



Maintenance and Service Guide

SUMMARY

This guide provides information about spare parts, removal and replacement of parts, security, backing up, and more.

© Copyright 2020 HP Development Company, L.P.

Bluetooth is a trademark owned by its proprietor and used by HP Inc. under license. Chrome, Chrome OS, Chromebook, Chromecast, Google, and Google Drive are trademarks of Google LLC. Intel, Core, vPro, and XMM are trademarks of Intel Corporation or its subsidiaries in the U.S. and/or other countries. SDHC, SDXC, and microSD are trademarks or registered trademarks of SD-3C LLC. Windows is either a registered trademark or trademark of Microsoft Corporation in the United States and/or other countries. USB Type-C® is a registered trademark of USB Implementers Forum.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

First Edition: August 2020

Document Part Number: M16432-001

Product notice

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

To access the latest user guides, go to <http://www.hp.com/support>, and follow the instructions to find your product. Then select **Manuals**.

Software terms

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

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

Safety warning notice

Reduce the possibility of heat-related injuries or of overheating the computer by following the practices described.


 **WARNING!** To reduce the possibility of heat-related injuries or of overheating the computer, do not place the computer directly on your lap or obstruct the computer air vents. Use the computer only on a hard, flat surface. Do not allow another hard surface, such as an adjoining optional printer, or a soft surface, such as pillows or rugs or clothing, to block airflow. Also, do not allow the AC adapter to come into contact with the skin or a soft surface, such as pillows or rugs or clothing, during operation. The computer and the AC adapter comply with the user-accessible surface temperature limits defined by applicable safety standards.

Table of contents

1 Product description	1
2 Components	4
Right	4
Left	5
Display	6
Keyboard area	7
Touchpad	7
Fingerprint reader	8
Special keys	9
Bottom	9
Labels	10
3 Illustrated parts catalog	12
Computer major components	12
Miscellaneous parts	14
4 Removal and replacement procedures preliminary requirements	17
Tools required	17
Service considerations	17
Plastic parts	17
Cables and connectors	17
Drive handling	17
Workstation guidelines	18
Electrostatic discharge information	18
Generating static electricity	19
Preventing electrostatic damage to equipment	19
Personal grounding methods and equipment	20
Grounding the work area	20
Recommended materials and equipment	20
Packaging and transporting guidelines	21
5 Removal and replacement procedures for authorized service provider parts	22
Component replacement procedures	22
Preparation for disassembly	22
Bottom cover	22

Battery	23
Solid-state drive	25
Touchpad	25
Speakers	26
Fingerprint sensor board	28
Heat sink with fans	29
Sensor (IR) board	30
System board	31
Display assembly	34
USB door	35
Volume button	36
Power button	37
Lock bracket	38
Kill switch button	39
Keyboard with top cover	40
6 Backing up, resetting, and recovering	42
Backing up	42
Resetting	42
Recovering	42
Installing the Chromebook Recovery Utility	43
Creating recovery media	43
Recovering the Chrome operating system	43
Setting up your computer after a reset or recovery	44
Erasing and reformatting the recovery media	44
7 Specifications	45
Computer specifications	45
34.3 cm (13.5 in) display specifications	46
8 Statement of memory volatility	47
Current BIOS steps	47
Nonvolatile memory usage	49
Questions and answers	51
Using HP Sure Start (select products only)	52
9 Power cord set requirements	53
Requirements for all countries	53
Requirements for specific countries and regions	53

10 Recycling	55
Index	56

1 Product description

This table provides detailed product information.

Table 1-1 Product components and their descriptions

Category	Description
Product Name	HP Elite c1030 Chromebook
Processors	10th Generation Intel® Core™ processors Intel Core i7-10610U (1.8 GHz [turbo up to 4.9 GHz], 4 cores, 8 MB L3 cache, 15 W) Intel Core i5-10310U (1.7 GHz [turbo up to 4.4 GHz], 4 cores, 6 MB L3 cache, 15 W) Intel Core i3-10110U (2.1 GHz [turbo up to 4.1 GHz], 2 cores, 4 MB L3 cache, 15 W)
Graphics	Internal graphics Intel UHD Graphics Supports HD Decode, DX12, and HDMI
Display	34.3 cm (13.5 in), Widescreen Ultra Extended Graphics Array (WUXGA) (1920 × 1280), UWVA, WLED, eDP + PSR, narrow bezel, 1.15 W, touch screen, privacy Gen4, USI support Antiglare, 400 nits BrightView, 400 nits Antiglare, privacy gen4, 1000 nits
Memory	Soldered on board, nonupgradeable DDR4-2666 dual-channel support Supports the following configurations: <ul style="list-style-type: none">• 16 GB• 8 GB
Primary storage	PCIe, NVMe, value, 2230, M.2 solid-state drive 256 GB 128 GB
Audio and video	HD audio Bang & Olufsen Dual stereo speakers HD Camera: HD WFOV + dual microphones 1280 × 720 by 30 frames per second Camera privacy switch
Wireless	Integrated wireless options with dual antennas (M.2/PCIe)

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

Category	Description
	Intel Wi-Fi 6 AX201 + Bluetooth® 5 (non-vPro®) (802.11ax 2 × 2, MU-MIMO, supporting gigabit file transfer speeds)
	Supports HP Connection Optimizer with Wi-Fi load balancing
	Support for Chromecast™
	Supports turbo-lite antenna design (extended range wireless LAN)
	Turbo-Lite antenna design
	Integrated WWAN options with dual antennas (M.2 30 × 42 socket PCIe) (select products only)
	Intel XMM™ 7360 LTE-Advanced (LTE CAT9)
	(2) WWAN antennas (world wide 5 band, configured at top of panel)
Media card reader	Supports microSD™, SDHC™, SDXC™ up to UHS-104
	Push-push insertion/removal
Ports, buttons	Hot plug/unplug and autodetect for correct output to wide-aspect vs. standard aspect video
	HDMI v1.4b supporting: up to 1920 × 1080 @ 60 Hz via USB Type-C®
	Audio-out (headphone)/audio-in (microphone) combo jack
	(2) USB 3.1 Gen 1 Type C (right and left side; support charging, power delivery, video, and data)
	(1) USB 3.1 Gen 1 Type A
	Nano SIM slot
	microSD card reader
	Privacy switch
	Volume button
Keyboard/pointing devices	Chrome Keyboard
	Full size, textured, island style, spill resistant, backlit, privacy
	Full size, textured, island style, spill resistant, backlit, nonprivacy
	Touchpad requirements
	Clickpad with soda-lime glass
	Multitouch gestures enabled
Pen	Taps enabled as default
	HP USI Pen (select products only)
Power requirements	Battery
	4 cell, 50.97 Whr, long life, HP Fast Charge
	AC adapter, USB Type-C, nPFC, straight
	65 W
	45 W
	Power cord

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

Category	Description
	1 m
Security	Nano security lock slot
	Fingerprint sensor
	Google® Titan C
Operating system	Google Chrome™ 64
Serviceability	End user replaceable parts
	AC adapter

2 Components

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

Right

Use the illustration and table to identify the components on the right side of the computer.

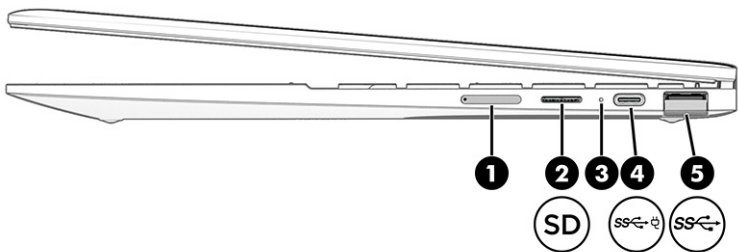



Table 2-1 Right-side components and their descriptions

Component	Description	
(1)	SIM card slot	Supports a wireless subscriber identity module (SIM) card.
(2)	SD Memory card reader	<p>Reads optional memory cards that store, manage, share, or access information.</p> <p>To insert a card:</p> <ol style="list-style-type: none">1. Hold the card label-side up, with the connectors facing the computer.2. Insert the card into the memory card reader, and then press in on the card until it is firmly seated. <p>To remove a card:</p> <ul style="list-style-type: none">▲ Press in on the card, and then remove it from the memory card reader.
(3)	AC adapter and battery light	<ul style="list-style-type: none">● On, White: The AC adapter is connected and the battery is fully charged.● On, Amber: The AC adapter is connected and the battery is charging.● Blinking amber: The battery has an error.● Off: The battery is not charging.
(4)	USB Type-C® power connector and SuperSpeed Plus port	<p>Connects an AC adapter that has a USB Type-C connector, supplying power to the computer and, if needed, charging the computer battery.</p> <p>– and –</p> <p>Connects a USB device, provides high-speed data transfer, and (for select products) charges small devices when the computer is on or in Sleep mode.</p>

Table 2-1 Right-side components and their descriptions (continued)

Component		Description
		NOTE: Cables, adapters, or both (purchased separately) might be required.
(5)	 USB SuperSpeed port	Connects a USB device, such as a cell phone, camera, activity tracker, or smartwatch, and provides high-speed data transfer.

Left

Use the illustration and table to identify the components on the left side of the computer.

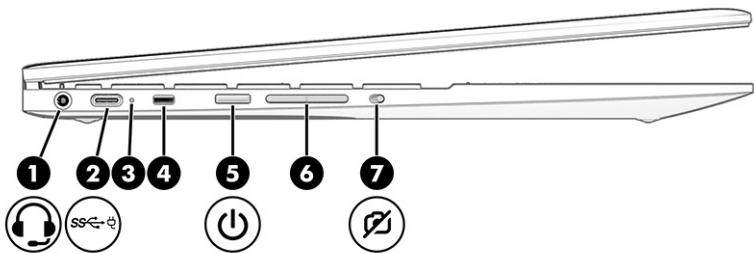


Table 2-2 Left-side components and their descriptions





Component		Description
(1)	 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, see the <i>Regulatory, Safety, and Environmental Notices</i> . NOTE: When a device is connected to the jack, the computer speakers are disabled.
(2)	 USB Type-C power connector and SuperSpeed Plus port	Connects an AC adapter that has a USB Type-C connector, supplying power to the computer and, if needed, charging the computer battery. – and – Connects a USB device, provides high-speed data transfer, and (for select products) charges small devices when the computer is on or in Sleep mode. NOTE: Cables, adapters, or both (purchased separately) might be required.
(3)	AC adapter and battery light	<ul style="list-style-type: none">On, White: The AC adapter is connected and the battery is fully charged.– and –The camera is in use.On, Amber: The AC adapter is connected and the battery is charging.

Table 2-2 Left-side components and their descriptions (continued)

Component		Description
		– and – The camera privacy switch is off. <ul style="list-style-type: none">• Blinking amber: The battery has an error.• Off: The battery is not charging.
(4)	Security cable slot	Attaches an optional security cable to the computer. NOTE: The security cable is designed to act as a deterrent, but it might not prevent the computer from being mishandled or stolen.
(5)	 Power button	<ul style="list-style-type: none">• When the computer is off, press the button briefly 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. <p>IMPORTANT: Pressing and holding down the power button results in the loss of unsaved information.</p> <p>If the computer has stopped responding and shutdown procedures are ineffective, press and hold the power button for at least 10 seconds to turn off the computer.</p> <p>To learn more about your power settings, see your power options.</p>
(6)	Volume button	Controls speaker volume on the computer.
(7)	 Camera privacy switch	Turns the camera on and off. To turn off the camera, slide the camera privacy switch toward the display. To turn on the camera, slide the camera privacy switch toward the front of the computer.

Display

Use the illustration and table to identify the components on the display.

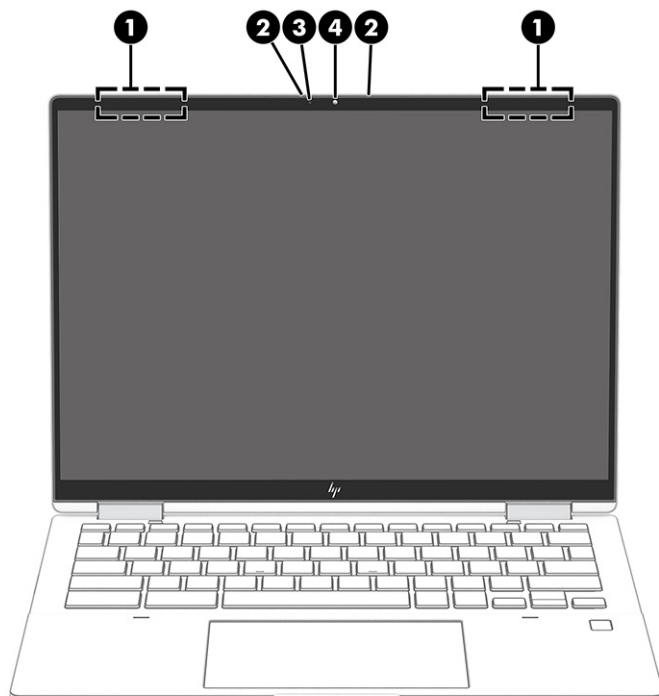


Table 2-3 Display components and their descriptions

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	On (white): The camera is in use. On (amber): The camera is turned off by the switch. Off: The camera is turned off by the software.
(4) Camera	Allows you to video chat, record video, and record still images. 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.

Keyboard area

Keyboards can vary by language.

Touchpad

The touchpad settings and components are described here.

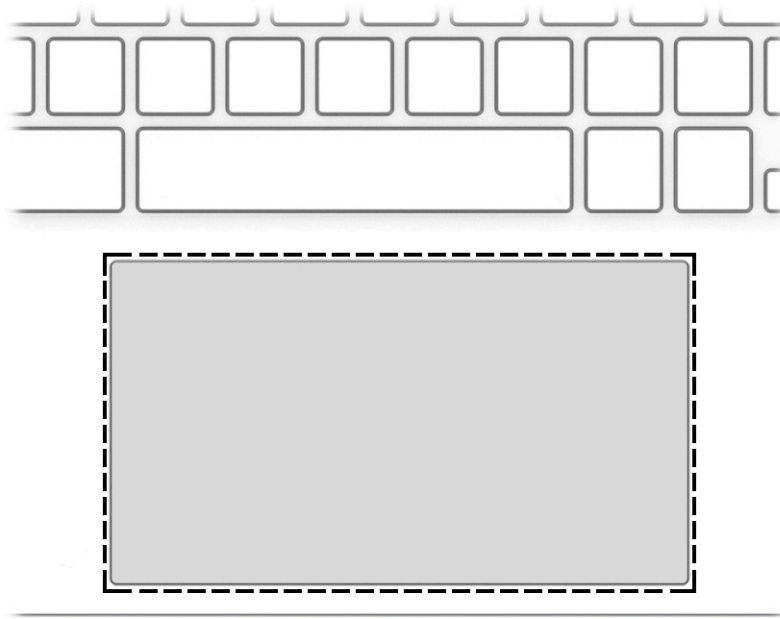


Table 2-4 Touchpad component and description

Component	Description
Touchpad zone	Reads your finger gestures to move the pointer or activate items on the screen.

Fingerprint reader

Fingerprint readers can be located on the touchpad, on a side panel of the computer, or on the top cover below the keyboard.

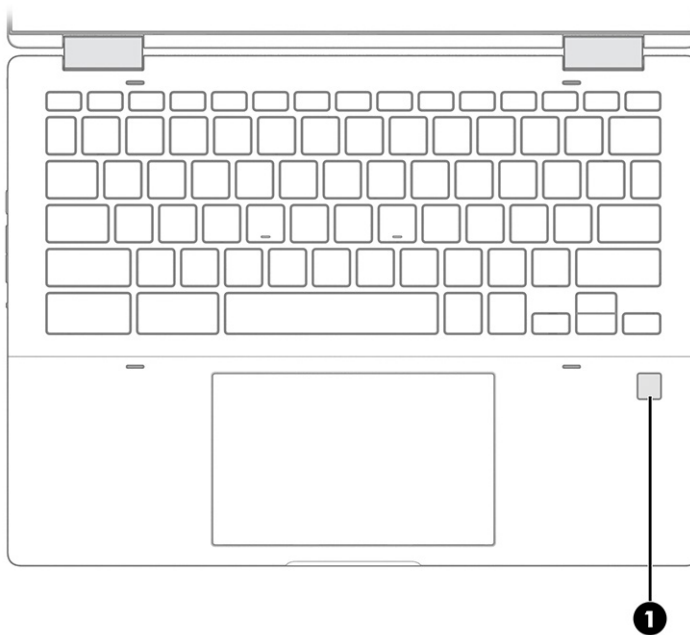


Table 2-5 Fingerprint reader and its description

Component	Description
(1) Fingerprint reader (select products only)	Allows a fingerprint to unlock the device instead of a password logon. ▲ Swipe down across the fingerprint reader. IMPORTANT: To prevent fingerprint logon issues, be sure when you register your fingerprint that all sides of your finger are registered by the fingerprint reader.

Special keys

Use the illustration and table to locate the special keys.

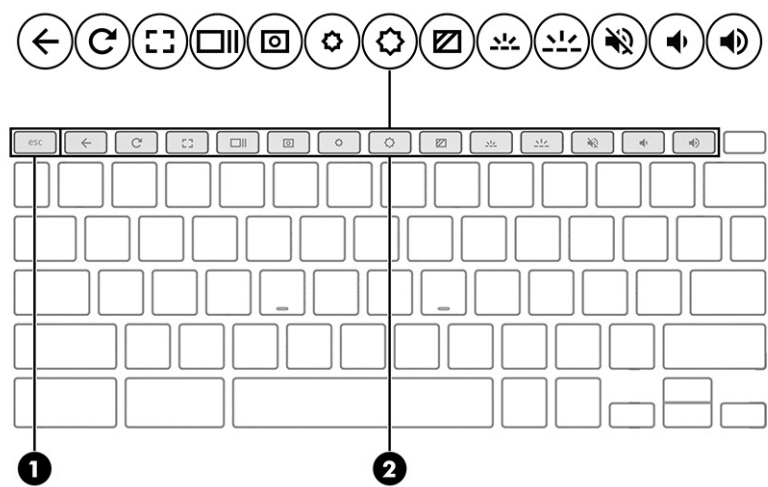


Table 2-6 Special keys and their descriptions

Component	Description
(1) esc key	Activates certain computer functions when pressed in combination with other keys, such as tab or shift .
(2) Action keys	Execute frequently used system functions.

Bottom

Use the illustration and table to identify the bottom components.

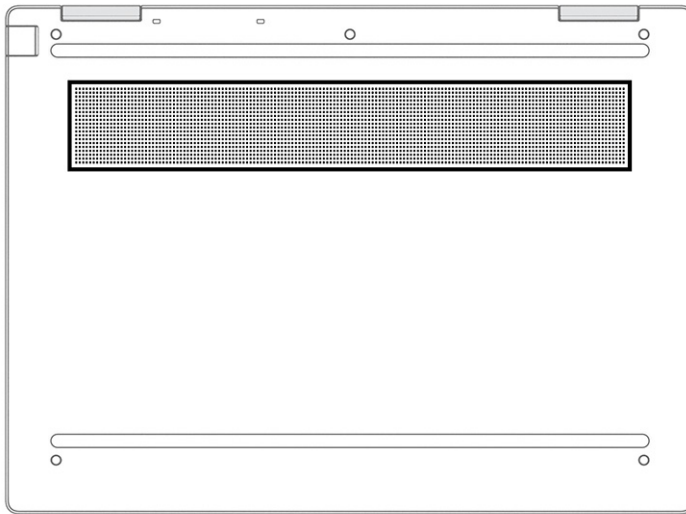



Table 2-7 Bottom component and description

Components	Description
Vent	Enables airflow to cool internal components. NOTE: The computer fan starts 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 that you might need when you troubleshoot system problems or travel internationally with the computer. Labels can 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 following examples. Refer to the illustration that most closely matches the service label on your computer.

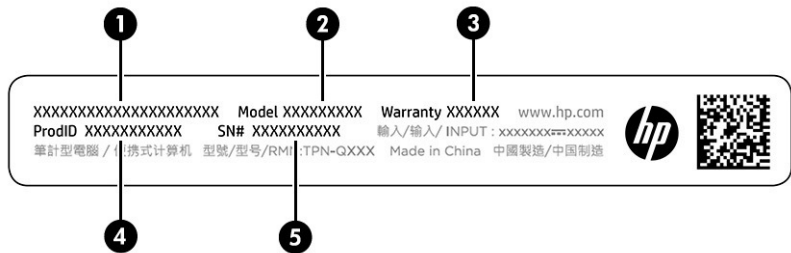
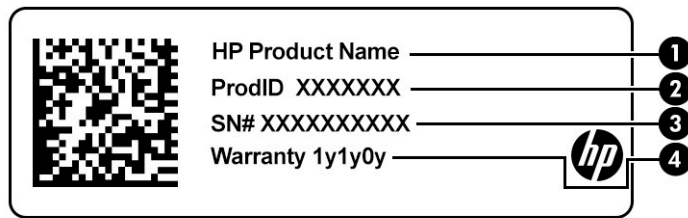


Table 2-8 Service label components

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

**Table 2-9 Service label components**

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


- Regulatory labels—Provide regulatory information about the computer.
- Wireless certification labels—Provide 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

Use this table to determine the spare parts that are available for the computer.

Computer major components

To identify the computer major components, use this illustration and table.

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

 **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.

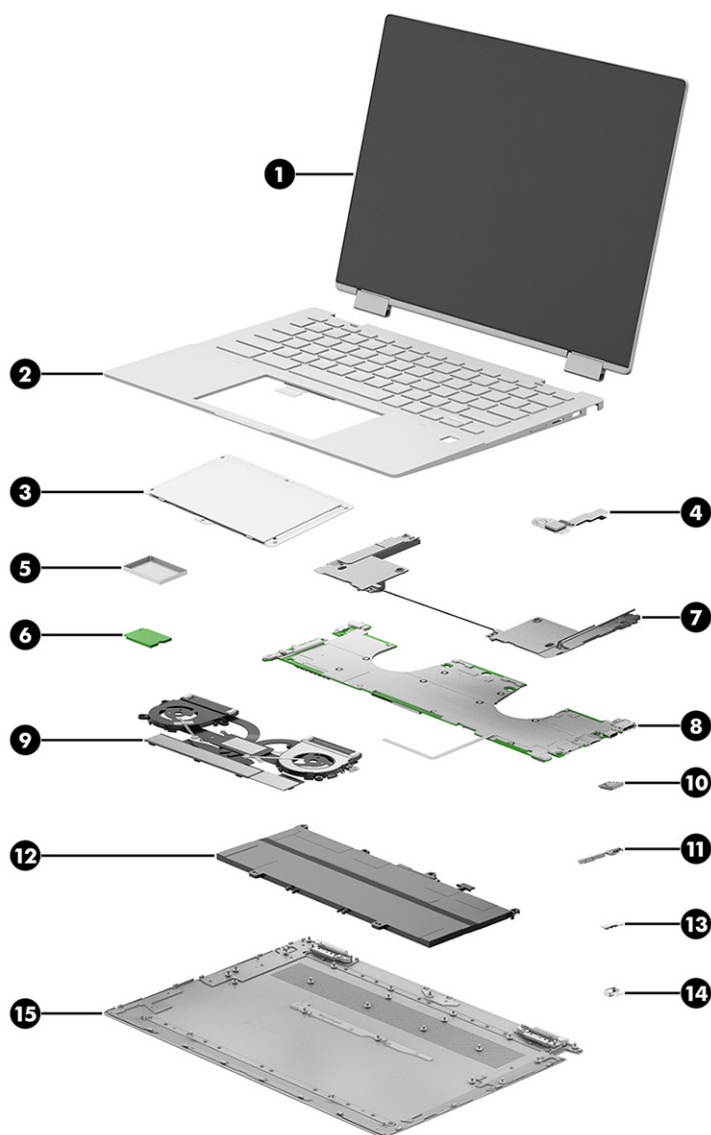


Table 3-1 Computer major component descriptions and part numbers

Item	Component	Spare part number
(1)	Display assembly NOTE: Only complete hinge-up display assemblies are offered as spare parts.	
	Antiglare, SVA, 400 nits	M11036-001
	BrightView, UWVA, 400 nits	M11037-001
	Antiglare, SVA, 1000 nits, privacy	M11038-001
(2)	Top cover with keyboard	
	No WWAN, nonprivacy	M12710-xx1
	No WWAN, privacy	M12711-xx1
	With WWAN, nonprivacy	M16753-xx1
	With WWAN, privacy	M16754-xx1
(3)	Touchpad (includes protective tape) NOTE: The touchpad cable is available in the Cable Kit as spare part number M10736-001.	M10725-001
(4)	Fingerprint sensor board (includes cable) NOTE: The fingerprint sensor bracket is available in the Bracket Kit as spare part number M16097-001.	M10726-001
(5)	Solid-state drive cover (included in the Miscellaneous Kit)	M10735-001
(6)	Solid-state drive (2230, PCIe, NVMe)	
	256 GB	M11042-002
	128 GB	M11040-002
*	WWAN module (not illustrated)	L98230-002
(7)	Speaker Kit	M00436-001
	For use in models without WWAN	M10724-001
	For use in models with WWAN	M10723-001
(8)	System board (includes integrated processor and system memory; includes replacement thermal material)	
	Intel Core i7-10610U processor and 16 GB of system memory (models with WWAN)	M25776-001
	Intel Core i7-10610U processor and 8 GB of system memory (models with WWAN)	M25775-001
	Intel Core i7-10610U processor and 16 GB of system memory (models without WWAN)	M10751-001
	Intel Core i7-10610U processor and 8 GB of system memory (models without WWAN)	M10749-001
	Intel Core i5-10310U processor and 16 GB of system memory (models with WWAN)	M25773-001
	Intel Core i5-10310U processor and 8 GB of system memory (models with WWAN)	M25774-001
	Intel Core i5-10310U processor and 16 GB of system memory (models without WWAN)	M10745-001
	Intel Core i5-10310U processor and 8 GB of system memory (models without WWAN)	M10747-001
	Intel Core i3-10110U processor and 8 GB of system memory (models with WWAN)	M25772-001

Table 3-1 Computer major component descriptions and part numbers (continued)

Item	Component	Spare part number
	Intel Core i3-10110U processor and 8 GB of system memory (models without WWAN)	M10743-001
(9)	Heat sink with fans	M10734-001
(10)	USB door (available in the Miscellaneous Kit)	M10735-001
(11)	Volume button (available in the Button Kit)	M11033-001
(12)	Battery (4 cell, 50 Whr)	L93559-002
(13)	Kill switch button (available in the Button Kit)	M11033-001
(14)	Lock bracket (available in the Bracket Kit)	M16097-001
	Power button (available in the Button Kit; not illustrated)	M11033-001
(15)	Bottom cover	M00432-001
	Models with WWAN	M10728-001
	Models without WWAN	M10729-001
	Sensor (IR) board (not illustrated)	M10722-001
NOTE: The sensor board cable is available in the Cable Kit as spare part number M10736-001.		

Miscellaneous parts

To identify the miscellaneous parts, use this table.

Table 3-2 Miscellaneous part descriptions and part numbers

Component	Spare part number
AC adapter, USB Type-C (nPFC, 1.8 m)	
65 W	L67440-001
45 W	L43407-001
Cable Kit (includes sensor board cable and touchpad cable)	M10736-001
Bracket Kit (includes fingerprint sensor bracket and lock bracket)	M16097-001
Miscellaneous Kit (includes fan connector protective tape, WWAN protective tape, WLAN protective tape, touchpad protective tape, solid-state drive shielding, RMA shielding, solid-state drive absorber, SIM tray, and USB door)	M10735-001
Screw Kit	M21369-001
HP USB-C/A Universal Dock with cable	L64087-001
HP USB-C-to-RJ-45 adapter	855560-001
HP USB-C-to-USB-A hub	916838-001
HP Nano Lock	918431-001
HP USB-C-to-HDMI 2.0 adapter	935325-001
HVAR USI Active Pen	L73384-001
Top load case	679921-001

Table 3-2 Miscellaneous part descriptions and part numbers (continued)

Component	Spare part number
Backpack	679923-001
HP USB Travel Mouse	757770-001
Power cord (C5, 1.0 m)	
Australia	L19358-001
Brazil	L19359-001
Denmark	L19360-001
Europe (Austria, Belgium, Finland, France, Germany, the Netherlands, Norway, and Sweden)	L19361-001
India	L19363-001
Israel	L19362-001
Italy	L19364-001
Japan	L19365-001
North America	L19367-001
People's Republic of China	L19368-001
South Africa	L19369-001
South Korea	L19366-001
Switzerland	L19370-001
Taiwan	L19372-001
Thailand	L19371-001
The United Kingdom	L19373-001
Power cord (C5, 1.8 m)	
Australia	L19358-002
Brazil	L19359-002
Denmark	L19360-002
Europe (Austria, Belgium, Finland, France, Germany, the Netherlands, Norway, and Sweden)	L19361-002
India	L19363-002
Israel	L19362-002
Italy	L19364-002
Japan	L19365-002
North America	L19367-002
People's Republic of China	L19368-002
South Africa	L19369-002
South Korea	L19366-002
Switzerland	L19370-002

Table 3-2 Miscellaneous part descriptions and part numbers (continued)

Component	Spare part number
Taiwan	L19372-002
Thailand	L19371-002
The United Kingdom	L19373-002

4 Removal and replacement procedures preliminary requirements

Use this information to properly prepare to disassemble and reassemble the computer.

Tools required

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

- Tweezers
- Nonconductive, nonmarking pry tool
- Magnetic Phillips P1 screwdriver
- Torx T5 screwdriver

Service considerations

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



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

Plastic parts

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

Cables and connectors

Handle cables with extreme care to avoid damage.



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.

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 so that they cannot be caught or snagged as you remove or replace parts. Handle flex cables with extreme care; these cables tear easily.

Drive handling

Note the following guidelines when handling drives.



IMPORTANT: Drives are fragile components. Handle them 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 2.54 cm (1 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 polystyrene foam.
- 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) might not appear to be affected at all and can work perfectly throughout a normal cycle. The device might 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 remove or install 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 [Personal grounding methods and equipment on page 20](#).

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

Follow these static electricity guidelines.

- 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

Event	Relative humidity		
	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 (dual in-line packages) 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 polystyrene foam	3,500 V	5,000 V	14,500 V
Removing bubble pack from PCB (printed circuit board)	7,000 V	20,000 V	26,500 V
Packing PCBs in foam-lined box	5,000 V	11,000 V	21,000 V
Multiple electric components can be packaged together in plastic tubes, trays, or polystyrene foam.			



NOTE: As little as 700 V 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

Using certain equipment can prevent static electricity damage to electronic components.

- **Wrist straps** are flexible straps with a maximum of $1\text{ M}\Omega \pm 10\%$ 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 $1\text{ M}\Omega \pm 10\%$ 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, follow these 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 polystyrene foam.
- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended materials and equipment

HP recommends certain materials and equipment to prevent static electricity.

- 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 $1\text{ M}\Omega \pm 10\%$ resistance

- Static-dissipative table or floor mats with hard tie to ground
- Field service kits
- Static awareness labels
- Wrist straps and footwear straps providing $1\text{ M}\Omega \pm 10\%$ 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 parts.

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

 **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.

Component replacement procedures

To remove and replace computer components, use these procedures.

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

You must remove, replace, or loosen as many as 50 screws when you service the parts described in this chapter. Make special note of each screw size and location during removal and replacement.

Preparation for disassembly

To remove and replace computer components, use these procedures.

See [Removal and replacement procedures preliminary requirements on page 17](#) 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

To remove the bottom cover, use this procedure and illustration.

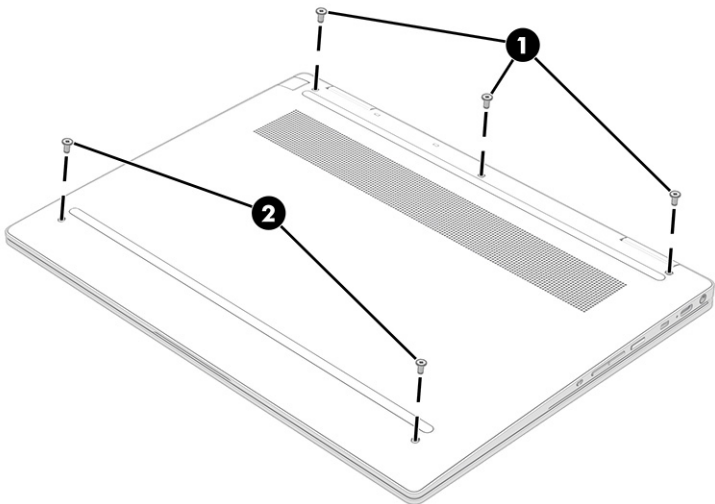
Table 5-1 Bottom cover description and part number

Description	Spare part number
Bottom cover for use with models with WWAN	M10728-001
Bottom cover for use with models without WWAN	M10729-001

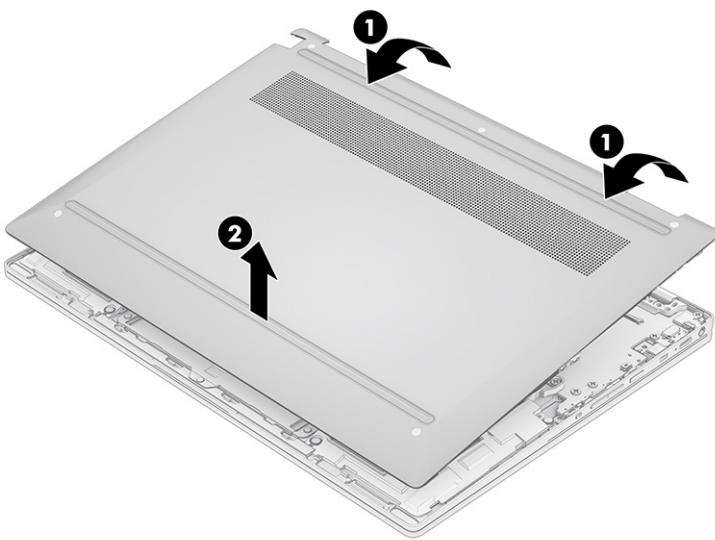
Before removing the bottom cover, prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).

Remove the bottom cover:

1. Remove the three Torx T5 2.0 × 7.0 screws **(1)** and the two Torx T5 M2.0 × 4.0 screws **(2)** that secure the bottom cover to the computer.



2. Use a nonmarking, nonconductive tool to release the top of the cover from the computer **(1)**.
3. Remove the bottom cover from the computer **(2)**.



To replace the bottom cover, reverse the removal procedures.

Battery

To remove the battery, use this procedure and illustration.

Table 5-2 Battery description and part number

Description	Spare part number
Battery (4 cell, 50 Whr)	L93559-002

⚠ WARNING! To avoid personal injury and damage to the product:

- Do *not* puncture, twist, or crack the battery.
 - Do *not* cause an external puncture or rupture to the battery. They can cause a short inside the battery, which can result in battery thermal runaway.
 - Do *not* handle or touch the battery enclosure with sharp objects such as tweezers or pliers, which might puncture the battery.
 - Do *not* compress or squeeze the battery case with tools or heavy objects stacked on top of the case. These actions can apply undue force on the battery.
 - Do *not* touch the connectors with any metallic surface or object, such as metal tools, screws, or coins, which can cause shorting across the connectors.
-

Before removing the battery, follow these steps:

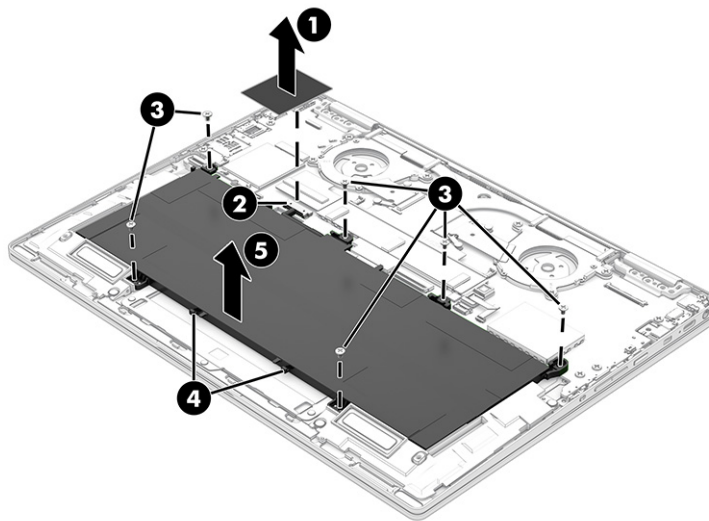
1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
 2. Remove the bottom cover ([Bottom cover on page 22](#)).
-

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

📌 IMPORTANT: Removing a battery that is the sole power source for the computer can cause loss of information. To prevent loss of information, save your work or shut down the computer through the operating system before you remove the battery.

Remove the battery:

1. Remove the tape from the top of the battery **(1)**.
2. Disconnect the battery cable from the system board **(2)**.
3. Remove the six Phillips M2.0 × 3.0 screws **(3)** that secure the battery to the computer.
4. Remove speaker cable from clips on bottom of battery **(4)**.
5. Remove the battery from the computer **(5)**.



To insert the battery, reverse the removal procedures.

Solid-state drive

To remove the M.2 solid-state drive, use this procedure and illustration.

Table 5-3 Solid-state drive descriptions and part numbers

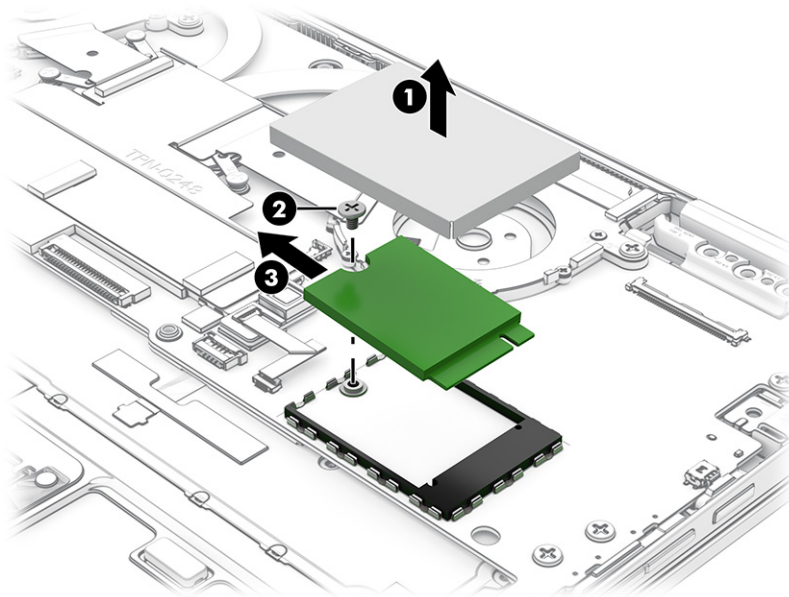
Description	Spare part number
256 GB, PCIe, value	M11042-002
128 GB, PCIe, value	M11040-002
Solid-state drive cover (included in the Miscellaneous Kit)	M10735-001

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

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 23](#)).

Remove the solid-state drive:

1. Use a thin tool to remove the cover from the solid-state drive **(1)**.
2. Remove the Phillips M2.0 × 3.0 screw **(2)** that secures the drive to the computer.
3. Pull the drive away from the socket to remove it **(3)**.



To install the solid-state drive, reverse the removal procedures.



NOTE: Solid-state drives are designed with a notch to prevent incorrect insertion.

Replace the cover by inserting the edges of the cover into the clips on the system board near the sides of the solid-state drive.

Touchpad

To remove the touchpad, use this procedure and illustration.

Table 5-4 Touchpad description and part number

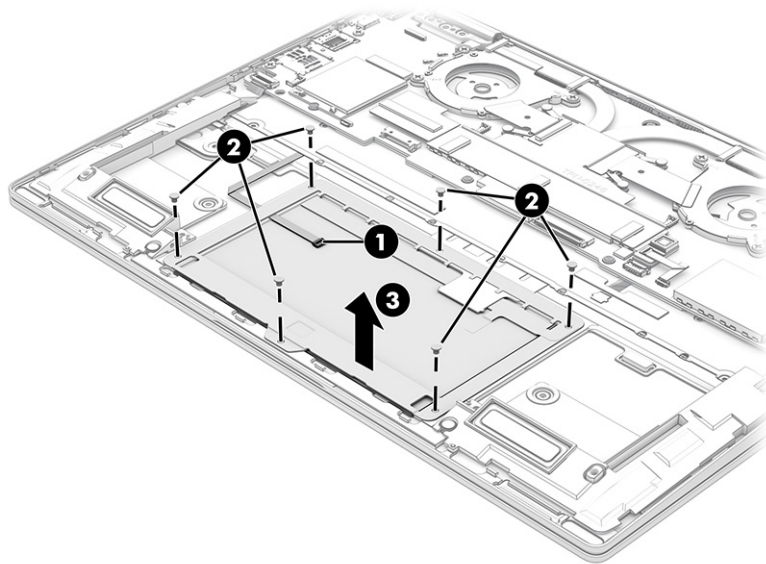
Description	Spare part number
Touchpad	M10725-001
Touchpad cable (included in Cable Kit)	M10736-001

Before removing the touchpad, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).

Remove the touchpad:

1. Disconnect the cable from the ZIF connector on the touchpad **(1)**.
2. Remove the protective shielding from the top of the touchpad.
3. Remove the six Phillips M2.0 × 2.0 screws **(2)** that secure the touchpad to the computer.
4. Remove the touchpad from the computer **(3)**.



Reverse this procedure to install the touchpad.

Speakers

To remove the speakers, use this procedure and illustration.

Table 5-5 Speaker description and part number

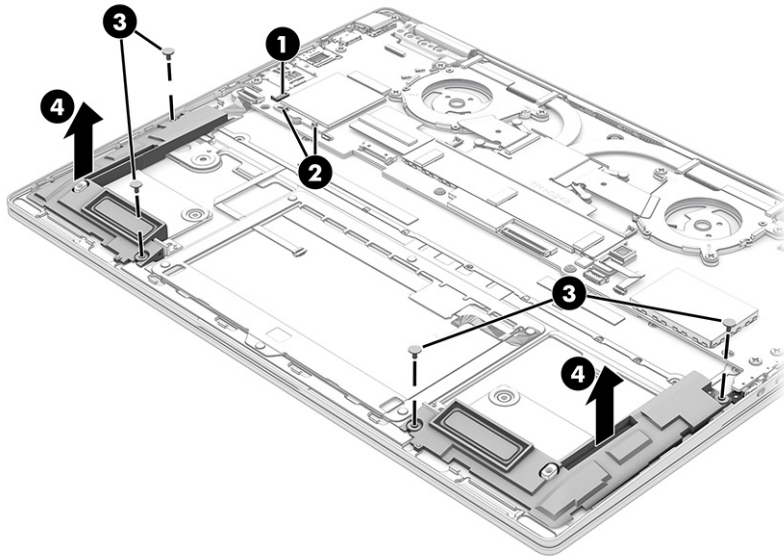
Description	Spare part number
Speaker Kit for use in models without WWAN	M10724-001
Speaker Kit for use in models with WWAN	M10723-001

Before removing the speakers, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).

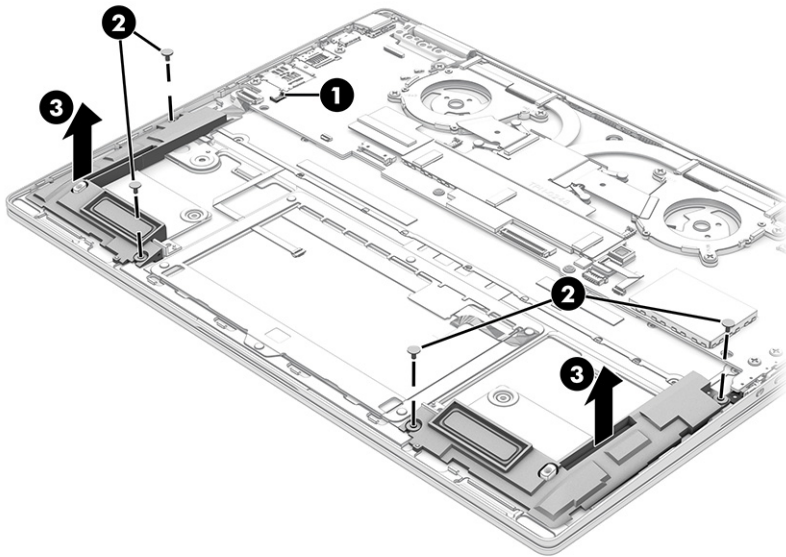
Remove the speakers:

1. **(Models with WWAN)** Disconnect the speaker cable from the system board **(1)**.
2. Disconnect the antenna cables from the WWAN module **(2)**.
3. Remove the four Phillips M1.6 × 3.2 screws **(3)** that secure the speakers to the computer.
4. Remove the speakers from the computer **(4)**.



5. **(Models without WWAN):** Disconnect the speaker cable from the system board **(1)**.
6. Remove the four Phillips M1.6 × 3.2 screws **(2)** that secure the speakers to the computer.

7. Remove the speakers from the computer **(3)** .



Reverse this procedure to install the speakers.

Fingerprint sensor board

To remove the fingerprint sensor board, use this procedure and illustration.

Table 5-6 Fingerprint sensor board description and part number

Description	Spare part number
Fingerprint sensor board	M10726-001
Fingerprint sensor bracket (available in the Bracket Kit)	M16097-001

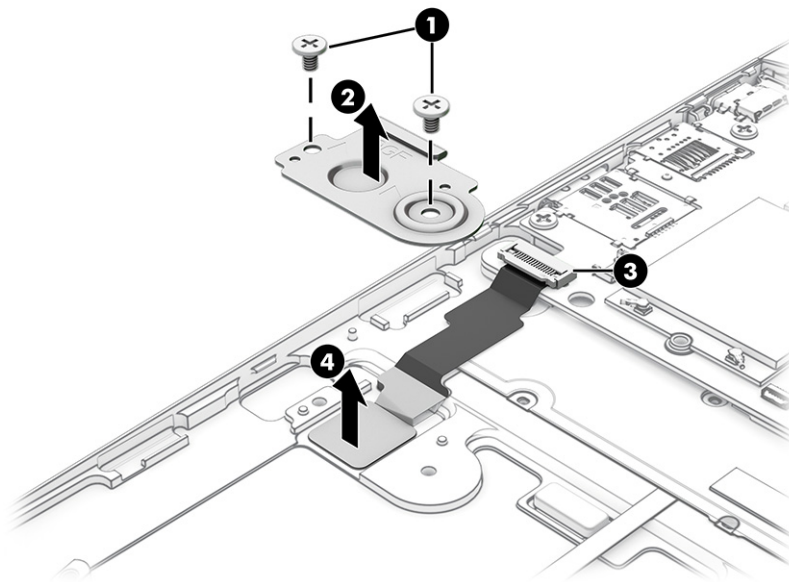
Before removing the fingerprint sensor board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).
4. Remove the speaker (see [Speakers on page 26](#)).

Remove the fingerprint sensor board:

1. Remove the two Phillips M2.0 × 2.0 screws **(1)** that secure the fingerprint sensor bracket, and then remove the bracket **(2)**.
2. Disconnect the cable from the ZIF connector on the system board **(3)**.

3. Remove the fingerprint sensor board from the computer **(4)**.



Reverse this procedure to install the fingerprint sensor board.

Heat sink with fans

To remove the heat sink with fans, use these procedures and illustrations.

Table 5-7 Heat sink with fans descriptions and part numbers

Description	Spare part number
Heat sink with fans	M10734-001

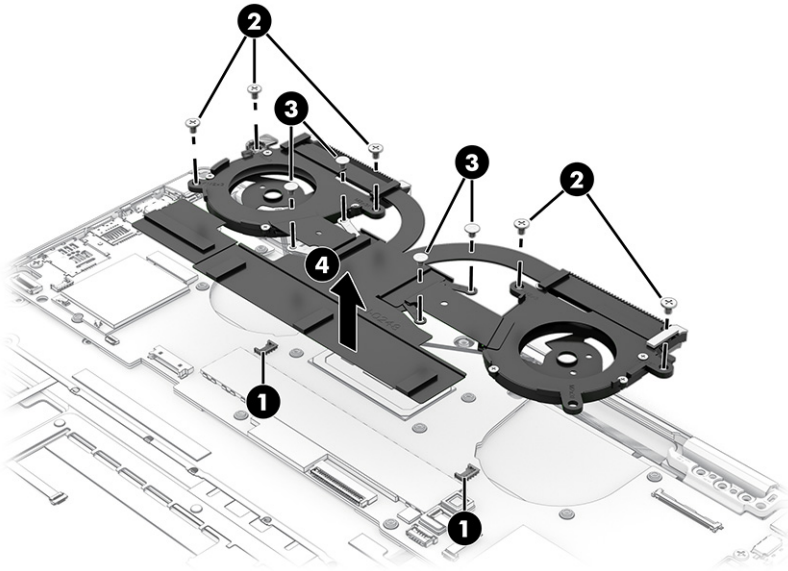
Before removing the heat sink with fans, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).

Remove the heat sink with fans:

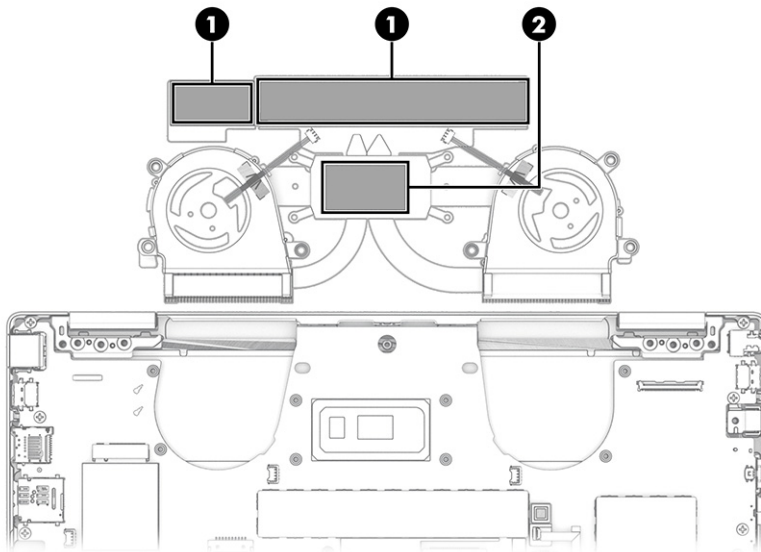
1. Disconnect the fan cables from the system board **(1)**.
2. Remove the five Phillips M2.0 × 2.0 screws **(2)** that secure the fans to the system board.

3. In the order indicated on the heat sink, remove the four Phillips M2.0 × 2.0 screws **(3)**, and then remove the heat sink from the computer **(4)**.



4. Thoroughly clean the thermal material 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. The following illustration shows the replacement thermal material locations.

Thermal pads **(1)** and thermal paste **(2)** are used on the heat sink.



Reverse this procedure to install the heat sink with fans.

Sensor (IR) board

To remove the sensor board, use this procedure and illustration.

Table 5-8 Sensor board description and part number

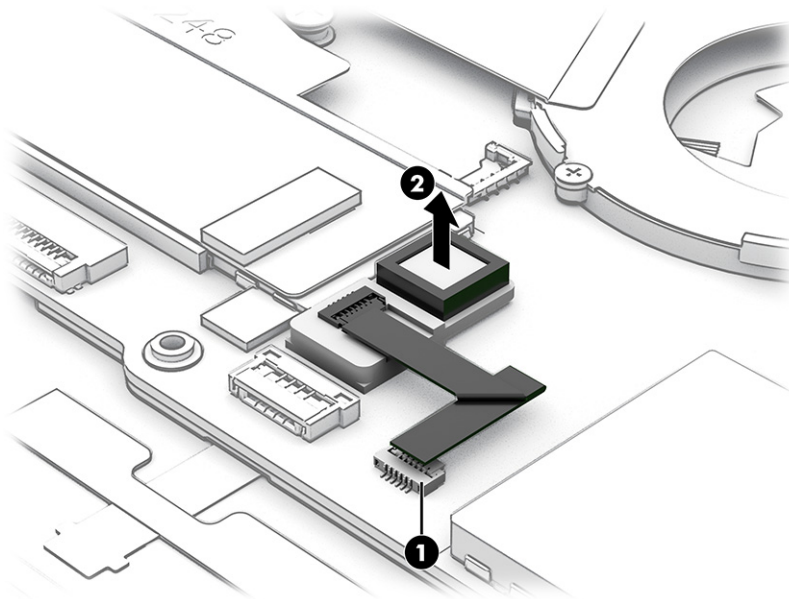
Description	Spare part number
Sensor (IR) board	M10722-001
Sensor board cable (included in Cable Kit)	M10736-001

Before removing the sensor board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 23](#)).

Remove the sensor board:

1. Disconnect the sensor board cable from the ZIF connector on the system board **(1)**.
2. Remove the sensor board from the computer **(2)**.



Reverse this procedure to install the sensor board.

System board

To remove the system board, use these procedures and illustrations.

Table 5-9 System board descriptions and part numbers

Description	Spare part number
Intel Core i7-10610U processor and 16 GB of system memory (models with WWAN)	M25776-001
Intel Core i7-10610U processor and 8 GB of system memory (models with WWAN)	M25775-001
Intel Core i7-10610U processor and 16 GB of system memory (models without WWAN)	M10751-001
Intel Core i7-10610U processor and 8 GB of system memory (models without WWAN)	M10749-001

Table 5-9 System board descriptions and part numbers (continued)

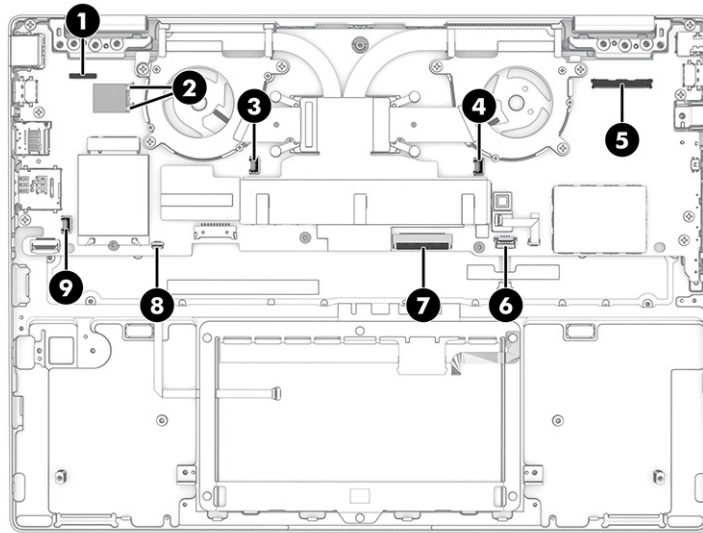
Description	Spare part number
Intel Core i5-10310U processor and 16 GB of system memory (models with WWAN)	M25773-001
Intel Core i5-10310U processor and 8 GB of system memory (models with WWAN)	M25774-001
Intel Core i5-10310U processor and 16 GB of system memory (models without WWAN)	M10745-001
Intel Core i5-10310U processor and 8 GB of system memory (models without WWAN)	M10747-001
Intel Core i3-10110U processor and 8 GB of system memory (models with WWAN)	M25772-001
Intel Core i3-10110U processor and 8 GB of system memory (models without WWAN)	M10743-001

Before removing the system board, follow these steps:

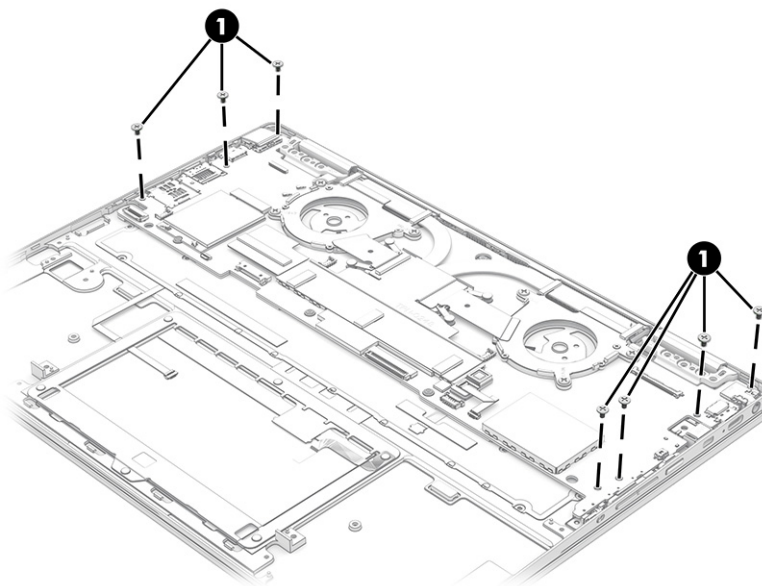
1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).

Remove the system board:

1. Disconnect the following cables from the system board:
 - Display cable **(1)**
 - Antenna cables from integrated WLAN module **(2)**
 - Fan cable **(3)**
 - Fan cable **(4)**
 - Display cable (ZIF) **(5)**
 - Keyboard backlight cable (ZIF) **(6)** (select products only)
 - Keyboard cable (ZIF) **(7)**
 - Touchpad cable (ZIF) **(8)**
 - Speaker cable **(9)**

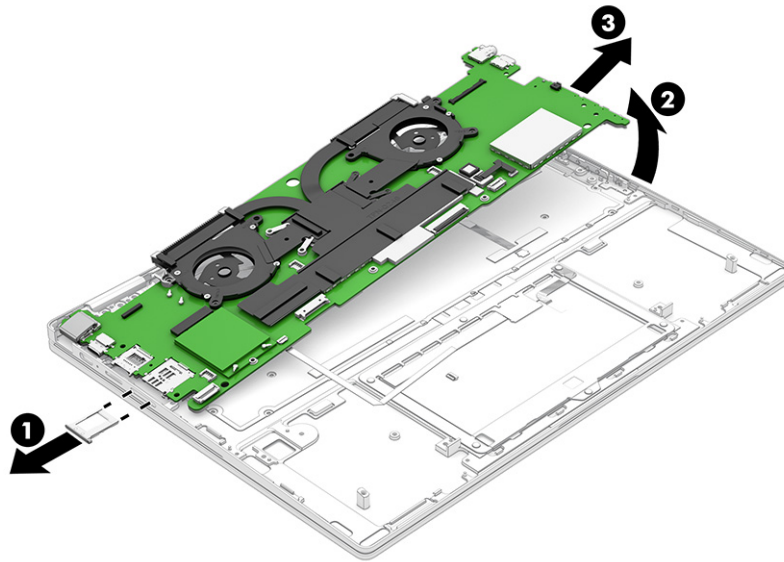


2. Remove the seven Phillips M2.0 × 2.0 screws that secure the system board to the computer.



3. Remove the insert from the SIM card slot (1).

4. Lift the front and right side of the system board **(2)**, and then pull the board up and to the right away from the connectors to remove it **(3)**.



Reverse this procedure to install the system board.

Display assembly

To remove and disassemble the display assembly, use these procedures and illustrations.

Table 5-10 Display assembly descriptions and part numbers

Description	Spare part number
Display assembly, antiglare, SVA, 400 nits	M11036-001
Display assembly, BrightView, UWVA, 400 nits	M11037-001
Display assembly, antiglare, SVA, 1000 nits, privacy	M11038-001

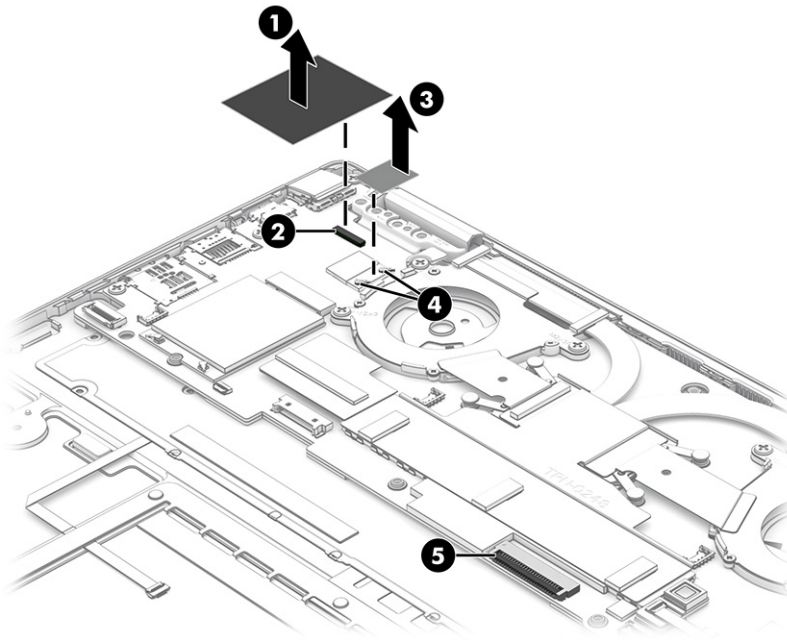
Before removing the display panel, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Disconnect the battery cable from the system board (see [Battery on page 23](#)).

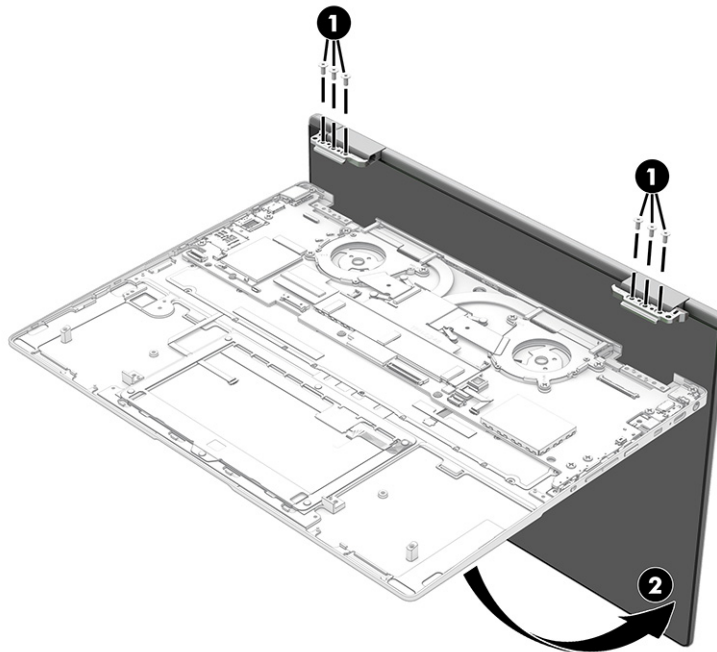
Remove the display assembly:

1. Lift the square protective cover off the left display cable and integrated WLAN module **(1)**.
2. Disconnect the left display cable from the system board **(2)**.
3. Lift the small clear plastic square protective cover from the top of the integrated WLAN module **(3)**.
4. Disconnect the antenna cables from the WLAN module **(4)**.

5. Lift the tape and disconnect the right display cable from the system board (5).



6. Remove the six Phillips M2.0 × 4.5 screws (1) that secure the display to the computer.
7. Open the computer to open the hinges, and then separate the computer from the display (2).



Reverse this procedure to replace the display assembly.

USB door

To remove the USB door, use this procedure and illustration.

Table 5-11 USB door description and part number

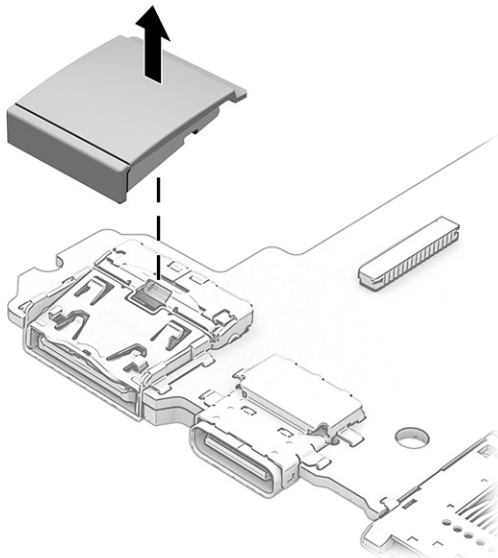
Description	Spare part number
USB door, left	M00444-001
USB door, right	M00445-001

Before removing the USB door, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).
4. Remove the system board (see [System board on page 31](#)).

Remove the USB door:

- ▲ Use a flat tool to lift and release the USB door from the system board.



To replace USB door, place the door on top of the connector and press down until it snaps into place.

Volume button

To remove the volume button, use this procedure and illustration.

Table 5-12 Volume button description and part number

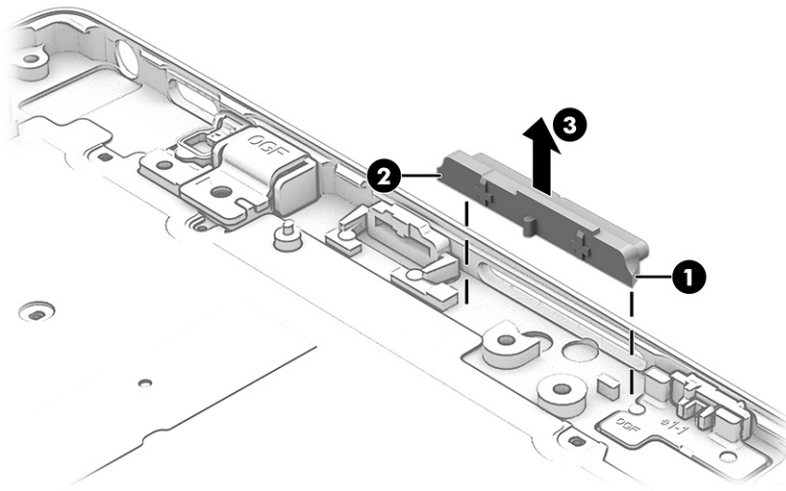
Description	Spare part number
Volume button (included in the Button Kit)	M11033-001

Before removing the volume button, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).
4. Remove the system board (see [System board on page 31](#)).

Remove the volume button:

1. Use tweezers to release the right **(1)** and left **(2)** sides of the button.
2. Remove the volume button from the computer **(3)**.



Reverse this procedure to install the volume button.

Power button

To remove the power button, use this procedure and illustration.

Table 5-13 Power button description and part number

Description	Spare part number
Power button (included in the Button Kit)	M11033-001

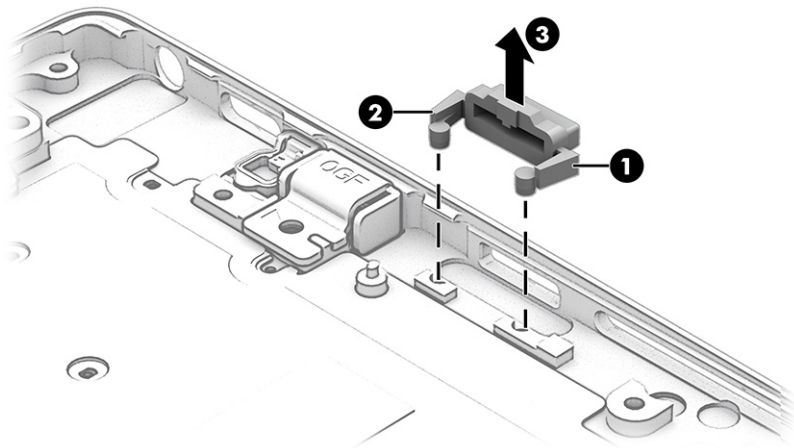
Before removing the power button, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).
4. Remove the system board (see [System board on page 31](#)).

Remove the power button:

1. Use tweezers to release the right **(1)** and left **(2)** sides of the button.

2. Remove the power button from the computer **(3)**.



Reverse this procedure to install the power button.

Lock bracket

To remove the lock bracket, use this procedure and illustration.

Table 5-14 Lock bracket description and part number

Description	Spare part number
Lock bracket (available in the Bracket Kit)	M16097-001

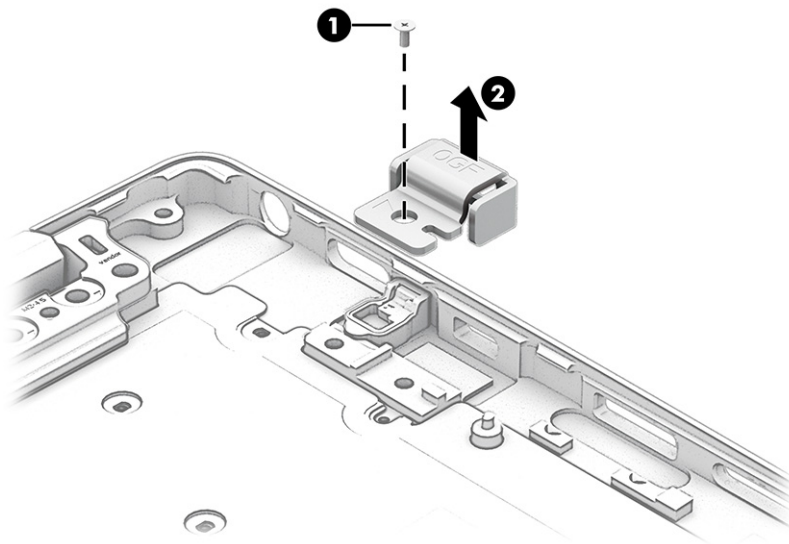
Before removing the lock bracket, follow these steps:

- 1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
- 2. Remove the bottom cover ([Bottom cover on page 22](#)).
- 3. Remove the battery (see [Battery on page 23](#)).
- 4. Remove the system board (see [System board on page 31](#)).

Remove the lock bracket:

- 1. Remove the Phillips M2.0 × 3.0 screw that secures the bracket to the computer **(1)**.

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



Reverse this procedure to install the lock bracket.

Kill switch button

To remove the kill switch button, use this procedure and illustration.

Table 5-15 Kill switch button description and part number

Description	Spare part number
Kill switch button (available in the Button Kit)	M11033-001

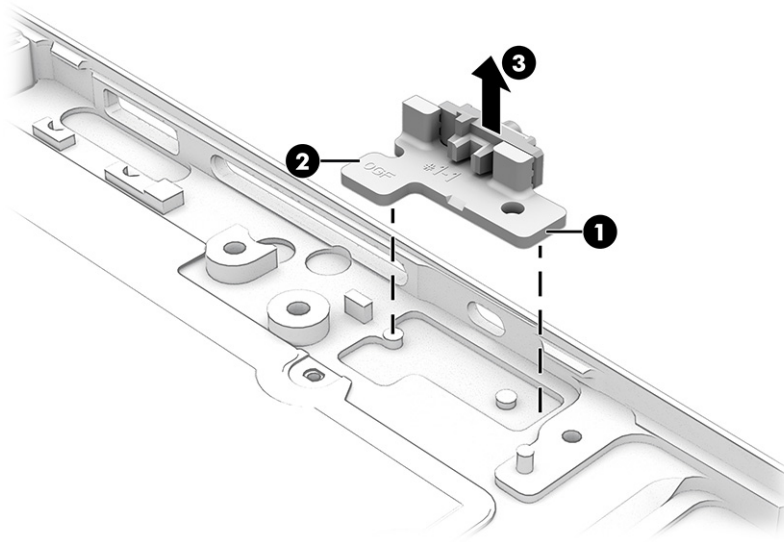
Before removing the kill switch button, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 22](#)).
2. Remove the bottom cover ([Bottom cover on page 22](#)).
3. Remove the battery (see [Battery on page 23](#)).
4. Remove the system board (see [System board on page 31](#)).

Remove the kill switch button:

1. Use tweezers to release the right (1) and left (2) sides of the button.

2. Remove the button from the computer (3).



Reverse this procedure to install the kill switch button.

Keyboard with top cover

The top cover with keyboard remains after removing all other spare parts from the computer. In this section, the first table provides the main spare part number for the top cover/keyboards. The second table provides the country codes.

Table 5-16 Keyboard with top cover descriptions and part numbers

Description	Spare part number
Keyboard with top cover, no WWAN, nonprivacy	M12710-xx1
Keyboard with top cover, no WWAN, for use in privacy models	M12711-xx1
Keyboard with top cover, for use in models with WWAN, nonprivacy	M16753-xx1
Keyboard with top cover, for use in models with WWAN, privacy	M16754-xx1

Table 5-17 Spare part 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	Iceland	-DD1	Slovenia	-BA1
Brazil	-201	India	-D61	South Korea	-AD1
Bulgaria	-261	Israel	-BB1	Spain	-071
Chile	-161	Italy	-061	Switzerland	-BG1
Czech Republic/Slovakia	-FL1	Japan	-291	Taiwan	-AB1
Denmark, Finland, and Norway	-DH1	The Netherlands	-B31	Thailand	-281

Table 5-17 Spare part country codes (continued)

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
French Canada	-DB1	Northern Africa	-FP1	Turkey	-141
France	-051	Portugal	-131	Ukraine	-BD1
Germany	-041	Romania	-271	United Kingdom	-031
Greece	-151	Russia	-251	United States	-001
Hungary	-211	Saudi Arabia	-171		

6 Backing up, resetting, and recovering

This chapter provides information about the standard procedures of backing up your personal data, resetting your computer to original factory conditions, and recovering your operating system with the Chromebook Recovery Utility.

Backing up

You can back up your data to an optional USB flash drive or SD memory card or through Google Drive™.

For detailed information about creating a backup, go to <http://www.support.google.com>

Resetting

A factory reset erases the information on your computer hard drive, including files in the Downloads folder. Before you reset, back up your files to an optional USB flash drive, to an SD memory card, or through Google Drive. The factory reset will not delete your files at these locations.

You might want to reset your computer in the following circumstances:

- You see the message "Reset this Chrome device."
- You are having problems with your user profile or settings.
- You restarted your computer, and it still doesn't work properly.
- You want to change the owner of your computer.

To reset your computer:

1. Under the **Settings** menu, select **Advanced**.
2. In the **Powerwash** section, select **Powerwash**.
3. Select **Restart**.
4. In the window that appears, select **Powerwash**, and then select **Continue**.
5. Follow the on-screen instructions to reset your computer, and sign in with your Google Account.



NOTE: The account you sign in with after you reset your computer is recognized as the owner account.


6. After you complete the reset, you can set up your computer and check to see whether the problem is fixed.

Recovering

When your Chrome OS™ doesn't work properly, you can perform a recovery. A recovery reinstalls the operating system, software programs, and original factory settings. It deletes locally saved files and saved networks for all accounts. A system recovery does not affect Google Accounts and data synced to Google Drive.



IMPORTANT: Recovery permanently erases everything on your computer hard drive, including your downloaded files. If possible, back up your files before you recover your computer.

 **NOTE:** For more information about performing a system recovery on your computer, go to <http://www.support.google.com>.

Before you begin the recovery process, you need the following prerequisites:

- A USB flash drive or SD memory card with a capacity of 4 GB or greater. All data is erased from this storage device when the recovery media is created, so back up all files from the device before you begin.
- A computer with internet access. You must also have administrative rights to the computer.
- Computer AC adapter. The computer must be plugged into AC power during recovery.
- The “Chrome OS is missing or damaged” screen displaying on your computer. If this message is not already displayed:
 - Turn on the computer, press and hold the **esc+f3** keys, and then press the power button. The computer restarts, and the screen shows the “Chrome OS is missing or damaged” screen.

Installing the Chromebook Recovery Utility

The Chromebook™ Recovery Utility recovers the original operating system and software programs that were installed at the factory. You can install this utility from the Chrome Web Store on any computer.

To install the Chromebook Recovery Utility:


- ▲ Open the Chrome Web Store, search for `chrome recovery`, select **Chromebook Recovery Utility** from the Apps list, and follow the on-screen instructions.

Creating recovery media

You can use recovery media to recover the original operating system and software programs that were installed at the factory.

To create recovery media:

1. Turn on a computer that has internet access.
-
2. Select the **Launcher** icon, and then select **All Apps**.
 3. In the Apps window, select **Recovery**, and then select **Get started**.
 4. Follow the on-screen instructions to create the recovery media.

 **NOTE:** All data and partitions on your recovery media will be deleted. Do not remove the USB flash drive or SD memory card until the process is complete.

Recovering the Chrome operating system

Use these instructions to recover the Chrome operating system on your computer using the recovery media that you created.

1. Disconnect any external devices connected to your computer, plug in the power cord, and then turn on the computer.
2. To enter recovery mode, press and hold **esc+f3**, and then press the power button. When the “Chrome OS is missing or damaged” screen appears, insert the recovery media into your computer. The recovery process begins immediately.
3. Wait while Chrome verifies the integrity of the recovery media.



NOTE: If you need to cancel the recovery during the verification process, press and hold the power button until the computer turns off. Do not disrupt the system recovery process after the verification step is complete.



NOTE: If an error message is displayed, you might need to run the Chrome Recovery Utility again or use a different USB flash drive or SD memory card.

4. When the “System Recovery is complete” message appears, remove the recovery media.

The computer restarts with Chrome OS reinstalled.

Setting up your computer after a reset or recovery

After a reset or recovery is complete, perform the initial setup process.

For details about setting up the computer, go to <http://www.support.google.com>.

Erasing and reformatting the recovery media

When you create recovery media, the USB flash drive or SD memory card is formatted as a recovery tool. After recovery, you must erase the recovery media to reuse your storage device. Follow these steps to use the Chromebook Recovery Utility to erase the recovery media.

1. Select the **Launcher** icon, and then select **All Apps**.
2. In the apps window, select **Recovery**.
3. Select the **Settings** icon, and then select **Erase recovery media**.
4. Select the USB flash drive or SD memory card that you inserted, select **Continue**, and then select **Erase now**.
5. After the recovery media is erased, select **Done** to close the Chromebook Recovery Utility, and then remove the USB flash drive or SD memory card.

The media is ready to be formatted using a formatting tool provided by your operating system.

7 Specifications

This chapter provides specifications for your computer.

Computer specifications

This section provides specifications for your computer. When traveling with your computer, the computer dimensions and weights, as well as input power ratings and operating specifications, provide helpful information.

Table 7-1 Computer specifications

	Metric	U.S.
Dimensions		
Width	294.5 mm	11.6 in
Depth	217.0 mm	8.54 in
Height, antiglare	16.7 mm	0.66 in
Height, BrightView	16.1 mm	0.63 in
Weight		
No WWAN	1333 g	2.94 lb
WWAN	1360 g	2.99 lb
Input power		
Operating voltage and current	19.5 V dc @ 3.33 A – 65 W 19.5 V dc @ 2.31 A – 45 W	
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.		

34.3 cm (13.5 in) display specifications

This section provides specifications for your display.

Table 7-2 Display specifications

	Metric	U.S.
Active diagonal size	34.3 cm	13.5 in
Resolution	1920 × 1200	
Surface treatment	Antiglare BrightView	
Brightness	1000 nits (privacy panels) 400 nits (nonprivacy panels)	
Viewing angle	UWVA	
Backlight	WLED	
Display panel interface	eDP	

8 Statement of memory volatility

For general information regarding nonvolatile memory in HP Business computers, and to restore nonvolatile memory that can contain personal data after the system has been turned off and the hard drive has been removed, use these instructions.

HP Business computer products that use Intel®-based or AMD®-based system boards contain volatile DDR memory. The amount of nonvolatile memory present in the system depends upon the system configuration. Intel-based and AMD-based system boards contain nonvolatile memory subcomponents as originally shipped from HP, with the following assumptions:

- No subsequent modifications were made to the system.
- No applications, features, or functionality were added to or installed on the system.

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



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

Current BIOS steps

Use these instructions to restore nonvolatile memory.

1. Follow these steps to restore the nonvolatile memory that can contain personal data. Restoring or reprogramming nonvolatile memory that does not store personal data is neither necessary nor recommended.
 - a. Turn on or restart the computer, and then quickly press **esc**.

NOTE: If the system has a BIOS administrator password, enter the password at the prompt.
 - b. Select **Main**, select **Apply Factory Defaults and Exit**, and then select **Yes** to load defaults. The computer restarts.
 - c. During the restart, press **esc** while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

NOTE: If the system has a BIOS administrator password, enter the password at the prompt.
 - d. Select the **Security** menu, select **Restore Security Settings to Factory Defaults**, and then select **Yes** to restore security level defaults. The computer reboots.
 - e. During the reboot, press **esc** while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

NOTE: If the system has a BIOS administrator password, enter the password at the prompt.
 - f. If an asset or ownership tag is set, select the **Security** menu and scroll down to the **Utilities** menu. Select **System IDs**, and then select **Asset Tracking Number**. Clear the tag, and then make the selection to return to the prior menu.

- g. If a DriveLock password is set, select the **Security** menu, and scroll down to **Hard Drive Utilities** under the **Utilities** menu. Select **Hard Drive Utilities**, select **DriveLock**, and then clear the check box for **DriveLock password on restart**. Select **OK** to proceed.
- h. Select the **Main** menu, and then select **Reset BIOS Security to factory default**. Click **Yes** at the warning message. The computer reboots.
- i. During the reboot, press **esc** while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.



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

- j. Select the **Main** menu, select **Apply Factory Defaults and Exit**, select **Yes** to save changes and exit, and then select **Shutdown**.
 - k. Reboot the system. If the system has a Trusted Platform Module (TPM), fingerprint reader, or both, one or two prompts will appear—one to clear the TPM and the other to Reset Fingerprint Sensor. Press or tap **f1** to accept or **f2** to reject.
 - l. Remove all power and system batteries for at least 24 hours.
2. Complete one of the following:
- Remove and retain the storage drive.
– or –
 - Clear the drive contents by using a third-party utility designed to erase data from an SSD.
– or –
 - Clear the contents of the drive by using the following BIOS Setup Secure Erase command option steps:

If you clear data using Secure Erase, you cannot recover it.

- a. Turn on or restart the computer, and then quickly press **esc**.
- b. Select the **Security** menu and scroll down to the **esc** menu.
- c. Select **Hard Drive Utilities**.
- d. Under **Utilities**, select **Secure Erase**, select the hard drive storing the data you want to clear, and then follow the on-screen instructions to continue.
– or –

Clear the contents of the drive using the following Disk Sanitizer commands steps:

- i. Turn on or restart the computer, and then quickly press **esc**.
- ii. Select the **Security** menu and scroll down to the **Utilities** menu.
- iii. Select **Hard Drive Utilities**.
- iv. Under **Utilities**, select **Disk Sanitizer**, select the hard drive with the data that you want to clear, and then follow the on-screen instructions to continue.



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

Nonvolatile memory usage

Use this table to troubleshooting nonvolatile memory usage.

Table 8-1 Troubleshooting steps for nonvolatile memory usage

Nonvolatile memory type	Amount (Size)	Does this memory store customer data?	Does this memory retain data when power is removed?	What is the purpose of this memory?	How is data entered into this memory?	How is this memory write-protected?
HP Sure Start flash (select models only)	8 MB	No	Yes	Provides protected backup of critical System BIOS code, EC firmware, and critical computer configuration data for select platforms that support HP Sure Start. For more information, see Using HP Sure Start (select products only) on page 52.	Data cannot be written to this device via the host processor. The content is managed solely by the HP Sure Start Embedded Controller.	This memory is protected by the HP Sure Start Embedded Controller.
Real Time Clock (RTC) battery backed-up CMOS configuration memory	256 bytes	No	Yes	Stores system date and time and noncritical data.	RTC battery backed-up CMOS is programmed using Computer Setup (BIOS), or by changing the Windows date & time.	This memory is not write-protected.
Controller (NIC) EEPROM	64 KB (not customer accessible)	No	Yes	Stores NIC configuration and NIC firmware.	NIC EEPROM is programmed using a utility from the NIC vendor that can be run from DOS.	A utility must be used to write data to this memory and is available from the NIC vendor. Writing data to this ROM in an inappropriate manner will render the NIC non-functional.
DIMM Serial Presence Detect (SPD) configuration data	256 bytes per memory module, 128 bytes programmable (not customer accessible)	No	Yes	Stores memory module information.	DIMM SPD is programmed by the memory vendor.	Data cannot be written to this memory when the module is installed in a computer. The specific write-protection method varies by memory vendor.
System BIOS	9 MB	Yes	Yes	Stores system BIOS code and computer configuration data.	System BIOS code is programmed at the factory. Code is updated when the system BIOS is updated. Configuration data and settings are entered using the Computer Setup (BIOS) or a custom utility.	NOTE: Writing data to this ROM in an inappropriate manner can render the computer non-functional. A utility must be used for writing data to this memory and is available

Table 8-1 Troubleshooting steps for nonvolatile memory usage (continued)

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

Questions and answers

Use this section to answer your questions about nonvolatile memory.

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



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

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

- a. Turn on or restart the computer, and then quickly press **esc**.
- b. Select **Main**, and then select **Apply Factory Defaults and Exit**.
- c. Follow the on-screen instructions.
- d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

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

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

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

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

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

3. Where is the UEFI BIOS located?

The UEFI BIOS is located on a flash memory chip. You must use a utility to write to the chip.

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

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

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

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

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



IMPORTANT: Resetting results in the loss of information.

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

- a. Turn on or restart the computer, and then quickly press **esc**.
- b. Select **Main**, and then select **Reset Security to Factory Defaults**.
- c. Follow the on-screen instructions.
- d. Select **Main**, select **Save Changes and Exit**, and then follow the on-screen instructions.

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

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

- a. Turn on or restart the computer, and then quickly press **esc**.
- b. Select the **Security** menu, select **Secure Boot Configuration**, and then follow the on-screen instructions.
- c. At the **Secure Boot Configuration** window, select **Secure Boot**, select **Clear Secure Boot Keys**, and then follow the on-screen instructions to continue.

Using HP Sure Start (select products only)

Select computer models are configured with HP Sure Start, a technology that continuously monitors your computer's BIOS for attacks or corruption.

If the BIOS becomes corrupted or is attacked, HP Sure Start restores the BIOS to its previously safe state, without user intervention. Those select computer models ship with HP Sure Start configured and enabled. HP Sure Start is configured and already enabled so that most users can use the HP Sure Start default configuration. Advanced users can customize the default configuration.

To access the latest documentation on HP Sure Start, go to <http://www.hp.com/support>.

9 Power cord set requirements

This chapter provides power cord requirements for countries and regions.

The wide-range input feature of the computer permits it to operate from any line voltage from 100 V ac to 120 V ac, or from 220 V ac to 240 V 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 or regions must meet the requirements of the country and region where the computer is used.

Requirements for all countries

These power cord 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 A and a nominal voltage rating of 125 V ac or 250 V ac, as required by the power system of each country or region.
- The appliance coupler must meet the mechanical configuration of an EN 60 320/IEC 320 Standard Sheet C13 connector for mating with the appliance inlet on the back of the computer.

Requirements for specific countries and regions

To determine power cord requirements for specific countries and regions, use this table.

Table 9-1 Power cord requirements for specific countries and regions

Country/region	Accredited agency	Applicable note number
Argentina	IRAM	1
Australia	SAA	1
Austria	OVE	1
Belgium	CEBEC	1
Brazil	ABNT	1
Canada	CSA	2
Chile	IMQ	1
Denmark	DEMKO	1
Finland	FIMKO	1
France	UTE	1
Germany	VDE	1

Table 9-1 Power cord requirements for specific countries and regions (continued)

Country/region	Accredited agency	Applicable note number
India	BIS	1
Israel	SII	1
Italy	IMQ	1
Japan	JIS	3
The Netherlands	KEMA	1
New Zealand	SANZ	1
Norway	NEMKO	1
The People's Republic of China	CCC	4
Saudi Arabia	SASO	7
Singapore	PSB	1
South Africa	SABS	1
South Korea	KTL	5
Sweden	SEMKO	1
Switzerland	SEV	1
Taiwan	BSMI	6
Thailand	TISI	1
The United Kingdom	ASTA	1
The United States	UL	2

1. The flexible cord must be Type H05VV-F, 3-conductor, 0.75 mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country or region where it will be used.
2. The flexible cord must be Type SVT/SJT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15 A, 125 V ac) or NEMA 6-15P (15 A, 250 V ac) configuration. CSA or C-UL mark. UL file number must be on each element.
3. The appliance coupler, flexible cord, and wall plug must bear a T mark and registration number in accordance with the Japanese Dentori Law. The flexible cord must be Type VCTF, 3-conductor, 0.75 mm² or 1.25 mm² conductor size. The wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V ac) configuration.
4. The flexible cord must be Type RVV, 3-conductor, 0.75 mm² conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the CCC certification mark.
5. The flexible cord must be Type H05VV-F 3-conductor, 0.75 mm² conductor size. KTL logo and individual approval number must be on each element. Approval number and logo must be printed on a flag label.
6. The flexible cord must be Type HVCTF 3-conductor, 1.25 mm² conductor size. Power cord set fittings (appliance coupler, cable, and wall plug) must bear the BSMI certification mark.
7. For 127 V ac, the flexible cord must be Type SVT or SJT 3-conductor, 18 AWG, with plug NEMA 5-15P (15 A, 125 V ac), with UL and CSA or C-UL marks. For 240 V ac, the flexible cord must be Type H05VV-F 3-conductor, 0.75 mm² or 1.00 mm² conductor size, with plug BS 1363/A with BSI or ASTA marks.

10 Recycling

When a nonrechargeable 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 website at <http://www.hp.com/recycle>.

Index

- A**
 - AC adapters, spare part numbers 14
 - action keys
 - identifying 9
- B**
 - backing up 42
 - battery
 - illustrated 12
 - spare part number 12
 - Bluetooth label 10
 - bottom cover
 - illustrated 12
 - removal 22
 - spare part number 12, 22
- C**
 - cautions
 - electrostatic discharge 17, 18
 - Chromebook Recovery Utility,
 - installing 43
 - components
 - bottom 9
 - display 6
 - keyboard area 7
 - left side 5
 - right side 4
 - computer major components 12
 - computer specifications 45
- D**
 - display
 - specifications 45, 46
- E**
 - electrostatic discharge (ESD) 17, 18
 - preventing damage 17, 18, 19
 - esc key, identifying 9
- F**
 - fan
 - illustrated 12
 - spare part number 12
 - fingerprint reader, identifying 8
 - fingerprint sensor board
 - removal 28
 - spare part numbers 28
- G**
 - grounding methods 17, 18, 20
 - guidelines
 - packaging 17, 21
 - transporting 17, 21
 - workstation 17, 18
- H**
 - hard drive
 - specifications 45
 - heat sink
 - illustrated 12
 - spare part number 12
 - heat sink with fans
 - removal 29
 - spare part numbers 29
 - HP Sure Start 47, 52
- I**
 - illustrated parts catalog 12
- K**
 - keyboard
 - product description 2
 - keyboard with top cover
 - spare part numbers 40
 - keys
 - esc 9
 - kill switch button
 - removal 39
 - spare part numbers 39
- L**
 - labels
 - Bluetooth 10
 - regulatory 10
 - serial number 10
 - service 10
 - wireless certification 10
 - WLAN 10
- M**
 - lock bracket
 - removal 38
 - spare part numbers 38
- N**
 - nonvolatile memory 47
- P**
 - packaging guidelines 17, 21
 - pointing device, product
 - description 2
 - ports
 - product description 2
 - power button
 - removal 37
 - spare part numbers 37
 - power cord
 - requirements for all countries 53
 - requirements for specific countries and regions 53
 - set requirements 53
 - power cords, spare part numbers 14
 - product description
 - keyboard 2
 - pointing device 2
 - ports 2
 - product name and number, computer 10
- R**
 - recovery media
 - creating 43
 - erase 44
 - recovery, performing 42
 - regulatory information
 - regulatory label 10
 - wireless certification labels 10

- removal and replacement
 - procedures 22
 - solid-state drive 25
- removing personal data from volatile system memory 47
- resetting 42
- S**
 - Screw Kit, spare part number 14
 - sensor board
 - removal 30
 - spare part numbers 30
 - serial number, computer 10
 - service labels, locating 10
 - solid-state drive
 - removal and replacement 25
 - spare part country codes 40
 - speaker
 - illustrated 12
 - removal 26
 - spare part number 12
 - spare part numbers 26
 - speakers, identifying 8
 - specifications
 - computer 45
 - display 45, 46
 - hard drive 45
 - static electricity 17, 18, 19
 - system board
 - illustrated 12
 - removal 31
 - spare part number 12
 - spare part numbers 31
 - system memory, removing personal data from volatile 47
 - system recovery
 - Chrome operating system 43
 - Chromebook Recovery Utility 43
 - recovery media 43
- T**
 - top cover/keyboard
 - illustrated 12
 - spare part number 12
 - touchpad
 - illustrated 12
 - removal 25
 - spare part number 12
 - spare part numbers 25
 - touchpad zone, identifying 7
- transporting guidelines 17, 21
- traveling with the computer 10
- U**
 - USB board
 - illustrated 12
 - spare part number 12
 - USB door
 - removal 35
 - spare part numbers 35
- V**
 - volume button
 - removal 36
 - spare part numbers 36
- W**
 - wireless certification label 10
 - WLAN device 10
 - WLAN label 10
 - workstation guidelines 17, 18