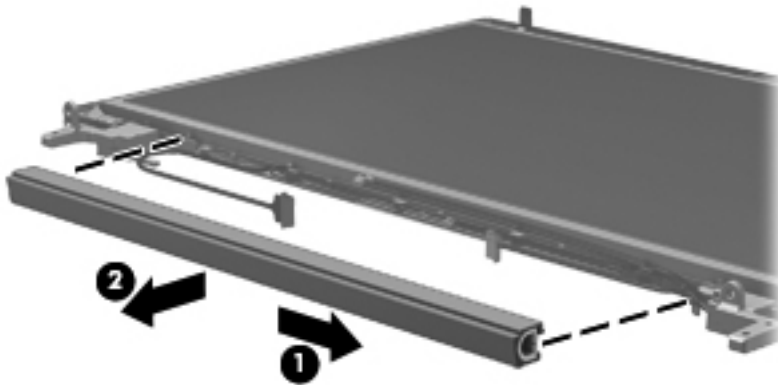
1. Remove the 2 Torx screws on each hinge (1).
2. Remove the two Phillips rawhead screws (2) on the upper left and right corners of the display panel.

3. Remove the 1 Phillips screws (3) that secure the display panel brackets to the hinge pipe.

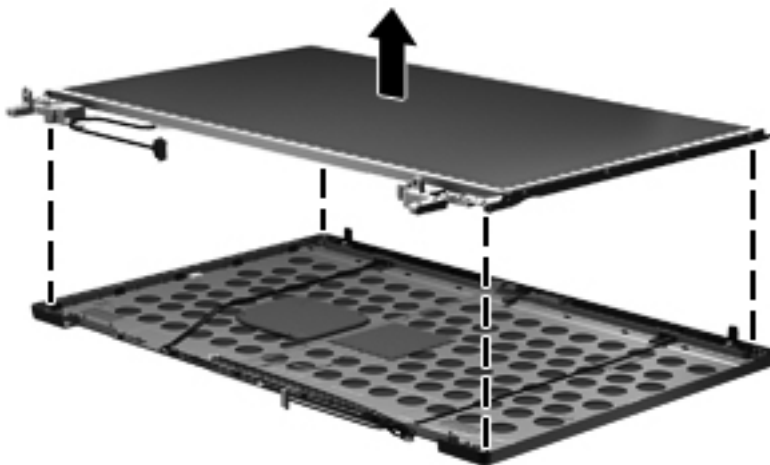


4. Slide the hinge pipe to the right (1) and remove the hinge pipe (2).

 **NOTE:** Make sure you pull back the antenna cables when removing the hinge pipe.



5. Remove the display panel.



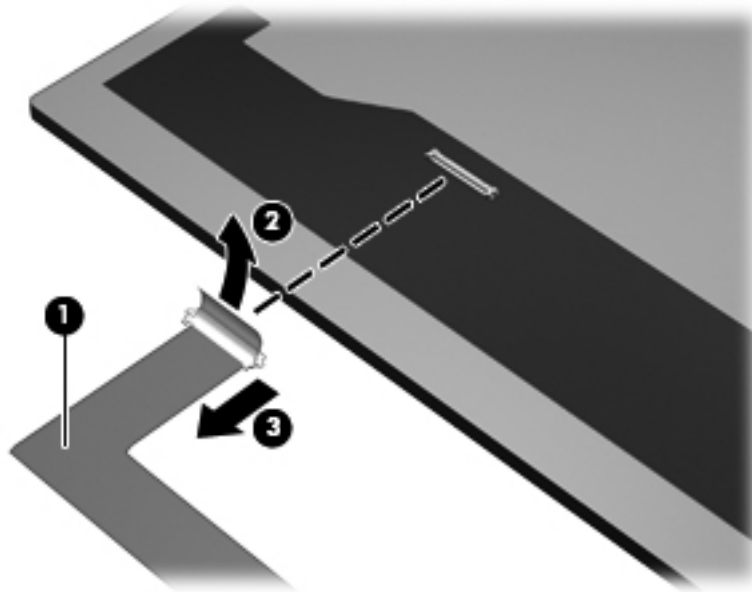
Reverse this procedure to reassemble and to install the display panel.

Display panel cable

Description	Spare part number
Display panel cable (select models only)	688761-001

To remove the display panel cable:

- ▲ Release the adhesive tape that secures the display panel cable to the display panel **(1)**. Disconnect the cable **(2)**, and then remove the cable **(3)**.

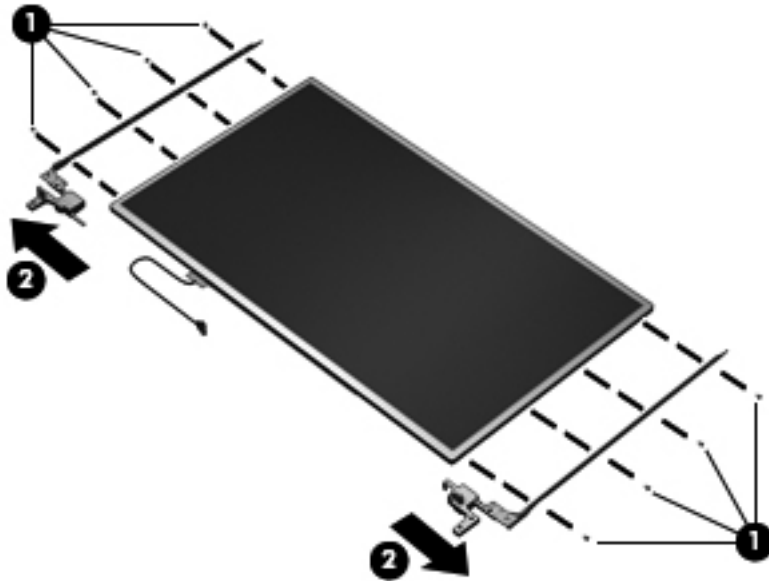


Hinge brackets

Description	Spare part number
Display hinge brackets kit (consists of the hinge piece and the vertical support brackets for the left and right sides)	652528-001

To remove the display panel hinge brackets:

- ▲ Remove the 4 screws that secure each hinge assembly to the panel (1), and then remove the hinge brackets (2).



Webcam module

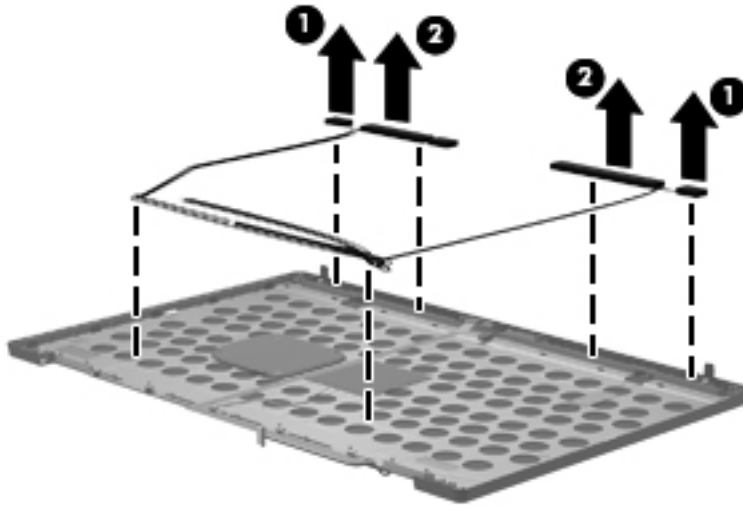
Description	Spare part number
Webcam module with microphone	688752-001

Before removing the webcam module, follow these steps:

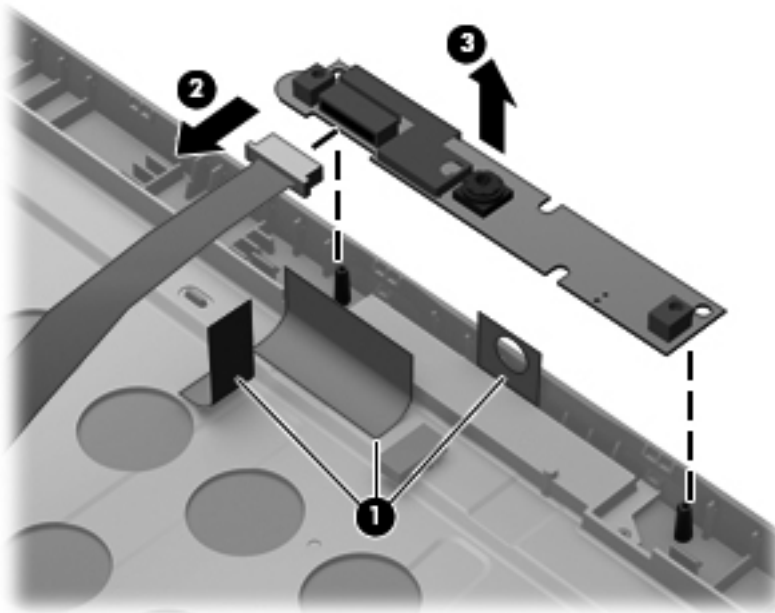
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the display assembly (see [Display assembly on page 78](#)).
5. Remove the display panel (see [Display panel on page 69](#)).

Remove the webcam module:

1. Lift the WLAN antenna cables (1), and then remove the WWAN antenna cables (2).



2. Remove the webcam cable (1) from the hinges and then disconnect the webcam cable from the display enclosure (2).
3. Remove the webcam module from the display enclosure (3).



Reverse this procedure to install the webcam module.

Top cover

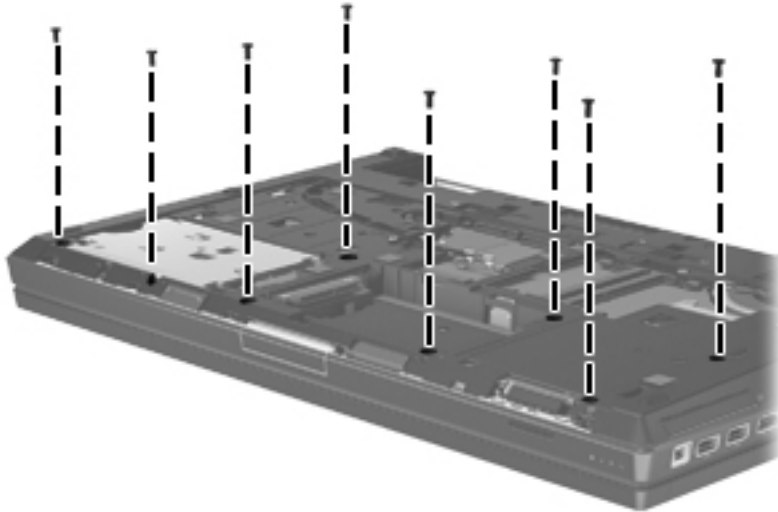
Description	Spare part number
Top cover (includes TouchPad)	688747-001

Before removing the top cover, follow these steps:

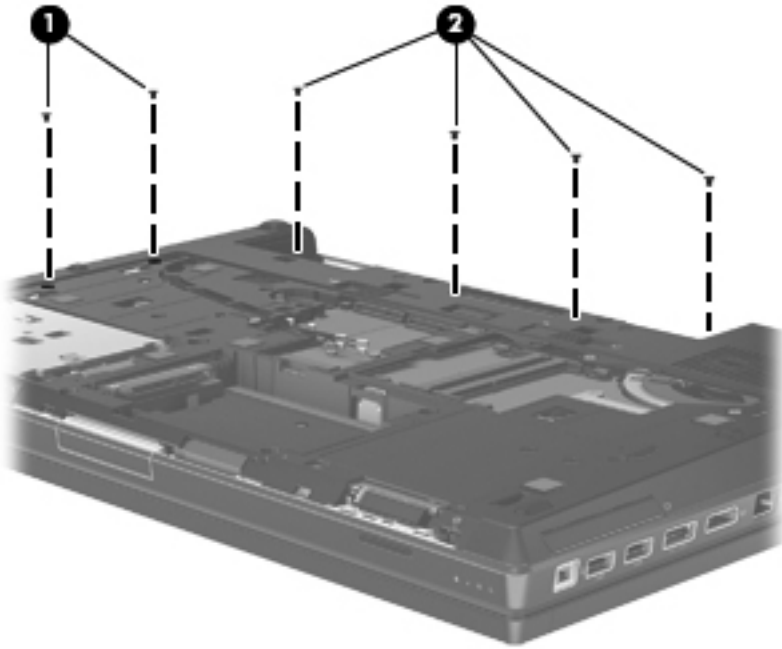
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).

Remove the top cover:

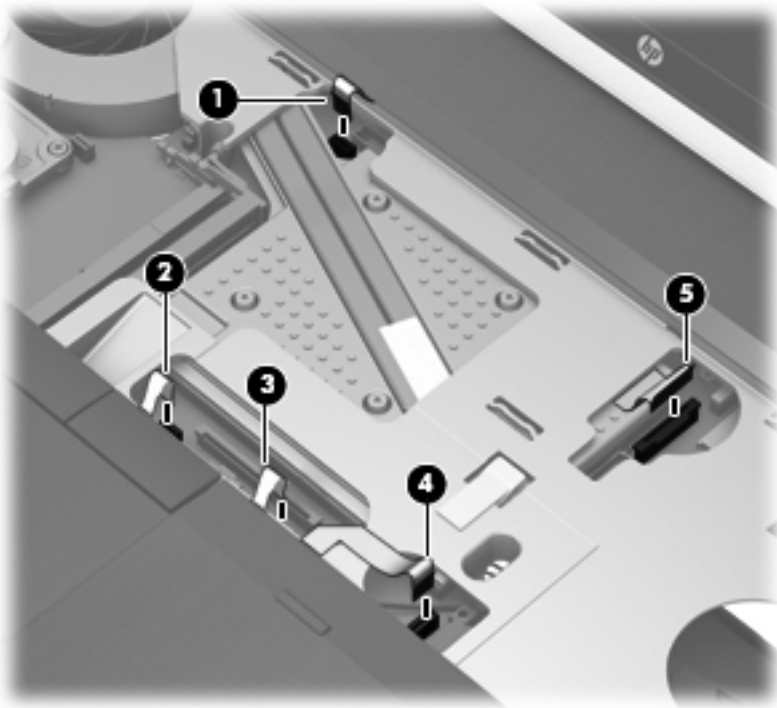
1. Position the computer right-side up, with the front toward you.
2. Remove the 8 Torx M2.5x6.0 screws that secure the base enclosure to the top cover.



3. Remove the two Phillips M2.5x3 screws in the optical drive/upgrade drive bay (1) and the four Phillips M2.5x3.0 screws inside the battery bay (2).



4. Disconnect the power button board cable (1). Disconnect the TouchPad cable on the left (2) and the right sides (3).
5. Disconnect the fingerprint reader cable (4) and then disconnect the application board cable (5).

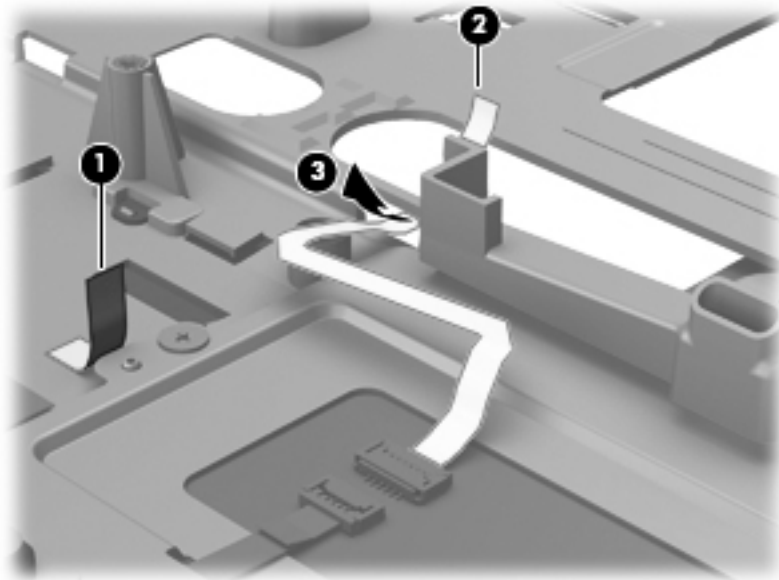


6. Position the computer right-side up.

7. Grasp the top cover by the hole in the optical disk drive/upgrade drive bay and lift up the front edge of the top cover (1).
8. Remove the top cover from the base enclosure (2).

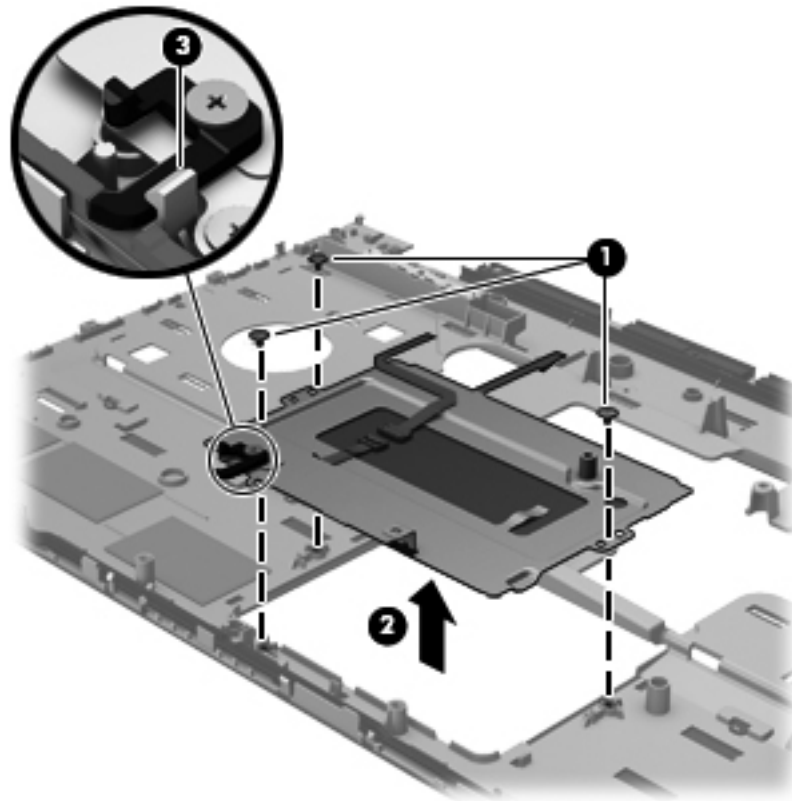


9. If it is necessary to replace the TouchPad:
 - a. Lift the adhesive tape (1), lift and release the TouchPad cable from the opening in top cover (2), and then release the TouchPad cable (3).




- b. Remove the three screws (1) securing the TouchPad to the top cover.
 - c. Release the TouchPad from the front clip (2) securing the TouchPad to the top cover.

- d. Release the TouchPad from the front right side clip (3) and then remove the TouchPad from the top cover.



Reverse this procedure to install the top cover and TouchPad.

 **NOTE:** In reversing this procedure, make sure that the display latch assembly actuator lines up correctly with the top cover to avoid damaging any components.

Display assembly

Description	Spare part number
Display panel, 43.9 cm (17.3 in), High Definition Plus (HD+) Anti-Glare (AG) LED WVA without webcam	691223-001
Display panel, 43.9 cm (17.3 in), FHD AG LED WVA	691224-001
43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color with webcam (not available with HP Mobile Broadband)	688736-001
43.9 cm (17.3 in), FHD AG RGB LED UVVA Dream Color without webcam (not available with HP Mobile Broadband)	688735-001
Display Hinge Kit	652528-001
Display hinge covers	652529-001

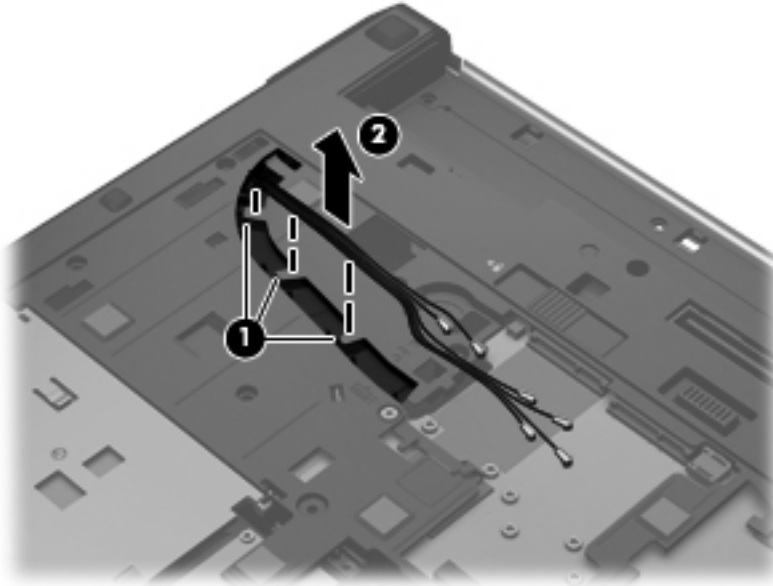
Before removing the display assembly, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).

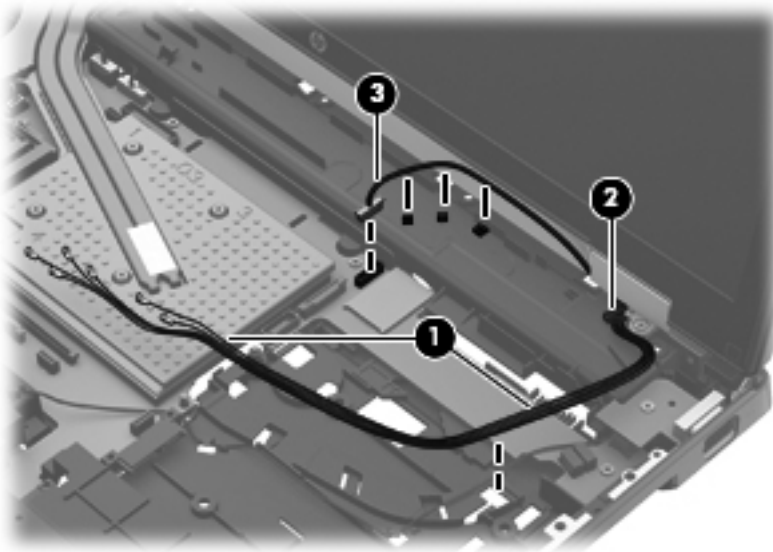
Remove the display assembly:

1. Position the computer upside down.

2. Remove the tape (1) that secures the WLAN and WWAN cables to the system board. (2).




3. Turn the computer right side up, facing you. Feed the WLAN and WWAN cables through the hole next to the keyboard screw (1), and then lift the cable free of the routing areas (2). Disconnect the webcam cable (3).

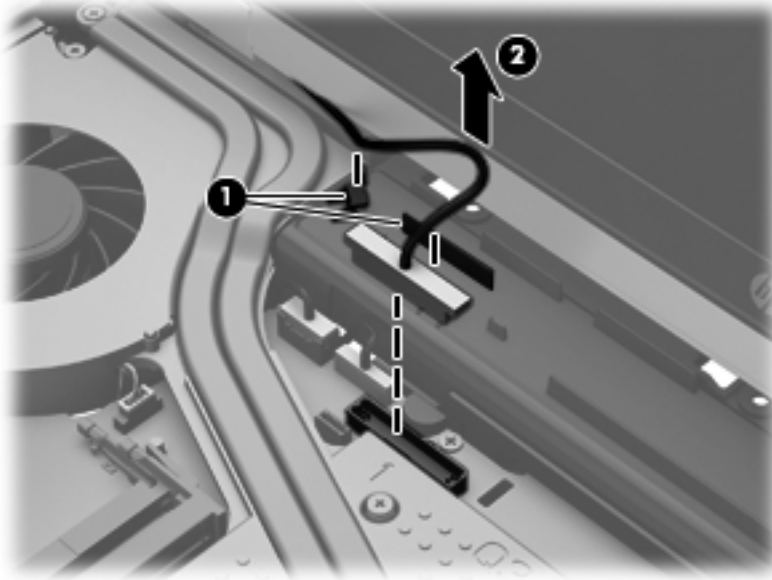


4. Position the computer with the rear towards you.

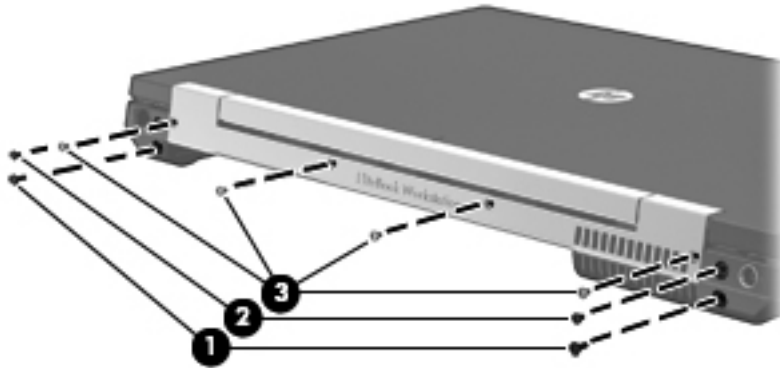
⚠ CAUTION: Support the display assembly when removing the display screws in the following steps. Failure to support the display assembly can result in damage to the assembly and other components.

5. Disconnect the display panel cable (1), and then remove the cable (2).

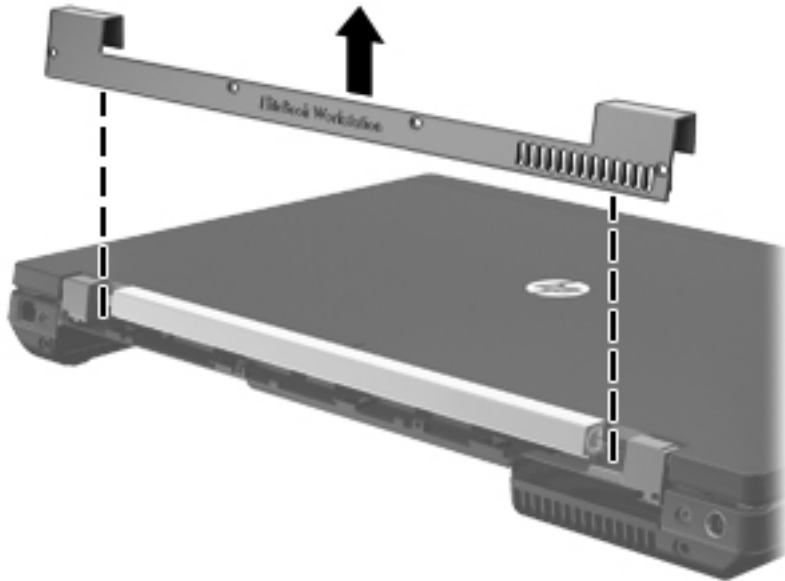
 **NOTE:** Make sure all cables are freed from the clips in the routing channel.



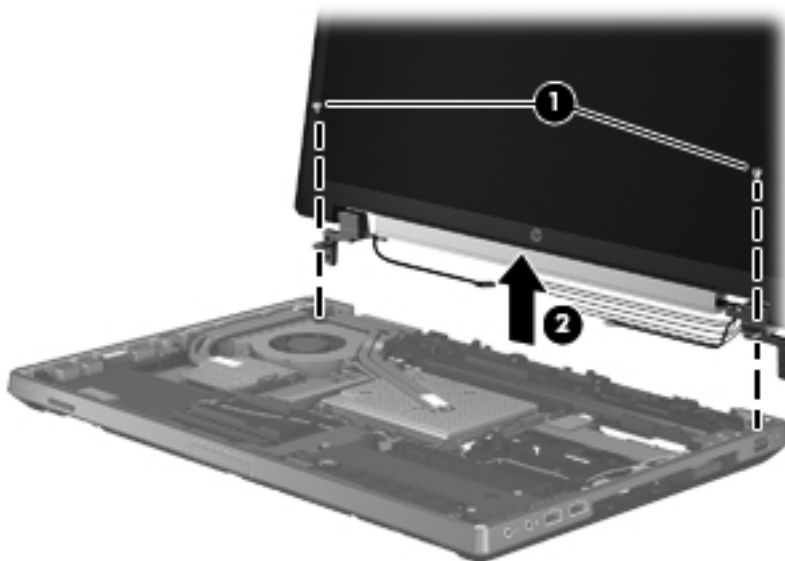
6. Turn the unit around, and then remove the Torx M2.5x7.0 screws (1) that secure the display hinges to the base enclosure. Next, remove the Torx M2.5x3.0 screws (2) that secure the hinge cover to the base enclosure. Remove the four 8 millimeter Torx screws (3) that secure the hinge cover to the base enclosure.



7. Position the computer with the rear toward you. Lift the rear hinges and remove.



8. Remove the two 6 millimeter Torx screws securing the display panel to the base enclosure (1), and then remove the display panel (2).



Reverse this procedure to reassemble and to install the display assembly.

Power button board

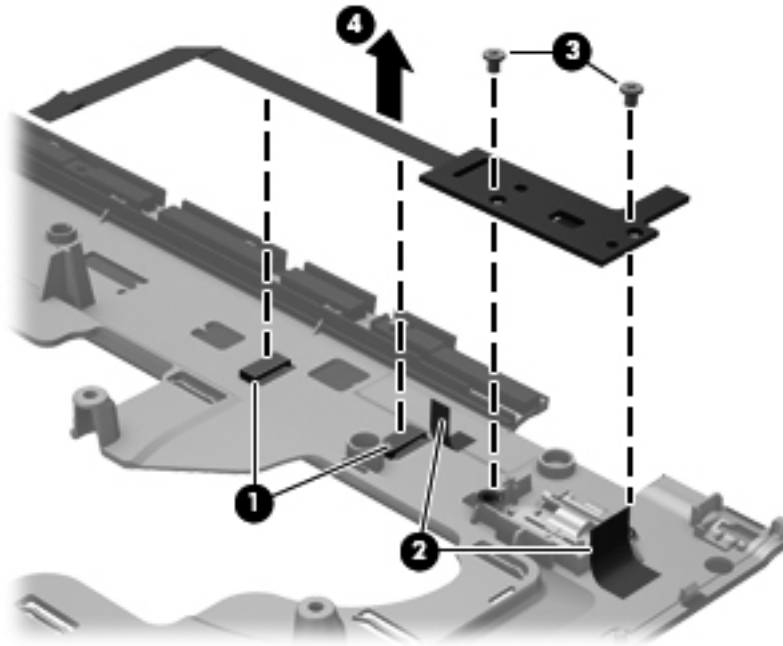
Description	Spare part number
Power button board	688749-001

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 42](#))
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).

Remove the power button board:

1. Position the top cover upside down with the front toward you.
2. Slide the power button board cable out from the clips in the top cover **(1)**.
3. Remove the conductive tape **(2)** that secures the power button board cable to the top cover.
4. Remove the two Phillips M2.5x3.0 screws **(3)** that secure the power button board to the top cover, and then remove the power button board **(4)**.



Reverse this procedure to install the power button board.

Application button board

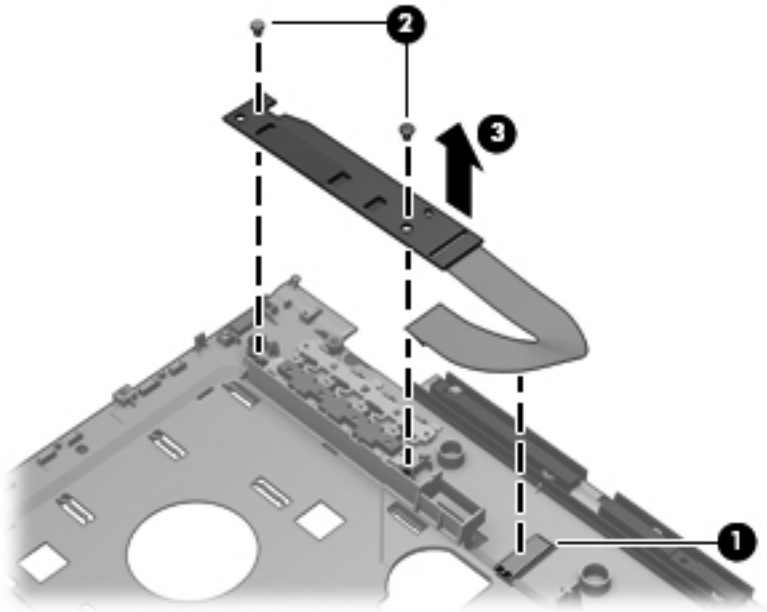
Description	Spare part number
Application button board	696901-001

Before removing the application 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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).

Remove the application button board:

1. Position the top cover upside down with the front toward you.
2. Slide the application button board cable (1) out from the clip in the top cover.
3. Remove the two Phillips M2.5x3.0 screws (2) that secure the application button board to the top cover.
4. Remove the application button board (3).



Reverse this procedure to install the application button board.

Fingerprint reader

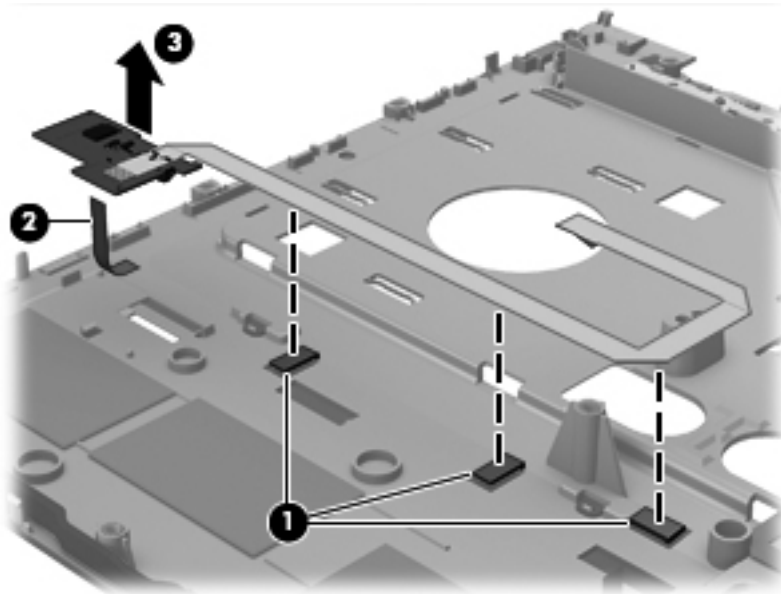
Description	Spare part number
Fingerprint reader	688743-001

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 42](#))
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).

Remove the fingerprint reader:

1. Position the top cover upside down with the front toward you.
2. Slide the fingerprint reader cable (1) out from the 3 clips in the top cover and remove it.
3. Peel off the tape (2) that secures the fingerprint reader to the top cover.
4. Lift the fingerprint reader (3) from the top cover.



Reverse this procedure to install the fingerprint reader.

Audio/USB 2.0 board

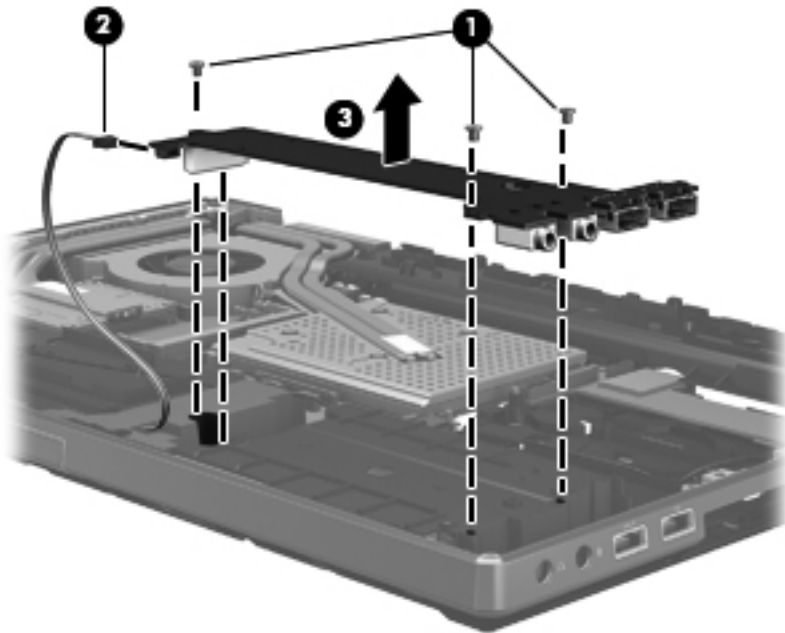
Description	Spare part number
Audio/USB 2.0 board	689284-001

Before removing the Audio/USB 2.0 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 42](#)),
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).

Remove the audio/USB 2.0 board:

1. Position the computer right-side up with the front toward you.
2. Remove the three Phillips M2.5x3.0 screws (1) that secure the audio/USB 2.0 board to the base enclosure.
3. Disconnect the speaker cable (2) from the Audio/USB 2.0 board.
4. Lift the left edge of the audio/USB 2.0 board to disconnect it from the system board and remove the audio/USB 2.0 board (3) at an angle to the left from the base enclosure



Reverse this procedure to install the audio/USB 2.0 board.

Speaker assembly

Description	Spare part number
Speaker assembly	652540-001

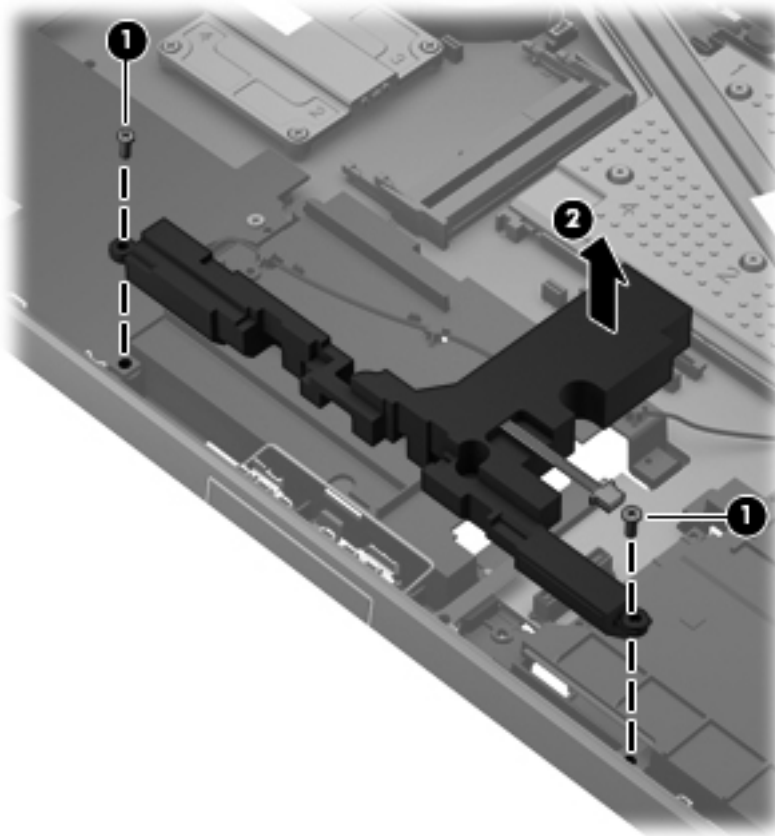
Before removing the speaker assembly, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the Smart Card reader (see [Smart Card reader on page 49](#)).
10. Remove the Audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).

Remove the speaker assembly:


1. Remove the two Phillips M2.5x6.0 screws **(1)** that secure the speaker assembly to the base enclosure.

2. Gently flex the band on the base enclosure next to the speaker assembly, and remove the speaker assembly (2).



Reverse this procedure to install the speaker assembly.

Modem module

 **NOTE:** The modem module spare part kit does not include a modem module cable. The modem module cable is included in the Cable Kit, spare part number 652545-001. See [Modem module cable on page 90](#) for information on replacing the modem module cable.

Description	Spare part number
56K V.92 1 data/fax modem	628824-001

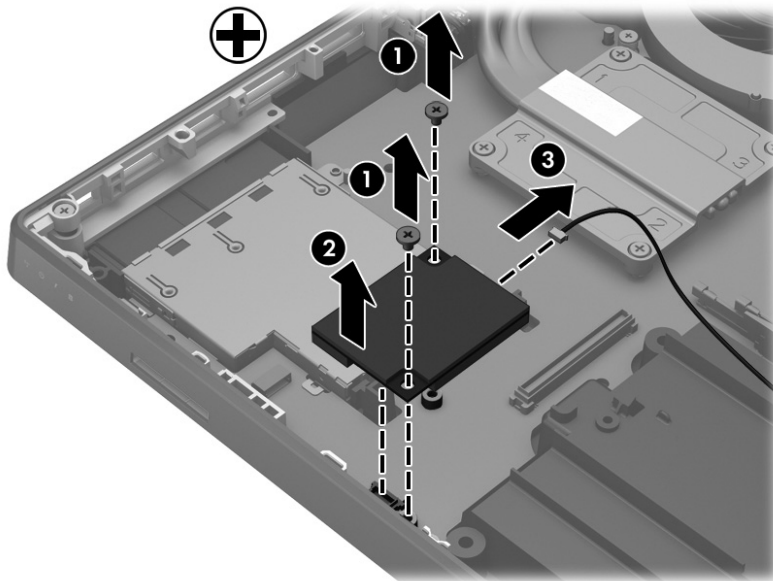
Before removing the modem module, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).

6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the Smart Card reader (see [Smart Card reader on page 49](#)).
10. Remove the Audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).

Remove the modem module:

1. Position the computer right-side up with the front toward you.
2. Remove the two Phillips M2.0x3.0 screws (1) that secure the modem to the system board.
3. Lift the modem upwards (2).
4. Disconnect the modem cable (3) from the modem.



Reverse this procedure to install the modem module.

Display (VGA) port

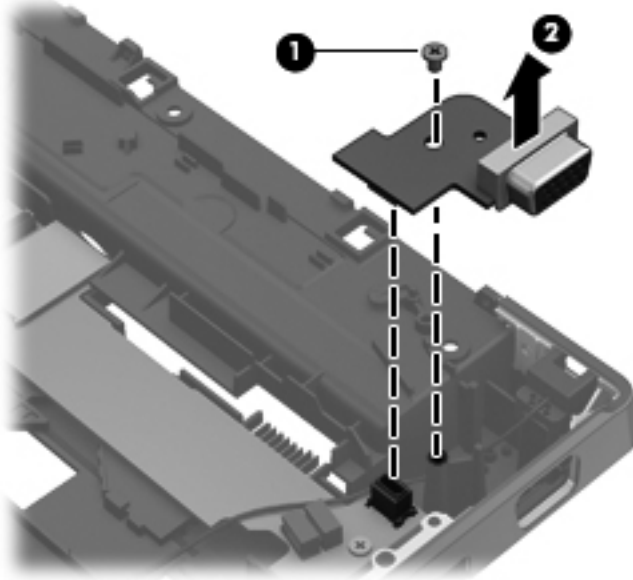
Before removing the modem module cable, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).


7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the Smart Card reader (see [Smart Card reader on page 49](#)).
10. Remove the Audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).

Remove the VGA port:

- ▲ Remove the Phillips screw **(1)** that secures the display (VGA) port to the base enclosure. Lift the port **(2)** up at an angle to remove it.



Modem module cable

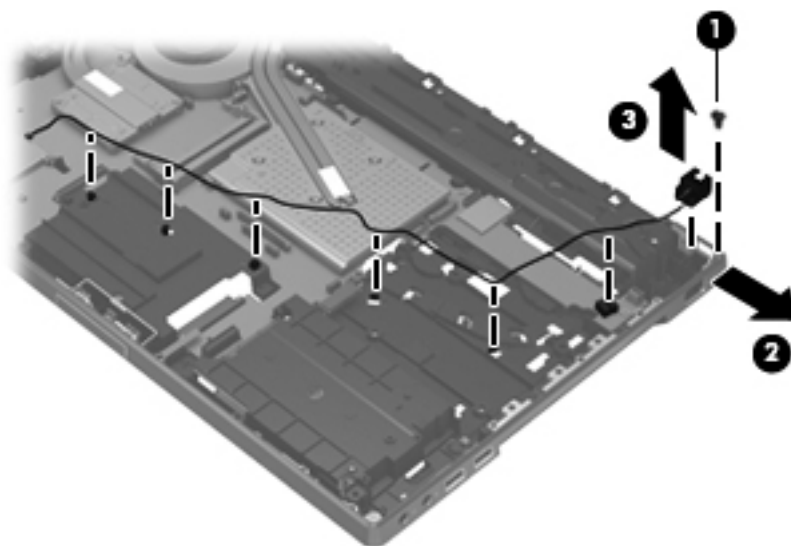
 **NOTE:** The modem module cable is included in the Cable Kit, spare part number 652545-001.

Before removing the modem module 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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the Smart Card reader (see [Smart Card reader on page 49](#)).
10. Remove the Audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).
11. Remove the modem module (see [Modem module on page 87](#)).

Remove the modem module cable:

1. Position the computer right side-up with the front toward you.
2. Remove the modem cable from the routing clips in the base enclosure.
3. Loosen the Torx M2.0x3.0 screw from the side black trim piece (1).
4. Gently pry the modem module cable out from the base enclosure (2), and then remove cable (3).



Reverse this procedure to install the modem module cable.

Card reader/USB 3.0 board

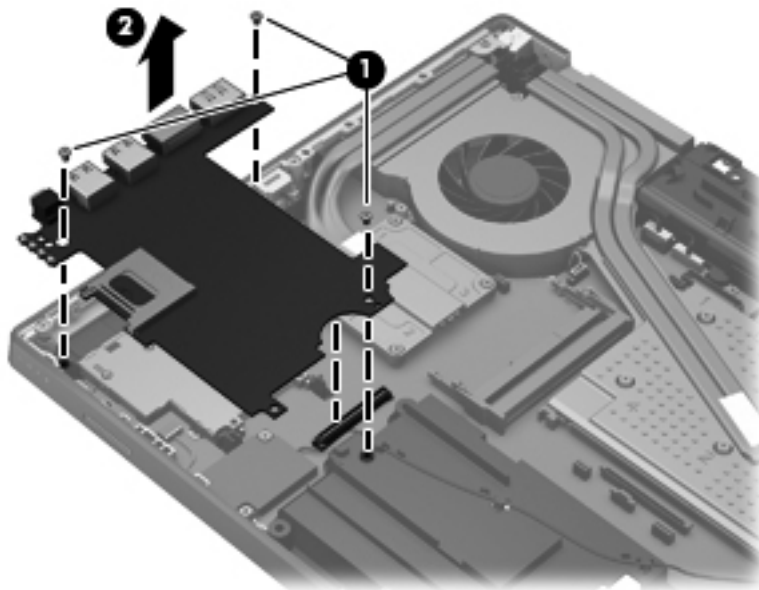
Description	Spare part number
Card reader/USB 3.0 board	689283-001

Before removing the card reader/USB 3.0 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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).


Remove the card reader/USB 3.0 board:

1. Position the computer right-side up with the front toward you.
2. Remove any plastic blanks in the card reader slots.
3. Remove the 3 Phillips M2.5x3.0 screws (1) that secure the card reader/USB 3.0 board to the base enclosure.
4. Lift the left side (2) of the card reader/USB 3.0 board to disconnect it from the system board.



Reverse this procedure to install the card reader/USB 3.0 board.

Bluetooth module cable

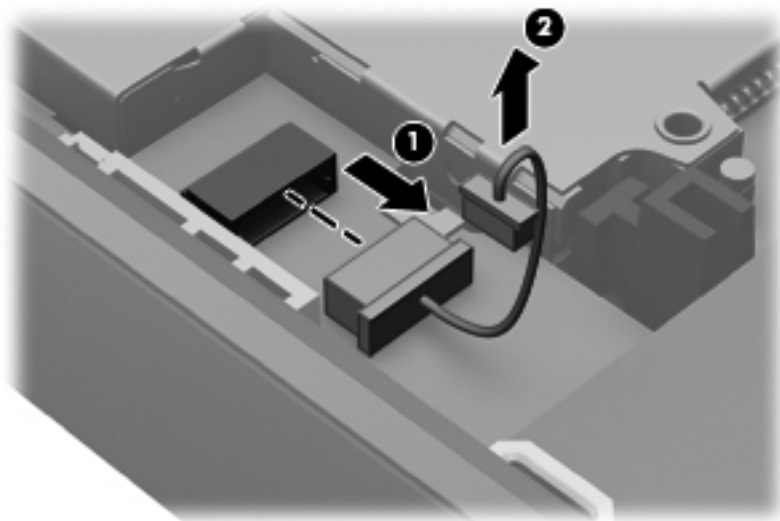
 **NOTE:** The Bluetooth module cable is included in the Cable Kit, spare part number 652545-001.

Before removing the Bluetooth module 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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the bluetooth module (see [Bluetooth module on page 50](#)).
10. Remove the card reader/USB 3.0 board (see [Card reader/USB 3.0 board on page 91](#)).


Remove the Bluetooth module cable:

1. Position the computer right-side up with the front toward you.
2. Disconnect the Bluetooth cable (1) from the system board.
3. Remove the Bluetooth cable (2).



Reverse this procedure to install the Bluetooth module cable.

System board

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



NOTE: Models that support quad-core processors have four memory slots. Models that support dual-core processors have two memory slots.

Description	Spare part number
For use in all countries and regions except the People's Republic of China:	
<ul style="list-style-type: none">For use with computer models equipped with Intel quad-core processors	688746-001
<ul style="list-style-type: none">For use with computer models equipped with Intel dual-core processors	688745-001
For use only in the People's Republic of China:	
<ul style="list-style-type: none">For use with computer models equipped with Intel quad-core processors	690035-001
<ul style="list-style-type: none">For use with computer models equipped with Intel dual-core processors	690034-001

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the display assembly (see [Display assembly on page 78](#)).
10. Remove the fan/graphics board heat sink (see [Fan/graphics board heat sink assembly on page 65](#)).
11. Remove the processor heat sink (see [Processor heat sink on page 99](#)).
12. Remove the audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).
13. Remove the speaker assembly (see [Speaker assembly on page 86](#)).
14. Remove the Card reader/USB 3.0 board (see [Card reader/USB 3.0 board on page 91](#)).

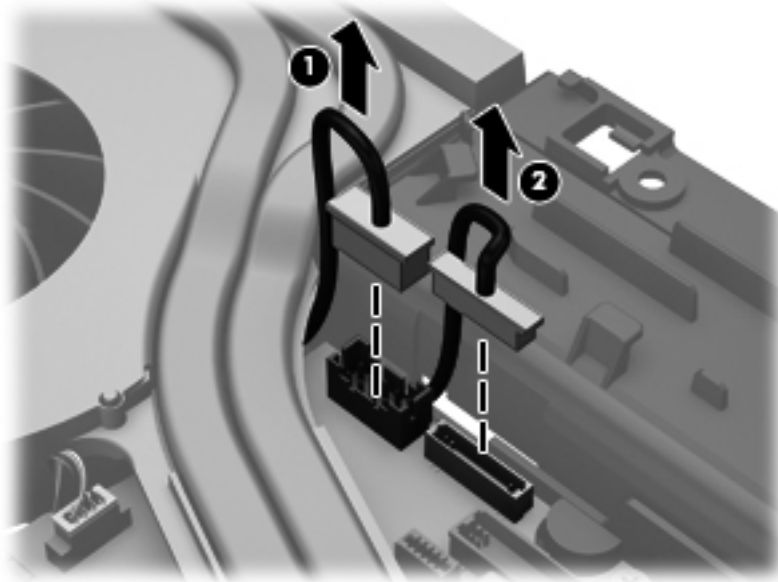
When replacing the system board, be sure that the following additional components are removed from the defective system board and installed on the replacement system board:

- SIM (see [SIM on page 43](#))
- Bluetooth module and cable (see [Bluetooth module on page 50](#) and [Bluetooth module cable on page 92](#))
- WLAN module (see [WLAN module on page 51](#))
- WWAN module (see [WWAN module on page 53](#))
- RTC battery (see [RTC battery on page 54](#))

- Primary memory modules (see [Primary memory module on page 58](#))
- Expansion memory modules (see [Expansion memory module on page 60](#))
- Graphics board (see [Graphics board on page 104](#))
- Processor heat sink (see [Processor heat sink on page 99](#))
- Processor (see [Processor on page 101](#))
- Modem module (see [Modem module on page 87](#))

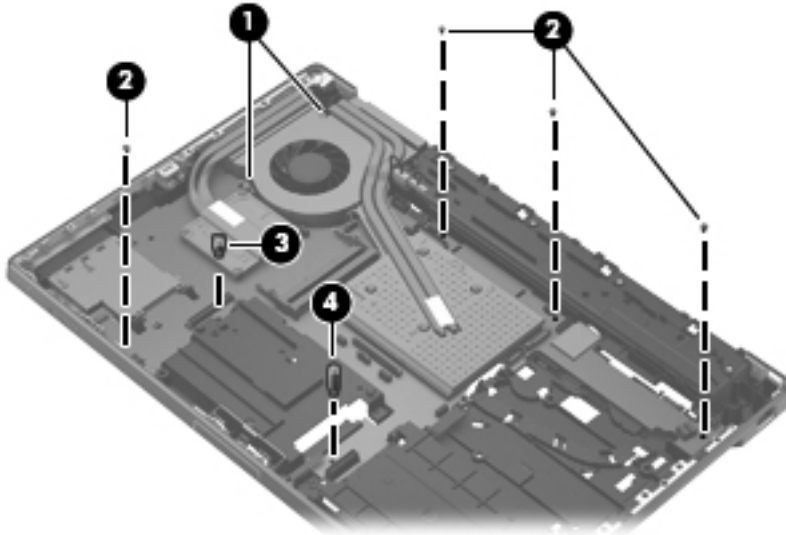
Remove the system board:

1. Disconnect the power connector cable **(1)** from the system board.
2. Disconnect the network cable **(2)** from the system board.

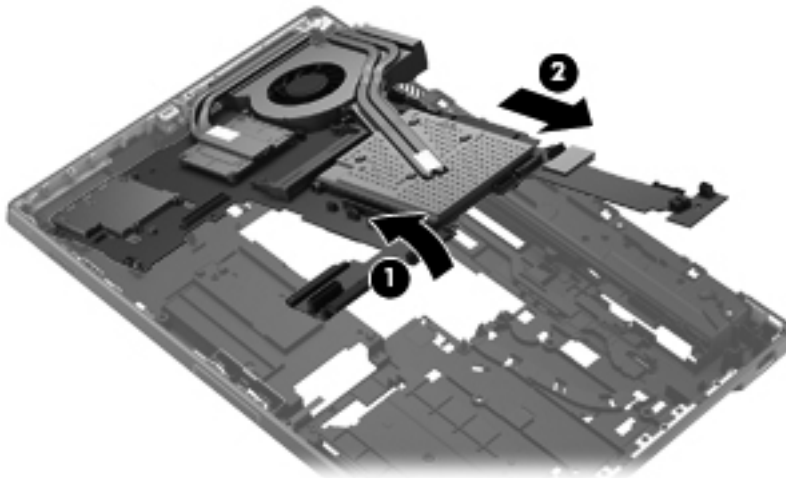


3. Remove the 2 captive screws securing the fan **(1)**.

4. Remove the 4 Phillips M2.5x3.0 screws (marked with a triangle icon) that secure the system board to the base enclosure (2), and then remove the short stand off screw (3) and the tall stand off screw (4).




5. Lift up on the right side of the system board (1), and then remove the system board (2) by sliding it out.



Reverse this procedure to install the system board.

Network cable and jack

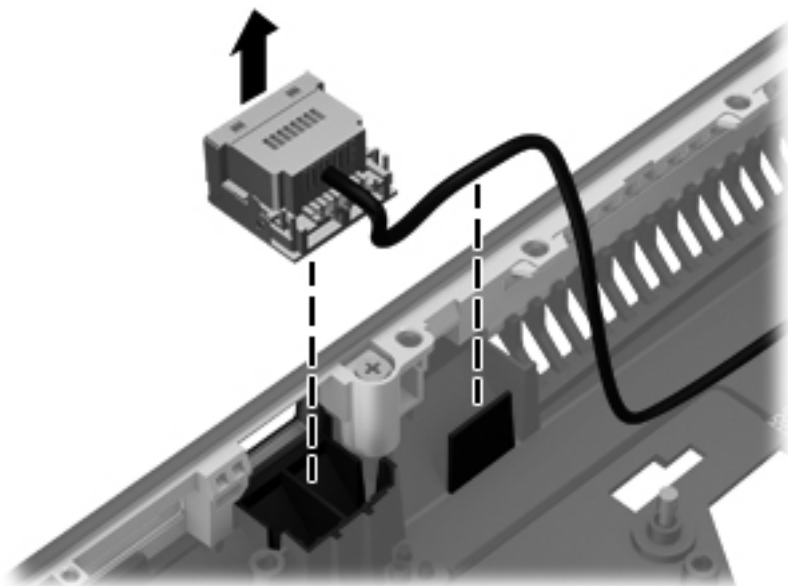
 **NOTE:** The network cable is included in the Cable Kit, spare part number 652545-001.

Before removing the network 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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the display assembly (see [Display assembly on page 78](#)).
10. Remove the fan/graphics board heat sink (see [Fan/graphics board heat sink assembly on page 65](#)).
11. Remove the processor heat sink (see [Processor heat sink on page 99](#)).

Remove the network cable:

- ▲ Remove the network cable from the sideband on the base enclosure.



Reverse this procedure to install the network cable.

Power connector cable

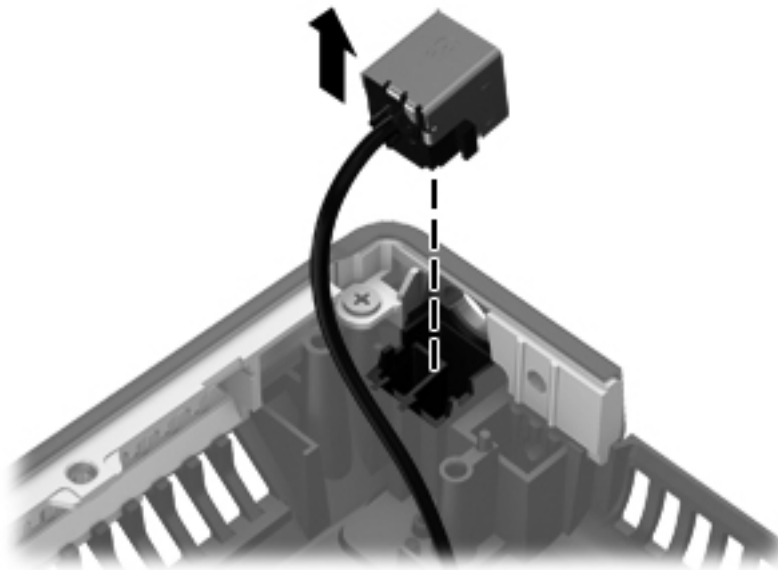
The power connector cable is included in the Cable Kit, spare part number 652545-001.

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the display assembly (see [Display assembly on page 78](#)).
10. Remove the fan/graphics board heat sink (see [Fan/graphics board heat sink assembly on page 65](#)).
11. Remove the processor heat sink (see [Processor heat sink on page 99](#)).

Remove the power connector cable:

- ▲ Remove the power connector cable jack from the base enclosure.



Reverse this procedure to install the Power connector cable.

Security lock

The security lock is included with the base enclosure assembly, spare part number 652535-001.

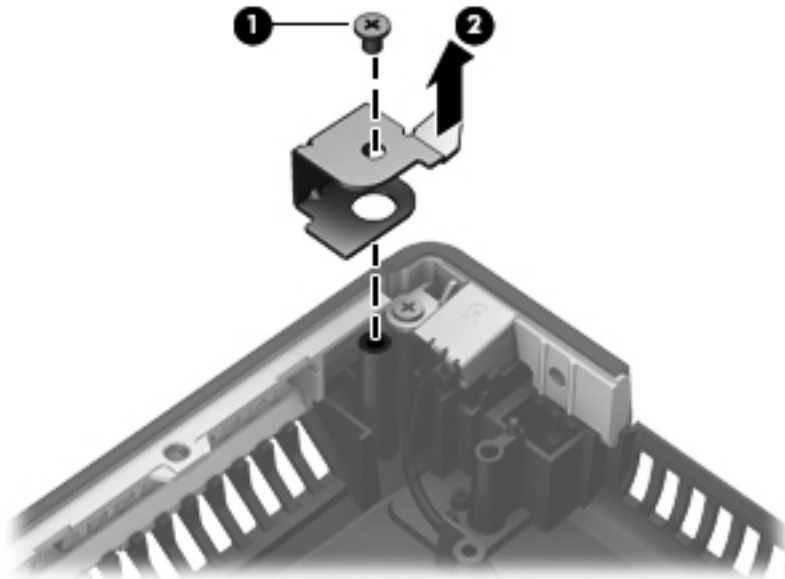
Before removing the security lock, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the display assembly (see [Display assembly on page 78](#)).
10. Remove the fan/graphics board heat sink (see [Fan/graphics board heat sink assembly on page 65](#)).
11. Remove the processor heat sink (see [Processor heat sink on page 99](#)).
12. Remove the audio/USB 2.0 board (see [Audio/USB 2.0 board on page 84](#)).
13. Remove the speaker assembly (see [Speaker assembly on page 86](#)).
14. Remove the Card reader/USB 3.0 board (see [Card reader/USB 3.0 board on page 91](#)).
15. Remove the system board (see [System board on page 92](#)).

Remove the security lock:

1. Position the computer right-side up with the front toward you.
2. Remove the Torx T9M2.5×6.0 screw **(1)** that secures the security lock to the base enclosure.

3. Rotate the security lock away from the base enclosure and remove the security lock from the base enclosure (2).



Reverse this procedure to install the security lock.

Processor heat sink


Description	Spare part number
For use only with computer models equipped with quad-core processors	653629-001
For use only with computer models equipped with dual-core processors	652542-001

Before removing the processor heat sink, follow these steps:

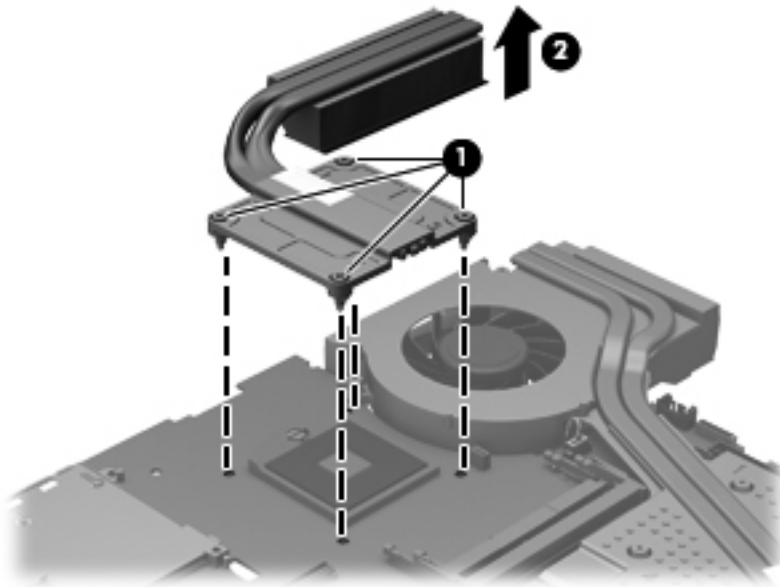
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#))
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the fan/graphics board heat sink assembly (see [Fan/graphics board heat sink assembly on page 65](#)).


Remove the processor heat sink:

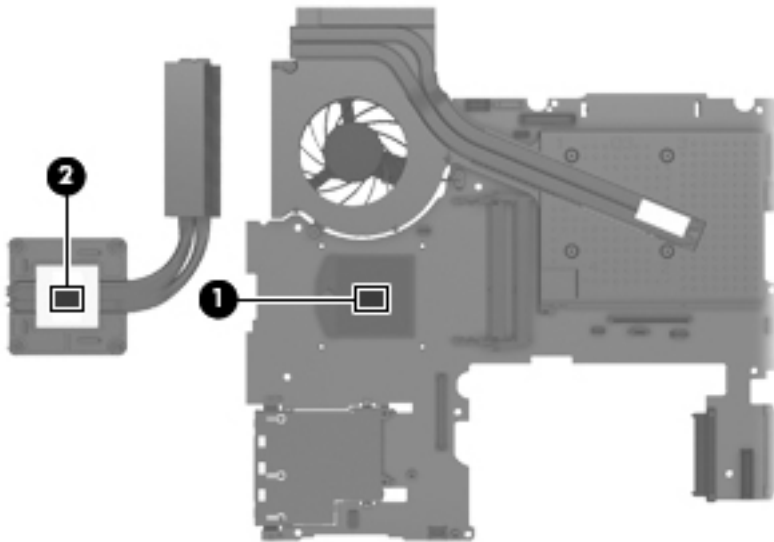
1. Following the sequence stamped into the processor heat sink, loosen the four Phillips captive screws **(1)** that secure the processor heat sink to the system board.

 **NOTE:** Due to the adhesive quality of the thermal material located between the processor heat sink and the processor, it may be necessary to move the processor heat sink from side to side to detach it from the system board.

2. Lift the processor heat sink up and to the right at an angle and remove it from the base enclosure **(2)**.



 **NOTE:** Thermal paste located on the surfaces of the processor **(1)** and the processor heat sink **(2)** must be thoroughly removed and replaced each time the processor heat sink is removed. Replacement thermal paste is 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
Next Generation Intel® Core™ processors , (support Intel Turbo Boost Technology) (includes replacement thermal material):	
i7-3610QM, 2.30 GHz (Turbo up to 3.30 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W	680646-001
i7-3720QM, 2.60 GHz (Turbo up to 3.60 GHz), 1600 MHz, 6 MB L3 Cache, 8 threads, 45W	681283-001
i7-3820QM, 2.70 GHz (Turbo up to 3.70 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 45W	681284-001
i7-3520M, 2.90 GHz (Turbo up to 3.60 GHz), 1600 MHz, 4 MB L3 Cache, 4 threads, 35W	681954-001
i7-3920XM, 2.90 GHz (Turbo up to 3.80 GHz), 1600 MHz, 8 MB L3 Cache, 8 threads, 55W	691351-001
Next Generation Intel® Core™ i5 processors , (support Intel Turbo Boost Technology) (includes replacement thermal material):	
i5-3360M, 2.80 GHz (Turbo up to 3.50 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W	681953-001
i5-3320M, 2.60 GHz (Turbo up to 3.30 GHz), 1600 MHz, 3 MB L3 Cache, 4 threads, 35W	681952-001


Before removing the processor, follow these steps:

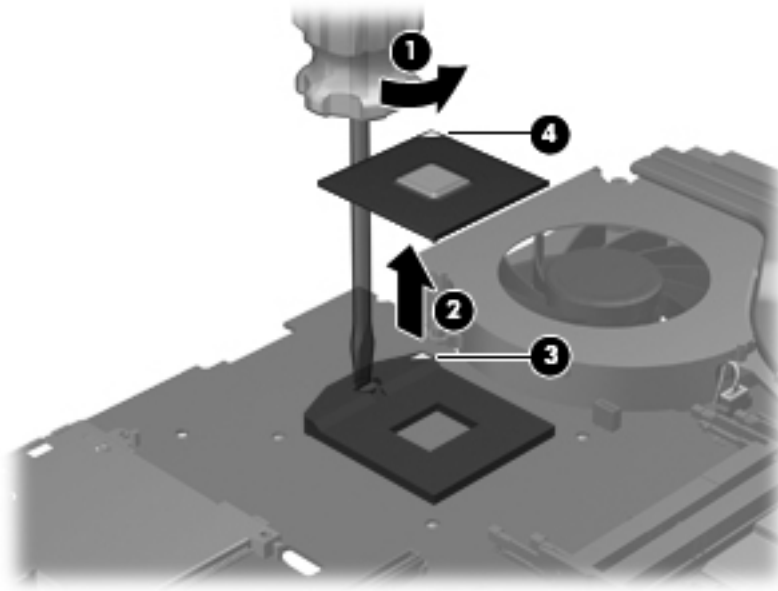
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 42](#))
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the fan/graphics board heat sink assembly (see [Fan/graphics board heat sink assembly on page 65](#)).
10. Remove the processor heat sink (see [Processor heat sink on page 99](#)).

Remove the processor:

1. Use a flat-bladed 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 you install the processor, the gold triangle (3) on the processor must be aligned with the triangle (4) embossed on the processor socket.

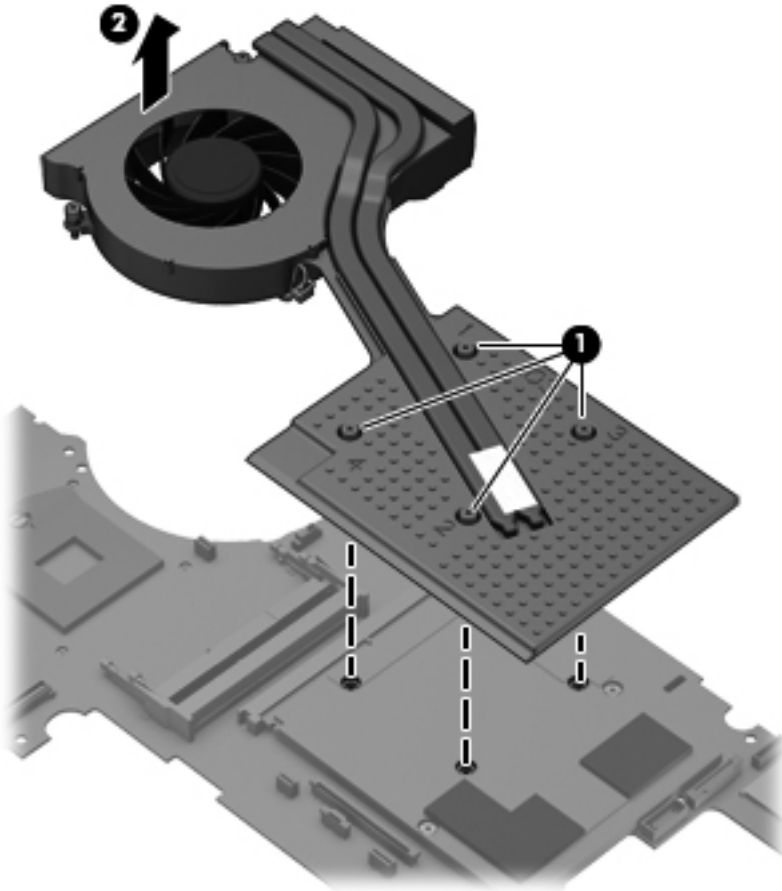



Reverse this procedure to install the processor.

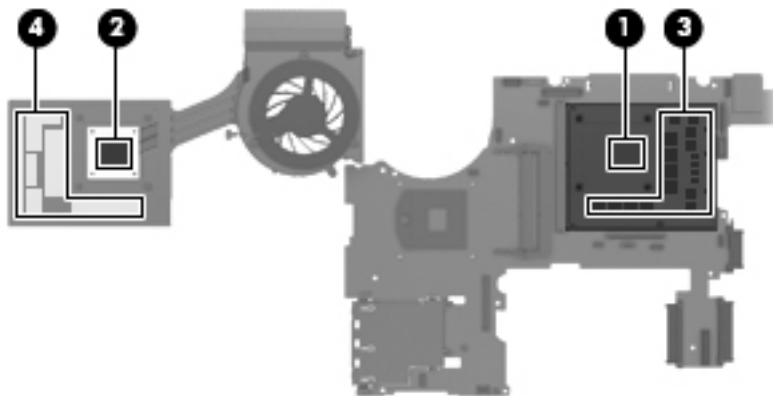
Fan/Heat sink

- ▲ Remove the 4 screws securing the fan/heat sink (1), and then remove the fan/heat sink (2).

 **NOTE:** Make sure the fan cable is disconnected from the system board.



 **NOTE:** This diagram shows a view of of the processor (1) the paste (2), the board components (3), and the pads (4). Thermal paste must be thoroughly removed and replaced each time the processor heat sink is removed. Replacement thermal paste is included in the processor heat sink and processor spare part kits.



Graphics board



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

Description	Spare part number
AMD FirePro M5950 XT-GL 1GB GDDR5 (DP 1.2 and Eyefinity Plus support)	689279-001
NVIDIA Quadro 5010M, N14E-Q5 4 GB dedicated GDDR5 video memory	689282-001
NVIDIA Quadro 4000M, N14E-Q3 2 GB dedicated GDDR5 video memory	689281-001
NVIDIA Quadro 3000M, N14E-Q1 2 GB dedicated GDDR5 video memory	689280-001

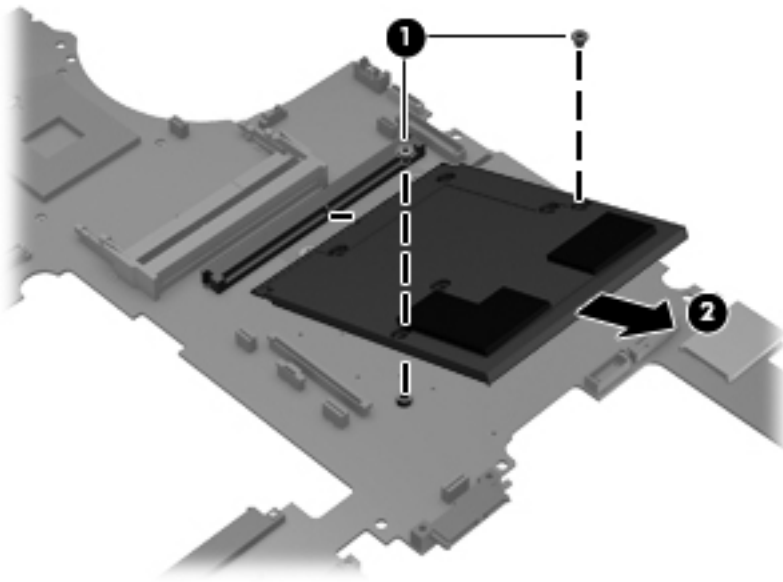
Before removing the graphics board, follow these steps:

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 42](#)),
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the fan/graphics board heat sink assembly (see [Fan/graphics board heat sink assembly on page 65](#)).

Remove the graphics board:

1. Remove the 2 Phillips M2.5×3.0 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 and remove (2).



Reverse this procedure to install the graphics board.

Fan

Description	Spare part number
Fan	688762-001

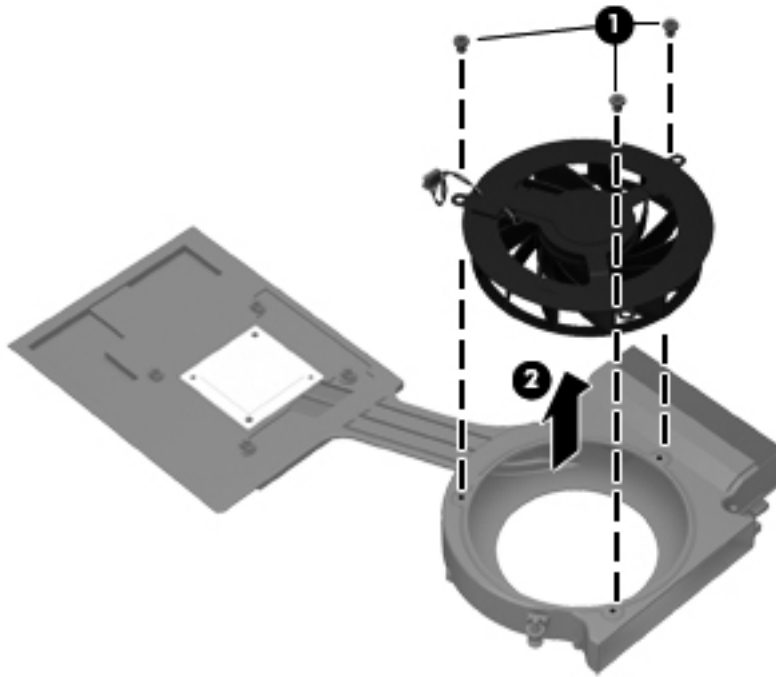
Before removing the fan, follow these steps:

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 42](#)).
5. Remove the service access cover (see [Service access cover on page 43](#)).
6. Remove the optical drive (see [Optical drive on page 54](#)) or upgrade bay hard drive (see [Upgrade bay hard drive on page 57](#)).
7. Remove the keyboard (see [Keyboard on page 62](#)).
8. Remove the top cover (see [Top cover on page 73](#)).
9. Remove the fan/graphics board heat sink assembly (see [Fan/graphics board heat sink assembly on page 65](#)).

Remove the fan from the fan/graphics board heat sink assembly:

1. Remove the 3 Phillips PM2.0×3.0 screws (1) that secure the fan to the fan/graphics board heat sink assembly.


2. Remove the fan (2).




Reverse this procedure to install the fan into the fan/graphics board heat sink assembly.

5 Computer Setup (BIOS) and Advanced System Diagnostics

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 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. 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 factory 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:** 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/wwwcontact_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**.

6 Specifications

Computer specifications

	Metric	U.S.
Dimensions		
Width	41.70 cm	16.40 in
Depth	27.20 cm	10.70 in
Height (front to back)	3.70 cm to 4.30 cm	1.47 in to 1.68 in
Weight		
	3.60 kg	7.96 lbs
Input power		
Operating voltage	19.5 V dc @ 4.74 A – 120 W	
Operating current	4.74 A	
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.

43.9 cm (17.3 in) WVA display specifications

	Metric	U.S.
Dimensions		
Width	24.4 cm	9.65 in
Depth	38.1 cm	15.0 in
Diagonal	43.9 cm	17.3 in
Number of colors	Up to 16.8 million	
Contrast ratio	200:1 (typical)	
Brightness	180 nits (typical)	
Backlight	LED	
Character display	80 × 25	
Total power consumption	6.0 W	
Viewing angle	+/-65 horizontal, +/-50° vertical (typical)	

Hard drive specifications

	750 GB*	500 GB*	320 GB*
Dimensions			
Height	9.5 mm	9.5 mm	9.5 mm
Width	7.0 mm	7.0 mm	7.0 mm
Weight	101 g	101 g	101 g
Interface type	SATA	SATA	SATA
Transfer rate	100 MB/sec	100 MB/sec	100 MB/sec
Security	ATA security	ATA security	ATA security
Seek times (typical read, including setting)			
Single track	3 ms	3 ms	3 ms
Average	13 ms	13 ms	13 ms
Maximum	24 ms	24 ms	24 ms
Logical blocks	1,250,242,867	976,752,240	625,121.433
Disk rotational speed	7200 rpm	7200 rpm	7200 rpm
Operating temperature	5°C to 55°C (41°F to 131°F)		
*1 GB = 1 billion bytes when referring to hard drive storage capacity. Actual accessible capacity is less. Actual drive specifications may differ slightly.			
NOTE: Certain restrictions and exclusions apply. Contact technical support for details.			

Blu-ray R/RE DVD±RW SuperMulti Double-Layer Drive specifications

Applicable disc	Read:	Write:
	BD-ROM, BD-ROM-DL, BD-R, BD-R-DL, BD-RE, BD-RE-DL, DVD-ROM, DVD+R, DVD+R-DL, DVD+RW, DVD-R, DVD-R-DL, DVD-RW, DVD-RAM (Ver.2), CD-DA, CD-ROM (mode 1 and mode 2), CD-ROM XA (mode 2, form 1 and form 2), Photo CD (single and multiple sessions), CD Extra, CD-R, CD-RW, and CD-TEXT	DVD-RAM (Ver.2), DVD+R, DVD-R, CD-R, and CD-ROM
Access time	BD	DVD
Random	< 230 ms	< 180 ms
Cache buffer	4.5 MB	
Data transfer rate		
2X BD-RAM	9 MB/sec	
8X DVD	2,400 KB/sec	
16X CD-R	2,400 KB/sec	
16X CD-RW	2,400 KB/sec	

Blu-ray ROM DVD±RW SuperMulti Double-Layer Drive specifications

Applicable disc	Read:	Write:	
	CD-DA, CD+(E)G, CD-MIDI, CDTEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVDROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM, HD-ROM (Single Layer), HD-ROM (Dual Layer), HD DVD-R, HD DVD-R for Dual Layer, HD DVD-RW	CD-R and CD-RW DVD+R, DVD+R(9), DVD+RW, DVD-R, DVD-R(9), DVD-RW, DVD-RAM	
Access time	CD	DVD	HD
Random	170 ms	170 ms	230 ms
Cache buffer	8 MB		
Data transfer rate			
24X CD-ROM	3,600 KB/sec		
8X DVD	10,800 KB/sec		

Applicable disc	Read:	Write:
24X CD-R	3,600 KB/sec	
16X CD-RW	2,400 KB/sec	
8X DVD+R	10,800 KB/sec	
4X DVD+RW	5,400 KB/sec	
8X DVD-R	10,800 KB/sec	
4X DVD-RW	5,400 KB/sec	
2.4X DVD+R(9)	2,700 KB/sec	
5X DVD-RAM	6,750 KB/sec	
1X BD-ROM	4,500 KB/sec	
1X BD-R read	4,500 KB/sec	
1X BD-RE read	4,500 KB/sec	
Transfer mode	Multiword DMA Mode	

DVD±RW SuperMulti Double-Layer Drive specifications

Applicable disc	Read:	Write:
	CD-DA, CD+(E)G, CD mIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo cD, Video CD), Multisession CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	CD-R and CD-RW DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM
Access time	CD	DVD
Random	< 175 ms	< 230 ms
Cache buffer	2.5 MB	
Data transfer rate		
24X CD-ROM	3,600 KB/sec	
8X DVD	10,800 KB/sec	
24X CD-R	3,600 KB/sec	
16X CD-RW	2,400 KB/sec	
8X DVD+R	10,800 KB/sec	
4X DVD+RW	5,400 KB/sec	
8X DVD-R	10,800 KB/sec	
4X DVD-RW	5,400 KB/sec	
2.4X DVD+R(9)	2,700 KB/sec	

Applicable disc	Read:	Write:
5X DVD-RAM	6,750 KB/sec	
Transfer mode	Multiword DMA Mode	

DVD-ROM Drive specifications


Applicable disc	Read:	Write:
	CD-DA, CD+(E)G, CD mIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo cD, Video CD), Multisession CD (Photo cD, CDEXTRA, Portfolio, CD-R, CD-RW), CDR, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	CD-R and CD-RW
Access time	CD	DVD
Random	< 110 ms	< 130 ms
Cache buffer	2 MB	
Data transfer rate		
24X CD-ROM	3,600 KB/sec	
8X DVD	10,800 KB/sec	
24X CD-R	3,600 KB/sec	
16X CD-RW	3,600 KB/sec	

7 Backup and recovery


To protect your information, use Windows Backup and Restore to 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, or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

Windows Backup and Restore provides the following options:

- Creating a system repair disc (select models only) by using the installed optical drive (select models only) or an optional external optical drive
- Backing up your information
- Creating a system image (select models only)
- Scheduling automatic backups (select models only)
- Creating system restore points
- Recovering individual files
- Restoring the computer to a previous state
- Recovering information using recovery tools

 **NOTE:** For detailed instructions, perform a search for these topics in Help and Support.

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

 **NOTE:** Windows includes the User Account Control feature to improve the security of your computer. You may be prompted for your permission or password for tasks such as installing software, running utilities, or changing Windows settings. See Help and Support for more information.


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 as follows:

- Windows DVD—Installs the operating system without additional drivers or applications.
- Driver 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 DVD can be created only once. Thereafter, the option to create that media will not be available.

1. Select **Start > All Programs > Productivity and Tools > HP Recovery Disc Creator**.
2. Select **Driver DVD** or **Windows DVD**.
3. From the drop-down menu, select the drive for burning the recovery media.
4. Click the **Burn** button to start the burning process.


Backing up your information

Recovery after a system failure is as good as your most recent backup. Immediately after setting up the computer, you should create system repair discs (select models only) using the installed optical drive (select models only) or an optional external optical drive and back up your system. 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 discs (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.

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 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.
- When backing up to discs, use any of the following types of discs (purchased separately): CD-R, CD-RW, 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.

 **NOTE:** DVDs and DVDs with double-layer (DL) support store more information than CDs, so using them for backup reduces the number of recovery discs required.

- When backing up to discs, number each disc before inserting it into the external drive.

To create a backup using Backup and Restore:

 **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. 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 a system repair disc (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: 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 discs you previously created (select models only), you must purchase a Windows 7 operating system DVD to reboot the computer and repair the operating system. For additional information, see the Using a Windows 7 operating system DVD (purchased separately) section.

Using the Windows recovery tools


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 completely erase hard drive contents 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 Windows partition.
To check for the Windows partition, select **Start > Computer**.
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, perform a search for these topics in Help and Support.

Using f11 recovery tools

 **CAUTION:** Using **f11** recovery tools 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 **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 HP Recovery partition: click **Start**, right-click **Computer**, click **Manage**, and then click **Disk Management**.

 **NOTE:** If the HP Recovery partition has been deleted, the **f11** restore option will not function. You must recover your operating system and programs using the Windows 7 operating system DVD and the Driver Recovery disc (both purchased separately) if the Windows partition and the HP Recovery partition are not listed. For additional information, see the Using a Windows 7 operating system DVD (purchased separately) section.


3. If the HP Recovery 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 a Windows 7 operating system DVD (purchased separately)

To order a Windows 7 operating system DVD, go to the HP website. 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. 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 you have created and any software 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 **Repair your computer**.
7. Follow the on-screen instructions.

After the repair is completed:

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

8 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 **1.5 m** (5.0 ft) 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.

9 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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