Maintenance and Service Guide

HP Pavilion 15 Laptop PC

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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.

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Safety warning notice

⚠ **CAUTION:** To reduce the possibility of heat-related injuries or of overheating the device, do not place the device directly on your lap or obstruct the device air vents. Use the device 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 device 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 1

2 Getting to know your computer 7

Right side 7

Left side 8

Display 9

Keyboard area 11

TouchPad 11

Lights 12

Power button, speakers, and vent 13

Special keys 14

Action keys 15

Bottom 16

Labels 16

3 Illustrated parts catalog 18

Computer components 18

Display assembly components 23

Mass storage devices 26

Cables 27

Miscellaneous parts 28

4 Removal and replacement procedures preliminary requirements 29

Tools required 29

Service considerations 29

Plastic parts 29

Cables and connectors 29

Drive handling 30

Workstation guidelines 30

Electrostatic discharge information 30

Generating static electricity 31

Preventing electrostatic damage to equipment 31

Personal grounding methods and equipment 32

Grounding the work area 32

Recommended materials and equipment 32

Packaging and transporting guidelines 33

5 Removal and replacement procedures for authorized service provider parts 34
Component replacement procedures 34
Preparation for disassembly 34
Bottom cover 34
Battery 37
Display assembly 39
Hard drive 50
WLAN module 52
Solid-state drive 54
Optane memory module 55
Memory module 56
Memory card reader board 57
USB board (select products only) 59
TouchPad 60
Lock bracket 63
Fan(s) 65
Heat sink 67
System board 70
Speakers 74
Power connector cable 76
Top cover with keyboard 78

6 Using Setup Utility (BIOS) 79
Starting Setup Utility (BIOS) 79
Updating Setup Utility (BIOS) 79
Determining the BIOS version 79
Downloading a BIOS update 80

7 Using HP PC Hardware Diagnostics 81
Using HP PC Hardware Diagnostics Windows (select products only) 81
Downloading HP PC Hardware Diagnostics Windows 81
Downloading the latest HP PC Hardware Diagnostics Windows version 82
Downloading HP Hardware Diagnostics Windows by product name or number (select products only) 82
Installing HP PC Hardware Diagnostics Windows 82
Using HP PC Hardware Diagnostics UEFI 82
Starting HP PC Hardware Diagnostics UEFI 83
Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive 83
Downloading the latest HP PC Hardware Diagnostics UEFI version 83
Downloading HP PC Hardware Diagnostics UEFI by product name or number (select products only) 83

Using Remote HP PC Hardware Diagnostics UEFI settings (select products only) 84
Downloading Remote HP PC Hardware Diagnostics UEFI 84
Downloading the latest Remote HP PC Hardware Diagnostics UEFI version 84
Downloading Remote HP PC Hardware Diagnostics UEFI by product name or number 84
Customizing Remote HP PC Hardware Diagnostics UEFI settings 84

8 Backing up, restoring, and recovering 86
Backing up information and creating recovery media 86
Using Windows tools 86
Using the HP Cloud Recovery Download Tool to create recovery media (select products only) 86
Restoring and recovery 87
Restoring, resetting, and refreshing using Windows tools 87
Recovering using HP Recovery media 87
Changing the computer boot order 87

9 Specifications 88

10 Power cord set requirements 89
Requirements for all countries 89
Requirements for specific countries and regions 89

11 Recycling 91

Index 92

1 Product description

Table 1-1 Product components and their descriptions

Category	Description
Product Name	**HP Pavilion 15 Laptop PC**
	Model numbers:
	15-cs0000 – 15-cs0999; 15-cs1000 – 15-cs1999; 15-cs2000 – 15-cs2999
	15t-cs000; 15t-cs100; 15t-cs200
Processors	**8th generation Intel® Core™ processors**
	i7-8565U 1.80 GHz (SC turbo up to 4.60 GHz) quad core processor (8.0 MB L3 cache, 2400-MHz FSB, 15 W)
	i7-8550U 1.80 GHz (SC turbo up to 4.00 GHz) quad core processor (8.0 MB L3 cache, 2400-MHz FSB, 15 W)
	i5-8265U 1.60 GHz (SC turbo up to 3.90 GHz) quad core processor (6.0 MB L3 cache, 2400-MHz FSB, 15 W)
	i5-8250U 1.60 GHz (SC turbo up to 3.40 GHz) quad core processor (6.0 MB L3 cache, 2400-MHz FSB, 15 W)
	i3-8145U 2.10 GHz (SC turbo up to 3.90 GHz) dual core processor (4.0 MB L3 cache, 2400-MHz FSB, 15 W)
	i3-8130U 2.20 GHz (SC turbo up to 3.40 GHz) dual core processor (4.0 MB L3 cache, 2400-MHz FSB, 15 W)
	7th generation Intel processors
	Core i7-7500U 2.70 GHz (SC turbo up to 3.50 GHz) dual core processor (4.0 MB L3 cache, 2133-MHz FSB, 15 W)
	Pentium® Gold 4415U 2.30 GHz, dual core processor (2.0 MB L3 cache, 2133-MHz FSB, 15 W)
Graphics	Support for HD decode, DX12, and high-definition multimedia interface (HDMI)
	Supports Optimus (select products only)
	Supports GPS (GPU Performance Scaling)
	Supports MR ready
	Internal graphics
	Intel UHD Graphics 620 (8th generation Intel Core processors)
	Intel HD Graphics 620 (7th generation Intel Core processors)
	Intel HD Graphics 610 (7th generation Intel Pentium processors)
	Hybrid graphics
	NVIDIA GeForce® GTX1050 with 2 GB of discrete video memory
	NVIDIA GeForce GTX1050 with 3 GB of discrete video memory
	NVIDIA GeForce GTX1050 with 4 GB of discrete video memory
	NVIDIA GeForce GTX1050Ti with 4-GB of discrete video memory
	NVIDIA GeForce MX250 with up to 4 GB of discrete video memory
	NVIDIA GeForce MX250 with up to 2 GB of discrete video memory

Table 1-1 Product components and their descriptions (continued)

Category	Description
	NVIDIA GeForce MX150 with up to 4 GB of discrete video memory
	NVIDIA GeForce MX150 with up to 2 GB of discrete video memory
	NVIDIA GeForce MX130 with up to 2 GB of discrete video memory
Panel	**15.6-in, white light-emitting (WLED), slim, eDP, 16:9 aspect ratio, narrow bezel**
	High definition (HD) (1366 × 768), BrightView, SVA, 220 nits (select products only)
	HD (1366 × 768), BrightView, SVA, 220 nits, Touch-on Panel (TOP) (select products only)
	HD (1366 × 768), anti glare, SVA, 220 nits (select products only)
	Full high-definition (FHD) (1920 × 1080), BrightView, UWVA, 220 nits (select products only)
	FHD (1920 × 1080), BrightView, UWVA, 250 nits, Touch-on Panel (TOP); touch solution with bezel, multi-touch enabled (select products only)
	FHD (1920 × 1080), anti glare, UWVA, 220 nits (select products only)
	FHD (1920 × 1080), anti glare, SVA, 220 nits (select products only)
	FHD (1920 × 1080), anti glare, UWVA, 300 nits, 72% CG (select products only)
Memory	Two SODIMM memory module slots, non-customer-accessible/non-upgradable
	Supports up to 16 GB of system memory
	DDR4-2400 dual channel support (select products only)
	DDR4-2133 dual channel support (select products only)
	Supports the following configurations:
	• 16384 GB (8192 GB × 2)
	• 12288 GB (8192 GB × 1 + 4096 GB × 1)
	• 8192 GB (8192 GB × 1 or 4096 GB × 2)
	• 6144 GB (4096 GB × 1 + 2048 GB × 1)
	• 4096 GB (4096 GB × 1)
Storage	**Support for 7.2 mm/9.5 mm, SATA, 2.5-inch hard drives (select models only)**
	Support for solid-state drive + hard drive (select products only)
	Support for M.2 SATA/PCIe solid-state drive (select products only)
	Accelerometer/Hard drive protection support
	Single hard drive configurations (select products only)
	2 TB, 5400 rpm, 7.2 mm
	1 TB, 5400 rpm, 7.2 mm
	500 GB, 5400 rpm, 7.0 mm
	Dual storage configurations (select products only)
	256 GB, PCIe, value, solid-state drive + 1 TB, 5400 rpm, 7.2 mm hard drive
	256 GB, SATA, TLC, solid-state drive + 1 TB, 5400 rpm, 7.2 mm hard drive

Table 1-1 Product components and their descriptions (continued)

Category	Description
	128 GB, SATA, TLC, solid-state drive + 2 TB, 5400 rpm, 7.2 mm hard drive
	128 GB, SATA, TLC, solid-state drive + 1 TB, 5400 rpm, 7.2 mm hard drive
	128 GB, SATA, TLC, solid-state drive + 500 GB, 5400 rpm, 7.0 mm hard drive
	M.2 SATA-3, TLC, solid-state drive (select products only)
	256 GB
	128 GB
	M.2, PCIe, NVMe, solid-state drive
	512 GB, TLC
	512 GB
	256 GB
	Intel Optane (3D Xpoint) Solution, PCIe, Gen3 × 2, M.2, solid-state drive (select products only)
	16 GB (Optane memory module) + 1 TB, 5400 rpm, 7.2 mm hard drive
Camera	**HP Wide Vision FHD infrared camera** with indicator light and 2 infrared lights, USB 2.0, FHD hybrid BSI sensor, f2.2, 88° wide field of vision
	1080p by 30 frames per second
	Supports Windows® Hello
	Dual array Digital Microphones with appropriate software - beam forming, echo cancellation, noise suppression
	HP Wide Vision HD camera with indicator light, USB 2.0, HD BSI sensor, f2.0, 88° wide field of vision
	720p by 30 frames per second
	Dual array Digital Microphones w/ appropriate software - beam forming, echo cancellation, noise suppression
Audio	**Audio brand**: B&O
	Audio control panel: B&O Audio Control
	Supports HP Audio Boost
	Dual speakers
RJ-45 (network) jack	Integrated 10/100/1000 NIC
Sensors	Accelerometer (select products only)
Wireless	Compatible with Miracast-certified devices
	Integrated wireless options with a single antenna
	Intel Dual Band Wireless-AC 9461 802.11ac 1 × 1 Wi-Fi + Bluetooth® 5 Combo Adapter (non-vPro) (select products only)
	Integrated wireless options with dual antennas (M.2/CNVi)
	Intel Dual Band Wireless-AC 9560 802.11ac 2 × 2 Wi-Fi + Bluetooth 5 (non-vPro) (MU-MIMO supported) (select products only)
	Intel Dual band wireless-AC 3168 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adaptor (non-vPro) (select products only)

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Intel Dual Band Wireless-AC 7265 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (non-vPro) (select products only)
	Realtek RTL8822BE 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported) (select products only/)
	Integrated wireless options with single antenna (M.2/PCIe)
	Realtek RTL8821CE 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported) (select products only)
	Realtek RTL8723DE 802.11bgn 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (select products only)
Media card reader	Supports SD™/SDHC™/SDXC™
	Push-push insertion/removal
Internal card expansion	One M.2 slot for solid-state drive
	One M.2 slot for WLAN
Ports	Hot plug/unplug and auto detect for correct output to wide-aspect vs standard aspect video (auto adjust panel resolution to fit embedded panel and external monitor connected)
	AC Smart Pin adapter plug
	Audio-out (headphone)/audio-in (microphone) combo jack
	HDMI v2.0 supporting up to 1920 × 1080 @ 60Hz
	RJ-45 (network) jack
	USB 3.1 Type-A ports (2, right side)
	USB Type-C port; USB 3.1 Gen 1 (left side); supports data transfer
	HDMI supporting up to 4096 × 2160 @ 60Hz (select products only)
Keyboard/ TouchPad	**Keyboard**
	Full-sized, two coat paint, island-style keyboard with numeric keypad
	Full-sized, three-coat paint, backlit, island-style keyboard with numeric keypad
	TouchPad
	Image sensor
	MultiTouch gestures enabled
	Support for Modern TrackPad gestures
	Taps enabled as default
Power requirements	**Battery**
	4-cell, 68 Whr, prismatic/polymer battery (select models only)
	3-cell, 41 Whr, prismatic/polymer battery
	Supports battery fast charge
	AC adapter
	120 W HP Smart AC adapter with power cord

Table 1-1 Product components and their descriptions (continued)

Category	Description
	90 W HP Smart AC adapter with power cord
	65 W HP Smart AC adapter (EM) with power cord
	65 W HP Smart AC adapter with power cord
	45 W HP Smart AC adapter with power cord
	Power cord
	1.0 m conventional power cord with a C5 connector
	1.0 m conventional power cord with a C5 connector + Japan plug adapter
Security	Nano security cable slot
	U2F (Universal 2nd Factor Authentication)
	Support for Trusted Platform Module (fTPM) 2.0
Operating system	FreeDOS 2.0
	Windows® 10 Home 64
	Windows 10 Home 64 Web/Kiosk
	Windows 10 Home 64 Chinese Market CPPP
	Windows 10 Home 64 High-End Chinese Market CPPP
	Windows 10 Home 64 Plus
	Windows 10 Home 64 Plus Microsoft Signature
	Windows 10 Home 64 Plus QVC
	Windows 10 Home 64 Plus Single Language
	Windows 10 Home 64 Plus Single Language Africa Market PPP
	Windows 10 Home 64 Plus Single Language APAC EM PPP
	Windows 10 Home 64 Plus Single Language India Market PPP
	Windows 10 Home 64 Plus Single Language Indonesia Market PPP
	Windows 10 Home 64 Plus Web/Kiosk
	Windows 10 Home 64 QVC
	Windows 10 Home 64 Single Language
	Windows 10 Home 64 Single Language Africa Market PPP
	Windows 10 Home 64 Single Language APAC EM PPP
	Windows 10 Home 64 Single Language India Market PPP
	Windows 10 Home 64 Single Language Indonesia Market PPP
	Windows 10 Home 64 Single Language Value Africa Market PPP
	Windows 10 Home 64 Single Language Value APAC EM PPP
	Windows 10 Home 64 Single Language Value India Market PPP

Table 1-1 Product components and their descriptions (continued)

Category	Description
	Windows 10 Home 64 Single Language Value Indonesia Market PPP
	Windows 10 Home 64 Value Notebook Single Language
	Windows 10 Home 64 Value Notebook Single Language SEAP
	Windows 10 Home 64 Value Notebook Single Language select GEO
	Windows 10 Home S 64
	Windows 10 Home S 64 Value
	Windows 10 Home S 64 Value Web/Kiosk
	Windows 10 Home S 64 S Value QVC
	Windows 10 Pro 64
	Windows 10 Pro 64 Web/Kiosk
	Windows 10 Pro 64 QVC
Serviceability	**End user replaceable parts**
	AC adapter

2 Getting to know your computer

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

Right side

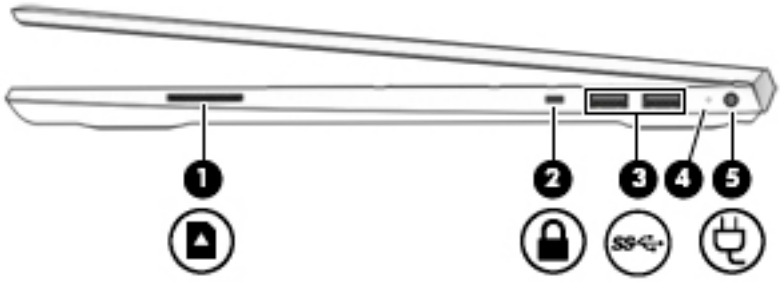

Table 2-1 Right-side components and their descriptions

Component			Description
(1)		Memory card reader	Reads optional memory cards that enable you to store, manage, share, or access information. To insert a card: 1. Hold the card label-side up, with 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)		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.
(3)		USB SuperSpeed ports (2)	Connect a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.
(4)		AC adapter and battery light	• White: The AC adapter is connected and the battery is fully charged. • Blinking white: The AC adapter is disconnected and the battery has reached a low battery level. • Amber: The AC adapter is connected and the battery is charging. • Off: The battery is not charging.
(5)		Power connector	Connects an AC adapter.

Left side

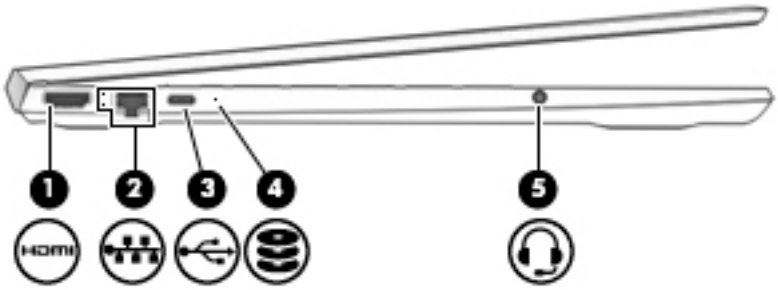

Table 2-2 Left-side components and their descriptions

Component		Description
(1)	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.
(2)	RJ-45 (network) jack/status lights	Connects a network cable. • White: The network is connected. • Amber: Activity is occurring on the network.
(3)	USB Type-C port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides data transfer. **NOTE:** Cables and/or adapters (purchased separately) may be required.
(4)	Drive light	• Blinking white: The hard drive is being accessed. • Amber: HP 3D DriveGuard has temporarily parked the hard drive.
(5)	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**. **NOTE:** When a device is connected to the jack, the computer speakers are disabled.

Display

NOTE: Refer to the illustration that most closely matches your computer.

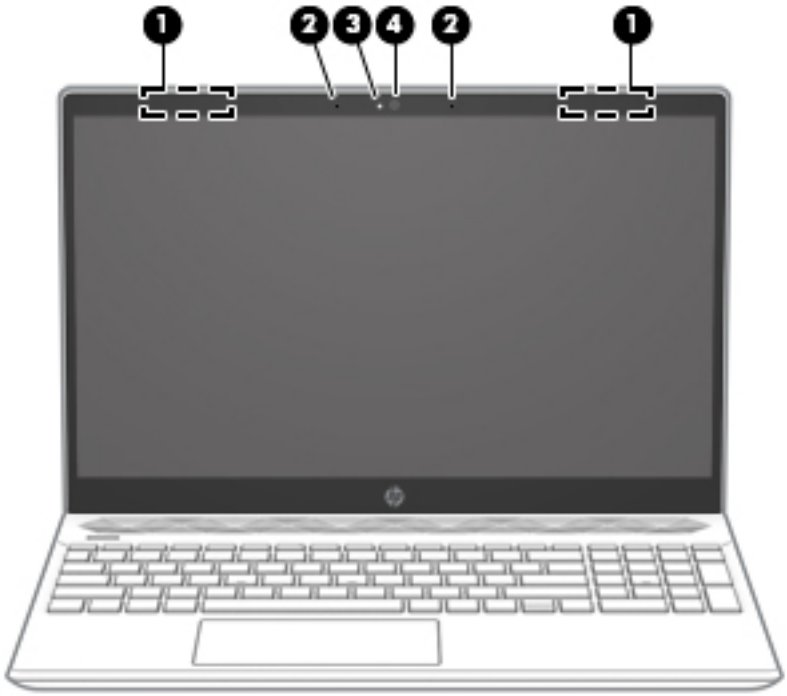

Table 2-3 Display components and their descriptions

Component		Description
(1)	WLAN antenna(s)*	Send and receive wireless signals to communicate with wireless local area networks (WLANs). **NOTE:** Depending on the model, your computer may have one or two wireless antennas. If your computer has a single antenna, it will be located on the right side.
(2)	Internal microphones	Record sound.
(3)	Camera light	On: The camera is in use.
(4)	Camera	Allows 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.

To access this guide:

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

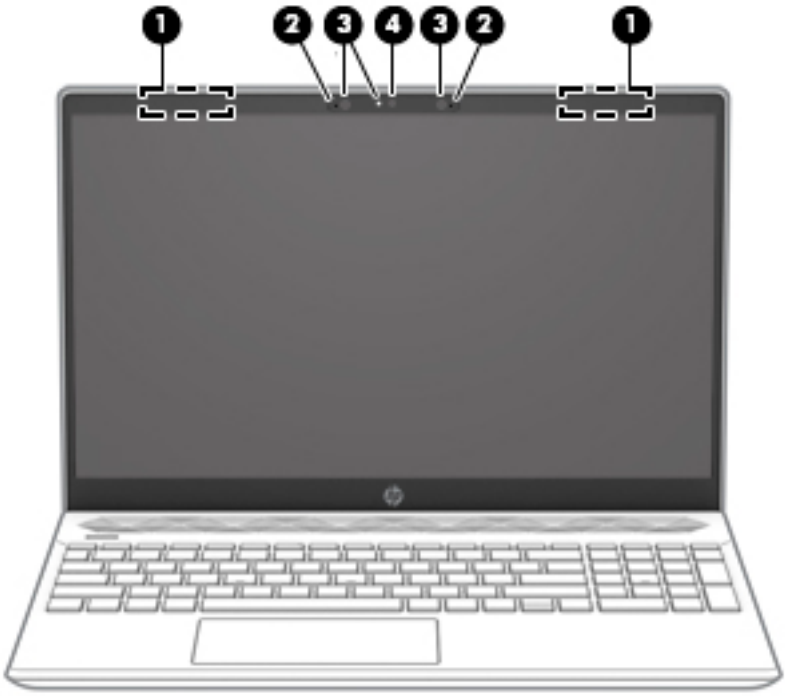

Table 2-4 Display components and their descriptions

Component		Description
(1)	WLAN antennas*	Send and receive wireless signals to communicate with wireless local area networks (WLANs).
(2)	Internal microphones	Record sound.
(3)	Camera light(s)	On: One or more cameras are in use.
(4)	Camera(s)	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.

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Keyboard area

TouchPad

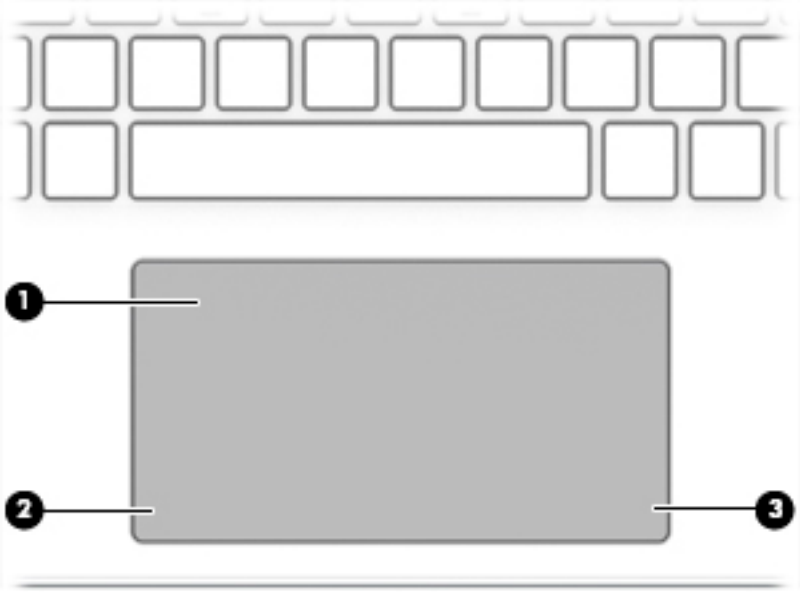


Table 2-5 TouchPad components and their descriptions

Component		Description
(1)	TouchPad zone	Reads your finger gestures to move the pointer or activate items on the screen.
(2)	Left TouchPad button	Functions like the left button on an external mouse.
(3)	Right TouchPad button	Functions like the right button on an external mouse.

Lights

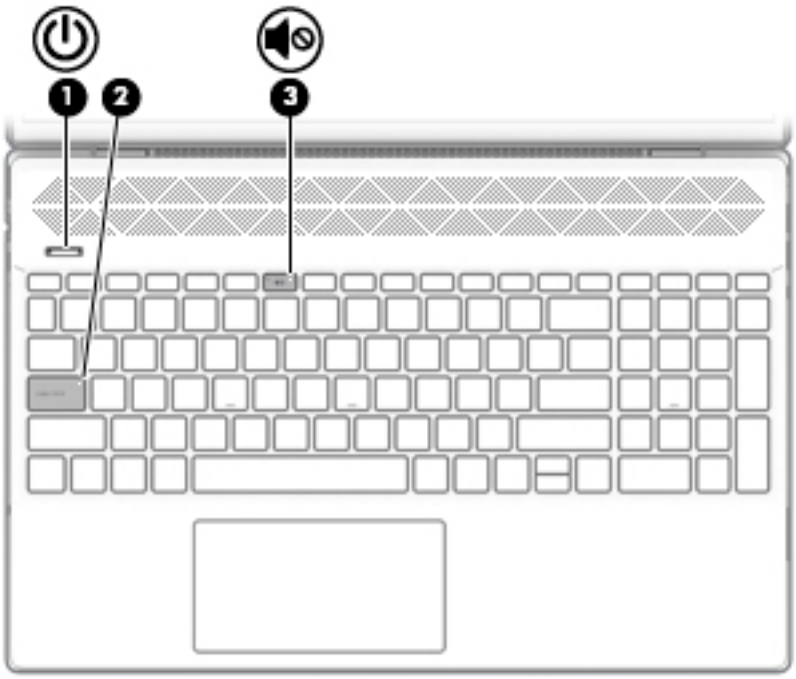


Table 2-6 Lights and their descriptions

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)	Mute light	• On: Computer sound is off. • Off: Computer sound is on.

Power button, speakers, and vent

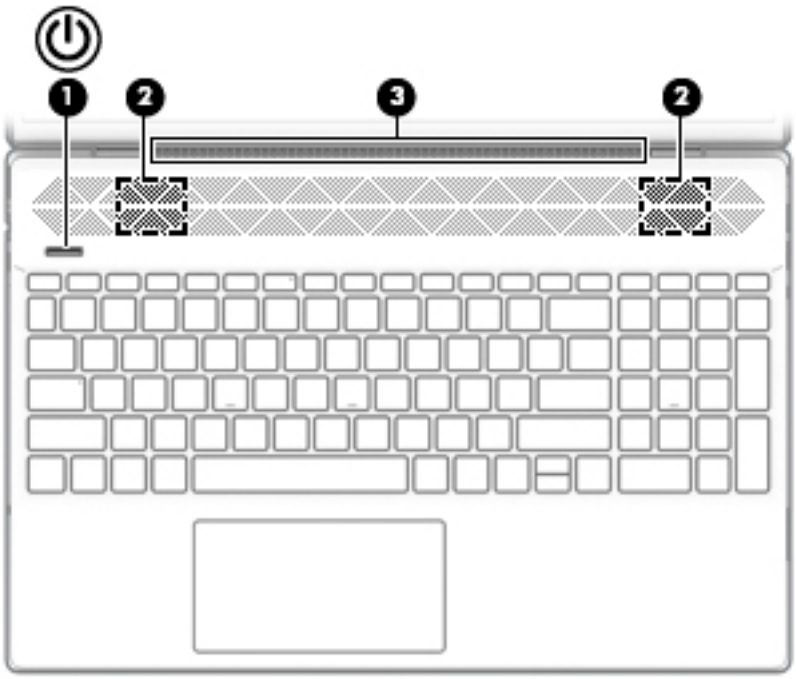


Table 2-7 Power button, speakers, and vent and their descriptions

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 (select products only). • 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 down 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** icon, and then select **Power Options**.
(2)	Speakers	Produce sound.
(3)	Vent	Enables air flow 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 cycloe on and off during routine operation.

Special keys

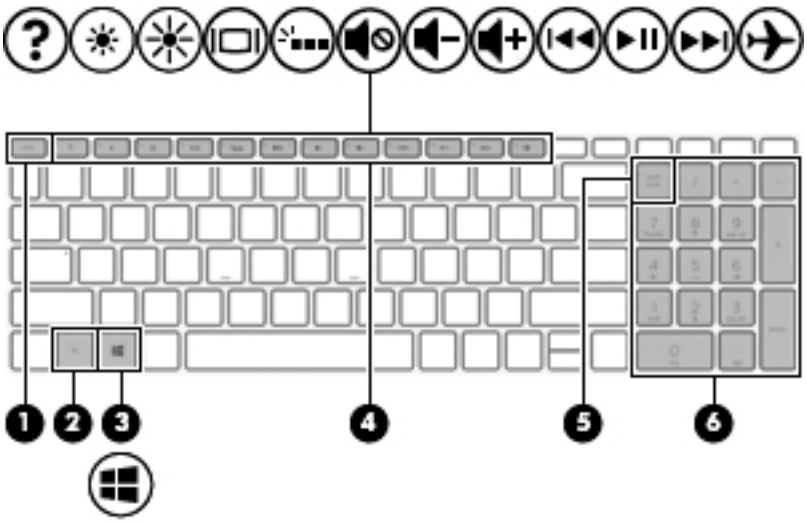


Table 2-8 Special keys and their descriptions

Component		Description
(1)	esc key	Displays system information when pressed in combination with the fn key.
(2)	fn key	Executes specific functions when pressed in combination with another key.
(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. **NOTE:** On select products, the f5 action key turns the keyboard backlight feature off or on.
(5)	num lock key	Alternates between the navigational and numeric functions on the integrated numeric keypad.
(6)	Integrated numeric keypad	A separate keypad to the right of the alphabet keyboard. When num lock is pressed, the keypad can be used like an external numeric keypad. **NOTE:** If the keypad function is active when the computer is turned off, that function is reinstated when the computer is turned back on.

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 14.

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

Table 2-9 Action keys and their descriptions

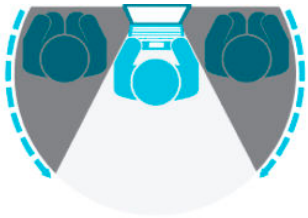
Icon	Description
	Helps prevent side-angle viewing from onlookers. If needed, decrease or increase brightness for well-lit or darker environments. Press the key again to turn off the privacy screen. 
	Decreases the screen brightness incrementally as long as you hold down the key.
	Increases the screen brightness incrementally as long as you hold down the key.
	Opens the “How to get help in Windows 10” webpage.
	Switches the screen image between display devices connected to the system. For example, if a monitor is connected to the computer, repeatedly pressing this key alternates the screen image from the computer display to the monitor display to a simultaneous display on both the computer and the monitor.
	Turns the keyboard backlight off or on. On select products, you can adjust the brightness of the keyboard backlight. Press the key repeatedly to adjust the brightness from high (when you first start up the computer), to low, to off. After you adjust the keyboard backlight setting, the backlight will revert to your previous setting each time you turn on the computer. The keyboard backlight will turn off after 30 seconds of inactivity. To turn the keyboard backlight back on, press any key or tap the TouchPad (select products only). To conserve battery power, turn off this feature.
	Plays the previous track of an audio CD or the previous section of a DVD or a Blu-ray Disc (BD).
	Starts, pauses, or resumes playback of an audio CD, a DVD, or a BD.
	Plays the next track of an audio CD or the next section of a DVD or a BD.
	Stops audio or video playback of a CD, a DVD, or a BD.
	Decreases speaker volume incrementally while you hold down the key.
	Increases speaker volume incrementally while you hold down the key.

Table 2-9 Action keys and their descriptions (continued)

Icon	Description
	Mutes or restores speaker sound.
	Turns the airplane mode and wireless feature on or off. **NOTE:** The airplane mode key is also referred to as the wireless button. **NOTE:** A wireless network must be set up before a wireless connection is possible.

Bottom

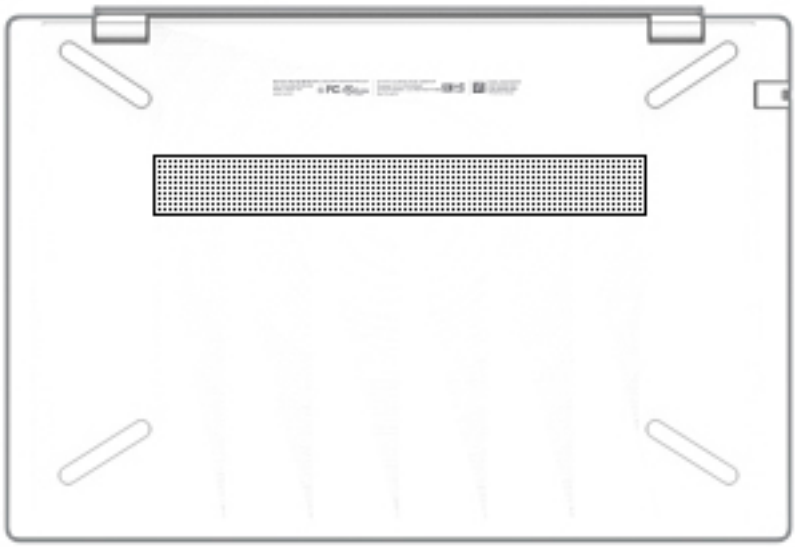


Table 2-10 Bottom components and their descriptions

Component	Description
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.

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.

Your service label will resemble one of the examples shown below. Refer to the illustration that most closely matches the service label on your computer.

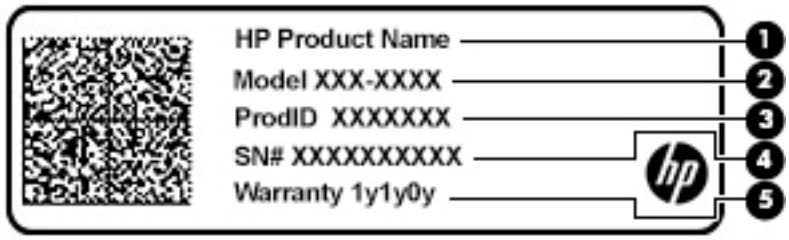


Table 2-11 Service label components

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

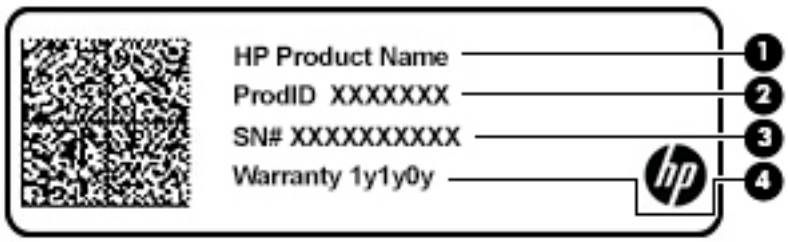


Table 2-12 Service label components

Component	
(1)	HP product name
(2)	Product ID
(3)	Serial number
(4)	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

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

Computer components

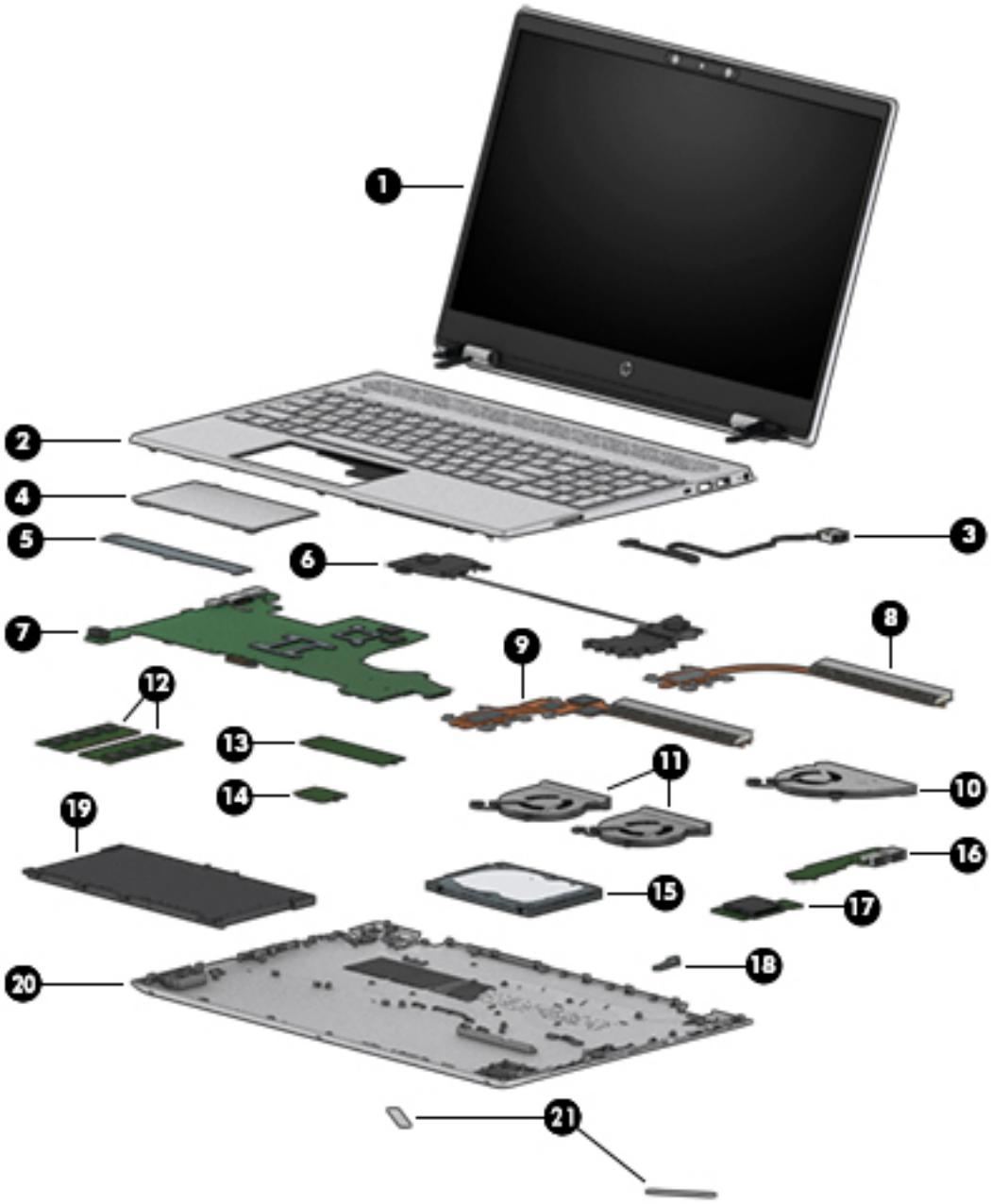


Table 3-1 Computer major components and their descriptions

Item	Component	Spare part number
(1)	**Display assembly**: The display assembly is spared at the subcomponent level only. For more display assembly spare part information, see Display assembly components on page 23.	
(2)	**Top cover with keyboard:**	
	Natural silver, backlit	L24752-xx1
	Natural silver, no backlight	L24753-xx1
	Pale gold, backlit	L24754-xx1
	Pale gold, no backlight	L24755-xx1
	Cloud blue, backlight	L49391-xx1
	Cloud blue, no backlight	L49392-xx1
	Luminous gold, backlight	L49393-xx1
	Luminous gold, no backlight	L49394-xx1
	Top cover with keyboard (on models equipped with GTX graphics):	
	Natural silver, backlit	L35339–xx1
	Natural silver, no backlight	L35340–xx1
(3)	**Power connector cable:** Power connector cable EMI tape is available in the Miscellaneous Parts Kit using spare part number L28015-001.	810327-006
	Power connector cable in models equipped with GTX graphics	L45827-001
(4)	**TouchPad:** **NOTE:** The TouchPad cable is available using spare part number L23893-001.	
	Natural silver	L24934-001
	Pale gold	L24933-001
	Fog blue	L51805-001
	Warm gold	L51806-001
(5)	**TouchPad bracket**	L23892-001
(6)	**Speakers** (includes cable)	L23900-001
	Speakers (on models equipped with GTX graphics) (include cable)	L41588-001
(7)	**System board** (includes processor and replacement thermal material):	
	System board for use in models with discrete graphics equipped with the following processors:	
	Intel Core i7-8565U processor and 4 GB of MX 250 discrete video memory	L50260-xx1
	Intel Core i7-8565U processor and 2 GB of MX 250 discrete video memory	L50259-xx1
	Intel Core i7-8565U processor and 4 GB of GTX 1050 discrete video memory	L34171-xx1
	Intel Core i7-8565U processor and 4 GB of GeForce MX150 discrete video memory	L34176-xx1
	Intel Core i7-8565U processor and 2 GB of GeForce MX150 discrete video memory	L34175-xx1

Table 3-1 Computer major components and their descriptions (continued)

Item	Component	Spare part number
	Intel Core i7-8565U processor with 3 GB of GTX discrete video memory	L46518-xx1
	Intel Core i7-8565U processor with 4 GB of GTX 1050Ti discrete video memory	L34172-xx1
	Intel Core i7-8550U processor and 4 GB of GeForce MX150 discrete video memory	L22820-xx1
	Intel Core i7-8550U processor and 2 GB of GeForce MX150 discrete video memory	L22817-xx1
	Intel Core i7-8550U processor and 2 GB of GeForce MX130 discrete video memory	L22814-xx1
	Intel Core i5-8265U processor and 2 GB of GeForce MX250 discrete video memory	L50258-xx1
	Intel Core i5-8265U processor and 2 GB of GTX 1050 discrete video memory	L34170-xx1
	Intel Core i5-8265U processor and 2 GB of GeForce MX130 discrete video memory	L34173-xx1
	Intel Core i5-8265U processor and 2 GB of GeForce MX150 discrete video memory	L34174-xx1
	Intel Core i5-8265U processor with 4 GB of GTX 1050Ti discrete video memory	L44879-xx1
	Intel Core i5-8265U processor with GTX and 3 GB of GeForce MX150 discrete video memory	L52957-xx1
	Intel Core i5-8250U processor and 4 GB of GeForce MX150 discrete video memory	L22818-xx1
	Intel Core i5-8250U processor and 2 GB of GeForce MX150 discrete video memory	L22815-xx1
	Intel Core i5-8250U processor and 2 GB of GeForce MX130 discrete video memory	L22813-xx1
	Intel Core i7-7500U processor and 4 GB of GeForce MX150 discrete video memory	L22819-xx1
	Intel Core i7-7500U processor and 2 GB of GeForce MX150 discrete video memory	L22816-xx1
	Intel Core i3-8130U processor and 2 GB of GeForce MX150 discrete video memory	L37245-xx1
	System board for use in models with UMA graphics equipped with the following processors:	
	Intel Core i7-8565U processor	L50262-xx1
	Intel Core i7-8550U processor	L22822-xx1
	Intel Core i5-8250U processor	L22821-xx1
	Intel Core i3-8145U processor	L50261-xx1
	Intel Core i3-8130U processor	L22824-xx1
	Intel Core i5-8265U processor	L34169-xx1
	Intel Pentium 4415U processor	L22823-xx1
(8)	**Heat sink, UMA graphics** (not pictured) for use only on computer models equipped with Intel Core i7-8550U/i5-8250U processors (includes replacement thermal material)	L23898-001
	Heat sink, UMA graphics (not pictured) for use only on computer models equipped with Intel Core i7-7500U/Pentium 4415U processors (includes replacement thermal material)	L23899-001
	Heat sink, GTX discrete graphics (not illustrated) (includes replacement thermal material)	L35251-001
(9)	**Heat sink, discrete graphics** (includes replacement thermal material)	L23897-001
(10)	**Fan for use in models with UMA graphics memory**	L27902-001
(11)	**Fan for use in models with discrete graphics memory**	L23895-001
	Fan for use in models with discrete graphics memory (on models equipped with GTX graphics)	L35338-001

Table 3-1 Computer major components and their descriptions (continued)

Item	Component	Spare part number
(12)	**Memory modules** (2, DDR4-2400, 1.2-V):	
	8 GB	862398-855
	4 GB	862397-855
	2 GB	864271-855
(13)	**Solid-state drive** (2280 M.2):	
	512 GB, PCIe	L25329-001
	512 GB, PCIe, TLC	L56705-001
	256 GB, SATA-3, TLC	L25327-001
	256 GB, PCIe	L25328-001
	128 GB, SATA-3, TLC	L25326-001
	Optane memory module, 16 GB, PCIe	L27309-001
(14)	**WLAN module**	
	Intel Dual Band Wireless-AC 7265 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (non-vPro)	901229-855
	Intel Dual Band Wireless-AC 3168 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (non-vPro)	863934-855
	Realtek RTL8822BE 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported)	924813-855
	Realtek RTL8821CE 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported)	L17365-005
	Realtek RTL8723DE-CG 802.11bgn 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter	L21480-005
	Intel Dual Band Wireless-AC + Bluetooth 5 Combo Adapter (non-vPro)	L22634-005
	Intel Dual Band Wireless-AC 9461 802.11ac 1 × 1 Wi-Fi + Bluetooth 5 Combo Adapter (non-vPro)	L25889-005
(15)	**Hard drive** (SATA, 7.0-mm; does not include hard drive bracket or hard drive cable):	
	2 TB, 5400-rpm	912487-855
	1 TB, 5400-rpm	762990-005
	500 GB, 5400-rpm	778186-005
	NOTE: Hard drive brackets are available using spare part number L19469-001. The hard drive cable is available using spare part number L23889-001	
(16)	**USB board** (select products only)	L23896-001
	NOTE: The USB board cable is available using spare part number L23901-001.	
(17)	**Memory card reader board**	L23890-001
	NOTE: The memory card reader board cable is available using spare part number L23891-001 and L41586-001 on models equipped with GTX graphics	
	Memory card reader board (on models equipped with GTX graphics)	L41585-001
(18)	**Lock bracket**	L23902-001
(19)	**Battery**	
	4-cell 68 Whr	L32654-005

Table 3-1 Computer major components and their descriptions (continued)

Item	Component	Spare part number
	3-cell, 41 Whr	L11119-855
(20)	**Bottom cover**	
	Natural silver	L23885-001
	Natural silver (on models equipped with GTX graphics)	L41587-001
	Pale gold	L23886-001
	Fog blue	L51801-001
	Warm gold	L51802-001
(21)	**Rubber Foot Kit** (includes Mylar screw cover):	
	For use in natural silver models	L23887-001
	For use in pale gold models	L23888-001
	For use in fog blue models	L51807-001
	For use in warm gold models	L51808-001

Display assembly components

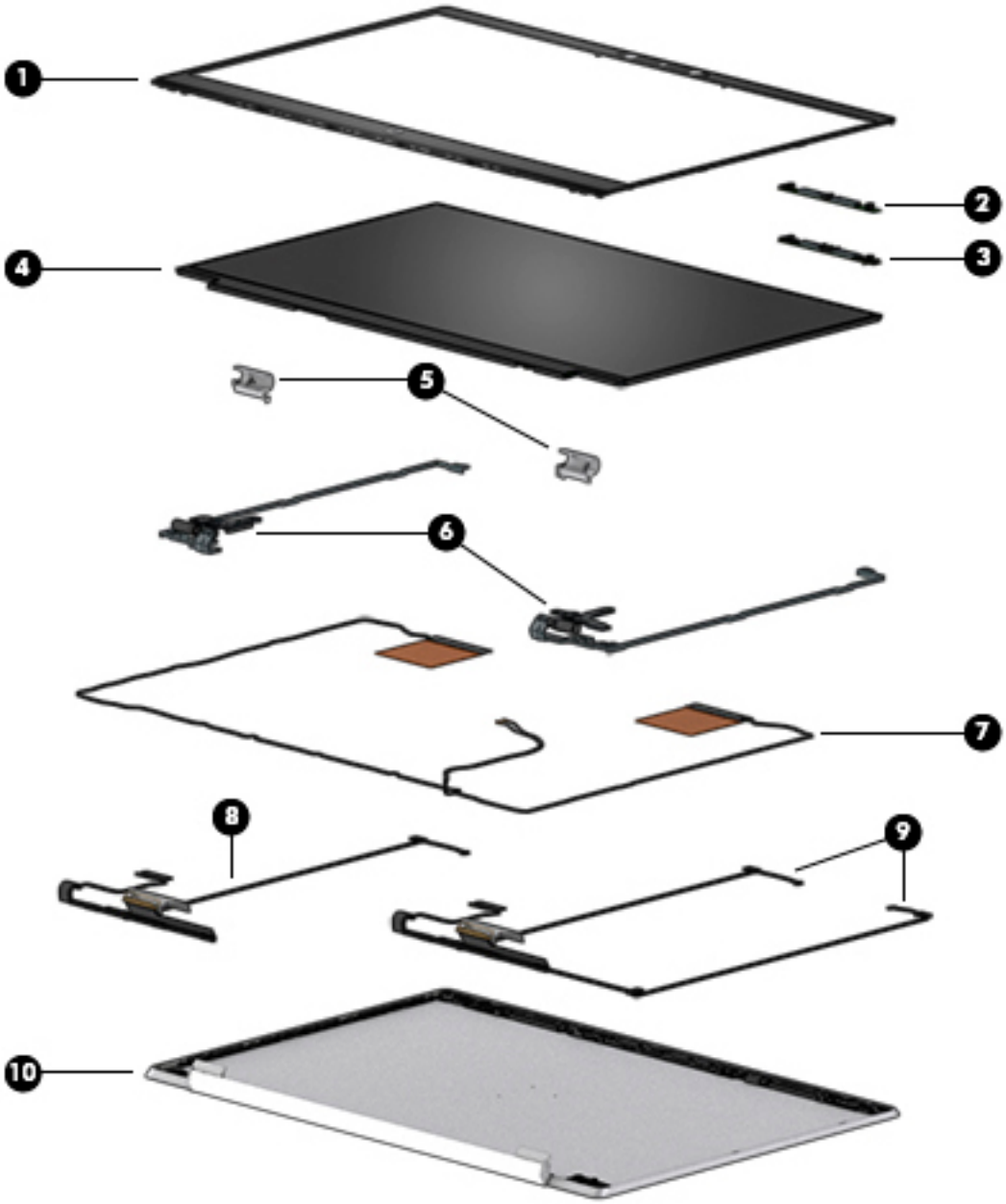


Table 3-2 Display components and their descriptions

Item	Component	Spare part number
(1)	**Display bezel**	
	For use on computer models equipped with a FHD infrared camera	L23909-001
	For use on computer models equipped with an HD non-infrared camera	L23908-001
(2)	**IR camera/microphone module** (includes display bezel adhesive)	L28107-001
(3)	**HD camera/microphone module** (includes display bezel adhesive)	L28108-001

Table 3-2 Display components and their descriptions (continued)

Item	Component	Spare part number
(4)	**Display panel** (includes display bezel adhesive and display rear cover adhesive):	
	FHD, anti glare, SVA, non-touch	L25331-001
	FHD, anti glare, UWVA, non-touch	L25332-001
	FHD, anti glare, UWVA, non-touch, narrow bezel	L47710-001
	FHD, BrightView, UWVA, non-touch	L25334-001
	FHD, BrightView, UWVA, touch screen	L25333-001
	HD, anti glare, non-touch	L25335-001
	HD, BrightView, non-touch	L25336-001
	HD, BrightView, touch	L25330-001
(5)	**Hinge covers** (include display bezel adhesive and display rear cover adhesive):	
	Pale gold	L23913-001
	Natural silver	L23914-001
	Fog blue	L51803-001
	Warm gold	L51804-001
(6)	**Hinges** (include left and right display hinges, display bezel adhesive, and display rear cover adhesive)	L23884-001
(7)	**Wireless antenna kits**:	
	Wireless Dual Antenna kit (includes left and right wireless antenna cables, display bezel adhesive, and display back cover adhesive):	L24790-001
	Wireless Single Antenna kit (includes wireless antenna cable, display bezel adhesive, and display back cover adhesive)	L31502-001
(8)	**Display panel cable for use in models with an HD, non-infrared camera** (include display bezel adhesive and display rear cover adhesive) :	
	Touch screen	L23905-001
	Non-touch screen	L23903-001
	Non-touch screen on models equipped with GTX graphics with an infrared camera	L43925-001
	Non-touch screen on models equipped with GTX graphics with an HD, non-infrared camera	L43924-001
(9)	**Display panel cable for use in models with an infrared camera** (include display bezel adhesive and display rear cover adhesive):	
	Touch screen	L23906-001
	Non-touch screen	L23904-001
(10)	**Display back cover** (includes antenna cables, display bezel adhesive and display panel adhesive tape kit):	
	For use in models with 220 nit or 250 nit display panels:	
	• Pale gold	L23880-001
	• Ceramic white	L23878-001
	• Sapphire blue	L23881-001

Table 3-2 Display components and their descriptions (continued)

Item	Component	Spare part number
	• Velvet burgundy	L23883-001
	• Mineral silver	L23879-001
	• Tranquil pink	L23882-001
	• Ceramic white + natural silver	L51798-001
	• Fog blue	L51799-001
	• Warm gold	L51800-001
	For use in models with 300 nit display panels:	
	• Pale gold	L59622-001
	• Ceramic white	L59620-001
	• Sapphire blue	L59623-001
	• Velvet burgundy	L59625-001
	• Mineral silver	L59621-001
	• Tranquil pink	L59624-001
	• Ceramic white + natural silver	L59626-001
	• Fog blue	L59627-001
	• Warm gold	L59628-001
	Adhesive tape kit (includes display bezel adhesive and display rear cover adhesive; not illustrated)	L23912-001
	Display panel connector tape (not illustrated)	L28015-001

Mass storage devices

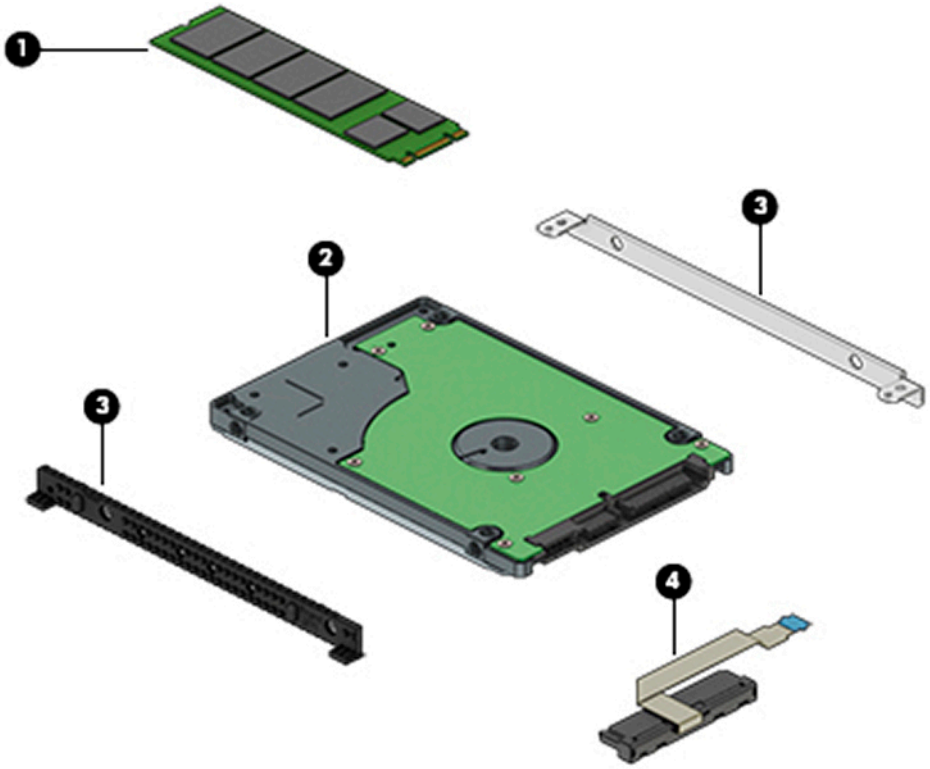


Table 3-3 Mass storage devices and their descriptions

Item	Component	Spare part number
(1)	**Solid-state drives** (M.2):	
	512 GB, PCIe	L25329-001
	512 GB, PCIe, TLC	L56705-001
	256 GB, SATA-3, TLC	L25327-001
	256 GB, PCIe	L25328-001
	128 GB, SATA-3, TLC	L25326-001
	Optane memory module, 16 GB, PCIe	L27309-001
(2)	**Hard drives** (does not include hard drive cable or brackets):	
	2 TB, 5400 rpm	912487-855
	1 TB, 5400 rpm	762990-005
	500 GB, 5400 rpm	778186-005
(3)	**Hard drive brackets**	L19469-001
(4)	**Hard drive cable**	L23889-001

Cables

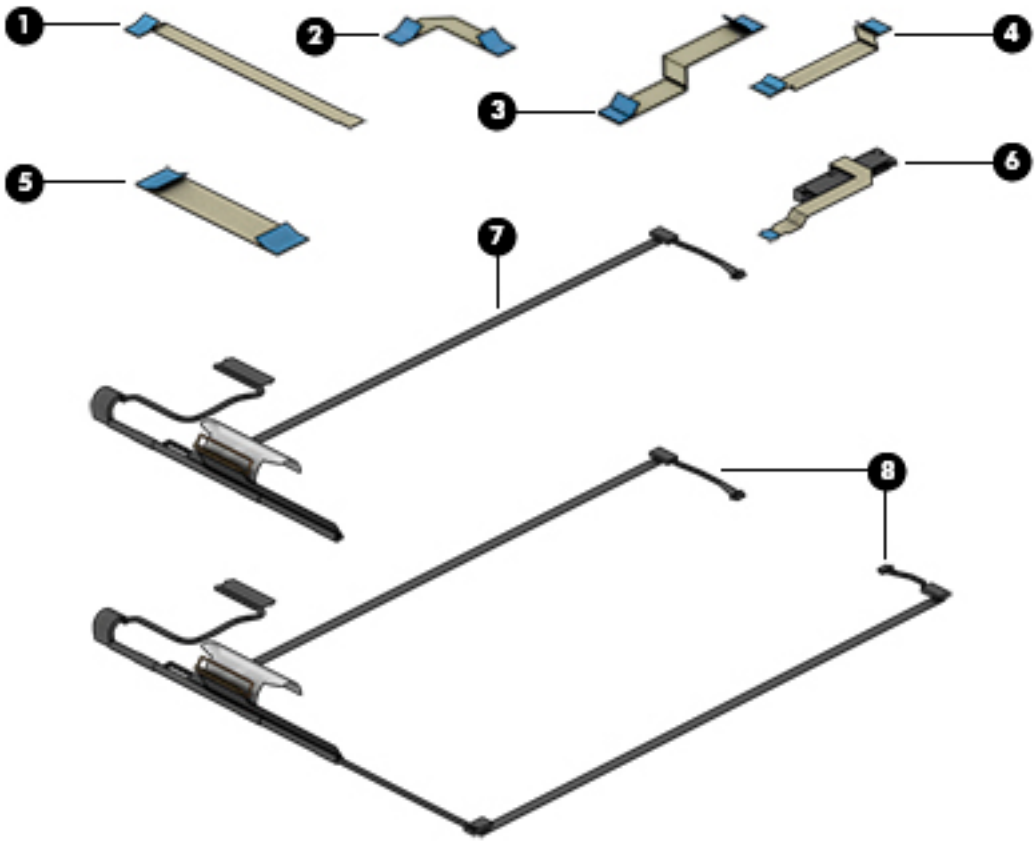


Table 3-4 Cables and their descriptions

Item	Component	Spare part number
(1)	**Memory card reader board cable**	L23891-001
(2)	**Memory card reader board cable** on models equipped with GTX graphics	L41586-001
(3)	**TouchPad cable**	L23893-001
(4)	**TouchPad cable** (on models equipped with GTX graphics)	L23893-001
(5)	**USB board cable** (select models onbly)	L23901-001
(6)	**Hard drive cable**	L23889-001
(7)	**Display cable for use in models with an HD, non-infrared camera** (includes display bezel adhesive and display rear cover adhesive):	
	Touch screen	L23905-001
	Non-touch screen	L23903-001
(8)	**Display cable for use in models with an infrared camera** (includes display bezel adhesive and display rear cover adhesive):	
	Touch screen	L23906-001
	Non-touch screen	L23904-001

Miscellaneous parts

Table 3-5 Miscellaneous parts and their descriptions

Component	Spare part number
AC adapter:	
120 W HP Smart AC adapter (PFC, Slim Barrel, 7.4–mm)	710415-001
90 W HP Smart AC adapter (PFC,RA, 4.5–mm)	937532-850
65 W HP Smart AC adapter (non-PFC, EM, RC, 4.5-mm)	913691-850
65 W AC adapter (non-PFC, S-3P, 4.5-mm)	710412-001
65 W AC adapter (non-PFC, S-3P, 4.5-mm) for use in Argentina	710340-850
45 W HP Smart AC adapter (non-PFC, RC, 4.5-mm, non-slim)	741727-001
45 W HP Smart AC adapter (non-PFC, RC, 4.5-mm) for use in Argentina	741553-852
Power cord (C5 connector, 1.0 m):	
For use in Argentina	L19357-001
For use in Australia	L19358-001
For use in Denmark	L19360-001
For use in Europe	L19361-001
For use in India	L19363-001
For use in Israel	L19362-001
For use in Italy	L19364-001
For use in Japan	L19365-001
For use in North America	L19367-001
For use in the People's Republic of China	L19368-001
For use in South Africa	L19369-001
For use in South Korea	L19366-001
For use in Switzerland	L19370-001
For use in Taiwan	L19372-001
For use in Thailand	L19371-001
For use in the United Kingdom	L19373-001
Duck head power cord for use in Japan	L33157-001
External DVD±RW DL SuperMulti Drive	747080-001
Miscellaneous Parts Kit (includes power connector cable EMI tape and display panel connector tape)	L28015-001
Screw Kit	L23915-001

4 Removal and replacement procedures preliminary requirements

Tools required

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

- Plastic, nonmarking pry tool
- Phillips P0 magnetic screw driver
- Phillips P1 magnetic screw driver
- Tweezer

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

IMPORTANT: Using excessive force during disassembly and reassembly can damage plastic parts.

Cables and connectors

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

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

Drive handling

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

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

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

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

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

Avoid dropping drives from any height onto any surface.

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

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

Avoid exposing a drive to temperature extremes or liquids.

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

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.

Electrostatic discharge information

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

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

IMPORTANT: To prevent damage to the device 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.

Generating static electricity

Note the following:

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

Table 4-1 Static electricity occurrence based on activity and humidity

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

NOTE: As little as 700 volts can degrade a product.

Preventing electrostatic damage to equipment

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

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

- Avoid contact with pins, leads, or circuitry.
- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal grounding methods and equipment

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

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

Table 4-2 Static shielding protection levels

Static shielding protection levels	
Method	**Voltage**
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

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

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

Recommended materials and equipment

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

- Antistatic tape
- Antistatic smocks, aprons, or sleeve protectors
- Conductive bins and other assembly or soldering aids
- Conductive foam
- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance
- Static-dissipative table or floor mats with hard tie to ground

- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing one-megohm +/- 10% resistance
- Material handling packages
- Conductive plastic bags
- Conductive plastic tubes
- Conductive tote boxes
- Opaque shielding bags
- Transparent metallized shielding bags
- Transparent shielding tubes

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.

5 Removal and replacement procedures for authorized service provider parts

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

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

IMPORTANT: Only HP authorized service providers should perform the removal and replacement procedures described here. Accessing the internal part could damage the computer or void the warranty.

Component replacement procedures

NOTE: Details about your computer, including model, serial number, product key, and length of warranty, are on the service tag at the bottom of your computer. See Labels on page 16 for details.

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

There are as many as 60 screws that must be removed, replaced, and/or loosened when servicing Authorized Service Provider only parts. Make special note of each screw size and location during removal and replacement.

Preparation for disassembly

See Removal and replacement procedures preliminary requirements on page 29 for initial safety procedures.

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.

Bottom cover

Table 5-1 Bottom cover description and part number

Description	Spare part number
Bottom cover for use in natural silver models	L23885-001
Bottom cover for use in natural silver models on models equipped with GTX graphics	L41587-001
Bottom cover for use in pale gold models	L23886-001
Bottom cover for use in fog blue models	L51801-001
Bottom cover for use in warm gold models	L51802-001

Before removing the bottom cover, follow these steps:

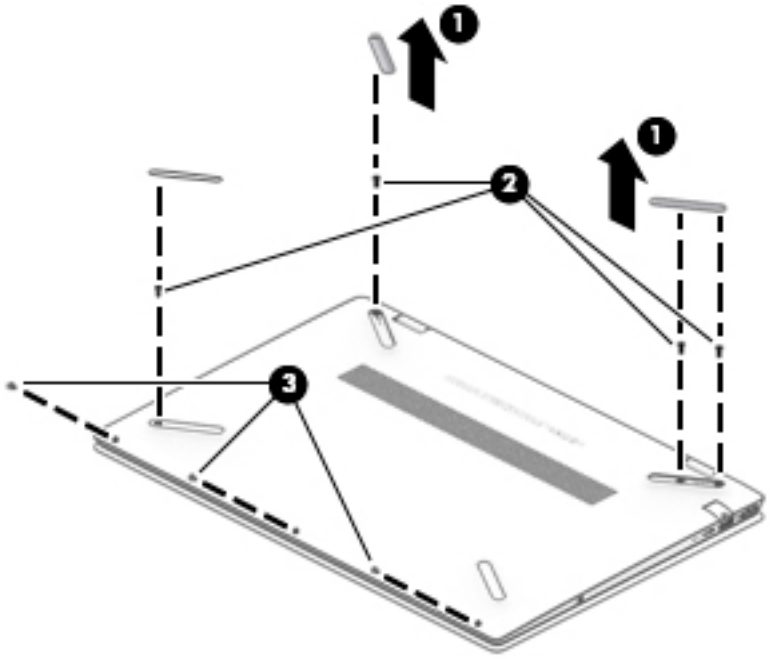
▲ Prepare the computer for disassembly (Preparation for disassembly on page 34).

Remove the bottom cover:

1. Remove the two rubber feet **(1)**.

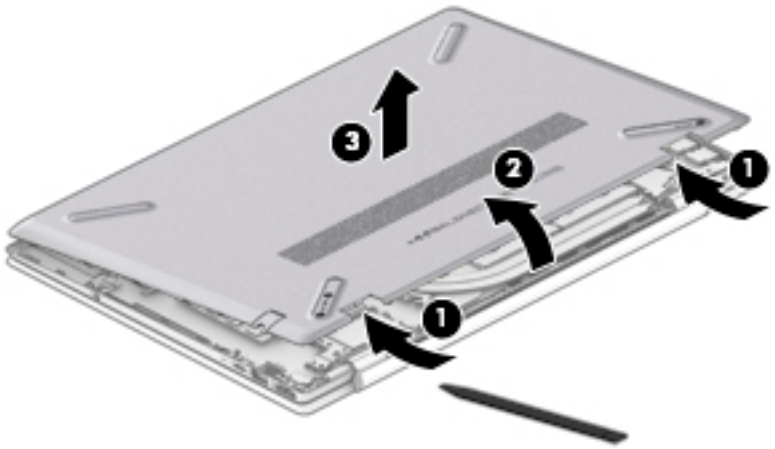
   The rubber feet are available using spare part number L23887-001 for natural silver models, L23888-001 for pale gold models, L51801-001 for fog blue models, and L51808-001 for warm gold models.

2. Remove the four Phillips M2.5 × 6.0 screws (P1 driver) **(2)** from under the feet and the three Phillips M2.0 × 4.0 screws (P0 driver) **(3)** along the bottom edge of the bottom cover that secure the bottom cover to the computer.



3. Starting under the hinges **(1)**, use a thin plastic tool to disengage the bottom cover from the computer **(2)**.

4. Remove the bottom cover **(3)**.

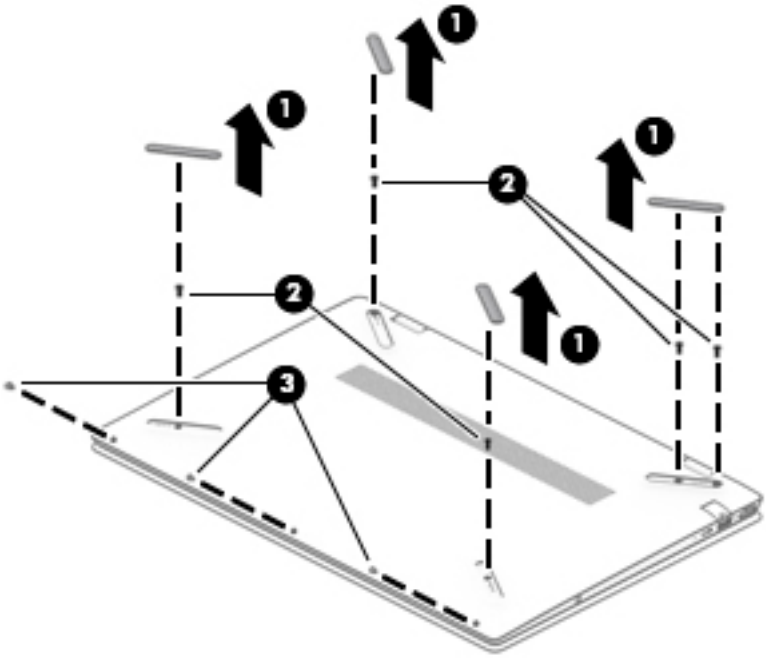


To remove the bottom cover on models equipped with GTX graphics:

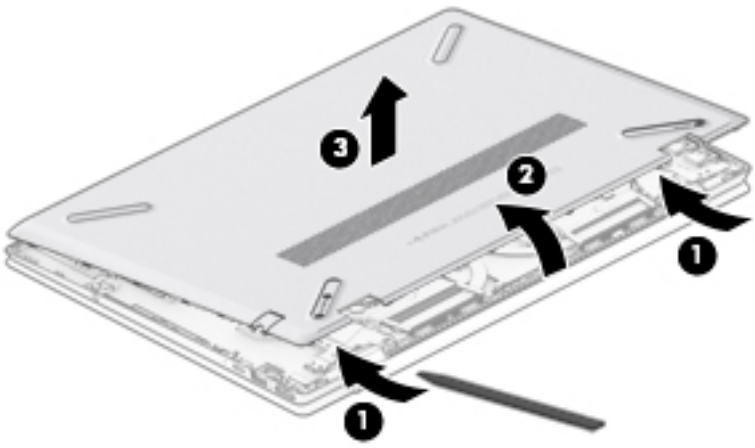
1. Remove the four rubber feet **(1)**.

   The rubber feet are available using spare part number L23887-001 for natural silver models and L23888-001 for pale gold models.

2. Remove the five Phillips M2.5 × 6.0 screws (P1 driver) **(2)** from under the feet and the three Phillips M2.0 × 4.0 screws (P0 driver) **(3)** along the bottom edge of the bottom cover that secure the bottom cover to the computer.



3. Starting under the hinges **(1)**, use a thin plastic tool to disengage the bottom cover from the computer **(2)**.
4. Remove the bottom cover **(3)**.



Reverse this procedure to install the bottom cover.

Battery

Table 5-2 Battery description and part number

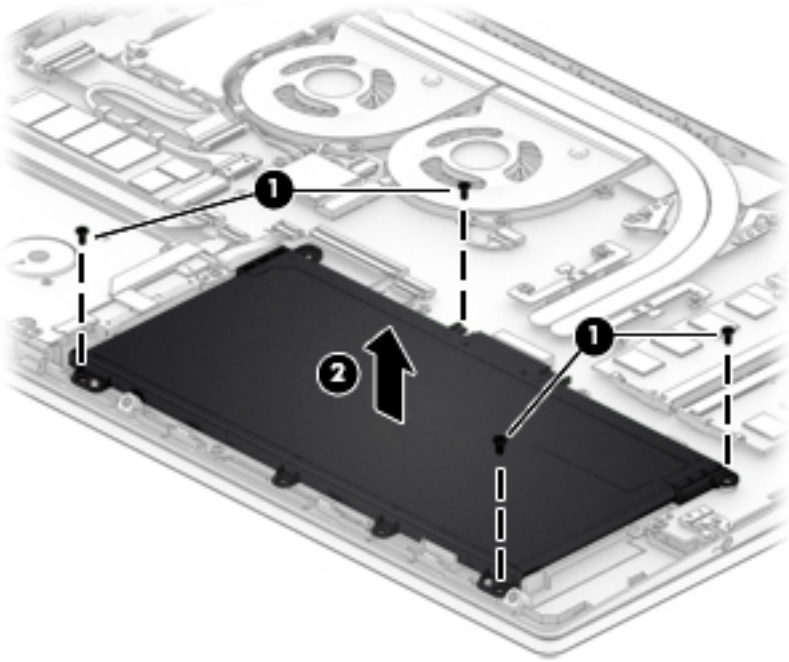
Description	Spare part number
4-cell, 68 Whr, Li-ion battery	L32654-005
3-cell, 41 Whr, Li-ion battery	L11119-855

Before removing the battery, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).

Remove the battery:

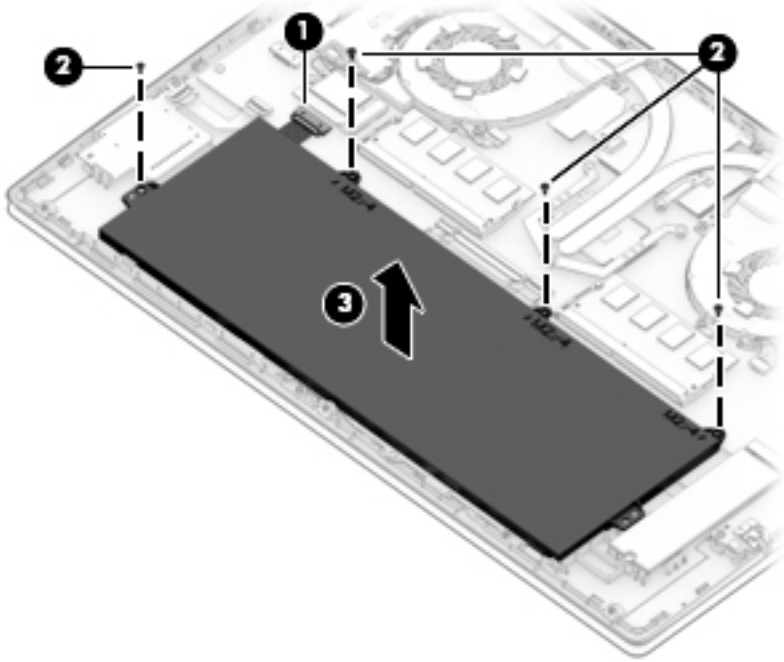
1. Remove the four Phillips M2.0 × 4.0 screws **(1)** that secure the battery to the computer.
2. Remove the battery from the computer **(2)**.



To remove the battery on models equipped with GTX graphics:

1. Disconnect the battery cable **(1)**.
2. Remove the three Phillips M2.0 × 4.0 screws **(2)** that secure the battery to the computer.

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



Reverse this procedure to install the battery.

Display assembly

NOTE: The display assembly is spared at the subcomponent level. For display assembly spare part information, see the individual removal subsections.

Before removing the display assembly, follow these steps:

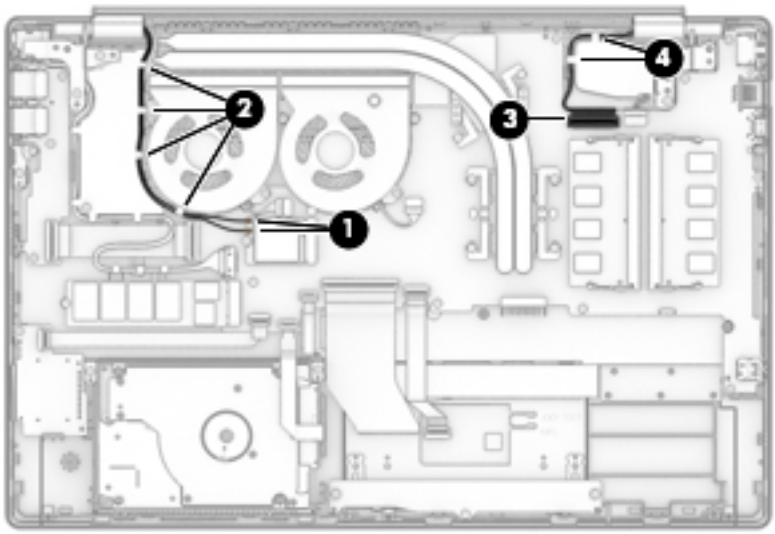
1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the display assembly:

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

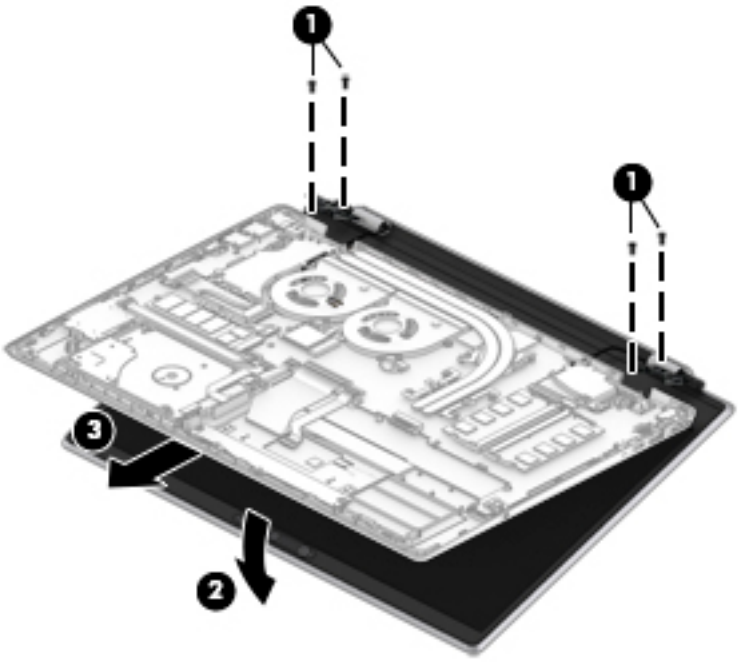
NOTE: The WLAN antenna cable labeled "1/MAIN" connects to the WLAN module "Main" terminal. The WLAN antenna cable labeled "2/AUX" connects to the WLAN module "Aux" terminal.

2. Release the WLAN antenna cables from the retention clips and routing channel built into the right speaker **(2)**.
3. Disconnect the display cable from the system board ZIF connector **(3)**.
4. Release the display panel from the retention clips and routing channel built into the left speaker **(4)**.

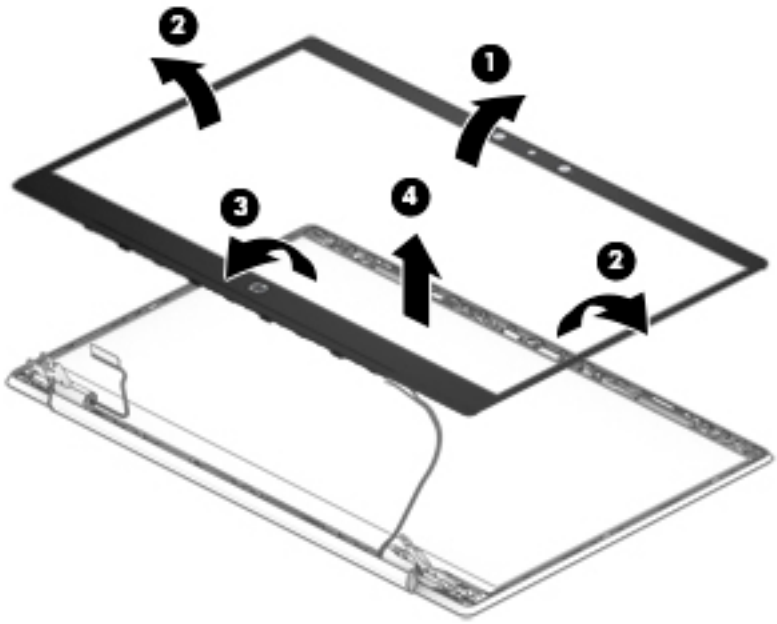


5. Remove the four Phillips M2.5 × 6.0 screws **(1)** that secure the display assembly to the computer.
6. Open the display to open the hinges **(2)**.

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



8. If it is necessary to replace the display bezel or any of the display assembly subcomponents:
   a. Release the top edge of the display bezel **(1)** from the display assembly.
   b. Release the left and right edges of the display bezel **(2)** from the display assembly.
   c. Release the bottom edge of the display bezel **(3)** from the display assembly.
   d. Remove the display bezel **(4)** from the display assembly.



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

- L23909-001 - FHD infrared camera
- L23908-001 - HD non-infrared camera

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

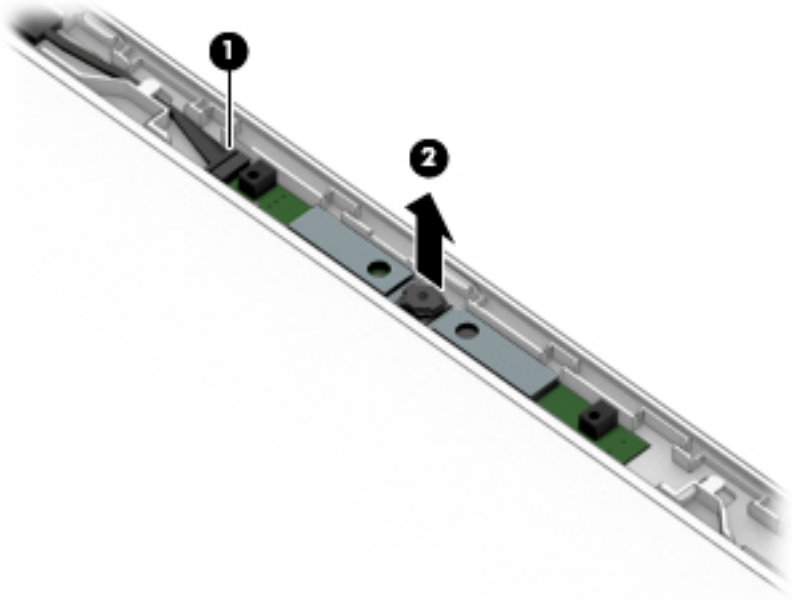
   a. Disconnect the cable **(1)** from the camera/microphone module.

   NOTE: Cables connect to both sides of IR cameras. A single cable connects to only one side of HD cameras.

   b. Detach the camera/microphone module **(2)** from the display back cover. (The module is attached with double-sided adhesive.)

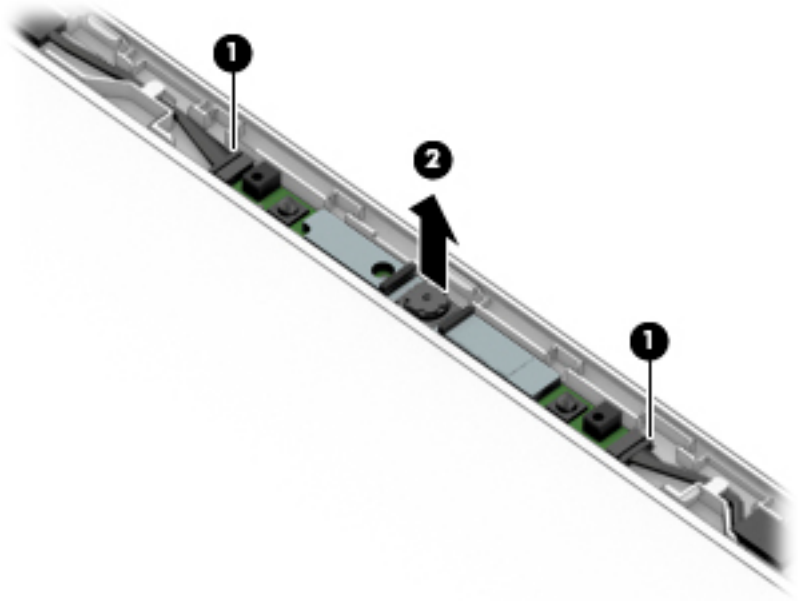
   The camera/microphone module is available using spare part number L28108-001 for HD non-infrared camera/microphone modules.

   Models with an HD camera



c. The camera/microphone module is available using spare part number L28107-001 for FHD infrared camera/microphone modules.

Models with an IR camera



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

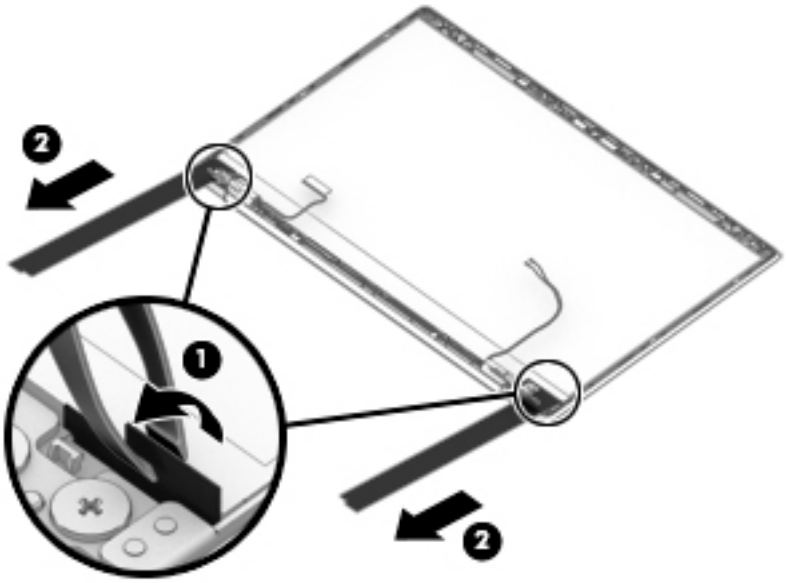
    a. Use tweezers to grasp the ends of the tape that secures the display panel to the display rear cover **(1)**.

b. Pull the tape out from behind the left and right sides of the panel **(2)**.

NOTE: You have to pull on the tape multiple times before it is completely removed.

Display panel adhesive tape is available using spare part number L23912-001.

In this kit, the thicker (1.0 mm) adhesives are used with 300 nit panels. The thinner (0.6 mm) adhesives are used with 220/250 nit panels.

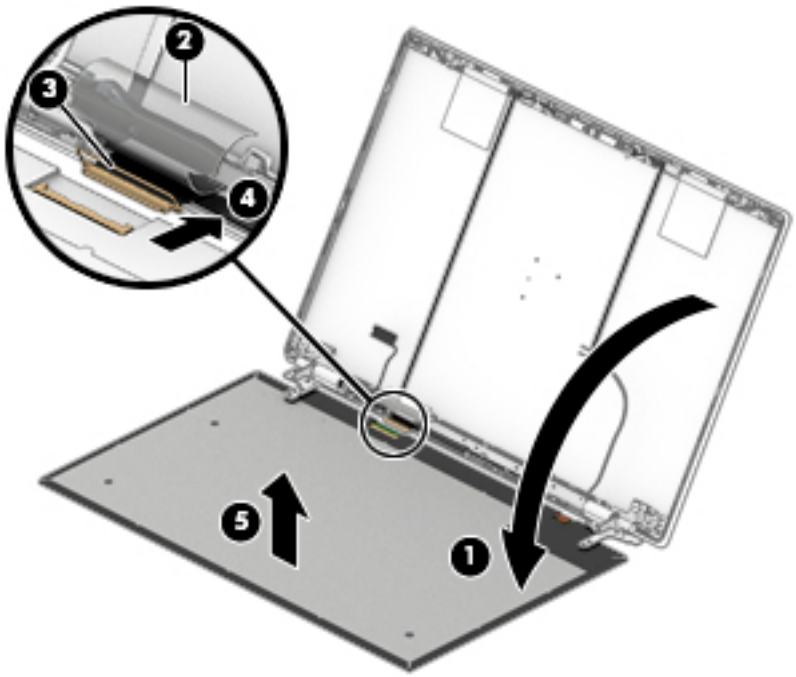


c. Swing the top edge of the display panel **(1)** up and forward until the panel rests upside down on the keyboard.

d. Release the adhesive support strip **(2)** that secures the display panel cable connector to the display panel.

e. Lift the connector support bracket **(3)**.

f. Disconnect the display panel cable **(4)** from the display panel, and then remove the display panel **(5)**.



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

L25331-001 – FHD, anti glare, SVA, non-touch

L25332-001 – FHD, anti glare, UWVA, non-touch

L47710-001 – FHD, anti glare, UWVA, non-touch, narrow bezel

L25334-001 – FHD, BrightView, UWVA, non-touch

L25333-001 – FHD, BrightView, UWVA, touch screen

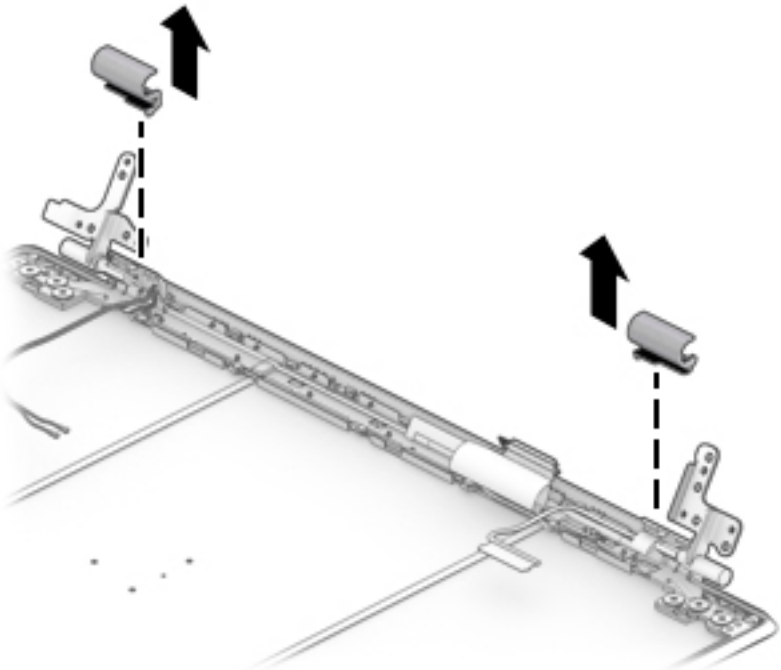
L25335-001 – HD, anti glare, SVA, non-touch

L25336-001 – HD, BrightView, SVA, non-touch

L25330-001 – HD, BrightView, SVA, touch screen

Display panel connector tape is available in the Miscellaneous Parts Kit using spare part number L28015-001.

11. If it is necessary to remove the hinge covers, pull up on the sides of the covers to remove them.



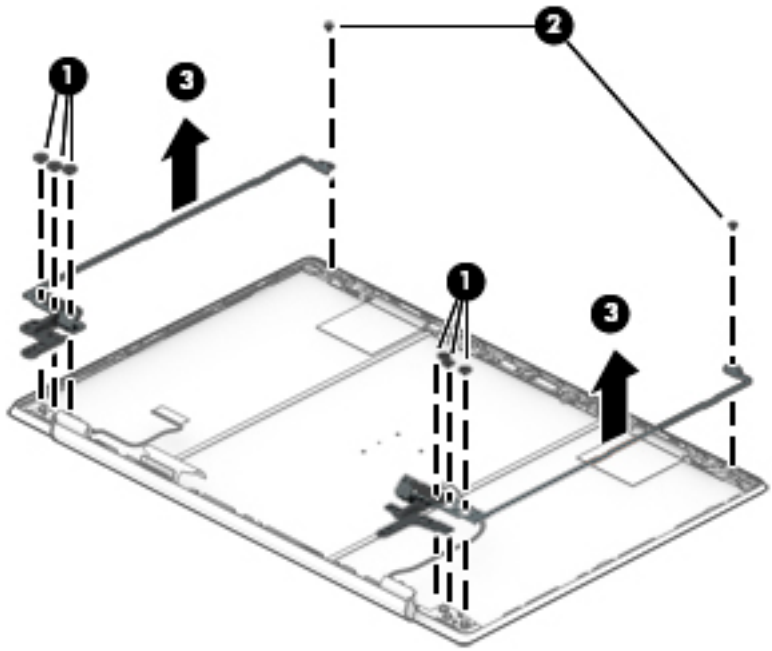
Hinge covers are available using spare part number L23913-001 for pale gold models, L23914-001 for natural silver models, L51803-001 for fog blue models, and L51804-001 for warm gold models.

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

    a. Remove the six Phillips M2.0 × 2.5 broadhead screws **(1)** from the bottom of the hinges.

    b. Remove the two Phillips M2.0 × 2.5 screws **(2)** from the top of the hinges.

    c. Remove the display hinges **(3)**.



The display hinges are available using spare part number L23884-001.

13. If it is necessary to remove the display panel cable:

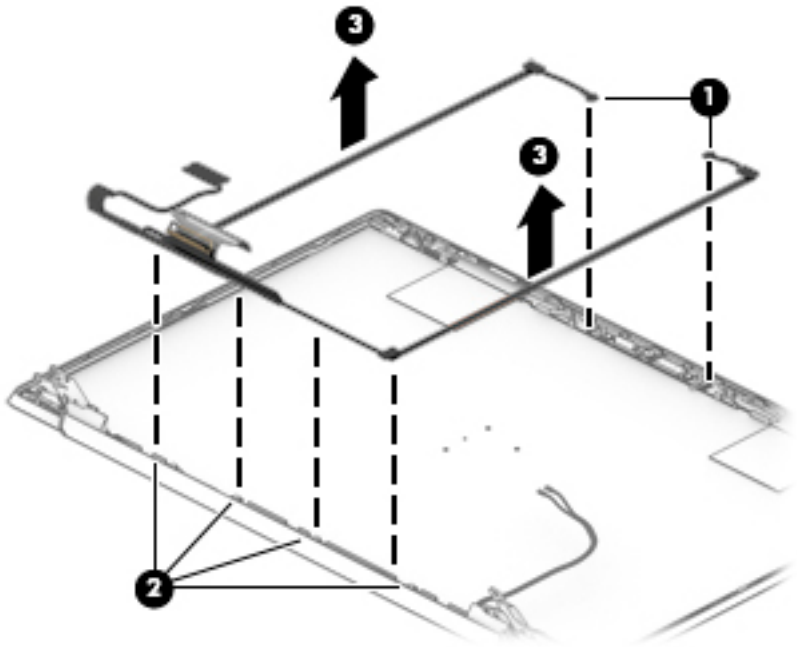
    a. Disconnect the cable from the camera module **(1)**.

    NOTE: Cables connect to both sides of IR cameras. A single cable connects to only one side of HD cameras.

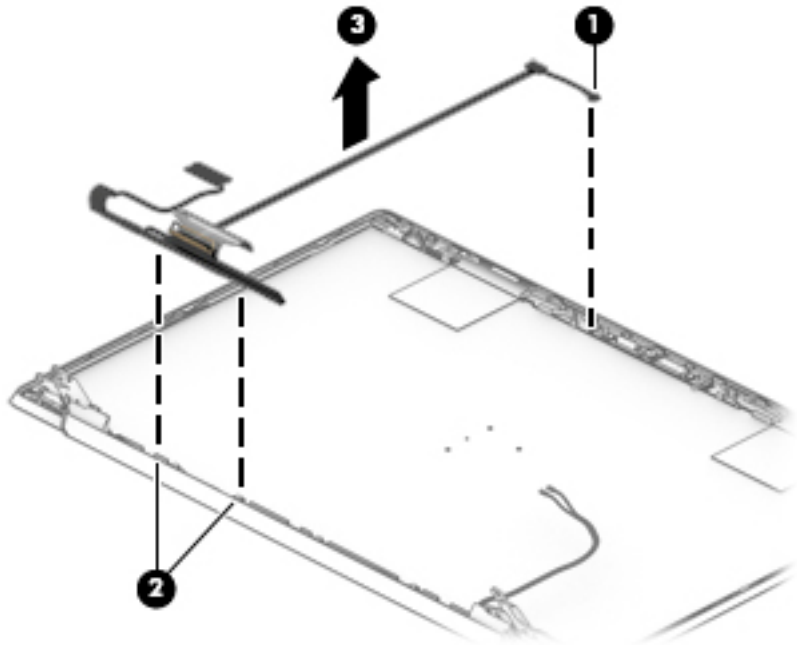
    b. Release the cable from the retention clips **(2)** and routing channel built into the bottom edge of the display back cover.

    c. Remove the display panel cable **(3)**.

    Models with an IR camera



d. Models with an HD camera



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

L23903-001 – non-touch display assembly and an HD camera

L23904-001 – non-touch display assembly and an infrared camera

L23905-001 – touch display assembly and an HD camera

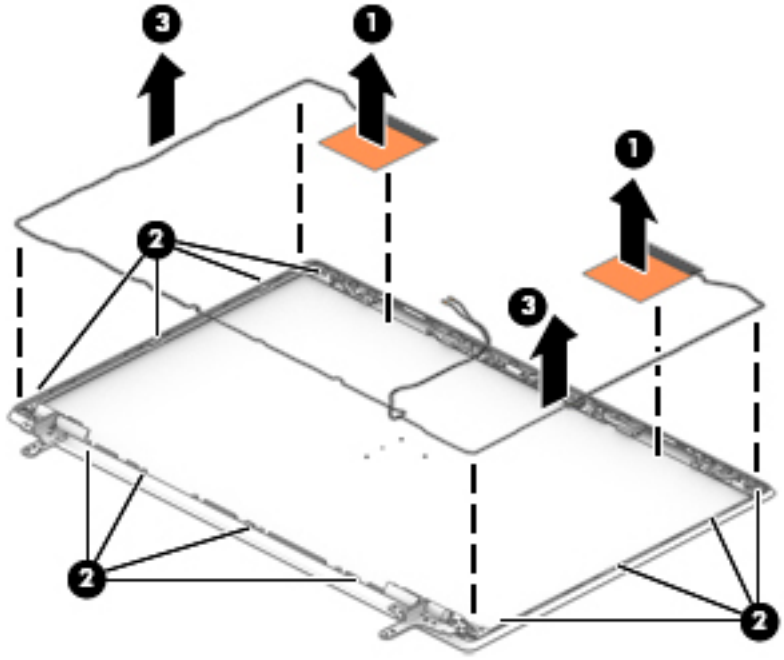
L23906-001 – touch display assembly and an infrared camera

14. If it is necessary to remove the wireless antenna cables and transceivers:

    a. Detach the wireless antenna transceivers **(1)** from the display back cover. The wireless antenna transceivers are attached to with double-sided adhesive.

    b. Release the wireless antenna cables from the retention clips **(2)** and routing channels built into the sides of the display back cover.

c. Remove the antennas from the display back cover **(3)**.



The wireless antenna cables and transceivers are available using spare part number L24790-001.

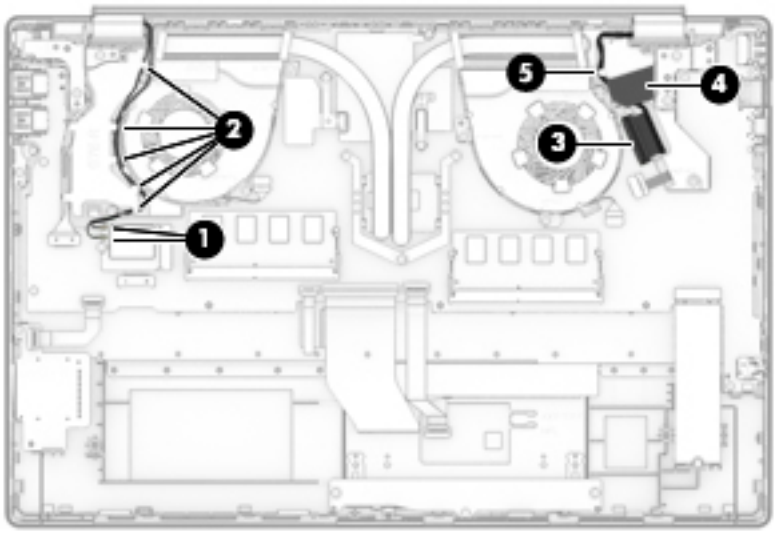
Remove the display assembly on models equipped with GTX graphics:

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

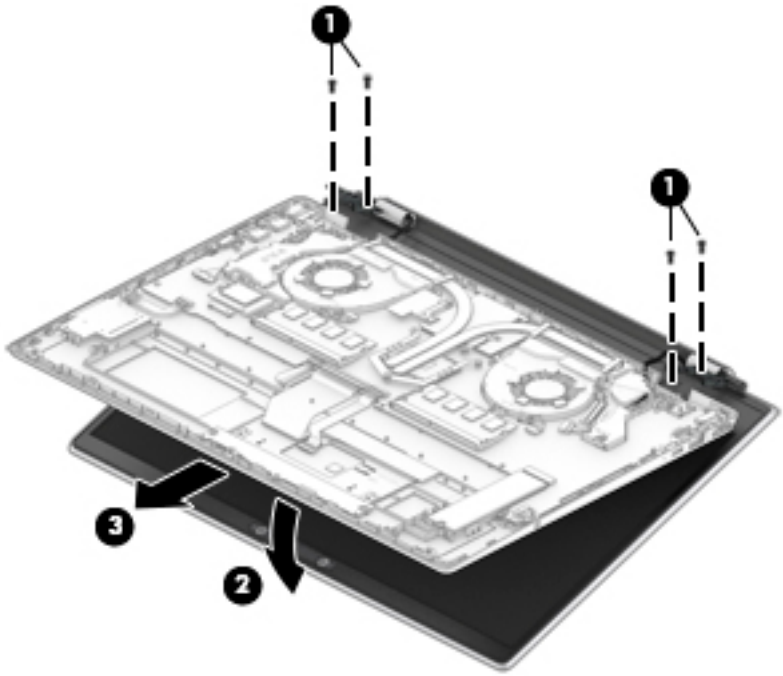
NOTE: The WLAN antenna cable labeled "1/MAIN" connects to the WLAN module "Main" terminal. The WLAN antenna cable labeled "2/AUX" connects to the WLAN module "Aux" terminal.

2. Release the WLAN antenna cables from the retention clips and routing channel built into the right speaker **(2)**.
3. Disconnect the display cable from the system board ZIF connector **(3)**.
4. Remove the left speaker **(4)**.

5. Release the display panel from the retention clips and routing channel built into the left speaker **(5)**.



6. Remove the four Phillips M2.5 × 6.0 screws **(1)** that secure the display assembly to the computer.
7. Open the display to open the hinges **(2)**.
8. Separate the display from the computer **(3)**.



NOTE: If it is necessary to replace the display bezel or any of the display assembly subcomponents, please see the instructions above.

Reverse this procedure to reassemble and install the display assembly.

Hard drive

NOTE: The hard drive spare part kit does not include the hard drive brackets or the hard drive cable. The hard drive brackets are available using spare part number L19469-001. The hard drive cable is available using spare part number L23889-001

Table 5-3 Hard drive description and part number

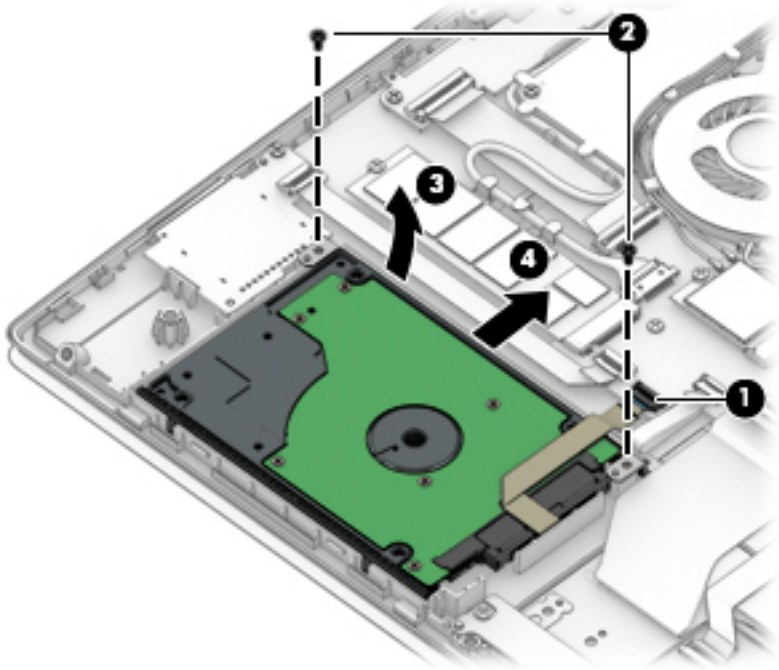
Description	Spare part number
2 TB, 5400 rpm	912487-855
1 TB, 5400 rpm	762990-005
500 GB, 5400 rpm	778186-005

Before removing the hard drive, follow these steps:

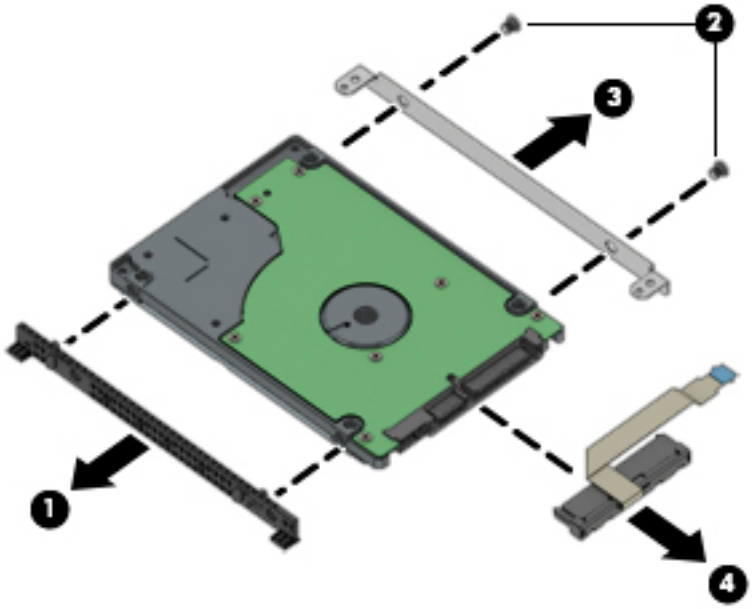
1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the hard drive:

1. Disconnect the hard drive cable from the ZIF connector on the system board **(1)**.
2. Remove the two Phillips M2.0 × 4.0 screws **(2)** that secure the hard drive to the computer.
3. Lift the inside of the hard drive up **(3)**, and then remove the hard drive from the computer **(4)**.



4. If it is necessary to disassemble the hard drive, pull the rubber bracket away from the hard drive **(1)**, remove the two Phillips M3.0 × 3.0 screws **(2)**, remove the metal bracket **(3)**, and then disconnect the hard drive cable **(4)**.



Reverse this procedure to reassemble and install the hard drive.

WLAN module

Table 5-4 WLAN module description and part number

Description	Spare part number
Intel Dual Band Wireless-AC 7265 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (non-vPro)	901229-855
Intel Dual Band Wireless-AC 3168 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (non-vPro)	863934-855
Realtek RTL8822BE 802.11ac 2 × 2 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported)	924813-855
Realtek RTL8821CE 802.11ac 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter (MU-MIMO supported)	L17365-005
Realtek RTL8723DE-CG 802.11bgn 1 × 1 Wi-Fi + Bluetooth 4.2 Combo Adapter	L21480-005
Intel Dual Band Wireless-AC + Bluetooth 5 Combo Adapter (non-vPro)	L22634-005
Intel Dual Band Wireless-AC 9461 802.11ac 1 × 1 Wi-Fi + Bluetooth 5 Combo Adapter (non-vPro)	L25889-005

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

Before removing the WLAN module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the WLAN module:

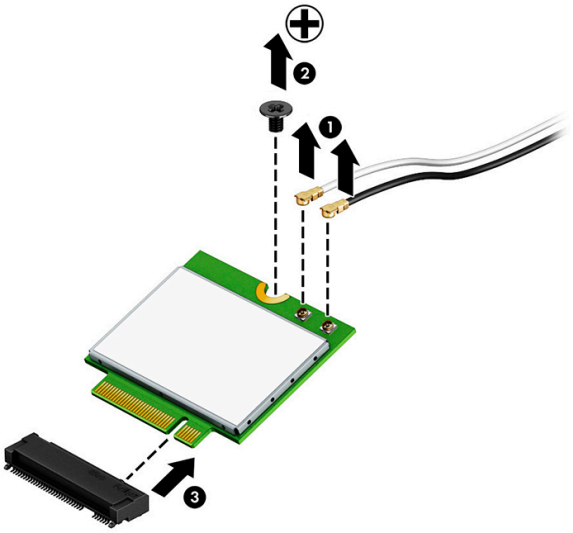
1. Disconnect the WLAN antenna cables **(1)** from the terminals on the WLAN module.

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

2. Remove the Phillips M2.0 × 3.0 screw **(2)** that secures the WLAN module to the computer. (The WLAN module tilts up.)

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

NOTE: The WLAN module is designed with a notch to prevent incorrect insertion.



Reverse this procedure to install the WLAN module.

Solid-state drive

Table 5-5 Solid-state drive description and part number

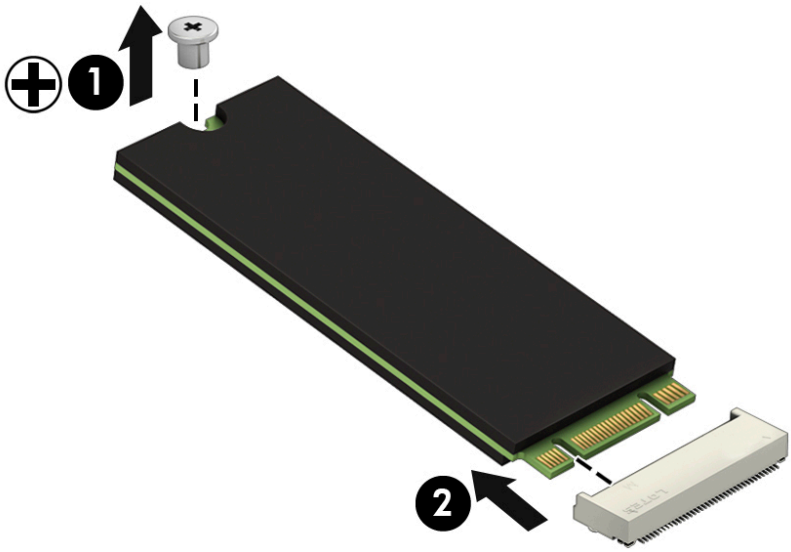
Description	Spare part number
512 GB, PCIe	L25329-001
512 GB, PCIe, TLC	L56705-001
256 GB, SATA-3, TLC	L25327-001
256 GB, PCIe	L25328-001
128 GB, SATA-3, TLC	L25326-001

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the solid-state drive module:

1. Remove the Phillips M2.0 × 3.0 screw **(1)** that secures the drive to the computer.
2. Remove the drive **(2)** by pulling it away from the socket.



Reverse this procedure to reassemble and install the solid-state drive.

Optane memory module

IMPORTANT: The M.2 connector that supports the Optane memory module can also support a solid-state drive. You cannot simultaneously install both an Optane memory module and a solid-state drive in the computer.

Table 5-6 Optane memory module description and part number

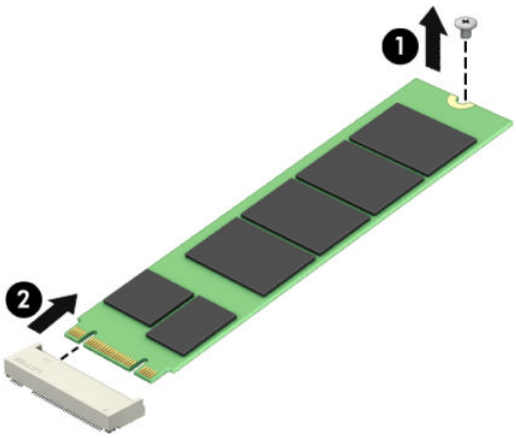
Description	Spare part number
Optane memory module, 16 GB	L27309-001

Before removing the Optane memory module, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the Optane memory module:

- Remove the Phillips M2.0 × 3.0 screw **(1)**, and then pull the module from the socket **(2)**.



Reverse this procedure to install the Optane memory module.

Memory module

NOTE: Primary and expansion memory is installed in a side-by-side configuration in the bottom of the computer. If only one memory module is installed, it must be installed in the socket labeled 1.

Table 5-7 Memory module description and part number

Description	Spare part number
8 GB, DDR4-2400, 1.2-V	862398-855
4 GB, DDR4-2400, 1.2-V	862397-855
2 GB, DDR4-2400, 1.2-V	864271-855

Before removing the memory module, follow these steps:

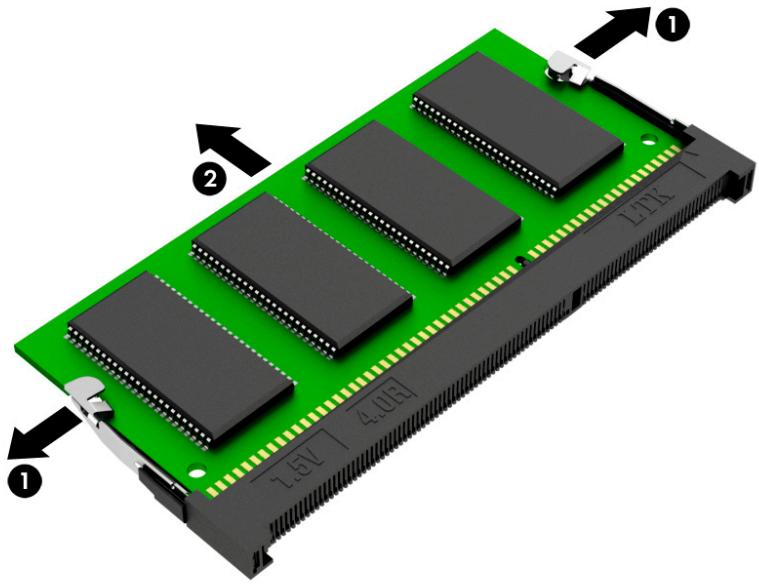
1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the memory module:

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

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

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



To protect a memory module after removal, place it in an electrostatic-safe container.

Reverse this procedure to install a memory module.

Memory card reader board

Table 5-8 Memory card reader board description and part number

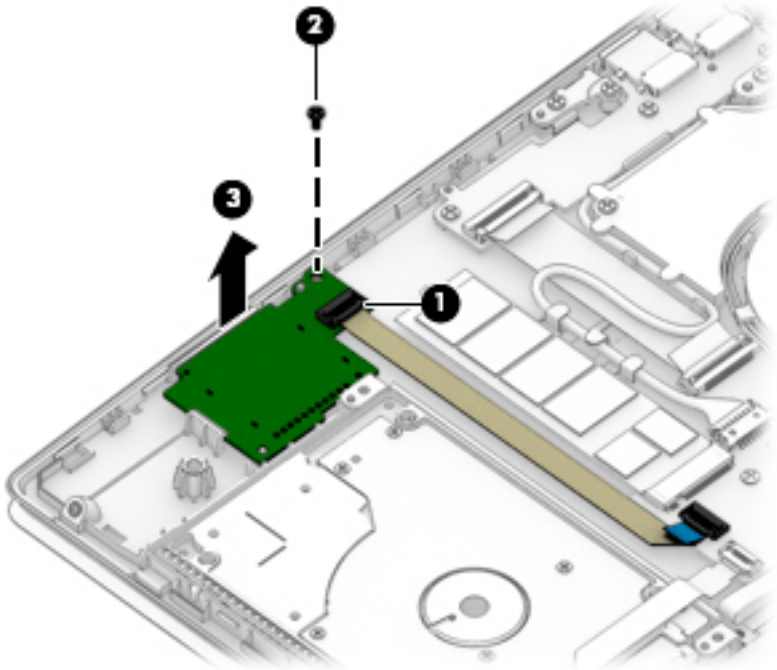
Description	Spare part number
Memory card reader board	L23890-001
Memory card reader board cable	L23891-001
Memory card reader board cable on models equipped with GTX graphics	L41586-001

Before removing the memory card reader board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the memory card reader board:

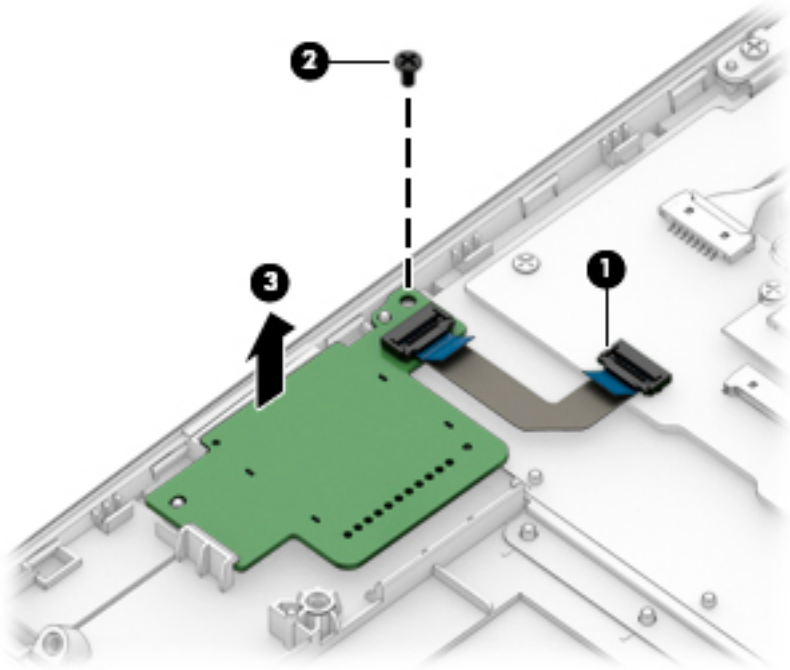
1. Disconnect the cable from the ZIF connector on the memory card reader board **(1)**.
2. Remove the Phillips M2.0 × 4.0 screw **(2)** that secures the board to the computer.
3. Remove the board from the computer **(3)**.



Remove the memory card reader board on models equipped with GTX graphics:

1. Disconnect the cable from the ZIF connector on the memory card reader board **(1)**.
2. Remove the Phillips M2.0 × 4.0 screw **(2)** that secures the board to the computer.

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



Reverse this procedure to install the memory card reader board.

USB board (select products only)

Table 5-9 USB board description and part number

Description	Spare part number
USB board	L23896-001
USB board cable	L23901-001

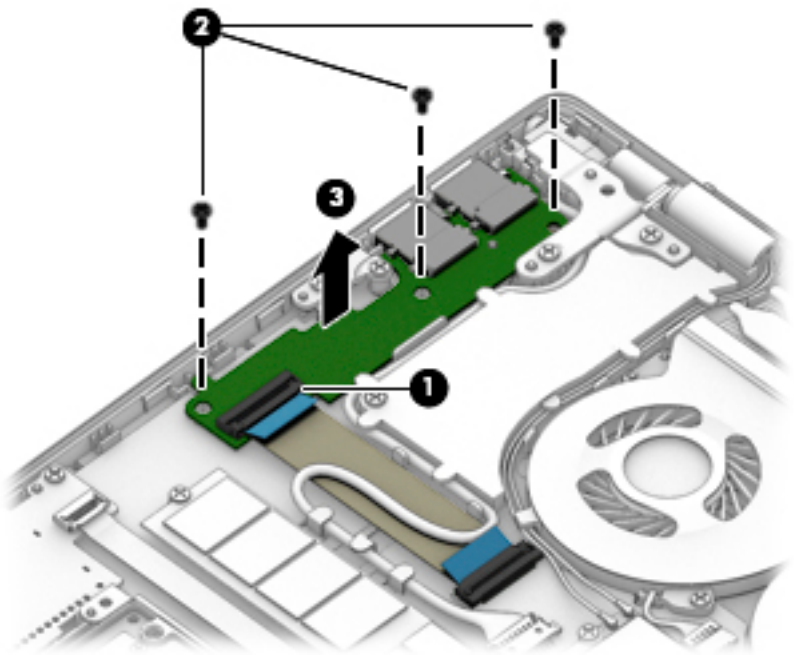
NOTE: On models equipped with GTX graphics, the USB board is soldered on to the system board, and cannot be removed.

Before removing the USB board, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the USB board:

1. Disconnect the cable from the ZIF connector on the USB board **(1)**.
2. Remove the three Phillips M2.0 × 4.0 screws **(2)** that secure the board to the computer.
3. Remove the board from the computer **(3)**.



Reverse this procedure to install the USB board.

TouchPad

Table 5-10 TouchPad description and part number

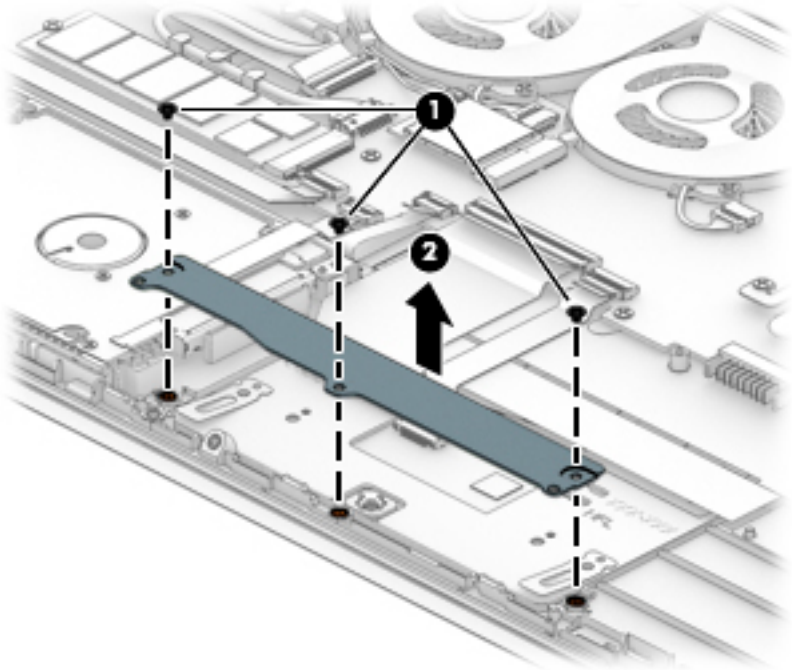
Description	Spare part number
TouchPad for use in natural silver models	L24934-001
TouchPad for use in pale gold models	L24933-001
TouchPad for use in fog blue models	L51805-001
TouchPad for use in warm gold models	L51806-001
TouchPad cable	L23893-001
TouchPad bracket	L23892-001

Before removing the TouchPad, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

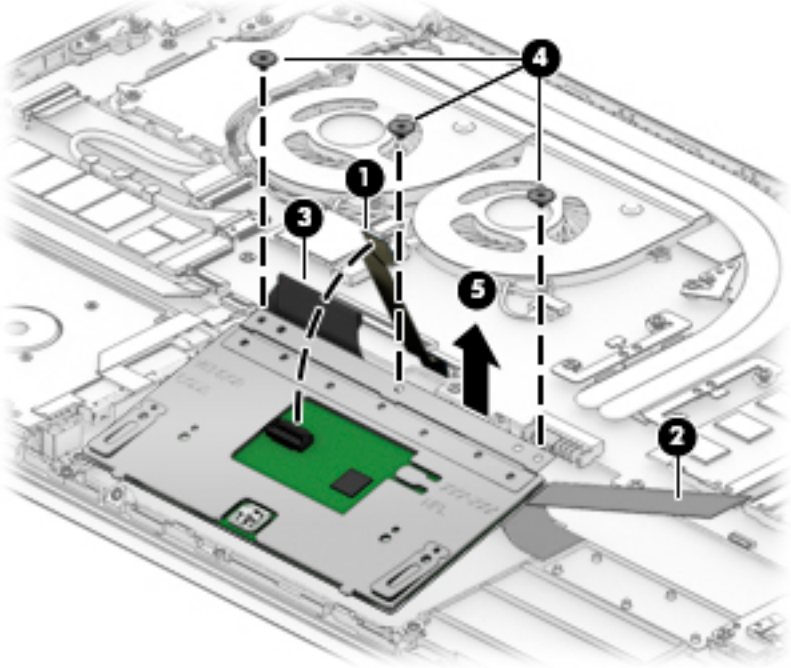
Remove the TouchPad:

1. Remove the three Phillips M2.0 × 2.5 screws **(1)** that secure the TouchPad bracket to the computer.
2. Remove the bracket **(2)** .



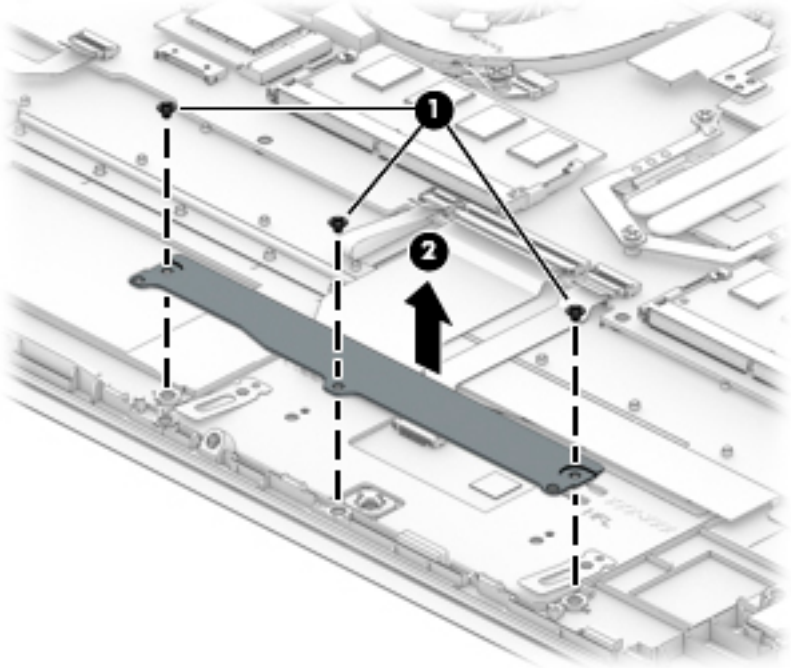
3. Disconnect the cable from the ZIF connector on the TouchPad **(1)**.
4. Lift the clear plastic from on top of the screws **(2)**.
5. Lift the keyboard cable up so you can access the TouchPad screws **(3)**.

6. Remove the three Phillips M2.0 × 2.0 broadhead screws **(4)** that secure the TouchPad to the computer.
7. Remove the TouchPad from the computer **(5)**.



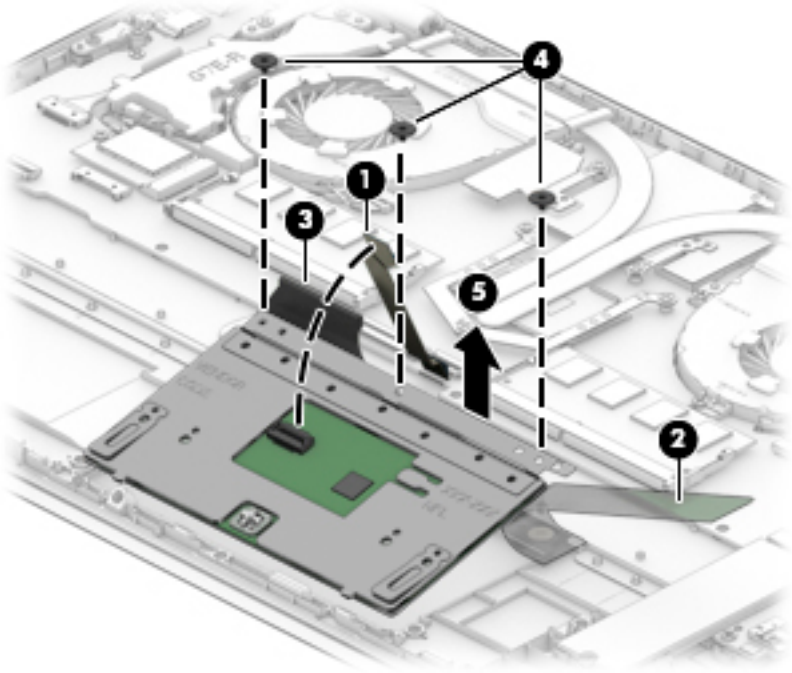
Remove the TouchPad on models equipped with GTX graphics:

1. Remove the three Phillips M2.0 × 2.5 screws **(1)** that secure the TouchPad bracket to the computer.
2. Remove the bracket **(2)**.



3. Disconnect the cable from the ZIF connector on the TouchPad **(1)**.
4. Lift the clear plastic from on top of the screws **(2)**.

5. Lift the keyboard cable up so you can access the TouchPad screws **(3)**.
6. Remove the three Phillips M2.0 × 2.0 broadhead screws **(4)** that secure the TouchPad to the computer.
7. Remove the TouchPad from the computer **(5)**.



Reverse this procedure to install the TouchPad.

Lock bracket

Table 5-11 Lock bracket description and part number

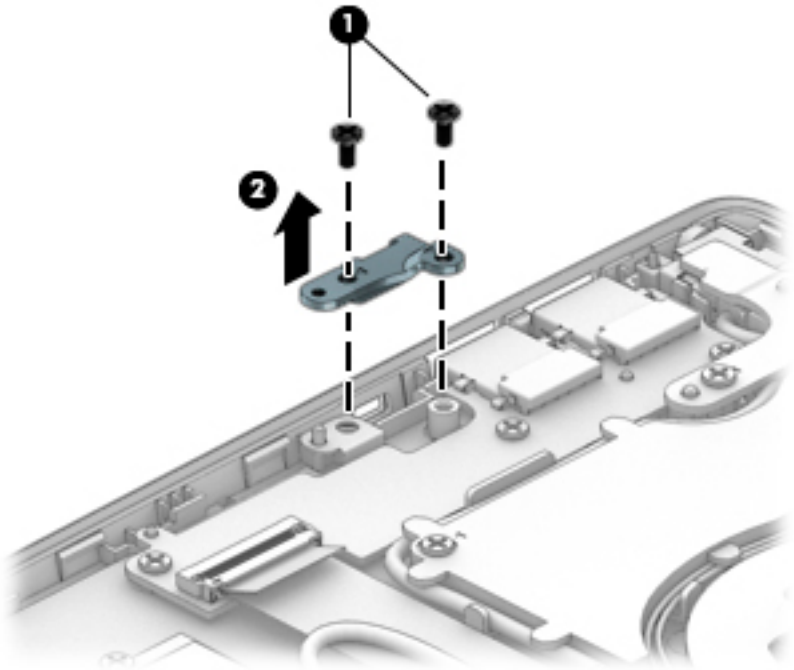
Description	Spare part number
Lock bracket	L23902-001

Before removing the lock bracket, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the lock bracket:

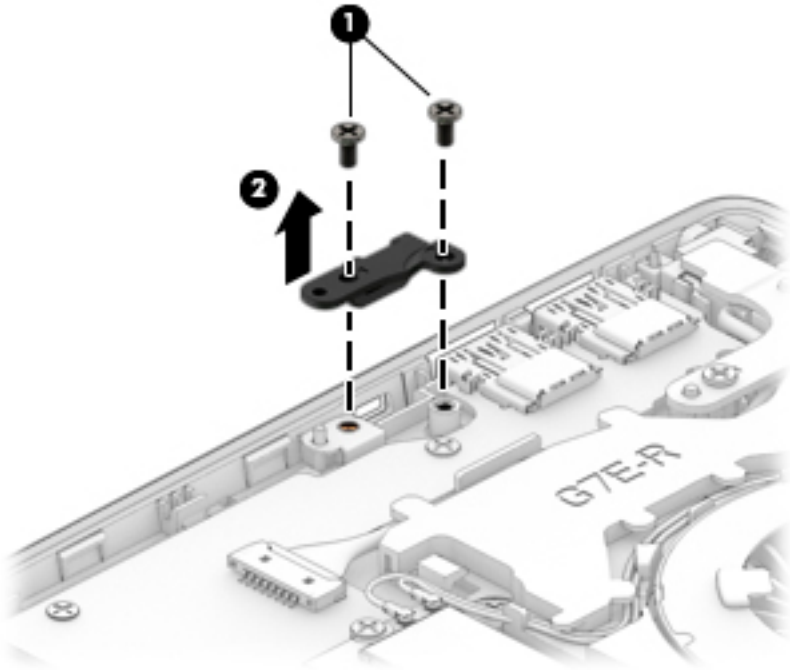
1. Remove the two Phillips M2.0 × 2.0 broadhead screws **(1)** that secure the lock bracket to the computer.
2. Remove the lock bracket from the computer **(2)**.



Remove the lock bracket on models equipped with GTX graphics:

1. Remove the two Phillips M2.0 × 2.0 broadhead screws **(1)** that secure the lock bracket to the computer.

2. Remove the lock bracket from the computer **(2)**.



Reverse this procedure to install the lock bracket.

Fan(s)

Table 5-12 Fan description and part number

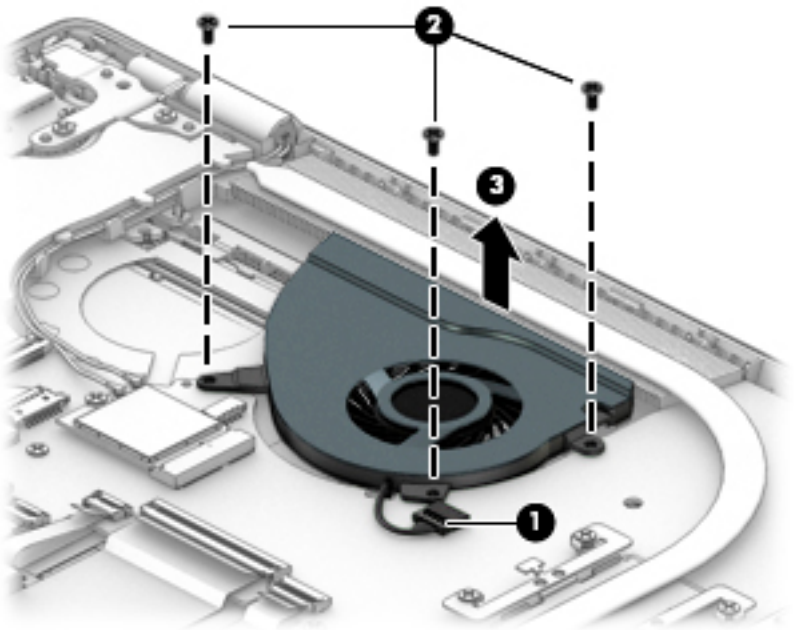
Description	Spare part number
Fans for use in models with discrete graphics memory	L23895-001
Fans for use in models with discrete graphics memory (on models equipped with GTX graphics)	L35338-001
Fan for use in models with UMA graphics memory	L27902-001

Before removing the fan(s), follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

Remove the fan in models with **UMA graphics memory**:

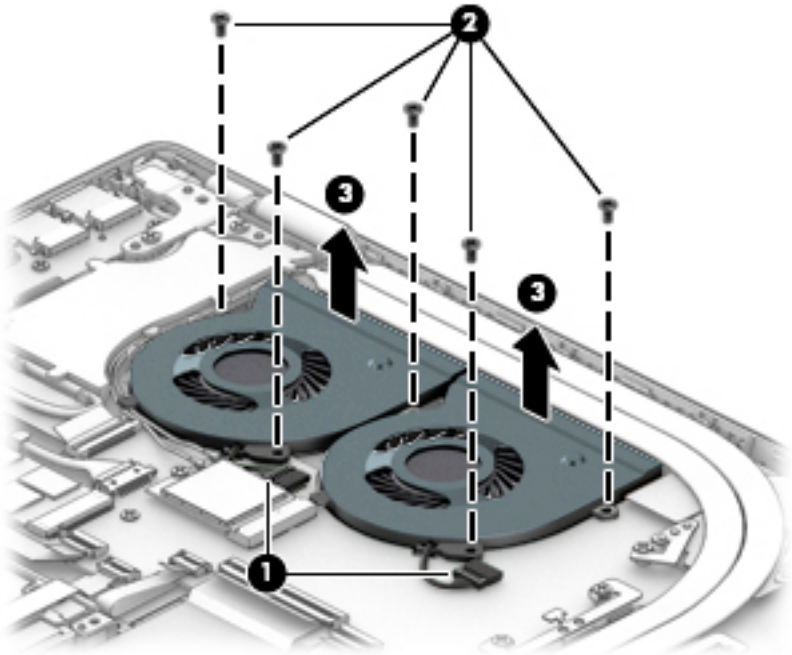
1. Disconnect the fan cable **(1)** from the system board.
2. Remove the three Phillips M2.0 × 4.0 screws **(2)** that secure the fan to the computer.
3. Remove the fan from the computer **(3)**.



Remove the fans in models with **discrete graphics memory**:

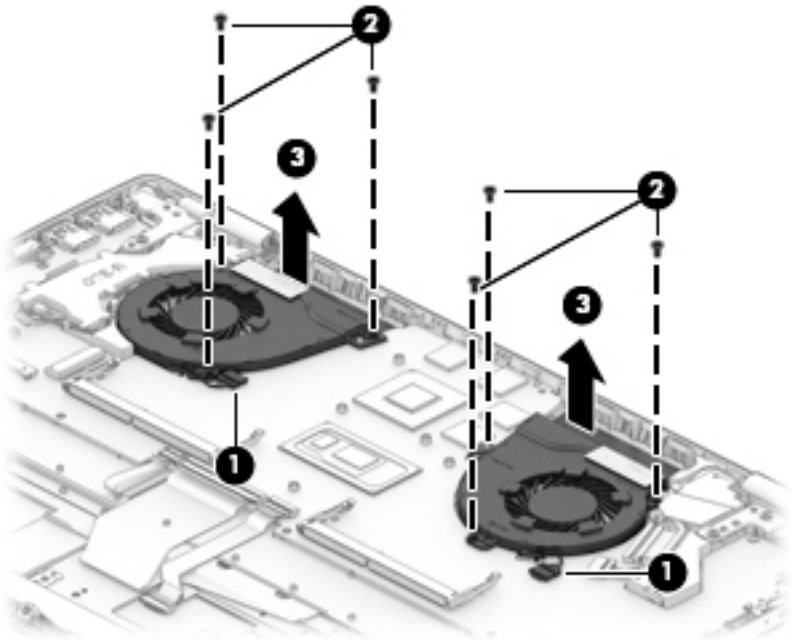
1. Disconnect the fan cables **(1)** from the system board.
2. Remove the five Phillips M2.0 × 4.0 screws **(2)** that secure the fans to the computer.

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



Remove the fans on models equipped with GTX graphics:

1. Disconnect the fan cables **(1)** from the system board.
2. Remove the six Phillips M2.0 × 4.0 screws **(2)** that secure the fans to the computer.
3. Remove the fans from the computer **(3)**.



Reverse this procedure to install the fan(s).

Heat sink

NOTE: The heat sink spare part kit includes replacement thermal material.

Table 5-13 Heat sink description and part number

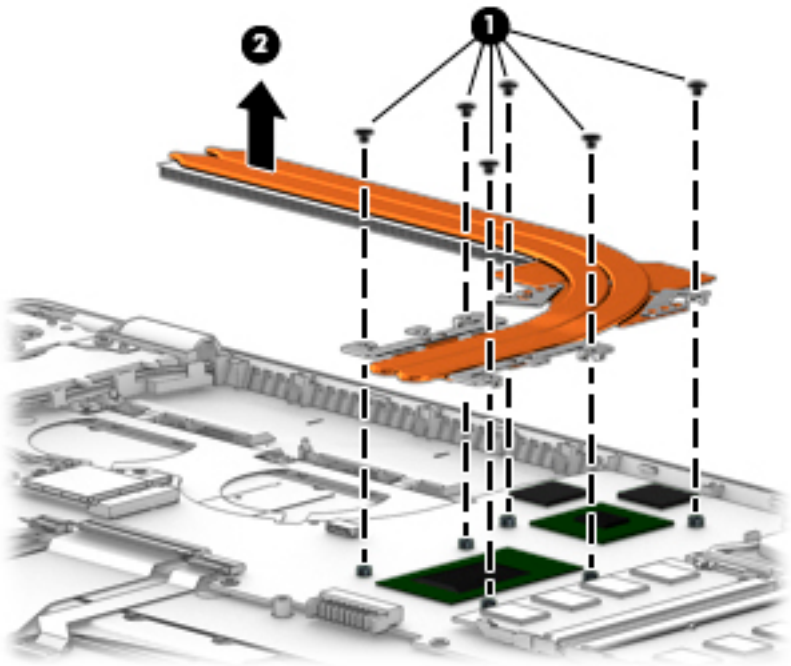
Description	Spare part number
Heat sink for use only on computer models equipped with a graphics subsystem with discrete memory	L23897-001
Heat sink for use only on computer models equipped with a graphics subsystem with discrete memory (on models equipped with GTX graphics)	L35251-001
Heat sink for use only on computer models equipped with Intel Core i7-8550U/i5-8250U processors and a graphics subsystem with UMA memory	L23898-001
Heat sink for use only on computer models equipped with Intel Core i7-7500U/Pentium 4415U processors and a graphics subsystem with UMA memory	L23899-001

Before removing the heat sink, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34).
3. Remove the battery (see Battery on page 37).

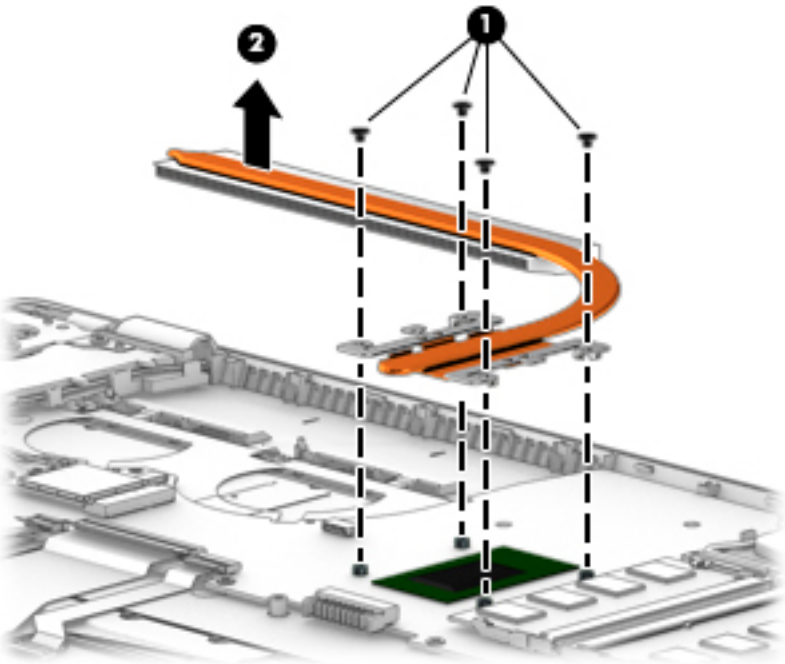
Remove the heat sink:

1. **Discrete graphics:** In the order indicated on the heat sink, remove the six Phillips M2.0 × 2.5 screws **(1)** that secure the heat sink to the system board.
2. Remove the heat sink **(2)**.



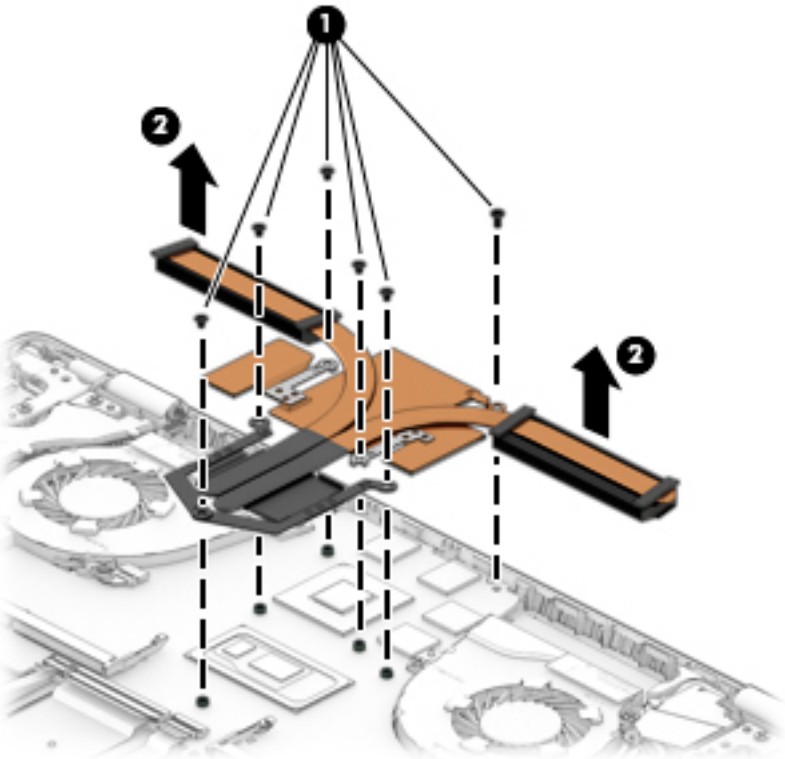
3. **UMA graphics:** In the order indicated on the heat sink, remove the four Phillips M2.0 × 2.5 screws **(1)** that secure the heat sink to the system board.

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



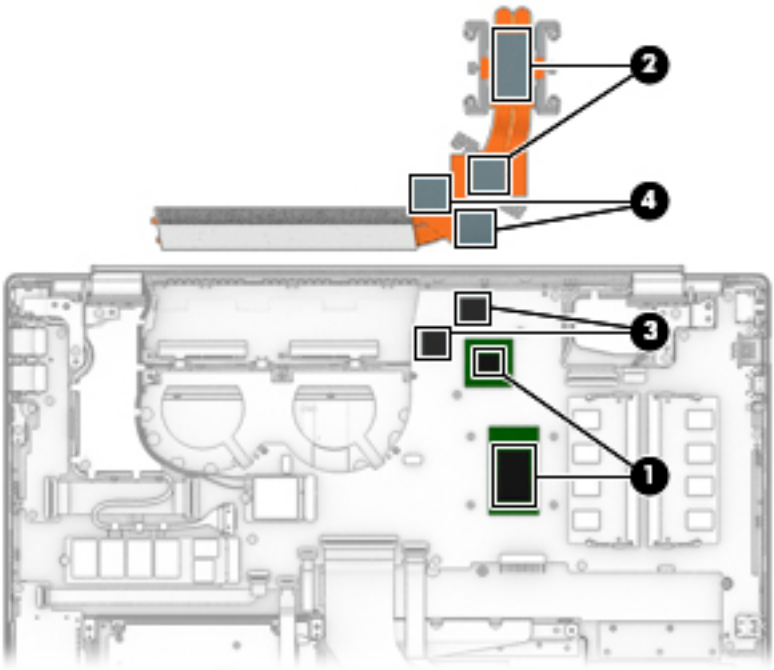
On models equipped with GTX graphics, follow these instructions to remove the heat sink:

1. In the order indicated on the heat sink, remove the six Phillips M2.0 × 2.5 screws **(1)** that secure the heat sink to the system board.
2. Remove the heat sink **(2)**.

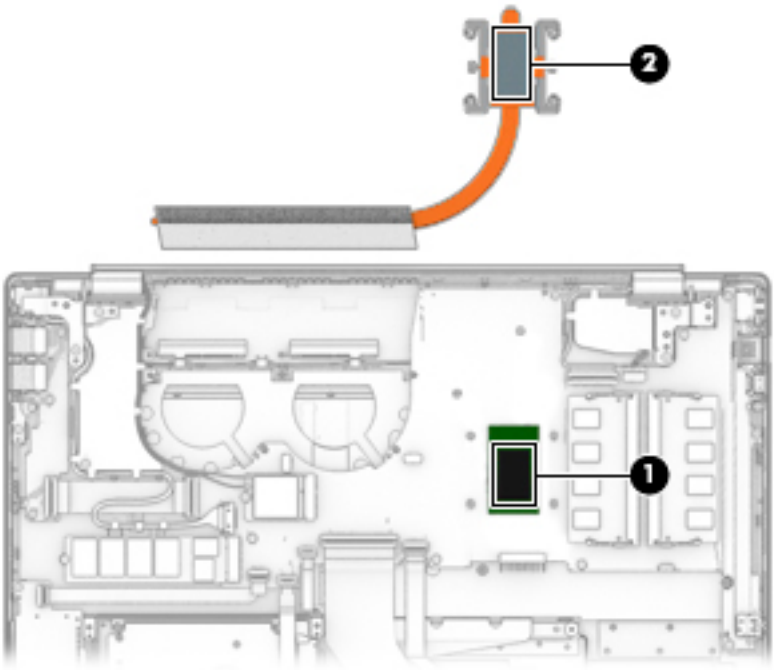


NOTE: The thermal material must be thoroughly cleaned from the surfaces of the heat sink and the system board components each time the heat sink is removed. Replacement thermal material is included with the heat sink and system board spare part kits.

Discrete memory: Thermal paste **(1), (2)**, and thermal pads, **(3), (4)**, are used on the heat sink **(2), (4)** and associated system board components **(1), (3)**.



UMA memory: Thermal paste is used on the processor **(1)** and the heat sink **(2)**.



Reverse this procedure to install the heat sink.

System board

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

Table 5-14 System board description and part number

Description	Spare part number
System board for use in models with discrete graphics equipped with the following processors:	
Intel Core i7-8565U processor and 4 GB of MX 250 discrete video memory	L50260-xx1
Intel Core i7-8565U processor and 2 GB of MX 250 discrete video memory	L50259-xx1
Intel Core i7-8565U processor and 4 GB of GTX 1050 discrete video memory	L34171-xx1
Intel Core i7-8565U processor and 4 GB of GeForce MX150 discrete video memory	L34176-xx1
Intel Core i7-8565U processor and 2 GB of GeForce MX150 discrete video memory	L34175-xx1
Intel Core i7-8565U processor with 3 GB of GTX discrete video memory	L46518-xx1
Intel Core i7-8565U processor with 4 GB of GTX 1050Ti discrete video memory	L34172-xx1
Intel Core i7-8550U processor and 4 GB of GeForce MX150 discrete video memory	L22820-xx1
Intel Core i7-8550U processor and 2 GB of GeForce MX150 discrete video memory	L22817-xx1
Intel Core i7-8550U processor and 2 GB GeForce MX130 discrete video memory	L22814-xx1
Intel Core i5-8265U processor and 2 GB of GeForce MX250 discrete video memory	L50258-xx1
Intel Core i5-8265U processor and 2 GB of GTX 1050 discrete video memory	L34170-xx1
Intel Core i5-8265U processor and 2 GB of GeForce MX130 discrete video memory	L34173-xx1
Intel Core i5-8265U processor and 2 GB of GeForce MX150 discrete video memory	L34174-xx1
Intel Core i5-8265U processor with 4 GB of GTX 1050Ti discrete video memory	L44879-xx1
Intel Core i5-8265U processor with GTX and 3 GB of GeForce MX150 discrete video memory	L52957-xx1
Intel Core i5-8250U processor and 4 GB of GeForce MX150 discrete video memory	L22818-xx1
Intel Core i5-8250U processor and 2 GB of GeForce MX150 discrete video memory	L22815-xx1
Intel Core i5-8250U processor and 2 GB of GeForce MX130 discrete video memory	L22813-xx1
Intel Core i7-7500U processor and 4 GB of GeForce MX150 discrete video memory	L22819-xx1
Intel Core i7-7500U processor and 2 GB of GeForce MX150 discrete video memory	L22816-xx1
Intel Core i3-8130U processor and 2 GB of GeForce MX150 discrete video memory	L37245-xx1
System board for use in models with UMA graphics equipped with the following processors:	
Intel Core i7-8565U processor	L50262-xx1
Intel Core i7-8550U processor	L22822-xx1
Intel Core i5-8250U processor	L22821-xx1
Intel Core i3-8145U processor	L50261-xx1
Intel Core i3-8130U processor	L22824-xx1
Intel Core i5-8265U processor	L34169-xx1
Intel Pentium 4415U processor	L22823-xx1

Before removing the system board, follow these steps:

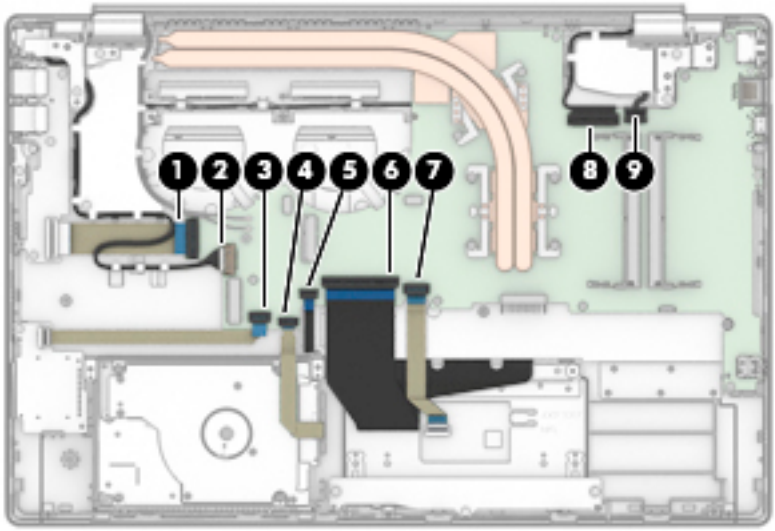
1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34), and then remove the following components:
   a. Battery (see Battery on page 37)
   b. Solid-state drive (see Solid-state drive on page 54) or Optane memory module (Optane memory module on page 55)
   c. Fan(s) (see Fan(s) on page 65)

When replacing the system board, be sure to remove the following components from the defective system board and install them on the replacement system board:

- WLAN module (see WLAN module on page 52)
- Memory modules (see Memory module on page 56)
- Heat sink (see Heat sink on page 67)

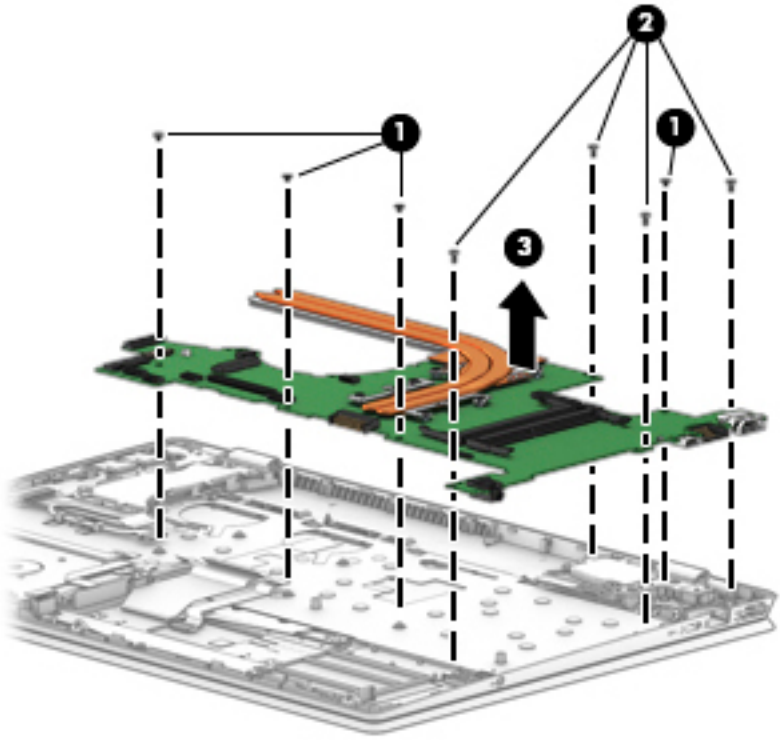
Remove the system board:

1. Disconnect the following cables:
   (1) USB board cable
   (2) Power connector cable
   (3) Memory card reader board cable
   (4) Hard drive connector cable
   (5) Backlight cable (select products only)
   (6) Keyboard cable
   (7) TouchPad cable
   (8) Display cable
   (9) Speaker cable



2. Remove the four Phillips M2.0 × 2.0 screws **(1)** that secure the system board to the computer.

3. Remove the four Phillips M2.0 × 4.0 screws **(2)** that secure the system board to the computer.
4. Lift the system board out of the computer **(3)**.



Removing the system board on models equipped with GTX graphics:

1. Disconnect the following cables:

   (1) Power connector cable

   (2) Memory card reader board cable

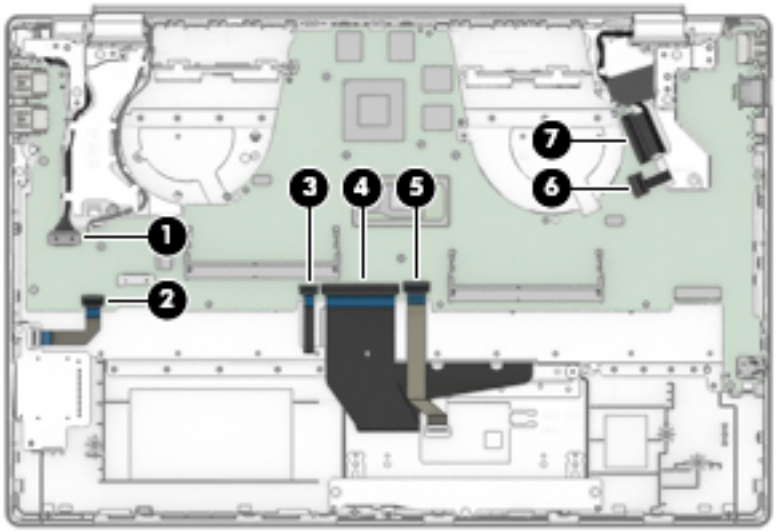
   (3) Backlight cable

   (4) Keyboard cable

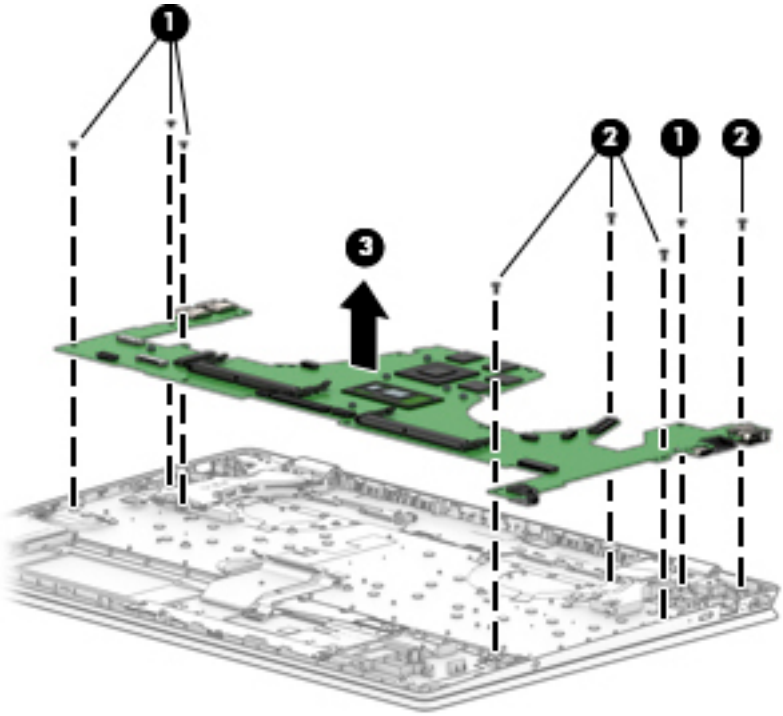
   (5) TouchPad cable

   (6) Speaker cable

   (7) Display cable



2. Remove the four Phillips M2.0 × 2.0 screws **(1)** that secure the system board to the computer.
3. Remove the four Phillips M2.0 × 4.0 screws **(2)** that secure the system board to the computer.
4. Lift the system board out of the computer **(3)**.



Reverse this procedure to install the system board.

Speakers

Table 5-15 Speaker description and part number

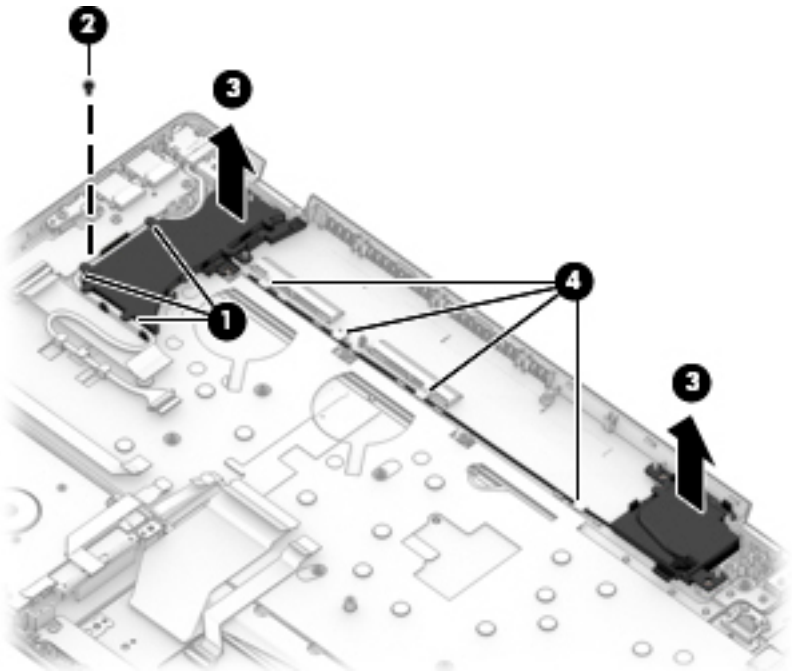
Description	Spare part number
Speakers (includes cable)	L23900-001
Speakers (on models equipped with GTX graphics) (includes cable)	L41588-001

Before removing the speakers, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34), and then remove the following components:
   a. Battery (see Battery on page 37)
   b. Solid-state drive (see Solid-state drive on page 54)
   c. Fan (see Fan(s) on page 65)
   d. System board (see System board on page 70)

Remove the speakers:

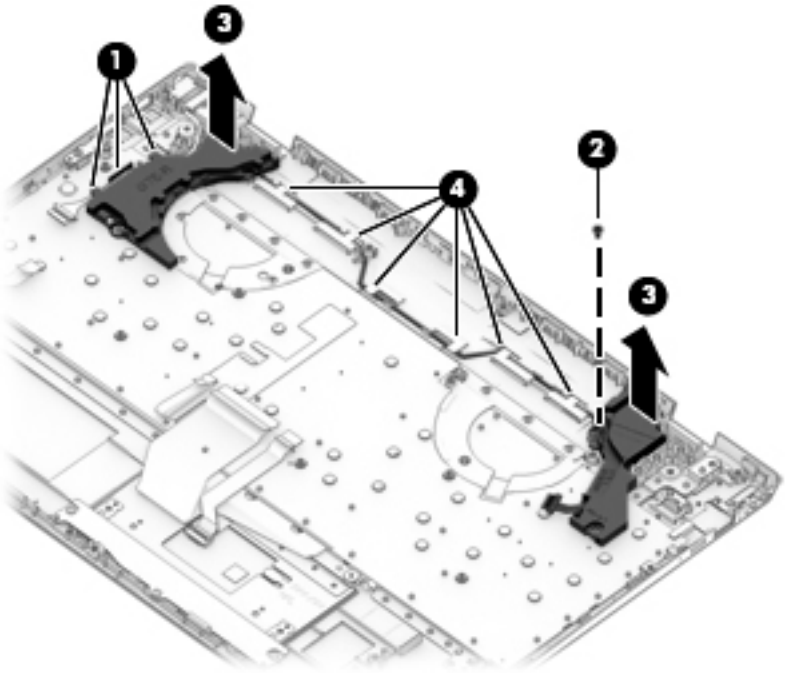
1. Release the cable from the retention clips and routing channel built into the right speaker **(1)**.
2. Remove the Phillips M2.0 × 4.0 screw **(2)** that secures the right speaker to the computer.
3. Lift the speakers up **(3)**.
4. Release the speaker cable from the retention clips and routing channel built into the computer **(4)**.



On models equipped with GTX graphics, follow these steps:

1. Release the cable from the retention clips and routing channel built into the right speaker **(1)**.
2. Remove the Phillips M2.0 × 4.0 screw **(2)** that secures the right speaker to the computer.

3. Lift the speakers up **(3)**.
4. Release the speaker cable from the retention clips and routing channel built into the computer **(4)**.



Reverse this procedure to install the speakers.

Power connector cable

Table 5-16 Power connector cable description and part number

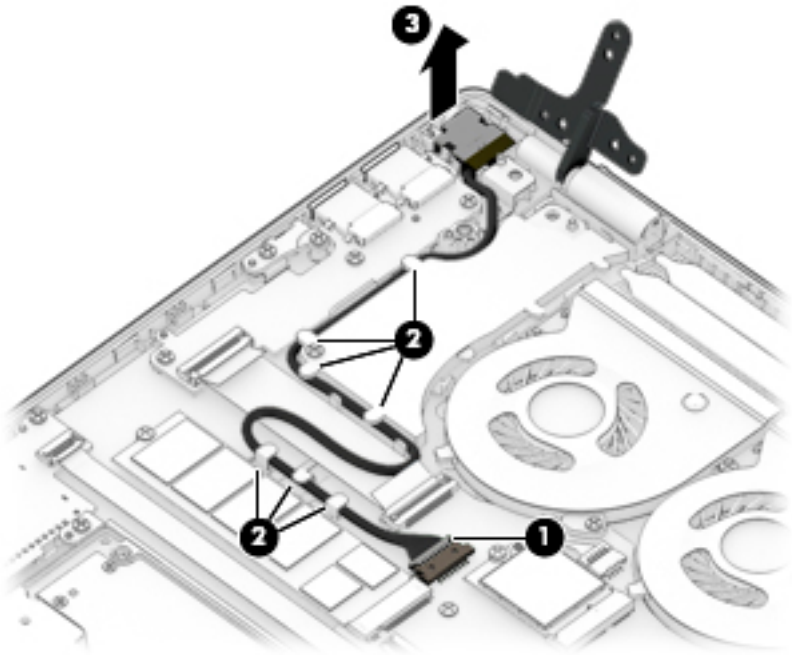
Description	Spare part number
Power connector cable	810327-006
Power connector cable EMI tape	L28015-001

Before removing the power connector cable, follow these steps:

1. Prepare the computer for disassembly (Preparation for disassembly on page 34).
2. Remove the bottom cover (see Bottom cover on page 34), and then remove the following components:
   a. Battery (see Battery on page 37)
   b. Display assembly (see Display assembly on page 39)

Remove the power connector cable:

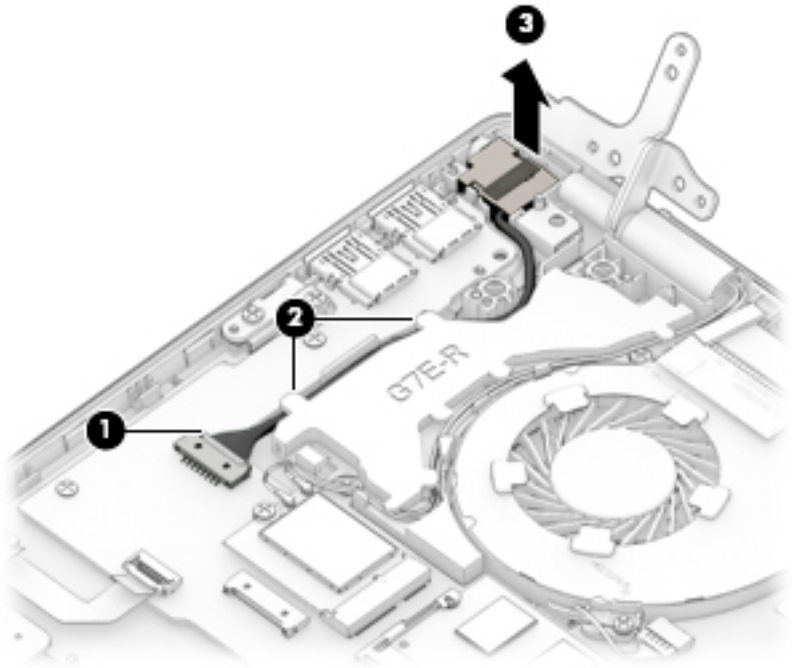
1. Make sure the left display hinge is in the open position.
2. Disconnect the power connector cable from the system board **(1)**.
3. Release the cable from the retention clips and routing channel built into the computer and speaker **(2)**.
4. Remove the power connector cable from the computer **(3)**.



Remove the power connector cable on models equipped with GTX graphics:

1. Make sure the left display hinge is in the open position.
2. Disconnect the power connector cable from the system board **(1)**.
3. Release the cable from the retention clips and routing channel built into the computer and speaker **(2)**.

4. Remove the power connector cable from the computer **(3)**.



Reverse this procedure to install the power connector cable.

Top cover with keyboard

The top cover with keyboard remains after removing all other spared parts from the computer.

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

Table 5-17 Top cover with keyboard description and part number

Description	Spare part number
Keyboard, backlit, natural silver	L24752-xx1
Keyboard, no backlight, natural silver	L24753-xx1
Keyboard, backlit, pale gold	L24755-xx1
Keyboard, no backlight, pale gold	L24754-xx1
Keyboard, backlit, natural silver (models with GTX graphics)	L35339-xx1
Keyboard, no backlight, natural silver (models with GTX graphics)	L35340-xx1
Keyboard, backlight, cloud blue	L49391-xx1
Keyboard, no backlight, cloud blue	L49392-xx1
Keyboard, backlight, luminous gold	L49393-xx1
Keyboard, no backlight, luminous gold	L49394-xx1

Table 5-18 Keyboard country codes

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	Israel	-BB1	Slovenia	-BA1
Bulgaria	-261	Italy	-061	South Korea	-AD1
Canada	-DB1	Japan	-291	Spain	-071
Czech Republic and Slovakia	-FL1	Latin America	-161	Switzerland	-BG1
Denmark, Finland, and Norway	-DH1	The Netherlands	-B31	Taiwan	-AB1
France	-051	Portugal	-131	Thailand	-281
Germany	-041	Romania	-271	Turkey	-141
Greece	-151	Russia	-251	United Kingdom	-031
Hungary	-211	Saudi Arabia	-171	United States	-001
India	-002				

6 Using Setup Utility (BIOS)

Setup Utility, 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). Setup Utility (BIOS) includes settings for the types of devices installed, the startup sequence of the computer, and the amount of system and extended memory.

NOTE: To start Setup Utility on convertible computers, your computer must be in notebook mode and you must use the keyboard attached to your notebook.

Starting Setup Utility (BIOS)

CAUTION: Use extreme care when making changes in Setup Utility (BIOS). Errors can prevent the computer from operating properly.

▲ Turn on or restart the computer and quickly press f10.

– or –

Turn on or restart the computer, quickly press esc, and then press f10 when the Start menu is displayed.

Updating Setup Utility (BIOS)

Updated versions of Setup Utility (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 Setup Utility (BIOS), first determine the BIOS version on your computer.

To reveal the BIOS version information (also known as *ROM date* and *System BIOS*), use one of these options.

- HP Support Assistant
  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 **My notebook**, and then select **Specifications**.
- Setup Utility (BIOS)
  1. Start Setup Utility (BIOS) (see Starting Setup Utility (BIOS) on page 79).
  2. Select **Main**, and then make note of the BIOS version.
  3. Select **Exit**, select one of the options, and then follow the on-screen instructions.
- In Windows, press CTRL+Alt+S.

To check for later BIOS versions, see Downloading a BIOS update on page 80.

Downloading a BIOS update

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

- Do not disconnect power from the computer by unplugging the power cord from the AC outlet.
- Do not shut down the computer or initiate Sleep.
- Do not insert, remove, connect, or disconnect any device, cable, or cord.

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

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. If the update is more recent than your BIOS version, 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.

BIOS installation procedures vary. Follow any instructions that appear on the screen after the download is complete. If no instructions appear, 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.

7 Using HP PC Hardware Diagnostics

Using HP PC Hardware Diagnostics Windows (select products only)

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 81.

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**.

When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. The screen displays one of the following options:

- A Failure ID link is displayed. Select the link and follow the on-screen instructions.
- A Quick Response (QR) code is displayed. With a mobile device, scan the code and then follow the on-screen instructions.
- Instructions for calling support are displayed. Follow those instructions.

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. Select **Download HP Diagnostics Windows**, and then select a location on your computer or a USB flash drive.

The tool is downloaded to the selected location.

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, follow these steps:

1. Go to http://www.hp.com/support.
2. Select **Get software and drivers**, select your type of product, and then enter the product name or number in the search box that is displayed.
3. In the **Diagnostics** section, select **Download**, and then follow the on-screen instructions to select the specific Windows diagnostics version to be downloaded to your computer or USB flash drive.

The tool is downloaded to the selected location.

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 USB 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

NOTE: For Windows 10 S computers, you must use a Windows computer and a USB flash drive to download and create the HP UEFI support environment because only .exe files are provided. For more information, see Downloading HP PC Hardware Diagnostics UEFI to a USB flash drive on page 83.

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 Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated. For assistance in solving the problem:

- Select **Get Support**, and then use a mobile device to scan the QR code that displays on the next screen. The HP Customer Support - Service Center page displays, with your Failure ID and product number automatically filled in. Follow the on-screen instructions.

  – or –

  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 83.

   b. Hard drive

   c. BIOS
3. When the diagnostic tool opens, select a language, 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. Select **Download HP Diagnostics UEFI**, 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 about 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. 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**, select your type of product, enter the product name or number in the search box that is displayed, 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 86).
- **Creating a restore point**—You can use Windows tools to create a restore point (see Using Windows tools on page 86).
- **Creating recovery media** (select products only)—You can use the HP Cloud Recovery Download Tool (select products only) to create recovery media (see Using the HP Cloud Recovery Download Tool to create recovery media (select products only) on page 86).
- **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 86).

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

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

Backing up information and creating recovery media

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.

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.

1. Select the **Start** button, and then select the **Get Help** app.
2. Enter the task you want to perform.

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

Using the HP Cloud Recovery Download Tool to create recovery media (select products only)

You can use the HP Cloud Recovery Download Tool to create HP Recovery media on a bootable USB flash drive.

To download the tool:

▲ Go to the Microsoft Store and search for HP Cloud Recovery.

For details, go to http://www.hp.com/support, search for HP Cloud Recovery, and then select "HP PCs – Using the Cloud Recovery Tool (Windows 10, 7)."

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.

Restoring and recovery

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 86.

Recovering using HP Recovery media

HP Recovery media is used to recover the original operating system and software programs that were installed at the factory. On select products, it can be created on a bootable USB flash drive using the HP Cloud Recovery Download Tool. For details, see Using the HP Cloud Recovery Download Tool to create recovery media (select products only) on page 86.

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.

To recover your system:

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

Changing the computer boot order

If your computer does not restart using the HP Recovery media, 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.

9 Specifications

Table 9-1 Computer specifications

	Metric	U.S.
Computer dimensions		
Width	**361.6 mm**	14.24 in
Depth	**245.6 mm**	9.67 in
Height	**17.9 mm**	0.71 in
Weight		
Solid-state drive models	**1852 g**	4.08 lbs
Hard drive models	**1927 g**	4.25 lbs
Solid-state drive + hard drive models	**1938 g**	4.27 lbs
Temperature		
Operating	**5°C to 35°C**	41°F to 95°F
Nonoperating	**-20°C to 60°C**	-4°F to 140°F
Relative humidity (noncondensing)		
Operating	10% to 90%	
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.

10 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

Table 10-1 Power cord requirements for specific countries and regions

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

Table 10-1 Power cord requirements for specific countries and regions (continued)

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

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

11 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.

Index

A

AC adapter and battery light, identifying 7
AC adapter, spare part numbers 28
action keys
  airplane mode 16
  help 15
  identifying 14, 15
  keyboard backlight 15
  mute 16
  next track 15
  pause 15
  play 15
  privacy screen 15
  screen brightness 15
  speaker volume 15
  stop 15
  switch screen image 15
  using 15
airplane mode key 16
antenna
  removal 47
  spare part number 24, 48
audio
  adjusting volume 15
audio, product description 3
audio-out (headphone)/audio-in (microphone) combo jack, identifying 8

B

backup, creating 86
backups 86
battery
  removal 37
  spare part number 21, 37
bezel
  removal 40
  spare part numbers 23, 40
BIOS
  determining version 79
  downloading an update 80
  starting the Setup Utility 79
  updating 79
Bluetooth label 17
boot order, changing 87
bottom components 16
bottom cover
  removal 34
  spare part number 22, 34
buttons
  left TouchPad 11
  power 13
  right TouchPad 11

C

camera
  identifying 9, 10
camera light, identifying 9, 10
camera, product description 3
camera/microphone module
  removal 41
  spare part numbers 23, 41, 42
caps lock light, identifying 12
card reader board
  spare part number 57
cautions
  electrostatic discharge 30
components
  bottom 16
  display 9
  keyboard area 11
  left side 8
  right side 7
computer components 18
connectors
  power 7

D

display assembly
  components 23
  removal 39
  spare part numbers 39
display back cover, spare part numbers 24
display components 9
display panel
  removal 42
  spare part numbers 24, 44
display panel cable
  removal 46
  spare part numbers 24, 47
display panel, product description 2
drive light, identifying 8
drives 26

E

electrostatic discharge (ESD) 30
  preventing damage 31
esc key, identifying 14

F

fan
  removal 65
  spare part number 20, 65
fn key, identifying 14

G

Get Help in Windows 10 action key 15
graphics, product description 1
grounding methods 32
guidelines
  packaging 33
  transporting 33
  workstation 30

H

hard drive
  product description 2
  removal 50
  spare part numbers 21, 50
hard drive bracket
  removal 51
  spare part number 21, 50
hard drive cable
  removal 51
  spare part number 21, 50
HDMI port
  identifying 8
heat sink
  removal 67
  spare part numbers 20, 67

hinge
removal 45
spare part number 24, 45
hinge covers
spare part number 24
HP PC Hardware Diagnostics UEFI
downloading 83
starting 83
using 82
HP PC Hardware Diagnostics Windows
downloading 81
installing 82
using 81
HP Recovery Manager
correcting boot problems 87
HP Recovery media
recovery 87

I
integrated numeric keypad, identifying 14
internal microphones, identifying 9, 10

J
jacks
audio-out (headphone)/audio-in (microphone) 8
network 8
RJ-45 (network) 8

K
keyboard
removal 78
spare part number 78
keyboard backlight action key 15
keyboard, product description 4
keyboard/top cover
spare part numbers 19
keypad, integrated numeric 14
keys
action 14
airplane mode 16
esc 14
fn 14
num lock 14
Windows 14

L
labels
Bluetooth 17
regulatory 17
serial number 16
service 16
wireless certification 17
WLAN 17
left side components 8
lights
AC adapter and battery 7
camera 9, 10
caps lock 12
drive 8
mute 12
power 12
RJ-45 (network) status 8
lock bracket
removal 63
spare part number 21, 63

M
mass storage devices 26
memory card reader board
removal 57
spare part number 21
memory card reader board cable
spare part number 57
memory module
product description 2
removal 56
spare part numbers 21, 56
microphone
product description 3
model name 1
mute light, identifying 12
mute volume action key 16

N
network jack, identifying 8
next track action key 15

O
operating system, product description 5
Optane memory module
removal 55
spare part number 55
spare part numbers 55
optical drive
spare part number 28

P
packaging guidelines 33
pause action key 15
play action key 15
ports
HDMI 8
product description 4
USB SuperSpeed 7
USB Type-C 8
power button, identifying 13
power connector
identifying 7
power connector cable
removal 76
spare part number 19, 76
power cord
set requirements 89
spare part numbers 28
power lights, identifying 12
power requirements, product description 4
privacy screen action key 15
privacy screen action key, identifying 15
processor, product description 1
product description
audio 3
camera 3
display panel 2
graphics 1
hard drive 2
internal card expansion 4
keyboard 4
Media card reader 4
memory module 2
microphone 3
operating system 5
ports 4
power requirements 4
processors 1
product name 1
RJ-45 (network) jack 3
security 5
sensors 3
serviceability 6
solid-state drive 2
storage 2
TouchPad 4
wireless 3
product name 1
product name and number, computer 16

R
recovery 86
discs 87
HP Recovery partition 87
media 87
USB flash drive 87
recovery media
creating using HP Cloud Recovery Download Tool 86
creating using Windows tools 86
regulatory information
regulatory label 17
wireless certification labels 17
Remote HP PC Hardware Diagnostics UEFI settings
customizing 84
using 84
removal/replacement
procedures 34
restoring 86
right side components 7
RJ-45 (network) jack, identifying 8
RJ-45 (network) jack, product description 3
RJ-45 (network) status lights, identifying 8
rubber feet
removal 35
spare part number 35
Rubber Foot Kit, spare part number 22

S
screen brightness action keys 15
Screw Kit, spare part number 28
security cable slot, identifying 7
security, product description 5
sensors, product description 3
serial number, computer 16
service labels, locating 16
serviceability, product description 6
slots
memory card reader 7
security cable 7
solid-state drive
product description 2
removal 54
spare part numbers 21, 54
speaker volume action keys 15
speakers
identifying 13
removal 74
spare part number 19, 74
special keys, using 14
static electricity 31
stop action key 15
storage, product description 2
switch screen image action key 15
system board
removal 70
spare part numbers 19, 70
system restore point, creating 86

T
tools required 29
top cover
removal 78
spare part number 78
TouchPad
removal 60
spare part number 19, 60
TouchPad bracket
removal 60
spare part number 19, 60
TouchPad buttons
identifying 11
TouchPad cable
spare part number 19, 21, 60
TouchPad zone, identifying 11
TouchPad, product description 4
transporting guidelines 33
traveling with the computer 17

U
USB board
removal 59
spare part number 59
USB board cable
spare part number 59
USB SuperSpeed ports, identifying 7
USB Type-C port, identifying 8

V
vent, identifying 16
vents
identifying 13
volume
adjusting 15
mute 16

W
webcam/microphone module cable
spare part numbers 24
Windows
backup 86
recovery media 86
system restore point 86
Windows key, identifying 14
Windows tools, using 86
wireless antenna
removal 47
spare part number 24, 48
wireless certification label 17
wireless, product description 3
WLAN antenna
removal 47
spare part number 24, 48
WLAN antennas, identifying 9, 10
WLAN device 17
WLAN label 17
WLAN module
removal 52
spare part numbers 21, 52
workstation guidelines 30