



Maintenance and Service Guide

SUMMARY

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

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Product notice

This 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 or versions of Windows. Systems may require upgraded and/or separately purchased hardware, drivers, software or BIOS update to take full advantage of Windows functionality. Windows 10 is automatically updated, which is always enabled. ISP fees may apply and additional requirements may apply over time for updates. Go to <http://www.microsoft.com> for details.

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

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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.

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.

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.

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1 Computer features

This chapter provides you with an overview of your computer's features.

Front

To identify the front panel components, use this illustration and table.

 **NOTE:** Your computer model might look slightly different from the illustration in this section.

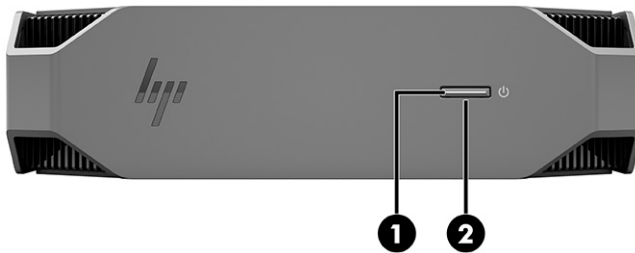



Table 1-1 Front components and their descriptions

Item	Icon	Component
1		Power button
2		Power light

Rear

To identify the rear panel components, use this illustration and table.

 **NOTE:** Your computer model might look slightly different from the illustration in this section.

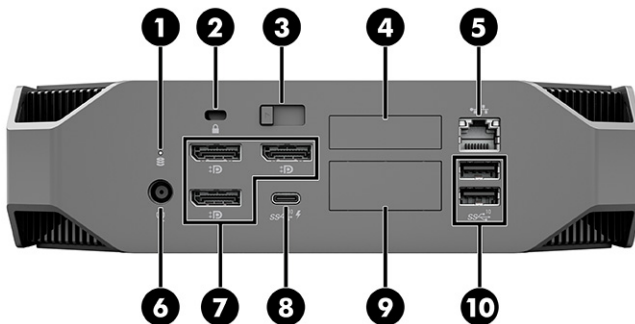









Table 1-2 Rear components and their descriptions

Item	Icon	Component	Item	Icon	Component
1		HDD activity	6		Power connector
2		Security cable slot	7		DisplayPort™ (DP) connectors (3)
3		Access panel release latch	8		USB Type-C® SuperSpeed Plus port with HP Sleep and Charge (optional)
4		Serial port (optional)	9		HP Flex IO module (optional) Supports: <ul style="list-style-type: none"> • VGA port • HDMI port • DisplayPort™ port • 2nd network jack • USB-C 3.1 Gen2 Charging Data Port <ul style="list-style-type: none"> • Dual USB Type-A 3 • Thunderbolt™ 3.0 port
5		RJ-45 (network) jack	10		USB SuperSpeedPlus ports (2)

NOTE: The labels for the rear panel connectors use industry-standard icons and colors.

NOTE: The DP ports are not supported when the system is configured with Intel® Xeon® E3-12x0 v5 processors. For all other processors, these DP ports are disabled by default when a discrete graphics card is installed.

NOTE: Simultaneous use of integrated Intel HD graphics and discrete graphics cards to drive more than two monitors can be enabled using Computer Setup. However, HP recommends using only discrete graphics cards when attaching three or more monitors.

Left

To identify the left side panel components, use this illustration and table.

 **NOTE:** Your computer model might look slightly different from the illustration in this section.

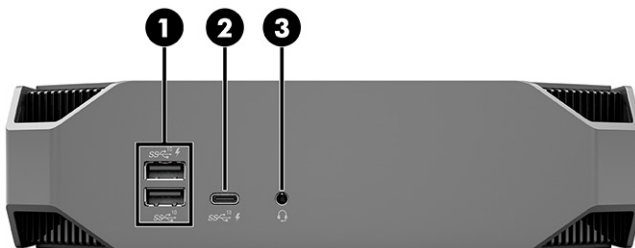





Table 1-3 Rear components and their descriptions

Item	Icon	Component
1		USB SuperSpeedPlus ports with HP Sleep and Charge (2)
2		USB Type-C SuperSpeedPlus port with HP Sleep and Charge
3		Audio-out (headphone)/Audio in (microphone) combo jack

Product specifications

Read this section to learn where to find the technical specifications about your computer.

To find the QuickSpecs for your product, go to <http://www.hp.com/go/quickspecs>, and then select the link. Select **Search all QuickSpecs**, type your model name in the search box, and then select **Go**.

– or –

Go to <http://www.hp.com/support>, and follow the instructions to find your product. Select **Product Information**, and then select your computer specifications.

2 Illustrated parts catalog

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

 **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.

Computer major components

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

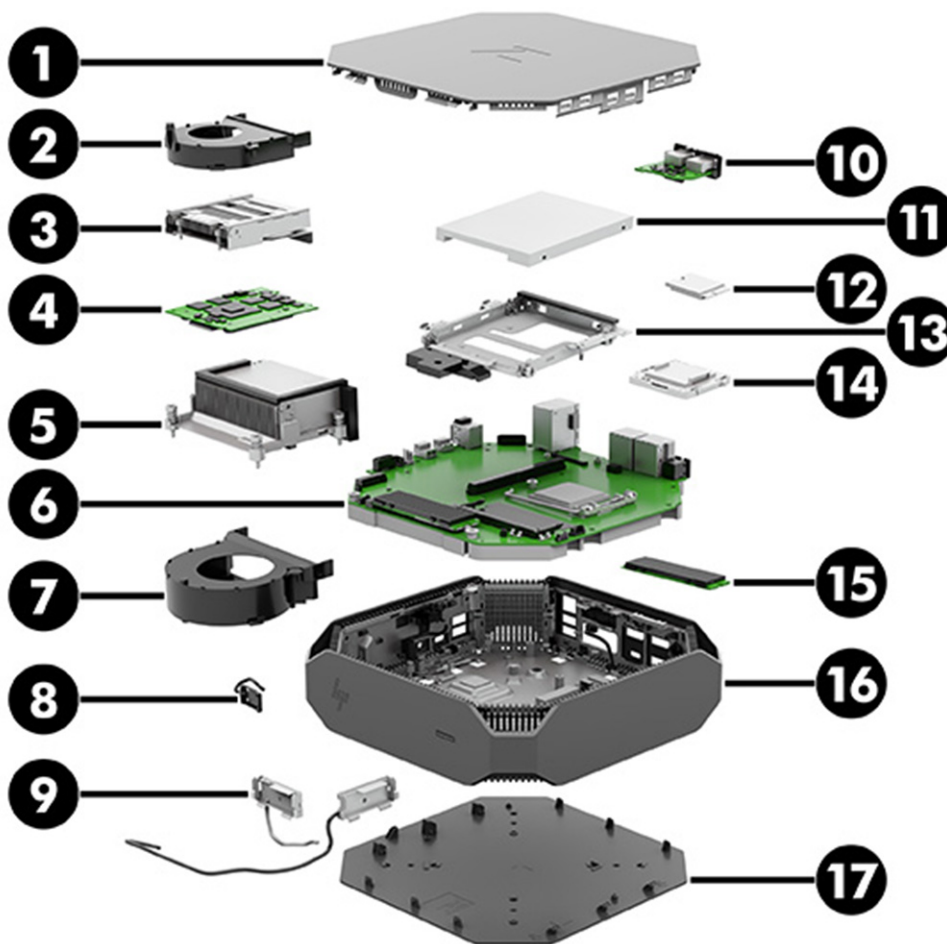


Table 2-1 Computer major components and their descriptions

Item	Description
(1)	Top cover
(2)	System fan
(3)	Graphics heat sink

Table 2-1 Computer major components and their descriptions (continued)

Item	Description
	125 W, AMD®
	125 W, NVIDIA®
	65 W - 80 W, AMD
	65 W - 80 W, NVIDIA
(4)	Graphics card
	NVIDIA Quadro® T2000
	NVIDIA Quadro T1000
	NVIDIA Quadro P620
	AMD Radeon® Pro WX 3200
(5)	Heat sink
(6)	System board (includes replacement thermal material)
	Performance
	Entry
(7)	Graphics fan
	125 W - 65 W, 28 mm
	125 W - 65 W, 18 mm
(8)	Speaker
(9)	Wireless antennas
(10)	Rear expansion port board
	Network interface controller (NIC)
	Thunderbolt 3
	Dual USB 3.1 Type-A
	USB/NIC
	Dual USB 3.1 Type-A/serial
	USB Type-C®
	HDMI
	DisplayPort
	Serial
	VGA
(11)	Hard drive
	1 TB, 7200 rpm
	500 GB, 7200 rpm
	500 GB, 7200 rpm, self-encrypting drive (SED), Opal2

Table 2-1 Computer major components and their descriptions (continued)

Item	Description
	256 GB, SATA-3, solid-state drive
(12)	WLAN module
(13)	Hard drive cage with connector
(14)	Processor (includes replacement thermal material)
	Intel® Core® i7-10900 (2.8 GHz, 20 MB Intel Smart Cache, 10 core, 65 W)
	Intel Core i7-10900K (3.7 GHz, 20 MB Intel Smart Cache, 10 core, 125 W)
	Intel Core i7-10700 (2.9 GHz, 16 MB Intel Smart Cache, 8 core, 65 W)
	Intel Core i7-10700K (3.8 GHz, 16 MB Intel Smart Cache, 8 core, 125 W)
	Intel Core i5-10600 (3.3 GHz, 12 MB Intel Smart Cache, 6 core, 65 W)
	Intel Core i5-10600K (4.1 GHz, 12 MB Intel Smart Cache, 6 core, 125 W)
	Intel Core i5-10500 (3.1 GHz, 12 MB Intel Smart Cache, 6 core, 65 W)
	Intel Core i5-10400 (2.9 GHz, 12 MB Intel Smart Cache, 6 core, 65 W)
	Intel Core i3-10320 (3.8 GHz, 8 MB Intel Smart Cache, 4 core, 65 W)
	Intel Core i3-10300 (3.7 GHz, 8 MB Intel Smart Cache, 4 core, 65 W)
	Intel Core i3-10100 (3.6 GHz, 6 MB Intel Smart Cache, 4 core, 65 W)
	Intel Xeon® W-1290P (3.7 GHz, 20 MB Intel Smart Cache, 10 core, 125 W)
	Intel Xeon W-1290 (3.2 GHz, 20 MB Intel Smart Cache, 10 core, 80 W)
	Intel Xeon W-1270P (3.8 GHz, 16 MB Intel Smart Cache, 8 core, 125 W)
	Intel Xeon W-1270 (3.4 GHz, 16 MB Intel Smart Cache, 8 core, 80 W)
	Intel Xeon W-1250P (4.1 GHz, 12 MB Intel Smart Cache, 8 core, 125 W)
	Intel Xeon W-1250 (3.3 GHz, 12 MB Intel Smart Cache, 6 core, 80 W)
	2 TB, TLC
	1 TB, TLC
	512 GB, TLC
	512 GB, TLC, self-encrypting drive (SED)
	256 GB, TLC
	256 GB, TLC, self-encrypting drive (SED)
(15)	Solid-state drive (M.2 2280, PCIe)
(16)	System chassis
	Ambient (thermal) sensor (not illustrated)
(17)	Bottom cover
	Power button board and hard drive LED cable kit (not illustrated)
	Memory modules (PC4-3200; not illustrated)

Table 2-1 Computer major components and their descriptions (continued)

Item	Description
	32 GB
	16 GB
	8 GB
	4 GB
	Memory modules (PC4-3200, ECC)
	16 GB
	8 GB
	4 GB

Mass storage devices

To identify the available hard drives and solid-state drives, use this table.

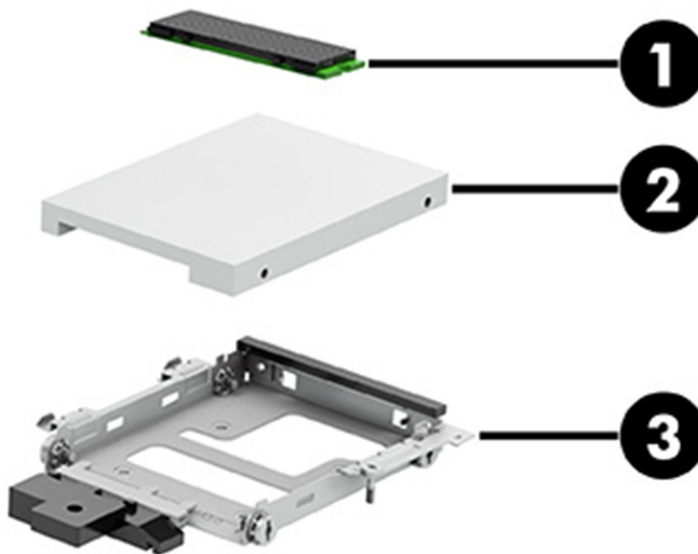


Table 2-2 Mass storage devices and their descriptions

Item	Description
(1)	Solid-state drive (M.2 2280, PCIe)
	2 TB, TLC
	1 TB, TLC
	512 GB, TLC
	512 GB, TLC, self-encrypting drive (SED)
	512 GB, value
	512 GB + 32 GB Optane™ memory

Table 2-2 Mass storage devices and their descriptions (continued)

Item	Description
	256 GB, TLC
	256 GB, TLC, self-encrypting drive (SED)
	256 GB, value
	256 GB + 16 GB Optane memory
	128 GB, TLC
	16 GB Optane memory module
(2)	Hard drive
	2 TB, 5400 rpm
	1 TB, 7200 rpm
	500 GB, 7200 rpm
	500 GB, 7200 rpm, self-encrypting drive (SED), Opal2
	500 GB, 7200 rpm, FIPS
(3)	Hard drive cage

Miscellaneous parts

To identify the various computer parts, use this table.

Table 2-3 Miscellaneous parts and their descriptions


Description
SATA data and power cable (for use with the hard drive)
Adapter
USB-C-to-DisplayPort
USB-C-to-HDMI 2.0
USB-C-to-VGA
DisplayPort-to-HDMI 2.0
DisplayPort-to-DVI
HP Premium Wireless Mouse
HP USB Premium Mouse
Keyboard
Wireless keyboard and mouse
USB, slim, smartcard
Wireless premium Keyboard
USB Premium Keyboard
Power cord (C5)

Table 2-3 Miscellaneous parts and their descriptions (continued)

Description
AC adapter (7.4 mm, PFC)
280 W
180 W

3 Routine care, SATA drive guidelines, and disassembly preparation

This information provides general service information for the computer. Adherence to the procedures and precautions is essential for proper service.


 **IMPORTANT:** When the computer is plugged into an AC power source, voltage is always applied to the system board. You must disconnect the power cord from the power source before opening the computer to prevent system board or component damage.

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 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

This table shows how humidity affects the electrostatic voltage levels generated by different activities. A product can be degraded by 700 V.

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

Table 3-1 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

Table 3-1 Static electricity occurrence based on activity and humidity (continued)

	Relative humidity		
	400 V	700 V	2,000 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.

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 this equipment to 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 3-2 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 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 the these 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

Operating guidelines

This information details how to prevent overheating and to help prolong the life of the computer.

- Keep the computer away from excessive moisture, direct sunlight, and extremes of heat and cold.
- Operate the computer on a sturdy, level surface. Leave a 10.2 cm (4 inch) clearance on all vented sides of the computer and above the monitor to permit the required airflow.
- Never restrict the airflow into the computer by blocking any vents or air intakes. Do not place the keyboard, with the keyboard feet down, directly against the front of the desktop unit as this also restricts airflow.
- Occasionally clean the air vents on all vented sides of the computer. Lint, dust, and other foreign matter can block the vents and limit the airflow. Be sure to unplug the computer before cleaning the air vents.
- Never operate the computer with the cover or side panel removed.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's recirculated or preheated air.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed previously still apply.
- Keep liquids away from the computer and keyboard.
- Never cover the ventilation slots on the monitor with any type of material.
- Install or enable power management functions of the operating system or other software, including Sleep states.

Routine care

Use this information to properly care for your computer.

General cleaning safety precautions

Use this information to safely clean your computer.

1. Never use solvents or flammable solutions to clean the computer.
2. Never immerse any parts in water or cleaning solutions; apply any liquids to a clean cloth and then use the cloth on the component.
3. Always unplug the computer when cleaning with liquids or damp cloths.
4. Always unplug the computer before cleaning the keyboard, mouse, or air vents.
5. Disconnect the keyboard before cleaning it.
6. Wear safety glasses equipped with side shields when cleaning the keyboard.

Cleaning the computer case

Follow all safety precautions before cleaning the computer case.

To clean the computer case, follow these procedures:

- To remove light stains or dirt, use plain water with a clean, lint-free cloth or swab.
- For stronger stains, use a mild dishwashing liquid diluted with water. Rinse well by wiping it with a cloth or swab dampened with clear water.
- For stubborn stains, use isopropyl (rubbing) alcohol. No rinsing is needed because the alcohol evaporates quickly and does not leave a residue.


- After cleaning, always wipe the unit with a clean, lint-free cloth.
- Occasionally clean the air vents on the computer. Lint and other foreign matter can block the vents and limit the airflow.

Cleaning the keyboard


Use this information to properly clean the keyboard. Follow all safety precautions before cleaning the keyboard.

To clean the tops of the keys or the keyboard body, follow the procedures described in [Cleaning the computer case on page 13](#).

When cleaning debris from under the keys, review all rules in [General cleaning safety precautions on page 13](#) before following these procedures.

 **CAUTION:** Use safety glasses equipped with side shields before attempting to clean debris from under the keys.

- You can remove visible debris underneath or between the keys by vacuuming or shaking.
- You can use canned, pressurized air to clean debris from under the keys. Use caution because too much air pressure can dislodge lubricants applied under the wide keys.
- If you remove a key, use a specially designed key puller to prevent damage to the keys. This tool is available through many electronic supply outlets.

 **IMPORTANT:** Never remove a wide leveled key (like the space bar) from the keyboard. If these keys are improperly removed or installed, the keyboard might not function properly.

- You can clean under a key with a swab moistened with isopropyl alcohol and squeezed out. Be careful not to wipe away lubricants necessary for proper key functions. Use tweezers to remove any fibers or dirt in confined areas. Allow the parts to air dry before reassembly.

Cleaning the monitor

Use this information to properly clean the monitor.

- Wipe the monitor screen with a clean cloth moistened with water or with a towelette designed for cleaning monitors. Do not use sprays or aerosols directly on the screen; the liquid can seep into the housing and damage a component. Never use solvents or flammable liquids on the monitor.
- To clean the monitor body, follow the procedures in [Cleaning the computer case on page 13](#).

Cleaning the mouse

Use this information to properly clean the mouse.

Before cleaning the mouse, be sure that the power to the computer is turned off.

- Clean the mouse ball by first removing the retaining plate and the ball from the housing. Pull out any debris from the ball socket and wipe the ball with a clean, dry cloth before reassembly.
- To clean the mouse body, follow the procedures in [Cleaning the computer case on page 13](#).

Service considerations

Keep these considerations in mind during the disassembly and assembly of the computer.

Tools and software requirements

Servicing the computer requires these tools.

- Torx T-15 screwdriver
- Flat-bladed screwdriver (can sometimes be used in place of the Torx screwdriver)
- Phillips P1 screwdriver
- Nonconductive, nonmarking pry tool
- Diagnostics software

Screws

The screws used in the computer are not interchangeable. They could have standard or metric threads and might be of different lengths.

If you use an incorrect screw during the reassembly process, it can damage the unit. HP strongly recommends that you keep all screws that you remove during disassembly with the removed part and then return them to their proper locations.



IMPORTANT: As you remove each subassembly from the computer, place it away from the work area to prevent damage.

Cables and connectors

Use this information properly handle cables.

Apply only the tension required to seat or unseat the cables during insertion or removal from the connector. Handle cables by the connector whenever possible. In all cases, avoid bending or twisting the cables, and route the cables so that they cannot be caught or snagged by parts being removed or replaced.



IMPORTANT: When servicing this computer, be sure to place cables in their proper location during the reassembly process. Improper cable placement can damage the computer.

Hard drives

Handle hard drives as delicate, precision components, avoiding all physical shock and vibration. This advice applies to failed drives as well as replacement spares.

- If a drive must be mailed, place the drive in a bubble-pack mailer or other suitable protective packaging and label the package “Fragile: Handle With Care.”
- Do not remove hard drives from the shipping package for storage. Keep hard drives in their protective packaging until they are actually mounted in the computer.
- Avoid dropping drives from any height onto any surface.
- If you are inserting or removing a hard drive, turn off the computer. Do not remove a hard drive while the computer is on or in standby mode.
- Before handling a drive, ensure that you are discharged of static electricity. While handling a drive, avoid touching the connector.
- Do not use excessive force when inserting a drive.
- Avoid exposing a hard drive to liquids, temperature extremes, or products that have magnetic fields such as monitors or speakers.

Lithium coin cell battery

The battery that comes with the computer provides power to the real-time clock and has a minimum lifetime of approximately three years.

See the appropriate removal and replacement chapter for the chassis that you are working on for instructions on the replacement procedures.

⚠ WARNING! This computer contains a lithium battery. There is a risk of fire and chemical burn if the battery is handled improperly. Do not disassemble, crush, puncture, short external contacts, dispose of in water or fire, or expose it to temperatures higher than 140°F (60°C). Do not attempt to recharge the battery.

📝 NOTE: Do not dispose of batteries, battery packs, and accumulators with general household waste. To forward them to recycling centers or proper disposal, use the public collection system or return them to HP, their authorized partners, or their agents.

SATA hard drives

The Self Monitoring Analysis and Recording Technology (SMART) ATA drives for the HP Personal Computers have built-in drive failure prediction that warns the user or network administrator of an impending failure or crash of the hard drive.

The SMART drive tracks fault prediction and failure indication parameters such as reallocated sector count, spin retry count, and calibration retry count. If the drive determines that a failure is imminent, it generates a fault alert.

Table 3-3 SATA hard drive characteristics

Serial ATA hard drive characteristics	
Number of pins/conductors in data cable	7/7
Number of pins in power cable	15
Maximum data cable length	100 cm (39.37 in)
Data interface voltage differential	400 mV–700 mV
Drive voltages	3.3 V, 5 V, 12 V
Jumpers for configuring drive	N/A
Data transfer rate	6.0 Gbps

Always use an HP-approved SATA 6.0 Gbps cable because it is fully backwards compatible with the SATA 1.5 Gbps drives. Current HP desktop products ship with SATA 6.0 Gbps hard drives.

SATA data cables are susceptible to damage if overflexed. Never crease a SATA data cable and never bend it tighter than a 30 mm (1.18 in) radius.

The SATA data cable is a thin, seven-pin cable designed to transmit data for only a single drive.


Cable management

Always follow good cable management practices when working inside the computer.

- Keep cables away from major heat sources like the heat sink.
- Keep cables clear of sliding or moveable parts to prevent them from being cut or crimped when the parts are moved.
- When folding a flat ribbon cable, never fold to a sharp crease. Sharp creases can damage the wires.
- Do not bend any cable sharply. A sharp bend can break the internal wires.
- Never bend a SATA data cable tighter than a 30 mm (1.18 in) radius.
- Never crease a SATA data cable.

4 Removal and replacement procedures

Adherence to these procedures and precautions is essential for proper service. After completing all necessary removal and replacement procedures, run the Diagnostics utility to verify that all components operate properly.

 **NOTE:** Not all features listed in this guide are available on all computers.


 **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.

Preparation for disassembly

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

See [Routine care, SATA drive guidelines, and disassembly preparation on page 10](#) 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.

 **IMPORTANT:** Turn off the computer before disconnecting any cables.

Regardless of the power state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. In some systems, the cooling fan is on even when the computer is in the Standby or Suspend modes. Always disconnect the power cord before servicing a unit.

2. Disconnect the power from the computer by unplugging the power cord from the computer.
3. Disconnect all external devices from the computer
4. If the computer is on a stand, remove the computer from the stand.

 **CAUTION:** Beware of sharp edges inside the chassis.

 **NOTE:** During disassembly, label each cable as you remove it, and note its position and routing. Keep all screws with the removed components.

Top cover

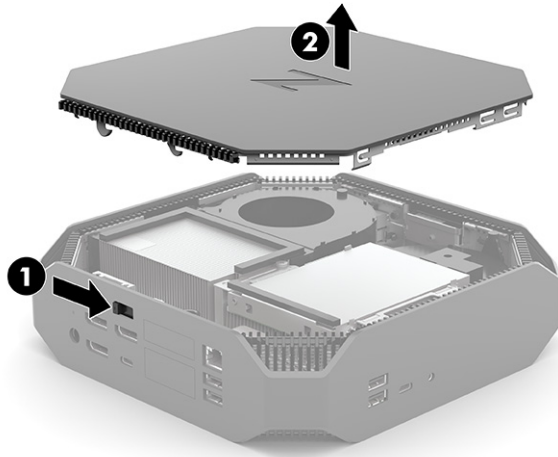
To remove the top cover, use these procedures.

Before removing the top cover, follow these steps:

- ▲ Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).

Remove the top cover:

- ▲ Slide the release latch **(1)**, and then lift the top cover off the computer **(2)**.



To install the top cover, reverse the removal procedure.

Locating internal components

Use this section to locate basic internal components.

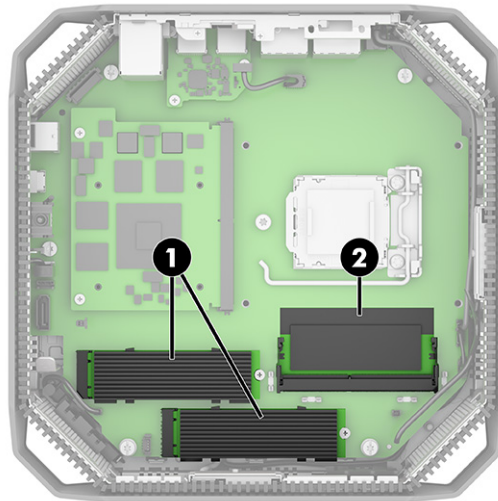


Table 4-1 Top internal components

Component	
(1)	Solid-state drives
(2)	Memory module (secondary)

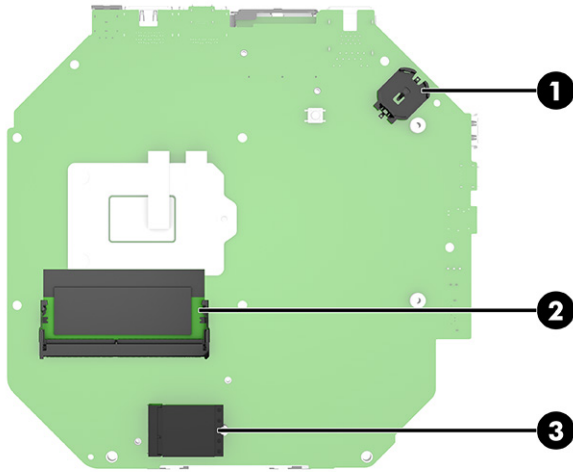


Table 4-2 Bottom internal components

Component	
(1)	RTC battery
(2)	Memory module (primary)
(3)	WLAN module

Memory modules (SODIMMs)

The computer offers two memory modules, one of the top, one on the bottom of the system board. To remove the memory modules, use this information and procedures.

The memory sockets on the system board can be populated with up to two industry-standard SODIMMs. These memory sockets are populated with at least one preinstalled SODIMM. To achieve the maximum memory support, you can populate the system board with up to 64 GB of memory.

Table 4-3 Memory module specifications


Component	Specification
Memory modules	1.2 volt DDR4-SDRAM memory modules
Compliance	Unbuffered non-ECC DDR4-3200 MHz-compliant
	Unbuffered ECC DDR4-3200 MHz-compliant
Pins	Industry-standard 260-pin containing the mandatory Joint Electronic Device Engineering Council (JEDEC) specification
Slots	2
Maximum memory	64 GB
Supported	2 Gbit, 4 Gbit, 8 Gbit, and 16 Gbit non-ECC memory technologies single-sided and double-sided memory modules

NOTE: The system does not operate properly if you install unsupported memory modules. Memory modules constructed with ×8 and ×16 DDR devices are supported; memory modules constructed with ×4 SDRAM are not supported.

Use this information to correctly populate SODIMM sockets:

There are two SODIMM sockets on the system board, with one socket per channel. The sockets are labeled DIMM1 and DIMM3. The DIMM1 socket operates in memory channel B. The DIMM3 socket operates in memory channel A.

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR4-SDRAM) small outline dual inline memory modules (SODIMMs).

 **IMPORTANT:** You must disconnect the power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power state, voltage is always supplied to the memory modules as long as the computer is plugged into an active AC outlet. Adding or removing memory modules while voltage is present can cause irreparable damage to the memory modules or system board.

IMPORTANT: When handling a memory module, be careful not to touch any of the contacts. Doing so can damage the module.

The memory module sockets have gold-plated metal contacts. When upgrading the memory, use memory modules with gold-plated metal contacts to prevent corrosion, oxidation, or both, resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, be sure that you are discharged of static electricity by briefly touching a grounded metal object.

Table 4-4 Memory module socket locations

Location	Description	System Board Label
Top of system board	SODIMM1 socket, channel B	DIMM1
Bottom of system board	SODIMM3 socket, channel A	DIMM3

The system automatically operates in single-channel mode, dual-channel mode, or flex mode, depending on how the SODIMMs are installed.

- The system operates in single-channel mode if the SODIMM sockets are populated in one channel only.
- The system operates in a higher-performing dual-channel mode if the memory capacity of the SODIMM in channel A is equal to the memory capacity of the SODIMM in channel B.
- The system operates in flex mode if the memory capacity of the SODIMM in channel A is not equal to the memory capacity of the SODIMM in channel B. In flex mode, the channel populated with the least amount of memory describes the total amount of memory assigned to dual channel and the remainder is assigned to single channel. If one channel has more memory than the other, assign the larger amount to channel A.
- In any mode, the maximum operational speed is determined by the slowest SODIMM in the system.

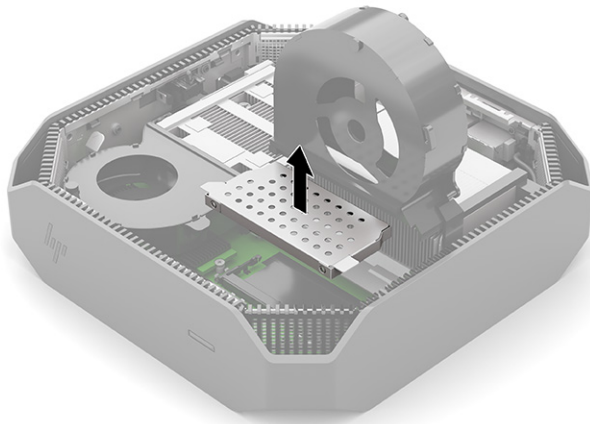
Before replacing the memory modules, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover ([Top cover on page 18](#)).
3. Locate the memory modules ([Locating internal components on page 19](#)).

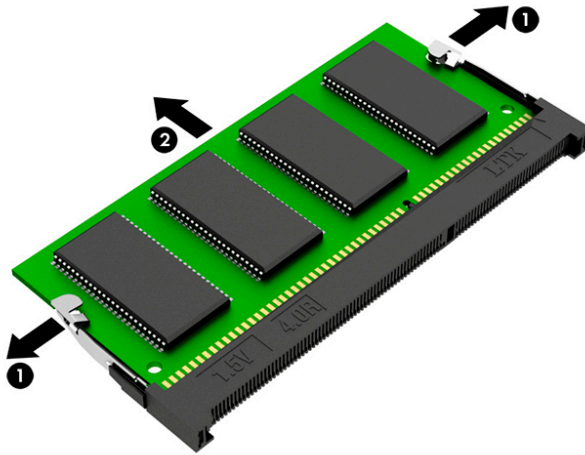
The primary memory module is located on the bottom of the system board. The secondary memory module is located on the top of the system board.

Remove a memory module:

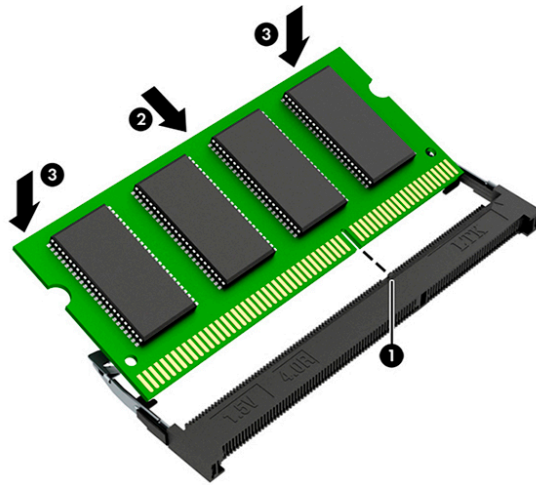
1. **To access the secondary memory module on the top of the system board:** Tilt the fan up and leave it in the up position, and then lift the memory cover off the memory module.




2. **To access the primary memory module on the bottom of the system board:** Remove the bottom cover (see [Bottom cover on page 34](#)).
3. To remove a SODIMM, press outward on the two latches on each side of the SODIMM (1), and then pull the SODIMM out of the socket (2).



- Slide the new SODIMM into the socket at approximately a 30° angle **(1)**, and then press the SODIMM down **(2)** so that the latches lock it in place.



 **NOTE:** A memory module can be installed in only one way. Match the notch on the module with the tab on the memory socket.

The computer automatically recognizes the additional memory when you turn on the computer.

Solid-state drive

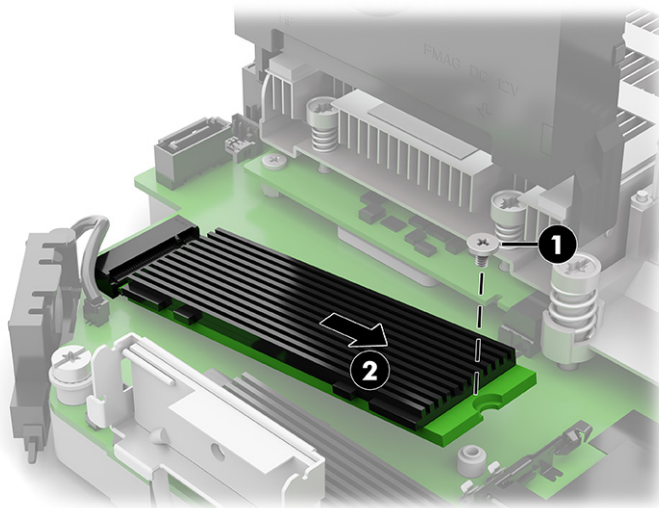
To remove the solid-state drive, use these procedures.

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

- Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
- Remove the top cover (see [Top cover on page 18](#)).
- Locate the solid-state drives ([Locating internal components on page 19](#)).

Remove a solid-state drive:


- Remove the screw that secures the drive to the system board **(1)**.
- Pull the drive out of the system board connector **(2)**. Use the same removal procedure for both drives.



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

Hard drive

To remove the hard drive, use these procedures.

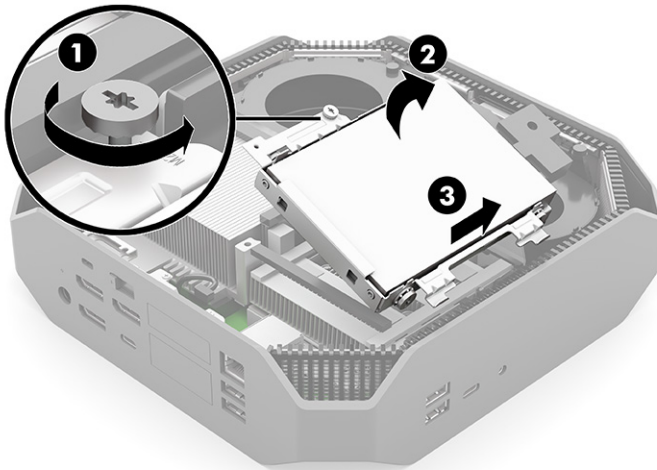
 **NOTE:** Before you remove the old hard drive, be sure to back up the data from the old hard drive so that you can transfer the data to the new hard drive.

Before removing the hard drive, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover ([Top cover on page 18](#)).

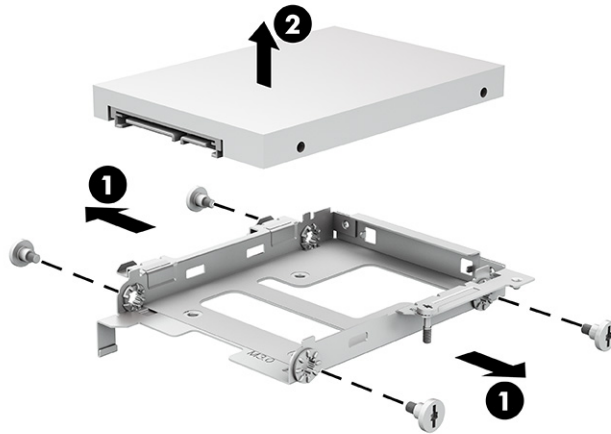
Remove the hard drive:

1. Disconnect the cable from the drive.
2. Loosen the captive Torx screw **(1)** that secures the drive.
3. Rotate the hard drive assembly up **(2)**, and then remove it from the computer **(3)**.



4. Remove the four Torx screws **(1)** that secure the hard drive to the drive cage.

5. Remove the hard drive from the cage **(2)**.



Graphics fan, heat sink, and card

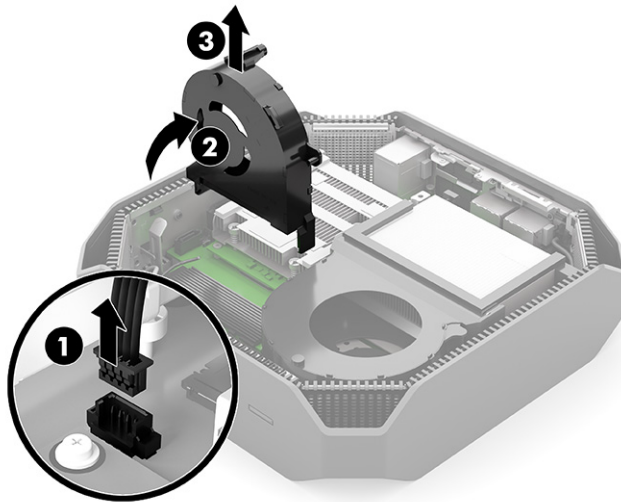
To remove graphics fan, heat sink, and card, use these procedures.

Before replacing the graphics card, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).

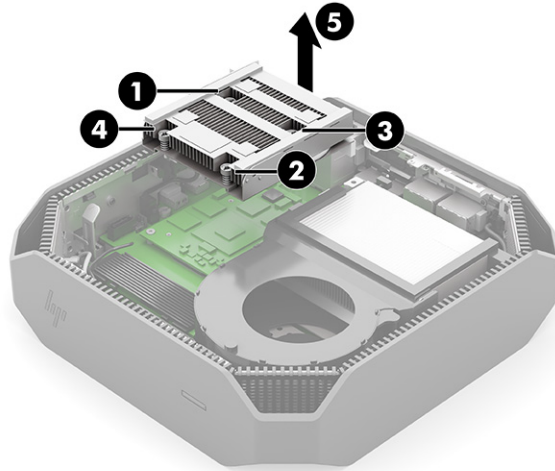
To replace the graphics fan, heat sink, and card:

1. Disconnect the fan cable from the system board **(1)**.
2. Rotate the top of the fan upright **(2)**, and then remove the fan from the computer **(3)**.

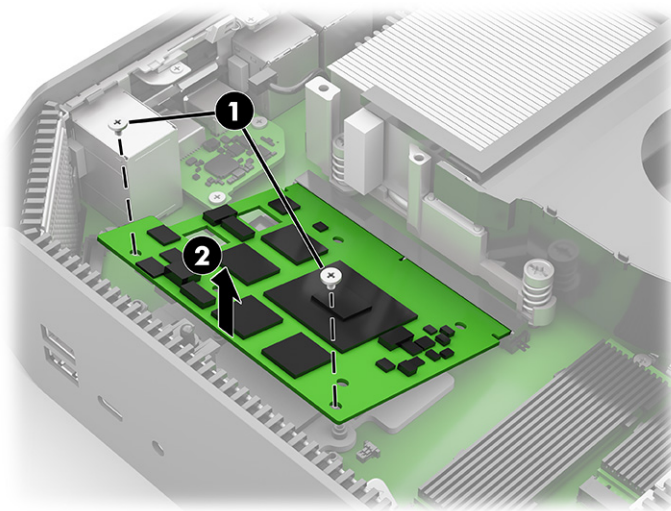


3. In the order indicated on the heat sink, loosen the four captive Phillips screws that secure the heat sink to the computer **(1) - (4)**.

4. Remove the heat sink from the computer **(5)**.



5. Remove the two Phillips screws from the graphics card **(1)**, and then rotate the card up and remove it from the socket **(2)**.



To install the graphics card, reverse the removal procedure.

Speaker

To remove the speaker, use these procedures.

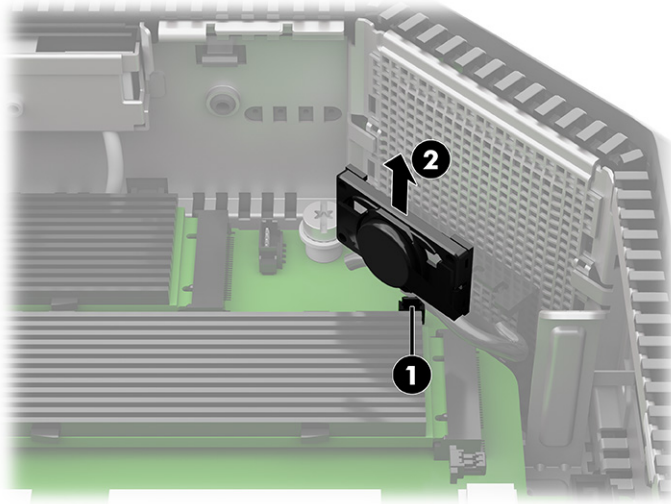
Before removing the speaker, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).

Remove the speaker:

1. Disconnect the speaker cable from the system board connector **(1)**.

2. Pull up on the speaker to remove it from the computer **(2)**.



To install the speaker, reverse the removal procedures.

Fan

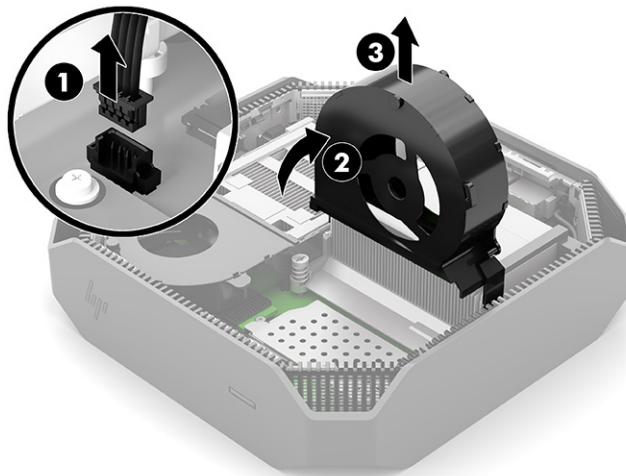
To remove the fan, use these procedures.

Before removing the fan, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).

Remove the fan:

1. Disconnect the fan cable from the system board connector **(1)**.
2. Rotate the top of the fan upright **(2)**, and then remove it from the computer **(3)**.



To install the fan, reverse the removal procedure.

Thermal sensor

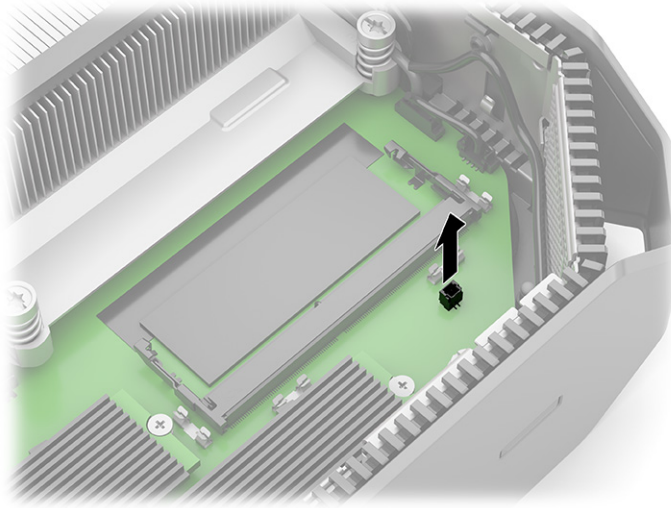
To remove the thermal sensor, use these procedures.

Before removing the thermal sensor, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the fan ([Fan on page 27](#)).

Remove the thermal sensor:

- ▲ Pull straight up to disconnect the thermal sensor from the system board.



To install the thermal sensor, reverse the removal procedure.

Rear expansion port board

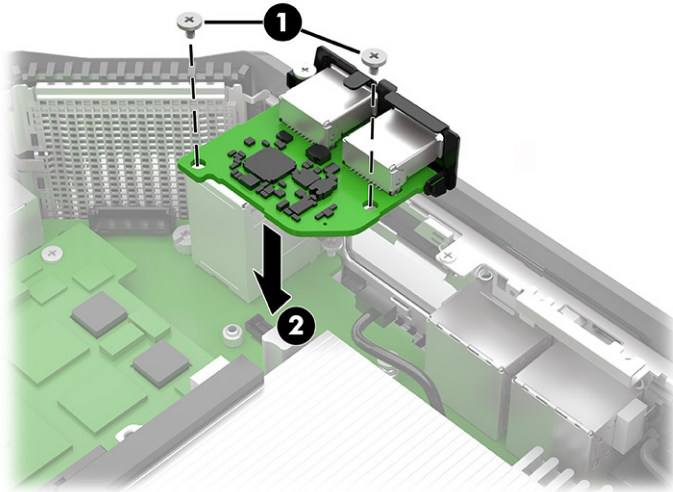
To remove rear expansion port board, use these procedures.

Before removing rear expansion port board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).

Remove rear expansion port board:


- ▲ Remove the two Phillips screws that secure the board to the computer **(1)**, and then lift the board to disconnect it from the connector **(2)** on the system board. You might need to use a tool to release the board.



To install rear expansion port board, reverse the removal procedure.

Processor heat sink

To remove the processor heat sink, use these procedures.

 **IMPORTANT:** The bond between the heat sink and the processor can be very tight.

If the computer will turn on, before removing the heat sink, turn on the computer until it warms the heat sink. Warming the heat sink loosens the bond between the heat sink and the processor, thereby making it easier to separate them.

Make sure not to pull the processor out of the socket when you lift the heat sink, especially if you cannot warm the heat sink before removal. Inadvertently removing the processor can damage the pins.


Before removing the heat sink, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the fan ([Fan on page 27](#)).


Remove the processor heat sink:

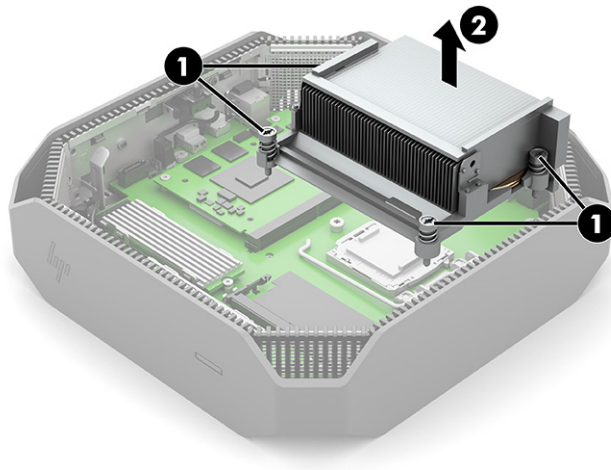
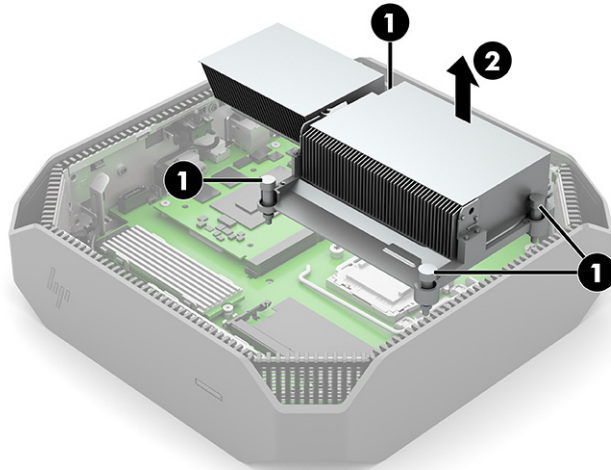
1. In the order indicated on the heat sink, loosen the four captive Torx screws **(1)**.

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

 **IMPORTANT:** Be sure to loosen the screws in the order indicated by the numbers stamped on the heat sink.

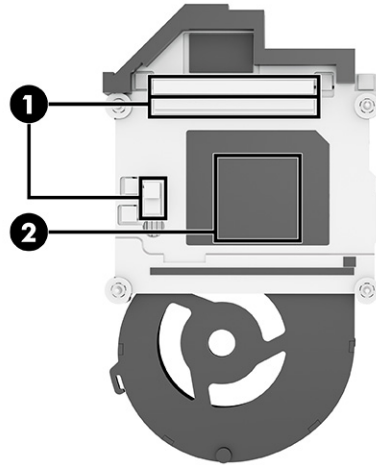
IMPORTANT: For optimum thermal performance, be sure not to touch the thermal grease on the surface of the processor or the heat sink.


 **NOTE:** Refer to the heat sink that matches your computer.



3. 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.



 **IMPORTANT:** Tighten heat sink retaining screws in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor to avoid damage that could require replacing the system board.

To replace the processor heat sink, reverse the removal procedures.

Processor

To remove the processor, use these procedures.


Before removing the processor, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the fan ([Fan on page 27](#)).
4. Remove the heat sink ([Processor heat sink on page 29](#)).

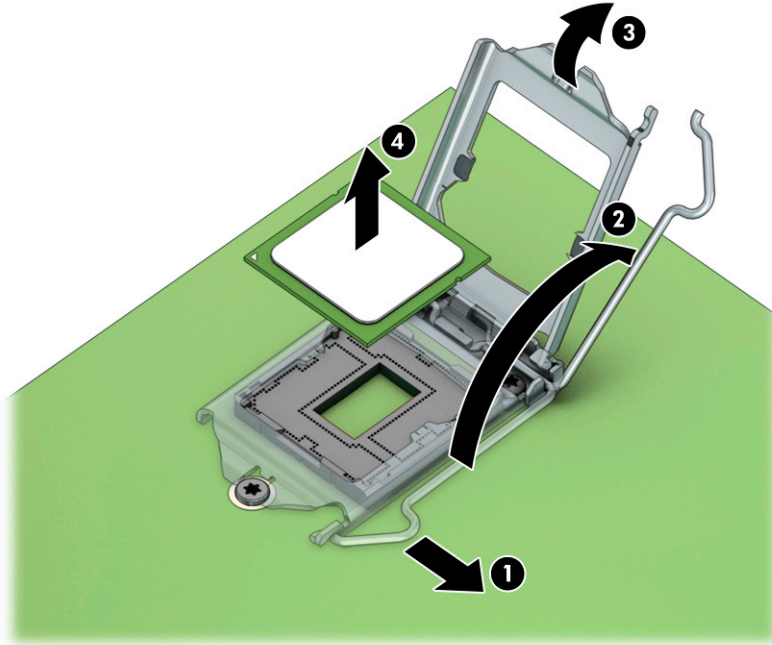
Remove the processor:

1. Pull the locking lever away from the processor **(1)**, and then rotate the lever to its full open position **(2)**.
2. Raise and rotate the microprocessor retainer to its fully open position **(3)**.


- Carefully lift the processor from the socket **(4)**.

 **IMPORTANT:** Do not handle the pins in the processor socket. These pins are fragile, and handling them could cause irreparable damage. If pins are damaged, you might have to replace the system board.

The heat sink must be installed within 24 hours of installing the processor to prevent damage to the processor's solder connections.



To replace the processor, reverse the removal procedures.

 **NOTE:** After installing a new processor onto the system board, always update the system ROM to ensure that the latest version of the BIOS is being used on the computer. For more information, see: <https://support.hp.com/us-en/document/c06366640>.

Power button board

To remove power button board, use these procedures.

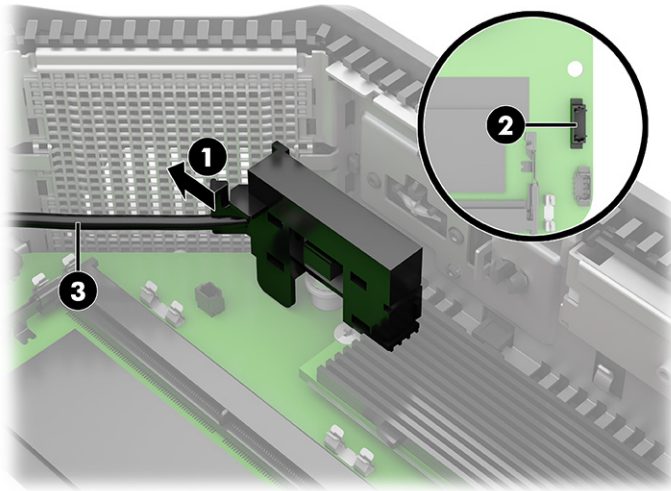
Before removing power button board, follow these steps:

- Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
- Remove the top cover (see [Top cover on page 18](#)).
- Remove the fan ([Fan on page 27](#)).

Remove power button board:

- Pull the side of the board to release it **(1)**.
- Disconnect the cable from the system board **(2)**.

3. Pull the cable out from its routing on the side of the computer **(3)**, and then remove the board from the computer.



To install the power button board, reverse the removal procedure.

System board

To remove the system board, use these procedures.



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

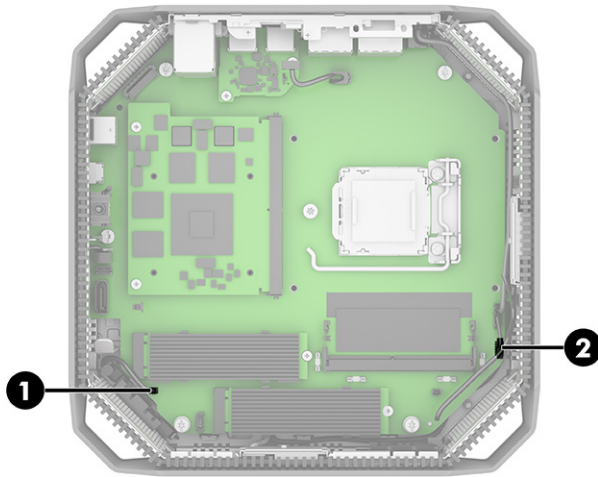
Before removing the system board, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the bottom cover (see [Bottom cover on page 34](#)).
4. Remove the memory modules (top and bottom of the system board) ([Memory modules \(SODIMMs\) on page 20](#)).
5. If applicable, remove the hard drive ([Hard drive on page 24](#)).
6. Remove the fan ([Fan on page 27](#)).
7. Remove the thermal sensor ([Thermal sensor on page 28](#)).
8. Remove the graphics fan, graphics heat sink, and graphics card ([Graphics fan, heat sink, and card on page 25](#)).
9. If applicable, remove rear expansion port board ([Rear expansion port board on page 28](#)).
10. Remove the processor heat sink ([Processor heat sink on page 29](#)).
11. Remove the processor ([Processor on page 31](#)).
12. Remove the WLAN module (from the bottom of the system board) ([WLAN module on page 36](#)).

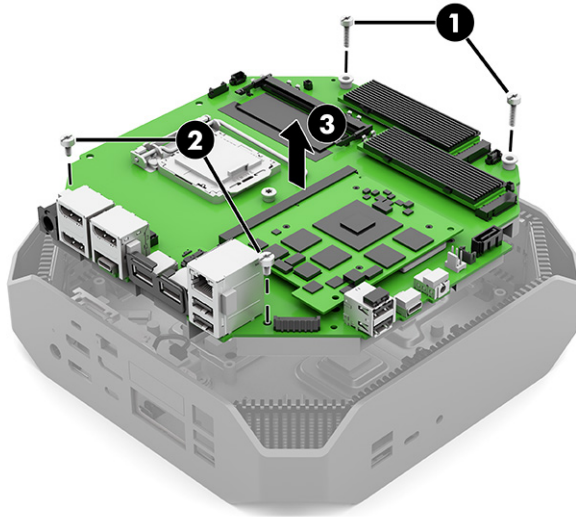
Remove the system board:

1. Disconnect the speaker cable from the system board **(1)**.

2. Disconnect the power button board cable from the system board (2).



3. Remove two longer screws from the front of the system board (1).
4. Remove two shorter screws from the rear of the system board (2).
5. Remove the system board from the computer (3).



To install the system board, reverse the removal procedures.



NOTE: When replacing the system board, you must change the chassis serial number in the BIOS.

When replacing the system board, you must reprogram the SMBIOS information about the affected computer. Failure to reprogram the board will result in eventual failure, such as an activation failure (when you would have to reactivate the computer) or a system recovery failure.

Update the SMBIOS information in Computer Setup.

Bottom cover

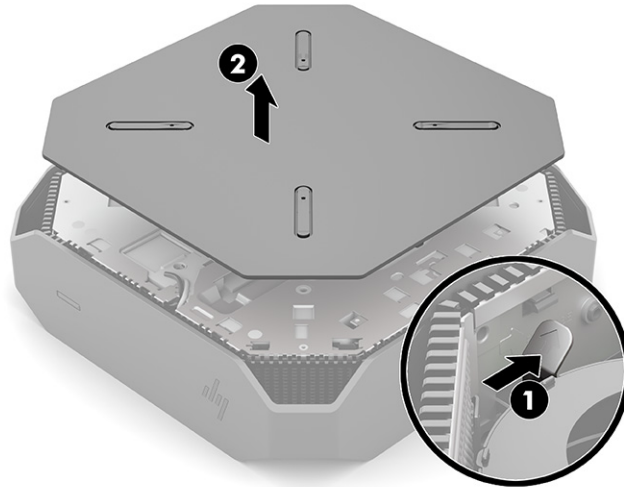
To remove the bottom cover, use these procedures.

Before removing the bottom cover, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).

Remove the bottom cover:

- ▲ From the inside of the computer, press the bottom cover release latch **(1)**, and then pull the bottom cover off the computer **(2)**.



To install the bottom cover, reverse the removal procedure.

Battery

The battery is located on the bottom of the system board. The battery that comes with the computer provides power to the real-time clock. When replacing the battery, use a battery equivalent to the battery originally installed in the computer. The computer comes with a 3 V lithium coin cell battery.

⚠ WARNING! The computer contains an internal lithium manganese dioxide battery. There is a risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

Do not attempt to recharge the battery.

Do not expose to temperatures higher than 60°C (149°F).

Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Replace the battery only with the HP spare part that is designated for this product.

📝 IMPORTANT: Before replacing the battery, back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings are cleared.

Static electricity can damage the electronic components of the computer or optional equipment. Before beginning these procedures, be sure that you are discharged of static electricity by briefly touching a grounded metal object.

📝 NOTE: You can extend the lifetime of the lithium battery by plugging the computer into an AC outlet. The lithium battery is used only when the computer is not connected to AC power.

HP encourages customers to recycle used electronic hardware, HP original print cartridges, and rechargeable batteries. For more information about recycling programs, go to <http://www.hp.com/recycle>.

Before removing the battery, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the bottom cover ([Bottom cover on page 34](#)).
4. Locate the RTC battery ([Locating internal components on page 19](#)).

Remove the battery:

1. To release the battery from its holder, squeeze the metal clamp that extends above one edge of the battery **(1)**. When the battery pops up, lift it out **(2)**.



2. Slide the replacement battery into position, positive side up. The battery holder automatically secures the battery in the proper position.

WLAN module

To remove the WLAN module, use these procedures.

The WLAN module is located on the bottom of the system board.

Before removing the WLAN module, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the bottom panel ([Bottom cover on page 34](#)).
4. Locate the WLAN module ([Locating internal components on page 19](#)).

Remove the WLAN module:

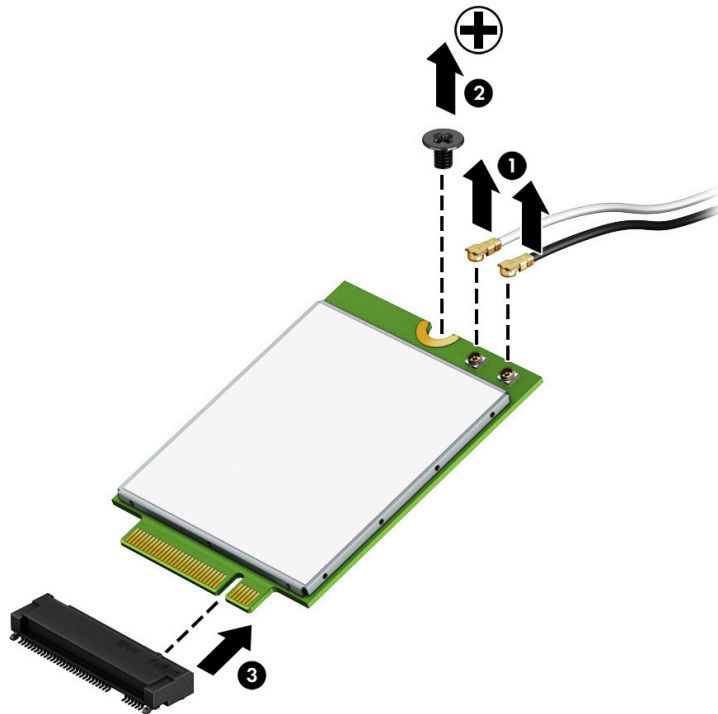
1. Disconnect the antenna cables from the module **(1)**.



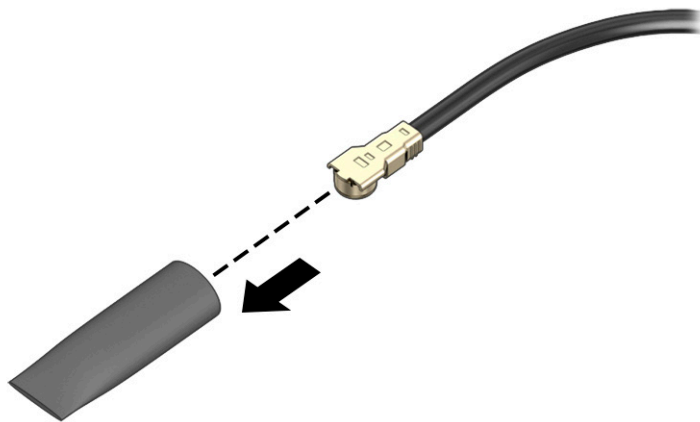
NOTE: The WLAN antenna cable labeled 1/MAIN connects to the WLAN module Main terminal. The WLAN antenna cable labeled 2/AUX connects to the WLAN module Aux terminal.

2. Remove the screw **(2)** that secures the module to the computer.


3. Pull the module to remove it from the socket (3).



4. If the WLAN antenna is not connected to the terminal on the WLAN module, a protective sleeve must be installed on the antenna connector, as shown in the following illustration.



To install the WLAN module, reverse the removal procedure.

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

Wireless antennas and cables

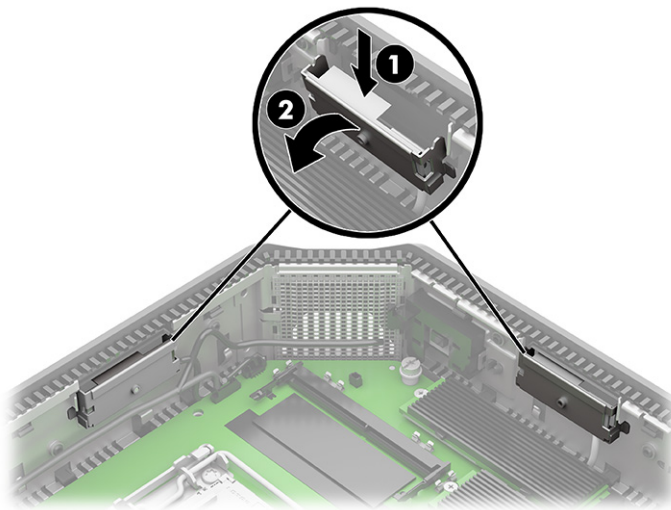
To remove the wireless antennas and cables, use these procedures. The cables route from the WLAN module on the bottom of the system board to the antennas mounted on the top of the computer.

Before removing the wireless antennas and cables, follow these steps:

1. Prepare the computer for disassembly ([Preparation for disassembly on page 18](#)).
2. Remove the top cover (see [Top cover on page 18](#)).
3. Remove the bottom cover (see [Bottom cover on page 34](#)).
4. Remove the fan ([Fan on page 27](#)).
5. Remove the graphics heat sink ([Graphics fan, heat sink, and card on page 25](#)).
6. Remove the processor heat sink ([Processor heat sink on page 29](#)).
7. Disconnect the antenna cables from the WLAN module ([WLAN module on page 36](#)).

Remove the wireless antennas:

1. Press down on the retention clips that secure the antenna to the chassis (**1**).
2. Rotate the antenna clips away from the chassis and remove the antennas (**2**).



3. Pull the antenna cables out of the routing to the bottom of the chassis.

To install the wireless antennas and cables, reverse the removal procedures.

5 Computer Setup (F10) Utility

This information provides details of the Computer Setup Utility.

- Change settings from the defaults or restore the settings to default values.
- View the system configuration, including settings for processor, graphics, memory, audio, storage, communications, and input devices.
- Modify the boot order of bootable devices such as hard drives or USB flash media devices.
- Enter the Asset Tag or property identification number assigned by the company to this computer.
- Enable the power-on password prompt during system restarts (warm boots) as well as during startup.
- Establish an administrator password that controls access to the Computer Setup (F10) Utility and the settings described in this section.
- Establish minimum requirements for valid passwords, including length and required types of characters.
- Secure integrated I/O functionality, including the serial, USB, or audio, or embedded NIC, so that they cannot be used until they are unsecured.
- Enable or disable different types of boot sources.
- Configure features such as Secure Boot, power management, virtualization support, and language and keyboard type used in Setup and POST.
- Replicate the system setup by saving system configuration information about a USB device and restoring it on one or more computers.
- Enable or disable DriveLock security or securely erase a hard drive (when supported by drive).

Using Computer Setup (F10) Utilities


You can access Computer Setup only by turning the computer on or restarting the system.


To access the Computer Setup Utilities menu, complete these steps:

1. Turn on or restart the computer.
2. Repeatedly press **f10** when the power button light turns white to access the utility.

You can also press **esc** to see a menu that allows you to access different options available at startup, including the Computer Setup utility.

A choice of four headings appears in the Computer Setup Utilities menu: Main, Security, Advanced, and UEFI Drivers.


 **NOTE:** If you do not press **f10** at the appropriate time, you must restart the computer and again repeatedly press **f10** when the power button light turns white to access the utility.

 **NOTE:** Selecting UEFI Drivers restarts the computer into the third-party option ROM management application. You can access this application directly by pressing **f3** during startup.

3. Use the arrow (left and right) keys to select the appropriate heading. Use the arrow (up and down) keys to select the option you want, and then press **enter**. To return to the Computer Setup Utilities menu, press **esc**.
4. To apply and save changes, select **Main > Save Changes and Exit**.
 - If you have made changes that you do not want applied, select **Ignore Changes and Exit**.
 - To restore settings from the Advanced and Main menus to original values, select **Apply Factory Defaults and Exit**.
 - To restore settings from the Advanced and Main menus to those previously saved by **Save Custom Defaults**, select **Apply Custom Defaults and Exit**. If no custom defaults have been saved, then factory defaults are used.

 **NOTE:** You cannot modify settings in the Security menu by selecting **Apply Defaults**. You reset those values by selecting **Restore Security Settings to Factory Defaults** at the bottom of the **Security** menu.

 **NOTE:** Not all settings shown in the following sections are available for all models.

 **IMPORTANT:** Do not turn computer power off while the BIOS is saving the Computer Setup (F10) changes because the settings could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

Computer Setup—Main

This table provides information about the Computer Setup Main menu.


 **NOTE:** Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 5-1 Computer Setup—Main

Option	Description
System Information	Lists all information in following list if Advanced System Information is selected. Lists smaller subset if Basic System Information is selected. <ul style="list-style-type: none"> • Product name • Installed memory size • Processor type • Processor cache size (L1/L2/L3) • Processor speed • MicroCode revision • Processor stepping • Memory speed • DIMM size (for each installed module) • System BIOS version • ME Firmware version (Intel only) • Video BIOS version • Reference code revision • Super I/O firmware version • USB Type-C controller firmware version

Table 5-1 Computer Setup—Main (continued)

Option	Description
	<ul style="list-style-type: none"> • Serial number • SKU number • UUID (Universally Unique Identifier) • Asset tracking number • Feature byte • Build ID • Product family • System board ID • System board CT number • Integrated MAC Address
System Diagnostics	<p>If the hard drive has the HP Advanced Diagnostics installed, the application launches. If HP Advanced Diagnostics is not installed, then a basic version that is built into the BIOS provides the capability to perform the following functions:</p> <ul style="list-style-type: none"> • Memory Test • Hard Drive Check • Language
Update System BIOS	<p>Lets you update the system BIOS from www.hp.com or another network server, from a removable USB drive, or from a file located on the hard drive.</p> <ul style="list-style-type: none"> • Check [current selection] for BIOS Updates <ul style="list-style-type: none"> The string that appears here depends on the setting in BIOS Update Preferences. • Lock BIOS Version <ul style="list-style-type: none"> If this option is selected, the system is locked to the current BIOS version and, updates are not allowed. • BIOS Rollback Policy <ul style="list-style-type: none"> ■ Unrestricted Rollback to older BIOS—Lets you roll back to any previous version of BIOS. ■ Restricted Rollback to older BIOS—If selected, Minimum BIOS Version becomes active, which lets you manually enter the minimum BIOS version that you can roll back to. • Allow BIOS Updates Using a Network • BIOS Update Preferences <ul style="list-style-type: none"> ■ Check for Update on Next Reboot—Default is disabled. ■ BIOS Source—Lets you select either HP.com or a custom URL. If Custom URL is selected, Edit Custom URL becomes active. HP recommends using a custom URL only for a managed IT environment. ■ Automatic BIOS Update Setting <ul style="list-style-type: none"> Allows configuration of a periodic check for updates: NOTE: If Microsoft® Windows® BitLocker Drive Encryption (BDE) is enabled, it must be temporarily suspended before the BIOS is flashed. ■ Do not update ■ Checking for updates and prompt the user to accept or reject the update at that time

Table 5-1 Computer Setup—Main (continued)

Option	Description
	<ul style="list-style-type: none"> ■ Checking for updates and install all new versions ■ Checking for updates and install only new versions marked important ■ BIOS Update Frequency <ul style="list-style-type: none"> ■ Daily ■ Weekly ■ Monthly (default) ● Network Configuration Settings ● Update BIOS Using Local Media <p>Lets you access files on either USB storage or the hard drive. The HP BIOS Update and Recovery application included in BIOS Softpaqs at www.hp.com copies the BIOS file to the correct location on the hard drive or USB device.</p>
Change date and time	Lets you update system date and time.
Set machine unique data	Allows you to set or view data that is unique to each machine, such as feature byte, build ID, serial number, SKU number, product family, system board CT number, and product name.
System IDs	Lets you set the following values: <ul style="list-style-type: none"> ● Asset Tracking Number ● Ownership Tag
Replicated Setup	<p>Backup current settings to USB device</p> <p>Saves system configuration to a formatted USB flash media device.</p> <p>Restore current settings from USB device</p> <p>Restores system configuration from a USB flash media device.</p>
Save Custom Defaults	Saves the current system configuration settings as the custom default set.
Apply Custom Defaults and Exit	Applies the custom default settings to the computer after rebooting. Does not apply to options in the Security menu.
Apply Factory Defaults and Exit	Restores the factory system configuration settings to the computer after rebooting. Does not apply to options in the Security menu.
Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.
Save Changes and Exit	Saves changes to current system configuration, exits Computer Setup, and reboots.
Suppress POST errors	Select to turn off any errors generated by Power On Self Test (POST) during boot up.

Computer Setup—Security

This table provides information about the Computer Setup Security menu.



NOTE: Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 5-2 Computer Setup—Security

Option	Description
Create BIOS Administrator Password	<p>Lets you set and enable a BIOS administrator password, which controls access to the following features:</p> <ul style="list-style-type: none"> • Setup Menu (F10) • Third Party Option ROM Management (F3) • Update system ROM • WMI commands that change system settings • BIOS Configuration Utility (BCU) • Alternative power-on password <p>NOTE: Creating a BIOS user disables the Fast Boot option.</p> <p>NOTE: If the password is set, you must change Computer Setup options, update the BIOS, and make changes to certain plug and play settings under Windows.</p>
Change BIOS Administrator Password (This selection is active only if a BIOS administrator password is set.)	<p>Lets you change the BIOS administrator password.</p> <p>You must know the current password to be able to change it.</p>
Create POST Power-On Password	<p>The power-on password prompt appears after a power cycle or reboot. If the user does not enter the correct power-on password, the unit will not boot.</p>
Change POST Power-On Password (This selection is active only if a BIOS administrator password is set.)	<p>Lets you change the POST power-on password.</p> <p>You must know the current password to be able to change it.</p>
Password Policies	<p>Let you set the guidelines for a valid password. Options include:</p> <ul style="list-style-type: none"> • Password minimum length • Requires at least one symbol • Requires at least one number • Requires at least one uppercase character • Requires at least one lowercase character • Allow spaces <p>Clear Password Jumper</p> <p>Select Honor to allow or Ignore to not allow the absence of the password jumper to clear the passwords at boot up. Default is Honor.</p>
Security Configuration	<p>TPM Embedded Security</p> <ul style="list-style-type: none"> • TPM Specification Version Displays the current TPM version. • TPM Device Lets you set the Trusted Platform Module as available or hidden. • TPM State Select to enable the TPM. • ClearTPM

Table 5-2 Computer Setup—Security (continued)

Option	Description
	<p>Select to reset the TPM to an unowned state. After the TPM is cleared, it is also turned off. To temporarily suspend TPM operations, turn the TPM off instead of clearing it.</p> <p>IMPORTANT: Clearing the TPM resets it to factory defaults and turns it off. You will lose all created keys and data protected by those keys.</p> <ul style="list-style-type: none"> • TPM Activation Policy <ul style="list-style-type: none"> ○ F1 to boot ○ Allow user to reject ○ No prompts
	<p>BIOS SureStart</p> <ul style="list-style-type: none"> • Verify Boot Block on every boot—Select to enable HP SureStart. • Dynamic Runtime Scanning of Boot Block—Verifies the integrity of the BIOS boot block region several times each hour while the computer is running. Default is Enabled. • Sure Start BIOS Settings Protection—When enabled, HP Sure Start locks all critical BIOS settings and provides enhanced protection for these settings using nonvolatile (flash) memory. <p>NOTE: An administrator password must be set to activate this setting.</p> <ul style="list-style-type: none"> • Enhanced HP Firmware Runtime Intrusion Prevention and Detection—Enables monitoring of HP system firmware executing out of main memory while the operating system is running. Any anomalies detected in HP system firmware that is active while the operating system is running will result in a Sure Start security event being generated. • Sure Start Security Event Policy—Controls HP Sure Start behavior upon identifying a critical security event (any modification to HP firmware) while the operating system is running. <ul style="list-style-type: none"> – Log Event Only—HP Sure Start will log all critical security events in the HP Sure Start audio log within the HP Sure Start nonvolatile (flash) memory. – Log Event and notify user—In addition to logging all critical security events, HP Sure Start will notify the user within the operating system that a critical event has occurred. – Log Event and power off system—In addition to logging all critical security events, HP Sure Start turns of the computer upon detecting a HP Sure Start Security Event. Because of the potential for data loss, HP recommends this setting only in situations where security integrity of the system is a higher priority than the risk of potential data loss.
	<p>Smart Cover</p> <ul style="list-style-type: none"> • Cover Removal Sensor (Disabled/Notify user/Administrator password) <p>Lets you disable the cover sensor or configure what action is taken if the computer cover is removed. Default is Disabled.</p> <p>NOTE: Notify user alerts the user with a POST error on the first boot after the sensor detects removal of the cover. If the password is set, Administrator Password requires that the password be entered to boot the computer if the sensor detects that the cover has been removed.</p>
	<p>Intel Software Guard Extensions (SGX)</p> <p>Intel SGX is a set of processor code instructions from that allows user-level code to allocate private regions of memory, that unlike normal process memory is also protected from processes running at higher privilege levels.</p> <ul style="list-style-type: none"> • Software control • Disable • Enable

Utilities

Hard Drive Utilities

Table 5-2 Computer Setup—Security (continued)

Option	Description
	<ul style="list-style-type: none"> • Save/Restore GPT of System Hard Drive Enabling this feature saves the GUID Partition Table (GPT) of the system hard drive. If the GPT is subsequently changed, the user is prompted to choose whether to restore GPT. • DriveLock/Automatic DriveLock Allows you to assign or modify a master or user password for hard drives. When this feature is enabled, the user is prompted to provide one of the DriveLock passwords during POST. If neither is successfully entered, the hard drive remains inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence. NOTE: This selection appears only when at least one drive that supports the DriveLock feature is attached to the system. IMPORTANT: Be aware that these settings take place immediately. It is not necessary to save. IMPORTANT: Be sure to document the DriveLock password. Losing a DriveLock password will render a drive permanently locked. After you select a drive, the following options are available: - Set DriveLock Master Password. Sets the drive's master password but does not enable DriveLock. - Enable DriveLock. Sets the drive's user password and enables DriveLock. • Secure Erase Lets you select a hard drive to completely erase. After you erase a hard drive with a program that uses Secure Erase firmware commands, no file recovery program, partition recovery program, or other data recovery method can extract data from the drive. • Allow OPAL Hard Drive SED Authentication Default is disabled.
System Management Command	Allows authorized personnel to reset security settings during a service event. Default is enabled.
Restore Security Settings to Default	This action resets security devices, clears BIOS passwords (not including DriveLock), and restores settings in the Security menu to factory defaults.

Computer Setup—Advanced

This table provides information about the Computer Setup Advanced menu.



NOTE: Support for specific Computer Setup options can vary, depending on the hardware configuration.

Table 5-3 Computer Setup—Advanced (for advanced users)

Option	Heading
Display Language	Lets you select the language of the menus in F10 Setup and the keyboard layout.
Scheduled Power-On	This feature wakes the system when it is off at a specified date and time.
Boot Options	Select the devices that the computer can boot from, as well as other options, including: <ul style="list-style-type: none"> • Startup Delay (sec). Enabling this feature adds a user-specified delay to the POST process. One purpose for the delay is to provide additional time to activate hotkeys such as esc for the Startup Menu or f10 for Computer Setup.

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	<ul style="list-style-type: none"> • Fast Boot—Default is enabled. • USB Storage Boot—Default is enabled. • Network (PXE) Boot—Default is enabled. • After Power Loss—Default is Power Off. <ul style="list-style-type: none"> ■ Power off—Causes the computer to remain off when power is restored. ■ Power on—Causes the computer to turn on automatically as soon as power is restored. ■ Previous state—Causes the computer to turn on automatically as soon as power is restored, if it was on when power was lost. <p>NOTE: If the system is configured to Power On from Keyboard Ports (see Power Management Options), then this setting is forced to Power On.</p> <ul style="list-style-type: none"> • Prompt on Memory Size Change. Default is enabled. • Prompt on Fixed Storage Change. Default is disabled. • Audio Alerts During Boot. Default is enabled. When disabled, most audible beeps from errors, warnings, and password prompts during boot up are suppressed. • UEFI Boot Order. <p>Default is enabled. Specify the order in which UEFI boot sources (such as a internal hard drive, USB hard drive, USB optical drive, or internal optical drive) are checked for a bootable operating system image.</p> <p>UEFI boot sources always have precedence over legacy boot sources.</p> • Legacy Boot Order <p>Specify the order in which legacy boot sources (such as a network interface card, internal hard drive, USB optical drive, or internal optical drive) are checked for a bootable operating system image.</p> <p>Specify the order of attached hard drives. The first hard drive in the order will have priority in the boot sequence and will be recognized as drive C (if any devices are attached).</p> <p>NOTE: To drag a device to a preferred place, press enter.</p> <p>NOTE: MS-DOS drive lettering assignments might not apply after a non-MS-DOS operating system has started.</p> <p>Shortcut to Temporarily Override Boot Order</p> <p>To boot one time from a device other than the default device specified in Boot Order, restart the computer and press esc (to access the Startup menu) and then f9 (Boot Menu), or only f9 (skipping the Startup menu) when the power button light turns white. After POST is completed, a list of bootable devices is displayed. Use the arrow keys to select the preferred bootable device and press enter. The computer then boots from the selected non-default device for this one time.</p>
Secure Boot Configuration	<p>Configure Secure Boot</p> <p>Configure Secure Boot setting, default enabled.</p> <p>Secure Boot Key Management</p> <p>Lets you manage the custom key settings.</p> <p>Import Custom Secure Boot keys</p> <p>Default is disabled.</p> <p>Clear Secure Boot Keys</p> <p>Lets you delete any previously loaded custom boot keys. Clearing keys will disable secure boot. Default is disabled.</p>

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	<p data-bbox="531 258 919 279">Reset Secure Boot keys to factory defaults</p> <p data-bbox="531 304 699 325">Default is disabled.</p> <p data-bbox="531 350 735 371">Enable MS UEFI CA key</p> <p data-bbox="531 396 1449 443">Disabling this setting alters the Secure Boot key list to further restrict the allowed software components. Set this option to disable to support Device Guard.</p> <p data-bbox="531 468 828 489">Ready BIOS for Device Guard Use</p> <p data-bbox="531 514 1294 535">Requires BIOS Administrator password to be configured and Secure Boot to be enabled.</p>
System Options	<p data-bbox="531 560 871 581">Configure storage controller for RAID</p> <p data-bbox="531 606 959 627">Enable Storage Controller as RAID Mode support.</p> <p data-bbox="531 653 676 674">Hyperthreading</p> <p data-bbox="531 699 1026 720">Lets you control processor capability. Default is enabled.</p> <p data-bbox="531 745 676 766">Multi-processor</p> <p data-bbox="531 791 1394 812">Use this option to disable multi-processor support under the operating system. Default is enabled.</p> <p data-bbox="531 837 922 858">Virtualization Technology (VTx) (Intel only)</p> <p data-bbox="531 884 1449 930">Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.</p> <p data-bbox="531 955 1067 976">Virtualization Technology for Directed I/O (VTd) (Intel only)</p> <p data-bbox="531 1001 1449 1047">Controls virtualization DMA remapping features of the chipset. Changing this setting requires turning the computer off and then back on. Default is disabled.</p> <p data-bbox="531 1073 791 1094">Accelerate USB Enumeration</p> <p data-bbox="531 1119 1125 1140">Reduces detection time for specific USB devices. Default is disabled.</p> <p data-bbox="531 1165 932 1186">Speed Selection on Mixed DIMM per Channel</p> <p data-bbox="531 1211 1267 1232">Lets you determine DRAM speed for a mixed DIMM configuration. Default is enabled.</p> <p data-bbox="531 1257 643 1278">Turbo Boost</p> <p data-bbox="531 1304 1034 1325">Enables Intel Turbo Boost Technology. Default is enabled.</p> <p data-bbox="531 1350 671 1371">RST Remapping</p> <p data-bbox="531 1396 1362 1417">Lets you configure M.2 SSD as a drive of the Intel chipset storage controller. Default is disabled.</p> <p data-bbox="531 1442 820 1463">NVMe Write Endurance Masking</p> <p data-bbox="531 1488 1358 1509">System will not pause to report a error if it exceeds NVMe write endurance. Default is disabled.</p> <p data-bbox="531 1535 679 1556">Early PCIe Delay</p> <p data-bbox="531 1581 1406 1602">Lets you configure the delay for add-on PCIe cards to finish PCI Express training. Default is disabled.</p> <p data-bbox="531 1627 671 1648">DMA Protection</p> <p data-bbox="531 1673 1150 1694">Select to enabled Direct Memory Access Protection. Default is enabled.</p> <p data-bbox="531 1719 759 1740">Pre-Boot DMA Protection</p> <p data-bbox="531 1766 1083 1787">Lets you configure the device scope for pre-OS DMA protection.</p> <p data-bbox="531 1812 722 1833">Performance Control</p> <p data-bbox="531 1858 908 1879">Lets you select system performance mode.</p>

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	<p>Power Button Override (disable/4 sec/15 sec)</p> <p>Lets you disable or enable and select the number of seconds you have to hold down the power button to force the system to turn off. Default is 4 sec.</p>
Built-In Device Options	<p>Embedded LAN Controller</p> <p>Select to show the device in the operating system. Default is enabled.</p> <p>Wake On LAN</p> <p>Lets you either disable the Wake On LAN feature or configure where the computer boots, including the network or hard drive. Default is Boot to Network.</p> <p>Video memory size</p> <p>Use this option to manage graphics memory allocation. The value you choose is allocated permanently to graphics and is unavailable to the operating system.</p> <p>Integrated Camera</p> <p>Clear to disable the integrated camera. Default is enabled.</p> <p>Audio Device</p> <p>Select to show the device in the operating system. Default is enabled.</p> <p>Integrated Microphone</p> <p>Clear to disable the integrated microphone. This does not affect devices plugged into audio jacks. Default is enabled.</p> <p>Internal Speakers (does not affect external speakers)</p> <p>Clear to disable the chassis speaker or speakers. This function is applicable to normal audio playback in the operating system and does not affect the error or warning beeps during POST. Default is enabled.</p> <p>LAN/WLAN auto switching</p> <p>Select to enable auto switching between a wired and wireless connection. Default is disabled.</p> <p>Wake on WLAN</p> <p>Select to enable wake on WLAN. Default is disabled.</p> <p>M.2 USB/Bluetooth</p> <p>Select to enable the M.2 controller. Default is enabled.</p> <p>Increase Idle Fan Speed(%)</p> <p>Sets idle fan speed percentage. This setting only changes the minimum fan speed. The fan is still automatically controlled.</p>
Port Options	<p>SATA2</p> <p>Lets you disable the connector. Default is enabled.</p> <p>Rear USB ports</p> <p>Lets you disable the ports. Default is enabled.</p> <p>Right USB ports</p> <p>Lets you disable the ports. Default is enabled.</p> <p>USB Legacy Port Charging</p> <p>Lets you enable USB charging port capability when the computer is in hibernate or shutdown mode. Default is enabled.</p>

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	<p data-bbox="531 254 842 275">USB Type-C Downstream Charging</p> <p data-bbox="531 302 1401 352">Lets you enable USB charging port capability when the computer is in hibernate on or off. Default is enabled.</p> <p data-bbox="531 373 719 394">Restrict USB Devices</p> <p data-bbox="531 422 1038 443">Specify the following categories of USB devices to enable:</p> <ul data-bbox="531 464 919 579" style="list-style-type: none"><li data-bbox="531 464 842 485">• Allow all USB devices (default)<li data-bbox="531 506 858 527">• Allow only keyboard and mouse<li data-bbox="531 548 919 569">• Allow all but storage devices and hubs. <p data-bbox="531 600 1452 705">When some devices are restricted, the system will disable USB ports that do not meet the allowed criteria. This feature is usually combined with similar policies within the operating system because USB devices can be moved to different ports. The ports disabled by the BIOS remain disabled until the system is restarted.</p> <p data-bbox="531 726 895 747">USB Type-C Controller Firmware Update</p> <p data-bbox="531 768 695 789">Default is enabled.</p>
Option ROM Launch Policy	<p data-bbox="531 821 1385 842">These policies control whether Legacy Option ROMs or UEFI drivers are loaded. Default is All UEFI.</p> <p data-bbox="531 863 863 884">Configure Option ROM Launch Policy</p> <ul data-bbox="531 905 762 1020" style="list-style-type: none"><li data-bbox="531 905 663 926">• All legacy<li data-bbox="531 947 647 968">• All UEFI<li data-bbox="531 989 762 1010">• All UEFI except video
Power Management Options	<p data-bbox="531 1052 938 1073">Runtime Power Management (enable/disable)</p> <p data-bbox="531 1094 1442 1144">Allows certain operating systems to reduce processor voltage and frequency when the current software load does not require the full capabilities of the processor. Default is enabled.</p> <p data-bbox="531 1165 927 1186">Extended Idle Power States (enable/disable)</p> <p data-bbox="531 1207 1442 1257">Allows certain operating systems to decrease the processors power consumption when the processor is idle. Default is enabled.</p> <p data-bbox="531 1278 932 1299">S5 Maximum Power Savings (enable/disable)</p> <p data-bbox="531 1320 1410 1400">Enabling this feature reduces the power of the system as much as possible in the S5 state. Power is removed from the wake up circuitry, the expansion slots, and any management features while in S5. Default is disabled.</p> <p data-bbox="531 1421 906 1442">SATA Power Management (enable/disable)</p> <p data-bbox="531 1463 1278 1484">Enables or disables SATA bus, device power management, or both. Default is enabled.</p> <p data-bbox="531 1505 967 1526">PCI Express Power Management (enable/disable)</p> <p data-bbox="531 1547 1458 1598">Enabling this option permits the PCI Express links to use Active Power State Management (ASPM) to enter lower power states while not in use. Default is enabled.</p> <p data-bbox="531 1619 959 1640">Power On from Keyboard Ports (enable/disable)</p> <p data-bbox="531 1661 1465 1711">When enabled, this feature allows a key press to turn on the system when it is off (S5 state). If using a USB keyboard, you must plug it into one of the rear ports labeled with the keyboard icon. Default is disabled.</p> <p data-bbox="531 1732 959 1753">Unique Sleep State Blink Rates (enable/disable)</p> <p data-bbox="531 1774 1422 1824">This feature is designed to provide a visual indication of what Sleep state the system is in. Each Sleep state has a unique blink pattern. Default is disabled.</p> <p data-bbox="531 1845 1161 1866">NOTE: A normal shutdown goes to the S4 state for Windows 8 or later.</p>

Table 5-3 Computer Setup—Advanced (for advanced users) (continued)

Option	Heading
	<p>S0 (On) = solid white light.</p> <p>S3 (Stand By) = 3 blinks at 1 Hz (50% duty cycle) followed by a pause of 2 seconds (white light), repeated cycles of 3 blinks and a pause.</p> <p>S4 (Hibernation) = 4 blinks at 1 Hz (50% duty cycle) followed by a pause of 2 seconds (white light), repeated cycles of 4 blinks and a pause.</p> <p>S5 (Soft Off) = Light is off.</p>
Electronic labels	Displays system labels.
Remote Management Options	<p>Active Management (AMT) (Intel only) (enable/disable). Default is enabled.</p> <p>Allows you to discover, repair, and protect networked computing devices.</p> <p>USB Key Provisioning Support (enable/disable) Default is disabled.</p> <p>USB Redirection Support (enable/disable). Default is enabled.</p> <p>USB redirection allows USB devices plugged into a client computer to be transparently redirected to the guest operating system.</p> <p>Unconfigure AMT on next boot (Do Not Apply/Apply). Default is Do Not Apply.</p> <p>SOL Terminal Emulation Mode (ANSI / VT100). Default is ANSI.</p> <p>SOL (serial-over-LAN) terminal emulation mode is only activated during remote AMT (Active Management Technology) redirection operations. The emulation options allow administrators to select which mode works best with their console.</p> <p>Show Unconfigure ME Confirmation Prompt (enable/disable). Default is enabled.</p> <p>Verbose Boot Messages (enable/disable). Default is enabled.</p> <p>Verbose boot shows additional logging information during startup, which is mainly for debugging if something goes wrong during bootup.</p> <p>Watchdog Timer (enable/disable). Default is enabled.</p> <p>Allows you to set amount of time for a operating system and BIOS watchdog alert to be sent if the timers are not deactivated. BIOS watchdog is deactivated by BIOS and would indicate that a halt occurred during execution if the alert is sent to the management console. An operating system alert is deactivated by the operating system image and would indicate that a hang occurred during its initialization.</p> <ul style="list-style-type: none"> • OS Watchdog Timer (min.) – (5/10/15/20/25). Default is 5 min. • BIOS Watchdog Timer (min.) – (5/10/15/20/25). Default is 5 min. <p>CIRA Timeout (min.) (1/2/3/4/Never)</p> <p>CIRA is Customer Initiated Remote Assistance, an Intel service to help users employing Active Management Technology (AMT).</p>

6 POST error messages

This section lists the error codes, error messages, and the various indicator light and audible sequences that you may encounter during Power-On Self-Test (POST) or computer restart, the probable source of the problem, and steps you can take to resolve the error condition.

POST Message Disabled suppresses most system messages during POST, such as memory count and non-error text messages. If a POST error occurs, the screen will display the error message. To manually switch to the POST Messages Enabled mode during POST, press any key (except **f10**, **f11**, or **f12**). The default mode is POST Message Disabled.

The POST mode selection determines the speed at which the computer loads the operating system and the extent to which it is tested.

Quick Boot is a fast startup process that does not run all of the system level tests, such as the memory test. Full Boot runs all of the ROM-based system tests and takes longer to complete.

You can enable Full Boot to run every 1 to 30 days on a regularly scheduled basis. To establish the schedule, reconfigure the computer to the Full Boot Every x Days mode, using Computer Setup.

 **NOTE:** For more information about Computer Setup, see [Computer Setup \(F10\) Utility on page 39](#).

POST numeric codes and text messages

This section identifies those POST errors that have numeric codes associated with them. The section also includes some text messages that you might encounter during POST.


 **NOTE:** The computer beeps once after a POST text message is displayed on the screen.

Table 6-1 POST numeric codes and text messages

Control panel message	Description	Recommended action
002-Option ROM Checksum Error	System ROM or expansion board option ROM checksum.	<ol style="list-style-type: none">1. Verify the correct ROM.2. Flash the ROM if needed.3. If an expansion board was recently added, remove it to see if the problem remains.4. Clear CMOS.5. If the message disappears, there might be a problem with the expansion card.6. Replace the system board.
003-System Board Failure	DMA or timers.	<ol style="list-style-type: none">1. Clear CMOS.2. Replace the system board.
005-Real-Time Clock Power Loss	Invalid time or date in configuration memory. RTC (real-time clock) battery may need to be replaced.	Reset the date and time under Control Panel (Computer Setup can also be used). If the problem persists, replace the RTC battery. See the Removal and Replacement section for instructions on installing a new battery.

Table 6-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
008–Microcode Patch Error	Processor is not supported by the BIOS.	<ol style="list-style-type: none">1. Upgrade BIOS to proper version.2. Change the processor.
009–PMM Allocation Error during MEBx Download	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">1. Reboot the computer.2. Unplug the power cord, reseal the memory modules, and reboot the computer.3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.4. If the error persists, replace the system board.
00A–Product Information Not Valid	The product information programmed into the system board is missing or invalid.	Use Computer Setup to update this information.
00B–MEBx Module did not checksum correctly	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">1. Reboot the computer.2. Unplug the power cord, reseal the memory modules, and reboot the computer.3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.4. If the error persists, replace the system board.
00C–PMM Deallocation Error during MEBx Cleanup	Memory error during POST execution of the Management Engine (ME) BIOS Extensions option ROM.	<ol style="list-style-type: none">1. Reboot the computer.2. Unplug the power cord, reseal the memory modules, and reboot the computer.3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.4. If the error persists, replace the system board.
00D–Setup Error during MEBx Execution	MEBx selection or exit resulted in a setup failure.	<ol style="list-style-type: none">1. Reboot the computer.2. Unplug the power cord, reseal the memory modules, and reboot the computer.3. If the memory configuration was recently changed, unplug the power cord, restore the original memory configuration, and reboot the computer.

Table 6-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
		<ol style="list-style-type: none"> 4. If the error persists, replace the system board.
00E-Inventory Error during MEBx Execution	BIOS information passed to the MEBx resulted in a failure.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
00F-Interface Error during MEBx Execution	MEBx operation experienced a hardware error during communication with the ME.	<ol style="list-style-type: none"> 1. Reboot the computer. 2. If the error persists, update to the latest BIOS version. 3. If the error still persists, replace the system board.
100-Front Audio Not Connected	Front audio cable has been detached or unseated from system board.	Reconnect or replace front audio cable.
2E1-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	The system memory size is different from the last startup. The most common reason is the removal of memory from the system board. Press the f1 key to save the memory changes.
2E2-Memory Error	Memory module configuration failed during boot up.	<ol style="list-style-type: none"> 1. Be sure that memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory modules. 4. If the error persists after replacing memory modules, replace the system board.
2E3-Incompatible Memory Module in Memory Socket(s) X, X, ...	A memory module in memory socket identified in the error message is missing critical SPD information, or is incompatible with the chipset.	<ol style="list-style-type: none"> 1. Verify proper memory module type. 2. Try another memory socket. 3. Replace with a supported module.
2E4-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.
2E5-ECC Memory Module Detected on Unsupported Platform	Recently added memory modules support ECC memory error correction.	<ol style="list-style-type: none"> 1. If additional memory was recently added, remove it to see if the problem remains. 2. Check product documentation for memory support information.
2E6-Memory Not Configured Correctly for Proper MEBx Execution	DIMM1 is not installed.	Make sure there is a memory module in the DIMM1 socket and that it is properly seated.
300-Configuration Change Warning	A change in storage configuration has been detected (see Boot Options menu in BIOS Setup to enable this feature). Either the installed hardware has changed, storage or firmware mode may have been changed, or	If no changes have been made prior to this warning, check that the drives are connected properly to power cables and system board. User Diagnostics (f2 during boot-up) may help identify any problem with specific devices.

Table 6-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
	a storage device may have failed to respond.	
301-Hard Disk 1: SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"> 1. Determine if hard drive is giving correct error message. Run the Drive Protection System test under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
302-Hard Disk 2: SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"> 1. Determine if hard drive is giving correct error message. Run the Drive Protection System test under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
309 – 30C: Hard Disk 3–6: SMART Hard Drive Detects Imminent Failure	Hard drive is about to fail. (Some hard drives have a hard drive firmware patch that will fix an erroneous error message.)	<ol style="list-style-type: none"> 1. Determine if hard drive is giving correct error message. Run the Drive Protection System test under using F2 Diagnostics when booting the computer. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
3F0-Boot Device Not Found	Boot device not found.	Insert boot device or load operating system.
3F1-Hard Disk 1 Error	Hard disk 1 error.	<ol style="list-style-type: none"> 1. Check and/or replace cables. 2. Clear CMOS. 3. Replace the hard disk drive.
3F2-Hard Disk 2 Error	Hard disk 2 error.	<ol style="list-style-type: none"> 1. Check and/or replace cables. 2. Clear CMOS. 3. Replace the hard disk drive.
400-Serial Port A Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	<ol style="list-style-type: none"> 1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.

Table 6-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
401-Serial Port B Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	<ol style="list-style-type: none"> 1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
402-Serial Port C Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	<ol style="list-style-type: none"> 1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
403-Serial Port D Address Conflict Detected	Both external and internal serial ports are assigned to the same resources.	<ol style="list-style-type: none"> 1. Remove any serial port expansion cards. 2. Clear CMOS. 3. Reconfigure card resources and/or run Computer Setup or Windows utilities.
419-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	If a PCI expansion card was recently added, remove it to see if the problem remains.
41A-Front USB1/USB2 Not Connected	Front USB cable has been detached or unseated from system board.	Reconnect or replace front USB cable.
41B-Device in PCI Express Slot Failed To Initialize	There is an incompatibility or problem with a PCIe device and the system or PCIe link could not be configured to a valid bus width or speed.	Try rebooting the system. If the error reoccurs, the device may not work with this system
43A-USB Type-C I2C Not Connected	Cable is required between I2C on card and USB-C on the system board.	Install cable between I2C on card and USB-C on the system board.
43B-More Than One USB type-C Cards Are Installed	More than one USB type-C card is installed.	Remove USB type-C card so only one is installed.
500-BIOS Recovery	A system BIOS recovery has occurred.	Not applicable.
70x-Wireless Mode Not Supported	The system has detected a wireless module installed in the system that is not supported and has been disabled.	Replace with a supported module.
800-Keyboard Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Be sure that none of the keys are depressed. 4. Replace keyboard.
801-Keyboard or System Unit Error	Keyboard failure.	<ol style="list-style-type: none"> 1. Reconnect the keyboard with computer turned off.

Table 6-1 POST numeric codes and text messages (continued)

Control panel message	Description	Recommended action
		<ol style="list-style-type: none"> 2. Be sure that none of the keys are depressed. 3. Replace the keyboard. 4. Replace the system board.
900-CPU Fan Not Detected	CPU fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat fan. 2. Reseat fan cable. 3. Replace fan.
901-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Fan is not connected or might have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat fan. 2. Reseat fan cable. 3. Replace fan.
904-SATA Cabling Error	One or more SATA devices are improperly attached. For optimal performance, the SATA 0 and SATA 1 ports should be used for hard drives before other ports.	Ensure SATA connectors are used in ascending order. For one device, use SATA 0. For two devices, use SATA 0 and SATA 1. For three devices, use SATA 0, SATA 1, and SATA 2.
90B-Fan Failure	The system has detected that a cooling fan is not operating correctly.	<ol style="list-style-type: none"> 1. Reseat fan. 2. Reseat fan.cable. 3. Replace fan.
90D-System Temperature	Thermal shutdown occurred. The system BIOS has detected your machine was previously shut down to avoid overheating. Overheating may occur if the cooling vents are blocked or the operating temperature exceeds the system specifications. The machine should return to normal operation once the situation is resolved.	Make sure system has proper airflow.
90E-Power Supply Fan Not detected	Power supply fan is not connected or may have malfunctioned.	<ol style="list-style-type: none"> 1. Reseat power supply fan. 2. Reseat fan cable. 3. Replace power supply fan.
910-Filter Warning	Airflow filter is dirty.	Replace the airflow filter.

Interpreting system validation diagnostic front panel LEDs and audible codes

This section identifies the front panel light codes as well as the audible codes that can occur before or during POST that might not have an error code or text message associated with them.

⚠ CAUTION: When the computer is plugged into an AC power source, voltage is always applied to the system board. To reduce the risk of personal injury from electrical shock and/or hot surfaces, be sure to disconnect the power cord from the AC outlet and allow the internal system components to cool before touching.

During the system validation phase that occurs at system startup, the BIOS validates the functionality of the following subsystems and conditions:

- AC adapter
- System board power
- Processor failure
- BIOS corruption
- Memory failure
- Graphics failure
- System board failure
- BIOS authentication failure

If an error is detected, specific patterns of long and short blinks, accompanied by long and short beeps (where applicable) are used to identify the error. These patterns will make up a two part code:

- Major – the category of the error
- Minor – the specific error within the category


 **NOTE:** Single beep/blink codes are not used.

Table 6-2 Beep pattern error identification

Number of long beeps/blinks	Error category
1	Not used
2	BIOS
3	Hardware
4	Thermal
5	System board

Patterns of blink/beep codes are determined by using the following parameters:

- 1 second pause occurs after the last major blink.
- 2 second pause occurs after the last minor blink.
- Beep error code sequences occur for the first 5 iterations of the pattern and then stop.
- Blink error code sequences continue until the computer is unplugged or the power button is pressed.

 **NOTE:** Not all diagnostic lights and audible codes are available on all models.

The red LED blinks to represent the major error category (long blinks). The white LED blinks to represent the minor error category (short blinks). For example, '3.5' indicates 3 long red blinks and 5 short white blinks to communicate the processor is not detected.

Table 6-3 Interpreting POST diagnostic front panel lights and audible codes

Category	Major/minor code	Description
BIOS	2.2	The main area (DXE) of BIOS has become corrupted and there is no recovery binary image available.
	2.3	The embedded controller policy requires the user to enter a key sequence.

Table 6-3 Interpreting POST diagnostic front panel lights and audible codes (continued)

Category	Major/minor code	Description
Hardware	2.4	The embedded controller is checking or recovering the boot block.
	3.2	The embedded controller has timed out waiting for BIOS to return from memory initialization.
	3.3	The embedded controller has timed out waiting for BIOS to return from graphics initialization.
	3.4	The system board displays a power failure (crowbar).*
	3.5	The processor is not detected.*
	3.6	The processor does not support an enabled feature.
Thermal	4.2	A processor over temperature condition has been detected.*
	4.3	An ambient temperature over temperature condition has been detected.
	4.4	An MXM over temperature condition has been detected.
System board	5.2	The embedded controller cannot find valid firmware.
	5.3	The embedded controller has timed out waiting for the BIOS.
	5.4	The embedded controller has timed out waiting for BIOS to return from system board initialization.
	5.5	The embedded controller rebooted the system after a possible lockup condition had been detected through the use of a System Health Timer, Automated System Recovery Timer, or other mechanism.


* Indicates hardware triggered event; all other events are controlled by the BIOS.

7 Password security and resetting CMOS

This computer supports two security password features that you can establish through the Computer Setup Utilities menu: administrator password and power-on password.

When you establish only an administrator password, any user can access all the information on the computer except Computer Setup. When you establish only a power-on password, the power-on password is required to access Computer Setup and any other information on the computer. When you establish both passwords, only the administrator password will give you access to Computer Setup.

When both passwords are set, you can use the administrator password in place of the power-on password as an override to log in to the computer. This feature is useful for a network administrator.

 **IMPORTANT:** Back up the BIOS settings or save them as custom defaults in case you need them later. You can back up in Computer Setup or with the BiosConfigUtility tool available from www.hp.com. See [Computer Setup \(F10\) Utility on page 39](#) for information about backing up the BIOS settings.

Changing a setup or power-on password

Use this procedure to change a password.

To change the power-on or setup password, complete the following steps:

1. Turn on or restart the computer.
To change the setup password, go to step 2.
To change the power-on password, go to step 3.
2. To change the setup password, as soon as the computer turns on:
 - Press **esc** while the “Press the ESC key for Startup Menu” message is displayed.
 - Press **f10** to enter Computer Setup.
3. When the key icon appears, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:

current password/new password/new password

 **NOTE:** Type the new password carefully because the characters do not appear on the screen.

4. Press **enter**.

The new password will take effect the next time the computer is restarted.

Deleting a setup or power-on password

Use this procedure to delete a password.

To delete the power-on or setup password, complete the following steps:

1. Turn on or restart the computer.
To delete the Setup password, go to step 2.

To delete the Power-on password, go to step 3.

2. To delete the Setup password, as soon as the computer turns on:
 - Press **esc** while the “Press the ESC key for Startup Menu” message is displayed.
 - Press **f10** to enter Computer Setup.
3. When the key icon appears, type your current password, a slash (/) or alternate delimiter character, your new password, another slash (/) or alternate delimiter character, and your new password again as shown:
current password/
4. Press **enter**.

8 Using HP PC Hardware Diagnostics

You can use the HP PC Hardware Diagnostics utility to determine whether your computer hardware is running properly. The three versions are HP PC Hardware Diagnostics Windows, HP PC Hardware Diagnostics UEFI (Unified Extensible Firmware Interface), and (for select products only) Remote HP PC Hardware Diagnostics UEFI, a firmware feature.

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 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 62](#).

Using an HP PC Hardware Diagnostics Windows hardware failure ID code

When HP PC Hardware Diagnostics Windows detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated.

- ▲ Depending on the instructions on the screen, choose one of these options:
 - If failure ID link is displayed, select the link and follow the on-screen instructions.
 - If instructions for calling support are displayed. Follow those instructions.

Accessing HP PC Hardware Diagnostics Windows

After HP PC Hardware Diagnostics Windows is installed, you can access it from the Start menu or HP Support Assistant.

Accessing HP PC Hardware Diagnostics Windows from the Start menu

After HP PC Hardware Diagnostics Windows is installed, follow these steps to access it.

1. Select the **Start** button.
2. Right-click **HP PC Hardware Diagnostics for Windows**, select **More**, and then select **Run as administrator**.
3. When the tool opens, select the type of diagnostic test that you want to run, and then follow the on-screen instructions.



NOTE: To stop a diagnostic test, select **Cancel**.

Accessing HP PC Hardware Diagnostics Windows from Support Assistant

After HP PC Hardware Diagnostics Windows is installed, follow these steps to access it from 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 **Troubleshooting and fixes**.
3. Select **Diagnostics**, and then select **HP PC Hardware Diagnostics Windows**.
4. When the tool opens, select the type of diagnostic test that you want to run, and then follow the on-screen instructions.



NOTE: To stop a diagnostic test, select **Cancel**.

Downloading HP PC Hardware Diagnostics Windows

The HP PC Hardware Diagnostics Windows downloading 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 from HP

To download HP PC Hardware Diagnostics Windows from HP, 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 downloads to the selected location.

Downloading the HP PC Hardware Diagnostics Windows from the Microsoft Store

You can download the HP PC Hardware Diagnostics Windows from the Microsoft Store.

1. Select the Microsoft Store app on your desktop or enter `Microsoft Store` in the taskbar search box.
2. Enter `HP PC Hardware Diagnostics Windows` in the **Microsoft Store** search box.
3. Follow the on-screen directions.

The tool downloads to the selected location.

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

You can download HP PC Hardware Diagnostics Windows by product name or number.



NOTE: For some products, you might have to download the software to a USB flash drive by using the product name or number.

1. Go to <http://www.hp.com/support>.
2. Select **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 downloads to the selected location.

Installing HP PC Hardware Diagnostics Windows

To install HP PC Hardware Diagnostics Windows, navigate to the folder on your computer or the USB flash drive where the .exe file downloaded, double-click the .exe file, and then follow the on-screen instructions.

Using HP PC Hardware Diagnostics UEFI

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

 **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 64](#).

If your PC does not start in Windows, you can use HP PC Hardware Diagnostics UEFI to diagnose hardware issues.

Using an HP PC Hardware Diagnostics UEFI hardware failure ID code


When HP PC Hardware Diagnostics UEFI detects a failure that requires hardware replacement, a 24-digit Failure ID code is generated.

For assistance in solving the problem:

- ▲ Select **Contact HP**, accept the HP privacy disclaimer, and then use a mobile device to scan the Failure ID code that appears on the next screen. The HP Customer Support - Service Center page appears 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 this procedure.

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 64](#).

- 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 some situations.

- HP PC Hardware Diagnostics UEFI is not included in the preinstallation 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 downloading 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, follow this procedure.

- 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)

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

 **NOTE:** For some products, you might have to download the software to a USB flash drive by using the product name or number.

- 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 might 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

HP Remote PC Hardware Diagnostics UEFI is also available as a SoftPaq that you can download to a server.

Downloading the latest Remote HP PC Hardware Diagnostics UEFI version

You can 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 Remote Diagnostics**, and then select **Run**.

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

You can download HP Remote PC Hardware Diagnostics UEFI by product name or number.

 **NOTE:** For some products, you might have to download the software by using the product name or number.

1. Go to <http://www.hp.com/support>.
2. Select **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 several 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 hard 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 that you use 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.

9 Backing up, restoring, and recovering

You can use Windows tools or HP software to back up your information, create a restore point, reset your computer, create recovery media, or restore your computer to its factory state. Performing these standard procedures can return your computer to a working state faster.

 **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

These methods of creating recovery media and backups are available on select products only.

Using Windows tools for backing up

HP recommends that you back up your information immediately after initial setup. You can do this task either using Windows Backup locally with an external USB drive or using online tools.

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


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


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.

For details:

▲ Go to <http://www.hp.com/support>, search for HP Cloud Recovery, and then select the result that matches the type of computer that you have.

 **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.

 **IMPORTANT:** HP recommends that you follow the [Restoring and recovery methods on page 67](#) to restore your computer before you obtain and use the HP recovery discs. Using a recent backup can return your machine to a working state sooner than using the HP recovery discs. After the system is restored, reinstalling all the operating system software released since your initial purchase can be a lengthy process.

Restoring and recovering your system

You have several tools available to recover your system both within and outside of Windows if the desktop cannot load.

HP recommends that you attempt to restore your system using the [Restoring and recovery methods on page 67](#).

Creating a system restore

System Restore is available in Windows. The System Restore software can automatically or manually create restore points, or snapshots, of the system files and settings on the computer at a particular point.

When you use System Restore, it returns your computer to its state at the time you made the restore point. Your personal files and documents should not be affected.


Restoring and recovery methods

After you run the first method, test to see whether the issue still exists before you proceed to the next method, which might now be unnecessary.

1. Run a Microsoft System Restore.
2. Run Reset this PC.
3. Recover using HP Recovery media. For more information, see [Recovering using HP Recovery media on page 67](#).

For more information about the first two methods, see the Get Help app:


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

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

Recovering using HP Recovery media


You can use HP Recovery media 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 66](#).

 **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.

 **NOTE:** HP recommends that you follow the [Restoring and recovery methods on page 67](#) to restore your computer before you obtain and use the HP recovery discs. Using a recent backup can return your machine to a working state sooner than using the HP recovery discs. After the system is restored, reinstalling all the operating system software released since your initial purchase can be a lengthy process.

Changing the computer boot order

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

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

To change the boot order:

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 press and hold the volume up button, and then select **f9**.
 - or –
 - Turn on or restart the tablet, quickly press and hold 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.

Using HP Sure Recover (select products only)

Select computer models are configured with HP Sure Recover, a PC OS recovery solution built into the hardware and software. HP Sure Recover can fully restore the HP OS image without installed recovery software.

Using HP Sure Recover, an administrator or user can restore the system and install:

- Latest version of the operating system
- Platform-specific device drivers
- Software applications, in the case of a custom image

To access the latest documentation for HP Sure Recover, go to <http://www.hp.com/support>. Follow the on-screen instructions to find your product and locate your documentation.


10 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**. Select **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 10-1 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 74.	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 10-1 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?
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.	on the HP website; go to http://www.hp.com/support . Select Find your product , and then follow the on-screen instructions.
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>.

11 Power cord set requirements

The power supplies on some computers have external power switches.

The voltage select switch feature on the computer permits it to operate from any line voltage of 100 V ac–120 V ac or 220 V ac–240 V ac. Power supplies on those computers that do not have external power switches are equipped with internal switches that sense the incoming voltage and automatically switch to the proper voltage.

The power cord set received with the computer meets the requirements for use in the country where you purchased the equipment.


Power cord sets for use in other countries must meet the requirements of the country where you use the computer.

General requirements

These requirements are applicable to all countries.


1. The power cord must be approved by an acceptable accredited agency responsible for evaluation in the country where the power cord set will be installed.
2. The power cord set must have a minimum current capacity of 10A (7A Japan only) and a nominal voltage rating of 125 V ac or 250 V ac, as required by each country's power system.
3. The diameter of the wire must be a minimum of 0.75 mm² or 18AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft).

The power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

 **WARNING!** Do not operate this product with a damaged power cord set. If the power cord set is damaged in any manner, replace it immediately.

Japanese power cord requirements

For use in Japan, use only the power cord received with this product.

 **IMPORTANT:** Do not use the power cord received with this product on any other products.

Country-specific requirements

This information provides additional requirements specific to a country.

Table 11-1 Power cord country-specific requirements

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO

Table 11-1 Power cord country-specific requirements (continued)

Country	Accrediting Agency	Country	Accrediting Agency
Canada (2)	CSA	Sweden (1)	SEMKO
Denmark (1)	DEMKO	Switzerland (1)	SEV
Finland (1)	SETI	United Kingdom (1)	BSI
France (1)	UTE	United States (2)	UL
Germany (1)	VDE		

1. The flexible cord must be Type H05VV-F, 3-conductor, 0.75mm² conductor size. Power cord set fittings (appliance coupler and plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.
2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3 conductor. The plug must be a 2-pole grounding type with a NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
3. Appliance coupler, flexible cord, and plug must bear a T mark and registration number in accordance with the Japanese Dentori Law. Flexible cord must be Type VCT or VCTF, 3-conductor, 0.75 mm² conductor size. Plug must be a 2-pole grounding type with a Japanese Industrial Standard C8303 (7 A, 125 V) configuration.

12 Specifications

This section provides specifications for your computer.

Table 12-1 Specifications

	Metric	U.S.
Dimensions		
Height	58 mm	2.3 in
Width	216 mm	8.5 in
Depth	216 mm	8.5 in
Approximate weight		
Performance	2.08 kg	4.58 lbs
Entry	1.87 kg	4.12 lbs
Temperature range		
Operating	5°C to 35°C	40°C to 95°F
Nonoperating	-40°F to 60°C	-40°F to 140°F
NOTE: Operating temperature is derated 1.0°C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level; no direct sustained sunlight. Maximum rate of change is 10° C/Hr. The upper limit might be limited by the type and number of options installed.		
Maximum altitude (unpressurized)		
Operating	3,048 m	10,000 ft
Nonoperating	9,144 m	30,000 ft
Relative humidity (noncondensing)		
Operating	10% to 90%	
Nonoperating (38.7°C max wet bulb)	5% to 95%	
Power supply		
Operating voltage range	90 V ac to 264 V ac	
Rated voltage range ¹	100 V ac to 240 V ac	
Rated line frequency	50 Hz to 60 Hz	
Operating line frequency	47 Hz to 63 Hz	
Standard efficiency		
	280 W, 89% efficient	
	180 W, 89% efficient	

¹ This system uses an active power factor-corrected power supply. This allows the system to pass the CE mark requirements for use in the countries of the European Union. The active power factor-corrected power supply also has the added benefit of not requiring an input-voltage range select switch.

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