



# HP EliteBook 8560w Mobile Workstation

Maintenance and Service Guide

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## Safety warning notice

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 **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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# Table of contents

<b>1 Product description .....</b>	<b>1</b>
<b>2 External component identification .....</b>	<b>7</b>
Top .....	7
TouchPad .....	7
Lights .....	8
Buttons and fingerprint reader .....	9
Keys .....	11
Front .....	12
Right .....	13
Left .....	14
Display .....	15
Rear .....	16
Bottom .....	17
<b>3 Illustrated parts catalog .....</b>	<b>19</b>
Service tag .....	19
Computer major components .....	20
Display components .....	27
Plastics Kit .....	29
Cable Kit .....	30
Mass storage devices .....	31
Miscellaneous parts .....	32
Sequential part number listing .....	35
<b>4 Removal and replacement procedures .....</b>	<b>42</b>
Preliminary replacement requirements .....	42
Tools required .....	42
Service considerations .....	42
Plastic parts .....	42
Cables and connectors .....	43

Drive handling .....	43
Grounding guidelines .....	44
Electrostatic discharge damage .....	44
Packaging and transporting guidelines .....	45
Workstation guidelines .....	45
Equipment guidelines .....	46
Component replacement procedures .....	47
Service tag .....	47
Battery .....	48
SIM .....	49
Service access cover .....	50
Expansion memory modules .....	51
RTC battery .....	53
WLAN module .....	54
WWAN module .....	56
Bluetooth module .....	58
Hard drive .....	60
Smart card reader .....	63
Optical drive .....	65
Keyboard .....	67
Primary memory module .....	69
Top cover .....	71
Power button board .....	74
Function button board .....	76
Fingerprint reader board .....	78
TouchPad button board .....	80
VGA port .....	82
Video card fan/heat sink assembly .....	84
Processor heat sink .....	86
Graphics card .....	88
Processor .....	90
Modem module .....	92
Audio/USB 3.0 board .....	94
Speakers .....	96
Secure Digital (SD) card/USB 2.0 assembly .....	99
Northbridge chip heat plate .....	101
RJ-45 connector cable .....	103
Power connector cable .....	105
System board .....	107
ExpressCard assembly .....	111
RJ-11 connector cable .....	113

Service access cover latch .....	115
Battery latch .....	117
Security lock .....	119
Display panel .....	121
Display assembly .....	124
<b>5 Computer Setup .....</b>	<b>130</b>
Starting Computer Setup .....	130
Using Computer Setup .....	130
Navigating and selecting in Computer Setup .....	130
Restoring factory settings in Computer Setup .....	131
Computer Setup menus .....	132
File menu .....	132
Security menu .....	133
System Configuration menu .....	134
<b>6 Specifications .....</b>	<b>138</b>
Computer specifications .....	138
39.6-cm (15.6-in) HD+ display specifications .....	139
39.6-cm (15.6-in) FHD display specifications .....	140
Hard drive specifications .....	141
DVD±RW and CD-RW SuperMulti DL Combo Drive specifications .....	142
Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive .....	143
Blu-ray Disc ROM Combo Drive .....	144
DVD-ROM Drive specifications .....	145
<b>7 Backup and recovery .....</b>	<b>146</b>
Windows 7 .....	146
Backing up your information .....	146
Performing a recovery .....	148
Using the Windows recovery tools .....	148
Using f11 .....	149
Using a Windows 7 operating system DVD (purchased separately) .....	149
Windows Vista .....	150
Backing up your information .....	150
Performing a recovery .....	151
Using the Windows recovery tools .....	151
Using f11 .....	152
Using a Windows Vista operating system DVD (purchased separately) .....	153

<b>8 Power cord set requirements .....</b>	<b>154</b>
Requirements for all countries and regions .....	154
Requirements for specific countries and regions .....	155
<b>9 Recycling .....</b>	<b>156</b>
Battery .....	156
Display .....	156
<b>Index .....</b>	<b>162</b>

# 1 Product description

Category	Description
<b>Product Name</b>	<b>HP EliteBook 8560w Mobile Workstation</b>
<b>Processors</b>	<b>Intel® Core™i7 processors</b>
	i7-2860QM, 2.50GHz (Turbo up to 3.60GHz), quad-core processor, 8MB L3 Cache, 8 threads, 45W
	i7-2820QM, 2.30GHz (Turbo up to 3.40GHz), quad-core processor, 8MB L3 Cache, 8 threads, 45W
	i7-2760QM, 2.40GHz (Turbo up to 3.50GHz), quad-core processor, 6MB L3 Cache, 8 threads, 45W
	i7-2720QM, 2.20GHz (Turbo up to 3.30GHz), quad-core processor, 6MB L3 Cache, 8 threads, 45W
	i7-2670QM, 2.20GHz (Turbo up to 3.10GHz), quad-core processor, 6MB L3 Cache, 8 threads, 45W
	i7-2630QM, 2.00GHz (Turbo up to 2.90GHz), quad-core processor, 6MB L3 Cache, 8 threads, 45W (not configurable with iAMT)
	i7-2640M, 2.80-GHz (Turbo up to 3.40), dual-core processor 3-MB L3 cache, 4 threads
	i7-2620M, 2.70-GHz (Turbo up to 3.40), dual-core processor 4-MB L3 cache, 4 threads
	<b>Intel Core i5 processors</b>
	i5-2540M, 2.60-GHz (Turbo up to 3.30), dual-core processor, 3-MB L3 cache, 4 threads
	i5-2520M, 2.50-GHz (Turbo up to 3.20), dual-core processor, 3-MB L3 cache, 4 threads
<b>Chipset</b>	Mobile Intel QM67 chipset
<b>Graphics</b>	NVIDIA Quadro 2000M
	NVIDIA Quadro 1000M
	AMD FirePro M5950
	OpenGL Driver Support
<b>Panel</b>	All display assemblies include 3 wireless local area network (WLAN) antennas and 2 wireless wide area network (WWAN) antennas
	<b>39.6 cm</b> (15.6 in) High-Definition Plus (HD+) AntiGlare (AG) LED WVA

Category	Description
	<b>39.6 cm</b> (15.6 in) HD+ AG LED WVA with webcam
	<b>39.6 cm</b> (15.6 in) FHD AG LED WVA
	<b>39.6 cm</b> (15.6 in) FHD AG LED WVA with webcam (for use with HP It2510 EV-DO/LTE Mobile Broadband Module)
	<b>39.6 cm</b> (15.6 in) FHD RGB UWVA display assembly with DreamColor
	<b>39.6 cm</b> (15.6 in) FHD AG RGB LED UWVA Dream Color
	<b>39.6 cm</b> (15.6 in) FHD AG RGB LED UWVA Dream Color with webcam
	Support privacy filter
	Ambient light sensor
<b>Memory</b>	In models that use quad-core processors, four SODIMM customer-accessible/upgradeable memory module slots supporting up to 32 GB of RAM
	In models that use dual-core processors, two SODIMM customer-accessible/upgradeable memory module slots supporting up to 16 GB of RAM
	PC3-10600, 1333-MHz, DDR3
	Supports dual-channel memory
	Supports the following configurations: <ul style="list-style-type: none"> <li>• 2048 MB Total System Memory (2048 x 1)</li> <li>• 4096 MB Total System Memory (4096 x 1)</li> <li>• 4096 MB Total System Memory (2048 x 2)</li> <li>• 8192 MB Total System Memory (8192 x 1)</li> <li>• 8192 MB Total System Memory (4096 x 2)</li> <li>• 8192 MB Total System Memory (2048 x 4) — only available with quad-core processors</li> <li>• 16384 MB Total System Memory (8192 x 2)</li> <li>• 16384 MB Total System Memory (4096 x 4) — only available with quad-core processors</li> <li>• 32768 MB Total System Memory (8192 x 4) — only available with quad-core processors</li> </ul>
<b>Primary location hard drive</b>	Customer-accessible
	Supports RAID 0/1
	Supports the following <b>7.0 mm</b> , <b>9.5-mm</b> , and <b>12.7 mm</b> SATA hard drives ( <b>6.35 cm</b> (2.50 in) ) <ul style="list-style-type: none"> <li>• 750 GB, 7200 rpm</li> <li>• 500 GB, 7200 rpm</li> <li>• 320 GB, 7200 rpm Self Encrypting Drive</li> <li>• 320 GB, 7200 rpm</li> </ul>

Category	Description
	Supports the following <b>6.35 cm</b> (2.5 in) solid-state drives: <ul style="list-style-type: none"> <li>• 256 GB</li> <li>• 128 GB</li> </ul>
<b>Upgrade bay</b>	Fixed (removal of 1 screw required)
	Customer-accessible
	Serial ATA
	Supports 500 GB, 7200 rpm drive
	Supports the following <b>12.7 mm</b> tray load optical drives: <ul style="list-style-type: none"> <li>• DVD-ROM Drive</li> <li>• DVD±RW and CD-RW SuperMulti Double Layer (DL) Drive</li> <li>• Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive</li> <li>• Blu-ray Disc R/RE DVD±RW SuperMulti DL Drive</li> </ul>
	Supports “No Drive” option
<b>Microphone</b>	Integrated dual-array microphone
<b>Audio</b>	HD Audio w/ SRS Premium Sound
	Stereo speakers
<b>Webcam</b>	Integrated webcam (720p HD)
<b>Modem</b>	56K V.92 MDC data/fax modem
	Modem cable not included
	Supports “No Modem” option
<b>Ethernet</b>	Intel 82579LM 10/100/1000 network interface card (NIC), with iAMT
	S3/S4/S5 wake on LAN
	NIC power down technology
	Ethernet cable not included
<b>Wireless</b>	<b>Integrated WLAN options by way of wireless module:</b> <ul style="list-style-type: none"> <li>• Intel Centrino® Advanced-N 6205, 802.11a/b/g/n, 2 x 2</li> <li>• Intel Centrino Ultimate-N 6300 802.11a/g/n, 3x3</li> <li>• Atheros 802.11a/g/n, 3x3</li> </ul>
	Three WLAN antennas built into display assembly
	Supports “no WLAN” option

Category	Description
	<p><b>Integrated WWAN options by way of wireless module:</b></p> <ul style="list-style-type: none"> <li>HP un2430 EV-DO/HSPA Mobile Broadband Module supporting GPS (After Market Option available)</li> <li>HP hs2340 HSPA+ Mobile Broadband Module supporting GPS (After Market Option not available)</li> <li>HP It2510 EV-DO/LTE Mobile Broadband Module (available only for the <b>39.6 cm</b> (15.6 in) FHD AG LED WVA display panel, part number 653275-001)—After Market Option not available</li> </ul>
	Two WWAN antennas built into display assembly
	Subscriber identity module (SIM) security (customer-accessible in battery bay)
	Supports “no WWAN” option
	<p><b>Integrated personal area network (PAN) options by way of Bluetooth® module:</b></p>
	HP Integrated Module with Bluetooth 2.1 Wireless Technology
	Supports “no WPAN” option
<b>External media card</b>	One ExpressCard/54 slot
	Integrated Media Card Reader supports Secure Digital Card (SD), SD High Capacity (SDHC), SD eXtended-Capacity (SDXC), MultiMediaCard (MMC), and MMC <i>plus</i> (MMC+) formats
<b>Ports</b>	Audio-in (stereo microphone)
	Audio-out (stereo headphone)
	DisplayPort (1.1a for models having NVIDIA graphics cards, 1.2 for modules having AMD graphics cards)
	RJ-11 (modem)
	RJ-45 (Ethernet, includes link and activity lights)
	USB 3.0 (2)
	USB 2.0 (2)
	eSATA/USB 2.0 combo
	VGA (Dsub 15-pin)
	1394a
	3-pin AC power
	Docking connector
	Microphone Input (mono)
	Multi-pin AC
<b>Docking</b>	HP Docking Station
	HP Advanced Docking Station
<b>Keyboard/pointing devices</b>	Full-size keyboard with separate numeric keypad and TouchPad scroll zone

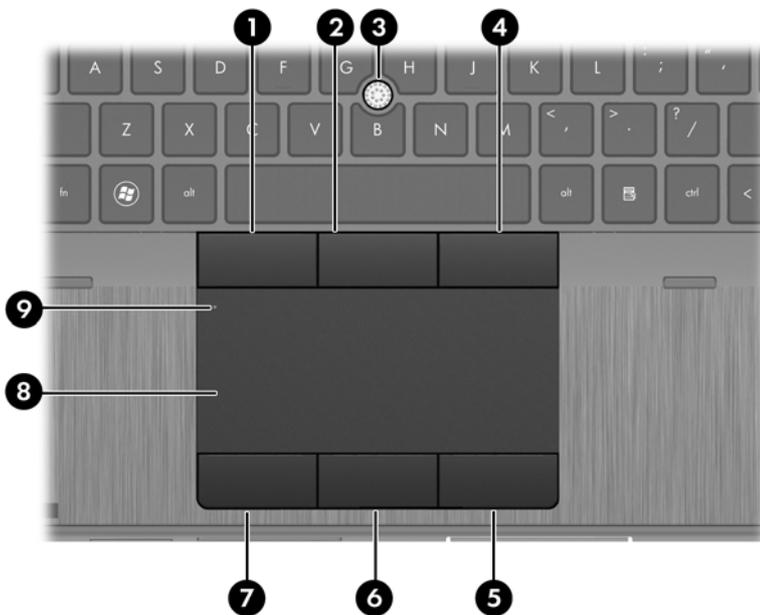
Category	Description
	Backlit full-size keyboard with separate numeric keypad and TouchPad scroll zone (select models only)
	Dual point (pointing stick and TouchPad) with 3 pointing stick buttons, 3 TouchPad buttons, and scroll zone
	Spill-resistant design, DuraKey coating
	Chemically strengthened glass cover on TouchPad
	Taps and gestures enabled by default: 2-finger scrolling, 2-finger zoom (pinch)
	Four launch buttons (QuickWeb/browser, wireless on/off, calculator, and mute volume)
<b>Power requirements</b>	AC adapter with localized cable plug support (3-wire plug with ground pin, supports 3-pin DC connector): <ul style="list-style-type: none"> <li>• 200W SLIM Smart AC Adapter</li> <li>• 150W SLIM Smart AC Adapter</li> <li>• 120W SLIM Smart AC Adapter</li> </ul>
	8-cell 2.8 Ah (83 Wh) Li-ion battery
	8-cell 2.8 Ah (75 Wh) Li-ion battery (Long-life)
	Support for 9-cell 73 Wh polymer HP ST09 Extended Life Battery (does not support HP Fast Charge)
	Support for 9-cell 100 Wh cylindrical HP BB09 Ultra-Capacity Extended Life Battery (does not support HP Fast Charge)
	HP Fast Charge Technology
<b>Security</b>	Integrated fingerprint reader
	Full volume encryption
	Integrated smart card reader
	Security cable slot
	Trusted Platform Module (TPM) V.1.2
	Preboot authentication (password, smart card)
<b>Operating system</b>	<b>Preinstalled operating systems:</b>
	Windows 7 Professional 64
	Windows 7 Professional 32
	Windows 7 Home Premium 64
	Windows Vista Home Basic 32
	FreeDOS
	<b>Microsoft® Office preinstalled with operating system:</b>
	Windows 7 Professional 32 with Microsoft® Office 2010 Starter
	Windows 7 Professional 64 with Microsoft Office 2010 Starter

<b>Category</b>	<b>Description</b>
	<b>Web download:</b>
	SRDVD Red Hat Enterprise Linux (RHEL)
	SRDVD SuSE Linux Enterprise (SLED)
	<b>Restore Media:</b>
	Windows 7 Professional 64
	Windows 7 Professional 32
	Windows 7 Home Premium 64
	DRDVD Windows 7
	Windows Vista Home Basic 32 (available to service only)
	Windows XP Professional 64 (available to service only)
	DRDVD Windows Vista (available to service only)
	<b>Web-only support:</b>
	Windows XP Professional 32
	Windows XP Professional 64
	Windows Vista Business 32
	Windows Vista Business 64
	Windows Vista Enterprise 32
	Windows Vista Enterprise 64
	Windows 7 Enterprise 32
	Windows 7 Enterprise 64
	Windows 7 Ultimate 32
	Windows 7 Ultimate 64
	<b>Certified:</b>
	Microsoft WHQL
	SuSE Linux
	Novell
<b>Serviceability</b>	<b>End-user replaceable parts:</b>
	AC adapter
	Battery (system)
	Hard drive
	Memory module
	Optical drive
	Mini-PCI components (WLAN, WWAN, SIM)

## 2 External component identification

### Top

### TouchPad



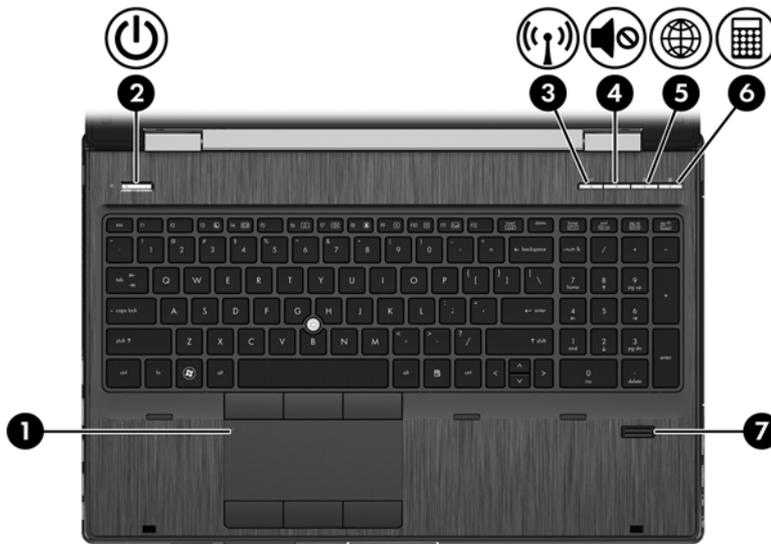
Component	Description
(1)	Left pointing stick button Functions like the left button on an external mouse.
(2)	Center pointing stick button Functions like the center button on an external mouse.
(3)	Pointing stick Moves the pointer and selects or activates items on the screen.
(4)	Right pointing stick button 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"> <li>Off: The TouchPad is on.</li> <li>Amber: The TouchPad is off.</li> </ul>
(2) Caps lock light	On: Caps lock is on.
(3)  Power light	<ul style="list-style-type: none"> <li>On: The computer is on.</li> <li>Blinking: The computer is in the Sleep state.</li> <li>Off: The computer is off or in Hibernation.</li> </ul>
(4) Num lock light	On: Num lock is on. <b>NOTE:</b> When the num lock light is on, the numeric functions on the integrated numeric keypad are available.
(5)  Wireless light	<ul style="list-style-type: none"> <li>White: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.</li> <li>Amber: All wireless devices are off.</li> </ul>
(6)  Mute light	<ul style="list-style-type: none"> <li>Amber: Computer sound is off.</li> <li>White: Computer sound is on.</li> </ul>
(7)  QuickWeb light	<ul style="list-style-type: none"> <li>On: The computer is on.</li> <li>Off: The computer is off or in Hibernation.</li> </ul> <b>NOTE:</b> For more information, refer to “HP QuickWeb” in this guide and to the HP QuickWeb software Help.
(8)  Calculator light	<ul style="list-style-type: none"> <li>On: The Windows® calculator function is on.</li> <li>Blinking: When the calculator button is pressed, the light blinks 4 times, and then the Windows calculator opens.</li> </ul>

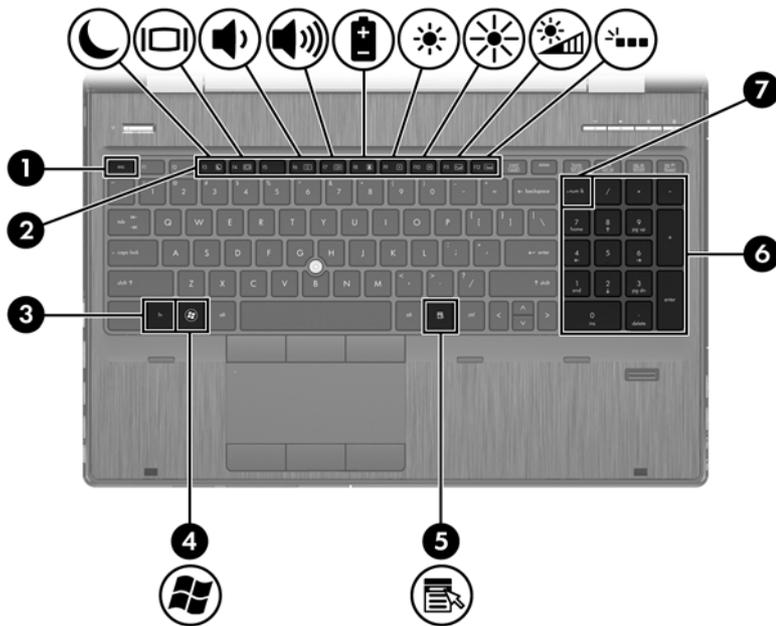
## Buttons and fingerprint reader



Component	Description
(1) TouchPad on/off button	Turns the TouchPad on and off.
(2)  Power button	<ul style="list-style-type: none"> <li>• When the computer is off, press the button to turn on the computer.</li> <li>• When the computer is on, press the button briefly to initiate Sleep.</li> <li>• When the computer is in the Sleep state, press the button briefly to exit Sleep.</li> <li>• When the computer is in Hibernation, press the button briefly to exit Hibernation.</li> </ul> <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"> <li>• <b>Windows 7</b>—Select <b>Start &gt; Control Panel &gt; System and Security &gt; Power Options</b>.</li> <li>• <b>Windows Vista</b>—Select <b>Start &gt; Control Panel &gt; System and Maintenance &gt; Power Options</b></li> <li>• Or refer to the <i>HP Notebook Reference Guide</i>.</li> </ul>
(3)  Wireless button	Turns the wireless feature on or off but does not establish a wireless connection.
(4)  Volume mute button	Mutes and restores speaker sound.

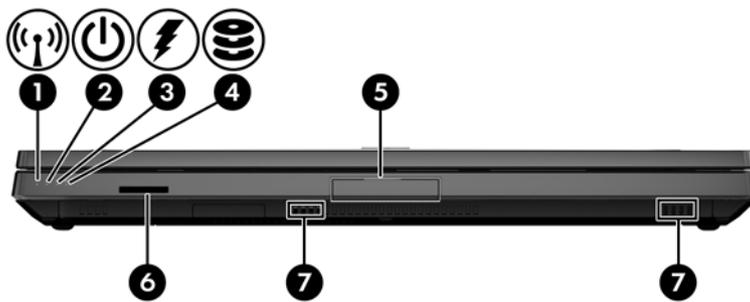
Component	Description
(5)  QuickWeb button	<ul style="list-style-type: none"> <li>• When the computer is off or in Hibernation, press the button to open HP QuickWeb.</li> <li>• When the computer is in Microsoft Windows, press the button to open the default Web browser.</li> <li>• When the computer is in HP QuickWeb, press the button to open the default Web browser.</li> </ul> <p><b>NOTE:</b> For more information, refer to “HP QuickWeb” in this guide and to the HP QuickWeb software Help. If your computer does not have HP QuickWeb software, the button does not perform any action or function.</p>
(6)  Calculator button	Opens the Windows calculator function.
(7) Fingerprint reader	Allows a fingerprint logon to Windows, instead of a password logon.

## Keys



Component	Description
(1) <a href="#">esc</a> key	Displays system information when pressed in combination with the <a href="#">fn</a> key.
(2) Function keys	Execute frequently used system functions when pressed in combination with the <a href="#">fn</a> key.
(3) <a href="#">fn</a> key	Executes frequently used system functions when pressed in combination with a function key, or the <a href="#">esc</a> 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) <a href="#">num lk</a> key	Enables/disables the integrated numeric keypad when pressed.

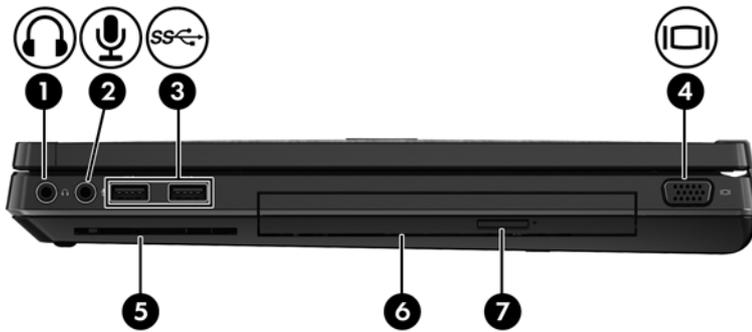
## Front



Component	Description
(1) Wireless light	<ul style="list-style-type: none"> <li>White: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on.</li> <li>Amber: All wireless devices are off.</li> </ul>
(2) Power light	<ul style="list-style-type: none"> <li>On: The computer is on.</li> <li>Blinking: The computer is in the Sleep state.</li> <li>Off: The computer is off or in Hibernation.</li> </ul>
(3) Battery light	<ul style="list-style-type: none"> <li>Amber: A battery is charging.</li> <li>White: A battery is close to full charge capacity.</li> <li>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.</li> <li>Off: If the computer is plugged into an external power source, the light turns off when all batteries in the computer are fully charged. If the computer is not plugged into an external power source, the light stays off until the battery reaches a low battery level.</li> </ul>
(4) Drive light	<ul style="list-style-type: none"> <li>Blinking white: The hard drive or optical drive is being accessed.</li> <li>Amber: HP 3D DriveGuard has temporarily parked the hard drive.</li> </ul>
(5) Display release latch	Opens the computer.
(6) Media Card Reader	Supports the following digital card formats: <ul style="list-style-type: none"> <li>MultiMediaCard</li> <li>MultiMediaCardplus (MMC+)</li> <li>Secure Digital (SD) Card</li> <li>Secure Digital HC (SDHC) Card</li> <li>Secure Digital XC (SDXC) Card</li> </ul>
(7) Speakers (2)	Produce sound.

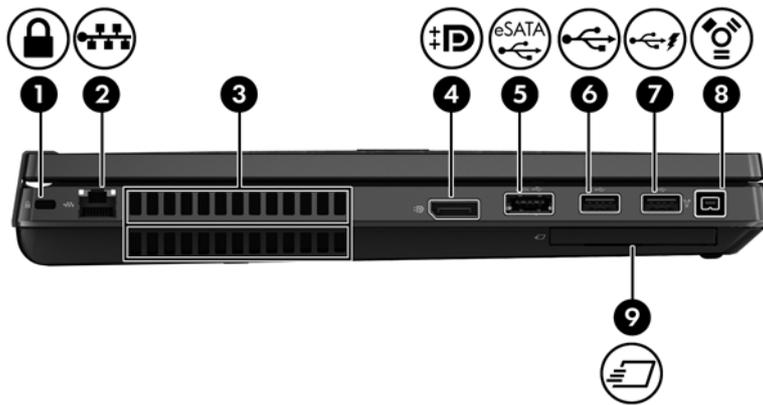
**NOTE:** To use the SRS Premium Sound software, select **Start > All Programs > SRS Premium Sound**.

## Right



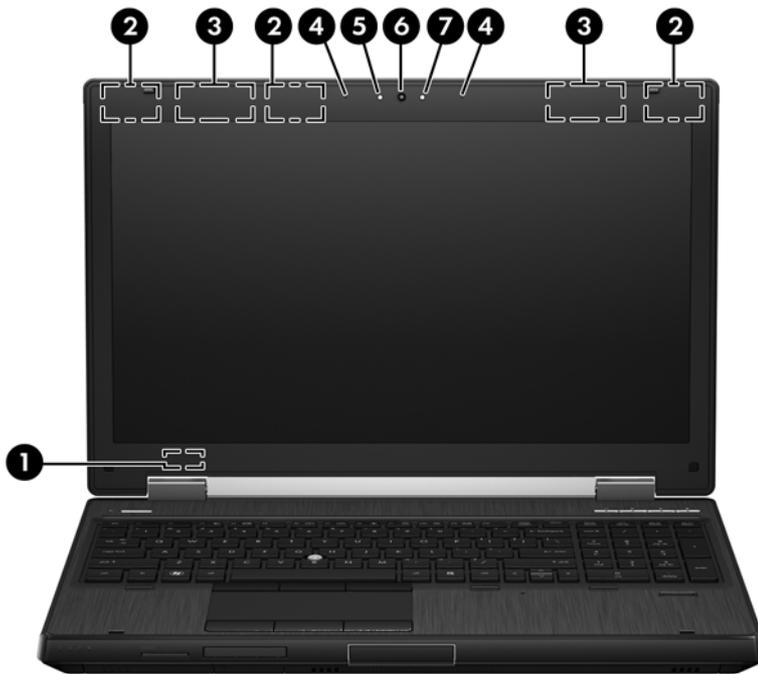
Component	Description
(1)  Audio-out (headphone) jack	<p>Produces sound when connected to optional powered stereo speakers, headphones, ear buds, a headset, or television audio.</p> <p><b>WARNING!</b> To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, refer to the <i>Regulatory, Safety and Environmental Notices</i>.</p> <p><b>NOTE:</b> 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 3.0 ports (2) (select models only)	Connect optional USB devices.
(4)  External monitor port	Connects an external VGA monitor or projector.
(5) Smart card reader	Supports optional smart cards.
(6) Upgrade bay (Optical drive shown)	<p>Reads and writes (select models only) to an optical disc.</p> <p><b>NOTE:</b> The upgrade bay can hold either a hard drive, an optical drive, or support a weight saver option.</p>
(7) Optical drive eject button	Ejects the optical drive.

## Left



Component	Description
(1) 	Security cable slot Attaches an optional security cable to the computer. <b>NOTE:</b> The security cable is designed to act as a deterrent, but it may not prevent the computer from being mishandled or stolen.
(2) 	RJ-45 (network) jack Connects a network cable.
(3)	Vents (2) Enables airflow to cool internal components. <b>NOTE:</b> 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.
(4) 	DisplayPort Connects an optional digital display device, such as a high-performance monitor or projector.
(5) 	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.
(6) 	USB 2.0 port Connects an optional USB device.
(7) 	USB charging port Connects an optional USB device.
(8) 	1394 port Connects an optional IEEE 1394 or 1394a device, such as a camcorder.
(9) 	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.  <b>NOTE:</b> 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)*	Send and receive wireless signals to communicate with wireless wide-area networks (WWAN).
(4) Internal microphones (2)	Record sound.
(5) Webcam light (select models only)	On: The webcam is in use.
(6) Webcam (select models only)	Records video and captures still photographs.  To use the webcam, select <b>Start &gt; All Programs &gt; HP &gt; HP Webcam</b> .
(7) Ambient light sensor	Automatically adjusts the display brightness based on the lighting conditions in your environment.

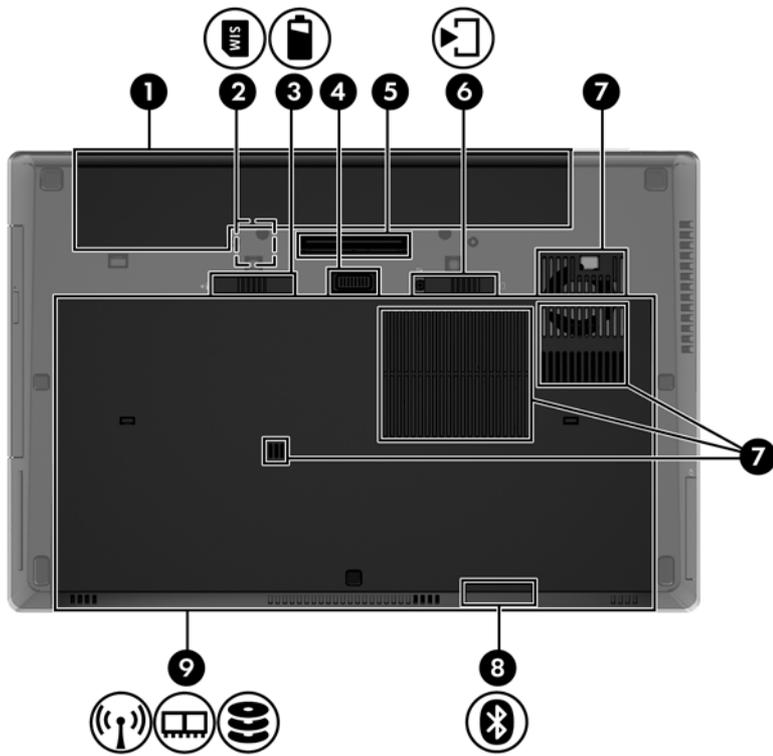
\*The antennas are not visible from the outside of the computer. For optimal transmission, keep the areas immediately around the antennas free from obstructions. To see wireless regulatory notices, refer to the section of the *Regulatory, Safety and Environmental Notices* that applies to your country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

## Rear



Component		Description
(1) 	RJ-11 (modem) jack (select models only)	Connects a modem cable.
(2) 	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 from the battery bay.
(4)	Accessory battery connector Connects an optional accessory battery.
(5)	Docking connector Connects an optional docking device.
(6) 	Bottom cover release latch Releases the bottom cover from the computer.
(7)	Vents (4) Enable airflow to cool internal components.  <b>NOTE:</b> 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.

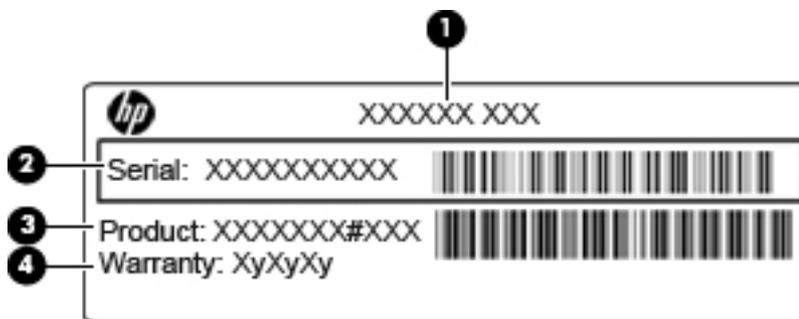
Component	Description
(8)  Bluetooth compartment	Contains a Bluetooth device (select models only).
(9)  Wireless and memory module compartments, and hard drive bay	<p>Contains the hard drive, the wireless LAN module slot, and the memory module slot.</p> <p><b>CAUTION:</b> To prevent an unresponsive system, 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.</p>

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## 3 Illustrated parts catalog

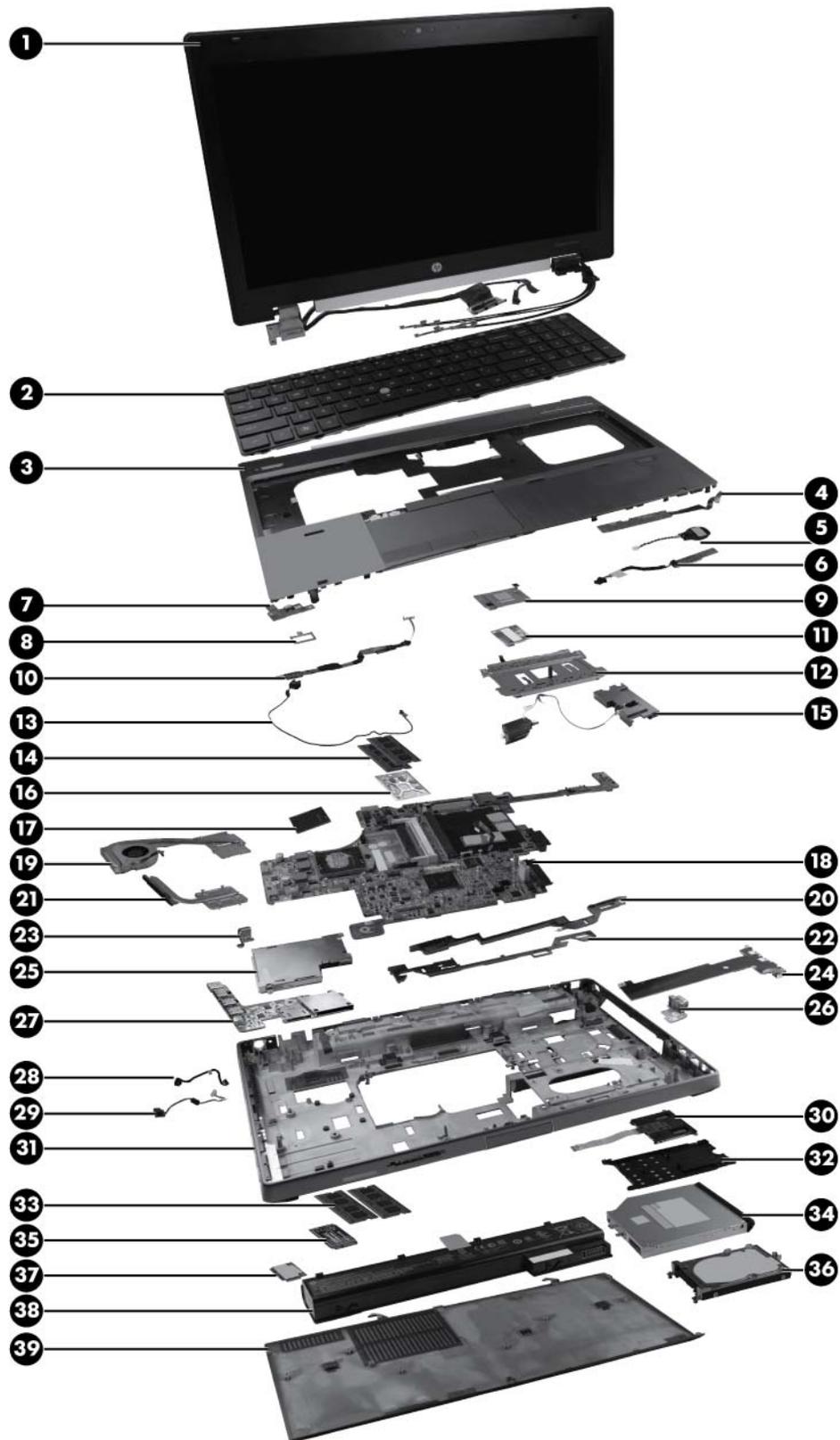
### Service tag

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



- Product name **(1)**. This is the product name affixed to the front of the computer.
- Serial number **(2)**. This alphanumeric identifier is unique to each product.
- Product part number **(3)**. This identifier provides specific information about the product's hardware components. The part number helps a service technician to determine what components and parts are needed.
- Warranty **(4)**. This number describes the duration (in years) of the warranty period for the computer.

# Computer major components



<b>Item</b>	<b>Description</b>	<b>Spare part number</b>
<b>(1)</b>	<b>39.6-cm (15.6 in) FHD RGB UWVA LCD display assembly with DreamColor</b>	
	For use in computer models without webcams	653277-001
	For use in computer models with webcams	653278-001
<b>(2)</b>	<b>Keyboard with pointing stick</b> (includes pointing stick and pointing stick cable)	
	For use in Belgium	652682-A41
	Backlit keyboard, for use in Belgium	652683-A41
	For use in Brazil	652682-201
	For use in Bulgaria	652682-261
	Backlit keyboard, for use in Bulgaria	652683-261
	For use in the Czech Republic and Slovakia	652682-A81
	Backlit keyboard, for use in the Czech Republic and Slovakia	652683-A81
	For use in Denmark	652682-081
	Backlit keyboard, for use in Denmark	652683-081
	For use in France	652682-051
	Backlit keyboard, for use in France	652683-051
	For use in French Canada	652682-121
	Backlit keyboard, for use in French Canada	652683-121
	For use in Germany	652682-041
	Backlit keyboard, for use in Germany	652683-041
	For use in Greece	652682-DJ1
	Backlit keyboard, for use in Greece	652683-DJ1
	For use in Hungary	652682-211
	Backlit keyboard, for use in Hungary	652683-211
	For use in Iceland	652682-DD1
	Backlit keyboard, for use in Iceland	652683-DD1
	For use in Israel	652682-BB1
	Backlit keyboard, for use in Israel	652683-BB1
	For use in Italy	652682-061
	Backlit keyboard, for use in Italy	652683-061
	For use in Japan	652682-291
	For use in Latin America	652682-161
	Backlit keyboard, for use in Latin America	652683-161
	For international use	652682-B31
	Backlit keyboard, for international use	652683-B31

<b>Item</b>	<b>Description</b>	<b>Spare part number</b>
	For use in Norway	652682-091
	Backlit keyboard, for use in Norway	652683-091
	For use in Portugal	652682-131
	Backlit keyboard, for use in Portugal	652683-131
	For use in Russia	652682-251
	Backlit keyboard, for use in Russia	652683-251
	For use in Saudi Arabia	652682-171
	Backlit keyboard, for use in Saudi Arabia	652683-171
	For use in Slovenia	652682-BA1
	Backlit keyboard, for use in Slovenia	652683-BA1
	For use in South Korea	652682-AD1
	Backlit keyboard, for use in South Korea	652683-AD1
	For use in Spain	652682-071
	Backlit keyboard, for use in Spain	652683-071
	For use in Sweden and Finland	652682-B71
	Backlit keyboard, for use in Sweden and Finland	652683-B71
	For use in Switzerland	652682-BG1
	Backlit keyboard, for use in Switzerland	652683-BG1
	For use in Taiwan	652682-AB1
	Backlit keyboard, for use in Taiwan	652683-AB1
	For use in Thailand	652682-281
	Backlit keyboard, for use in Thailand	652683-281
	For use in Turkey	652682-141
	Backlit keyboard, for use in Turkey	652683-141
	For use in the United Kingdom	652682-031
	Backlit keyboard, for use in the United Kingdom	652683-031
	For use in the United States	652682-001
	Backlit keyboard, for use in the United States	652683-001
<b>(3)</b>	<b>Top cover</b> (includes TouchPad button and bracket)	652652-001
<b>(4)</b>	<b>Function button board</b>	652665-001
<b>(5)</b>	<b>RTC battery</b>	652650-001
<b>(6)</b>	<b>Bluetooth module</b> (does not include Bluetooth module cable)	537921-001

**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 652662-001. For information about Cable Kit contents, see [Cable Kit on page 30](#).

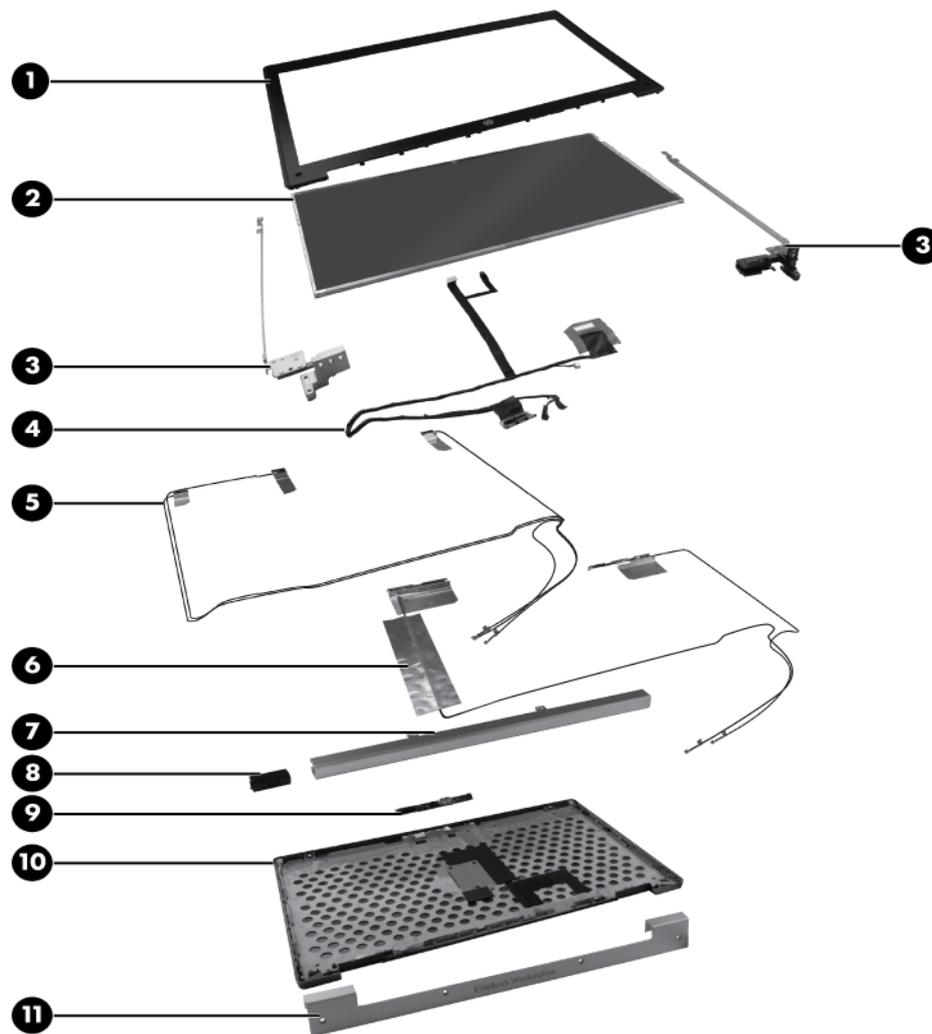
Item	Description	Spare part number
(7)	<b>Power button board</b>	652654-001
(8)	<b>Fingerprint reader board bracket</b> (included with the fingerprint reader board, spare part number 652681-001)	
(9)	<b>Northbridge chip heat plate</b> (includes replacement thermal material)	652685-001
(10)	<b>Fingerprint reader board</b>	652681-001
(11)	<b>Modem module</b> (56k v.92 MDC data/fax modem)	628824-001
	<b>NOTE:</b> 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 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30</a> .	
(12)	<b>TouchPad button board</b> (included with top cover, spare part number)	
(13)	<b>RJ-11 (modem) jack</b> (included in the Cable Kit, spare part number 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30</a> .)	
(14)	<b>Secondary memory modules</b>	
	8-GB	634091-001
	4-GB	621569-001
	2-GB	621565-001
(15)	<b>Speakers</b>	652669-001
(16)	<b>Graphics card</b> (includes replacement thermal material)	
	NVIDIA Quadro 1000M graphics card	652673-001
	NVIDIA Quadro 2000M graphics card	652674-001
	AMD FirePro M5950 graphics card	652676-001
(17)	<b>Processor</b>	
	<b>Intel® Core™ i7 processors</b>	
	i7-2860QM, 2.50 GHz (Turbo up to 3.60 GHz), quad-core processor, 8 MB L3 Cache, 8 threads, 45 W	666175-002
	i7-2820QM, 2.30 GHz (Turbo up to 3.40 GHz), quad-core processor, 8 MB L3 Cache, 8 threads, 45 W	657414-001
	i7-2760QM, 2.40 GHz (Turbo up to 3.50 GHz), quad-core processor, 6 MB L3 Cache, 8 threads, 45 W	666174-002
	i7-2720QM, 2.20 GHz (Turbo up to 3.30 GHz), quad-core processor, 6 MB L3 Cache, 8 threads, 45 W	657413-001
	i7-2670QM, 2.20 GHz (Turbo up to 3.10 GHz), quad-core processor, 6 MB L3 Cache, 8 threads, 45 W	665116-002
	i7-2630QM, 2.00 GHz (Turbo up to 2.90 GHz), quad-core processor, 6 MB L3 Cache, 8 threads, 45 W (not configurable with iAMT)	657412-001
	i7-2640M, 2.80 GHz (Turbo up to 3.40), dual-core processor, 3 MB L3 cache, 4 threads, 35 W	666173-002
	i7-2620M, 2.70 GHz (Turbo up to 3.40), dual-core processor, 4 MB L3 cache, 4 threads, 35 W	657411-001
	<b>Intel Core i5 processors</b>	

Item	Description	Spare part number
	i5-2540M, 2.60 GHz (Turbo up to 3.30), dual-core processor, 3 MB L3 cache, 4 threads, 35 W	657410-001
	i5-2520M, 2.50 GHz (Turbo up to 3.20), dual-core processor, 3 MB L3 cache, 4 threads, 35 W	657409-001
<b>(18)</b>	<b>System board</b> (includes replacement thermal material and VGA support bracket)	
	For use with dual-core processors in all countries except China and Ukraine	652637-001
	(Alcor chip upgrade) For use with dual-core processors in all countries except China and Ukraine	684318-001
	For use with quad-core processors in all countries except China and Ukraine	652638-001
	(Alcor chip upgrade) For use with quad-core processors in all countries except China and Ukraine	684319-001
	For use with dual-core processors in China and Ukraine only	656213-002
	(Alcor chip upgrade) For use with dual-core processors in China and Ukraine only	684320-001
	For use with quad-core processors in China and Ukraine only	656214-002
	(Alcor chip upgrade) For use with quad-core processors in China and Ukraine only	684321-001
<b>(19)</b>	<b>Video card fan/heat sink assembly</b>	
	For use in computers with AMD FirePro M5950 and NVIDIA Quadro 1000M graphics cards	652675-001
	For use in computers with AMD FirePro M5950 for eSTAR	670940-001
	For use in computers with NVIDIA Quadro 2000M graphics cards	652677-001
<b>(20)</b>	<b>Battery latch</b> (includes latch, knob, and spring)	
	<b>NOTE:</b> The battery latch is included with the base enclosure, spare part number 652649-001.	
<b>(21)</b>	<b>Processor heat sink</b>	
	<b>NOTE:</b> The processor heat sink is included with the video card fan/heat sink assembly, spare part numbers 652675-001 and 652677-001.	
	For use with AMD FirePro M5950 and NVIDIA Quadro 1000M graphics cards	652675-001
	For use with NVIDIA Quadro 2000M graphics cards	652677-001
<b>(22)</b>	<b>Service access cover latch</b>	
	<b>NOTE:</b> The service access cover latch is included with the base enclosure, spare part number 652649-001.	
<b>(23)</b>	<b>Security lock</b>	
	<b>NOTE:</b> The security lock is included with the base enclosure assembly, spare part number 652649-001.	
<b>(24)</b>	<b>Audio/USB 3.0 board</b>	652668-001
<b>(25)</b>	<b>ExpressCard assembly</b>	
	For use in models without the Alcor chip upgrade	652680-001
	For use in models with the Alcor chip upgrade	684793-001
<b>(26)</b>	<b>VGA port</b>	652656-001

Item	Description	Spare part number
(27)	<b>Secure Digital (SD) card/USB 2.0 assembly board</b>	652670-001
(28)	<b>Power connector</b> (included in the Cable Kit, spare part number 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30.</a> )	
(29)	<b>RJ-45 (network) jack</b> (included in the Cable Kit, spare part number 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30.</a> )	
(30)	<b>Smart card reader</b> (includes door and cable)	652672-001
(31)	<b>Base enclosure</b>	652649-001
(32)	<b>Smart card reader door</b> (included with the smart card reader, spare part number 652672-001.)	
(33)	<b>Primary memory modules</b> (PC3-10600, 1333-MHz, DDR3)	
	8 GB	634091-001
	4 GB	621569-001
	2 GB	621565-001
(34)	<b>Optical drive</b> (includes bracket, bezel, and screws)	
	DVD-ROM Drive	653019-001
	DVD±RW and CD-RW SuperMulti DL Combo Drive	653020-001
	Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive	653021-001
	Blu-ray Disc R/RE DVD±RW SuperMulti DL Drive	653022-001
	Upgrade bay bezel (not illustrated)	660578-001
(35)	<b>WWAN module</b>	
	HP hs2340 HSPA+ Mobile Broadband Module	632155-001
	HP un2430 EV-DO/HSPA Mobile Broadband Module	634400-001
	HP lt2510 EV-DO/LTE Mobile Broadband Module, requires Long Term Evolution (LTE) display panel, part number 653273-001	634513-001
(36)	<b>Hard drive</b>	
	750 GB, 7200 rpm	633252-001
	500 GB, 7200 rpm	634926-001
	320 GB, 7200 rpm, Self Encrypting	626978-001
	320 GB, 7200 rpm, 2.5-in	641672-001
	320 GB, 7200 rpm, 7-mm	641674-001
	<b>Solid-state drive</b>	
	256 GB solid-state drive	653435-001
	256 GB solid-state drive, SATA III	681121-001
	256 GB solid-state drive, Self-Encrypting Drive (SED)	684564-001
	128 GB solid-state drive	653434-001
	128 GB solid-state drive, SATA III	681120-001

<b>Item</b>	<b>Description</b>	<b>Spare part number</b>
	<b>Hard drive upgrade bay</b> (not illustrated)	655547-001
<b>(37)</b>	<b>WLAN module</b>	
	Intel Centrino Advanced N 6205, 2x2 a/b/g/n WiFi Adapter	631954-001
	Intel Centrino Ultimate-N 6300 802.11 3x3 a/g/n WiFi Adapter	572511-001
	Atheros 802.11 3x3 a/g/n WiFi Adapter	630435-001
<b>(38)</b>	<b>Battery</b>	
	8-cell Li-ion 83-Wh battery	632427-001
	8-cell Li-ion 75-Wh battery	632425-001
	9-cell Li-ion 73-Wh extended life battery	634089-001
	9-cell Li-ion 100-Wh ultra-capacity extended life battery	634087-001
<b>(39)</b>	<b>Service access cover (with feet)</b>	652648-001
	<b>Cable Kit</b> (not illustrated). For information about Cable Kit contents, see <a href="#">Cable Kit on page 30</a> .	652662-001

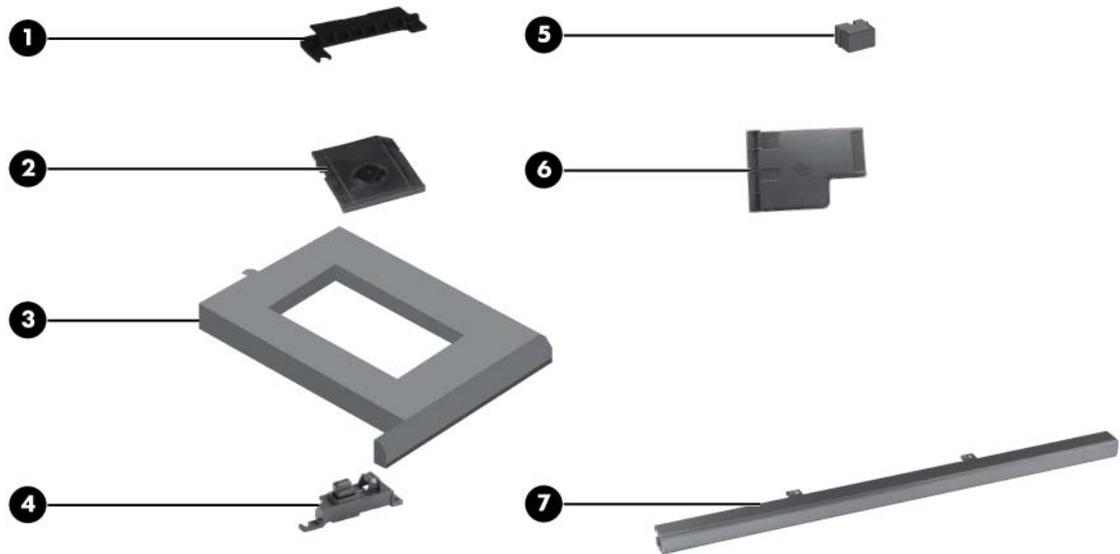
# Display components



Item	Description	Spare part number
(1)	<b>Display bezel</b>	
	For use on computer models with a webcam	652639-001
	For use on computer models without a webcam	652640-001
(2)	<b>39.6-cm (15.6 in) display panel</b>	
	HD+ WVA display panel	653271-001
	FHD WVA display panel for use only with LTE module	653275-001
	FHD WVA display panel	653273-001
(3)	<b>Display hinges</b> (includes left and right hinges)	652646-001
(4)	<b>Display cable kit</b>	652641-001
(5)	WLAN antennas and cables (included in the Cable Kit, spare part number 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30.</a> )	

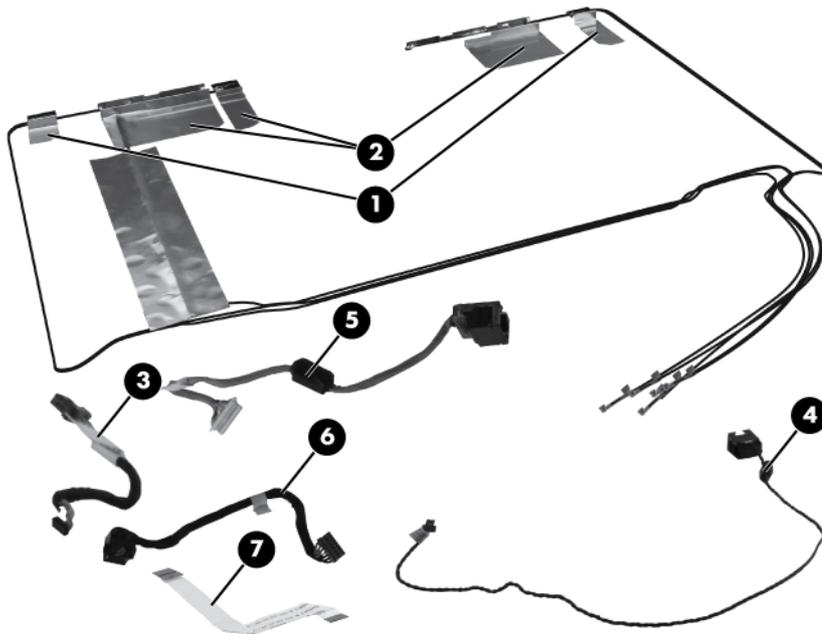
Item	Description	Spare part number
(6)	WWAN antennas and cables (included in the Cable Kit, spare part number 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30.</a> )	
(7)	Cable routing tray (included with the Raw Panel Support Kit, 657408-001)	
(8)	<b>Webcam module</b>	652659-001
(9)	<b>Ambient light sensor</b>	652689-001
	<b>Raw Panel Support Kit</b>	657408-001
(10)	Display enclosure	
	WLAN antennas and cables	
	WWAN antennas and cables	
	Cable routing tray	
(11)	<b>Display Hinge Cover Kit</b>	
	For use on computer models without DreamColor displays	652657-001
	For use on computer models with DreamColor displays	652658-001
(12)	<b>Logo nameplate</b> (with light; for use on the back cover of the LCD; not illustrated)	652666-001
	<b>NOTE:</b> This part is not shown in the illustration.	

# Plastics Kit



Item	Description	Spare part number
	<b>Plastics Kit:</b>	652664-001
	<b>Plastics Kit</b> (for use in models with the Alcor chip upgrade)	<b>684794-001</b>
(1)	Battery cover	
(2)	SD Card blank	
(3)	Optical drive weight saver	
(4)	Display latch button	
(5)	RJ-11 jack cover	
(6)	ExpressCard blank	
(7)	Inverter cover (2 are included—one for models with DreamColor and one for models without DreamColor)	

## Cable Kit



Item	Description	Spare part number
	<b>Cable Kit:</b>	652662-001
(1)	WWAN antenna	
(2)	WLAN antenna	
(3)	Bluetooth module cable	
(4)	RJ11 connector cable	
(5)	RJ45 connector cable	
(6)	Power connector cable	
(7)	TouchPad cable	

# Mass storage devices



Item	Description	Spare part number
(1)	<b>Hard drive bracket</b> (included in the Hard Drive Hardware Kit, spare part number 644694-001)	
(2)	<b>Hard drive</b>	
	750 GB, 7200 rpm	633252-001
	500 GB, 7200 rpm	634926-001
	320 GB, 7200 rpm, Self Encrypting	626978-001
	320 GB, 7200 rpm, 2.5-in	641672-001
	320 GB, 7200 rpm, 7-mm	641674-001
	<b>Solid-state drive</b> (not shown)	
	256 GB solid-state drive (SSD)	653435-001
	256 GB solid-state drive, SATA III	681121-001
	256 GB solid-state drive, Self-Encrypting Drive (SED)	684564-001
	128 GB solid-state drive	653434-001
	128 GB solid-state drive, SATA III	681120-001
	<b>Hard drive upgrade bay</b> (not illustrated)	655547-001
(3)	<b>Optical drive</b>	
	DVD±RW and CD-RW SuperMulti DL Combo Drive	653020-001
	Blu-ray Disc R/RE DVD±RW SuperMulti DL Drive	653022-001
	DVD-ROM Drive	653019-001

Item	Description	Spare part number
	Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive	653021-001
(4)	<b>Optical drive bracket</b>	652688-001
	<b>Upgrade bay bezel</b> (not illustrated)	660578-001

## Miscellaneous parts

Description	Spare part number
<b>AC adapters</b>	
200-W AC adapter	645154-001
120-W AC adapter	645156-001
150-W AC adapter	646212-001
<b>Power cords:</b>	
For use in Argentina	490371-D01
For use in Australia	490371-011
For use in Brazil	490371-202
For use in Bulgaria	490371-021
For use in Denmark	490371-081
For use in India	490371-D61
For use in Israel	490371-BB1
For use in Italy	490371-061
For use in Japan	490371-291
For use in the People's Republic of China	490371-AA1
For use in South Africa	490371-AR1
For use in South Korea	490371-AD1
For use in Switzerland	490371-111
For use in Taiwan	490371-AB1
For use in Thailand	490371-201
For use in the United Kingdom and Singapore	490371-031
For use in the United States	490371-001
Power cord for use in North America (3-prong)	491683-001
Power cord for use in Australia (3-prong)	491683-011
Power cord for use in Europe, the Middle East, and Africa (3-prong)	491683-021
Power cord for use in the United Kingdom and Singapore (3-prong)	491683-031
Power cord for use in Italy (3-prong)	491683-061

<b>Description</b>	<b>Spare part number</b>
Power cord for use in Denmark (3-prong)	491683-081
Power cord for use in Switzerland (3-prong)	491683-111
Power cord for use in Thailand (3-prong)	491683-201
Power cord for use in Brazil (3-prong)(3-prong)	491683-202
Power cord for use in Japan (3-prong)	491683-291
Power cord for use in the People's Republic of China (3-prong)	491683-AA1
Power cord for use in Taiwan (3-prong)	491683-AB1
Power cord for use in India (3-prong)	491683-D61
Power cord for use in Saudi Arabia (3-prong)	491683-171
Power cord for use in South Korea (3-prong)	491683-AD1
Power cord for use in South Africa (3-prong)	491683-AR1
Power cord for use in Israel (3-prong)	491683-BB1
Power cord for use in Argentina (3-prong)	491683-D01
<b>Rubber Kit</b> (includes rubber feet and rubber screw covers)	652663-001
<b>Plastics Kit</b> (for more information about the Plastics Kit, see <a href="#">Plastics Kit on page 29.</a> )	652664-001
<b>Plastics Kit</b> (for use in models with the Alcor chip upgrade)	684794-001
<b>Mouse</b>	
Optical	390632-001
Travel, USB	434594-001
<b>Notebook combination lock</b>	591699-001
<b>Case</b> , professional slim top load	592923-001

Description	Spare part number
<b>HP keyed cable lock</b>	626729-001
<b>Screw Kit</b>	652661-001
<ul style="list-style-type: none"> <li>• Phillips M2.0×5.0 captive screw</li> <li>• Black Phillips M2.5×12.0 captive screw</li> <li>• Silver Phillips M2.5×12.0 captive screw</li> <li>• Phillips M2.0×7.0 captive screw</li> <li>• Phillips M2.0×4.0 screw</li> <li>• Phillips M3.0×3.0 screw</li> <li>• Phillips M2.5×5.0 screw</li> <li>• Phillips M2.5×3.0 screw</li> <li>• Phillips M2.0×3.0 screw</li> <li>• Black Phillips M2.5×6.0 screw</li> <li>• Black Phillips M2.0×5.0 screw</li> <li>• HM2.5×6.0 hex screw lock</li> <li>• Torx 8M2.5×7.0 screw</li> <li>• Torx 8M2.5×8.0 screw</li> <li>• Torx 8M2.0×8.0 screw</li> <li>• Torx 8M2.5×6.0 screw</li> </ul>	

## Sequential part number listing

<b>Spare part number</b>	<b>Description</b>
390632-001	Mouse, optical
434594-001	Mouse, travel, USB
490371-001	Power cord for use in North America (3-pin)
490371-011	Power cord for use in Australia (3-pin)
490371-021	Power cord for use in Europe, the Middle East, and Africa (3-pin)
490371-031	Power cord for use in the United Kingdom and Singapore (3-pin)
490371-061	Power cord for use in Italy (3-pin)
490371-081	Power cord for use in Denmark (3-pin)
490371-111	Power cord for use in Switzerland (3-pin)
490371-201	Power cord for use in Thailand (3-pin)
490371-202	Power cord for use in Brazil (3-pin)
490371-291	Power cord for use in Japan (3-pin)
490371-AA1	Power cord for use in the People's Republic of China (3-pin)
490371-AB1	Power cord for use in Taiwan (3-pin)
490371-AD1	Power cord for use in South Korea (3-pin)
490371-AR1	Power cord for use in South Africa (3-pin)
490371-BB1	Power cord for use in Israel (3-pin)
490371-D01	Power cord for use in Argentina (3-pin)
490371-D61	Power cord for use in India (3-pin)
491683-001	Power cord for use in North America (3-prong)
491683-011	Power cord for use in Australia (3-prong)
491683-021	Power cord for use in Europe, the Middle East, and Africa (3-prong)
491683-031	Power cord for use in the United Kingdom and Singapore (3-prong)
491683-061	Power cord for use in Italy (3-prong)
491683-081	Power cord for use in Denmark (3-prong)
491683-111	Power cord for use in Switzerland (3-prong)
491683-171	Power cord for use in Saudi Arabia (3-prong)
491683-201	Power cord for use in Thailand (3-prong)
491683-202	Power cord for use in Brazil (3-prong)(3-prong)
491683-291	Power cord for use in Japan (3-prong)
491683-AA1	Power cord for use in the People's Republic of China (3-prong)
491683-AB1	Power cord for use in Taiwan (3-prong)

Spare part number	Description
491683-AD1	Power cord for use in South Korea (3-prong)
491683-AR1	Power cord for use in South Africa (3-prong)
491683-BB1	Power cord for use in Israel (3-prong)
491683-D01	Power cord for use in Argentina (3-prong)
491683-D61	Power cord for use in India (3-prong)
537921-001	Bluetooth module
572511-001	Intel Centrino Ultimate-N 6300 802.11 3x3 a/g/n WiFi Adapter
591699-001	Notebook combination lock
592923-001	Case, professional slim top load
621565-001	2-GB memory module (PC3-10600, 1333-MHz, DDR3)
621569-001	4-GB memory module (PC3-10600, 1333-MHz, DDR3)
626729-001	HP keyed cable lock
626978-001	320-GB, 7200-rpm hard drive, Self Encrypting (includes hard drive bracket and screws)
628824-001	56k v.92 MDC data/fax modem module  <b>NOTE:</b> 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 652662-001. For information about Cable Kit contents, see <a href="#">Cable Kit on page 30</a> .
630435-001	Atheros 802.11 3x3 a/g/n WiFi Adapter
631954-001	Intel Centrino Advanced N 6205, 2x2 a/b/g/n WiFi Adapter
632155-001	HP hs2340 HSPA+ Mobile Broadband Module
632425-001	8-cell, 2.8-Ah (75-Wh) Li-ion battery
632427-001	8-cell, 2.8-Ah (83-Wh) Li-ion battery
633252-001	750 GB, 7200 rpm hard drive (includes hard drive bracket and screws)
634087-001	9-cell, 3.0-Ah (100-Wh) Li-ion ultra-capacity extended life battery
634089-001	9-cell, 2.8-Ah (73-Wh) Li-ion extended life battery
634091-001	8 GB memory module (PC3-10600, 1333 MHz, DDR3)
634400-001	HP un2430 EV-DO/HSPA Mobile Broadband Module
634513-001	HP It2510 EV-DO/LTE Mobile Broadband Module (requires Long Term Evolution panel)
634926-001	500 GB, 7200 rpm hard drive (includes hard drive bracket and screws)
641672-001	320 GB, 7200 rpm hard drive, 2.5-in (includes hard drive bracket and screws)
641674-001	320 GB, 7200 rpm hard drive, 7 mm (includes hard drive bracket and screws)
644694-001	Hard Drive Hardware Kit
645154-001	200-W AC adapter
645156-001	120-W AC adapter

<b>Spare part number</b>	<b>Description</b>
646212-001	150-W AC adapter
652637-001	System board for use with dual-core processors in all countries and regions except Russia and the People's Republic of China (does not include Alcor chip upgrade; includes replacement thermal material and VGA support bracket)
652638-001	System board for use with quad-core processors in all countries and regions except Russia and the People's Republic of China (does not include Alcor chip upgrade; includes replacement thermal material and VGA support bracket)
652639-001	Display bezel for use on computer models with a webcam
652640-001	Display bezel for use on computer models without a webcam
652641-001	Display cable for use on computer models without DreamColor displays (includes microphone and webcam connector)
652646-001	Display hinges (includes left and right hinges)
652647-001	Display latch with hook
652648-001	Service access cover
652649-001	Base enclosure
652650-001	RTC battery
652652-001	Top cover for use on computer models that include a fingerprint reader (includes TouchPad button and bracket)
652654-001	Power button board
652656-001	VGA port
652657-001	Display hinge covers (for use on computer models without DreamColor displays)
652658-001	Display hinge covers (for use on computer models with DreamColor displays)
652659-001	Webcam module
652660-001	Microphone board
652661-001	Screw Kit
652662-001	Cable Kit (for information about Cable Kit contents, see <a href="#">Cable Kit on page 30</a> .)
652663-001	Rubber Kit (includes rubber feet and rubber screw covers)
652664-001	Plastics Kit (for information about Plastics Kit contents, see <a href="#">Plastics Kit on page 29</a> .)
652665-001	Function button board
652666-001	Logo nameplate with light; for use on the back cover of the LCD
652668-001	Audio/USB 3.0 board (select models only)
652669-001	Speakers
652670-001	Secure Digital (SD) card/USB 2.0 assembly board
652672-001	Smart card reader (includes door and cable)
652673-001	NVIDIA Quadro 1000M graphics card (includes replacement thermal material)
652674-001	NVIDIA Quadro 2000M graphics card (includes replacement thermal material)

<b>Spare part number</b>	<b>Description</b>
652675-001	Heat sink with fan (for use in computers with AMD FirePro M5950 and NVIDIA Quadro 1000M graphics cards)
652676-001	AMD FirePro M5950 graphics card (includes replacement thermal material)
652677-001	Heat sink with fan (for use in computers with NVIDIA Quadro 2000M graphics cards)
652680-001	ExpressCard assembly board for use in models without the Alcor chip upgrade
652681-001	Fingerprint reader board (includes fingerprint reader board cable)
652682-001	Keyboard with pointing stick for use in the United States (includes keyboard and pointing stick cables)
652682-031	Keyboard with pointing stick for use in the United Kingdom (includes keyboard and pointing stick cables)
652682-041	Keyboard with pointing stick for use in Germany (includes keyboard and pointing stick cables)
652682-051	Keyboard with pointing stick for use in France (includes keyboard and pointing stick cables)
652682-061	Keyboard with pointing stick for use in Italy (includes keyboard and pointing stick cables)
652682-071	Keyboard with pointing stick for use in Spain (includes keyboard and pointing stick cables)
652682-081	Keyboard with pointing stick for use in Denmark (includes keyboard and pointing stick cables)
652682-091	Keyboard with pointing stick for use in Norway (includes keyboard and pointing stick cables)
652682-121	Keyboard with pointing stick for use in French Canada (includes keyboard and pointing stick cables)
652682-131	Keyboard with pointing stick for use in Portugal (includes keyboard and pointing stick cables)
652682-141	Keyboard with pointing stick for use in Turkey (includes keyboard and pointing stick cables)
652682-161	Keyboard with pointing stick for use in Latin America (includes keyboard and pointing stick cables)
652682-171	Keyboard with pointing stick for use in Saudi Arabia (includes keyboard and pointing stick cables)
652682-201	Keyboard with pointing stick for use in Brazil (includes keyboard and pointing stick cables)
652682-211	Keyboard with pointing stick for use in Hungary (includes keyboard and pointing stick cables)
652682-251	Keyboard with pointing stick for use in Russia (includes keyboard and pointing stick cables)
652682-261	Keyboard with pointing stick for use in Bulgaria (includes keyboard and pointing stick cables)
652682-281	Keyboard with pointing stick for use in Thailand (includes keyboard and pointing stick cables)
652682-291	Keyboard with pointing stick for use in Japan (includes keyboard and pointing stick cables)
652682-A41	Keyboard with pointing stick for use in Belgium (includes keyboard and pointing stick cables)
652682-A81	Keyboard with pointing stick for use in the Czech Republic and Slovakia (includes keyboard and pointing stick cables)
652682-AB1	Keyboard with pointing stick for use in Taiwan (includes keyboard and pointing stick cables)
652682-AD1	Keyboard with pointing stick for use in South Korea (includes keyboard and pointing stick cables)
652682-B31	Keyboard with pointing stick for international use (includes keyboard and pointing stick cables)
652682-B71	Keyboard with pointing stick for use in Sweden and Finland (includes keyboard and pointing stick cables)
652682-BA1	Keyboard with pointing stick for use in Slovenia (includes keyboard and pointing stick cables)
652682-BB1	Keyboard with pointing stick for use in Israel (includes keyboard and pointing stick cables)

<b>Spare part number</b>	<b>Description</b>
652682-BG1	Keyboard with pointing stick for use in Switzerland (includes keyboard and pointing stick cables)
652682-D61	Keyboard with pointing stick for use in India (includes keyboard and pointing stick cables)
652682-DD1	Keyboard with pointing stick for use in Iceland (includes keyboard and pointing stick cables)
652682-DJ1	Keyboard with pointing stick for use in Greece (includes keyboard and pointing stick cables)
652682-DW1	Keyboard with pointing stick for use in the Africa - French/Arabic (includes keyboard and pointing stick cables)
652683-001	Backlit keyboard with pointing stick for use in the United States (includes keyboard and pointing stick cables)
652683-031	Backlit keyboard with pointing stick for use in the United Kingdom (includes keyboard and pointing stick cables)
652683-041	Backlit keyboard with pointing stick for use in Germany (includes keyboard and pointing stick cables)
652683-051	Backlit keyboard with pointing stick for use in France (includes keyboard and pointing stick cables)
652683-061	Backlit keyboard with pointing stick for use in Italy (includes keyboard and pointing stick cables)
652683-071	Backlit keyboard with pointing stick for use in Spain (includes keyboard and pointing stick cables)
652683-081	Backlit keyboard with pointing stick for use in Denmark (includes keyboard and pointing stick cables)
652683-091	Backlit keyboard with pointing stick for use in Norway (includes keyboard and pointing stick cables)
652683-121	Backlit keyboard with pointing stick for use in French Canada (includes keyboard and pointing stick cables)
652683-131	Backlit keyboard with pointing stick for use in Portugal (includes keyboard and pointing stick cables)
652683-141	Backlit keyboard with pointing stick for use in Turkey (includes keyboard and pointing stick cables)
652683-161	Backlit keyboard with pointing stick for use in Latin America (includes keyboard and pointing stick cables)
652683-171	Backlit keyboard with pointing stick for use in Saudi Arabia (includes keyboard and pointing stick cables)
652683-211	Backlit keyboard with pointing stick for use in Hungary (includes keyboard and pointing stick cables)
652683-251	Backlit keyboard with pointing stick for use in Russia (includes keyboard and pointing stick cables)
652683-261	Backlit keyboard with pointing stick for use in Bulgaria (includes keyboard and pointing stick cables)
652683-281	Backlit keyboard with pointing stick for use in Thailand (includes keyboard and pointing stick cables)
652683-A41	Backlit keyboard with pointing stick for use in Belgium (includes keyboard and pointing stick cables)
652683-A81	Backlit keyboard with pointing stick for use in Czech Republic and Slovakia (includes keyboard and pointing stick cables)
652683-AB1	Backlit keyboard with pointing stick for use in Taiwan (includes keyboard and pointing stick cables)
652683-AD1	Backlit keyboard with pointing stick for use in South Korea (includes keyboard and pointing stick cables)
652683-B31	Backlit keyboard with pointing stick for international use (includes keyboard and pointing stick cables)
652683-B71	Backlit keyboard with pointing stick for use in Sweden and Finland (includes keyboard and pointing stick cables)
652683-BA1	Backlit keyboard with pointing stick for use in Slovenia (includes keyboard and pointing stick cables)
652683-BB1	Backlit keyboard with pointing stick for use in Israel (includes keyboard and pointing stick cables)
652683-BG1	Backlit keyboard with pointing stick for use in Switzerland (includes keyboard and pointing stick cables)

Spare part number	Description
652683-D61	Backlit keyboard with pointing stick for use in India (includes keyboard and pointing stick cables)
652683-DD1	Backlit keyboard with pointing stick for use in Iceland (includes keyboard and pointing stick cables)
652683-DJ1	Backlit keyboard with pointing stick for use in Greece (includes keyboard and pointing stick cables)
652683-DW1	Backlit keyboard with pointing stick for use in Africa - French/Arabic (includes keyboard and pointing stick cables)
652684-001	Pointing stick cover
652685-001	PCH thermal material
652687-001	Smart card bracket
652688-001	Optical drive bracket
652689-001	Ambient light sensor board (includes cable)
653019-001	DVD-ROM drive
653020-001	DVD±RW and CD-RW SuperMulti DL Combo Drive
653021-001	Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive
653022-001	Blu-ray Disc R/RE DVD±RW SuperMulti DL Drive
653271-001	<b>39.6-cm</b> (15.6 in) HD+ WVA display panel
653273-001	<b>39.6-cm</b> (15.6 in) FHD WVA display panel
653275-001	<b>39.6-cm</b> (15.6 in) FHD WVA LTE display panel
653277-001	<b>39.6-cm</b> (15.6 in) FHD RGB UWVA display assembly with DreamColor for computer models without webcams
653278-001	<b>39.6-cm</b> (15.6 in) FHD RGB UWVA display assembly with DreamColor for computer models with webcams
653434-001	128 GB solid-state drive (SSD) (includes hard drive bracket and screws)
653435-001	256 GB solid-state drive (SSD) (includes hard drive bracket and screws)
655547-001	Hard drive upgrade bay
656213-002	System board with dual-core processors for use only in the People's Republic of China and Ukraine (does not include Alcor chip upgrade; includes replacement thermal material and VGA support bracket)
656214-002	System board with quad-core processors for use only in the People's Republic of China and Ukraine (does not include Alcor chip upgrade; includes replacement thermal material and VGA support bracket)
657408-001	Raw Panel Support Kit (includes a display enclosure with display cable, WLAN antennas and cables, WWAN antennas, and cables, and cable routing tray)
657409-001	i5-2520M, 2.50 GHz (Turbo up to 3.20) processor 3 MB L3 cache, 4 threads
657410-001	i5-2540M, 2.60 GHz (Turbo up to 3.30) processor 3 MB L3 cache, 4 threads
657411-001	i7-2620M, 2.70 GHz (Turbo up to 3.40) processor 4 MB L3 cache, 4 threads
657412-001	i7-2630QM, 2.00 GHz (Turbo up to 2.90 GHz), processor 6 MB L3 Cache, 8 threads, 45 W (not configurable with iAMT)
657413-001	i7-2720QM, 2.20 GHz (Turbo up to 3.30 GHz), processor 6 MB L3 Cache, 8 threads, 45W
657414-001	i7-2820QM, 2.30 GHz (Turbo up to 3.40 GHz), processor 8 MB L3 Cache, 8 threads, 45W

<b>Spare part number</b>	<b>Description</b>
660578-001	Upgrade bay bezel
665116-002	i7-2670QM, 2.20 GHz (Turbo up to 3.10 GHz), processor 6 MB L3 Cache, 8 threads, 45 W (not configurable with iAMT)
666173-002	i7-2640M, 2.80 GHz (Turbo up to 3.40 GHz), processor 3 MB L3 Cache, 8 threads, 45 W
666174-002	i7-2760QM, 2.40 GHz (Turbo up to 3.30 GHz), processor 6 MB L3 Cache, 8 threads, 45 W
666175-002	i7-2860QM, 2.50 GHz (Turbo up to 3.60 GHz), processor 6 MB L3 Cache, 8 threads, 45 W
670940-001	Video card fan/heat sink assembly for use in computers with AMD FirePro M5950 for eSTAR
681120-001	128 GB solid-state drive (SSD), SATA III (includes hard drive bracket and screws)
681121-001	256 GB solid-state drive (SSD), SATA III (includes hard drive bracket and screws)
684318-001	(Alcor chip upgrade) System board with dual-core processors for use in all countries and regions except for the People's Republic of China and Ukraine (includes replacement thermal material and VGA support bracket)
684319-001	(Alcor chip upgrade) System board with quad-core processors for use only in all countries and regions except for the People's Republic of China and Ukraine (includes replacement thermal material and VGA support bracket)
684320-001	(Alcor chip upgrade) System board with dual-core processors for use only in the People's Republic of China and Ukraine (includes replacement thermal material and VGA support bracket)
684321-001	(Alcor chip upgrade) System board with quad-core processors for use only in the People's Republic of China and Ukraine (includes replacement thermal material and VGA support bracket)
684564-001	256 GB solid-state drive (SSD), Self-Encrypting Drive (SED) (includes hard drive bracket and screws)
684793-001	ExpressCard assembly board for use in models with the Alcor chip upgrade
684794-001	Plastics Kit for use in models with the Alcor chip upgrade

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# 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
- Phillips P0 and P1 screwdrivers
- Torx 9 screwdriver

### Service considerations

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



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

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### Plastic parts



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**CAUTION:** 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.

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## Cables and connectors

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**⚠ 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.

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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

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**⚠ 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:

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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 2.5 cm (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."

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## 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 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 can work perfectly throughout a normal cycle. Or the device may function normally for a while, and 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 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 contact, transport products in static-safe tubes, bags, or boxes.
- Protect ESD-sensitive parts and assemblies with conductive or approved 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 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 nonconductive 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 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 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 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
- Nonconductive 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

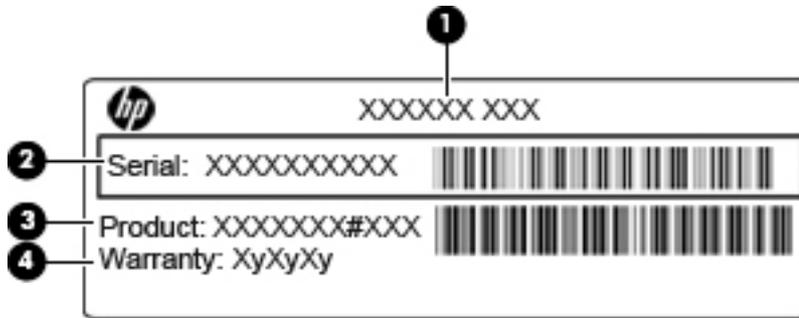
# Component replacement procedures

This chapter provides removal and replacement procedures.

There are as many as 95 screws and screw locks, in 15 different sizes, 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 description provided on the service tag.



- Product name **(1)**. This is the product name affixed to the front of the computer.
- Serial number **(2)**. This alphanumeric identifier is unique to each product.
- Product part number **(3)**. This identifier provides specific information about the product's hardware components. The part number helps a service technician to determine what components and parts are needed.
- Warranty **(4)**. This number describes the duration (in years) of the warranty period for the computer.

## Battery

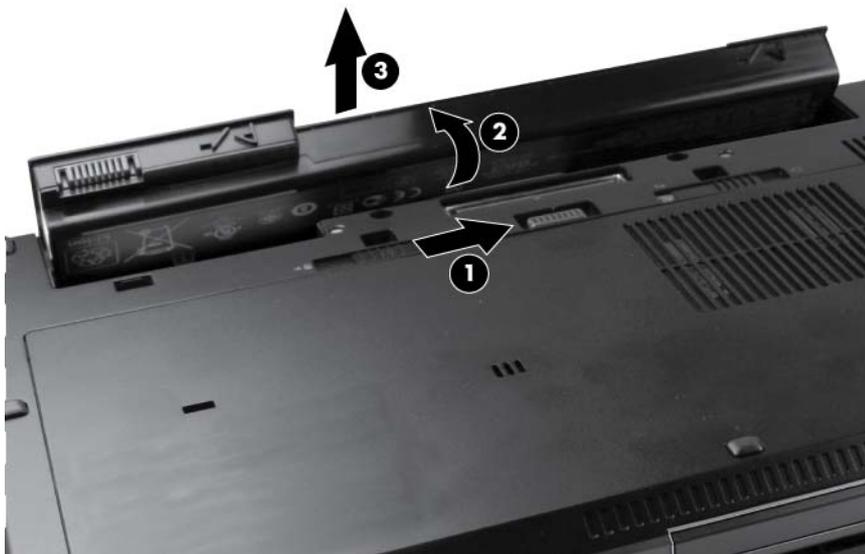
Description	Spare part number
8-cell, 83-Wh Li-ion battery	632427-001
8-cell, 75-Wh Li-ion battery	632425-001
9-cell, 73-Wh Li-ion extended life battery	634089-001
9-cell, 100-Wh Li-ion ultra-capacity extended life battery	634087-001

Before disassembling the computer, follow these steps:

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

Remove the battery:

1. Turn the computer upside-down on a flat surface, with the battery bay toward you.
2. Slide the battery release latch **(1)** to release the battery.
3. Rotate the battery **(2)** forward, and then remove it from the computer **(3)** from the computer.



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

## SIM

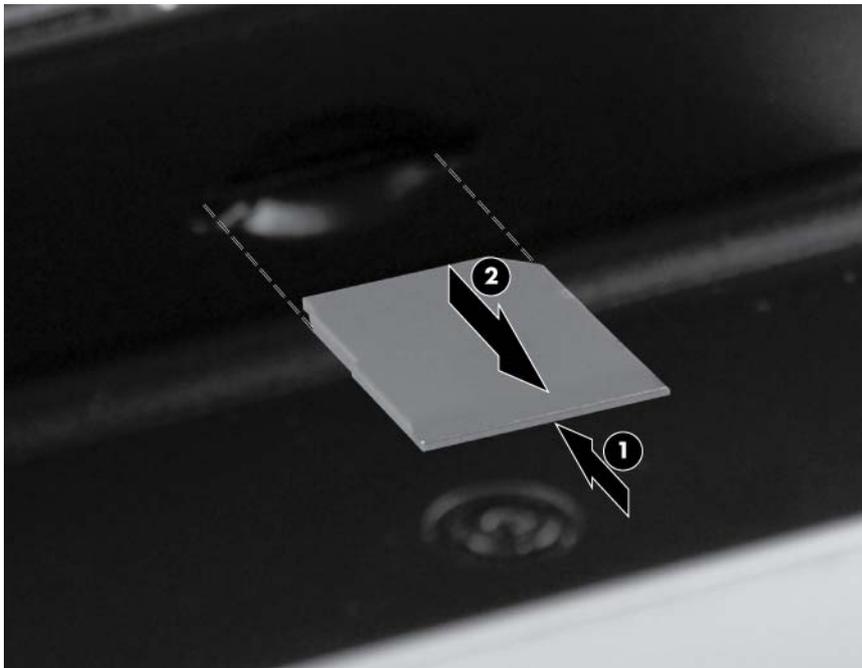
 **NOTE:** If there is a SIM inserted in the SIM slot, it must be removed before disassembling the computer. Be sure that the SIM is reinserted in the SIM slot after reassembling the computer.

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 48](#)).

Remove the SIM:

1. Inside the battery bay, press in on the SIM **(1)**. (The module is partially ejected from the SIM slot.)
2. Remove the SIM **(2)** from the SIM slot.



Reverse this procedure to install the SIM.

## Service access cover

Description	Spare part number
Service access cover	652648-001

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 48](#)).

Remove the service access cover:

1. Position the computer upside down, with the front of the computer toward you.
2. Slide the service access cover release latch to the left **(1)**.
3. Slide the service access cover toward you **(2)**.
4. Remove the service access cover **(3)**.



## Expansion memory modules



**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 652637-001, 656213-002, 684318-001, or 684320-001 has two memory module 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 652638-001, 656214-002, 684319-001, or 684321-001 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
2 GB (PC3-10600, 1333 MHz, DDR3)	621565-001
4 GB (PC3-10600, 1333 MHz, DDR3)	621569-001
8 GB (PC3-10600, 1333 MHz, DDR3)	634091-001

Before removing a memory module, follow these steps:

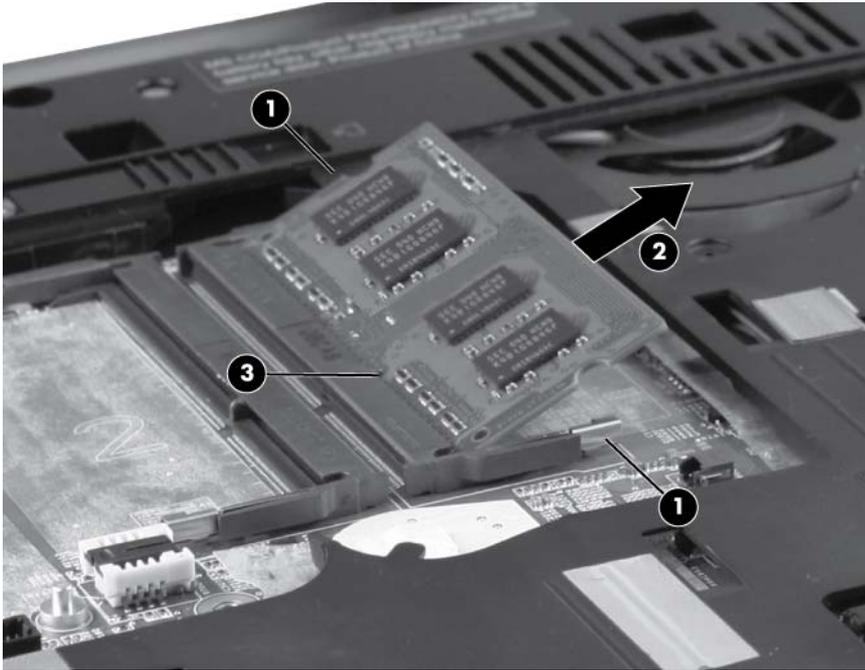
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

Remove the memory module:

1. Position the computer upside-down, with the front toward you.
2. Spread the retaining tabs **(1)** on each side of the memory module slot to release the memory module. (The edge of the module opposite the slot rises away from the computer.)

3. Remove the 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 insertion into the memory module slot.



Reverse this procedure to install a primary expansion memory module.

## RTC battery

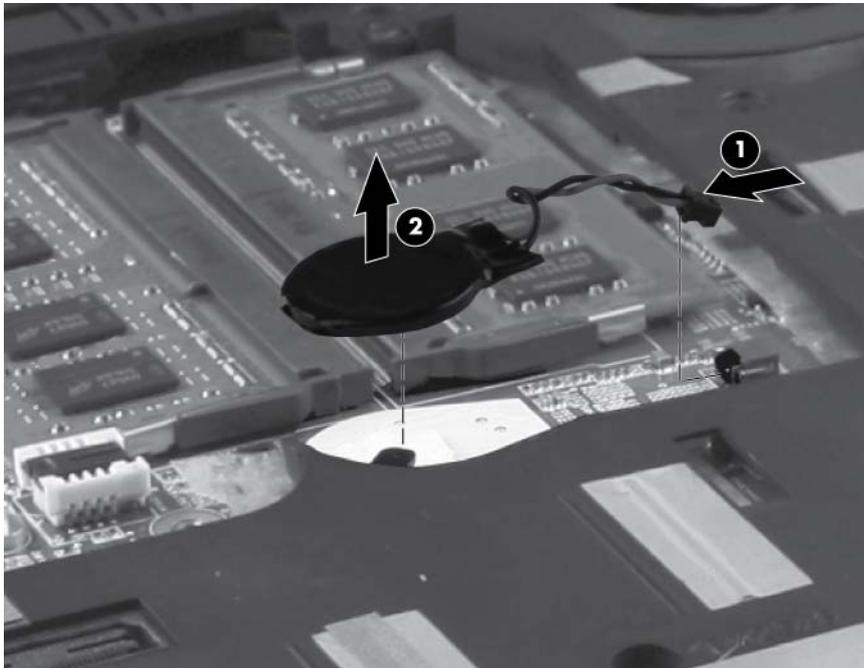
Description	Spare part number
RTC battery	652650-001

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

Remove the RTC battery:

1. Position the computer upside-down, with the front toward you.
2. Disconnect the RTC battery cable (1) from the system board.
3. Gently pull the battery (2) from the double-sided tape that secures it to the system board and remove it from the computer.



Reverse this procedure to install the RTC battery.

## WLAN module

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

Description	Spare part number
Atheros 802.11 3x3 a/g/n WiFi Adapter	630435-001
Intel Centrino Ultimate-N 6300 802.11 3x3 a/g/n WiFi Adapter	572511-001
Intel Centrino Advanced N 6205, 2x2 a/b/g/n WiFi Adapter	631954-001

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

Remove the WLAN module:

1. Position the computer upside-down, with the front toward you.
2. Disconnect the WLAN antenna cables **(1)**, **(2)**, and **(3)** from the terminals on the WLAN module.

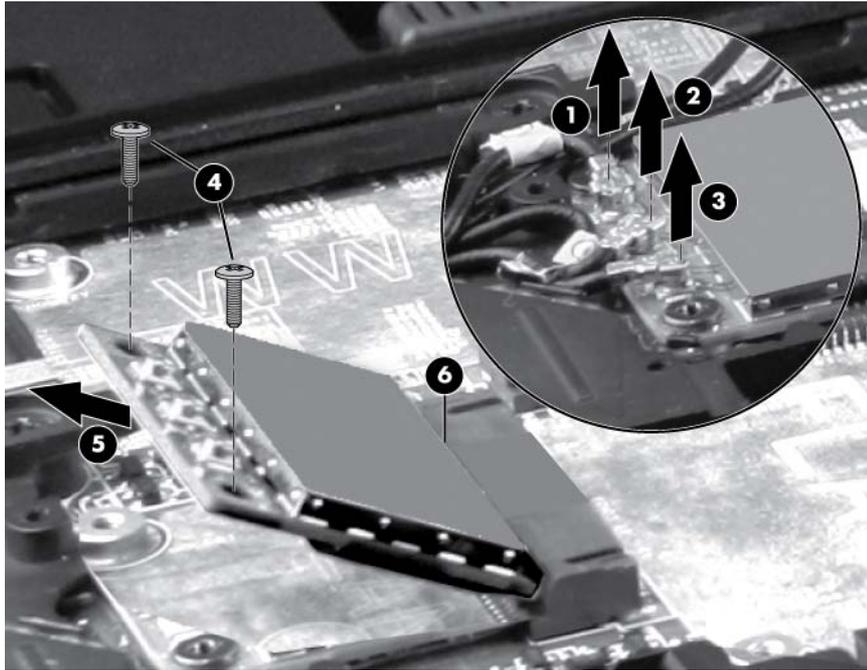


**NOTE:** The black WLAN antenna cable is connected to the WLAN module “Main” terminal. The white WLAN antenna cable is connected to the WLAN module “Aux” terminal. If the computer is equipped with an 802.11 a/b/g/n WLAN module, the yellow WLAN antenna cable is connected to the middle terminal on the WLAN module.

3. Remove the two Phillips M2.5×3.0 screws **(4)** that secure the WLAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

4. Remove the WLAN module (5) by pulling the module away from the slot at an angle.

 **NOTE:** WLAN modules are designed with a notch (6) to prevent incorrect insertion.



Reverse this procedure to install the WLAN module.

## WWAN module

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

Description	Spare part number
HP hs2340 HSPA+ Mobile Broadband Module	632155-001
HP un2430 EV-DO/HSPA Mobile Broadband Module	634400-001
HP It2510 EV-DO/LTE Mobile Broadband Module (requires Long Term Evolution panel)	634513-001

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

Remove the WWAN module:

1. Position the computer right-side up with front toward you.
2. Disconnect the WWAN antenna cables **(1)** and **(2)** from the terminals on the WWAN module.

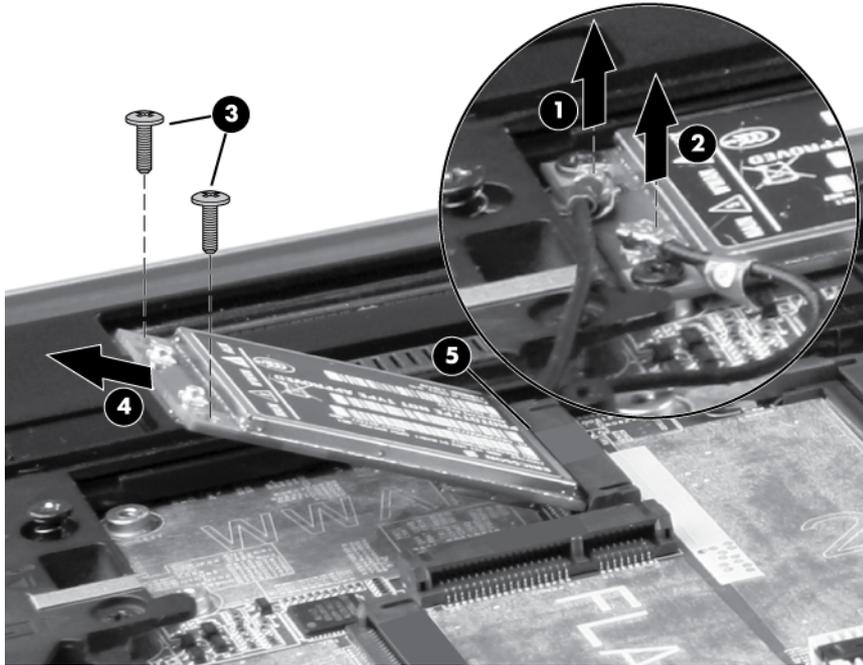


**NOTE:** The red WWAN antenna cable is connected to the WWAN module “Main” terminal. The blue WWAN antenna cable is connected to the WWAN module “Aux” terminal.

3. Remove the two Phillips M2.5×3.0 screws **(3)** that secure the WWAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

4. Remove the WWAN module (4) by pulling the module away from the slot at an angle.

 **NOTE:** WWAN modules are designed with a notch (5) to prevent incorrect insertion.



Reverse this procedure to install the WWAN module.

## 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 652662-001. For information about Cable Kit contents, see [Cable Kit on page 30](#).

Description	Spare part number
Bluetooth module	537921-001

Before removing the Bluetooth 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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

Remove the Bluetooth module:

1. Position the computer upside-down, with the front toward you.
2. Remove the tape from the top of the Bluetooth module **(1)**.
3. Remove the tape from the Bluetooth cable **(2)**.
4. Disconnect the Bluetooth cable **(3)** from the system board.
5. Disconnect the Bluetooth module cable **(4)** from the Bluetooth module.

6. Remove the Bluetooth module.



Reverse this procedure to install the Bluetooth module.

## Hard drive

Description	Spare part number
750 GB, 7200 rpm hard drive	633252-001
500 GB, 7200 rpm hard drive	634926-001
320 GB, 7200 rpm, Self Encrypting hard drive	626978-001
320 GB, 7200 rpm hard drive, 2.5-in	641672-001
320 GB, 7200 rpm hard drive, 7-mm	641674-001
256 GB solid-state drive (SSD)	653435-001
256 GB solid-state drive, SATA III	681121-001
256 GB solid-state drive, Self-Encrypting Drive (SED)	684564-001
128 GB solid-state drive (SSD)	653434-001
128 GB solid-state drive, SATA III	681120-001
Hard drive upgrade bay	655547-001
Hard Drive Hardware Kit (includes hard drive bracket and screws)	644694-001

Before disassembling the computer, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).

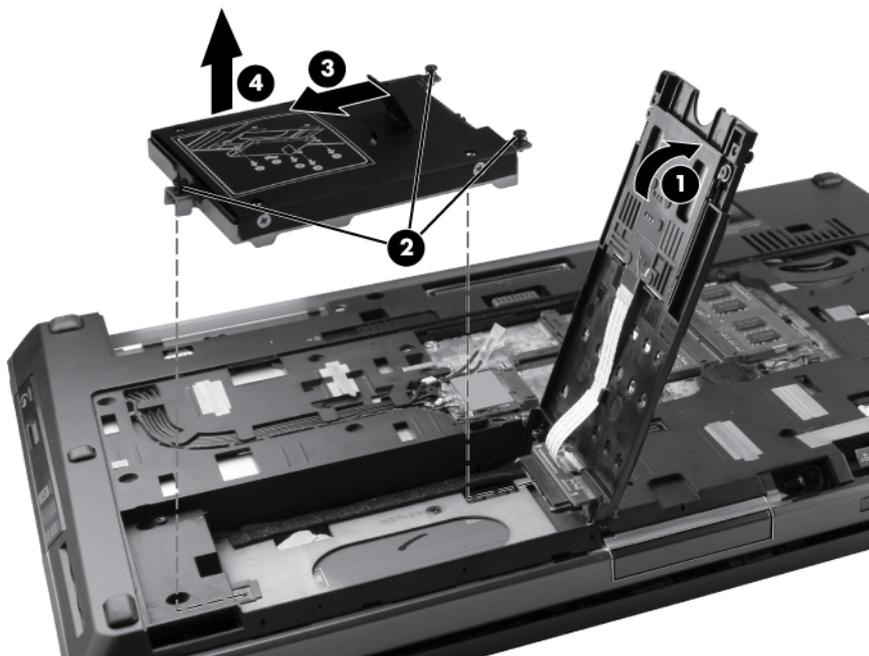
Remove the hard drive:

1. Position the computer upside-down, with the front toward you.
2. Remove the tape from the top of the smart card reader door (1).

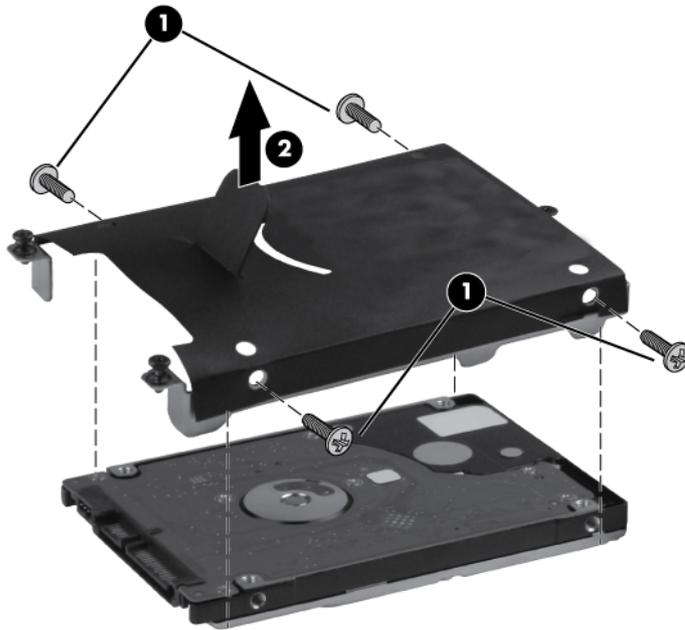
3. Loosen the two Phillips M2.0×5.0 captive screws (2) that secure the smart card reader door to the computer.



4. Open the smart card reader door until it rests on its hinges (1).
5. Remove three Phillips M2.50×6.0 spring-loaded screws (2) that secure the hard drive to the computer.
6. Grasp the tab on the hard drive, pull the hard drive to the left (3), and remove the hard drive (4) from the hard drive bay.



7. If it is necessary to replace the hard drive bracket, remove the four Phillips M3.0×3.0 hard drive bracket screws (1) from the sides of the hard drive.
8. Lift the bracket (2) straight up to remove it from the hard drive.



Reverse this procedure to reassemble and install the hard drive.

## Smart card reader

Description	Spare part number
Smart card reader (includes door and cable)	652672-001

Before removing the smart card reader, follow these steps:

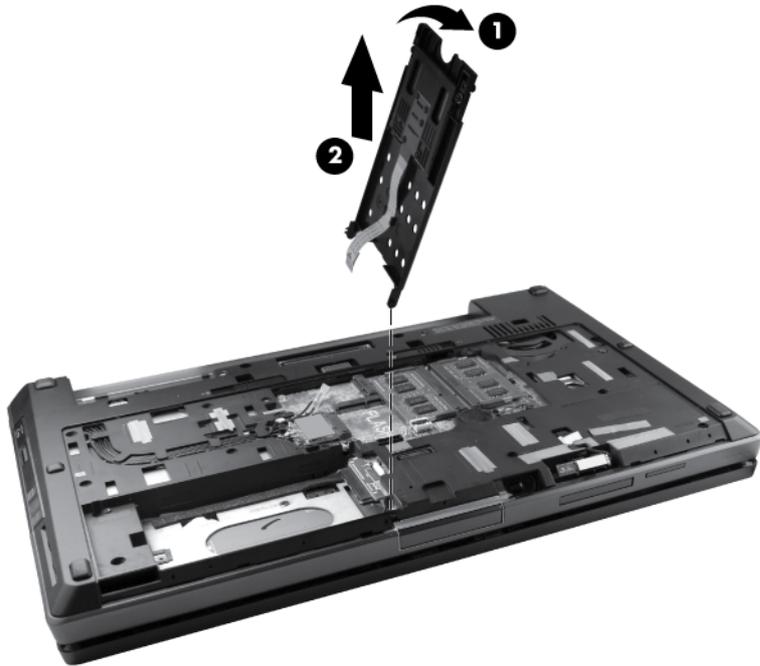
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the hard drive (see [Hard drive on page 60](#)).

Remove the smart card reader:

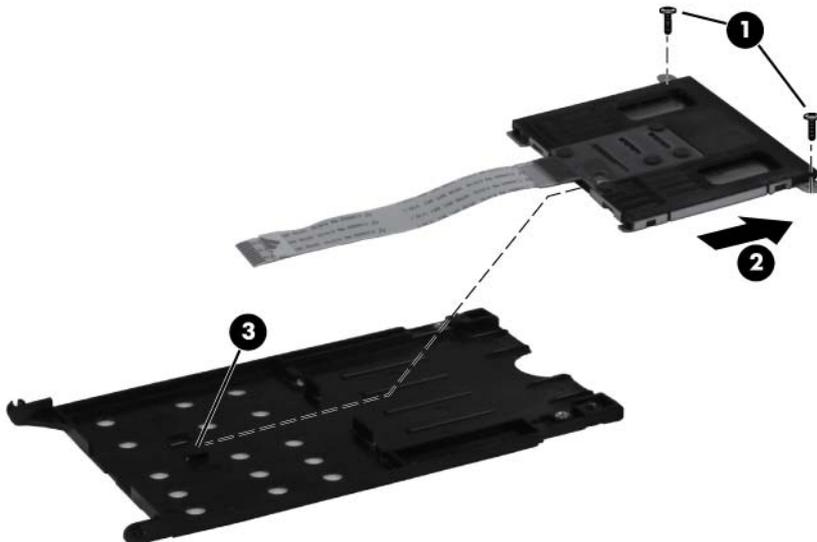
1. If you need to replace the smart card reader door, close the door (1).
2. Open the zero insertion force (ZIF) connector for the smart card reader cable (2) and then disconnect the cable from the system board (3).



3. Reopen the door (1), and then lift the smart card reader door straight up from the computer (2).



4. If it is necessary to replace the smart card reader, remove the two Phillips M2.0×3.0 screws (1) that secure the smart card reader to the smart card reader door.
5. Slide the smart card reader out of the smart card reader door (2) while allowing the cable to slide out of the door guide (3).



Reverse this procedure to reassemble and install the smart card reader.

## Optical drive

 **NOTE:** All optical drive spare part kits include an optical drive bezel.

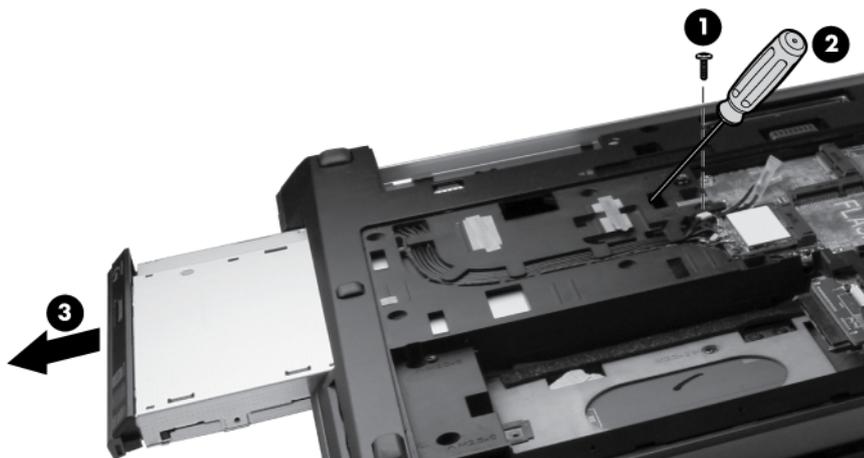
Description	Spare part number
DVD-ROM Drive	653019-001
DVD±RW and CD-RW SuperMulti DL Combo Drive	653020-001
Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive	653021-001
Blu-ray Disc R/RE DVD±RW SuperMulti DL Drive	653022-001
Upgrade bay bezel (not illustrated)	660578-001

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the hard drive (see [Hard drive on page 60](#)).

Remove the optical drive:

1. Position the computer upside-down with the front side toward you.
2. Remove the Phillips M2.5×12.0 locking screw **(1)** that secures the optical drive to the computer.
3. Insert a small tool **(2)** into the drive release opening and press the optical drive tab to the left.
4. Remove the optical drive **(3)** from the computer.



5. If it is necessary to replace the optical drive bracket, position the optical drive with the rear toward you.
6. Remove the three Phillips M2.0×3.0 screws (1) that secure the optical drive bracket to the optical drive.
7. Remove the optical drive bracket (2).



Reverse this procedure to install an optical drive.

## Keyboard

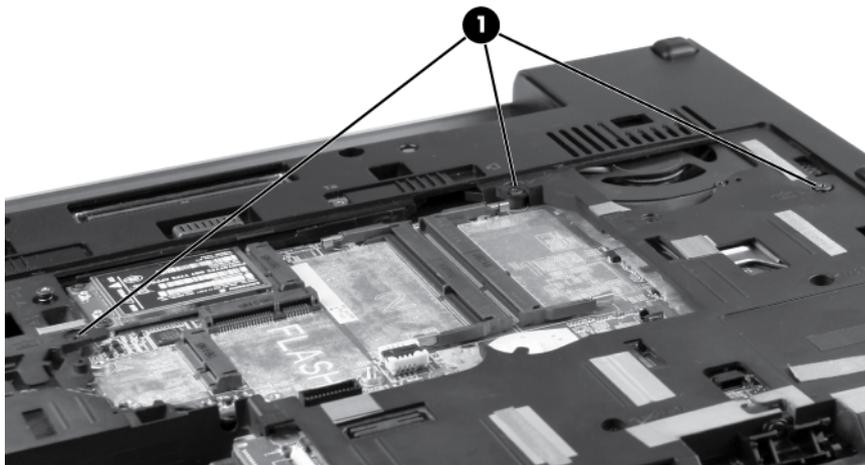
 **NOTE:** For spare part numbers, see [Computer major components on page 20](#).

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the optical drive (see [Optical drive on page 65](#)).

Remove the keyboard:

1. Turn the computer upside-down, with the rear toward you.
2. Loosen the three Phillips captive spring-loaded screws **(1)** that secure the keyboard to the computer.

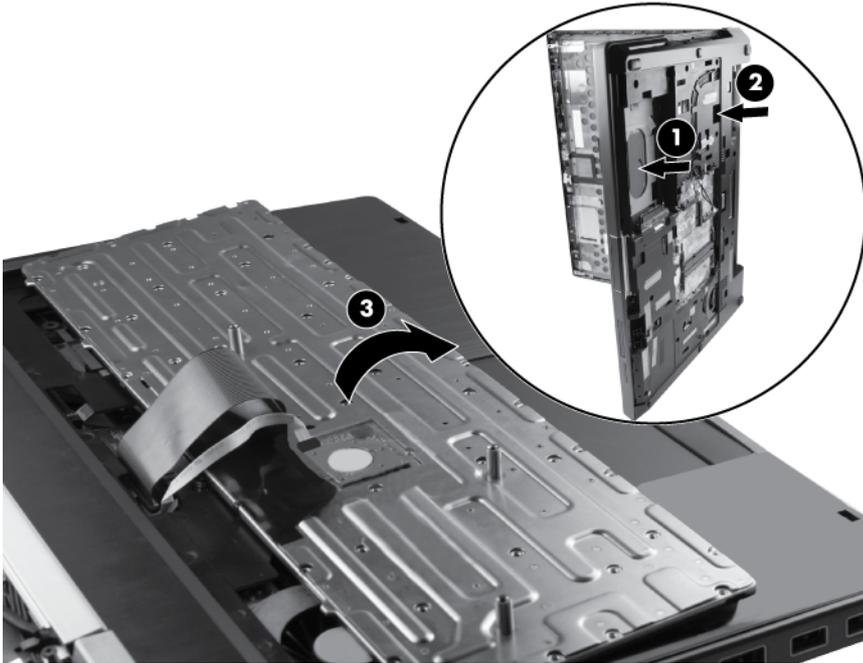


3. Open the computer and turn it on its side.
4. Insert a finger into the finger hole **(1)**, and press on the keyboard until it disengages from the base enclosure.

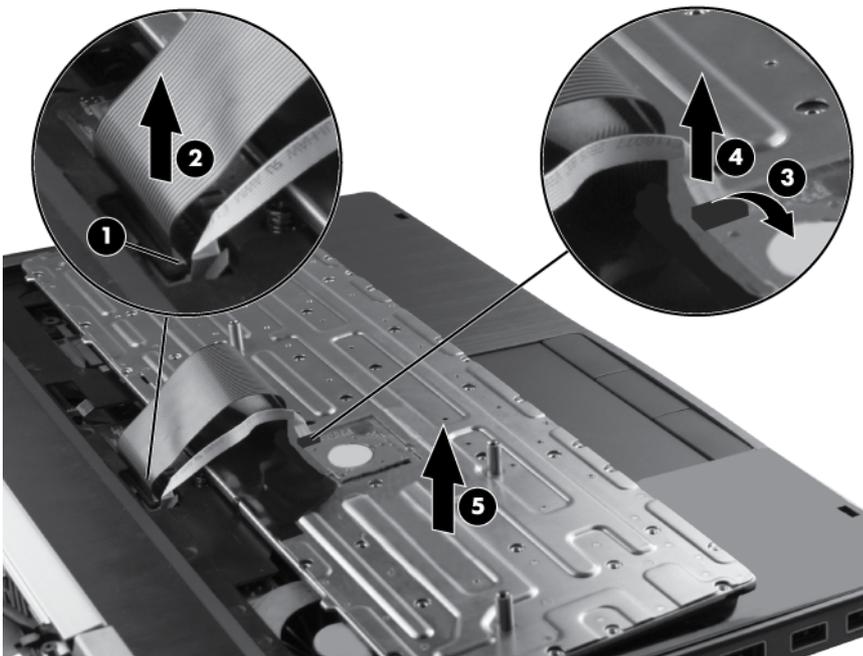
 **NOTE:** The center of the keyboard is the release point. If the keyboard does not easily disengage, press on the keyboard through the opening in the optical drive area **(2)**.

5. Turn the opened computer right-side up, with the front toward you.

6. Lift the rear edge of the keyboard and then rotate the keyboard (3) forward until it rests upside-down on top of the TouchPad.



7. Release the ZIF connector for the keyboard cable (1), and then disconnect the cable from the system board (2).
8. Release the ZIF connector for the pointing stick cable (3) and then disconnect the cable from the system board (4).
9. Remove the keyboard (5).



Reverse this procedure to install the keyboard.

## Primary memory module



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

A computer having a system board with spare part number 652637-001, 656213-002, 684318-001, or 684320-001 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 652638-001, 656214-002, 684319-001, or 684321-001 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
2 GB (PC3-10600, 1333 MHz, DDR3)	621565-001
4 GB (PC3-10600, 1333 MHz, DDR3)	621569-001
8 GB (PC3-10600, 1333 MHz, DDR3)	634091-001

Before removing a memory module, follow these steps:

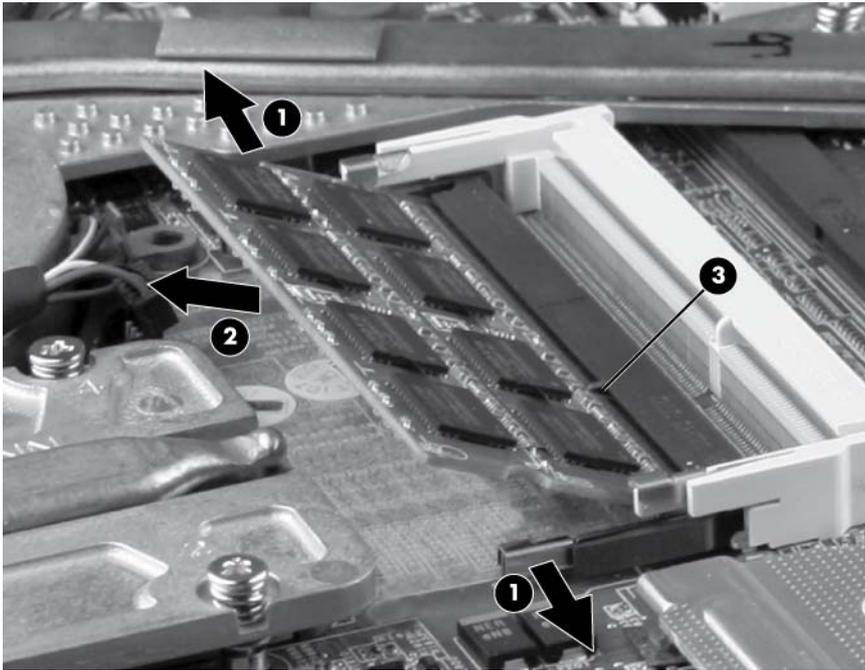
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Keyboard (see [Keyboard on page 67](#))

Remove the memory module:

1. Spread the retaining tabs **(1)** on each side of the memory module slot to release the memory module. (The edge of the module opposite the slot rises away from the computer.)

2. Remove the 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 insertion into the memory module slot.



Reverse this procedure to install a primary memory module.

## Top cover

The top covers include TouchPad button and bracket.

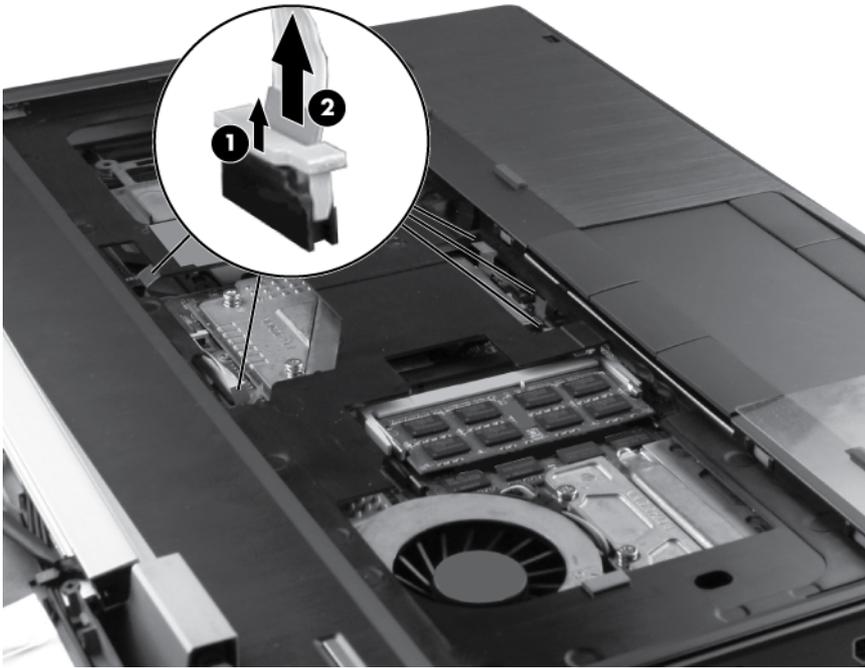
Description	Spare part number
For use on computer models with a fingerprint reader	652652-001

Before removing the top cover, follow these steps:

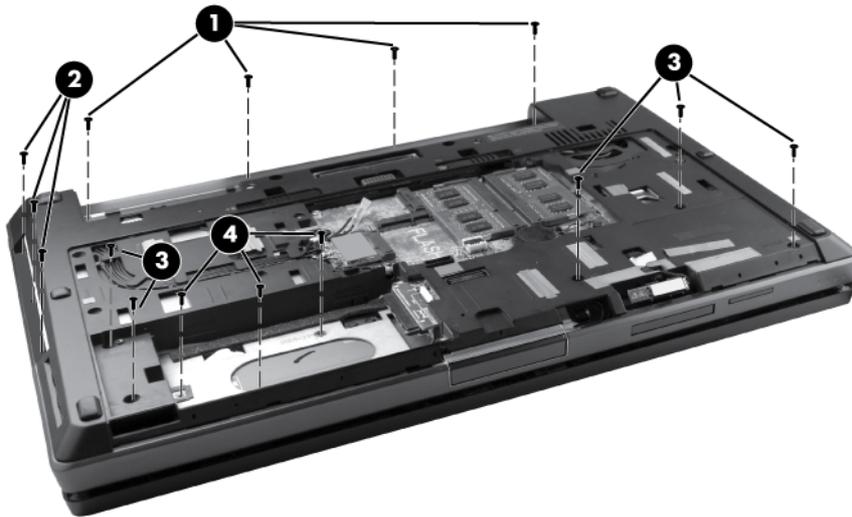
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))

Remove the top cover:

1. Turn the computer right-side up, with the front toward you.
2. Release the following ZIF connectors **(1)** and disconnect the corresponding cables **(2)** from the system board:
  - Power button ZIF connector
  - TouchPad ZIF cable
  - TouchPad buttons ZIF cable
  - Fingerprint reader ZIF cable
  - Application buttons ZIF cable



3. Remove the following screws that secure the top cover to the base enclosure:
- Four Torx 9M2.5×4.0 screws in the battery bay (1)
  - Three Torx 9M2.0×4.0 screws in the optical drive bay (2)
  - Five Torx 9M2.5×6.0 screws from the front edge and middle of the computer (3)
  - Three Phillips M2.5×3.0 screws from the hard drive bay (4)



4. Pull up the back edge **(1)** of the top cover, and then lift the cover **(2)** away at an angle.



Reverse this procedure to install the top cover.

## Power button board

Description	Spare part number
Power button board	652654-001

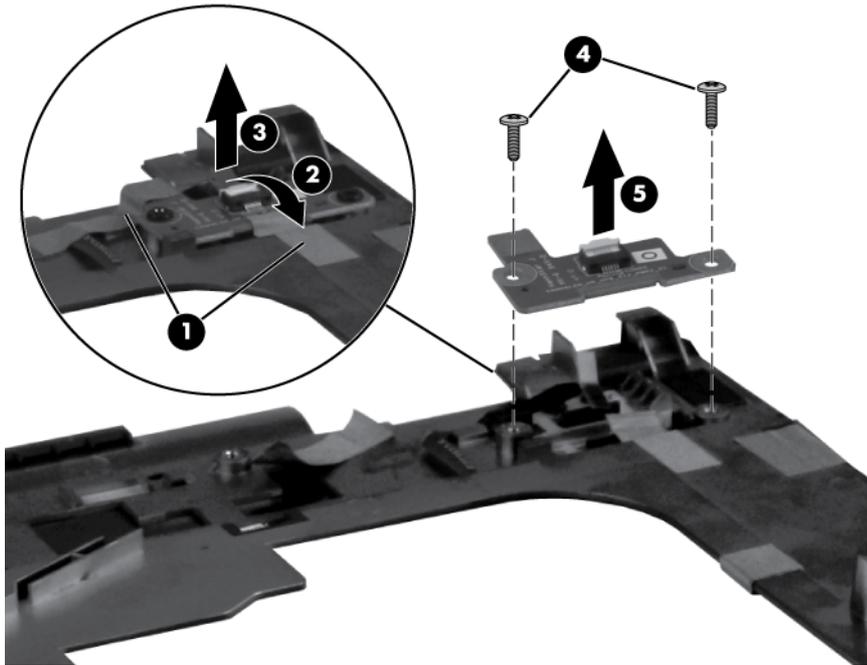
Before removing the power button board, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the power button board:

1. Position the top cover upside-down, with the front toward you.
2. Remove the two pieces of tape from the top of the power button board **(1)**.
3. Release the ZIF connector **(2)** for the power button board cable and then disconnect the cable **(3)**.

4. Remove the two Torx 9M2.5×4.0 screws (4) that secure the power button board to the top cover and then remove the power button board (5).



Reverse this procedure to install the power button board.

## Function button board

Description	Spare part number
Function button board (includes cable)	652665-001

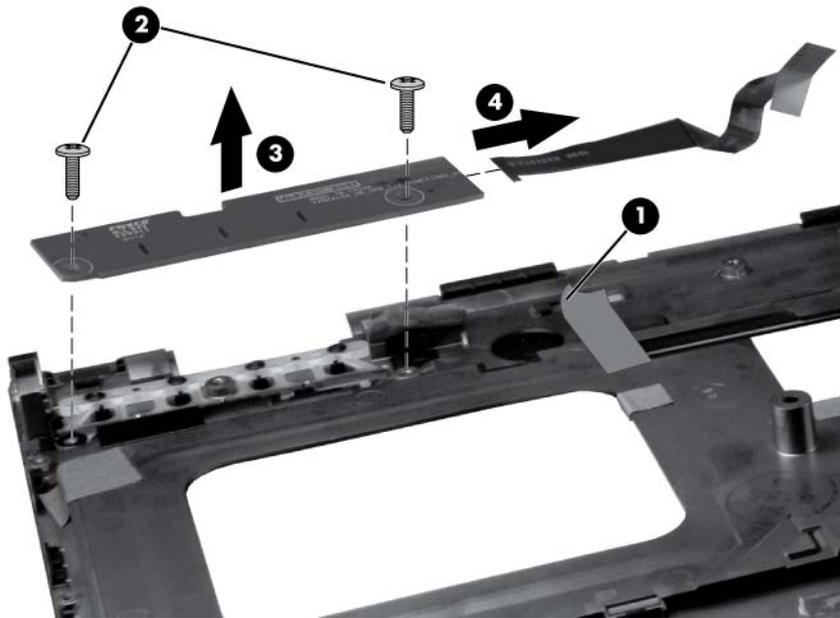
Before removing the function button board, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the function button board:

1. Position the top cover upside-down, with the front toward you.
2. Remove the tape **(1)** from the top of the function button board.
3. Remove the two Torx 9M2.5×4.0 screws **(2)** that secure the function button board to the top cover.
4. Lift the function button board **(3)** from the top cover.

5. Disconnect the function button board cable (4) from the function button board.



Reverse this procedure to install the function button board.

## Fingerprint reader board

Description	Spare part number
Fingerprint reader board (includes bracket)	652681-001

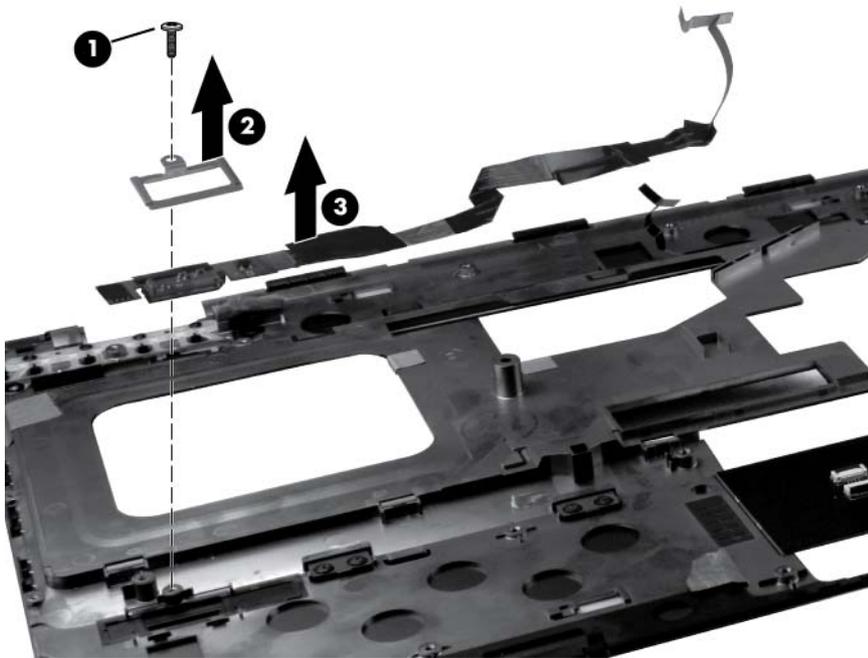
Before removing the fingerprint reader board, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the fingerprint reader board:

1. Position the top cover upside-down, with the front toward you.
2. Remove the Phillips M2.0×3.0 screw **(1)** that secures the fingerprint reader board to the top cover.
3. Remove the fingerprint reader board bracket **(2)** from the fingerprint reader board.

4. Lift the fingerprint reader board (3) from the top cover.



Reverse this procedure to install the fingerprint reader board.

## TouchPad button board

Description	Spare part number
TouchPad button board (included with top cover, spare part number 652652-001)	

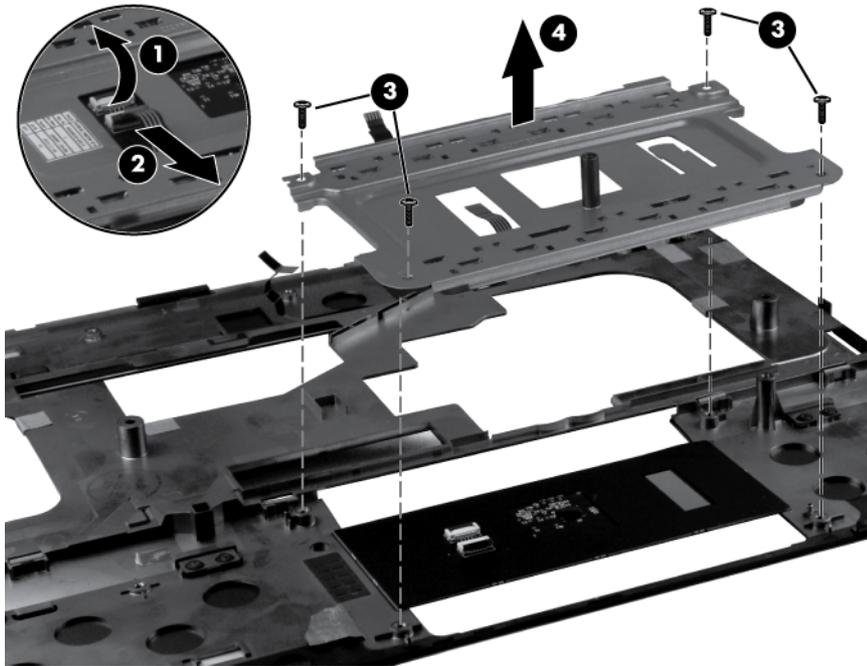
Before removing the TouchPad button board, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the TouchPad button board:

1. Position the top cover upside-down, with the front toward you.
2. Release the ZIF connector **(1)** for the TouchPad button board cable and then disconnect the cable **(2)**.
3. Remove the four Torx 9M2.5×4.0 screws **(3)** that secure the TouchPad button board to the top cover.

4. Lift the TouchPad button board (4) from the top cover.



Reverse this procedure to install the TouchPad button board.

## VGA port

Description	Spare part number
VGA port	652656-001

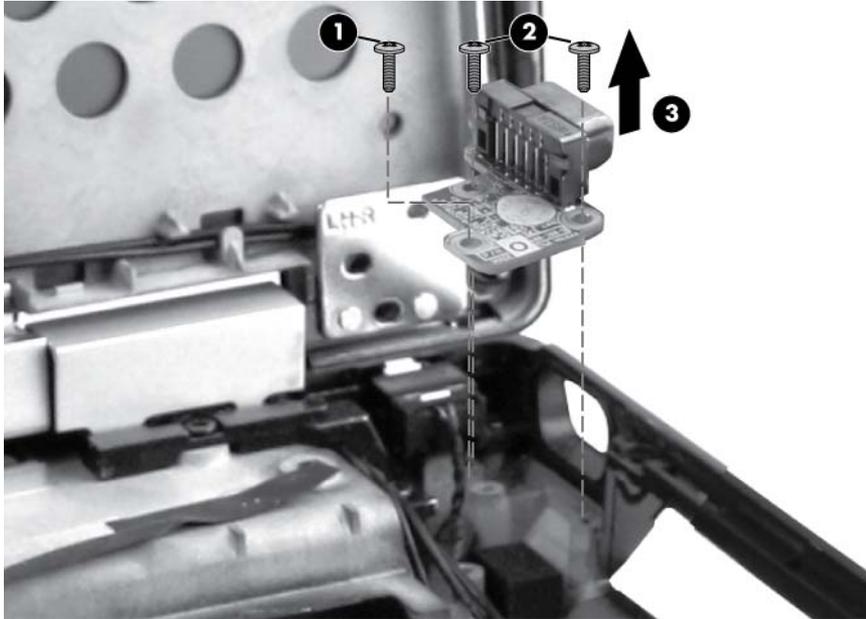
Before removing the VGA port, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the VGA port:

1. Position the computer right-side up with the front toward you.
2. Remove the Phillips M2.5×9.0 screw **(1)** that secures the VGA port to the base enclosure.
3. Remove the two Torx 9M2.5×3.0 screws **(2)** that secure the VGA port to the base enclosure.

4. Lift and remove the port from the base enclosure (3).



Reverse this procedure to install the VGA port.

## Video card fan/heat sink assembly

Description	Spare part number
Video card fan/heat sink assembly for use in computers with AMD FirePro M5950 and NVIDIA Quadro 1000M graphics cards	652675-001
Video card fan/heat sink assembly for use in computers with AMD FirePro M5950 for eSTAR	670940-001
Video card fan/heat sink assembly for use in computers with NVIDIA Quadro 2000M graphics cards	652677-001

Before removing the video card fan/heat sink 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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the video card fan/heat sink assembly:

1. Position the computer right-side up, with the front toward you.
2. Disconnect the fan cable **(1)** from the system board.
3. Remove the three Torx 9M2.5×6.0 screws **(2)** that secure the fan to the base enclosure.



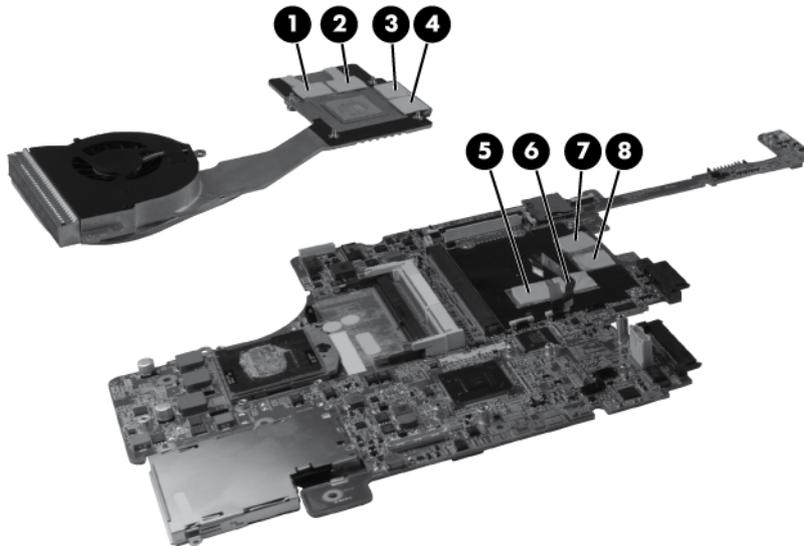
**NOTE:** The screw closest to the display may be hidden under display cables.

4. Loosen the four captive screws **(3)** that secure the video card heat sink to the base enclosure.

5. Lift the video card fan/heat sink assembly from the base enclosure (4).



**NOTE:** The thermal material must be thoroughly cleaned from the surfaces of the heat sink (1), (2), (3), and (4) and the system board (5), (6), (7), and (8), each time the heat sink is removed. Replacement thermal material is included with all heat sink and system board spare part kits.



Reverse this procedure to install the video card fan/heat sink assembly.

**NOTE:** To properly ventilate the computer, allow at least a 7.6 cm (3 in) 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.

## Processor heat sink

All heat sink spare part kits include replacement thermal material.

Description	Spare part number
<b>NOTE:</b> The processor heat sink is included with the video card fan/heat sink assembly.	
Video card fan/heat sink assembly for use in computers with AMD FirePro M5950 and NVIDIA Quadro 1000M graphics cards	652675-001
Video card fan/heat sink assembly for use in computers with NVIDIA Quadro 2000M graphics cards	652677-001

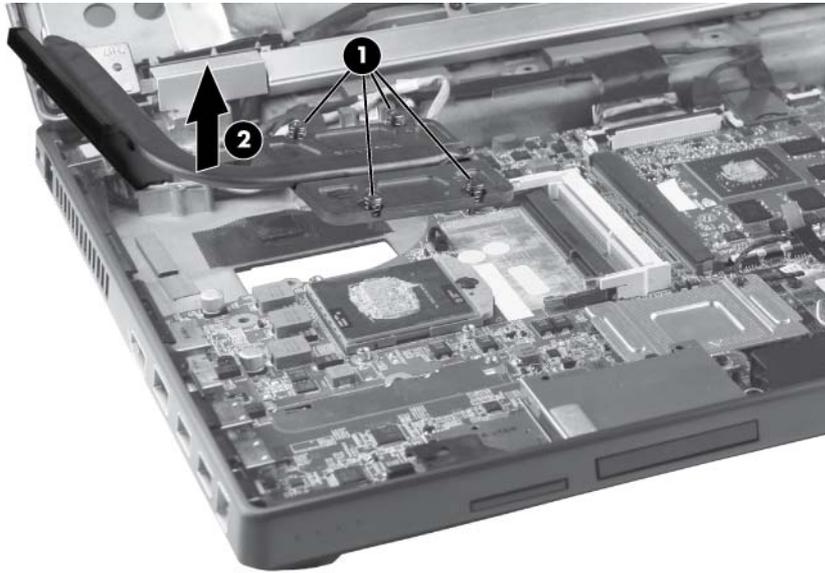
Before removing the processor heat sink, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))

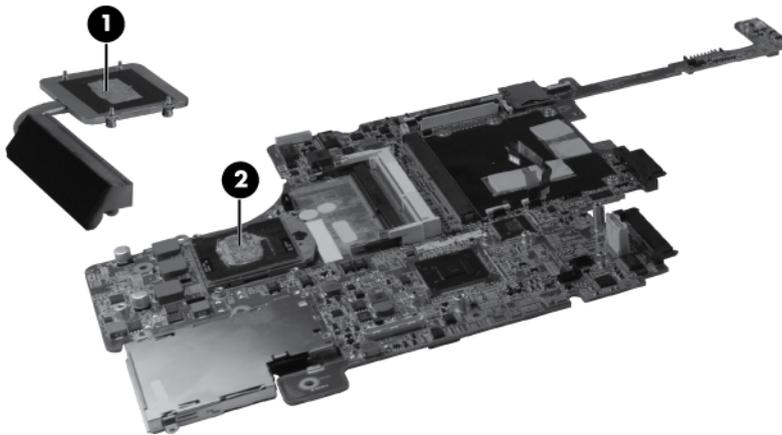
Remove the processor heat sink:

1. Position the computer right-side up, with the front toward you.
2. Loosen the four captive screws **(1)** that secure the processor heat sink to the base enclosure.

3. Remove the heat sink (2) from the computer.



 **NOTE:** The thermal material must be thoroughly cleaned from the surfaces of the processor heat sink components (1) and system board components (2) each time the processor heat sink is removed. Thermal material is included with all heat sink and processor spare part kits.



Reverse this procedure to install the processor heat sink.

## Graphics card



**NOTE:** All graphics card spare part kits include replacement thermal material.

Description	Spare part number
NVIDIA Quadro 1000M graphics card	652673-001
NVIDIA Quadro 2000M graphics card	652674-001
AMD FirePro M5950 graphics card	652676-001

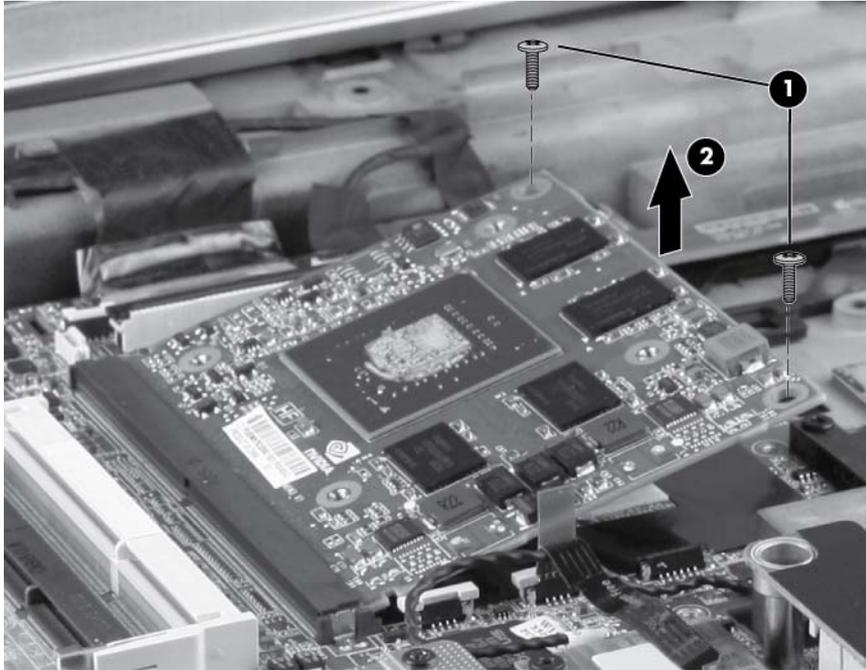
Before removing the graphics card, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))

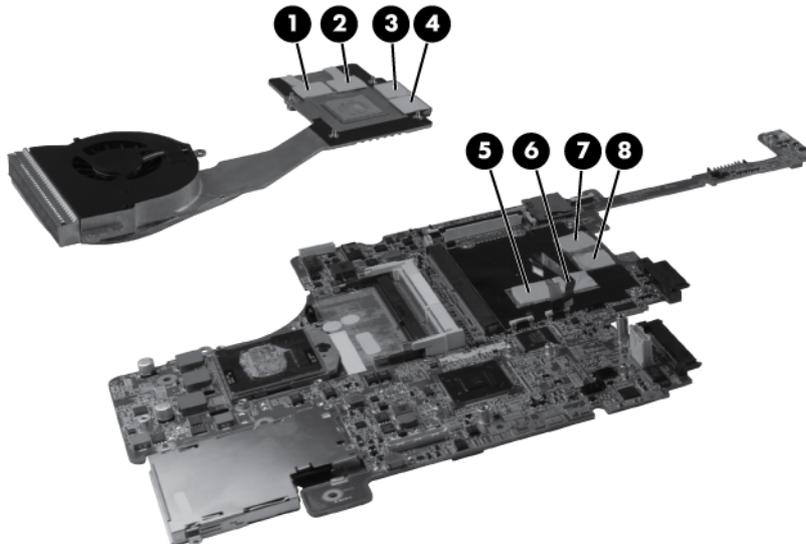
Remove the graphics card:

1. Position the computer right-side up, with the front toward you.
2. Remove the two Torx 9M2.5×6.0 screws **(1)** that secure the graphics card to the computer. (The edge of the board opposite the graphics card slot rises away from the computer.)

3. Remove the graphics card (2) by sliding it away from the slot at an angle.



 **NOTE:** The thermal material must be thoroughly cleaned from the surfaces of the graphics card components (1), (2), (3), and (4) and the system board components (5), (6), (7), and (8), each time the graphics card is removed. Replacement thermal material is included with all graphics card and system board spare part kits.



Reverse this procedure to install the graphics card.

## Processor



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

Description	Spare part number
<b>Intel Core i7 processors, quad-core</b>	
i7-2860QM, 2.50-GHz (Turbo up to 3.60) processor 8-MB L3 cache, 8 threads	666175-002
i7-2820QM, 2.30-GHz (Turbo up to 3.40) processor 8-MB L3 cache, 8 threads	657414-001
i7-2760QM, 2.40-GHz (Turbo up to 3.50) processor 6-MB L3 cache, 8 threads	666174-002
i7-2720QM, 2.20-GHz (Turbo up to 3.30) processor 6-MB L3 cache, 8 threads	657413-001
i7-2670QM, 2.20-GHz (Turbo up to 3.10) processor 6-MB L3 cache, 8 threads (not configurable with iAMT)	665116-002
i7-2630QM, 2.00-GHz (Turbo up to 2.90) processor 6-MB L3 cache, 8 threads (not configurable with iAMT)	657412-001
<b>Intel Core i7 processor, dual-core</b>	
i7-2640M, 2.80-GHz (Turbo up to 3.40) processor 3-MB L3 cache, 8 threads	666173-002
i7-2620M, 2.70-GHz (Turbo up to 3.40) processor 4-MB L3 cache, 4 threads	657411-001
<b>Intel Core i5 processors, dual-core</b>	
i5-2540M, 2.60-GHz (Turbo up to 3.30) processor 3-MB L3 cache, 4 threads	657410-001
i5-2520M, 2.50-GHz (Turbo up to 3.20) processor 3-MB L3 cache, 4 threads	657409-001

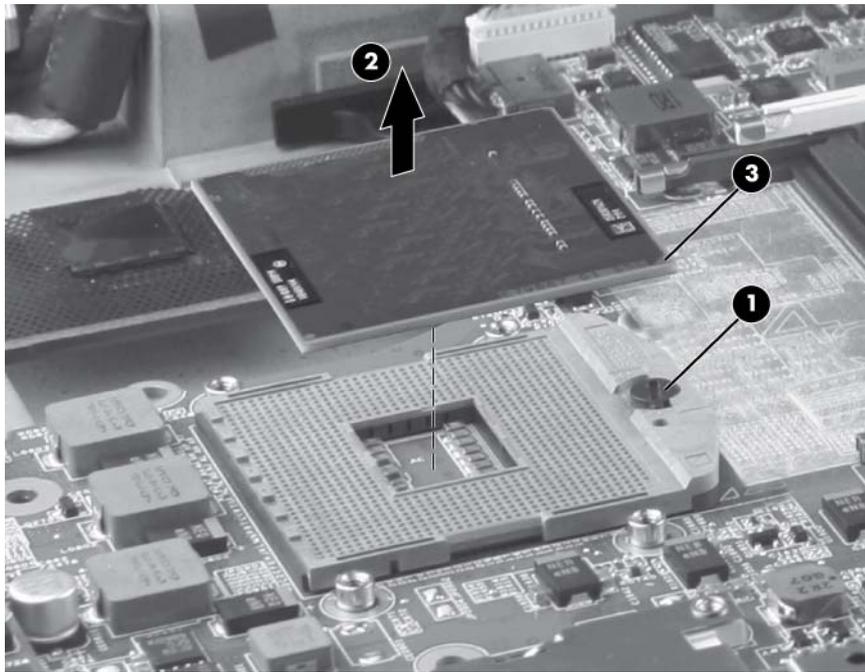
Before removing the processor, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))

Remove the processor:

1. Position the computer right-side up, with the front toward you.
2. Use a flat-bladed screwdriver to turn the processor locking screw **(1)** one-half turn counterclockwise until you hear a click.
3. Lift the processor **(2)** straight up and remove it.

 **NOTE:** The gold triangle **(3)** on the processor must be aligned with the triangle embossed on the processor slot when you install the processor.



Reverse this procedure to install the processor.

## 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 652662-001. For information about Cable Kit contents, see [Cable Kit on page 30](#).

Description	Spare part number
56k v.92 MDC data/fax modem module	628824-001

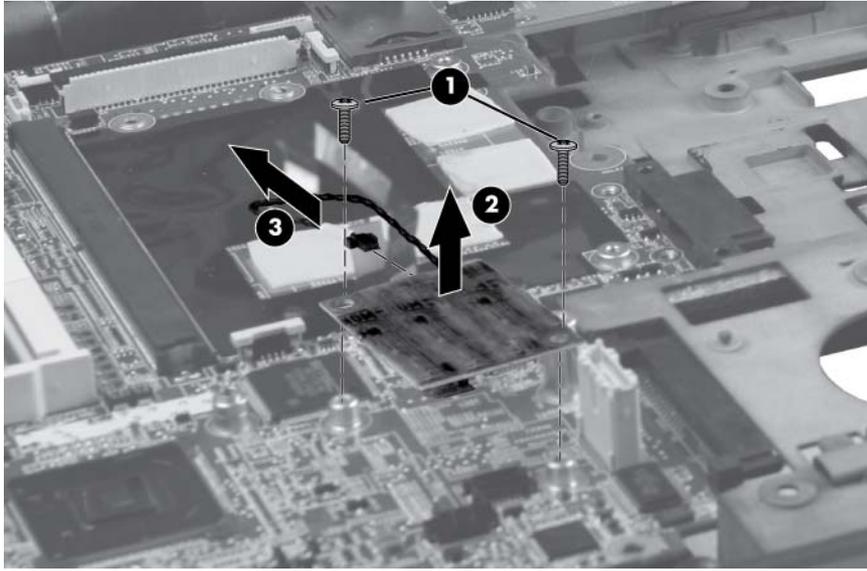
Before removing the modem module, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. Processor (see [Processor on page 90](#))

Remove the modem module:

1. Turn the computer right-side up, with the front toward you.
2. Remove the two Phillips M2.0×3.0 barrel screws **(1)** that secure the modem module to the system board.
3. Disconnect the modem module **(2)** from the system board by lifting it straight up.

4. Disconnect the modem module cable (3) from the system board.



Reverse this procedure to install the modem module.

## Audio/USB 3.0 board

Description	Spare part number
Audio/USB 3.0 board (select models only)	652668-001

Before removing the audio/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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. Processor (see [Processor on page 90](#))
  - h. Modem module (see [Modem module on page 92](#))

Remove the audio/USB 3.0 board:

1. Turn the computer right-side up, with the front toward you.
2. Remove the three Torx 9M2.5×4.0 screws (**1**) that secure the audio/USB 3.0 board to the system board.

3. Disconnect the audio/USB 3.0 board (2) from the system board by lifting it out at an angle.



Reverse this procedure to install the modem module.

## Speakers

Description	Spare part number
Speaker	652669-001

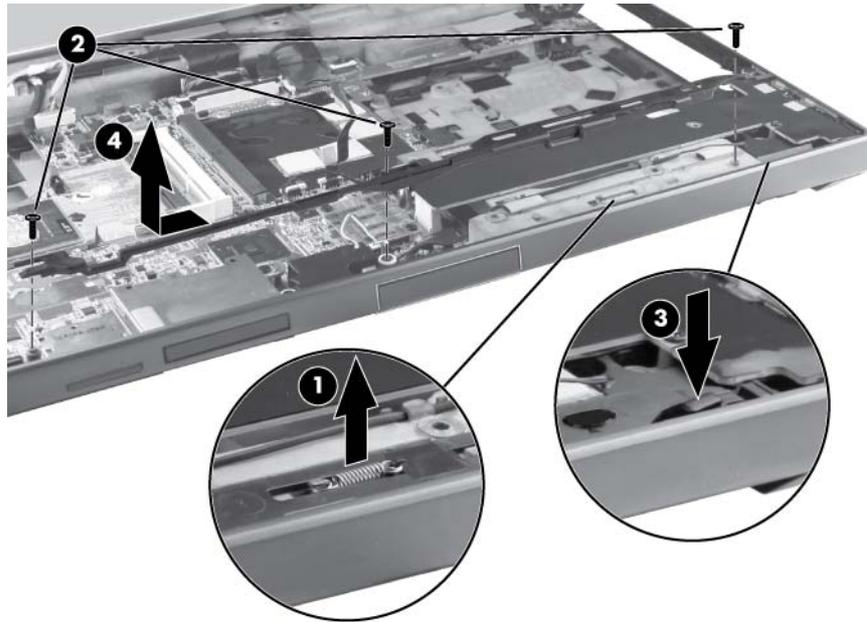
Before removing the speakers, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. Processor (see [Processor on page 90](#))
  - h. Modem module (see [Modem module on page 92](#))
  - i. Audio/USB 3.0 board (see [Audio/USB 3.0 board on page 94](#))

Remove the speakers:

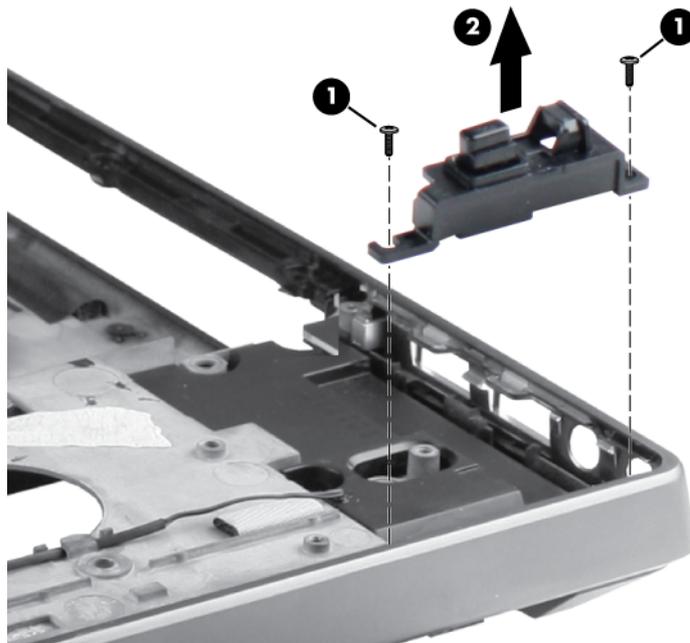
1. Position the computer right-side up, with the front toward you.
2. Remove the display latch:
  - a. Remove the spring **(1)** from the display latch lock.
  - b. Remove the three Phillips M2.0×2.0 screws **(2)** from the display latch lock.
  - c. Push down the button **(3)** in the front right corner of the display latch lock.

- d. Slide the display latch lock to the left and remove by pulling straight up from the base enclosure (4).



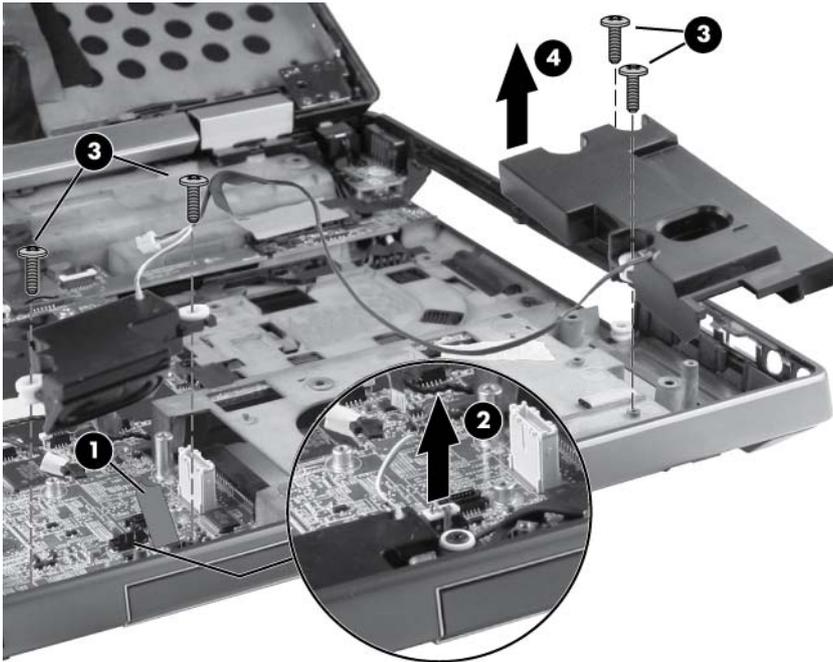
3. Remove the display latch spring buttons:

- a. In the lower right corner of the base enclosure, remove the two Torx 9M2.0×4.0 screws (1) that secure the display latch spring button to the base enclosure.
- b. Lift the right display latch spring button (2) straight up from the base enclosure.



4. Remove the tape (1) from the top of the speakers.
5. Disconnect the speaker cable (2) from the system board.

6. Remove the four Torx 9M2.0×4.0 screws (3) that secure the speakers to the base enclosure.
7. Remove the speakers (4) from the base enclosure.



Reverse this procedure to install the speakers.

## Secure Digital (SD) card/USB 2.0 assembly

Description	Spare part number
Secure Digital (SD) card/USB 2.0 assembly	652670-001

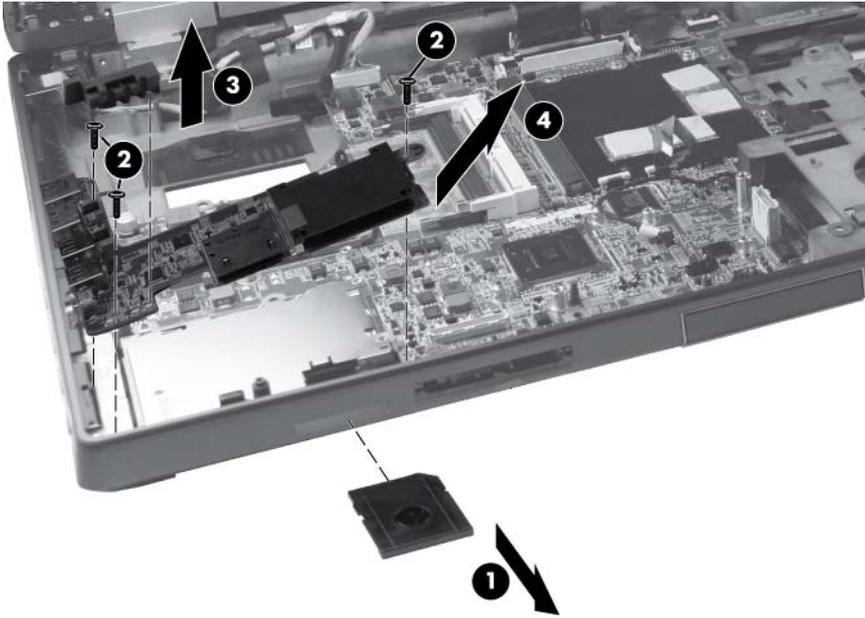
Before removing the Secure Digital (SD) card/USB 2.0 board, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. Processor (see [Processor on page 90](#))
  - h. Modem module (see [Modem module on page 92](#))
  - i. Audio/USB 3.0 board (see [Audio/USB 3.0 board on page 94](#))
  - j. Speakers (see [Speakers on page 96](#))

Remove the Secure Digital (SD) card/USB 2.0 assembly:

1. Position the computer right-side up, with the front toward you.
2. Remove the SD slot protective insert **(1)**.
3. Remove the three Torx 9M2.5×4.0 screws **(2)** that secure the assembly to the system board.

4. Lift the assembly up (3) and remove the assembly from the base enclosure at a 45 degree angle (4).



Reverse this procedure to install the Secure Digital (SD) card/USB 2.0 assembly.

## Northbridge chip heat plate

Description	Spare part number
Northbridge chip heat plate	652685-001

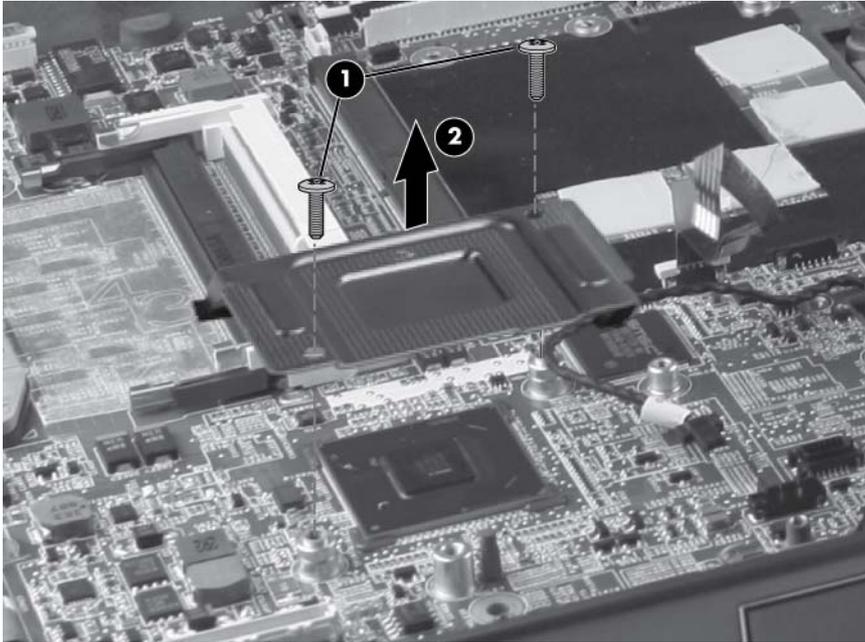
Before removing the Northbridge chip heat plate, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the Northbridge chip heat plate:

1. Position the computer right-side up, with the front toward you.
2. Remove the two Phillips M2.5×3.0 screws (**1**) that secure the Northbridge chip heat plate to the system board.

3. Remove the Northbridge chip heat plate from the system board (2).



Reverse this procedure to install the Northbridge chip heat plate.

## RJ-45 connector cable



**NOTE:** The RJ-45 connector cable is included in the Cable Kit, spare part number 652662-001.

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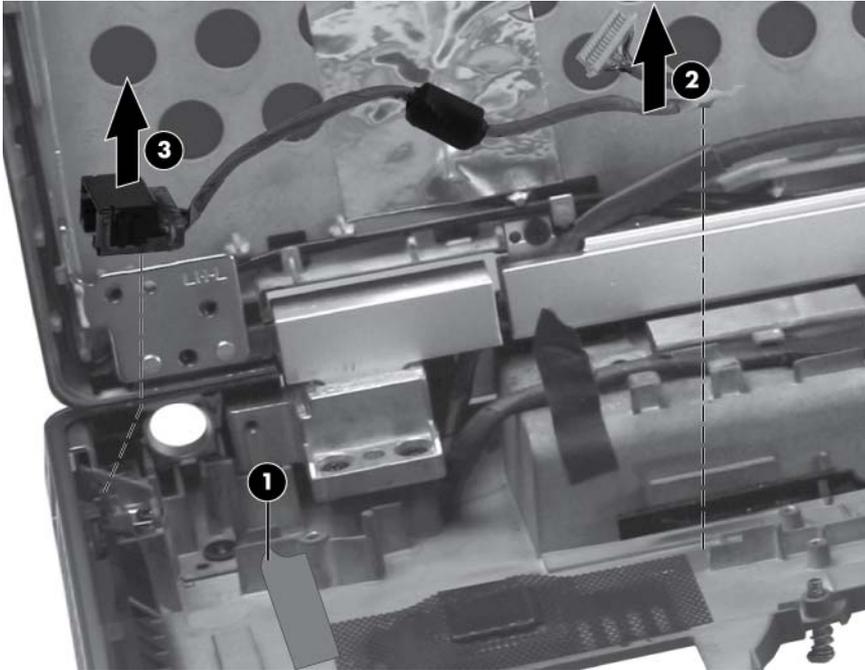
Before removing the RJ-45 connector cable, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))

Remove the RJ-45 connector cable:

1. Position the computer right-side up, with the front toward you.
2. Remove the tape **(1)** from the top of the RJ-45 connector cable.
3. Remove the RJ-45 connector cable from the clips and routing channel **(2)** built into the base enclosure.

4. Remove the RJ-45 connector cable from the base enclosure (3).



Reverse this procedure to install the RJ-45 connector cable.

## Power connector cable



**NOTE:** The power connector cable is included in the Cable Kit, spare part number 652662-001.

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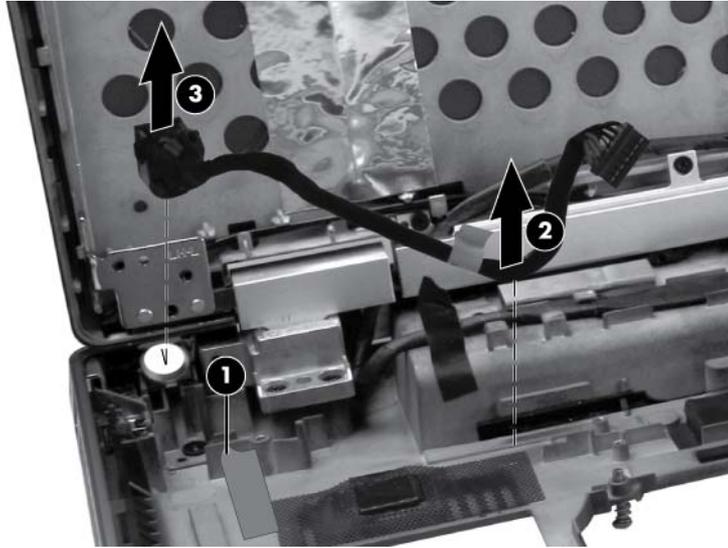
Before removing the power connector cable, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))

Remove the power connector cable:

1. Position the computer right-side up, with the front toward you.
2. Remove the tape **(1)** from the top of the power connector cable.
3. Lift the power connector cable **(2)** up from the routing in the rear of the base enclosure.

4. Remove the power connector cable from the enclosure (3).



Reverse this procedure to install the power connector cable.

## System board



**NOTE:** All system board spare part kits include replacement thermal material and VGA support bracket.



**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 with dual-core processors	652637-001
(Alcor chip upgrade) For use with dual-core processors	684318-001
For use with quad-core processors	652638-001
(Alcor chip upgrade) For use with quad-core processors	684319-001
For use with dual-core processors in China and Ukraine	656213-002
(Alcor chip upgrade) For use with dual-core processors in China and Ukraine	684320-001
For use with quad-core processors in China and Ukraine	656214-002
(Alcor chip upgrade) For use with quad-core processors in China and Ukraine	684321-001

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))

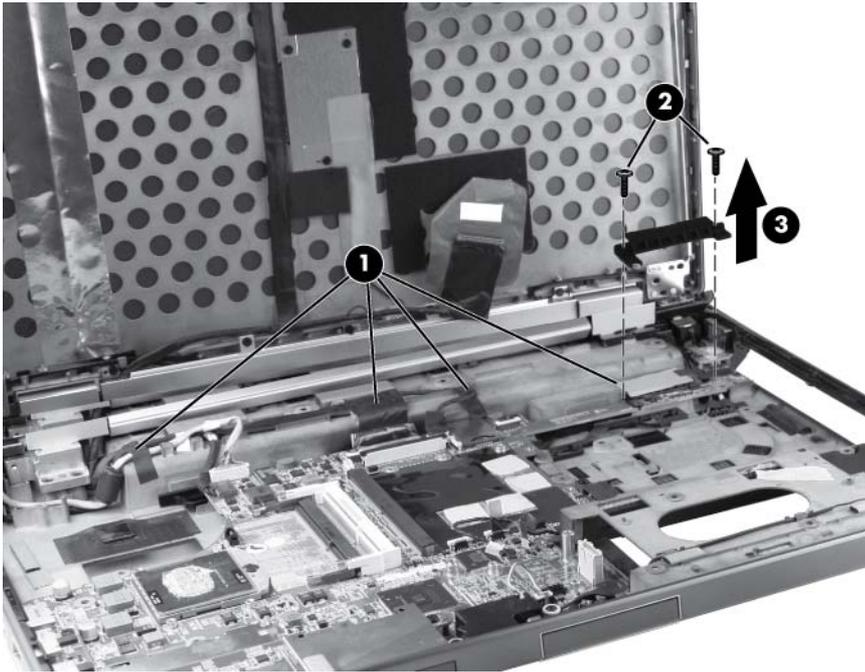
When replacing the system board, be sure that the following components are removed from the defective system board and installed on the replacement system board:

- SIM (see [SIM on page 49](#))
- Memory modules (see [Expansion memory modules on page 51](#))

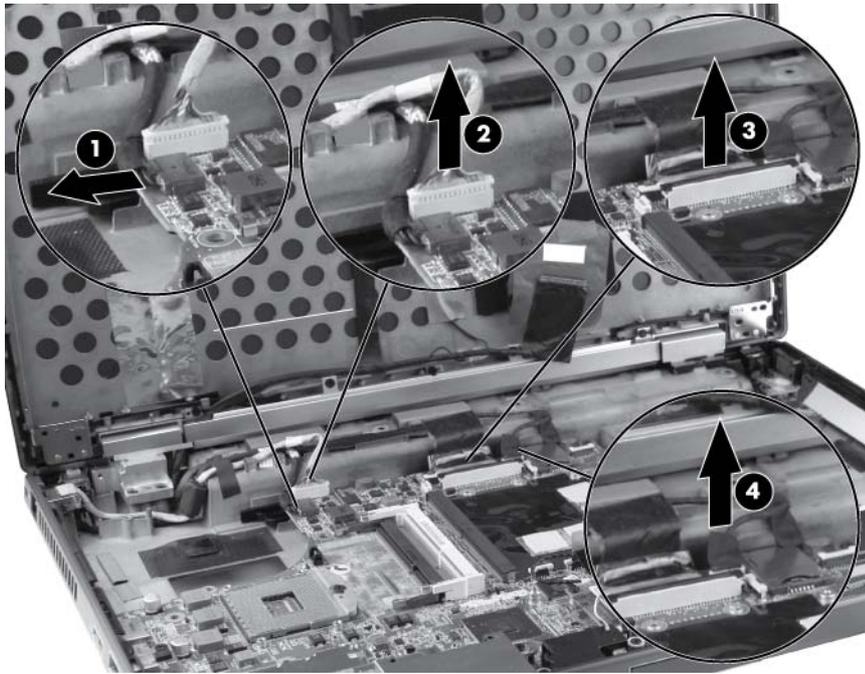
- WLAN module (see [WLAN module on page 54](#))
- WWAN module (see [WWAN module on page 56](#))
- Processor (see [Processor on page 90](#))
- Graphics card (see [Graphics card on page 88](#))

Remove the system board:

1. Position the computer right-side up, with the front toward you.
2. Remove the tape (1) that secures the cabling to the system board.
3. Remove the screws (2) that secure the plastic bracket to the system board, and then remove the bracket (3).

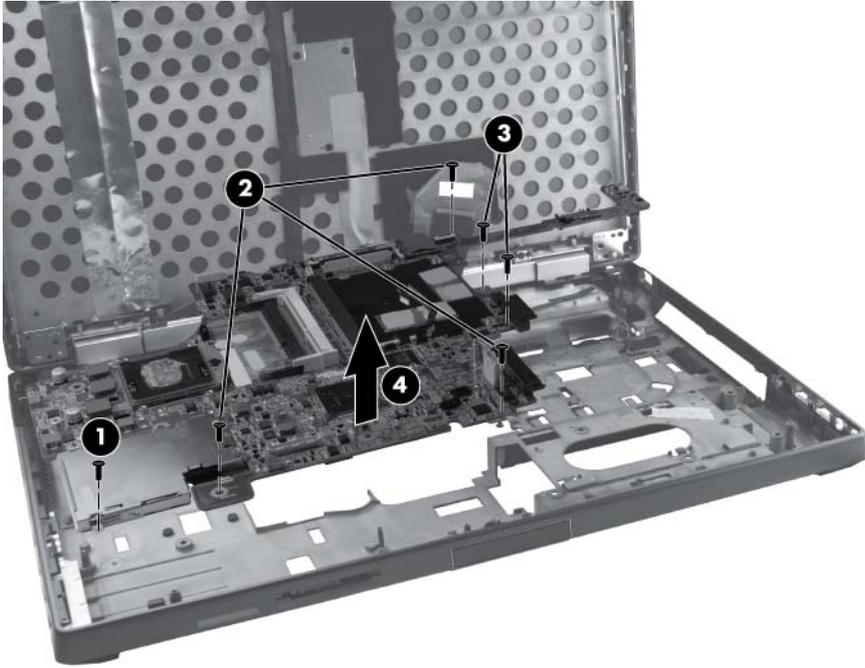


4. Disconnect the power jack **(1)**, the network cable **(2)**, the display cable **(3)**, and the webcam cable **(4)**.



5. Remove the Phillips M2.0×3.0 screw **(1)** that secures the smart card reader to the system board.
6. Remove the three Torx 9M2.5×4.0 screws **(2)** that secure the system board to the base enclosure.
7. Remove the two Torx 9M2.0×8.0 screws **(3)** that secure the system board to the optical drive connector.

8. Remove the system board (4) from the base enclosure.



Reverse the preceding procedure to install the system board.

## ExpressCard assembly

Description	Spare part number
ExpressCard assembly for use in models without the Alcor chip upgrade	652680-001
ExpressCard assembly for use in models with the Alcor chip upgrade	684793-001

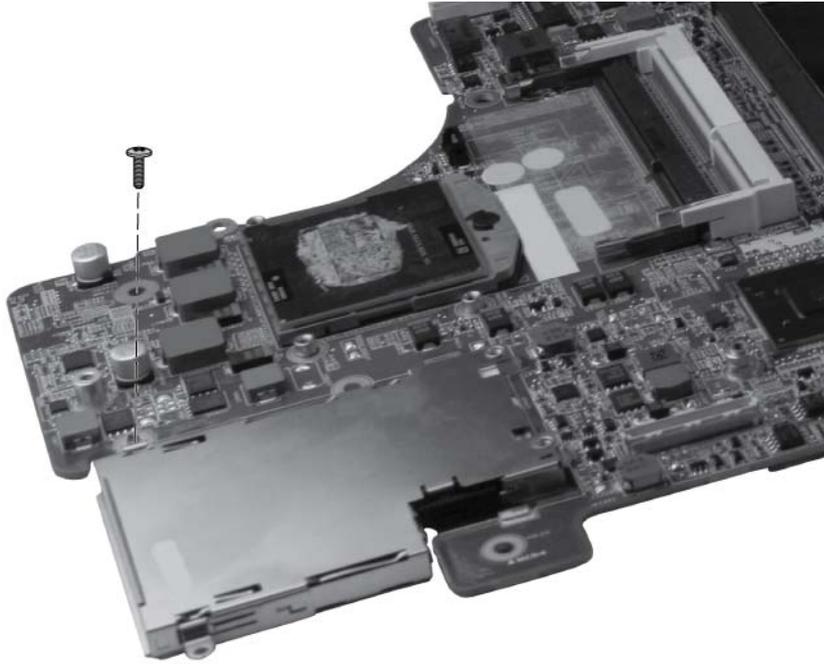
Before removing the ExpressCard assembly, follow these steps:

1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet, and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. System board (see [System board on page 107](#))

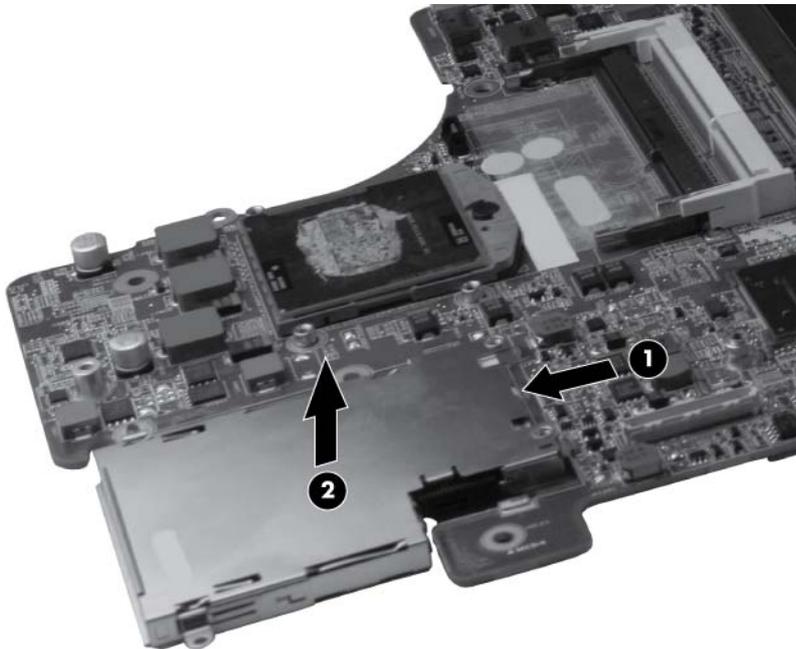
Remove the ExpressCard assembly:

1. Position the system board upright.

2. Remove the Torx 8M2.5×4.0 screw that secures the ExpressCard assembly to the system board.



3. Using a small screwdriver, press to release the latch (1) that secures the assembly to the connector, and then lift the assembly up (2) and off the system board.



Reverse this procedure to install the ExpressCard assembly.

## RJ-11 connector cable



**NOTE:** The RJ-11 connector cable is included in the Cable Kit, spare part number 652662-001.

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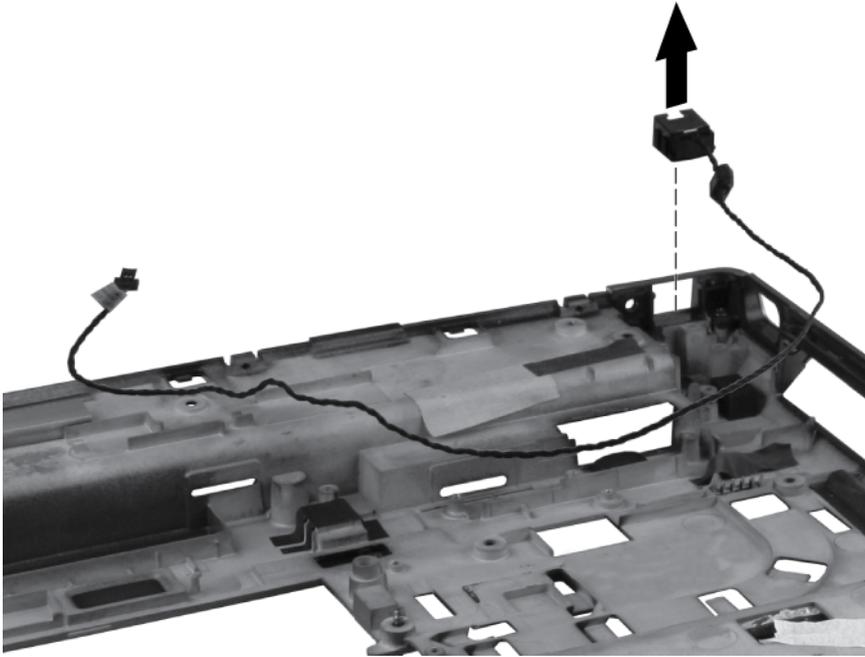
Before removing the RJ-11 connector cable, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. System board (see [System board on page 107](#))

Remove the RJ-11 connector cable:

1. Position the computer right-side up, with the front toward you.

2. Remove the RJ-11 connector cable from the clips and routing channel built into the base enclosure.



3. Remove the RJ-11 connector cable from the base enclosure.  
Reverse this procedure to install the RJ-11 connector cable.

## Service access cover latch



**NOTE:** The service access cover latch is included with the base enclosure assembly, spare part number 652649-001.

---

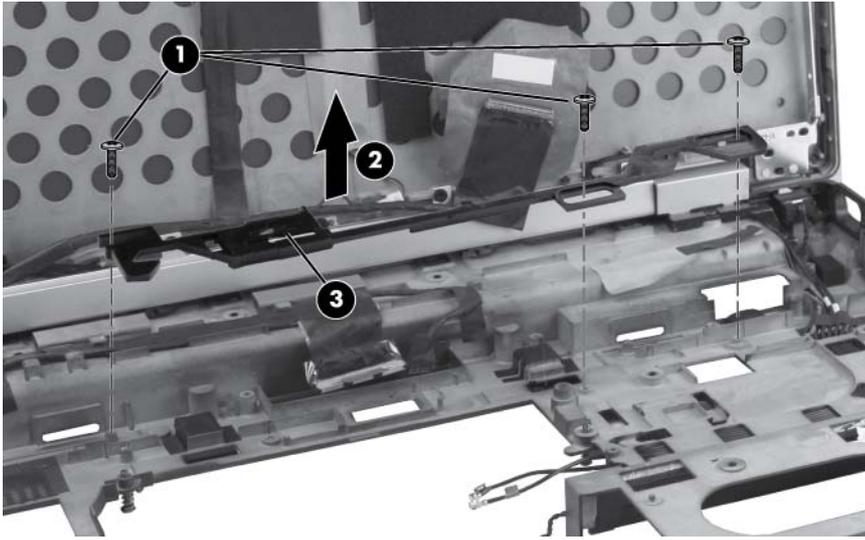
Before removing the service access cover latch, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. System board (see [System board on page 107](#))
  - h. RJ-11 connector cable (see [RJ-11 connector cable on page 113](#))

Remove the service access cover latch:

1. Position the computer right-side up with the front toward you.
2. Remove the three Phillips M2.0×2.0 screws **(1)** that secure the service access cover latch to the base enclosure.

3. Remove the service access cover latch from the base enclosure (2), ensuring that the spring (3) remains intact with the service access cover latch.



Reverse this procedure to install the service access cover latch.

## Battery latch

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 **NOTE:** The battery latch is included with the base enclosure assembly, spare part number 652649-001.

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Before removing the battery latch, 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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. System board (see [System board on page 107](#))
  - h. RJ-11 connector cable (see [RJ-11 connector cable on page 113](#))
  - i. Service access cover latch (see [Service access cover latch on page 115](#))

Remove the battery latch:

1. Position the computer right-side up with the front toward you.

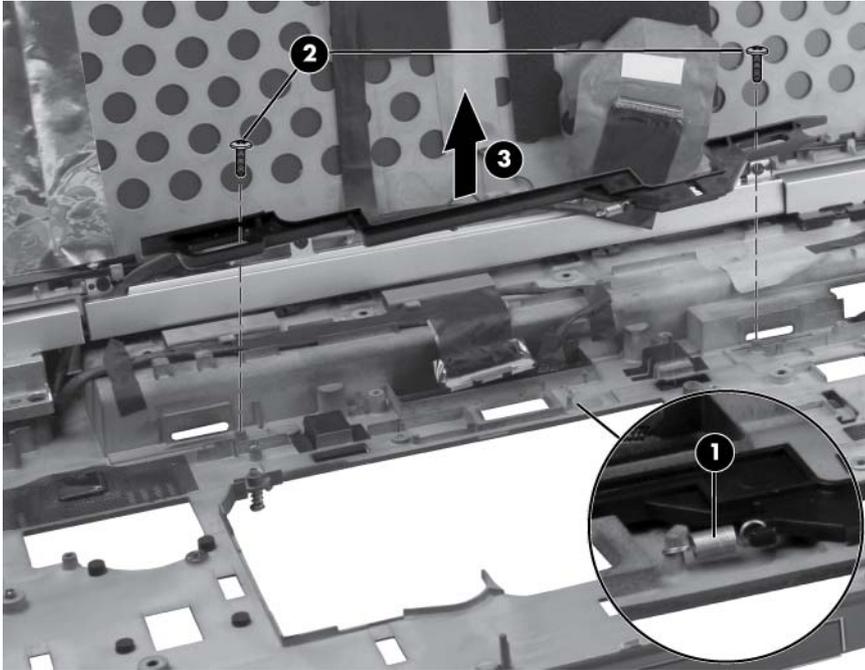
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 **CAUTION:** Ensure that the spring (1) remains intact while removing the battery latch.

---

2. Remove the two Phillips M2.0×2.0 screws (2) that secure the battery latch to the base enclosure.

3. Remove the battery latch from the base enclosure (3).



Reverse this procedure to install the battery latch.

## Security lock

 **NOTE:** The security lock is included with the base enclosure assembly, spare part number 652649-001.

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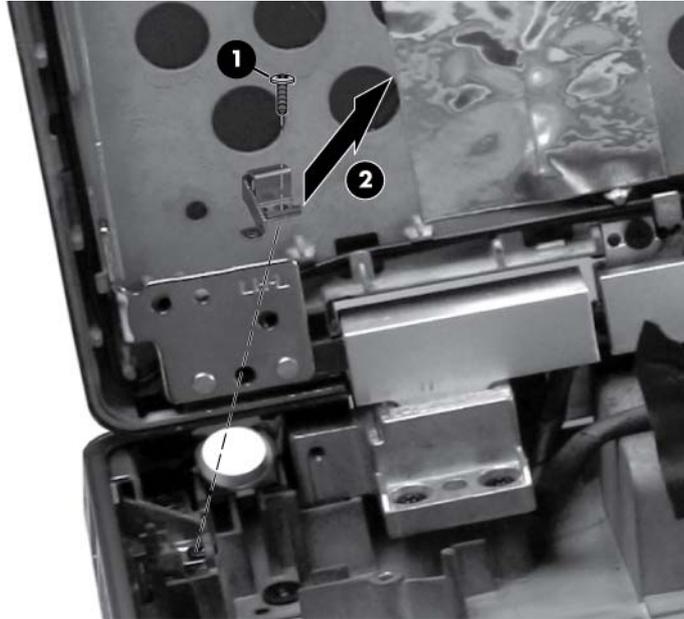
Before removing the security lock, follow these steps:

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 48](#)).
5. Remove the service access cover (see [Service access cover on page 50](#)).
6. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))
  - e. Video card fan/heat sink assembly (see [Video card fan/heat sink assembly on page 84](#))
  - f. Processor heat sink (see [Processor heat sink on page 86](#))
  - g. System board (see [System board on page 107](#))

Remove the security lock:

1. Position the computer right-side up with the front toward you.
2. Remove the Torx 9M2.5×6.0 screw **(1)** that secures the security lock to the base enclosure.

3. Remove the security lock (2) at an angle from the base enclosure.



Reverse this procedure to install the security lock.

## Display panel

Description	Spare part number
HD+ WVA display panel	653271-001
FHD WVA display panel for use only with LTE module	653275-001
FHD WVA display panel	653273-001

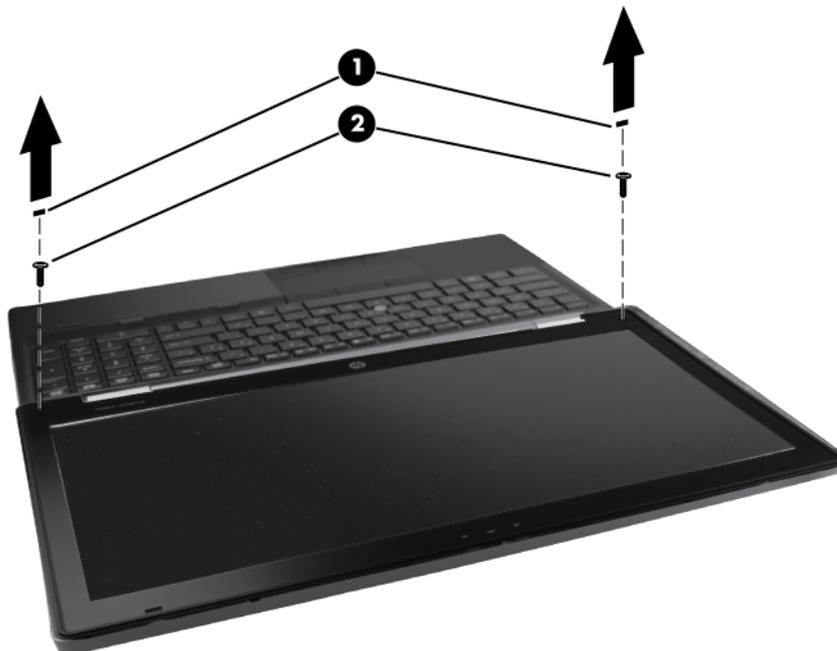
 **NOTE:** The display panel can be removed separately from the display assembly.

Before removing the display panel, follow these steps:

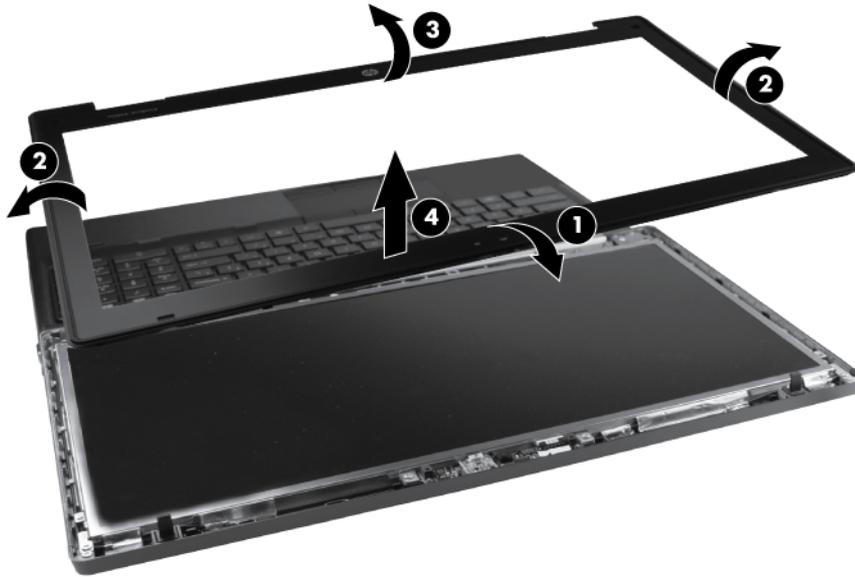
1. Shut down the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect all external devices connected to the computer.
3. Disconnect the power from the computer by first unplugging the power cord from the AC outlet and then unplugging the AC adapter from the computer.
4. Remove the battery (see [Battery on page 48](#)).

Remove the display panel:

1. Remove the display bezel:
  - a. Position the computer upright on a flat surface with the display panel open.
  - b. Remove the two rubber pads (1) that cover the display panel screws.
  - c. Remove the two Torx 9M2.5×5.0 screws (2) that secure the display bezel to the display enclosure.



- d. Flex the top **(1)** of the bezel from the inside edge until it disengages from the display back cover.
- e. Flex the inside edge of the left side and the right side **(2)** of the bezel until it disengages from the display back cover.
- f. Flex the bottom **(3)** of the bezel from the inside edge until it disengages from the display back cover.
- g. Remove the display bezel from the display back cover **(4)**.



- 2. Remove the six Torx 9M2.5×5.0 screws that secure the display panel to the display enclosure.
- 3. Disengage the display panel from the base enclosure by closing the display enclosure to 45 degrees while holding the sides of the display panel.
- 4. Remove the two pieces of tape that secure cables to the back of the display panel.
- 5. Remove the eight **(1)** Phillips M2.0×3.0 screws that secure the display panel to the display hinges (four on either side).

6. Remove the display panel (2).



Reverse this procedure to install the display panel.

## Display assembly

Description	Spare part number
<b>39.6-cm (15.6 in) FHD RGB UWVA LCD display assembly with DreamColor:</b>	
For use in computer models without webcams	653277-001
For use in computer models with webcams	653278-001

 **NOTE:** It is not necessary to remove the display panel in order to remove the display assembly. However, for access to the webcam module, WLAN module, or WWAN module, you must remove the display panel. For display panel removal instructions, see [Display panel on page 121](#)

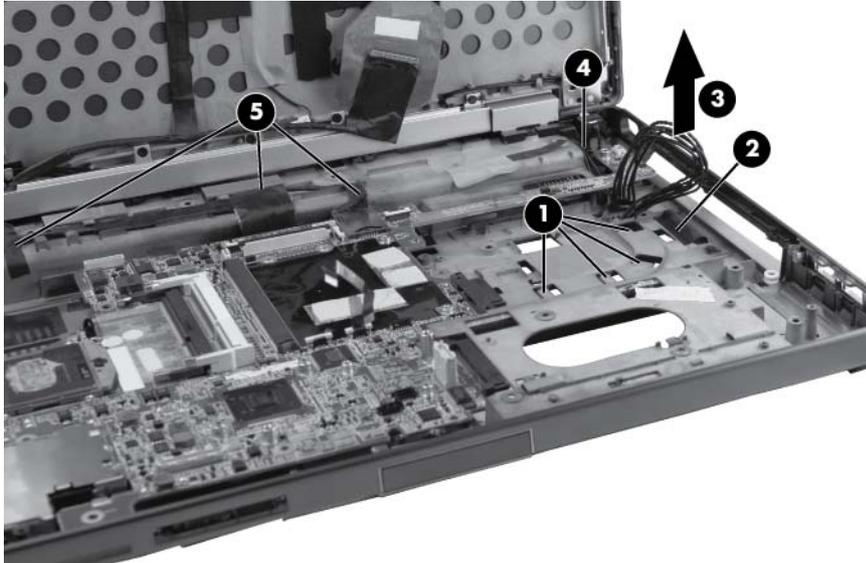
Before removing the display assembly, follow these steps:

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 48](#)).
5. (Optional) Remove the display panel (see [Display panel on page 121](#)).
6. Remove the service access cover (see [Service access cover on page 50](#)).
7. Disconnect the wireless antenna cables from the WLAN module (see [WLAN module on page 54](#)) and the WWAN module (see [WWAN module on page 56](#)).
8. Remove the following components:
  - a. Hard drive (see [Hard drive on page 60](#))
  - b. Optical drive (see [Optical drive on page 65](#))
  - c. Keyboard (see [Keyboard on page 67](#))
  - d. Top cover (see [Top cover on page 71](#))

Remove the display assembly:

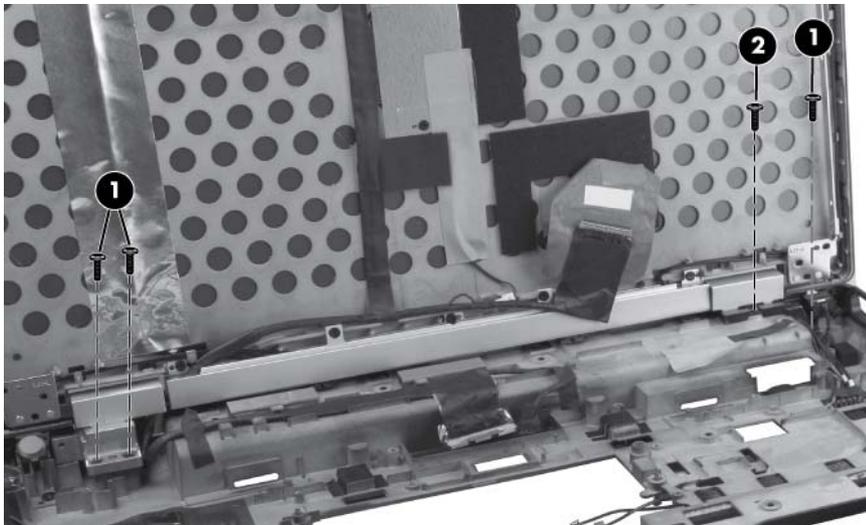
1. Position the computer right-side up, with the front toward you.
2. Remove the WLAN and WWAN antenna cables from the routing channel in the base enclosure **(1)**.
3. Remove the tape that covers the cables **(2)**.
4. Thread the WLAN and WWAN antenna cables through the hole **(3)** and then back up underneath the system board **(4)**.

5. Remove the tape from along the back edge of the system board (4).



**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.

6. Remove the three Torx 9M2.5×6.0 screws (1) from the left hinge bracket and lower right hinge bracket .
7. Remove the Torx 9M2.5×4.0 screw (2) from the upper right hinge bracket.



8. Position the computer with the back toward you.
9. Remove the four Torx 9M2.5×5.5 screws (1) on the back of each hinge.
10. Remove the four Torx 9M2.5×3.5 screws (2) that secure the logo nameplate to the base enclosure.

11. Lift the display assembly **(3)** straight up from the base enclosure and remove it.

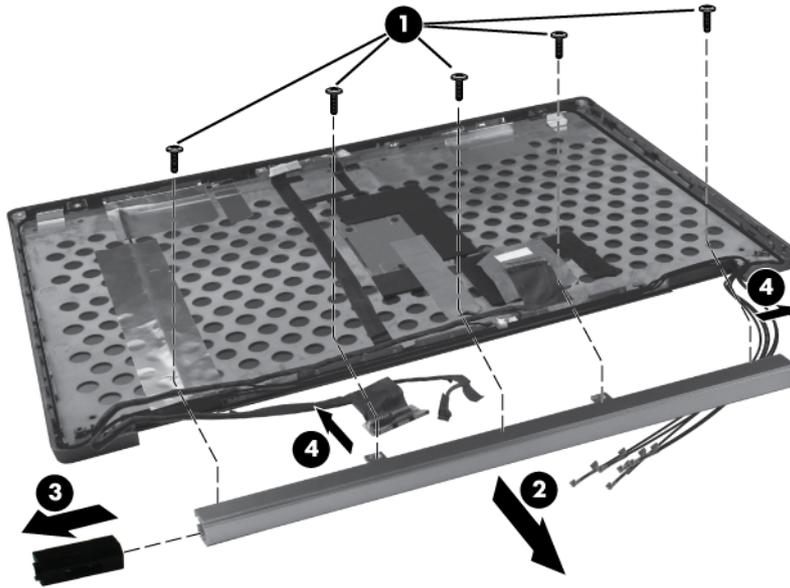


12. If it is necessary to replace the display hinges, remove them from the hinge cover. The left and right display hinges are available using spare part number 652646-001.



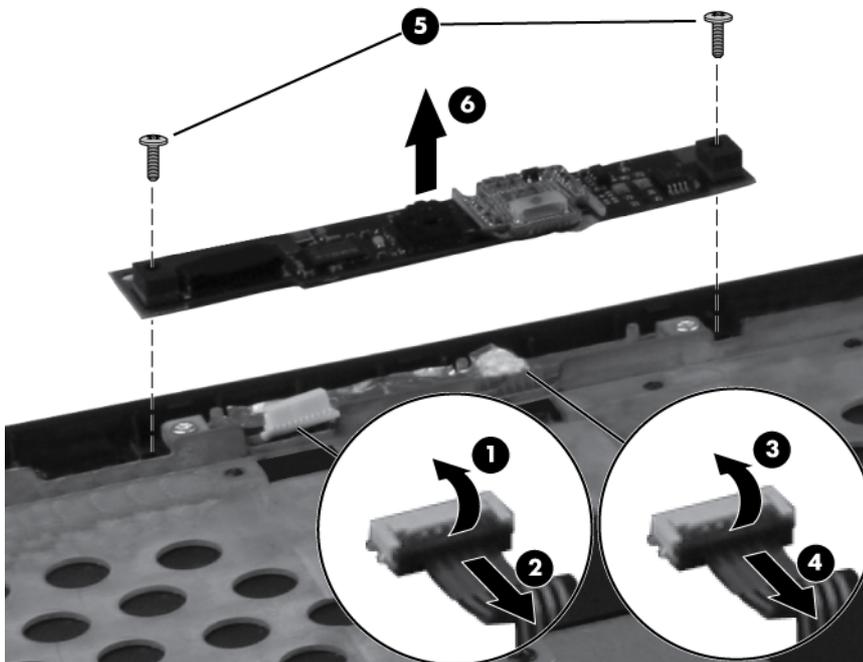
13. If it is necessary to remove the cable routing tray, remove the five Phillips M2.0×3.0 screws **(1)** that secure the cable routing tray to the display enclosure. The cable routing tray is available in the Raw Panel Support Kit, spare part number 657408-001.

14. Pull the tray (2) away from the display enclosure. Remove the end cap (3) from the tray, and then remove the cables (4).

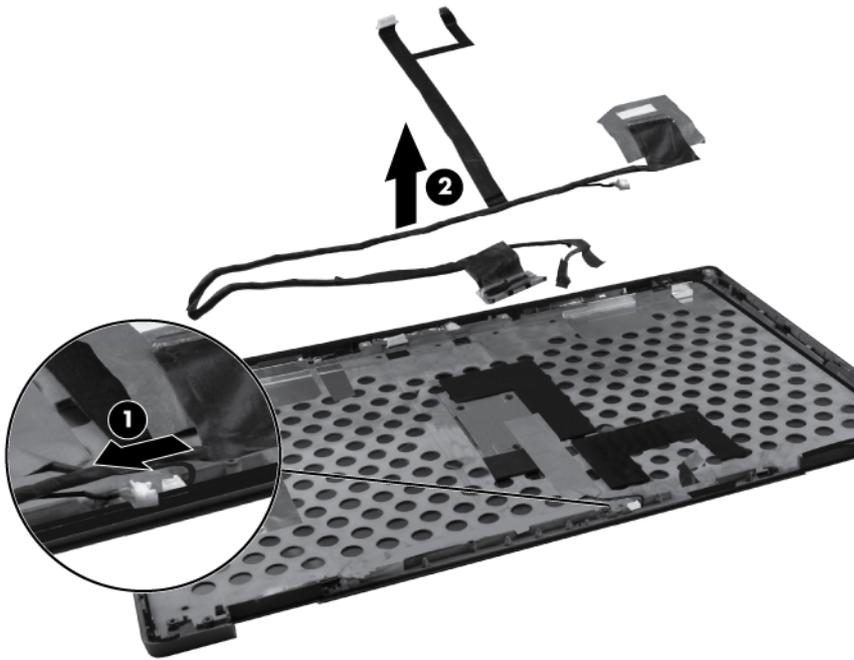


15. If it is necessary to replace the webcam module or ambient light sensor from the display enclosure, release the ZIF connector (1) for the webcam cable and disconnect the cable (2). Then release the ZIF connector (3) for the ambient light sensor cable (4) and disconnect the cable.

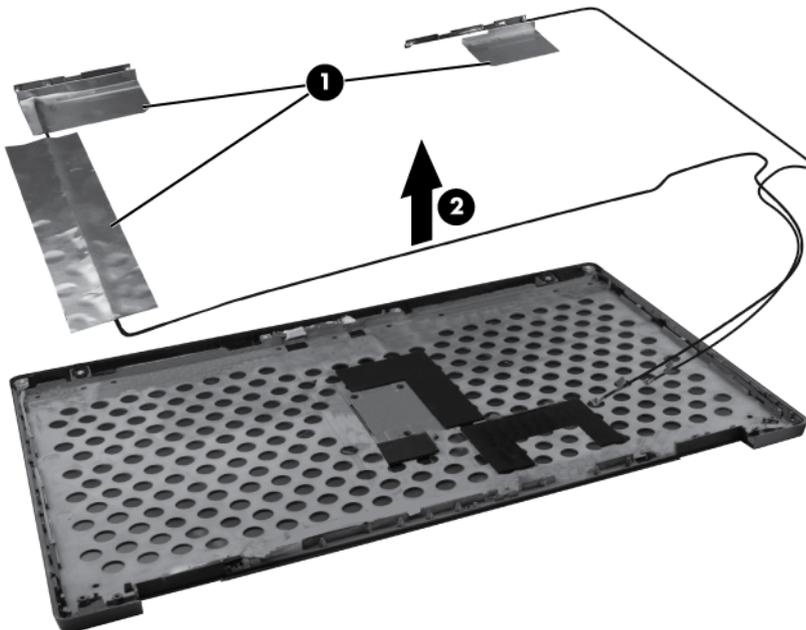
16. Remove the two Phillips screws (5) that secure the webcam to the display enclosure, and then remove the webcam (6).



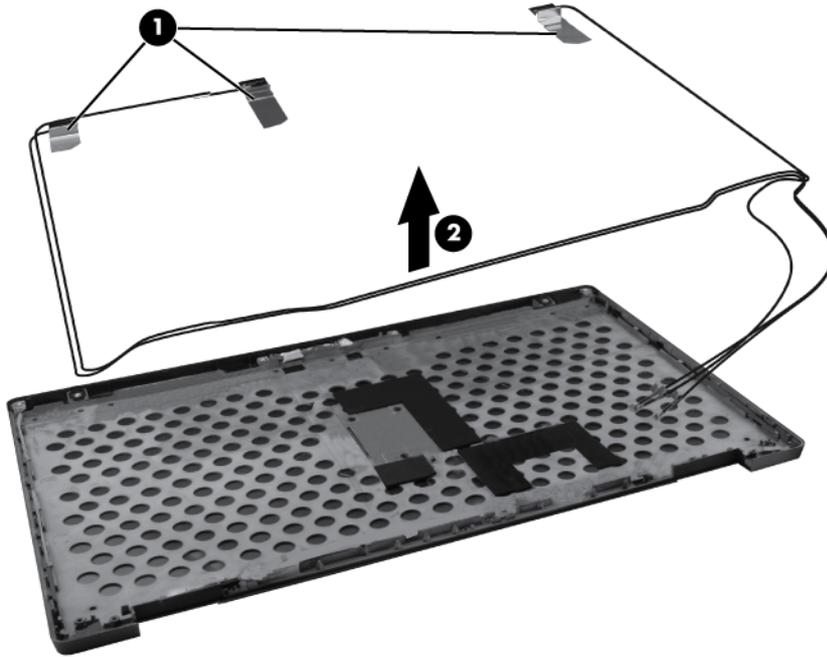
17. If it is necessary to replace the webcam/ambient light sensor cable, disconnect the cable from the ambient light sensor board (1), and then remove the cable (2).



18. If it is necessary to replace the WWAN antenna cables, detach the WWAN antenna transceivers (1) from the adhesive on the back cover, and then release the cables from the clips (2) that secure the cables to the display back cover.



19. If it is necessary to replace the WLAN antenna cables, detach the WLAN antenna transceivers (1) from the adhesive on the back cover, and then release the cables from the clips (2) that secure the cables to the display back cover.



Reverse this procedure to reassemble and install the display assembly.

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# 5 Computer Setup

## Starting Computer Setup

Computer Setup is a preinstalled, ROM-based utility that can be used even when the operating system is not working or will not load.

---

 **NOTE:** Some of the Computer Setup menu items listed in this guide may not be supported by your computer.

 **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 BIOS Setup.

## Using Computer Setup

### Navigating and selecting in Computer Setup

The information and settings in Computer Setup are accessed from the File, Security, Diagnostics, and System Configuration menus.

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 BIOS Setup.
3. Select the **File, Security, Diagnostics,** or **System Configuration** menu.

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

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 **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 BIOS 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.

---

# Computer Setup menus

The menu tables in this section provide an overview of Computer Setup options.

 **NOTE:** Some of the Computer Setup menu items listed in this chapter may not be supported by your computer.

## File menu

Select	To do this
System Information	<ul style="list-style-type: none"><li>• View identification information for the computer and the batteries in the system.</li><li>• View specification information for the processor, cache and memory size, system ROM, video revision, and keyboard controller version.</li></ul>
Set System Date and Time	Set or change the date and time on the computer.
System Diagnostics	Displays the following information: <ul style="list-style-type: none"><li>• System Information<ul style="list-style-type: none"><li>◦ Identification information for the computer and the batteries in the system.</li><li>◦ Specification information for the processor, cache and memory size, system ROM, video revision, and keyboard controller version.</li></ul></li><li>• Start-up Test—Verifies the system components needed for starting the computer.</li><li>• Run-In Test—Runs a comprehensive check on system memory.</li><li>• Hard Disk Test—Runs a comprehensive self-test on any hard drive in the system.</li><li>• Memory Test—Runs a comprehensive test on any memory installed in the computer.</li><li>• Battery Test—Runs a comprehensive test on any batteries installed in the computer.</li><li>• Error Log—Displays a log file if any errors have occurred.</li></ul>
Restore defaults	Replace the configuration settings in Computer Setup with the original factory settings. (Hard drive mode, password settings, and security settings are not changed when you restore the factory settings.)
Reset BIOS security to factory default	Restore the BIOS security settings to the factory default.
Ignore changes and exit	Cancel any changes entered during the current session. Then, exit and restart the computer.
Save changes and exit	Save any changes entered during the current session. Then, exit and restart the computer. Your changes go into effect when the computer restarts.

## Security menu



**NOTE:** Some of the menu items listed in this section may not be supported by your computer.

Select	To do this
<b>Administrator Tools</b>	
Setup BIOS Administrator Password	Set up a BIOS administrator password.
<b>User Management (requires a BIOS administrator password)</b>	
Create New BIOS User Account	<ul style="list-style-type: none"><li>• Select from a list of BIOS users.</li><li>• Select from a list of ProtectTools users.</li></ul>
Password Policy (requires a BIOS administrator password)	Revise password policy criteria.
HP SpareKey	Enable/disable HP SpareKey (enabled by default).
Always Prompt for HP SpareKey Enrollment	Enable/disable HP SpareKey enrollment (enabled by default).
Fingerprint Reset on Reboot (if present)	Reset/clear the fingerprint reader ownership (select models only; disabled by default).
<b>User Tools</b>	
Change Password	Enter, change, or delete a BIOS administrator password.
HP SpareKey Enrollment	Enroll or reset HP SpareKey, which is a set of security questions and answers used if you forget your password.
<b>Anti Theft</b>	
AT-p	Enable/disable Anti-Theft Protection.
DriveLock Passwords	<ul style="list-style-type: none"><li>• Enable/disable DriveLock on any computer hard drive (enabled by default).</li><li>• Change a DriveLock user password or master password.</li></ul> <p><b>NOTE:</b> DriveLock settings are accessible only when you enter Computer Setup by turning on (not restarting) the computer.</p>
Automatic DriveLock	Enable/disable Automatic DriveLock support.
TPM Embedded Security	Enable/disable support for Trusted Platform Module (TPM) Embedded Security, which protects the computer from unauthorized access to owner functions available in Embedded Security for ProtectTools. For more information, refer to the ProtectTools software Help.  <b>NOTE:</b> You must have a setup password to change this setting.
Disk Sanitizer	Run Disk Sanitizer to destroy all existing data on the primary hard drive or the drive in the upgrade bay.  <b>CAUTION:</b> If you run Disk Sanitizer, the data on the selected drive is destroyed permanently.
System IDs	Enter a user-defined computer asset tracking number and ownership tag.

## System Configuration menu



**NOTE:** Some of the listed System Configuration options may not be supported by your computer.

Select	To do this
Language	Change the Computer Setup language.
Boot Options	<ul style="list-style-type: none"><li>• Set a Startup Menu delay (in seconds).</li><li>• Set the Multiboot Express Boot Popup delay (in seconds).</li><li>• Enable/disable Custom Logo (disabled by default).</li><li>• Enable/disable Display Diagnostic URL (enabled by default).</li><li>• Enable/disable CD-ROM boot (disabled by default).</li><li>• Enable/disable SD Card boot (enabled by default).</li><li>• Enable/disable floppy boot (enabled by default).</li><li>• Enable/disable PXE Internal NIC boot (enabled by default).</li><li>• Enable/Disable Unified Extensible Firmware Interface (UEFI) Boot Mode (disabled by default).</li><li>• Set the Legacy Boot Order.</li></ul>
Device Configurations	<ul style="list-style-type: none"><li>• Enable/disable USB legacy support (enabled by default). When enabled, USB legacy support allows the following:<ul style="list-style-type: none"><li>◦ Use of a USB keyboard in Computer Setup even when a Windows operating system is not running.</li><li>◦ Startup from bootable USB devices, including a hard drive, diskette drive, or optical drive connected by a USB port to the computer.</li></ul></li><li>• Select a parallel port mode: ECP (Enhanced Capabilities Port), standard, bidirectional, or EPP (Enhanced Parallel Port).</li><li>• Enable/disable fan always on while connected to an AC outlet (enabled by default).</li><li>• Enable/disable Data Execution Prevention (select models only). When enabled, the processor can disable some virus code execution, which helps to improve computer security (disabled by default).</li><li>• SATA (Serial Advanced Technology Attachment) device mode. The following options are available:<ul style="list-style-type: none"><li>◦ AHCI (Advanced Host Controller Interface)</li><li>◦ IDE (Integrated Drive Electronics)</li><li>◦ RAID (Redundant Array of Independent Disks) (select models only)</li></ul></li></ul>

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Select	To do this
	<p><b>NOTE:</b> Availability of these options varies by computer model.</p> <ul style="list-style-type: none"><li>• Enable/disable secondary battery fast charge (enabled by default).</li><li>• Enable/disable HP QuickLook (enabled by default).</li><li>• Enable/disable Preboot Authentication on HP QuickLook Boot (enabled by default).</li><li>• Enable/disable HP QuickWeb (enabled by default).</li><li>• Enable/disable HP QuickWeb: Write Protect (disabled by default).</li><li>• Enable/disable Virtualization Technology (select models only; disabled by default).</li><li>• Enable/disable TXT (Intel Trusted Execution Technology) (select models only; disabled by default).</li><li>• Multi Core CPU (enabled by default).</li><li>• Intel HT Technology (enabled by default).</li><li>• Enable/disable Wake on USB (enabled by default).</li><li>• Enable/disable Num lock state at boot (disabled by default).</li></ul>

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Select	To do this
Built-In Device Options	<ul style="list-style-type: none"><li>• Enable/disable the wireless button state (enabled by default).</li><li>• Enable/disable embedded WLAN device radio (select models only; enabled by default).</li><li>• Enable/disable the embedded Bluetooth device radio (enabled by default).</li><li>• Enable/disable the Network Interface Controller (NIC) (enabled by default).</li><li>• Enable/disable LAN/WLAN switching (disabled by default).</li><li>• Set the wake on LAN state. Options include the following:<ul style="list-style-type: none"><li>◦ Disabled</li><li>◦ Boot to Network</li><li>◦ Follow Boot Order</li></ul></li><li>• Enable/disable the Ambient Light Sensor.</li><li>• Enable/disable the Notebook Upgrade Bay device (enabled by default).</li><li>• Enable/disable the fingerprint device (enabled by default).</li><li>• Enable/disable the integrated camera (enabled by default).</li><li>• Enable/disable the Power Monitor Circuit (enabled by default).</li><li>• Enable/disable the audio device (enabled by default).</li><li>• Enable/disable a modem device (enabled by default).</li><li>• Enable/disable the microphone (enabled by default).</li><li>• Enable/disable the internal speakers (enabled by default).</li></ul>

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Select	To do this
Port Options	<p><b>NOTE:</b> All port options are enabled by default.</p> <ul style="list-style-type: none"> <li>• Enable/disable the serial port.</li> <li>• Enable/disable the parallel port.</li> <li>• Enable/disable the flash media reader.</li> <li>• Enable/disable the USB port.</li> </ul> <p><b>CAUTION:</b> Disabling the USB port also disables MultiBay devices and ExpressCard devices on the advanced port replicator.</p> <ul style="list-style-type: none"> <li>• Enable/disable the 1394 port.</li> <li>• Enable/disable the ExpressCard slot.</li> <li>• Enable/disable the smart card slot.</li> <li>• Enable/disable the eSATA port.</li> </ul>
AMT Options	<ul style="list-style-type: none"> <li>• Enable/disable Firmware Verbosity.</li> <li>• Enable/disable AMT Setup Prompt (Ctrl+P).</li> <li>• Enable/disable USB Key Provisioning Support.</li> <li>• Enable/disable Unconfigure AMT on next boot.</li> <li>• Select Terminal Emulation Mode. <ul style="list-style-type: none"> <li>◦ ANSI</li> <li>◦ VT100</li> </ul> </li> <li>• Enable/disable Firmware Progress Event Support.</li> <li>• Enable/disable Initiate Intel CIRA.</li> </ul>
Set Security Level	Change, view, or hide security levels for all BIOS menu items.
Restore Security Defaults	Restore the default security settings.

# 6 Specifications

## Computer specifications

	Metric	U.S.
<b>Dimensions</b>		
Length	25.2 cm	9.9 in
Width	37.4 cm	14.7 in
Height (front to rear)	3.2 to 3.7 cm	1.28 to 1.45 in
<b>Weight</b> (equipped with 39.6-cm (15.6-in) HD+ display, NV Graphics, DVD drive, 1-GB DIMM, 160-GB hard drive, WLAN module, 8-cell battery)	2.89 kg	6.37 lbs
<b>Input power</b>		
Operating voltage	19.0 V dc @ 4.74 A – 90 W	
Operating current	4.74 A	
<b>Temperature</b>		
Operating	5°C to 35°C	41°F to 95°F
<b>Relative humidity</b>		
Operating	10% to 90%	
Nonoperating	5% to 95%	
<b>Maximum altitude</b> (unpressurized)		
Operating (14.7 to 10.1 psia)	-15 m to 3,048 m	50 ft to 10,000 ft
Nonoperating (14.7 to 4.4 psia)	-15 m to 12,192 m	-50 ft to 40,000 ft
<b>Shock</b>		
Operating	125 g, 2 ms, half-sine	
Nonoperating	200 g, 2 ms, half-sine	
<b>Random vibration</b>		
Operating	0.75 g zero-to-peak, 10 Hz to 500 Hz, 0.25 oct/min sweep rate	

	Metric	U.S.
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.

## 39.6-cm (15.6-in) HD+ display specifications

	Metric	U.S.
<b>Dimensions</b>		
Height	20.9 cm	8.25 in
Width	35.9 cm	14.15 in
Diagonal	39.6 cm	15.6 in
<b>Surface treatment</b>	Anti-glare	
<b>Contrast ratio</b>	300:1 (typical)	
<b>Refresh rate</b>	60 Hz	
<b>Brightness</b>	200 nits (typical)	
<b>Pixel resolution</b>		
Pitch	0.2151 mm	
Format	1600 × 900	
Configuration	RGB stripe	
<b>Backlight</b>	LED	
<b>PPI</b>	118 ppi	
<b>Viewing angle</b>	30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)	

## 39.6-cm (15.6-in) FHD display specifications

	Metric	U.S.
<b>Dimensions</b>		
Height	20.9 cm	8.25 in
Width	35.9 cm	14.15 in
Diagonal	39.6 cm	15.6 in
<b>Surface treatment</b>	Anti-glare	
<b>Contrast ratio</b>	300:1 (typical)	
<b>Refresh rate</b>	60 Hz	
<b>Brightness</b>	220 nits (typical)	
<b>Pixel resolution</b>		
Pitch	0.179 × 0.179 mm	
Format	1920 × 1080	
Configuration	RGB stripe	
<b>Backlight</b>	LED	
<b>PPI</b>	142 ppi	
<b>Viewing angle</b>	60/60/50/50 (Left/Right/Down/Up) (minimum) or 70/70/60/60 (Left/Right/Down/Up) (typical)	

## Hard drive specifications

	500-GB*	320-GB*	250-GB*
<b>Dimensions</b>			
Height	9.5 mm	9.5 mm	9.5 mm
Width	70 mm	70 mm	70 mm
Weight	101 g	101 g	101 g
<b>Interface type</b>	SATA	SATA	SATA
<b>Transfer rate</b>	100 MB/sec	100 MB/sec	100 MB/sec
<b>Security</b>	ATA security	ATA security	ATA security
<b>Seek times</b> (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
<b>Logical blocks</b>	1,048,576,000	625,141,400	488,397,168
<b>Disc rotational speed</b>	7200 rpm	7200 rpm	7200 rpm
<b>Operating temperature</b>	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.			
<b>NOTE:</b> Certain restrictions and exclusions apply. Contact technical support for details.			

# DVD±RW and CD-RW SuperMulti DL Combo 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, 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
<b>Center hole diameter</b>	1.5 cm (0.59 in)	
<b>Disc diameter</b>		
Standard disc	12 cm (4.72 in)	
Mini disc	8 cm (3.15 in)	
<b>Disc thickness</b>	1.2 mm (0.047 in)	
<b>Track pitch</b>	0.74 µm	
<b>Access time</b>	<b>CD</b>	<b>DVD</b>
Random	< 175 ms	< 230 ms
Full stroke	< 285 ms	< 335 ms
<b>Audio output level</b>	Line-out, 0.7 Vrms	
<b>Cache buffer</b>	2 MB	
<b>Data transfer rate</b>		
24X CD-ROM	3,600 KB/sec	
8X DVD-ROM	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	
5X DVD-RAM	6,750 KB/sec	
<b>Transfer mode</b>	Multiword DMA Mode	
<b>Startup time</b>	< 15 seconds	
<b>Stop time</b>	< 6 seconds	

# Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive

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		
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		

## Blu-ray Disc ROM Combo Drive

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, 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, BD-ROM, BD-R, BD-RE	CD-R, CD-RW, DVD+R, DVD+R(9), DVD+RW, DVD-R, DVD-R(9), DVD-RW, DVD-RAM	
Access time	CD	DVD	BD-ROM
Random	<190 ms	<190 ms	<230 ms
Maximum Media Capacity (read)	50 GB		
Maximum Media Capacity (write)	8.5 GB		
Data transfer rate			
24X CD-ROM	3,600 KB/sec		
8X DVD	10,800 KB/sec		
16X CD-R	2,400 KB/sec		
10X CD-RW	1,500 KB/sec		
8X DVD+R	10,800 KB/sec		
8X DVD+RW	10,800 KB/sec		
8X DVD-R	10,800 KB/sec		
6X DVD-RW	8,100 KB/sec		
4X DVD+R Dual Layer	5,400 KB/sec		
4X DVD-R Dual Layer	5,400 KB/sec		
5X DVD-RAM	6,750 KB/sec		
2X BD-ROM	9,000 KB/sec		

## DVD-ROM Drive specifications

<b>Applicable disc</b>	DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18, CD-ROM (Mode 1 and 2), CD Digital Audio, CD-XA ready (Mode 2, Form 1 and Form 2), CD-I (Mode 2, Form 1 and Form 2), CD-R, CD-RW, Photo CD (single and multisession), CD-Bridge	
<b>Center hole diameter</b>	1.5 cm (0.59 in)	
<b>Disc diameter</b>		
Standard disc	12 cm (4.72 in)	
Mini disc	8 cm (3.15 in)	
<b>Disc thickness</b>	1.2 mm (0.047 in)	
<b>Track pitch</b>	0.74 $\mu$ m	
<b>Access time</b>	<b>CD</b>	<b>DVD</b>
Random	< 100 ms	< 125 ms
Full stroke	< 175 ms	< 225 ms
<b>Audio output level</b>	Line-out, 0.7 Vrms	
<b>Cache buffer</b>	512 KB	
<b>Data transfer rate</b>		
CD-R (24X)	3600 KB/s (150 KB/s at 1X CD rate)	
CD-RW (10X)	1500 KB/s (150 KB/s at 1X CD rate)	
CD-ROM (24X)	3600 KB/s (150 KB/s at 1X CD rate)	
DVD (8X)	10,800 KB/s (1,352 KB/s at 1X DVD rate)	
Multiword DMA mode 2	16.6 MB/s	
<b>Startup time</b>	< 10 seconds	
<b>Stop time</b>	< 3 seconds	

---

# 7 Backup and recovery

## Windows 7

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), 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)
- Backing up individual files and folders
- 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.



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

---

## Backing up your information

Recovery after a system failure is as complete as your most current backup. You should create system repair discs (select models only) and your initial backup immediately after software setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup. The system repair 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.

To create a screen shot:

1. Display the screen you want to save.
2. Copy the screen image:

To copy only the active window, press **alt+fn+prt sc**.

To copy the entire screen, press **fn+prt sc**.

3. Open a word-processing document, and then select **Edit > Paste**.

The screen image is added to the document.

4. Save the document.

- 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 installed in your computer.



---

**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 optical drive of the computer.

To create a backup using Backup and Restore, follow these steps:



---

**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).



---

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

---

## Performing a 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, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

---

## Using the Windows recovery tools

To recover information you previously backed up, follow these steps:

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.

---

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

---

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

---

 **CAUTION:** Using Startup Repair 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 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 and the HP Recovery partition.

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

To check for the HP Recovery partition, select **Start**, right-click **Computer**, click **Manage**, and then click **Disk Management**.

---

 **NOTE:** If the Windows partition and the HP Recovery partition are not listed, you must recover your operating system and programs using the Windows 7 operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

---

3. If the Windows partition and the HP Recovery partition are 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

 **CAUTION:** Using **f11** 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**, follow these steps:

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

 **NOTE:** If the HP Recovery partition is not listed, you must recover your operating system and programs using the Windows 7 operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows 7 operating system DVD (purchased separately)” section in this guide.

---

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)

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. Make sure that your most recent backup (stored on discs or on an external drive) is easily accessible. To order a Windows 7 operating system DVD, go to <http://www.hp.com/support>, select your country or region, and then follow the on-screen instructions. You can also order the DVD by calling technical support. For contact information, refer to 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, follow these steps:

 **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.

## Windows Vista

To protect your information, use the Backup and Restore Center to back up individual files and folders, back up your entire hard drive (select models only), or create system restore points. In case of system failure, you can use the backup files to restore the contents of your computer.

The Backup and Restore Center provides the following options:

- Backing up individual files and folders
- Backing up the entire hard drive (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.



---

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

---

## Backing up your information

Recovery after a system failure is as complete as your most current backup. You should create your initial backup immediately after software setup. As you add new software and data files, you should continue to back up your system on a regular basis to maintain a reasonably current backup.

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

To create a screen shot:

1. Display the screen you want to save.
2. Copy the screen image:
  - To copy only the active window, press **alt+fn+prt sc**.
  - To copy the entire screen, press **fn+prt sc**.
3. Open a word-processing document, and then select **Edit > Paste**.

The screen image is added to the document.

4. Save the document.
- 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 installed in your computer.

---

 **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 optical drive of the computer.

To create a backup using Backup and Restore Center, follow these steps:

---

 **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 Center**.
2. Follow the on-screen instructions to back up your entire computer (select models only) or your files.

---

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

---

## Performing a recovery

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

- Windows recovery tools: You can use the Backup and Restore Center 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, you must purchase a Windows Vista® operating system DVD to reboot the computer and repair the operating system. For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

---

## Using the Windows recovery tools

To recover information you previously backed up, follow these steps:

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



---

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

---

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



**CAUTION:** Using Startup Repair 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 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 and the HP Recovery partition. To find the partitions, select **Start > Computer**.



**NOTE:** If the Windows partition and the HP Recovery partition have been deleted, you must recover your operating system and programs using the Windows Vista operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

---

3. Restart the computer, and then press **f8** before the Windows operating system loads.
4. Select **Repair your computer**.
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



**CAUTION:** Using **f11** 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**, follow these steps:

1. If possible, back up all personal files.
2. If possible, check for the presence of the HP Recovery partition. To find the partition, select **Start > Computer**.



**NOTE:** If the HP Recovery partition has been deleted, you must recover your operating system and programs using the Windows Vista operating system DVD and the *Driver Recovery* disc (both purchased separately). For additional information, refer to the “Using a Windows Vista operating system DVD (purchased separately)” section in this guide.

---

3. 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.
4. Press **f11** while the “Press <F11> for recovery” message is displayed on the screen.
5. Follow the on-screen instructions.

## Using a Windows Vista operating system DVD (purchased separately)

If you are unable to boot (start up) your computer, you must purchase a Windows Vista operating system DVD to reboot the computer and repair the operating system. Make sure that your most recent backup (stored on discs or on an external drive) is easily accessible. To order a Windows Vista operating system DVD, go to <http://www.hp.com/support>, select your country or region, and then follow the on-screen instructions. You can also order the DVD by calling technical support. For contact information, refer to the *Worldwide Telephone Numbers* booklet included with the computer.

---

 **CAUTION:** Using a Windows Vista 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 Vista operating system DVD, follow these steps:

---

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

---

1. If possible, back up all personal files.
2. Restart the computer, and then insert the Windows Vista 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.

---

## 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 and regions

The requirements listed below 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	CCC	5
South Korea	EK	4
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-mm<sup>2</sup> 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-mm<sup>2</sup> 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-mm<sup>2</sup> 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-mm<sup>2</sup> 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

## Battery

When a 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 computer battery disposal.

## Display

- 
- ⚠ **WARNING!** The backlight contains mercury. Exercise caution when removing and handling the backlight to avoid damaging this component and causing exposure to the mercury.
  - ⚠ **CAUTION:** The procedures in this chapter can result in damage to display components. The only components intended for recycling purposes are the LCD panel and the backlight. When you remove these components, handle them carefully.
  - 📄 **NOTE: Materials Disposal.** This HP product contains mercury in the backlight in the display assembly that might require special handling at end-of-life. Disposal of mercury may be regulated because of environmental considerations. For disposal or recycling information, contact your local authorities, or see the Electronic Industries Alliance (EIA) Web site at <http://www.eiae.org>.
- 

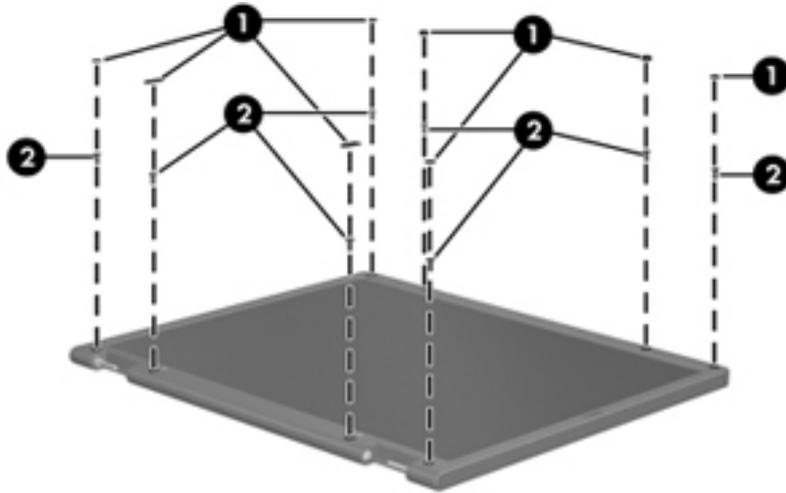
This section provides disassembly instructions for the display assembly. The display assembly must be disassembled to gain access to the backlight **(1)** and the liquid crystal display (LCD) panel **(2)**.



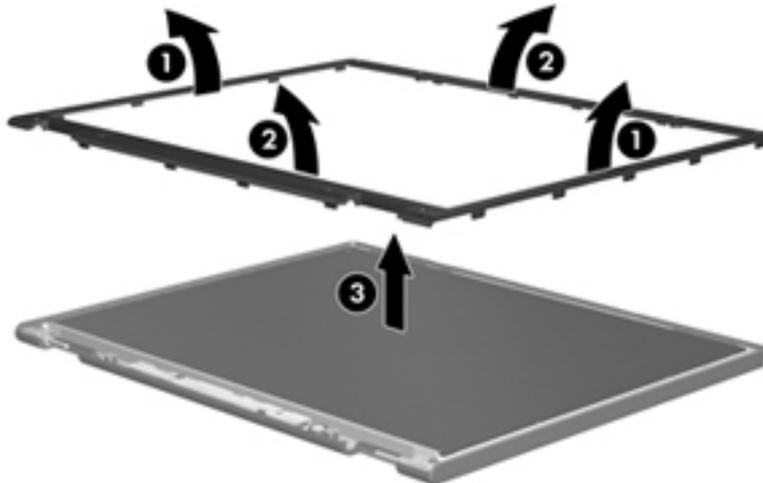
- 
- 📄 **NOTE:** The procedures provided in this chapter are general disassembly instructions. Specific details, such as screw sizes, quantities, and locations, and component shapes and sizes, can vary from one computer model to another.
-

Perform the following steps to disassemble the display assembly:

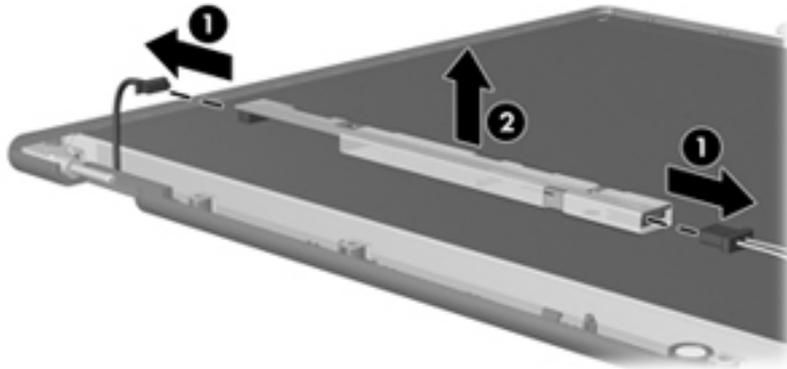
1. Remove all screw covers (1) and screws (2) that secure the display bezel to the display assembly.



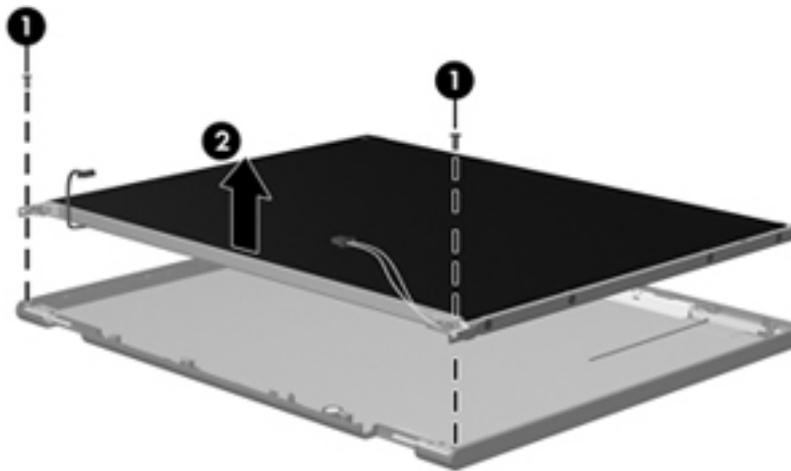
2. Lift up and out on the left and right inside edges (1) and the top and bottom inside edges (2) of the display bezel until the bezel disengages from the display assembly.
3. Remove the display bezel (3).



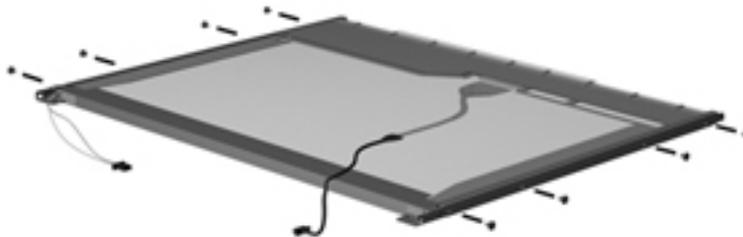
4. Disconnect all display panel cables (1) from the display inverter and remove the inverter (2).



5. Remove all screws (1) that secure the display panel assembly to the display enclosure.
6. Remove the display panel assembly (2) from the display enclosure.

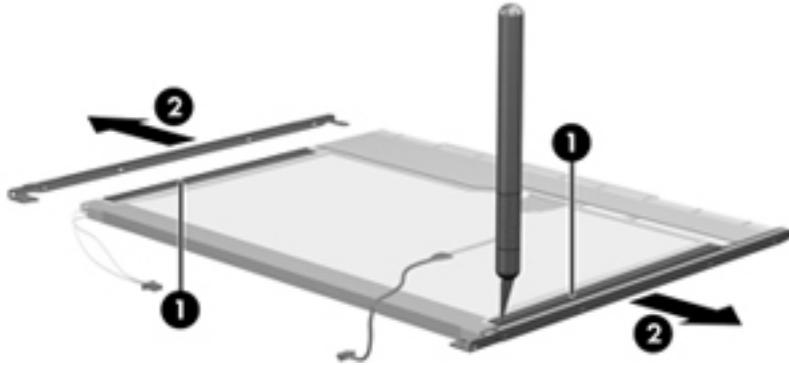


7. Turn the display panel assembly upside-down.
8. Remove all screws that secure the display panel frame to the display panel.

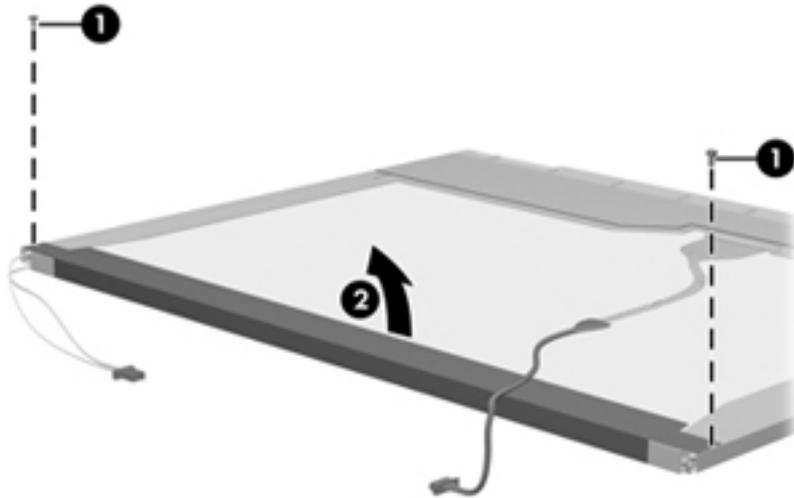


9. Use a sharp-edged tool to cut the tape (1) that secures the sides of the display panel to the display panel frame.

10. Remove the display panel frame (2) from the display panel.

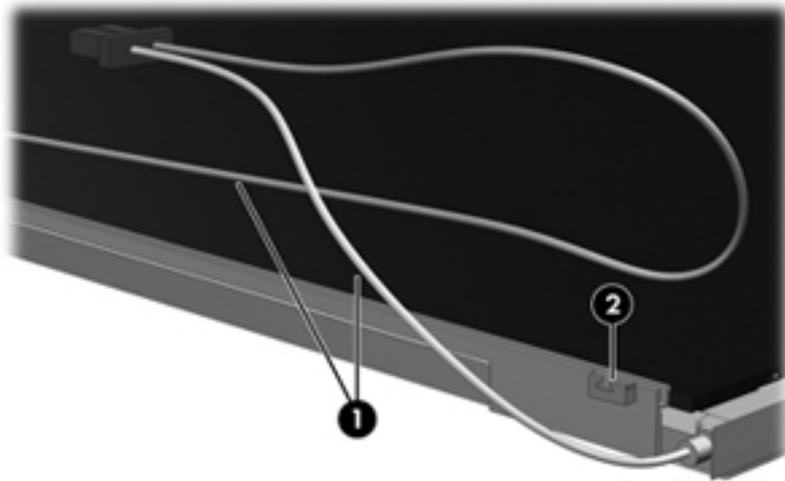


11. Remove the screws (1) that secure the backlight cover to the display panel.
12. Lift the top edge of the backlight cover (2) and swing it outward.



13. Remove the backlight cover.
14. Turn the display panel right-side up.

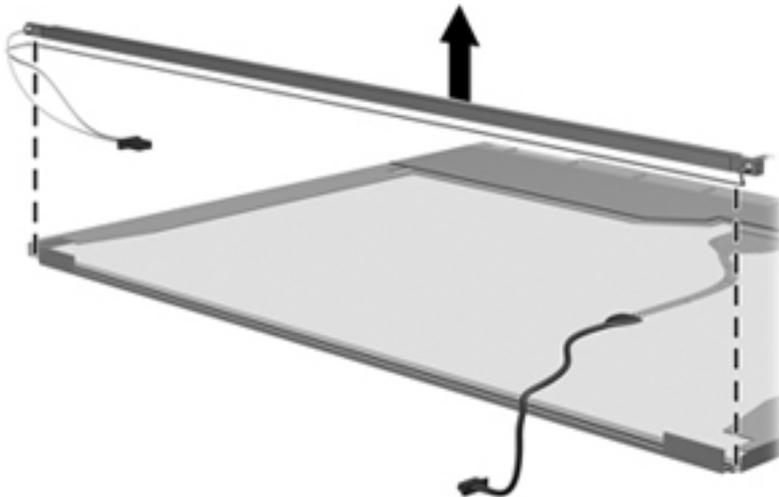
15. Remove the backlight cables (1) from the clip (2) in the display panel.



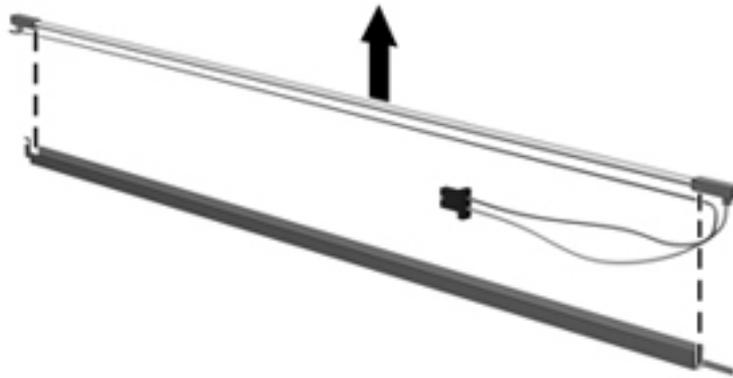
16. Turn the display panel upside-down.

**⚠ WARNING!** The backlight contains mercury. Exercise caution when removing and handling the backlight to avoid damaging this component and causing exposure to the mercury.

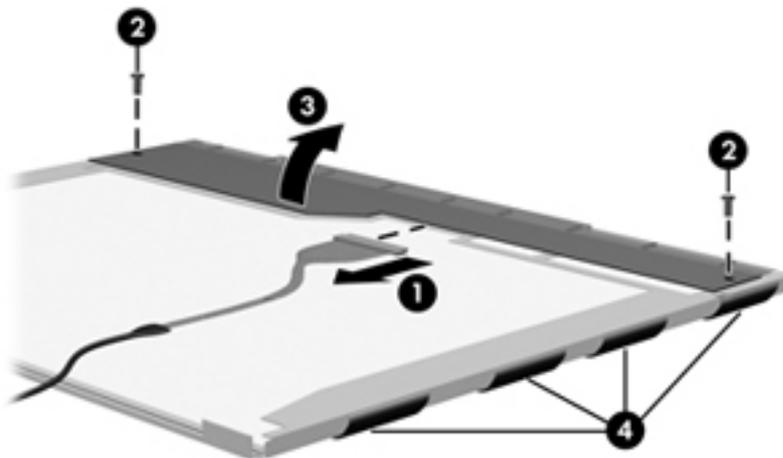
17. Remove the backlight frame from the display panel.



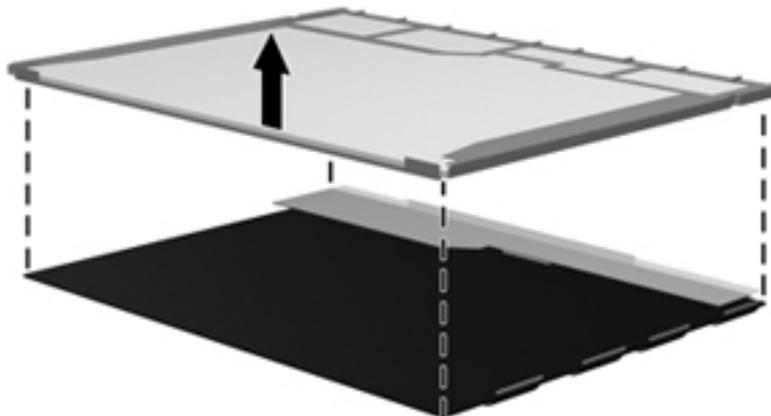
18. Remove the backlight from the backlight frame.



19. Disconnect the display panel cable (1) from the LCD panel.
20. Remove the screws (2) that secure the LCD panel to the display rear panel.
21. Release the LCD panel (3) from the display rear panel.
22. Release the tape (4) that secures the LCD panel to the display rear panel.



23. Remove the LCD panel.



24. Recycle the LCD panel and backlight.

---

# Index

## Symbols/Numerics

1394 port, identifying 14

## A

AC adapter, spare part number  
32, 36

ambient light sensor  
identifying 15  
spare part number 28, 40

AMT options 137  
AMT Setup Prompt (Ctrl-P)  
137  
Firmware Progress Event  
Support 137  
Firmware Verbosity 137  
Initiate Intel CIRA 137  
Terminal Emulation Mode 137  
Unconfigure AMT on next  
boot 137  
USB Key Provisioning  
Support 137

antennas, disconnecting 54, 56

Anti Theft 133

audio, product description 3  
audio-in (microphone) jack 13  
audio-out (headphone) jack 13  
audio/USB 3.0 board  
removal 94  
spare part number 37, 94

## B

backing up files 146  
Backup and Restore 146, 147  
Backup and Restore Center 150,  
151  
base enclosure, spare part  
number 25, 37

battery  
removal 48  
spare part number 26, 36, 48  
battery bay, identifying 17  
battery connector, accessory 17  
battery cover, illustrated 29  
battery latch removal 117  
battery light 12  
battery release latch 17  
BIOS administrator password  
133

Blu-ray Disc R/RE DVD±RW  
SuperMulti DL Drive  
removal 65  
spare part number 25, 31, 40,  
65

Blu-ray Disc ROM Drive,  
specifications 144  
Blu-ray Disc ROM DVD±RW  
SuperMulti DL Combo Drive  
removal 65  
spare part number 25, 32, 40,  
65  
specifications 143

Bluetooth cable, illustrated 30

Bluetooth compartment,  
identifying 18

Bluetooth module  
removal 58  
spare part number 22, 36, 58

boot options 134

boot order 134

bottom cover release latch,  
identifying 17

built-in device  
ambient light sensor 136  
audio device 136  
Bluetooth device radio 136  
fingerprint reader 136

integrated camera 136  
internal speakers 136  
LAN/WLAN switching 136  
microphone 136  
modem 136  
Network Interface Controller  
(LAN) 136  
Notebook Upgrade Bay 136  
Power Monitor Circuit 136  
Wake on LAN 136  
wireless button 136  
WLAN device radio 136

built-in device options 136

buttons

calculator 10  
center TouchPad 7  
left TouchPad 7  
optical drive eject button 13  
pointing stick 7  
power 9  
QuickWeb 10  
right TouchPad 7  
TouchPad on/off 7, 9  
volume mute 9  
wireless 9

## C

Cable Kit

contents 30  
spare part number 26, 30, 37

cables, service considerations 43

calculator

button, identifying 10  
light 8

caps lock light, identifying 8

chipset, product description 1

components

bottom 17  
display 15

- front 12
- left side 14
- rear 16
- right side 13
- top 7
- Computer Setup
  - File menu 132
  - navigating and selecting 130
  - restoring factory settings 131
  - Security menu 133
  - System Configuration menu 134
- computer specifications 138
- connector, power 16
- connectors, service
  - considerations 43
- creating a backup 146
- D**
- device configurations 134
- disk sanitizer 133
- diskette drive, precautions 43
- display assembly
  - removal 124
  - spare part number 21, 40, 124
- display bezel
  - removal 121
  - spare part number 27, 37
- display cable kit
  - spare part number 27, 37
- display component recycling 156
- display components, spare part number 27
- display hinge covers, spare part number 37
- display hinges, spare part number 27, 37
- display latch button, illustrated 29
- display latch kit, spare part number 37
- display panel
  - product description 1
  - removal 121
  - spare part number 27, 40, 121
- display panel support kit, spare part number 40
- display release latch 12
- display specifications 139, 140
- DisplayPort, identifying 14
- docking connector, identifying 17
- docking support, product
  - description 4
- drive light 12
- DriveLock password 133
- DriveLock, automatic 133
- drives
  - boot order 134
  - preventing damage 43
- DVD-ROM Drive
  - precautions 43
  - removal 65
  - spare part number 25, 31, 40, 65
  - specifications 145
- DVD±RW and CD-RW SuperMulti DL Combo Drive
  - precautions 43
  - removal 65
  - spare part number 25, 31, 40, 65
- E**
- electrostatic discharge 44
- eSATA/USB 2.0 combo port, identifying 14
- esc key, identifying 11
- Ethernet, product description 3
- Execution Disable 134
- expansion memory module
  - removal 51
  - spare part number 51
- ExpressCard assembly
  - removal 111
  - spare part number 111
- ExpressCard blank, illustrated 29
- ExpressCard board, spare part number 38, 41
- ExpressCard slot, identifying 14
- external media cards, product description 4
- external monitor port 13
- F**
- f11 recovery 149, 152
- File menu 132
- fingerprint reader board
  - removal 78
  - spare part number 38, 78
- fingerprint reader, identifying 10
- fn key, identifying 11
- function button board
  - removal 76
  - spare part number 37, 76
- function keys, identifying 11
- G**
- graphics card
  - removal 88
  - spare part number 23, 37, 38, 88
- graphics card heat sink, spare part number 38
- graphics, product description 1
- grounding equipment and methods 46
- H**
- hard drive
  - precautions 43
  - product description 2
  - removal 60
  - spare part number 25, 31, 36, 60
  - specifications 141
- hard drive bay, identifying 18
- hard drive bracket, removal 62
- hard drive hardware kit, spare part number 36
- hard drive recovery 149, 152
- heat sink
  - spare part number 23
- hinges, spare part number 27, 37
- HP QuickLook 135
- HP SpareKey enrollment 133
- I**
- integrated numeric keypad, identifying 11
- integrated webcam light, identifying 15
- Intel HT Technology 135
- internal display switch 15
- internal microphones, identifying 15
- inverter cover, illustrated 29
- J**
- jacks
  - audio-in (microphone) 13

- audio-out (headphone) 13
  - network 14
  - RJ-11 (modem) 16
  - RJ-45 (network) 14
- K**
- keyboard
    - product description 4
    - removal 67
    - spare part number 21, 38, 67
  - keypad, integrated numeric 11
  - keys
    - esc 11
    - fn 11
    - function 11
    - num lk 11
    - Windows applications 11
    - Windows logo 11
- L**
- language, changing in Computer Setup 134
  - latch, battery release 17
  - legacy support, USB 130, 134
  - lights
    - battery 12
    - calculator 8
    - caps lock 8
    - drive 12
    - mute 8
    - num lock 8
    - power 8, 12
    - QuickWeb 8
    - TouchPad 8
    - webcam 15
    - wireless 8, 12
  - logo nameplate
    - spare part number 28, 37
- M**
- mass storage devices, spare part number 31
  - Media Card Reader, identifying 12
  - memory module
    - product description 2
    - removal 51, 69
    - spare part number 36, 51, 69
  - microphone (audio-in) jack
    - product description 3
  - microphone board, spare part number 37
  - model name 1
  - modem module
    - product description 3
    - removal 92
    - spare part number 23, 36, 92
  - Multi Core CPU 135
  - mute light, identifying 8
- N**
- network jack, identifying 14
  - Northbridge chip heat plate
    - removal 101
  - num lk key, identifying 11
  - num lock light 8
- O**
- operating system, product description 5
  - optical drive
    - precautions 43
    - product description 3
    - removal 65
    - spare part number 25, 31, 65
    - specifications 142, 143, 144, 145
  - optical drive bracket, spare part number 32
    - 40
  - optical drive weight saver
    - illustrated 29
- P**
- packing guidelines 45
  - parallel port mode 134
  - passwords 133
  - PCH thermal material
    - spare part number 40
  - plastic parts 42
  - Plastics Kit
    - contents 29
    - spare part number 29, 33, 37
  - pointing device, product description 4
  - pointing stick 7
  - pointing stick buttons 7
  - pointing stick cover
    - spare part number 40
  - port options 137
    - 1394 port 137
    - eSATA port 137
    - ExpressCard slot 137
    - flash media reader 137
    - parallel port 137
    - serial port 137
    - smart card slot 137
    - USB port 137
- ports
- 1394 14
  - DisplayPort 14
  - eSATA/USB 2.0 combo 14
  - external monitor 13
    - product description 4
  - USB 2.0 14
  - USB 3.0 13
  - USB charging 14
- power button board
  - removal 74
  - spare part number 37, 74
- power button, identifying 9
- power connector cable
  - illustrated 30
  - removal 105
  - spare part number 105
- power connector, identifying 16
- power cord
  - set requirements 154
  - spare part number 32, 35
- power light 8, 12
- power requirements, product description 5
- primary memory module
  - removal 69
  - spare part number 69
- processor
  - product description 1
  - removal 90
  - spare part number 23, 90
- processor heat sink
  - removal 86
  - spare part number 86
- product description
  - audio 3
  - chipset 1
  - display panel 1
  - docking support 4
  - Ethernet 3
  - external media cards 4
  - graphics 1
  - hard drives 2

- keyboard 4
- memory module 2
- microphone 3
- modem module 3
- operating system 5
- optical drives 3
- pointing devices 4
- ports 4
- power requirements 5
- processors 1
- product name 1
- security 5
- serviceability 6
- webcam 3
- wireless 3
- product name 1

**Q**

- QuickWeb button 10
- QuickWeb light 8

**R**

- recovery partition 149, 152
- removal/replacement
  - preliminaries 42
  - procedures 47
- restoring
  - factory settings 132
  - hard drive 149, 152
  - security defaults 137
- RJ-11 (modem) jack
  - identifying 16
  - spare part number 23
- RJ-11 connector cable
  - removal 113
- RJ-11 jack cover
  - illustrated 29
- RJ-45 (network) jack, identifying 14
- RJ-45 connector cable
  - removal 103
- RTC battery
  - removal 53
  - spare part number 37, 53
- Rubber Kit, spare part number 37

**S**

- SATA (Serial Advanced Technology Attachment) devices 134
  - AHCI (Advanced Host Controller Interface) 134
  - IDE (Integrated Drive Electronics) 134
- Screw Kit, spare part number 34, 37
- SD Card blank, illustrated 29
- Secondary Battery Fast Charge 135
- Secure Digital (SD) card/USB 2.0 assembly
  - removal 99
  - spare part number 99
- Secure Digital (SD) card/USB 2.0 assembly board, spare part number 37
- Secure Digital card/USB 2.0 assembly board
  - spare part number 25
- security cable slot, identifying 14
- Security menu 133
  - always prompt for HP SpareKey enrollment 133
  - Automatic DriveLock 133
  - change password 133
  - Disk Sanitizer 133
  - DriveLock 133
  - fingerprint reader reset 133
  - HP Sparekey 133
  - HP Sparekey enrollment 133
  - password policy 133
  - set up BIOS administrator password 133
  - System IDs 133
- security, product description 5
- service access cover
  - removal 50
  - spare part number 37, 50
- service access cover latch
  - removal 115
- service considerations 42
- service tag 19, 47
- serviceability, product description 6
- set security level 137

- setup utility
  - File menu 132
  - navigating and selecting 130
  - restoring factory settings 131
  - Security menu 133
  - System Configuration menu 134
- SIM slot, identifying 17
- SIM, removal 49
- slots
  - ExpressCard 14
  - security cable 14
- smart card bracket, spare part number 40
- smart card reader
  - identifying 13
  - removal 63
  - spare part number 37, 63
- solid-state drive, spare part number 25, 31, 40, 41, 60
- speakers
  - identifying 12
  - removal 96
  - spare part number 23, 37, 96
- specifications
  - Blu-ray Disc ROM Drive 144
  - Blu-ray Disc ROM DVD±RW SuperMulti DL Combo Drive 143
  - computer 138
  - display 139, 140
  - DVD-ROM Drive 145
  - DVD±RW and CD-RW SuperMulti DL Combo Drive 142
  - hard drive 141
  - optical drive 142, 143, 144, 145
- static-shielding materials 46
- system board
  - removal 107
  - spare part number 24, 37, 40, 41, 107
- System Configuration menu 134
- system date and time 132
- system diagnostics 132
- system fan 134
- system IDs 133
- system information 132

**T**

- thermal material, replacement 87
- tools required 42
- top cover
  - removal 71
  - spare part number 22, 37, 71
- TouchPad button board
  - removal 80
  - spare part number 80
- TouchPad buttons 7
- TouchPad light, identifying 8
- TouchPad on/off button 7, 9
- TouchPad, identifying 7
- TPM Embedded Security 133
- transporting guidelines 45
- TXT (Intel Trusted Execution Technology) 135

**U**

- Unified Extensible Firmware Interface (UEFI) mode 134
- upgrade bay, identifying 13
- USB 3.0 ports, identifying 13
- USB charging port 14
- USB legacy support 130, 134
- USB port, identifying 14
- User management 133

**V**

- vents, identifying 14, 17
- VGA port
  - removal 82
  - spare part number 37, 82
- video card fan/heat sink assembly
  - removal 84
  - spare part number 84
- Virtualization Technology 135
- volume mute button, identifying 9

**W**

- webcam
  - identifying 15
  - product description 3
  - spare part number 37
- webcam light, identifying 15
- webcam module, spare part number 28
- Windows 7 operating system
  - DVD 149
  - Windows applications key, identifying 11
  - Windows logo key, identifying 11
  - Windows Vista operating system
    - DVD 153
  - wireless antennas
    - disconnecting 54, 56
    - identifying 15
  - wireless button, identifying 9
  - wireless lights 8, 12
  - wireless, product description 3
  - WLAN antennas, identifying 15
  - WLAN module
    - removal 54
    - spare part number 26, 36, 54
  - workstation guidelines 45
  - WWAN antennas, identifying 15
  - WWAN module
    - removal 56
    - spare part number 25, 36, 56

