HP EliteBook 1050 G1

Maintenance and Service Guide
IMPORTANT! This document is intended for HP authorized service providers only.

First Edition: May 2018

Document Part number: L21788-001

Product notice

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

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

Software terms

By installing, copying, downloading, or otherwise using any software product preinstalled on this computer, you agree to be bound by the terms of the HP End User License Agreement (EULA). If you do not accept these license terms, your sole remedy is to return the entire unused product (hardware and software) within 14 days for a full refund subject to the refund policy of your seller.

For any further information or to request a full refund of the price of the computer, please contact your seller.

Safety warning notice

⚠ **WARNING!** To reduce the possibility of heat-related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to contact the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user-accessible surface temperature limits defined by the International Standard for Safety of Information Technology Equipment (IEC 60950-1).

Table of contents

1 Product description

Category	Description
Product name	HP EliteBook 1050 G1
Processor	**8th generation Intel® Core™ processors**
	i7-8850H (2.6-GHz, turbo up to 4.3 GHz, 2400-MHz/9-MB L3 cache, six core, 45 W, Intel UHD Graphics 630 GPU)
	i7-8750H (2.2-GHz, turbo up to 4.1 GHz, 2400-MHz/9-MB L3 cache, six core, 45 W, Intel UHD Graphics 630 GPU)
	i5-8400H (2.5-GHz, turbo up to 4.2 GHz, 2400-MHz/8-MB L3 cache, quad core, 45 W, Intel UHD Graphics 630 GPU)
	i5-8300H (2.3-GHz, turbo up to 4.0 GHz, 2400-MHz/8-MB L3 cache, quad core, 45 W, Intel UHD Graphics 630 GPU)
	Support for Intel Dynamic Platform and Thermal Framework (Intel DPTF) in HP BIOS
Graphics	**Internal graphics** (Intel Core i5 processors only)
	Intel UHD Graphics 630
	Discrete graphics
	NVIDIA GeForce GTX 1050 with Max-Q Design with 4096 MB of dedicated video memory
	Supports DisplayPort 1.3 (supported through Thunderbolt 3); DisplayPort 1.4 ready
	Supports hybrid (switchable) graphics
	Supports Nvidia Optimus Technology
	Supports Open GL 4.5/Open CL 1.2/Vulkan 1.0
	Supports Nvidia Surround Technology
Panel	**39.6-cm (15.6-in), anti glare, LED, UWVA, 72% CG, eDP+PSR,16:9 aspect ratio**
	Full high-definition (FHD), anti glare (1920×1080), 400 nits, slim, ambient light sensor
	Full high-definition (FHD), anti glare (1920×1080), 400 nits, slim, ambient light sensor, with HD camera
	Full high-definition (FHD), anti glare (1920×1080), 400 nits, slim, ambient light sensor, with HD+IR cameras
	Full high-definition (FHD), anti glare (1920×1080), 650 nits, uslim, privacy
	Full high-definition (FHD), anti glare (1920×1080), 650 nits, uslim, privacy, with HD+IR cameras
	Ultra high-definition (UHD), anti glare (3840×2160), 400 nits, ambient light sensor
	Ultra high-definition (UHD), anti glare (3840×2160), 400 nits, uslim, ambient light sensor, with HD camera
	Ultra high-definition (UHD), anti glare (3840×2160), 400 nits, uslim, ambient light sensor, with HD+IR cameras
Memory	Two customer-accessible/upgradable memory module slots
	DDR4-2666 dual channel support

Category	Description
	Supports up to 32 GB of system RAM in the following configurations
	• 32768-MB total system memory (16384×2)
	• 16384-MB total system memory (8192×2 or 16384×1)
	• 8192-MB total system memory (8192×1) or (4096×2)
Primary storage, M.2	**M.2 (NGFF), SS/DS, solid-state drive (2280)**
	SATA
	512 GB, SATA-3, FIPS-140-2, TLC
	256 GB, SATA-3, self-encrypting drive, Opal 2, TLC
	PCIe (NVMe)
	2 TB, TLC
	1 TB, TLC
	512 GB, TLC
	512 GB, TLC, Opal 2
	256 GB, TLC
	256 GB, TLC, Opal 2
Secondary storage, M.2	**M.2 (NGFF), SS/DS, solid-state drive (2280)**
	SATA
	512 GB, SATA-3, FIPS-140-2, TLC
	256 GB, SATA-3, self-encrypting drive, Opal 2, TLC
	PCIe (NVMe)
	2 TB, TLC
	1 TB, TLC
	512 GB, TLC
	512 GB, TLC, Opal 2
	256 GB, TLC
	256 GB, TLC, Opal 2
Camera	HD camera, 720p (select models only)
	IR/RGB 720p FHD camera (select models only)
Audio	HP Bang & Olufsen Audio (Conexant CX8400)
	HP Noise Cancellation Software
	HP Clear Sound Amp
	Intel SST Audio
	Microphone (dual array)
	Microphone (world facing)

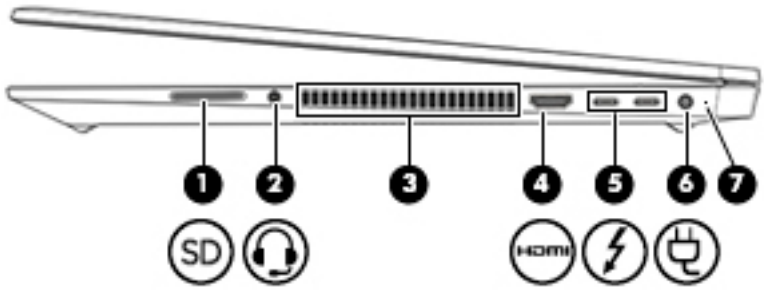
Category	Description
	Stereo speakers (4)
Wireless Network	**WLAN Bluetooth**
	Bluetooth 5.0 only supported using combo card
	Integrated WLAN options with dual antennas; soldered to system board
	WLAN antennas (2) (configured at top of panel on all models)
	Bluetooth disabled IOPT
	WLAN disabled IOPT
	Support for the following WLAN formats:
	• Intel Dual Band Wireless-AC 9560 802.11 AC 2x2 WiFi + Bluetooth 5.0 Combo Adapter (non-vPro, MU-MIMO supported)
	• Intel Dual Band Wireless-AC 9560 802.11 AC 2x2 WiFi + Bluetooth 5.0 Combo Adapter (vPro, MU-MIMO supported)
	NFC (select models only):
	NFC Mirage WNC XRAV-1 (NXP NPC300 I2C 10mm × 17mm)
	NFC antenna
External media card	**HP Multi-Format Digital Media Reader**
	Support SD/SDHC/SDXC
Ports	HDMI 2.0 with discrete graphics; HDMI 1.4 with UMA graphics
	USB 3.0 port
	USB 3.0 charging port (S3/S5)
	USB Type-C port with ThunderBolt (2)
	Multi-pin AC port
	Headphone/line out and microphone/line in combo jack
Docking	HP Thunderbolt Dock 230W G2
	HP ZBook Dock with Thunderbolt 3
Keyboard/pointing devices	**Keyboard**
	Backlit, spill-resistant, standard notebook keyboard with DuraKeys
	Backlit, spill-resistant, standard notebook keyboard with DuraKeys - privcy
	TouchPad
	Default to Microsoft PTP requirement
	Glass with chemical-etched surface
Power	**AC adapter** (Smart, 4.5 mm)
	150 W, slim
	Power cord
	1 meter, C5, 3-wire power cord

Category	Description
	Battery
	6-cell, 95.6-Whr, 4.15 Ah, polymer battery (2.5-inch bay not available when selected)
	4-cell, 64-Whr, 4.15 Ah, polymer battery
	HP Fast Charge Technology
Security	TPM 2.0 (Infineon; soldered down)
	Security lock
	Touch fingerprint sensor (select models only)
	Drive encryption preboot option - password, fingerprint, selected smart cards
	BIOS preboot power on - BIOS option (password, fingerprint)
Operating system	**Operating system version:**
	Windows 10, RS3
	Preinstalled:
	Windows 10 Home 64 Plus
	Windows 10 Home 64 Plus Single Language
	Windows 10 Home 64 High-End Chinese Market CPPP
	Windows 10 Pro 64
	FreeDOS 2.0
	Restore media:
	Windows 10 DRDVD
	Windows 10 Pro 64 OSDVD
	Windows 10 DRUSB
	Windows 10 Pro 64 OSUSB
	Certified:
	Microsoft WHQL
	Web-only support:
	Windows 10 Enterprise 64
	Windows 10 Enterprise 64 LTSB 1607
Serviceability	**End-user replaceable parts**
	AC adapter

2 Components

Your computer features top-rated components. This chapter provides details about your components, where they're located, and how they work.

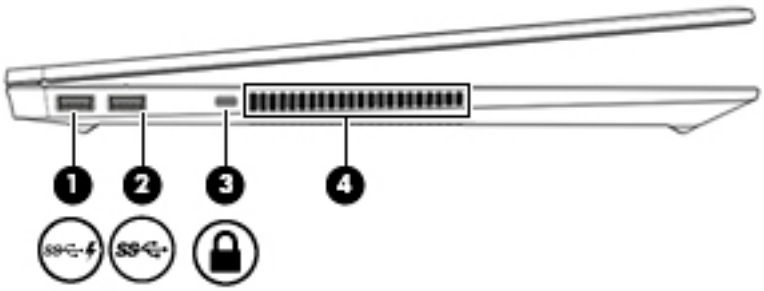
Right



Component			Description
(1)	SD	Memory card reader	Reads optional memory cards that store, manage, share, or access information. To insert a card: 1. Hold the card label-side up, with the connectors facing the computer. 2. Insert the card into the memory card reader, and then press in on the card until it is firmly seated. To remove a card: ▲ Press in on the card, and then remove it from the memory card reader.
(2)		Audio-out (headphone)/Audio-in (microphone) combo jack	Connects optional powered stereo speakers, headphones, earbuds, a headset, or a television audio cable. Also connects an optional headset microphone. This jack does not support optional standalone microphones. **WARNING!** To reduce the risk of personal injury, adjust the volume before putting on headphones, earbuds, or a headset. For additional safety information, refer to the *Regulatory, Safety, and Environmental Notices*. To access this guide: ▲ Select the **Start** button, select **HP Help and Support**, and then select **HP Documentation**. – or – ▲ Select the **Start** button, select **HP**, and then select **HP Documentation**. **NOTE:** When a device is connected to the jack, the computer speakers are disabled.
(3)		Vent	Enables airflow to cool internal components.

Component			Description
			NOTE: The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(4)		HDMI port	Connects an optional video or audio device, such as a high-definition television, any compatible digital or audio component, or a high-speed High Definition Multimedia Interface (HDMI) device.
(5)		USB Type-C power connector and Thunderbolt™ ports (2) with HP Sleep and Charge	Connect an AC adapter that has a USB Type-C connector, supplying power to the computer and, if needed, charging the computer battery. – and – Connect and charge most USB devices that have a Type-C connector, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer. – and – Connect a display device that has a USB Type-C connector, providing DisplayPort output. **NOTE:** Your computer may also support a Thunderbolt docking station. **NOTE:** Cables and/or adapters (purchased separately) may be required.
(6)		Power connector	Connects an AC adapter.
(7)		Battery light	When AC power is connected: • White: The battery charge is greater than 90 percent. • Amber: The battery charge is from 0 to 90 percent. • Off: The battery is not charging. When AC power is disconnected (battery not charging): • Blinking amber: The battery has reached a low battery level. When the battery has reached a critical battery level, the battery light begins blinking rapidly. • Off: The battery is not charging.

Left



Component			Description
(1)		USB SuperSpeed port with HP Sleep and Charge	Connects a USB device, provides high-speed data transfer, and even when the computer is off, charges most products such as a cell phone, camera, activity tracker, or smartwatch.
(2)		USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(3)		Security cable slot	Attaches an optional security cable to the computer. **NOTE:** The security cable is designed to act as a deterrent, but it may not prevent the computer from being mishandled or stolen.
(4)		Vent	Enables airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.

Display

Component		Description
(1)	WLAN antennas* (select products only)	Send and receive wireless signals to communicate with wireless local area networks (WLANs).
(2)	Internal microphones (2)	Record sound.
(3)	Camera light (select products only)	On: The camera is in use.
(4)	Camera(s) (select products only)	Allow(s) you to video chat, record video, and record still images. Some cameras also allow a facial recognition logon to Windows, instead of a password logon. **NOTE:** Camera functions vary depending on the camera hardware and software installed on your product.

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

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

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– or –

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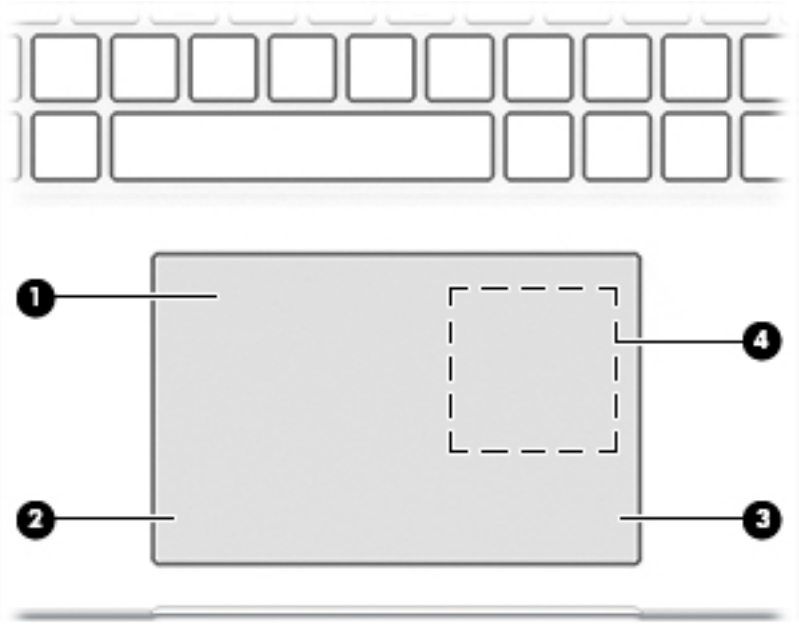
Keyboard area

TouchPad



Component		Description
(1)	TouchPad zone	Reads your finger gestures to move the pointer or activate items on the screen.
(2)	Left control zone	Textured area that allows you to perform additional gestures.
(3)	Right control zone	Textured area that allows you to perform additional gestures.
(4)	Near Field Communications (NFC) tapping area and antenna* (select products only)	Allows you to wirelessly share information when you tap it with an NFC-enabled device.

*The antenna is not visible from the outside of the computer. For optimal transmission, keep the area immediately around the antenna free from obstructions.

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

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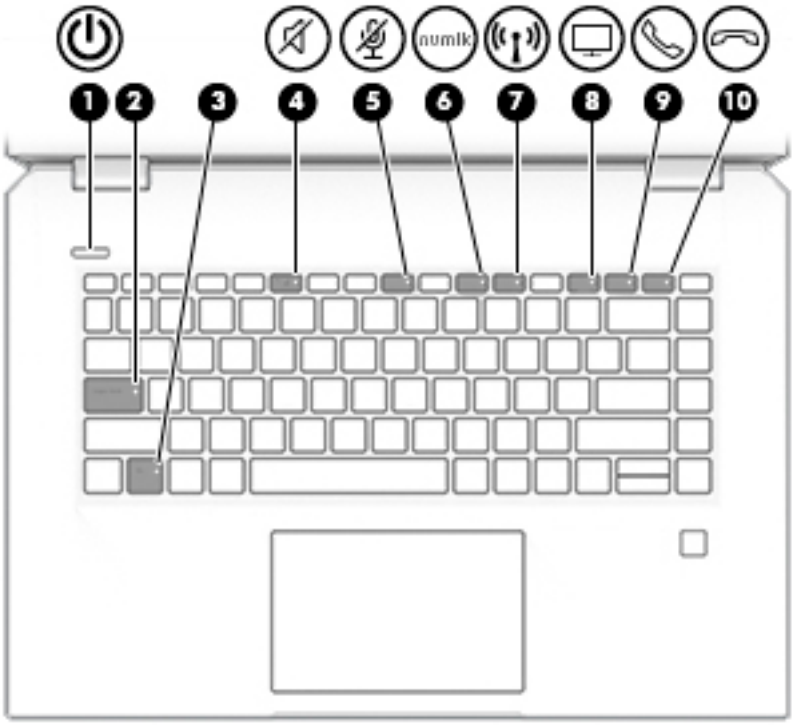
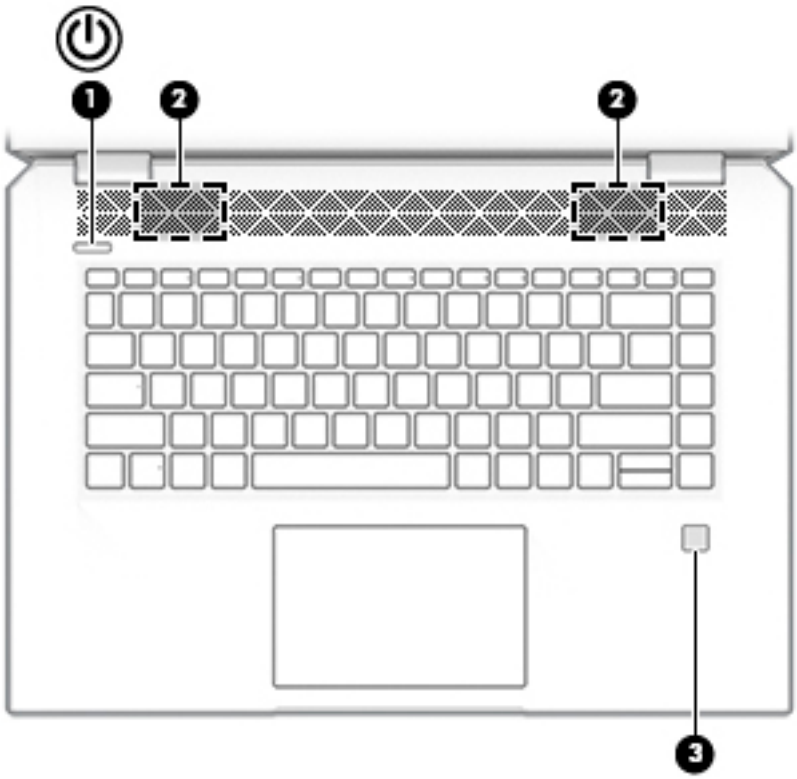
Lights



Component			Description
(1)		Power light	• On: The computer is on. • Blinking: The computer is in the Sleep state, a power-saving state. The computer shuts off power to the display and other unneeded components. • Off: The computer is off or in Hibernation. Hibernation is a power-saving state that uses the least amount of power.
(2)		Caps lock light	On: Caps lock is on, which switches the key input to all capital letters.
(3)		Fn lock light	On: The fn key is locked.
(4)		Mute light	• On: Computer sound is off. • Off: Computer sound is on.
(5)		Microphone mute light	• On: Microphone is off. • Off: Microphone is on.
(6)	num lk	Num lk light	On: Num lock is on.
(7)		Wireless light	On: An integrated wireless device, such as a wireless local area network (WLAN) device and/or a Bluetooth® device, is on. **NOTE:** On some models, the wireless light is amber when all wireless devices are off.
(8)		Sharing or presenting light	On: Sharing is on.

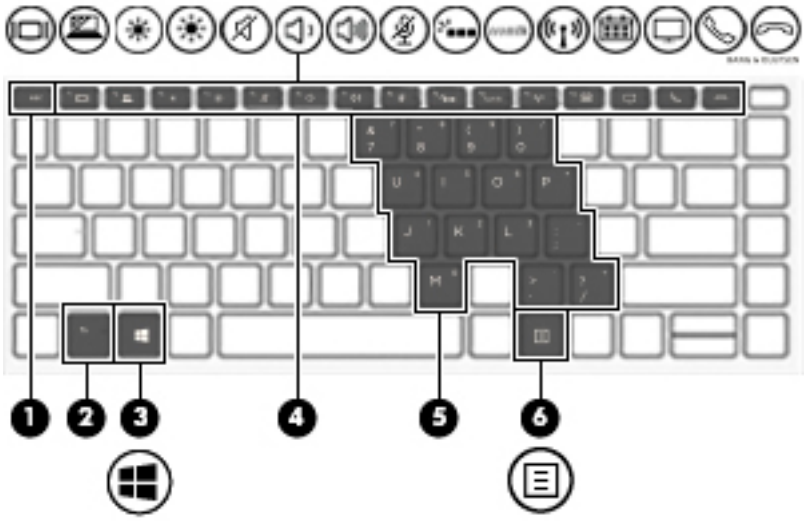
Component			Description
(9)		Call answer light	On: Call answer is on.
(10)		Call end light	On: Call end is on.

Button, speakers, and fingerprint reader



Component			Description
(1)		Power button	• When the computer is off, press the button to turn on the computer. • When the computer is on, press the button briefly to initiate Sleep. • When the computer is in the Sleep state, press the button briefly to exit Sleep. • When the computer is in Hibernation, press the button briefly to exit Hibernation. **CAUTION:** Pressing and holding down the power button results in the loss of unsaved information. If the computer has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 5 seconds to turn off the computer. To learn more about your power settings, see your power options. ▲ Right-click the **Power meter** icon and then select **Power Options**.
(2)		Speakers (2)	Produce sound.
(3)		Fingerprint reader (select products only)	Allows a fingerprint logon to Windows, instead of a password logon.

Special keys



Component			Description
(1)		esc key	Displays system information when pressed in combination with the fn key.
(2)		fn key	Executes frequently used system functions when pressed in combination with another key. Such key combinations are called *hot keys*.
(3)		Windows key	Opens the **Start** menu. **NOTE:** Pressing the Windows key again will close the **Start** menu.
(4)		Action keys	Execute frequently used system functions. See Action keys on page 13.
(5)		Embedded numeric keypad	A numeric keypad superimposed over the keyboard alphabet keys. When num lk is pressed, the keypad can be used like an external numeric keypad. Each key on the keypad performs the function indicated by the icon in the upper-right corner of the key. **NOTE:** If the keypad function is active when the computer is turned off, that function is reinstated when the computer is turned back on.
(6)		Windows application key	Displays options for a selected object.

Action keys

An action key performs the function indicated by the icon on the key. To determine which keys are on your product, see Special keys on page 12.

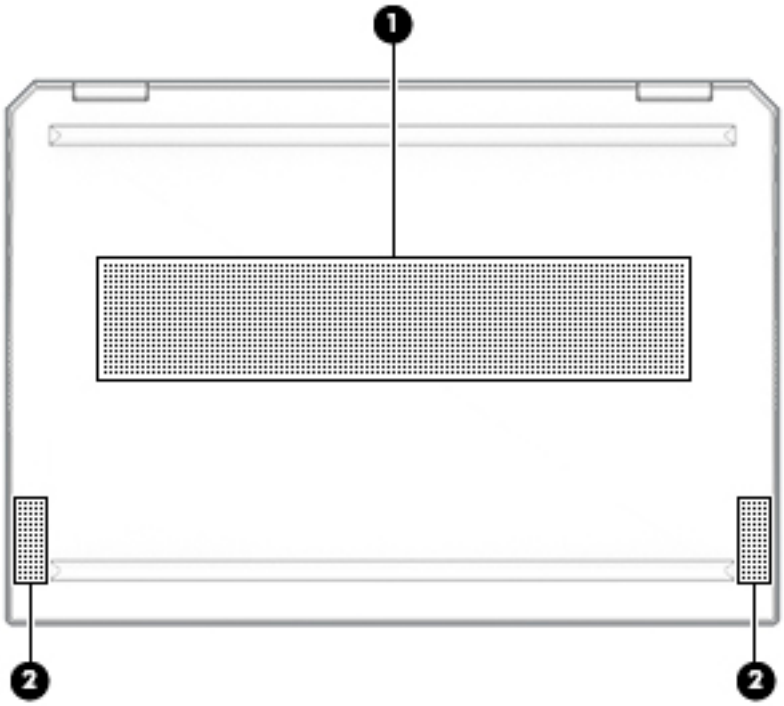
▲ To use an action key, press and hold the key.

Icon	Description
	Switches the screen image among display devices connected to the system. For example, if a monitor is connected to the computer, repeatedly pressing the key alternates the screen image from computer display to monitor display to simultaneous display on both the computer and monitor.
	Helps prevent side-angle viewing from onlookers. If needed, decrease or increase brightness for well-lit or darker environments. Press the key again to turn off the privacy screen. **NOTE:** To quickly turn on the highest privacy setting, press fn+p. 
	Decreases the screen brightness incrementally as long as you hold down the key.
	Increases the screen brightness incrementally as long as you hold down the key.
	Mutes or restores speaker sound.
	Decreases speaker volume incrementally while you hold down the key.
	Increases speaker volume incrementally while you hold down the key.
	Mutes the microphone.
	Turns the keyboard backlight off or on. **NOTE:** To conserve battery power, turn off this feature.
num lk	Turns the embedded numeric keypad on and off.
	Turns the wireless feature on or off. **NOTE:** A wireless network must be set up before a wireless connection is possible.
	Provides quick access to your Skype for Business calendar. **NOTE:** This feature requires Skype® for Business or Lync® 2013 running on Microsoft Exchange or Office 365® servers.
	Turns the screen sharing function on or off. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.
	• Answers a call.

Icon	Description
	• Starts a call during a 1-on-1 chat. • Places a call on hold. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.
	• Ends a call. • Declines incoming calls. • Ends screen sharing. **NOTE:** This feature requires Skype for Business or Lync 2013 running on Microsoft Exchange or Office 365 servers.

NOTE: The action key feature is enabled at the factory. You can disable this feature by pressing and holding the fn key and the left shift key. The fn lock light will turn on. After you have disabled the action key feature, you can still perform each function by pressing the fn key in combination with the appropriate action key.

Bottom



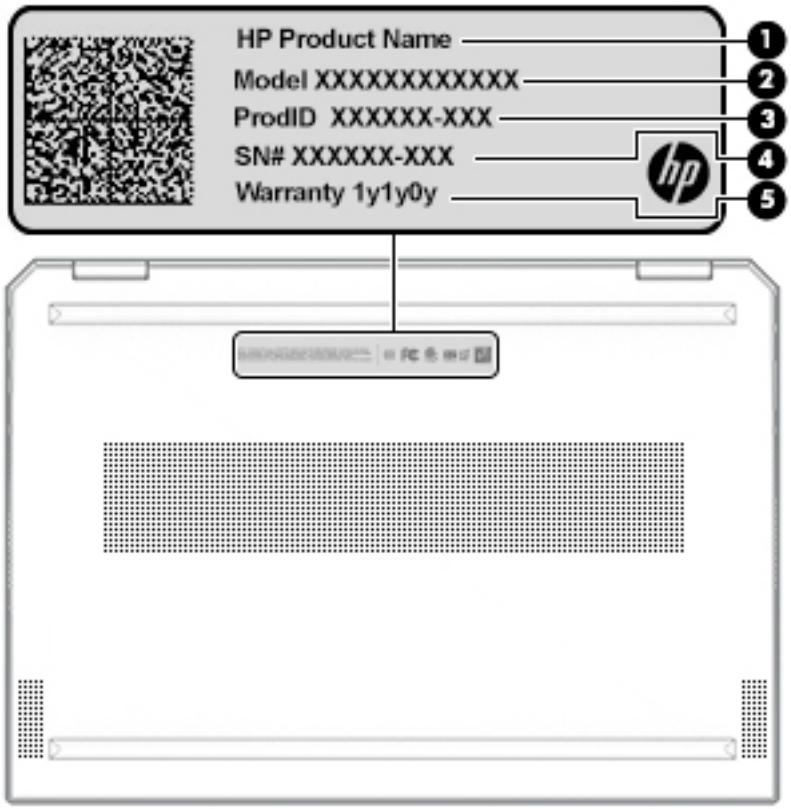
Component		Description
(1)	Vent	Enables airflow to cool internal components. **NOTE:** The computer fan starts up automatically to cool internal components and prevent overheating. It is normal for the internal fan to cycle on and off during routine operation.
(2)	Speakers (2)	Produce sound.

Labels

The labels affixed to the computer provide information you may need when you troubleshoot system problems or travel internationally with the computer. Labels may be in paper form or imprinted on the product.

IMPORTANT: Check the following locations for the labels described in this section: the bottom of the computer, inside the battery bay, under the service door, on the back of the display, or on the bottom of a tablet kickstand.

- Service label—Provides important information to identify your computer. When contacting support, you may be asked for the serial number, the product number, or the model number. Locate this information before you contact support.

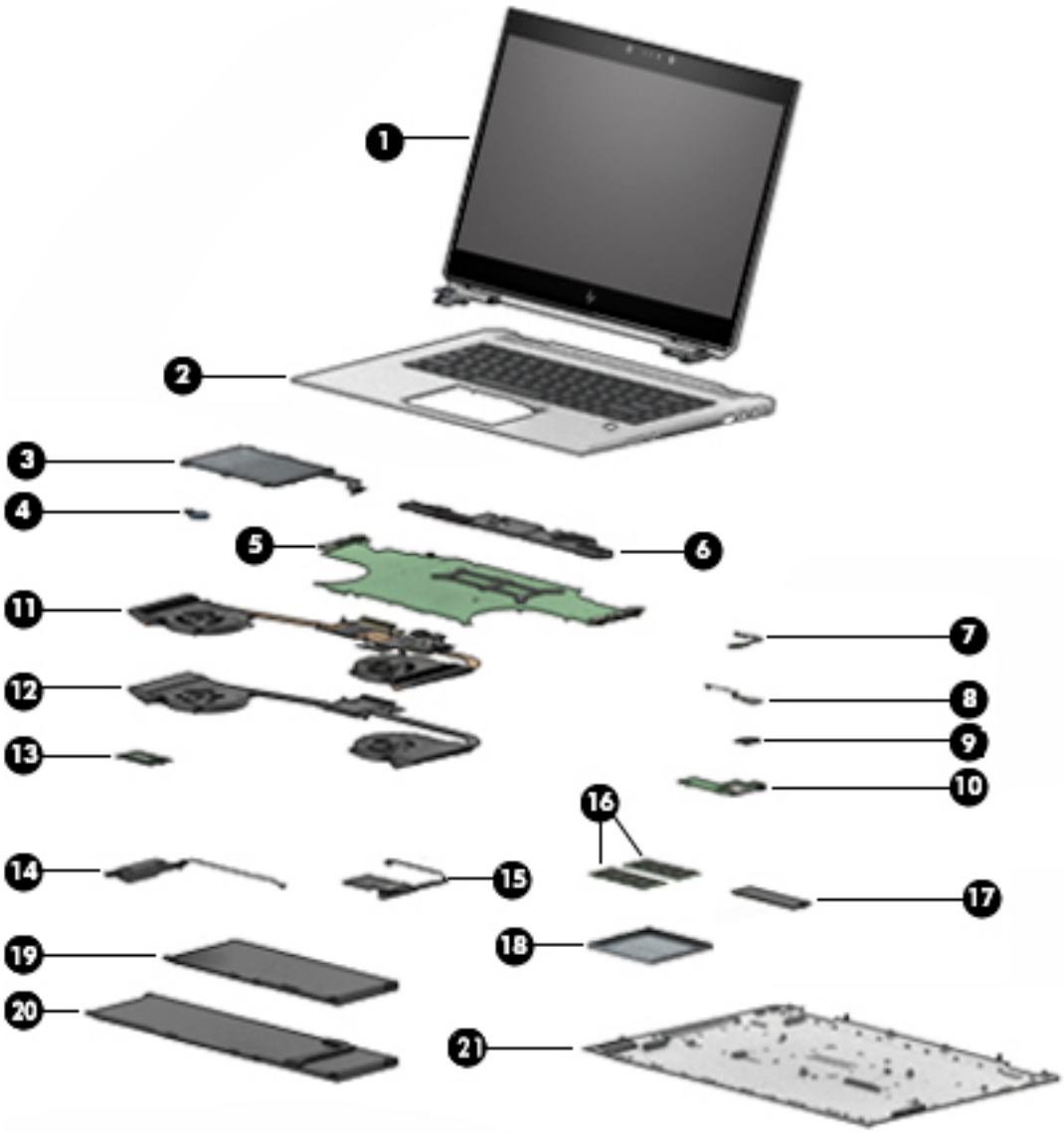


Component	
(1)	HP product name (select products only)
(2)	Model number
(3)	Product ID
(4)	Serial number
(5)	Warranty period

- Regulatory label(s)—Provide(s) regulatory information about the computer.
- Wireless certification label(s)—Provide(s) information about optional wireless devices and the approval markings for the countries or regions in which the devices have been approved for use.

3 Illustrated parts catalog

Computer major components

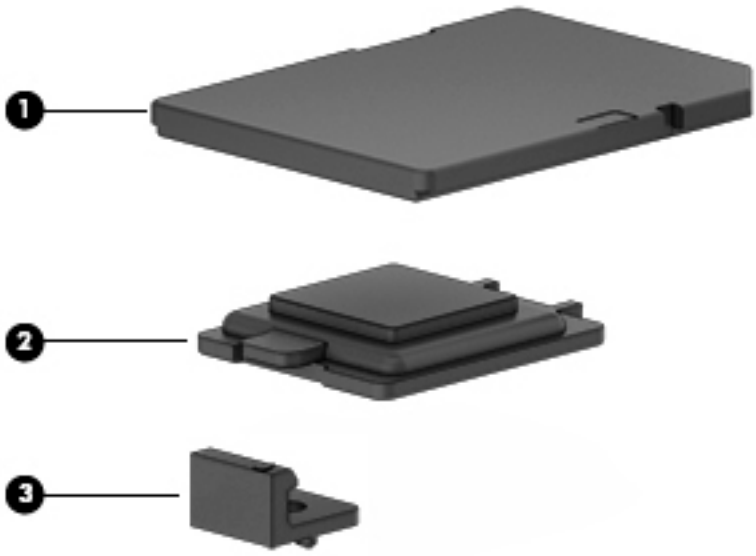


Item	Component	Spare part number
(1)	**Display assembly** (non-touch) **NOTE:** The display assembly is spared at the subcomponent level only. For display assembly spare part information, see Display assembly subcomponents on page 21.	
(2)	**Top cover with keyboard** (includes keyboard cable): **NOTE:** For a detailed list of keyboard country codes, see Top cover/keyboard on page 66.	
	Backlit keyboard	L34212-xx1

Item	Component	Spare part number
	Backlit, privacy keyboard	L34213-xx1
(3)	**TouchPad**	L31559-001
(4)	**RTC battery**	not spared
(5)	**System board** (includes processor and replacement thermal material): All system boards use the following part numbers: xxxxxx-001: Non-Windows operating systems xxxxxx-601: Windows 10 operating system	
	For use in models with discrete graphics memory:	
	• Intel Core i7-8850H processor	L31553-001, -601
	• Intel Core i7-8750H processor	L31552-001, -601
	• Intel Core i5-8400H processor	L31551-001, -601
	• Intel Core i5-8300H processor	L31550-001, -601
	For use in models with UMA graphics memory:	
	• Intel Core i7-8850H processor	L31557-001, -601
	• Intel Core i7-8750H processor	L31556-001, -601
	• Intel Core i5-8400H processor	L31555-001, -601
	• Intel Core i5-8300H processor	L31554-001, -601
(6)	**Top speaker**	L28672-001 (Speaker Kit)
(7)	**NFC module**	L02249-001
(8)	**Fingerprint reader board**	L33678-001
(9)	**Fingerprint reader bracket**	L28674-001 (Bracket Kit)
(10)	**Card reader board/audio board** (includes cable)	L31572-001
	Thermal module (includes replacement thermal material):	
(11)	For use only with models with discrete graphics memory	L28670-001
(12)	For use only with models with UMA graphics memory	L30973-001
(13)	**Power button board** (includes cable)	L28661-001
	Speaker Kit	L28672-001
(14)	Left speaker	
(15)	Right speaker	
(16)	**Memory module** (DDR4-2400-MHz)	
	16 GB	937438-850
	8 GB	937236-850
	4 GB	L10598-850
(17)	**Solid-state drive** (M.2)	

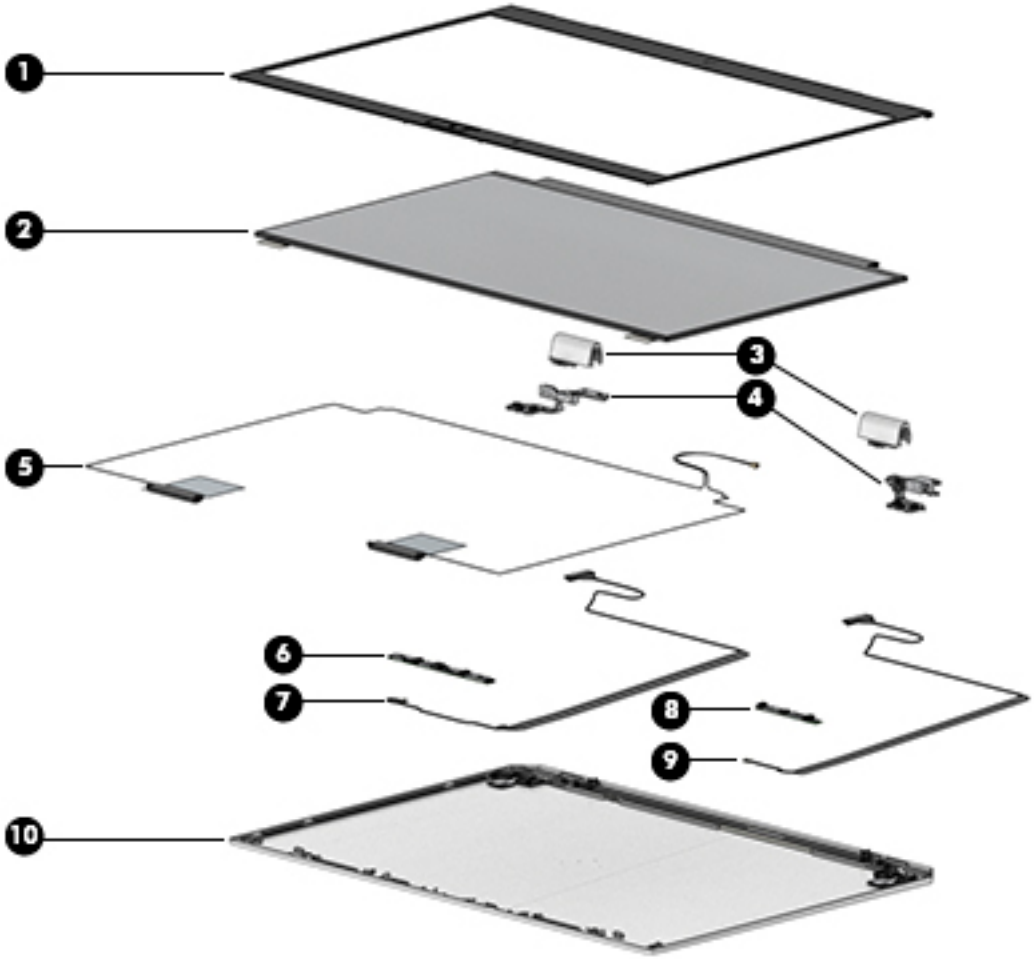
Item	Component	Spare part number
	2-TB, PCIe, TLC	L32557-001
	1-TB, PCIe, TLC	L32553-001
	512-GB, PCIe, TLC	L32559-001
	512-GB, PCIe, self-encrypting drive (SED), OPAL 2, TLC	L32558-001
	512-GB, SATA, FIPS, TLC	L32560-001
	256-GB, PCIe, TLC	L32555-001
	256-GB, PCIe, self-encrypting drive (SED), OPAL 2	L32554-001
	256-GB, SATA-3, self-encrypting drive (SED), OPAL 2	L32556-001
(18)	**Memory cover**	L28674-001 (Bracket Kit)
(19)	**Battery** (4-cell)	L07046-855
(20)	**Battery** (6-cell)	L07045-855
(21)	**Bottom cover**	L31560-001
	WLAN module (not illustrated)	
	Intel Wireless-AC 9560 802.11ac 2x2 WiFi + BT 5 Combo Adaptor (vPro)	L32652-005
	Intel Wireless-AC 9560 802.11ac 2x2 WiFi + BT 5 Combo Adaptor (non vPro)	L32650-005

Plastics Kit



Item	Component	Spare part number
	Plastics Kit	L32730-001
(1)	Card reader insert	
(2)	Fingerprint reader insert	
(3)	Central hook	

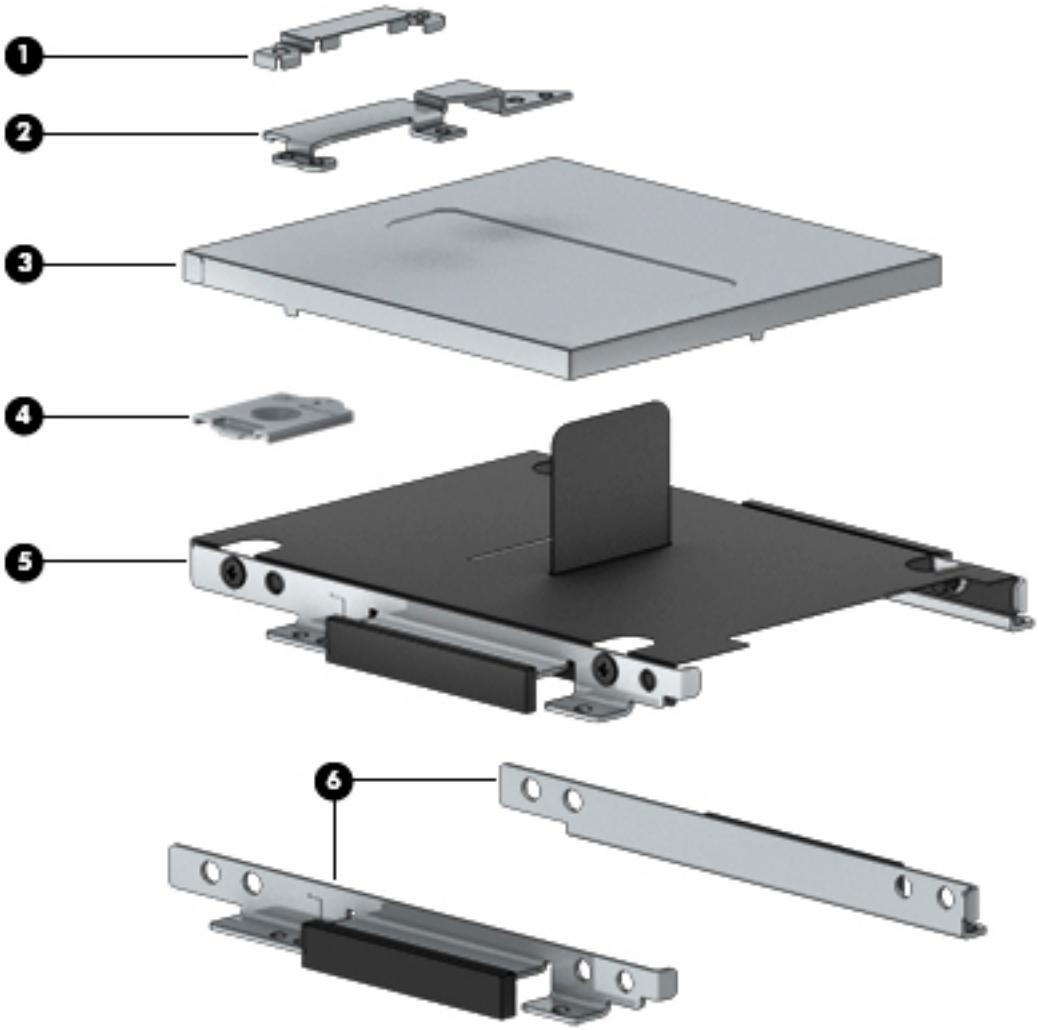
Display assembly subcomponents



Item	Component	Spare part number
(1)	**Display bezel**	
	For use in models with an ambient light sensor:	
	• Equipped with only an HD camera	L31564-001
	• Equipped with an IR camera	L31565-001
	• Not equipped with a camera	L31566-001
	For use in models without an ambient light sensor	
	• Equipped with only an HD camera	L31567-001
	• Equipped with an IR camera	L31568-001
	• Not equipped with a camera	L31569-001
(2)	**Display panel** (includes display cable, bezel adhesive, and panel adhesive tape)	
	FHD	L32562-001
	FHD, privacy	L32561-001

Item	Component	Spare part number
	UHD	L32563-001
(3)	**Hinge cap** (left and right; includes bezel adhesive)	L31570-001
(4)	**Display hinges** (includes left and right hinges and bezel adhesive)	L28659-001
(5)	**Antenna** (left and right, includes bezel adhesive)	L31688-001
(6)	**Camera module, IR camera** (includes bezel adhesive)	L30660-001
(7)	**Camera cable, IR** (separate cables for IR camera, IR camera on DreamColor display, IR camera on displays without an ambient light sensor; includes bezel adhesive, cover adhesive)	L31696-001 (Display Cable Kit)
(8)	**Camera module, HD** (includes bezel adhesive)	L28470-001
(9)	**Camera cable, HD** (separate cables for HD camera, HD camera on DreamColor displays; includes bezel adhesive, cover adhesive)	L31696-001 (Display Cable Kit)
(10)	**Display enclosure** (includes bezel adhesive)	
	FHD display	L31561-001
	UHD display	L31562-001
	Privacy display	L31563-001
	Camera shutter (not illustrated)	L31319-001

Bracket Kit



Item	Component	Spare part number
	Bracket Kit	L28674-001
(1)	LCD clip	
(2)	Power connector bracket	
(3)	Memory cover	
(4)	Fingerprint reader bracket	
(5)	Hard drive bracket (not used in this model)	
(6)	Left and right hard drive brackets (not used in this model)	

Miscellaneous parts

Component	Spare part number
AC adapter, 150-W HP Smart adapter (PFC, 4.5-mm)	L32661-001
Rubber Kit	L28671-001
Cable Kit (includes hard drive connector cable (not used), fingerprint reader cable, TouchPad cable, and NFC cable)	L28668-001
Screw Kit	L28673-001

4 Removal and replacement procedures preliminary requirements

Tools required

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

- Flat-bladed screw driver
- Magnetic screw driver
- Phillips P0 and P1 screw drivers
- Torx screwdriver
- Thin plastic (non-conductive) prying tool (spudger)

Service considerations

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

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

Plastic parts

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.

Cables and connectors

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

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

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, then degrade in the internal layers, reducing its life expectancy.

⚠ **CAUTION:** To prevent damage to the tablet 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.

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

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

Packaging and transporting guidelines

Follow these grounding guidelines when packaging and transporting equipment:

- To avoid hand 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, screw drivers, 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 ±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 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 plastics	Bags	1,500 V
Carbon-loaded plastic	Floor mats	7,500 V
Metallized laminate	Floor mats	5,000 V

5 Removal and replacement procedures for authorized service provider parts

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

Component replacement procedures

There are as many as 82 screws that must be removed, replaced, and/or loosened when servicing the parts described in this chapter. Make special note of each screw size and location during removal and replacement.

Bottom cover

Description	Spare part number
Bottom cover	L31560-001

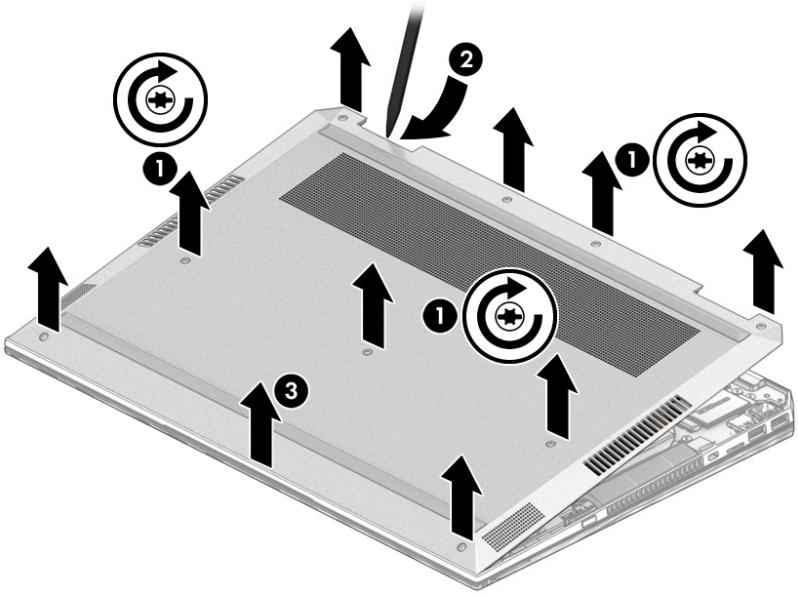
Before removing the bottom cover, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.

Remove the bottom cover:

1. Loosen the 9 captive Torx screws **(1)** that secure the bottom cover to the computer.

2. Starting near the display hinges, use a plastic non-conductive tool **(2)** to release the bottom cover, and then remove the bottom cover from the computer **(3)**.



Reverse this procedure to install the bottom cover.

Battery

Description	Spare part number
6-cell, 95-WHr, 4.15-AHr, Li-ion battery	L07045-855
4-cell, 64-WHr, 4.15-AHr, Li-ion battery	L07046-855

Before removing the battery, follow these steps:

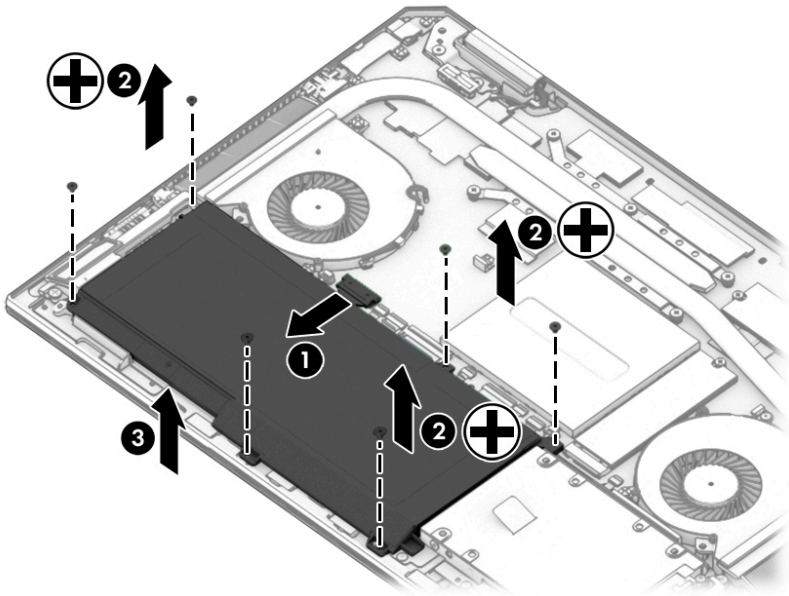
1. Turn off the computer. If you are unsure whether the computer is off or in Hibernation, turn the computer on, and then shut it down through the operating system.
2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).

Remove the battery:

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

4-cell battery

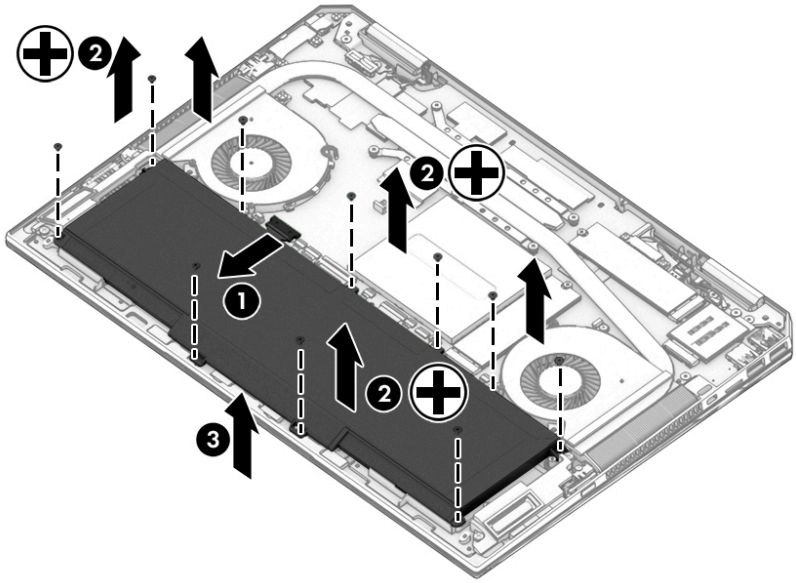
1. Disconnect the battery cable from the system board **(1)**.
2. Remove the six Phillips M2.0×3.0 screws **(2)** that secure the battery to the computer.
3. Remove the battery from the computer **(3)**.



6-cell battery

1. Disconnect the battery cable from the system board **(1)**.
2. Remove the 10 Phillips M2.0×3.0 screws **(2)** that secure the battery to the computer.

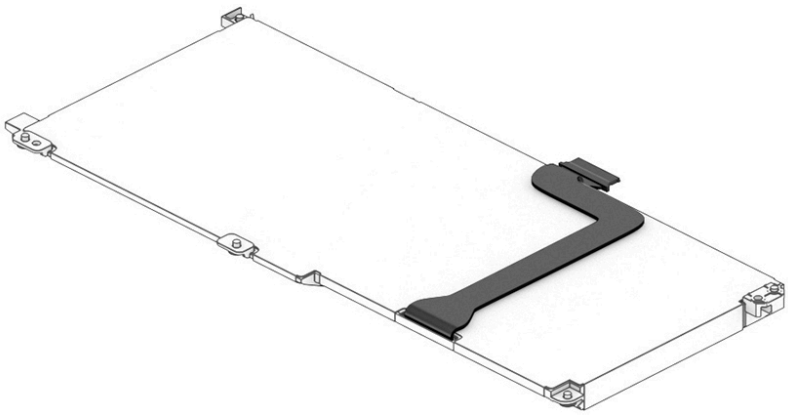
3. Remove the battery from the computer **(3)**.



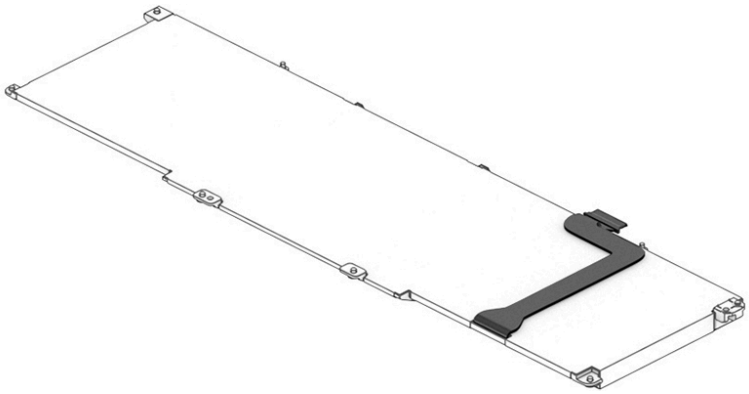
Reverse this procedure to install the battery.

When installing the battery, be sure to properly route the battery cable as shown in the following images:

4-cell battery cable routing



6-cell battery cable routing



Solid-state drive (M.2)

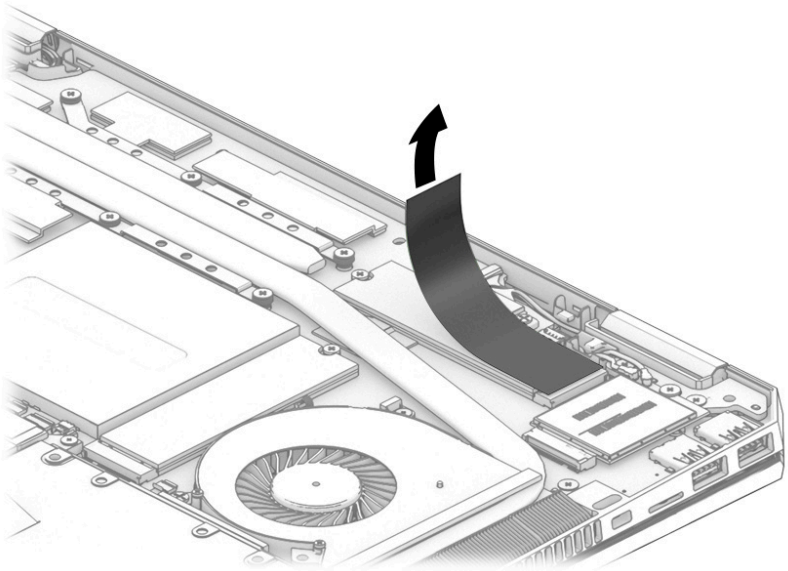
Description	Spare part number
2-TB, TLC	L32557-001
1-TB, TLC	L32553-001
1-TB, MLC	L28685-001
512-GB, TLC	L32559-001
512-GB, self-encrypting drive (SED), OPAL 2, TLC	L32558-001
512-GB, FIPS, TLC	L32560-001
256-GB, TLC	L32555-001
256-GB, PCIe, self-encrypting drive (SED), OPAL 2	L32554-001
256-GB, SATA-3, self-encrypting drive (SED), OPAL 2	L32556-001

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

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

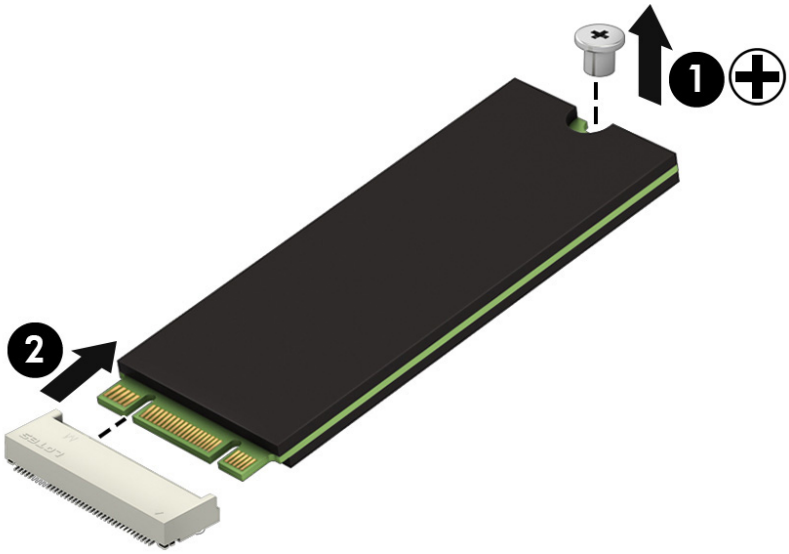
Remove the solid-state drive:

1. Lift the Mylar from atop the solid-state drive.



2. Remove the Phillips M2.0×3.0 screw **(1)** that secures the solid-state drive to the system board.

3. Remove the solid-state drive **(2)** by pulling the drive away from the slot at an angle.



Reverse this procedure to install the solid-state drive.

Memory module

Description	Spare part number
16 GB	937438-850
8 GB	937236-850
4 GB	L10598-850

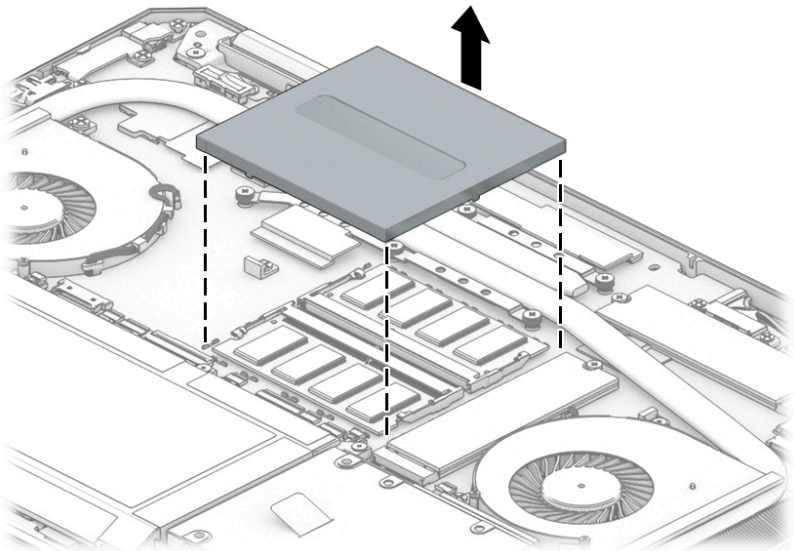
Before removing a memory module, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the memory module:

1. Lift the memory cover off the system board.

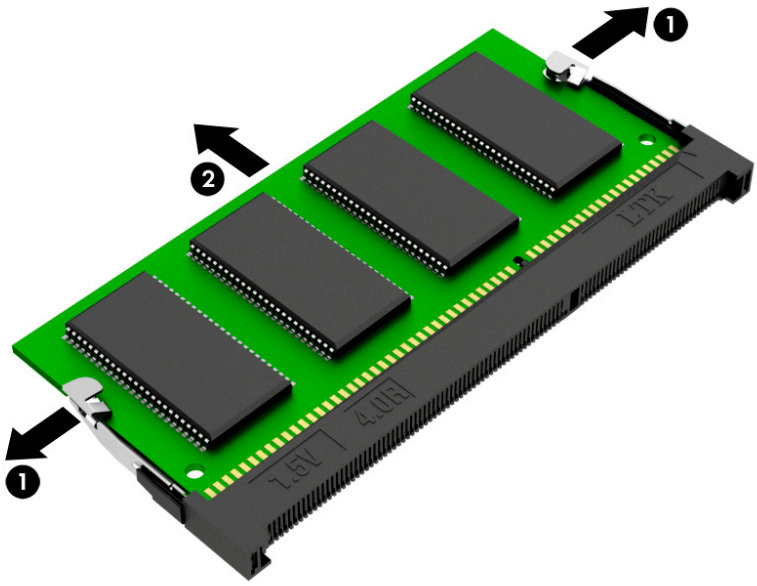
NOTE: The memory cover is available in the Bracket Kit using spare part number L28674-001.



2. Spread the retaining tabs **(1)** on each side of the memory module slot to release the memory module. (The memory module tilts up.)

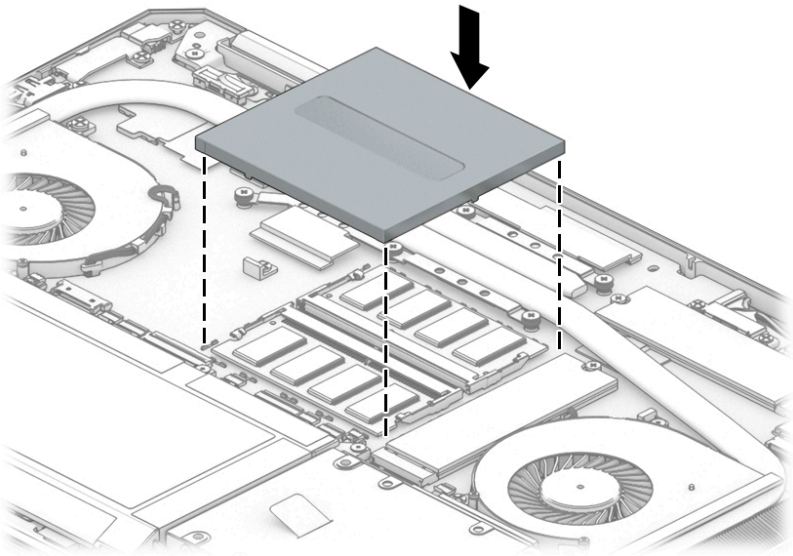
3. Remove the memory module **(2)** by pulling the module away from the slot at an angle.

IMPORTANT: To prevent damage to the memory module, hold the memory module by the edges only. Do not touch the components on the memory module.



Reverse this procedure to install a memory module.

Small clips on the system board hold the memory cover in place. When replacing the memory cover, be sure to align the cover with these clips.



WLAN/Bluetooth combo card

Description	Spare part number
Intel Wireless-AC 9560 802.11ac 2x2 WiFi + BT 5 Combo Adaptor (vPro)	L32652-005
Intel Wireless-AC 9560 802.11ac 2x2 WiFi + BT 5 Combo Adaptor (non vPro)	L32650-005

Before removing the WLAN module, follow these steps:

1. Shut down the computer.
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 bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the WLAN module:

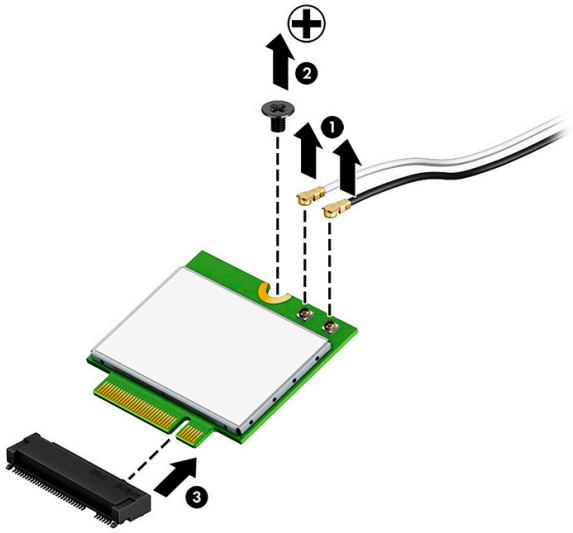
1. Disconnect the WLAN antenna cables **(1)** from the terminals on the WLAN module.

NOTE: The WLAN antenna cable labeled '1' connects to the WLAN module "Main" terminal labeled '1'. The WLAN antenna cable labeled '2' connects to the WLAN module 'Aux' terminal labeled '2'. If the computer is equipped with an 802.11a/b/g/n WLAN module, the yellow WLAN antenna cable connects to the middle terminal on the WLAN module.

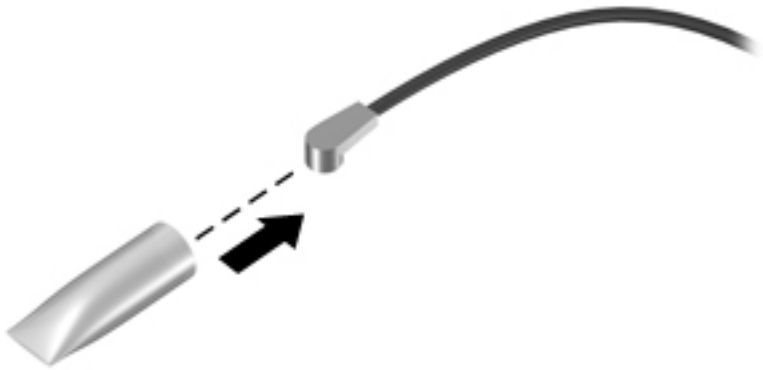
2. Remove the Phillips M2.0×2.0 screw **(2)** that secures the WLAN module to the computer. (The edge of the module opposite the slot rises away from the computer.)

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

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



NOTE: If the WLAN antennas are not connected to the terminals on the WLAN module, the protective sleeves must be installed on the antenna connectors, as shown in the following illustration.



Reverse this procedure to install the WLAN module.

Fingerprint reader board

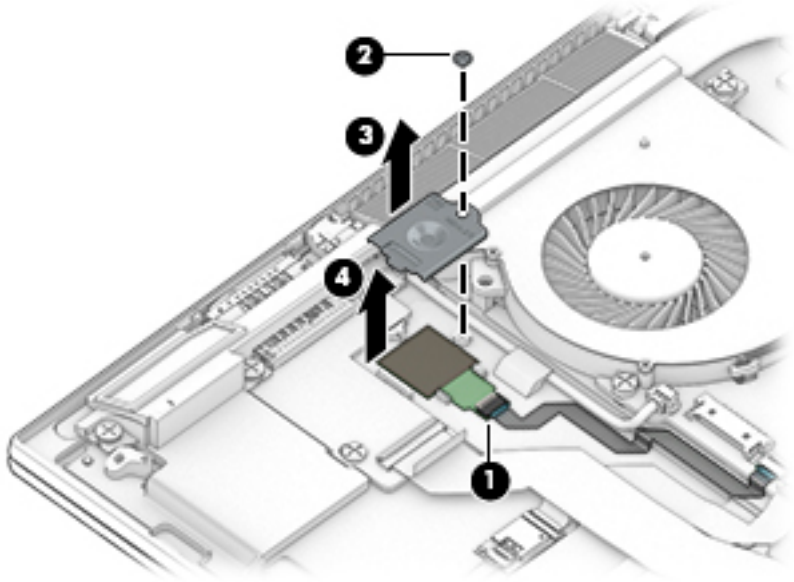
Description	Spare part number
Fingerprint reader board (includes bracket)	L33678-001
Fingerprint reader board bracket	L28674-001 (Bracket Kit)
Fingerprint reader cable	L28668-001 (Cable Kit)

Before removing the fingerprint reader board, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the fingerprint reader board:

1. Disconnect the cable from the fingerprint reader board ZIF connector **(1)**.
2. Remove the Phillips M2.0×2.5 screw **(2)** that secures the fingerprint reader bracket to the computer.
3. Lift the bracket off the fingerprint reader **(3)**.
4. Remove the fingerprint reader from the computer **(4)**.



Reverse this procedure to install the fingerprint reader board.

TouchPad

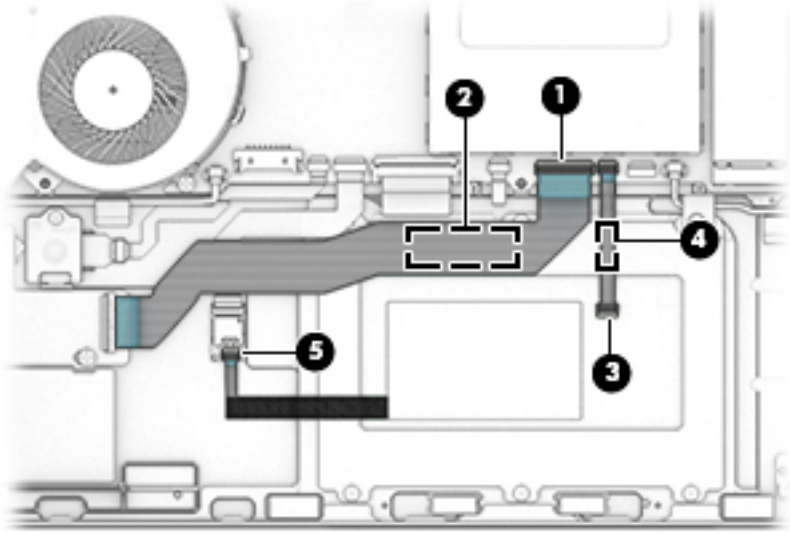
Description	Spare part number
TouchPad	L31559-001
TouchPad cable	L28668-001 (Cable Kit)

Before removing the TouchPad, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

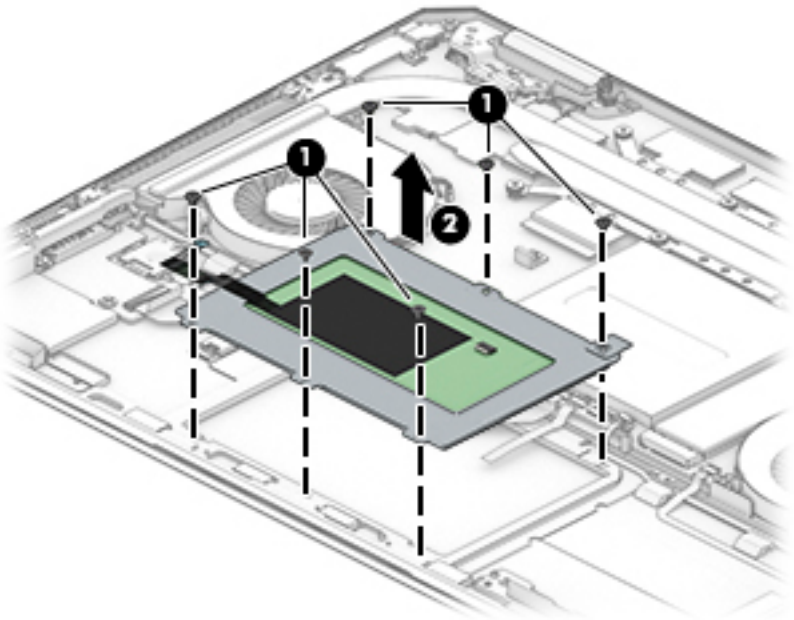
Remove the TouchPad:

1. Disconnect the card reader/audio cable from the system board ZIF connector **(1)**.
2. Remove the cable from the adhesive that secures it to the TouchPad **(2)**.
3. Disconnect the TouchPad cable from the TouchPad ZIF connector **(3)**.
4. Remove the cable from the adhesive that secures it to the TouchPad **(4)**.
5. Disconnect the NFC antenna cable from the NFC board ZIF connector **(5)**.



6. Remove the six Phillips M2.0×2.0 screws **(1)** that secure the TouchPad to the top cover.

7. Lift the TouchPad out of the computer **(2)**.



Reverse this procedure to install the TouchPad.

NFC module

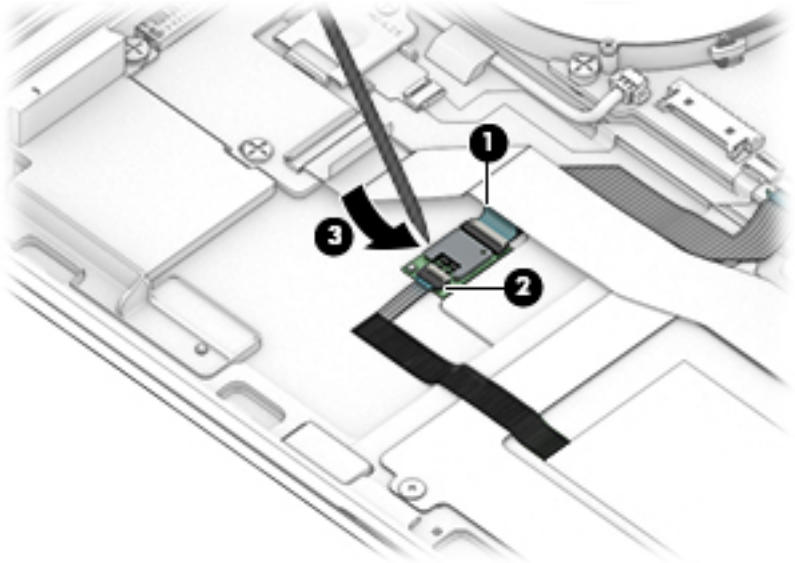
Description	Spare part number
NFC module	L02249-001
NFC module cable	L28668-001 (Cable Kit)

Before removing the NFC module, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the NFC module:

1. Disconnect the system board cable **(1)** and the NFC antenna cable **(2)** from the ZIF connectors on the NFC module.
2. Use a plastic non-conductive tool to release the NFC module from the adhesive securing it to the computer **(3)**, and then remove the module from the computer.



Reverse the removal procedures to install the NFC module.

Bottom speakers

Description	Spare part number
Bottom speakers (includes cable)	L28672-001 (Speaker Kit)

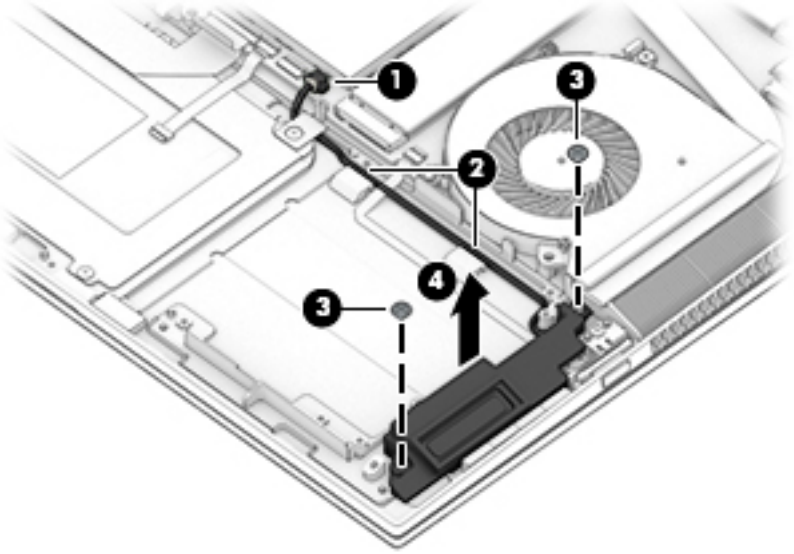
Before removing the bottom speakers, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the speakers:

Left speaker

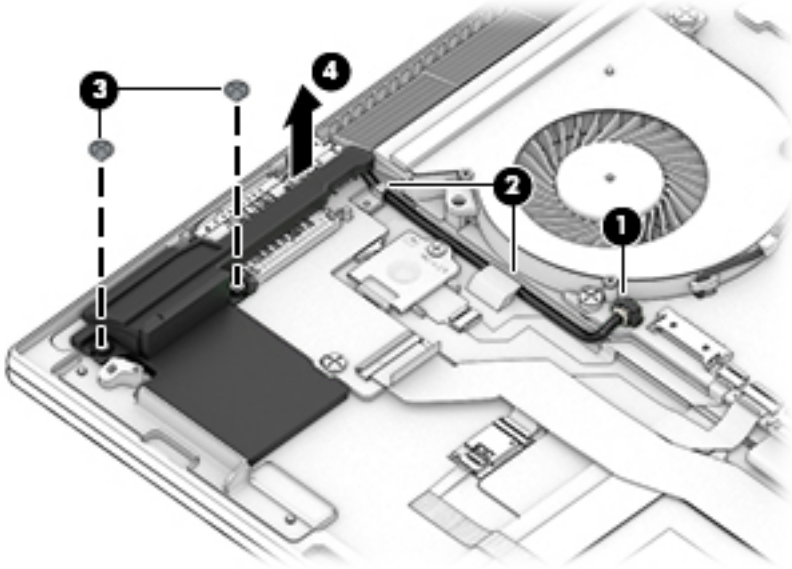
1. Disconnect the speaker cable from the system board **(1)**.
2. Remove the speaker cable from the clips **(2)**.
3. Remove the two Phillips M2.0×2.0 screws **(3)** that secure the speaker to the computer.
4. Remove the speaker **(4)**.



Right speaker

1. Disconnect the speaker cable from the system board **(1)**.
2. Remove the speaker cable from the clips **(2)**.
3. Remove the two Phillips M2.0×2.0 screws **(3)** that secure the speaker to the computer.

4. Remove the speaker **(4)**.



Reverse this procedure to install the speakers.

NOTE: When installing the speakers, make sure the rubber grommets around the screws are correctly installed.

Card reader/audio board

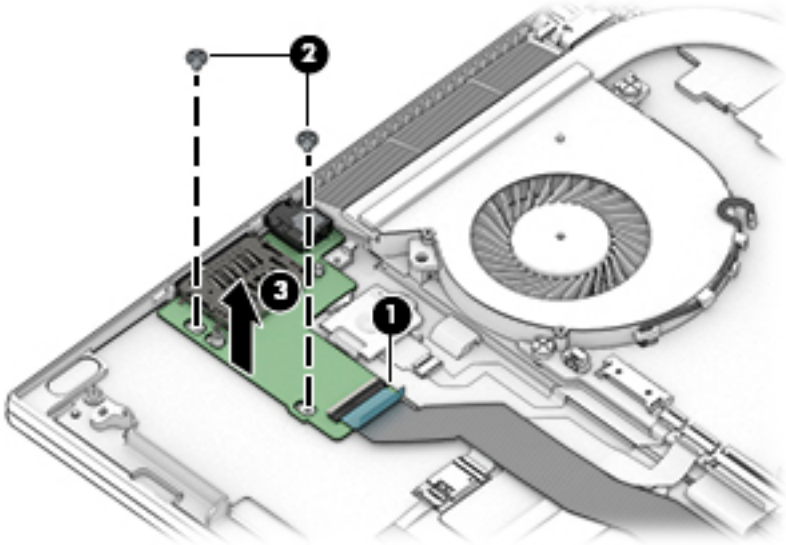
Description	Spare part number
Card reader/audio board (includes cable)	L31572-001

Before removing the card reader/audio board, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).
6. Remove the right speaker (see Bottom speakers on page 43).

Remove the card reader/audio board:

1. Disconnect the cable from the card reader/audio board ZIF connector **(1)**.
2. Remove the two Phillips M2.0×2.0 screws **(2)** that secure the board to the computer.
3. Lift the board out of the computer **(3)**.



Reverse this procedure to install the card reader/audio board.

Thermal module

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

Description	Spare part number
Thermal module for use only with models with discrete graphics memory	L28670-001
Thermal module for use only with models with UMA graphics memory	L30973-001

Before removing the thermal module, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

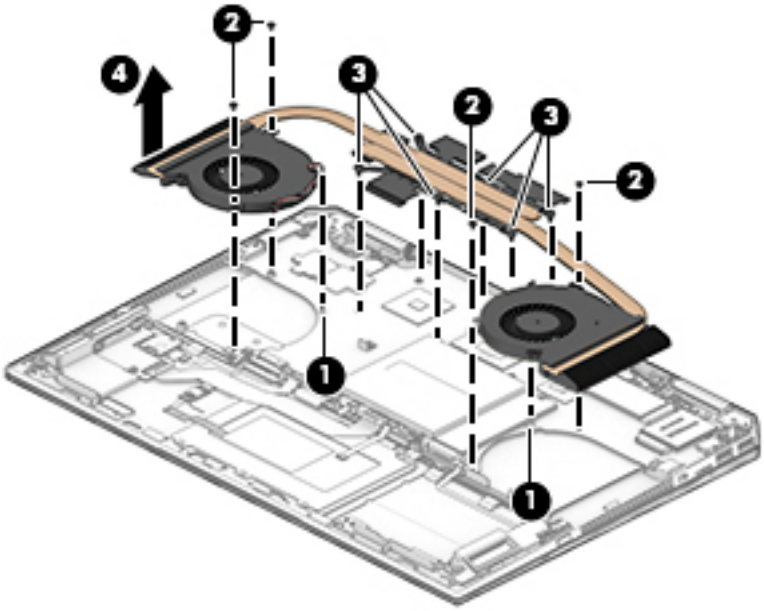
Remove the thermal module:

1. Disconnect the cable for each fan from the system board **(1)**.
2. Remove the two Phillips M2.0×4.0 screws from each fan **(2)** and the six captive screws (discrete models) or four captive screws (UMA models) in the middle of the heat sink (between the fans) in the order indicated on the heat sink **(3)**.

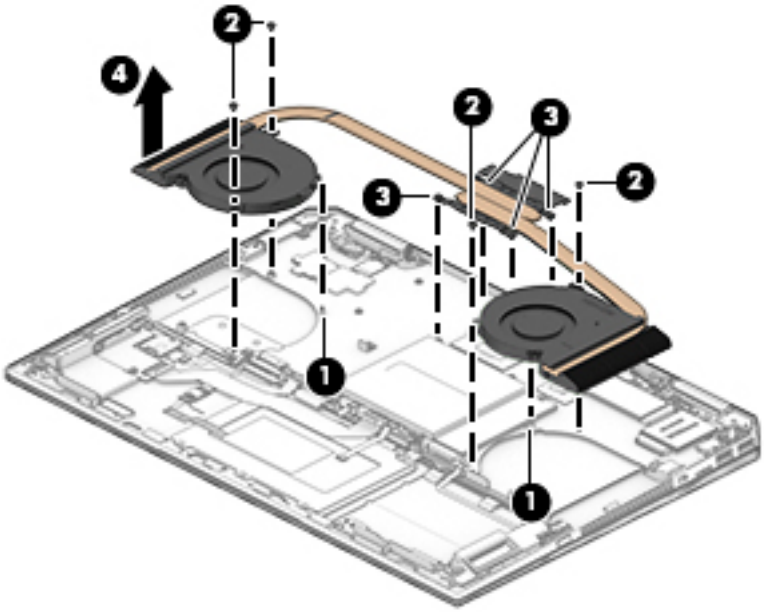
3. Remove the fan/heat sink assembly **(4)**.

CAUTION: When lifting the heat sink out of the computer, be careful not to bend the arms that connect the fans.

Discrete graphics models:



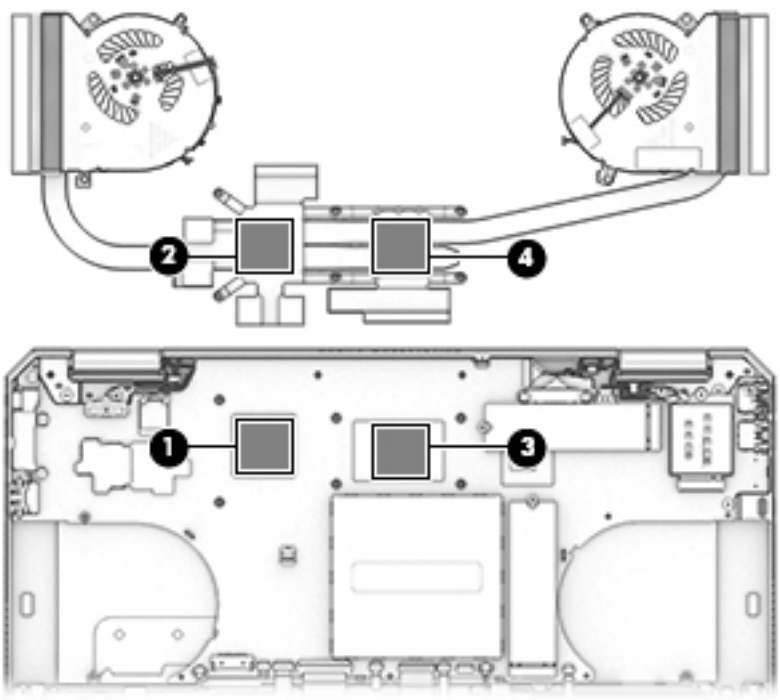
UMA graphics models:



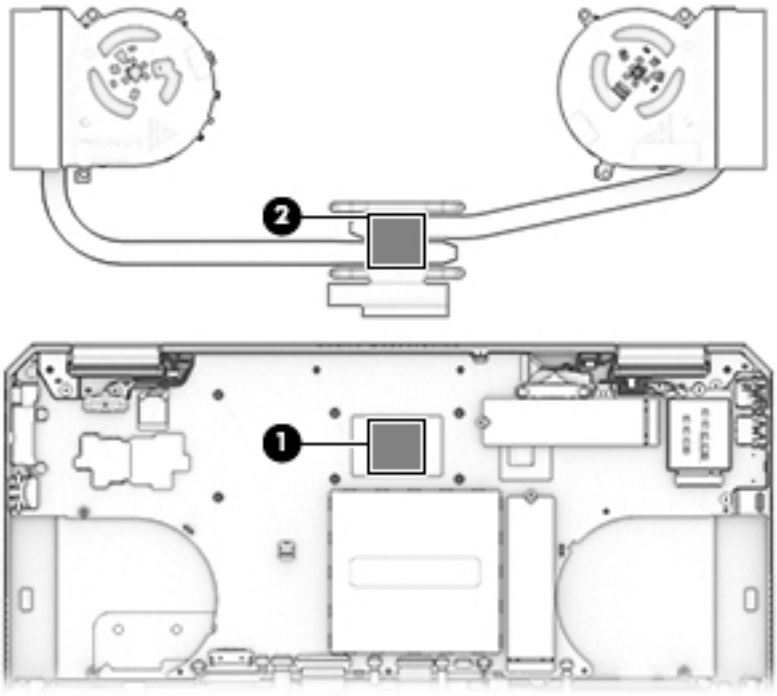
Various thermal pads are used on the system board components and the heat sink sections and that service them. See the following images for thermal pad locations.

NOTE: The thermal material must be thoroughly cleaned from the surfaces of the fan/heat sink assembly and the system board components each time the fan/heat sink assembly is removed. Replacement thermal material is included with the thermal module and system board spare part kits.

Discrete graphics models:



UMA graphics models:



Reverse this procedure to install the thermal module.

System board

NOTE: All system boards use the following part numbers:

xxxxxx-001: Non-Windows operating systems

xxxxxx-601: Windows 10 operating system

Description	Spare part number
System board with integrated processor for use in models with discrete graphics memory:	
• Intel Core i7-8850H processor	L31553-001, -601
• Intel Core i7-8750H processor	L31552-001, -601
• Intel Core i5-8400H processor	L31551-001, -601
• Intel Core i5-8300H processor	L31550-001, -601
System board with integrated processor for use in models with UMA graphics memory:	
• Intel Core i7-8850H processor	L31557-001, -601
• Intel Core i7-8750H processor	L31556-001, -601
• Intel Core i5-8400H processor	L31555-001, -601
• Intel Core i5-8300H processor	L31554-001, -601

Before removing the system board, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

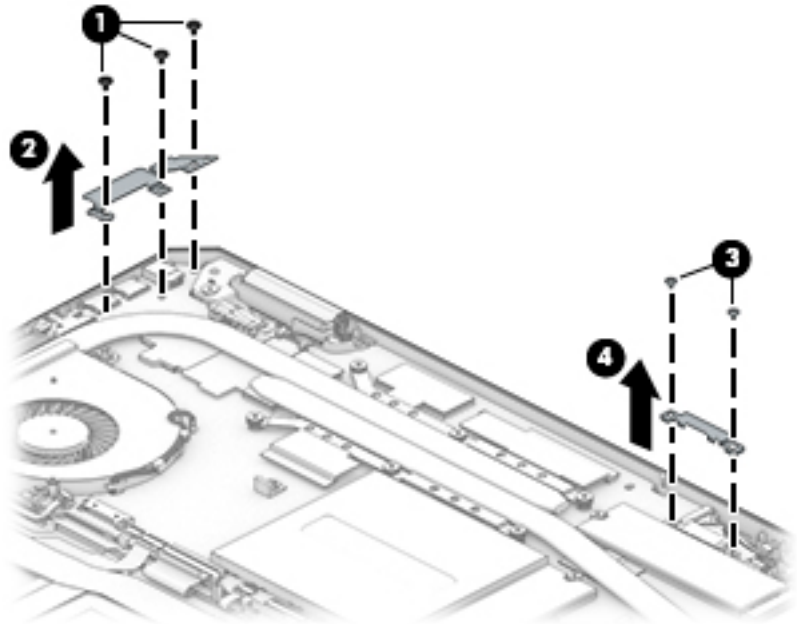
NOTE: When replacing the system board, be sure that the following components are removed from the defective system board and installed on the replacement system board (as applicable):

- Solid-state drive (see Solid-state drive (M.2) on page 33
- Memory module (see Memory module on page 35)

Remove the system board:

1. Remove the three Phillips M2.0×4.0 screws **(1)** from the USB Type-C/power connector bracket, and then lift the bracket off the system board **(2)**.

2. Remove the two Phillips M2.0×2.0 screws (P0 driver) **(3)** from the display connector bracket, and then lift the bracket off the system board **(4)**.



Brackets are available in the Bracket Kit using spare part number L28674-001.

3. Disconnect the following cables from the system board:

   (1) Camera cable

   (2) WLAN antennas cable

   (3) Display cable

   (4) Top speaker cable

   (5) Power button board cable

   (6) Right speaker cable

   (7) TouchPad cable

   (8) Card reader cable

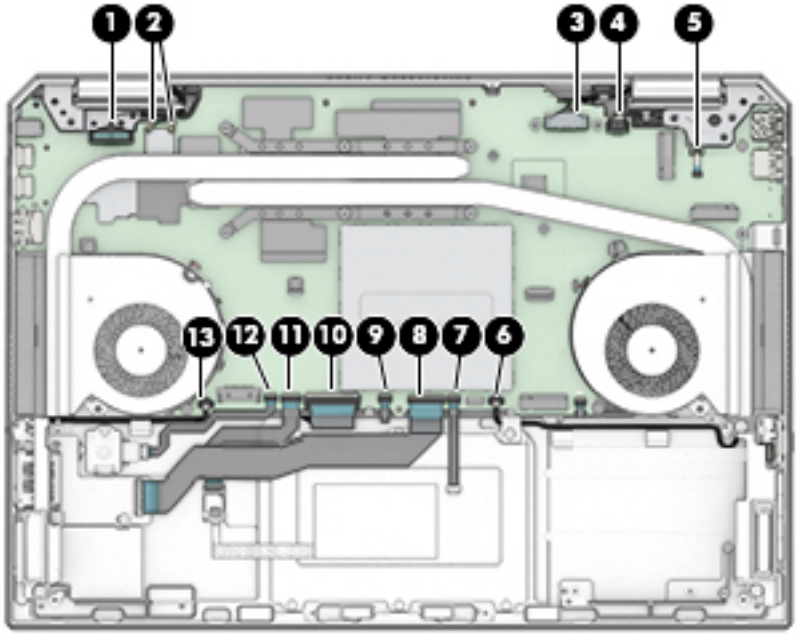
   (9) Keyboard backlight cable

   (10) Keyboard cable

   (11) NFC cable

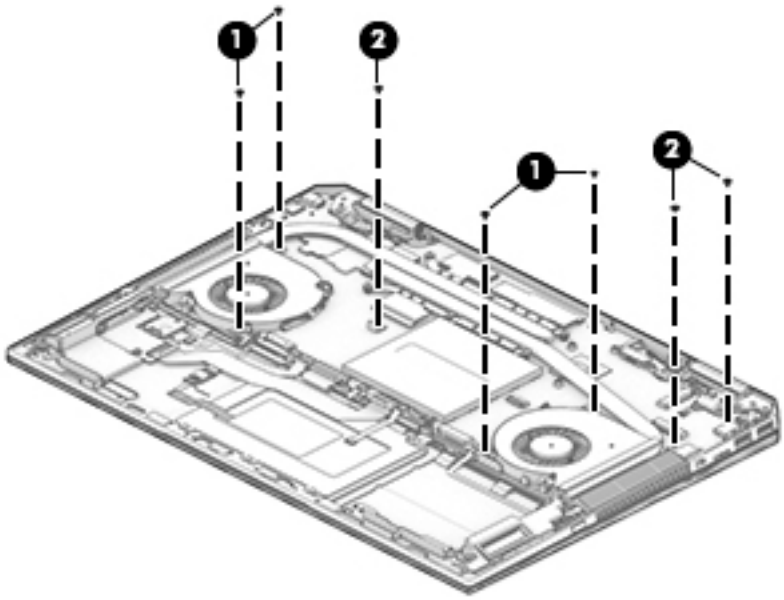
   (12) Fingerprint reader cable

   (13) Left speaker cable

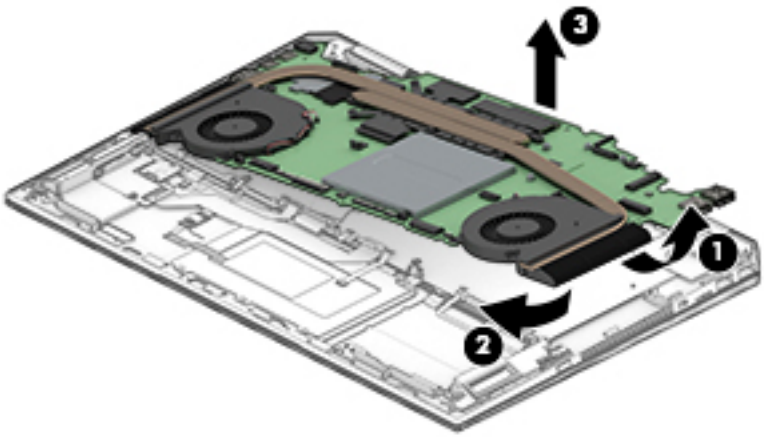


4. Remove the two Phillips M2.0×4.0 screws **(2)** from each fan.

5. Remove the three Phillips M2.0×4.0 screws **(2)** that secure the system board.



6. Lift in the right side of the board until the connectors disengage from the left side of the computer **(1)**.
7. Rotate the board **(2)**, and then remove the system board from the computer **(3)**.



Reverse this procedure to install the system board.

RTC battery

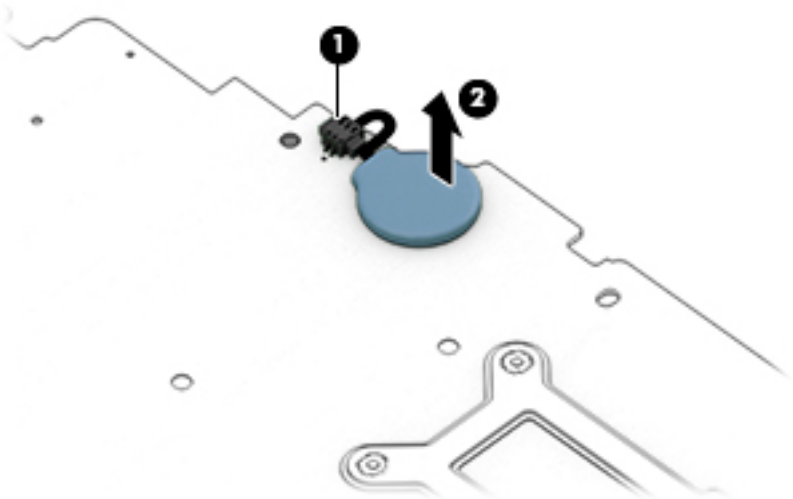
Description	Spare part number
RTC battery (includes cable and double-sided adhesive)	not spared

Before removing the RTC battery, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).
6. Remove the system board (see System board on page 49).

Remove the RTC battery:

1. Position the system board upside down.
2. Disconnect the cable **(1)** from the system board.
3. Lift the battery to detach it from the adhesive on the system board **(2)**.



Reverse this procedure to install the RTC battery.

Power button board

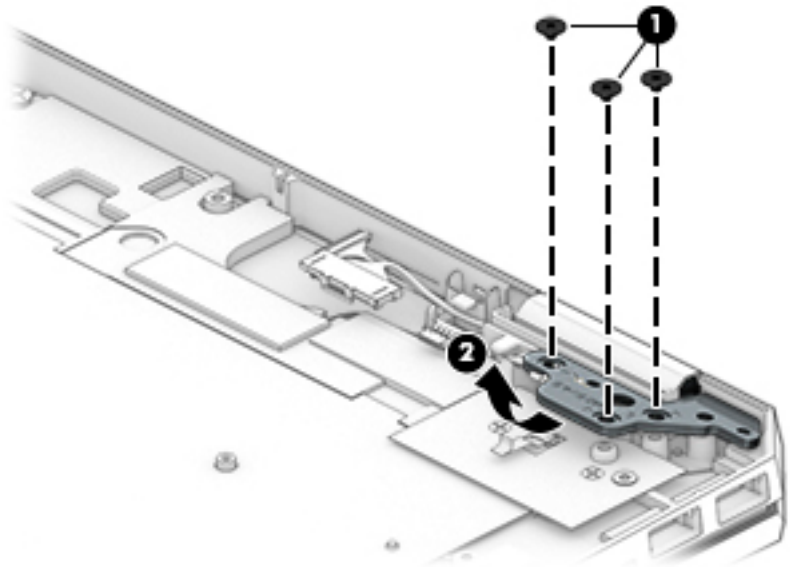
Description	Spare part number
Power button board (includes cable)	L28661-001

Before removing the power button board, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).
6. Remove the system board (see System board on page 49).

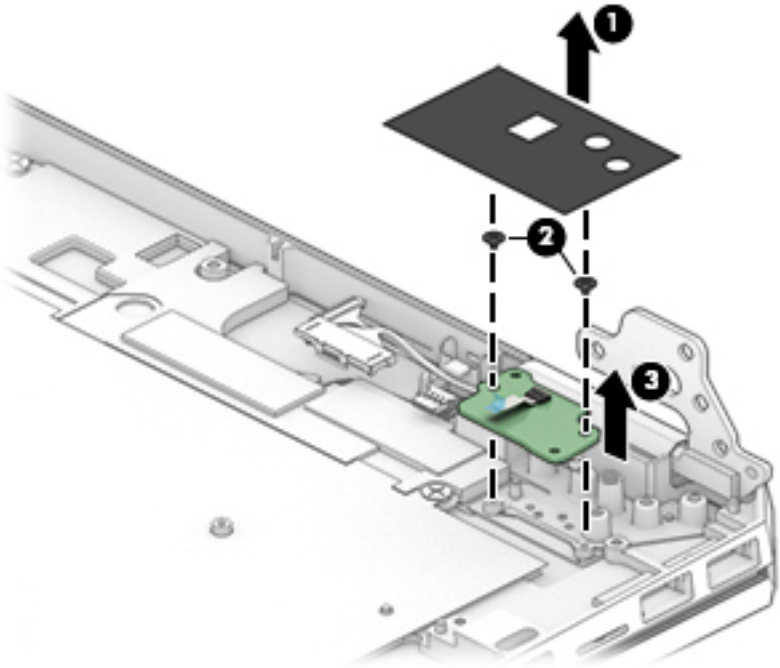
Remove the power button board:

1. Remove the three Phillips M2.5×4.5 screws **(1)** from the right hinge.
2. Rotate the hinge upward **(2)**.



3. Lift the Mylar from on top of the board **(1)**.
4. Remove the two Phillips M2.0×3.0 screws **(2)** that secure the board to the computer.

5. Remove the board from the computer **(3)**.



Reverse this procedure to install the power button board.

Top speaker

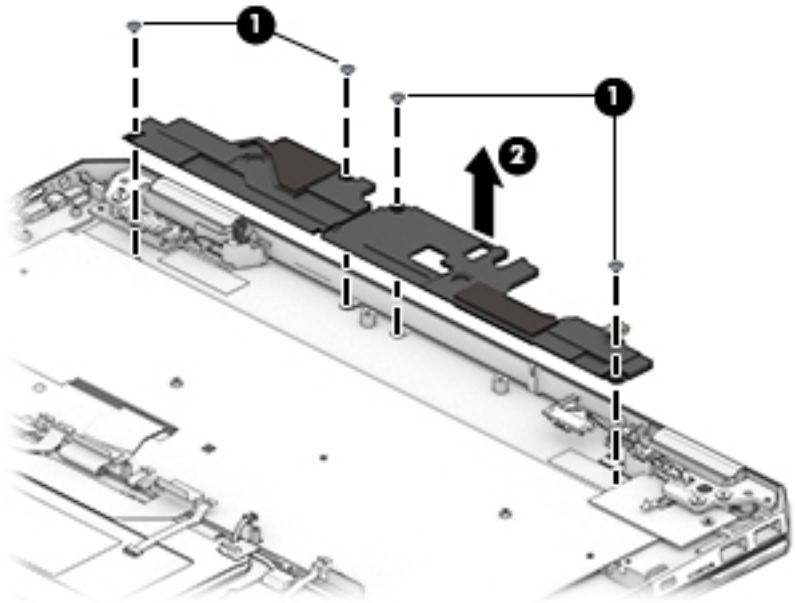
Description	Spare part number
Top speaker	L28672-001 (Speaker Kit)

Before removing the top speaker, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).
6. Remove the system board (see System board on page 49).

Remove the top speaker:

1. Remove the four Phillips M2.0×3.0 screws **(1)** that secure the top speaker to the computer.
2. Remove the speaker from the computer **(2)**.



Reverse this procedure to install the top speaker.

Display assembly

NOTE: Display assemblies are spared at the subcomponent level only. For display assembly spare part information, see the individual removal subsections.

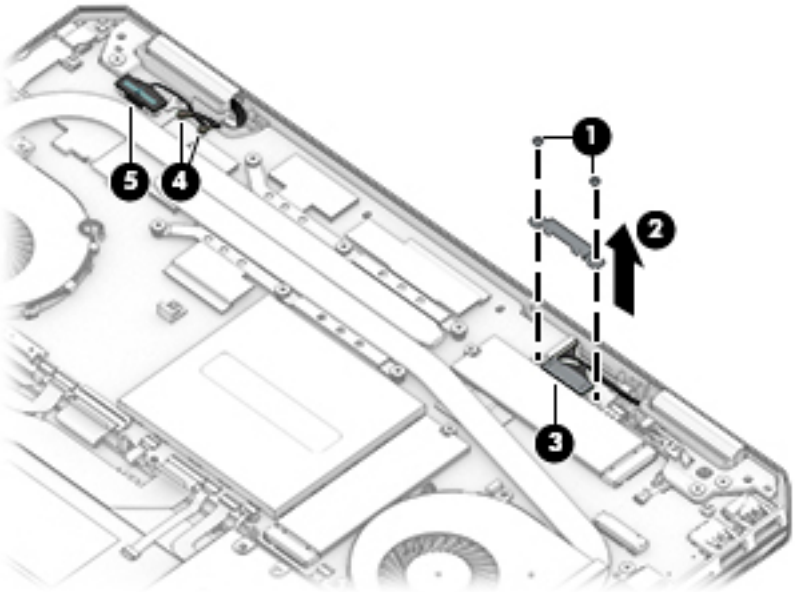
To remove the display assembly and access display assembly subcomponents, follow these steps:

1. Turn off 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 the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer.
4. Remove the bottom cover (see Bottom cover on page 29).
5. Remove the battery (see Battery on page 31).

Remove the display assembly:

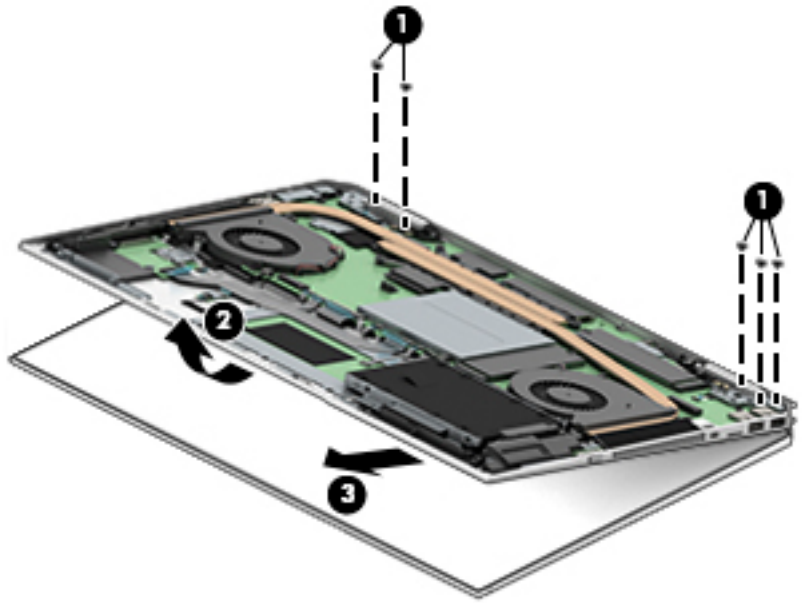
1. Remove the two Phillips M2.0×3.0 screws **(1)** from the display cable connector bracket.
2. Remove the bracket **(2)**, and then disconnect the display cable from the system board **(3)**.
3. Disconnect the antennas from the WLAN antenna posts **(4)**.
4. Disconnect the camera cable from the system board **(5)**.

   Brackets are available in the Bracket Kit using spare part number L28674-001.



5. Remove the five Phillips M2.5×4.5 screws **(1)** that secure the display to the computer.
6. Open the computer as far as possible **(2)**.

7. Separate the display from the computer **(3)**.



8. If it is necessary to replace any of the display assembly subcomponents:

   a. Use a plastic tool to disengage the bezel starting at the top **(1)**, left and right sides **(2)**, and bottom **(3)**.

b. Remove the display bezel **(4)**.

The display bezel is available using the following spare part numbers:

L31564-001: Models with an ambient light sensor and only an HD camera

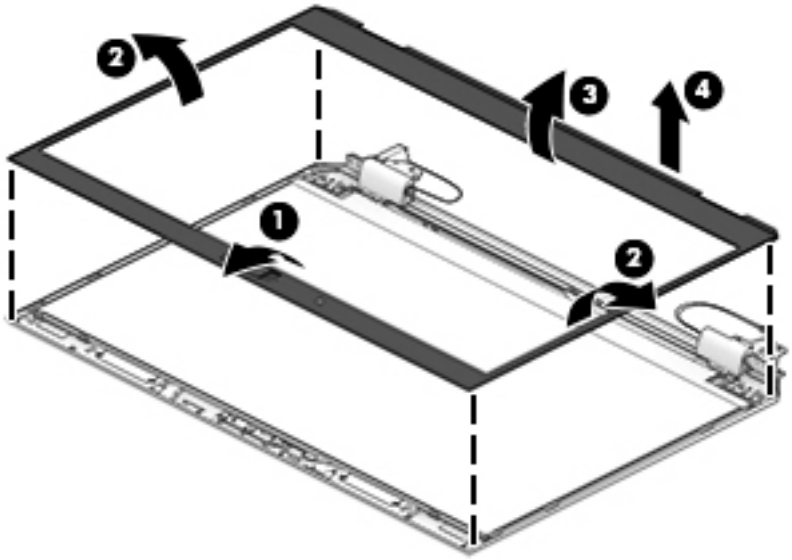
L31565-001: Models with an ambient light sensor and an IR camera

L31566-001: Models with an ambient light sensor and without a camera

L31567-001: Models without an ambient light sensor and only an HD camera

L31568-001: Models without an ambient light sensor and an IR camera

L31569-001: Models without an ambient light sensor and without a camera



9. If it is necessary to replace the camera module:

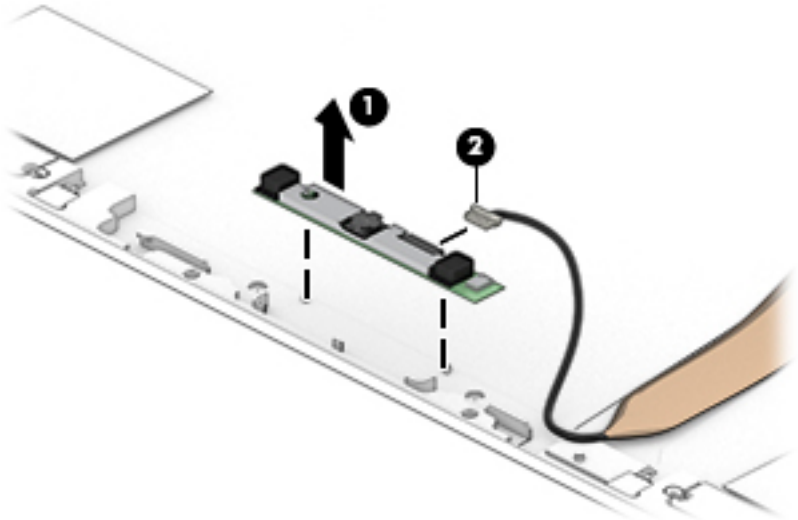
⚠ **CAUTION:** Handle the module with caution, as it has a thin profile and is susceptible to damage when not handled carefully.

a. HD camera

Detach the camera module **(1)** from the display enclosure. (The module is attached to the display enclosure with double-sided adhesive.)

b. Disconnect the cable from the module **(2)**.

NOTE: HD cameras have one connected cable. IR cameras have two connected cables.

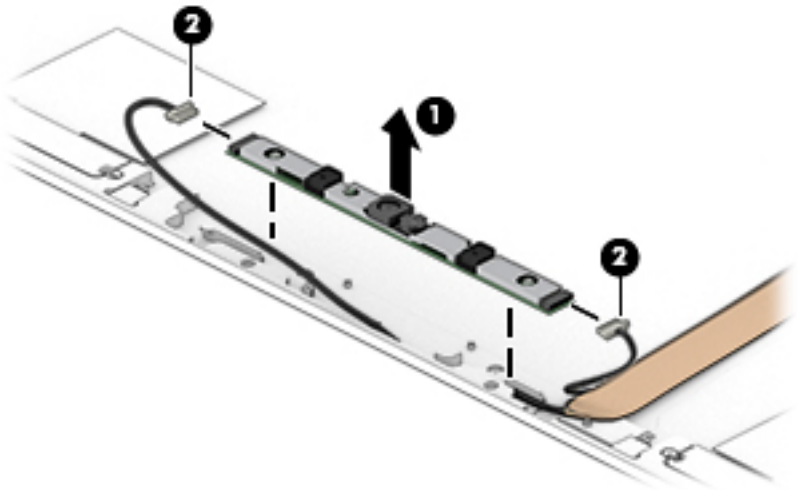


The camera module is available using spare part number L28470-001 for HD cameras.

c. **IR camera**

Detach the camera module **(1)** from the display enclosure. (The module is attached to the display enclosure with double-sided adhesive.)

d. Disconnect the cables from the sides of the module **(2)**.



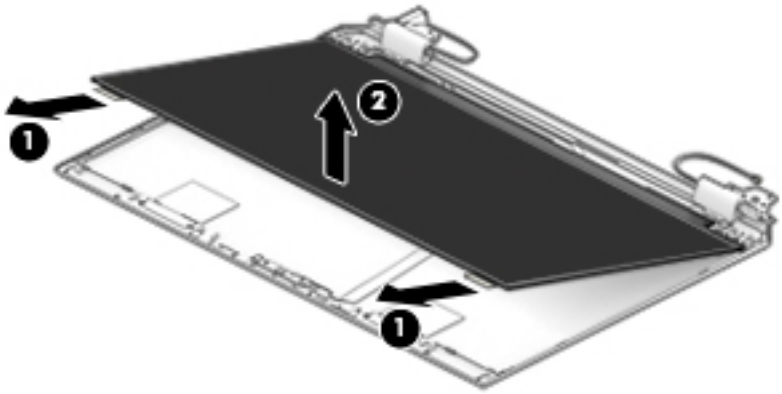
The camera module is available using spare part number L30660-001 for IR cameras.

10. If it is necessary to replace the display panel:

a. Use tweezers to grasp the tape at the top of the panel, and then pull the tape out from behind the panel **(1)**.

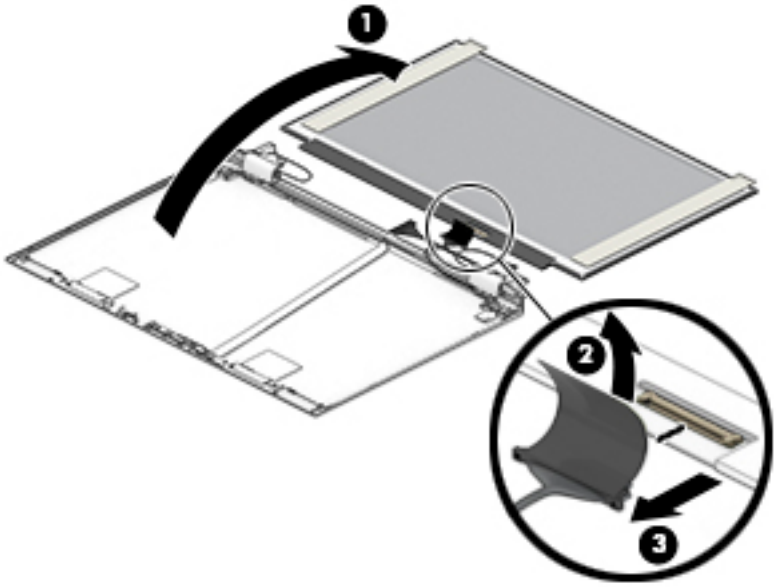
CAUTION: Before positioning the display panel upside down, make sure the work surface is clear of tools, screws, and any other foreign objects. Failure to follow this caution can result in damage to the display panel.

b. Lift the top edge of the display panel **(2)**.



c. Rotate the display panel over and place it upside down next to the display enclosure **(1)**.

d. Lift the tape **(2)**, and then disconnect the display panel cable **(3)** from the display panel.



The display panel is available using the following spare part numbers:

FHD panel: L32562-001

FHD, privacy panel: L32561-001

UHD panel: L32563-001-001

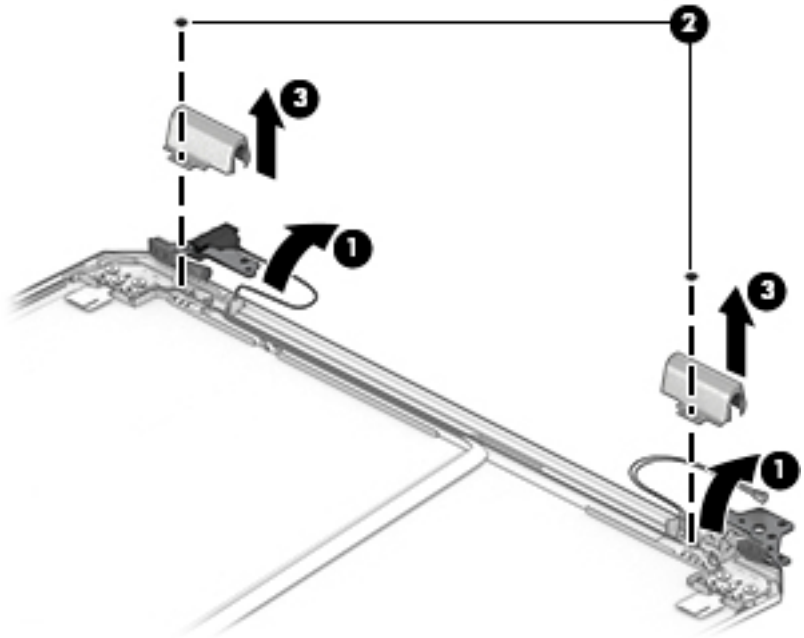
11. If it is necessary to replace the hinge covers:

a. Rotate the hinges as far as possible **(1)**.

b. Remove the Phillips M2.0×2.0 screw **(2)** that secures each hinge cover to the display enclosure.

c. Lift the hinge covers off the hinges **(3)**.

The hinge covers are available using spare part number L31570-001.

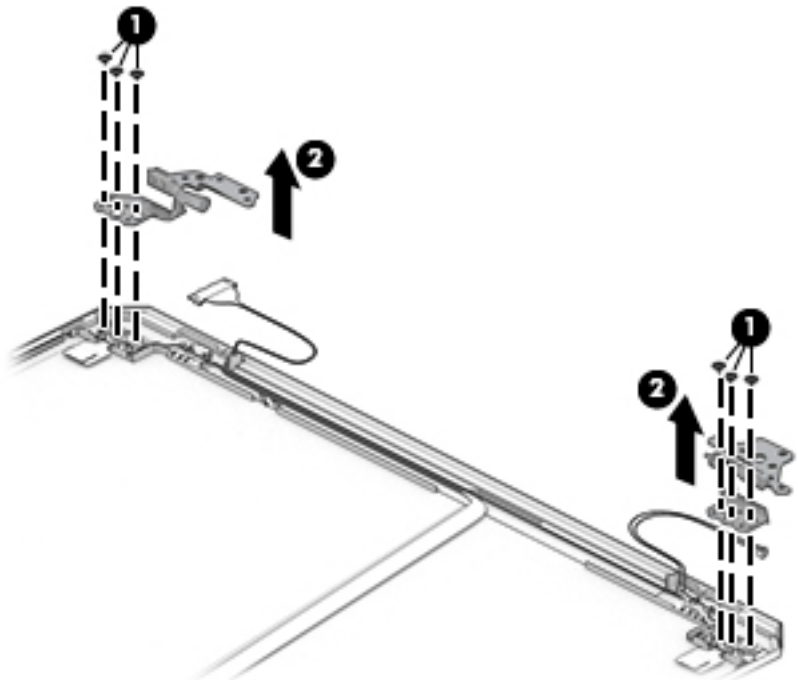


12. If it is necessary to replace the display hinges:

a. Remove the three broad head Phillips M2.0×2.0 screws **(1)** that secure each display hinge to the display enclosure.

b. Remove the display hinges **(2)**.

Both display hinges are available using spare part number L28659-001.

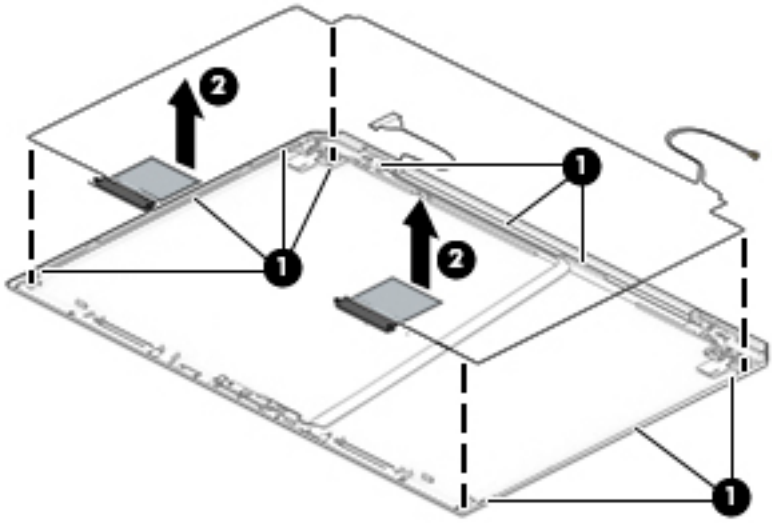


13. If it is necessary to replace the wireless antennas:

    a. Remove the cables from the routing path on the sides and bottom of the display enclosure **(1)**.

    b. Peel the antennas off the display **(2)**.

    The antennas are available using spare part number L31688-001.



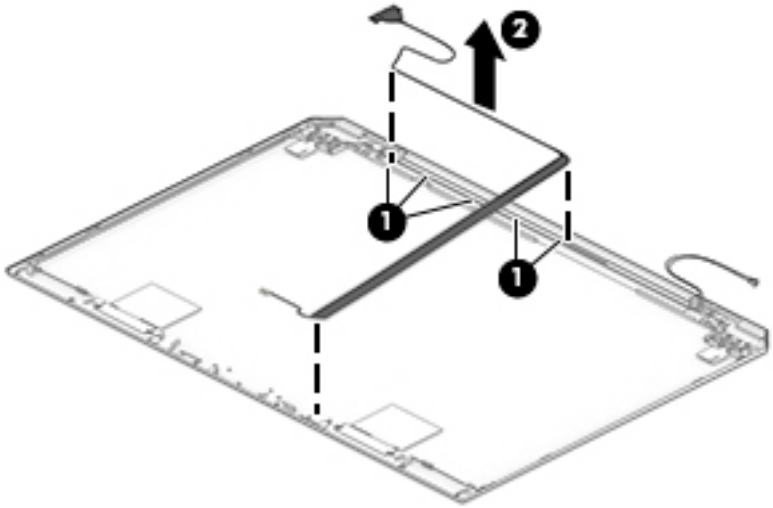
14. If it is necessary to replace the camera cable:

    a. Remove the camera cable from the routing path along the bottom and inside of the display enclosure **(1)**.

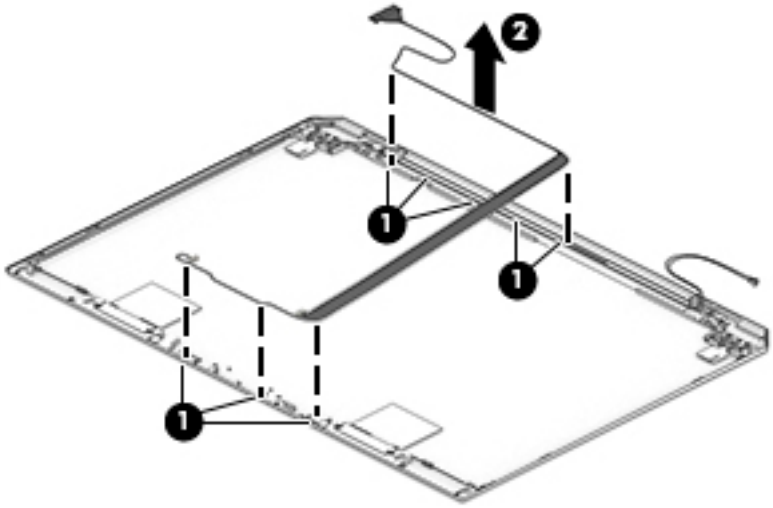
b. Remove the camera cable from the display enclosure **(2)**.

The camera cable is available using spare part number L31696-001.

HD camera models



IR camera models

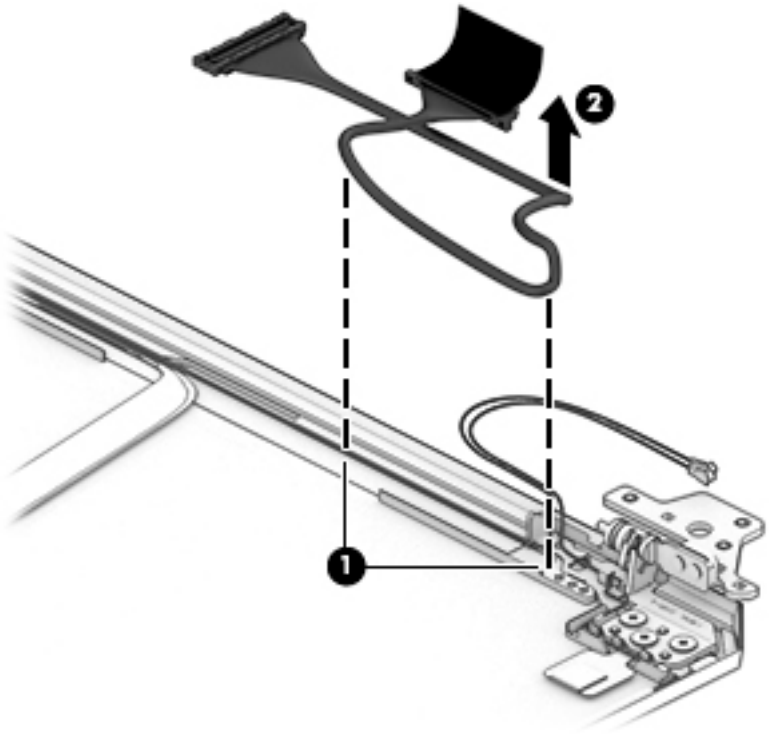


15. If it is necessary to replace the display cable:

a. Remove the display cable from the routing path along the bottom of the display enclosure **(1)**.

b. Remove the display cable from the display enclosure **(2)**.

The display cable is available using spare part number L31696-001.



Reverse this procedure to reassemble and install the display assembly.

Top cover/keyboard

The top cover/keyboard spare remains after removing all other spare parts.

In this section, the first table provides the main spare part number for the keyboard. The second table provides the country codes.

Description	Spare part number
Keyboard, backlit	L34212-xx1
Keyboard, backlit, privacy	L34213-xx1

For use in country or region	Spare part number	For use in country or region	Spare part number	For use in country or region	Spare part number
Belgium	-A41	India	-D61	Slovenia	-BA1
Brazil	-201	Israel	-BB1	South Korea	-AD1
Bulgaria	-261	Italy	-061	Spain	-071
Canada	-DB1	Japan	-291	Sweden and Finland	-B71
Czech Republic and Slovakia	-FL1	Latin America	-161	Switzerland	-BG1
Denmark	-081	The Netherlands	-B31	Taiwan	-AB1
Denmark, Finland, and Norway	-DH1	Northern Africa	-FP1	Thailand	-281
France	-051	Norway	-091	Turkey	-141
Germany	-041	Portugal	-131	Turkey-F	-541
Greece	-151	Romania	-271	United Kingdom	-031
Hungary	-211	Russia	-251	United States	-001
Iceland	-DD1	Saudi Arabia	-171		

6 Computer Setup (BIOS), TPM, and HP Sure Start

Using Computer Setup

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

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

Starting Computer Setup

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

Using a USB keyboard or USB mouse to start Computer Setup (BIOS)

You can start Computer Setup by using a keyboard or mouse connected to a USB port, but you must first disable FastBoot.

1. Turn on or restart the computer, and when the HP logo appears, press f9 to enter the Boot Device Options menu.
2. Clear the check box for **Fast Boot**.
3. To save your changes and exit, select the **Save** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

– or –

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

Your changes go into effect when the computer restarts.

Navigating and selecting in Computer Setup

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

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

- To exit Computer Setup menus without saving your changes:

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

  – or –

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

- To save your changes and exit Computer Setup menus:

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

  – or –

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

Your changes go into effect when the computer restarts.

Restoring factory settings in Computer Setup

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

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

1. Start Computer Setup. See Starting Computer Setup on page 67.
2. Select **Main**, and then select **Apply Factory Defaults and Exit**.

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

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

   – or –

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

Your changes go into effect when the computer restarts.

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

Updating the BIOS

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

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

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

Determining the BIOS version

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

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

1. Start Computer Setup. See Starting Computer Setup on page 67.
2. Select **Main**, and then select **System Information**.
3. To exit Computer Setup without saving your changes, select the **Exit** icon in the lower-right corner of the screen, and then follow the on-screen instructions.

   – or –

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

To check for later BIOS versions, see Downloading a BIOS update on page 69.

Downloading a BIOS update

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

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

Do not shut down the computer or initiate Sleep.

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

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

   – or –

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

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

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

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

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

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

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

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

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

Changing the boot order using the f9 prompt

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

1. Access the Boot Device Options menu:
   - Turn on or restart the computer, and when the HP logo appears, press f9 to enter the Boot Device Options menu.
2. Select a boot device, press enter, and then follow the on-screen instructions.

TPM BIOS settings (select products only)

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

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

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

To access TPM settings in Computer Setup:

1. Start Computer Setup. See Starting Computer Setup on page 67.
2. Select **Security**, select **TPM Embedded Security**, and then follow the on-screen instructions.

Using HP Sure Start (select products only)

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

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

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

7 Using HP PC Hardware Diagnostics

Using HP PC Hardware Diagnostics Windows

HP PC Hardware Diagnostics Windows is a Windows-based utility that allows you to run diagnostic tests to determine whether the computer hardware is functioning properly. The tool runs within the Windows operating system in order to diagnose hardware failures.

If HP PC Hardware Diagnostics Windows is not installed on your computer, first you must download and install it. To download HP PC Hardware Diagnostics Windows, see Downloading HP PC Hardware Diagnostics Windows on page 71.

After HP PC Hardware Diagnostics Windows is installed, follow these steps to access it from HP Help and Support or HP Support Assistant.

1. To access HP PC Hardware Diagnostics Windows from HP Help and Support:

   a. Select the **Start** button, and then select **HP Help and Support**.

   b. Right-click **HP PC Hardware Diagnostics Windows**, select **More**, and then select **Run as administrator**.

   – or –

   To access HP PC Hardware Diagnostics Windows from HP Support Assistant:

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

      – or –

      Select the question mark icon in the taskbar.

   b. Select **Troubleshooting and fixes**.

   c. Select **Diagnostics**, and then select **HP PC Hardware Diagnostics Windows**.

2. When the tool opens, select the type of diagnostic test you want to run, and then follow the on-screen instructions.

NOTE: If you need to stop a diagnostic test at any time, select **Cancel**.

3. When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in correcting the problem, contact support, and then provide the Failure ID code.

Downloading HP PC Hardware Diagnostics Windows

- The HP PC Hardware Diagnostics Windows download instructions are provided in English only.
- You must use a Windows computer to download this tool because only .exe files are provided.

Downloading the latest HP PC Hardware Diagnostics Windows version

To download HP PC Hardware Diagnostics Windows, follow these steps:

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

   To run the tool on your computer, download it to the computer desktop.

   – or –

   To run the tool from a USB flash drive, download it to a USB flash drive.
3. Select **Run**.

Downloading HP Hardware Diagnostics Windows by product name or number (select products only)

NOTE: For some products, it may be necessary to download the software to a USB flash drive by using the product name or number.

To download HP PC Hardware Diagnostics Windows by product name or number (select products only), follow these steps:

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**, and then enter the product name or number.
3. In the **HP PC Hardware Diagnostics** section, select **Download**, and then select the installation location:

   To run the tool on your computer, download it to the computer desktop.

   – or –

   To run the tool from a USB flash drive, download it to a USB flash drive.
4. Select **Run**.

Installing HP PC Hardware Diagnostics Windows

To install HP PC Hardware Diagnostics Windows, follow these steps:

- Navigate to the folder on your computer or the flash drive where the .exe file was downloaded, double-click the .exe file, and then follow the on-screen instructions.

Using HP PC Hardware Diagnostics UEFI

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

If your PC will not boot into Windows, you can use HP PC Hardware Diagnostics UEFI to diagnose hardware issues.

When HP PC Hardware Diagnostics UEFI detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in correcting the problem, contact support, and provide the Failure ID code.

NOTE: To start diagnostics on a convertible computer, your computer must be in notebook mode, and you must use the attached keyboard.

NOTE: If you need to stop a diagnostic test, press esc.

Starting HP PC Hardware Diagnostics UEFI

To start HP PC Hardware Diagnostics UEFI, follow these steps:

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

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

   a. Connected USB flash drive

   NOTE: To download the HP PC Hardware Diagnostics UEFI tool to a USB flash drive, see Downloading the latest HP PC Hardware Diagnostics UEFI version on page 73.

   b. Hard drive

   c. BIOS
3. When the diagnostic tool opens, select the type of diagnostic test you want to run, and then follow the on-screen instructions.

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive

Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive can be useful in the following situations:

- HP PC Hardware Diagnostics UEFI is not included in the preinstall image.
- HP PC Hardware Diagnostics UEFI is not included in the HP Tool partition.
- The hard drive is damaged.

NOTE: The HP PC Hardware Diagnostics UEFI download instructions are provided in English only, and you must use a Windows computer to download and create the HP UEFI support environment because only .exe files are provided.

Downloading the latest HP PC Hardware Diagnostics UEFI version

To download the latest HP PC Hardware Diagnostics UEFI version to a USB flash drive:

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

Downloading HP PC Hardware Diagnostics UEFI by product name or number (select products only)

NOTE: For some products, it may be necessary to download the software to a USB flash drive by using the product name or number.

To download HP PC Hardware Diagnostics UEFI by product name or number (select products only) to a USB flash drive:

1. Go to http://www.hp.com/support.
2. Enter the product name or number, select your computer, and then select your operating system.
3. In the **Diagnostics** section, follow the on-screen instructions to select and download the specific UEFI Diagnostics version for your computer.

Using Remote HP PC Hardware Diagnostics UEFI settings (select products only)

Remote HP PC Hardware Diagnostics UEFI is a firmware (BIOS) feature that downloads HP PC Hardware Diagnostics UEFI to your computer. It can then execute the diagnostics on your computer, and it may upload results to a preconfigured server. For more information on Remote HP PC Hardware Diagnostics UEFI, go to http://www.hp.com/go/techcenter/pcdiags, and then select **Find out more**.

Downloading Remote HP PC Hardware Diagnostics UEFI

NOTE: HP Remote PC Hardware Diagnostics UEFI is also available as a Softpaq that can be downloaded to a server.

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

To download the latest Remote HP PC Hardware Diagnostics UEFI version, follow these steps:

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

Downloading Remote HP PC Hardware Diagnostics UEFI by product name or number

NOTE: For some products, it may be necessary to download the software by using the product name or number.

To download HP Remote PC Hardware Diagnostics UEFI by product name or number, follow these steps:

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**, enter the product name or number, select your computer, and then select your operating system.
3. In the **Diagnostics** section, follow the on-screen instructions to select and download the **Remote UEFI** version for the product.

Customizing Remote HP PC Hardware Diagnostics UEFI settings

Using the Remote HP PC Hardware Diagnostics setting in Computer Setup (BIOS), you can perform the following customizations:

- Set a schedule for running diagnostics unattended. You can also start diagnostics immediately in interactive mode by selecting **Execute Remote HP PC Hardware Diagnostics**.
- Set the location for downloading the diagnostic tools. This feature provides access to the tools from the HP website or from a server that has been preconfigured for use. Your computer does not require the traditional local storage (such as a disk drive or USB flash drive) to run remote diagnostics.
- Set a location for storing the test results. You can also set the user name and password settings used for uploads.
- Display status information about the diagnostics run previously.

To customize Remote HP PC Hardware Diagnostics UEFI settings, follow these steps:

1. Turn on or restart the computer, and when the HP logo appears, press f10 to enter Computer Setup.
2. Select **Advanced**, and then select **Settings**.

3. Make your customization selections.
4. Select **Main**, and then **Save Changes and Exit** to save your settings.

Your changes take effect when the computer restarts.

8 Backing up, restoring, and recovering

This chapter provides information about the following processes, which are standard procedure for most products:

- **Backing up your personal information**—You can use Windows tools to back up your personal information (see Using Windows tools on page 76).
- **Creating a restore point**—You can use Windows tools to create a restore point (see Using Windows tools on page 76).
- **Creating recovery media** (select products only)—You can use HP Recovery Manager or HP Cloud Recovery Download Tool (select products only) to create recovery media (see Creating HP Recovery media (select products only) on page 76).
- **Restoring and recovery**—Windows offers several options for restoring from backup, refreshing the computer, and resetting the computer to its original state (see Using Windows tools on page 76).
- **Removing the Recovery Partition**—To remove the Recovery partition to reclaim hard drive space (select products only), select the **Remove Recovery Partition** option of HP Recovery Manager. For more information, see Removing the HP Recovery partition (select products only) on page 80.

Using Windows tools

IMPORTANT: Windows is the only option that allows you to back up your personal information. Schedule regular backups to avoid information loss.

You can use Windows tools to back up personal information and create system restore points and recovery media, allowing you to restore from backup, refresh the computer, and reset the computer to its original state.

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

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

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

NOTE: You must be connected to the Internet to access the Get Help app.

Creating HP Recovery media (select products only)

After you have successfully set up the computer, use HP Recovery Manager to create a backup of the HP Recovery partition on the computer. This backup is called HP Recovery media. In cases where the hard drive is corrupted or has been replaced, the HP Recovery media can be used to reinstall the original operating system.

To check for the presence of the Recovery partition in addition to the Windows partition, right-click the **Start** button, select **File Explorer**, and then select **This PC**.

NOTE: If your computer does not list the Recovery partition in addition to the Windows partition, contact support to obtain recovery discs. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

On select products, you can use the HP Cloud Recovery Download Tool to create HP Recovery media on a bootable USB flash drive. For more information, see Using the HP Cloud Recovery Download Tool to create recovery media on page 78.

Using HP Recovery Manager to create recovery media

NOTE: If you cannot create recovery media yourself, contact support to obtain recovery discs. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

Before you begin

Before you begin, note the following:

- Only one set of recovery media can be created. Handle these recovery tools carefully, and keep them in a safe place.
- HP Recovery Manager examines the computer and determines the required media storage capacity.
- To create recovery media, use one of the following options:

NOTE: If the computer does not have a recovery partition, HP Recovery Manager displays the Windows Create a Recovery Drive feature. Follow the on-screen instructions to create a recovery image on a blank USB flash drive or hard drive.

  - If your computer has an optical drive with DVD writer capability, be sure to use only high-quality blank DVD-R, DVD+R, DVD-R DL, or DVD+R DL discs. Do not use rewritable discs such as CD±RW, DVD±RW, double-layer DVD±RW, or BD-RE (rewritable Blu-ray) discs, which are not compatible with HP Recovery Manager software.
  - If your computer does not include an integrated optical drive with DVD writer capability, you can use an external optical drive (purchased separately) to create recovery discs, as described above. If an external optical drive is used, you must connect it directly to a USB port on the computer. It cannot be connected to a USB port on an external device, such as a USB hub.
  - To create a recovery flash drive, use a high-quality blank USB flash drive.
- Be sure that the computer is connected to AC power before you begin creating the recovery media.
- The creation process can take an hour or more. Do not interrupt this process.
- If necessary, you can exit the program before you have finished creating all of the recovery media. HP Recovery Manager will finish the current DVD or flash drive. The next time you start HP Recovery Manager, you will be prompted to continue.

Creating the recovery media

To create HP Recovery media using HP Recovery Manager:

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

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

If you need to recover the system, see Recovering using HP Recovery Manager on page 78.

Using the HP Cloud Recovery Download Tool to create recovery media

To create HP Recovery media using the HP Cloud Recovery Download Tool:

1. Go to http://www.hp.com/support.
2. Select **Software and Drivers**, and then follow the on-screen instructions.

Restoring and recovery

Restoring and recovery can be performed using one or more of the following options: Windows tools, HP Recovery Manager, or the HP Recovery partition.

IMPORTANT: Not all methods are available on all products.

Restoring, resetting, and refreshing using Windows tools

Windows offers several options for restoring, resetting, and refreshing the computer. For details, see Using Windows tools on page 76.

Restoring using HP Recovery Manager and the HP Recovery partition

You can use HP Recovery Manager and the HP Recovery partition (select products only) to restore the computer to the original factory state:

- **Resolving problems with preinstalled applications or drivers**—To correct a problem with a preinstalled application or driver:
  1. Type `recovery` in the taskbar search box, and then select **HP Recovery Manager**.
  2. Select **Reinstall drivers and/or applications**, and then follow the on-screen instructions.
- **Using System Recovery**—To recover the Windows partition to original factory content, select the **System Recovery** option from the HP Recovery partition (select products only) or use the HP Recovery media. For more information, see Recovering using HP Recovery Manager on page 78. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 76.
- **Using Factory Reset** (select products only)—Restores the computer to its original factory state by deleting all information from the hard drive and recreating the partitions and then reinstalling the operating system and the software that was installed at the factory (select products only). To use the **Factory Reset** option, you must use HP Recovery media. If you have not already created recovery media, see Creating HP Recovery media (select products only) on page 76.

NOTE: If you have replaced the hard drive in the computer, you can use the Factory Reset option to install the operating system and the software that was installed at the factory.

Recovering using HP Recovery Manager

You can use HP Recovery Manager software to recover the computer to its original factory state by using the HP Recovery media that you either created or that you obtained from HP, or by using the HP Recovery partition (select products only).

If you have not already created HP Recovery media, see Creating HP Recovery media (select products only) on page 76.

IMPORTANT: HP Recovery Manager does not automatically provide backups of your personal data. Before beginning recovery, back up any personal data that you want to retain. See Using Windows tools on page 76.

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

NOTE: When you start the recovery process, only the options available for your computer are displayed.

Before you begin, note the following:

- HP Recovery Manager recovers only software that was installed at the factory. For software not provided with this computer, you must either download the software from the manufacturer's website or reinstall the software from the media provided by the manufacturer.
- If the computer hard drive fails, HP Recovery media must be used. This media is created using HP Recovery Manager. See Creating HP Recovery media (select products only) on page 76.
- If your computer does not allow the creation of HP Recovery media or if the HP Recovery media does not work, contact support to obtain recovery media. Go to http://www.hp.com/support, select your country or region, and then follow the on-screen instructions.

Recovering using the HP Recovery partition (select products only)

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

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

To start HP Recovery Manager from the HP Recovery partition:

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

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

   – or –

   For computers or tablets with keyboards attached:

   ▲ Press f11 while the computer boots, or press and hold f11 as you press the power button.

   For tablets without keyboards:

   ▲ Turn on or restart the tablet, quickly hold down the volume up button, and then select **f11**.
2. Select **Troubleshoot** from the boot options menu.
3. Select **Recovery Manager**, and then follow the on-screen instructions.

NOTE: If your computer does not automatically restart in HP Recovery Manager, change the computer boot order, and then follow the on-screen instructions. See Changing the computer boot order on page 80.

Recovering using HP Recovery media

If your computer does not have an HP Recovery partition or if the hard drive is not working properly, you can use HP Recovery media to recover the original operating system and software programs that were installed at the factory.

▲ Insert the HP Recovery media, and then restart the computer.

NOTE: If your computer does not automatically restart in HP Recovery Manager, change the computer boot order, and then follow the on-screen instructions. See Changing the computer boot order on page 80.

Changing the computer boot order

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

To change the boot order:

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

1. Insert the HP Recovery media.
2. Access the system **Startup** menu.

   For computers or tablets with keyboards attached:

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

   For tablets without keyboards:

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

   – or –

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

Removing the HP Recovery partition (select products only)

HP Recovery Manager software allows you to remove the HP Recovery partition (select products only) to free up hard drive space.

IMPORTANT: After you remove the HP Recovery partition, you will not be able to perform System Recovery or create HP Recovery media. Before removing the Recovery partition, create HP Recovery media. See Creating HP Recovery media (select products only) on page 76.

Follow these steps to remove the HP Recovery partition:

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

9 Specifications

Computer specifications

	Metric	U.S.
Dimensions		
Width	**360 mm**	14.17 in
Depth	**254 mm**	10.00 in
Height (front to rear, LED display assembly)	**18.9 mm**	0.74 in
Weight (4-cell battery)	**2.05 kg**	4.54 lb
Input power		
Operating voltage and current	19.5 V dc @ 6.15 A - 120 W, Slim Smart AC Adapter (select models only) 19.5 V dc @ 7.69 A - 150 W, Slim Smart AC Adapter (select models only) 19.5 V dc @ 10.3A - 200 W, Slim Smart AC Adapter (select models only)	
Temperature		
Operating	**5°C to 35°C**	41°F to 95°F
Nonoperating	**-20°C to 60°C**	-4°F to 140°F
Relative humidity (non-condensing)		
Operating	10% to 90%	
Nonoperating	5% to 95%	
Maximum altitude (unpressurized)		
Operating	**-15 m to 3,048 m**	-50 ft to 10,000 ft
Nonoperating	**-15 m to 12,192 m**	-50 ft to 40,000 ft

NOTE: Applicable product safety standards specify thermal limits for plastic surfaces. The device operates well within this range of temperatures.

M.2 PCIe solid-state drive specifications

	256-GB*	512-GB*	1-TB*
Dimensions			
Height	1 mm	1 mm	1 mm
Length	50.8 mm	50.8 mm	50.8 mm
Width	28.9 mm	28.9 mm	28.9 mm
Weight	< 10 g	< 10 g	< 10 g
Interface type	ATA-7	ATA-7	ATA-7
Transfer rate			
Sequential Read	Up to 2150 MB/s	Up to 2150 MB/s	Up to 2150 MB/s
Random Read	Up to 300,000 IOPs	Up to 300,000 IOPs	Up to 300,000 IOPs
Sequential Write	Up to 1260 MB/s	Up to 1550 MB/s	Up to 1550 MB/s
Random Write	Up to 100,000 IOPs	Up to 100,000 IOPs	Up to 100,000 IOPs
Ready time, Maximum (to not busy)	1.0 s	1.0 s	1.0 s
Access times			
Logical	0.1	0.1	0.1
Total logical sectors	500,118,192	1,000,215,216	1,500,336,388
Operating temperature			
Operating	0° to 70°C (32°F to 158°F)	0° to 70°C (32°F to 158°F)	0° to 70°C (32°F to 158°F)
Non-operating	-40° to 80°C (-40°F to 176°F)	-40° to 85°C (-40°F to 185°F)	-40° to 85°C (-40°F to 185°F)

*1 GB = 1 billion bytes when referring to hard drive storage capacity. Actual accessible capacity is less.

NOTE: Certain restrictions and exclusions apply. Contact technical support for details.

M.2 solid-state drive specifications

	256-GB*	512-GB*
Dimensions		
Height	1 mm	1 mm
Length	50.8 mm	50.8 mm
Width	28.9 mm	28.9 mm
Weight	< 10 g	< 10 g
Interface type	ATA-7	ATA-7
Transfer rate		
Sequential Read	Up to 540 MB/s	Up to 500 MB/s
Random Read	Up to 85K IOPs	Up to 84K IOPs
Sequential Write	Up to 280 MB/s	Up to 455 MB/s
Random Write	Up to 67K IOPs	Up to 59K IOPs
Ready time, Maximum (to not busy)	1.0 s	3.0 s
Access times		
Logical	0.1	0.1
Total logical sectors	500,118,192	1.000.215.216
Operating temperature		
Operating	0° to 70°C (32°F to 158°F)	0° to 70°C (32°F to 158°F)
Non-operating	-55° to 90°C (-67°F to 194°F)	-40° to 85°C (-40°F to 185°F)

*1 GB = 1 billion bytes when referring to hard drive storage capacity. Actual accessible capacity is less.

NOTE: Certain restrictions and exclusions apply. Contact technical support for details.

10 Statement of memory volatility

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

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

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

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

Current BIOS steps

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

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

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

   b. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes** to load defaults.

   The computer will reboot.

   c. During the reboot, press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

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

   d. Select the **Security** menu, select **Restore Security Settings to Factory Defaults**, and then select **Yes** to restore security level defaults.

   The computer will reboot.

   e. During the reboot, press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

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

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

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

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

   The computer will reboot.

i. During the reboot, press esc while the “Press the ESC key for Startup Menu” message is displayed at the bottom of the screen.

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

j. Select the **Main** menu, select **Apply Factory Defaults and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.

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

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

2. Complete one of the following:

   - Remove and retain the storage drive.

   – or –

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

   – or –

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

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

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

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

c. Select **Hard Drive Utilities**.

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

Nonvolatile memory usage

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
HP Sure Start flash (select models only)	8 MBytes	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical computer configuration data for select platforms that support HP Sure Start. For more information, see Using HP Sure Start (select models only) on page 89.	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 Bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using the Computer Setup (BIOS), or changing the Microsoft Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KBytes (not customer accessible)	No	Yes	Stores NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility is required to write data to this memory and is available from the NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 Bytes per memory module, 128 Bytes programmable (not customer accessible)	No	Yes	Stores memory module information.	DIMM SPD is programmed by the memory vendor.	Data cannot be written to this memory when the module is installed in a computer. The specific write-protection method varies by memory vendor.
System BIOS	9 MBytes	Yes	Yes	Stores system BIOS code and computer configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are input using the Computer Setup (BIOS) or a custom utility.	**NOTE:** Writing data to this ROM in an inappropriate manner can render the computer non-functional. A utility is required for writing data to this memory and is available on the HP website; go to http://www.hp.com/support. Select **Find your**

Nonvolatile Memory Type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data input into this memory?	How is this memory write-protected?
						product, and then follow the on-screen instructions.
Intel Management Engine Firmware (present only in select Elite or Z models. For more information, go to http://www.hp.com/support. Select **Find your product**, and then follow the on-screen instructions.)	1.5 MBytes or 7 MBytes	Yes	Yes	Stores Management Engine Code, Settings, Provisioning Data and iAMT third-party data store.	Management Engine Code is programmed at the factory. Code is updated via Intel secure firmware update utility. Unique Provisioning Data can be entered at the factory or by an administrator using the Management Engine (MEBx) setup utility. The third party data store contents can be populated by a remote management console or local applications that have been registered by an administrator to have access to the space.	The Intel chipset is configured to enforce hardware protection to block all direct read/write access to this area. An Intel utility is required for updating the firmware. Only firmware updates digitally signed by Intel can be applied using this utility.
Bluetooth flash (select products only)	2 Mbit	No	Yes	Stores Bluetooth configuration and firmware.	Bluetooth flash is programmed at the factory. Tools for writing data to this memory are not publicly available but can be obtained from the silicon vendor.	A utility is required for writing data to this memory and is made available through newer versions of the driver whenever the flash requires an upgrade.
802.11 WLAN EEPROM	4 Kbit to 8 Kbit	No	Yes	Stores configuration and calibration data.	802.11 WLAN EEPROM is programmed at the factory. Tools for writing data to this memory are not made public.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Webcam (select products only)	64 Kbit	No	Yes	Stores webcam configuration and firmware.	Webcam memory is programmed using a utility from the device manufacturer that can be run from Windows.	A utility is required for writing data to this memory and is typically not made available to the public unless a firmware upgrade is necessary to address a unique issue.
Fingerprint reader (select products only)	512 KByte flash	Yes	Yes	Stores fingerprint templates.	Fingerprint reader memory is programmed by user enrollment in HP ProtectTools Security Manager.	Only a digitally signed application can make the call to write to the flash.

Questions and answers

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

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

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

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

   b. Select **Main**, and then select **Apply Factory Defaults and Exit**.

   c. Follow the on-screen instructions.

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

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

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

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

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

   HP has provided options in Computer Setup (BIOS) to allow you to run in legacy BIOS, if required by the operating system. Examples of this requirement would be if you upgrade or downgrade the OS.

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

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

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

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

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

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

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

IMPORTANT: Resetting will result in the loss of information.

These steps will not reset Custom Secure Boot Keys. See question and answer 7 for information about resetting the keys.

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

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

c. Follow the on-screen instructions.

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

7. **How can the Custom Secure Boot Keys be reset?**

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

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

b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.

c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select models only)

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

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

11 Power cord set requirements

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

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

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

Requirements for all countries

The following requirements are applicable to all countries and regions:

- The length of the power cord set must be at least 1.0 m (3.3 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 all countries 113

Requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Argentina	IRAM	1
Australia	SAA	1
Austria	OVE	1
Belgium	CEBEC	1
Brazil	ABNT	1
Canada	CSA	2
Chile	IMQ	1
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1
India	ISI	1
Israel	SII	1
Italy	IMQ	1
Japan	JIS	3
The Netherlands	KEMA	1
New Zealand	SANZ	1
Norway	NEMKO	1
The People's Republic of China	CCC	4
Saudi Arabia	SASO	7
Singapore	PSB	1
South Africa	SABS	1
South Korea	KTL	5
Sweden	SEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	6
Thailand	TISI	1
The United Kingdom	ASTA	1
The United States	UL	2

1. The flexible cord must be Type H05VV-F, 3-conductor, 0.75 mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
2. The flexible cord must be Type SVT/SJT 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 ac) or NEMA 6-15P (15 A, 250 V ac) configuration. CSA or C-UL mark. UL file number must be on each element.

Country/region	Accredited agency	Applicable note number

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 VCTF, 3-conductor, 0.75 mm² or 1.25 mm² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V ac) configuration.
4. The flexible cord must be Type RVV, 3-conductor, 0.75 mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the CCC certification mark.
5. The flexible cord must be Type H05VV-F 3-conductor, 0.75 mm² conductor size. KTL logo and individual approval number must be on each element. Corset approval number and logo must be printed on a flag label.
6. The flexible cord must be Type HVCTF 3-conductor, 1.25 mm² conductor size. Power cord set fittings (appliance coupler, cable, and wall plug) must bear the BSMI certification mark.
7. For 127 V ac, the flexible cord must be Type SVT or SJT 3-conductor, 18 AWG, with plug NEMA 5-15P (15 A, 125 V ac), with UL and CSA or C-UL marks. For 240 V ac, the flexible cord must be Type H05VV-F 3-conductor, 0.75 mm² or 1.00 mm2 conductor size, with plug BS 1363/A with BSI or ASTA marks.

12 Recycling

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

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

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