Hardware Reference Guide

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Product notice

This guide describes features that are common to most models. Some features may not be available on your product. To access the latest user guide, go to http://www.hp.com/support, and follow the instructions to find your product. Then select **User Guides**.

Software terms

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

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

About This Guide

This guide provides basic information for upgrading the computer.

WARNING! Indicates a hazardous situation that, if not avoided, **could** result in death or serious injury.

CAUTION: Indicates a hazardous situation that, if not avoided, **could** result in minor or moderate injury.

IMPORTANT: Indicates information considered important but not hazard-related (for example, messages related to property damage). An Important alert warns the user that failure to follow a procedure exactly as described could result in loss of data or in damage to hardware or software. Also contains essential information to explain a concept or to complete a task.

NOTE: Contains additional information to emphasize or supplement important points of the main text.

TIP: Provides helpful hints for completing a task.

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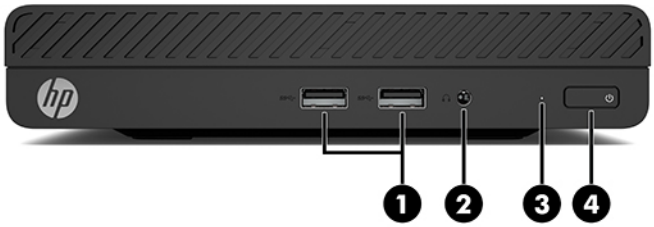
1 Product features

Standard configuration features

Features may vary depending on the model. For support assistance and to learn more about the hardware and software installed on your computer model, run the HP Support Assistant utility.

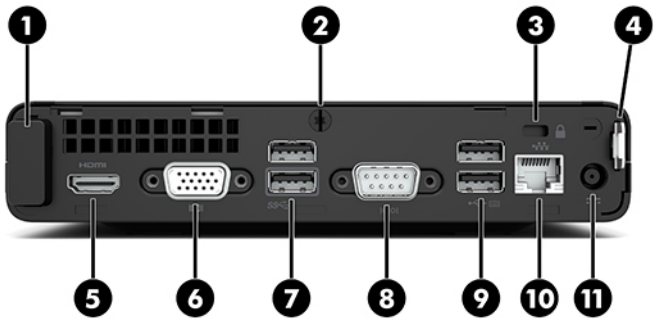
NOTE: This computer model can be used in a tower orientation or a desktop orientation. The tower stand is sold separately.

Front panel components



Front panel components			
1	USB SuperSpeed ports (2)	3	Hard drive activity light
2	Audio-out (headphone)/Audio-in (microphone) combo jack	4	Power button

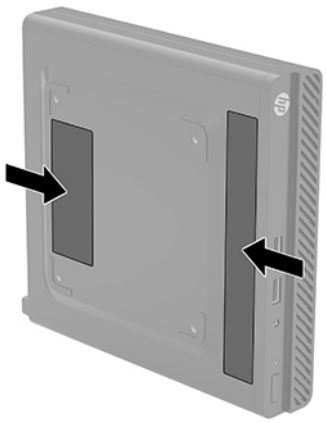
Rear panel components



Rear panel components			
1	Antenna cover	7	USB SuperSpeed ports (2)
2	Access panel thumbscrew	8	Serial port
3	Security cable slot	9	USB ports with optional keyboard power-on support (2)
4	Padlock loop	10	RJ-45 (network) jack
5	HDMI monitor port	11	Power connector
6	VGA monitor connector		

Serial number location

Each computer has a unique serial number and a product ID number that are located on the exterior of the computer. Keep these numbers available when contacting customer service for assistance.



2 Setup

Changing from desktop to tower orientation

The computer can be used in a tower orientation with an optional tower stand that can be purchased from HP.

1. Remove/disengage any security devices that prohibit changing the orientation of the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before changing the orientation the computer.

5. Orient the computer so that its right side is facing up, and place the computer in the optional stand.

NOTE: To stabilize the computer in a tower orientation, HP recommends the use of the optional tower stand.

6. Reconnect the AC power cord and any external devices, and then turn on the computer.

NOTE: Ensure that at least 10.2 centimeters (4 inches) of space on all sides of the computer remains clear and free of obstructions.

7. Lock any security devices that were disengaged before the computer was moved.

Attaching the computer to a mounting fixture

The computer can be attached to a wall, swing arm, or other mounting fixture using the four VESA mounting holes on the bottom of the computer.

NOTE: This apparatus is intended to be supported by UL or CSA Listed wall mount bracket.

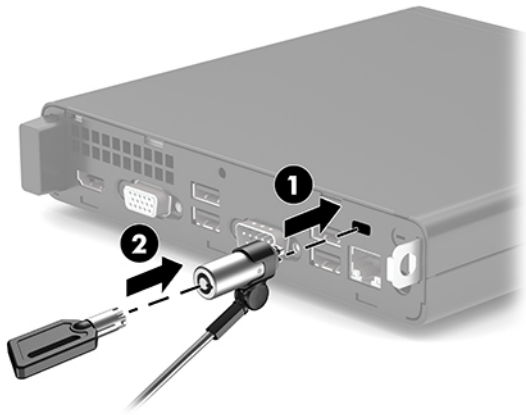
1. If the computer is on a stand, remove the computer from the stand and lay the computer down.
2. To attach the computer to a swing arm (sold separately), insert four screws through the holes on the swing arm plate and into the mounting holes on the computer.

IMPORTANT: This computer supports the VESA industry standard 100 mm mounting holes. To attach a third-party mounting solution to the computer, use the screws that are supplied with the solution. It is important to verify that the manufacturer's mounting solution is compliant with the VESA standard and is rated to support the weight of the computer. For best performance, it is important to use the AC power cord and other cables provided with the computer.

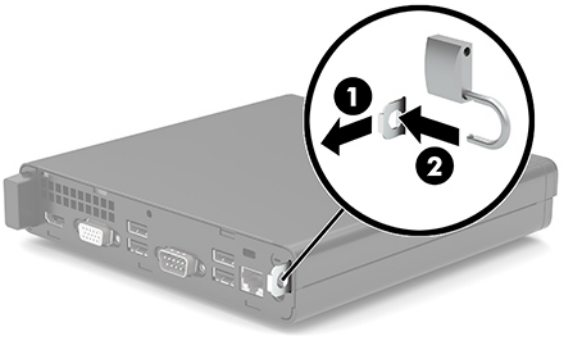
To attach the computer to other mounting fixtures, follow the instructions included with the mounting fixture to ensure that the computer is safely attached.

Installing a security cable or padlock

You can attach a security cable to the rear of the computer. Use the key provided to attach and remove the security cable.



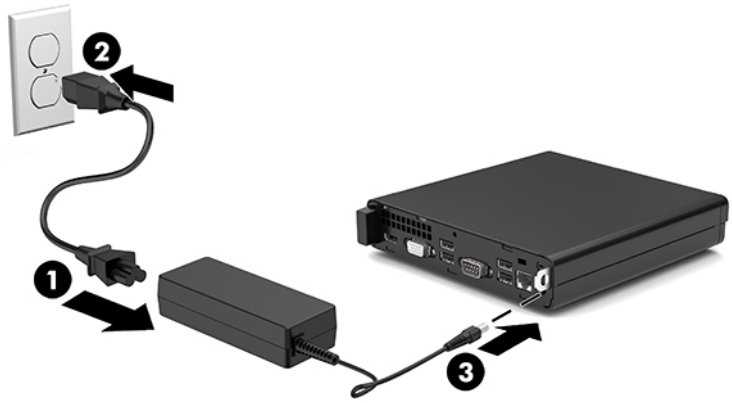
To install a padlock, slide the padlock loop (1) out from the rear of the computer and install the padlock (2) in the loop.



NOTE: The security cable and padlock are designed to act as a deterrent, but they may not prevent the computer from being mishandled or stolen.

Connecting the AC power cord and AC adapter

Connect one end of the AC power cord to the AC adapter (1) and the other end to a grounded AC outlet (2), and then connect the AC adapter to the power connector on the computer (3).



3 Hardware upgrades

Serviceability features

The computer includes features that make it easy to upgrade and service. A Torx T15 or flat-bladed screwdriver is needed for some of the installation procedures described in this chapter.

Warnings and cautions

Before performing upgrades be sure to carefully read all of the applicable instructions, cautions, and warnings in this guide.

WARNING! To reduce the risk of personal injury from electrical shock, hot surfaces, or fire:

Disconnect the AC power cord from the AC outlet and allow the internal system components to cool before you touch them.

Do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

Do not disable the AC power cord grounding plug. The grounding plug is an important safety feature.

Plug the AC power cord into a grounded (earthed) AC outlet that is easily accessible at all times.

To reduce the risk of serious injury, read the *Safety & Comfort Guide*. It describes proper workstation setup, and proper posture, health, and work habits for computer users. The *Safety & Comfort Guide* also provides important electrical and mechanical safety information. The *Safety & Comfort Guide* is available on the Web at http://www.hp.com/ergo.

WARNING! Energized and moving parts inside.

Disconnect power to the equipment before removing the enclosure.

Replace and secure the enclosure before re-energizing the equipment.

IMPORTANT: Static electricity can damage the electrical components of the computer or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See Electrostatic discharge on page 33 for more information.

When the computer is plugged into an AC power source, voltage is always applied to the system board. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

Removing the computer access panel

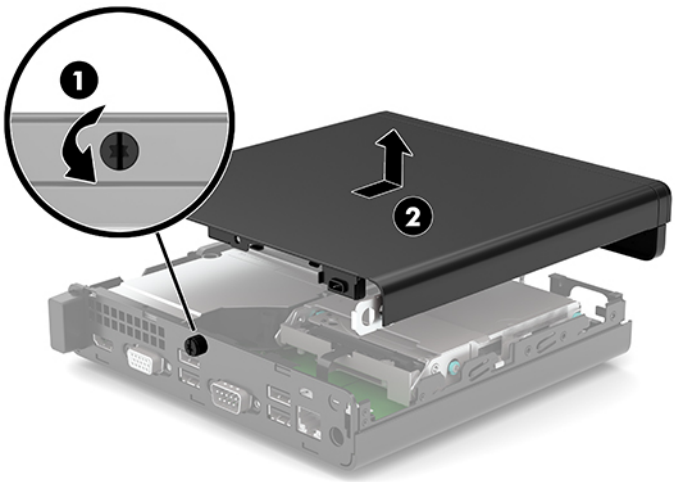
To access internal components, you must remove the computer access panel.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

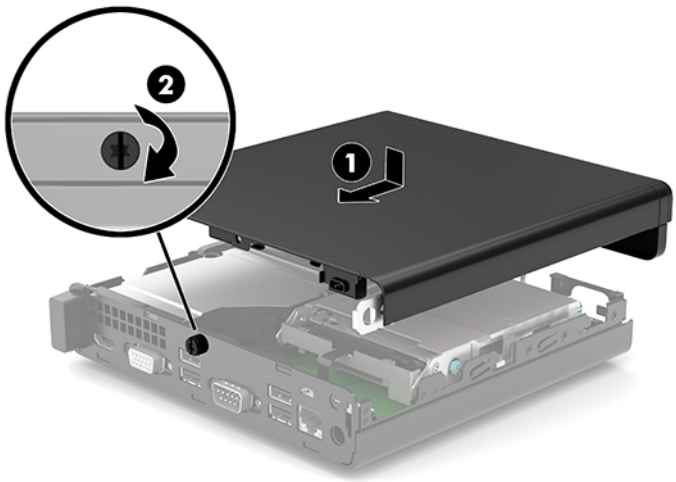
5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the thumbscrew (1) on the rear of the computer. Then slide the panel forward and then lift it off the computer (2).

NOTE: If necessary, a Torx T15 or flat-bladed screwdriver can be used to loosen the thumbscrew.



Replacing the computer access panel

Place the access panel on the computer (1) and then slide it back. Then install the thumbscrew (2) to secure the panel in place.



Upgrading system memory

The computer comes with at least one small outline, dual in-line memory module (SODIMM). To achieve maximum memory support, you can populate the system board with up to 32 GB of memory.

Memory module specifications

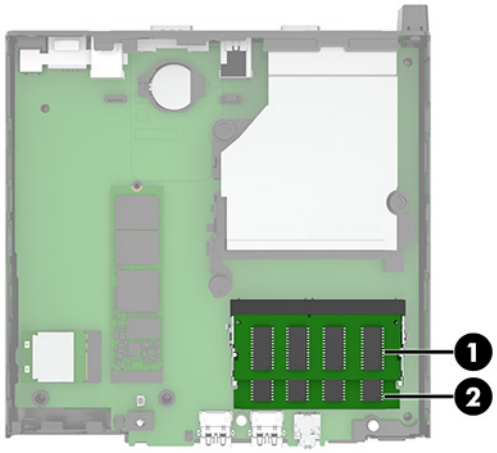
For proper system operation, the memory modules must meet the following qualifications:

Specifications	
Memory modules	1.2-volt DDR4 Small Outline DIMMs
Compliance	unbuffered non-ECC PC4-19200 DDR4-2400 MT/s compliant or unbuffered non-ECC PC4-21333 DDR4-2666 MT/s compliant **NOTE:** Memory modules support data transfer rates up to 2666 MT/s; actual data rate is determined by the system's configured processor. See processor specifications for supported memory data rate.
Pins	Industry-standard 260-pin containing the mandatory Joint Electronic Device Engineering Council (JEDEC) specification
Support (latency)	Support CAS 17-17-17 for DDR4-2400 MT/s and CAS 19-19-19 for DDR4-2666 MT/s
Slots	2
Maximum memory	32 GB (2 × 16 GB)
Support (Gbit)	8 Gbit, non-ECC, unbuffered single-sided and double-sided memory modules
Note	The system will not operate properly if you install unsupported memory modules. Memory modules constructed with x8 and x16 DDR devices are supported; memory modules constructed with x4 SDRAM are not supported.

HP offers upgrade memory for this computer and advises that the consumer purchase it to avoid compatibility issues with unsupported third-party memory.

Installing memory modules

There are two memory module slots on the system board, with one slot per channel. The slots are labeled DIMM1 and DIMM3. The DIMM1 slot operates in memory channel B. The DIMM3 slot operates in memory channel A.



Item	Description	System board label	Slot color
1	Memory module slot, Channel A	DIMM3	Black
2	Memory module slot, Channel B	DIMM1	Black

The system will automatically operate in single-channel mode, dual-channel mode, or flex mode, depending on how the memory modules are installed.

- The system will operate in single-channel mode if the memory module slots are populated in one channel only.
- The system will operate in a higher-performing dual-channel mode if the memory capacity of the memory module in Channel A is equal to the memory capacity of the memory module in Channel B.
- The system will operate in flex mode if the memory capacity of the memory module in Channel A is not equal to the memory capacity of the memory module 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 will have more memory than the other, the larger amount should be assigned to channel A.
- In any mode, the maximum operational speed is determined by the slowest memory module in the system.

IMPORTANT: You must disconnect the AC power cord and wait approximately 30 seconds for the power to drain before adding or removing memory modules. Regardless of the power-on 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 may cause irreparable damage to the memory modules or system board.

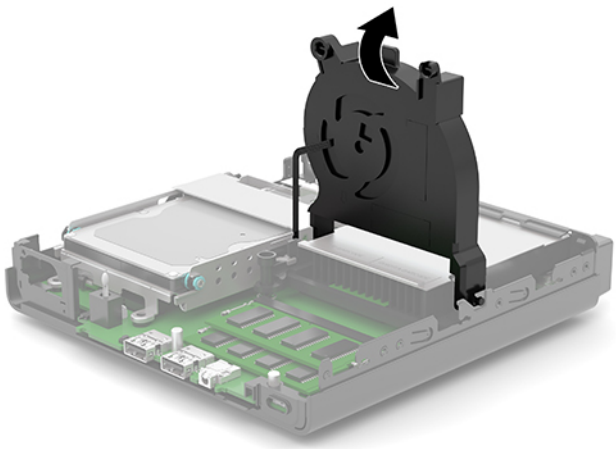
The memory module slots have gold-plated metal contacts. When upgrading the memory, it is important to use memory modules with gold-plated metal contacts to prevent corrosion and/or oxidation resulting from having incompatible metals in contact with each other.

Static electricity can damage the electronic components of the computer or optional cards. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. For more information, see Electrostatic discharge on page 33.

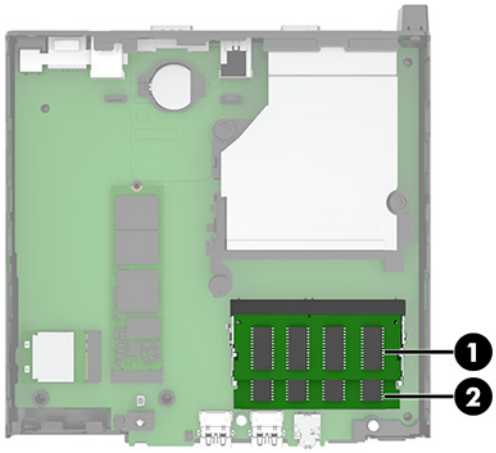
When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.
5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.

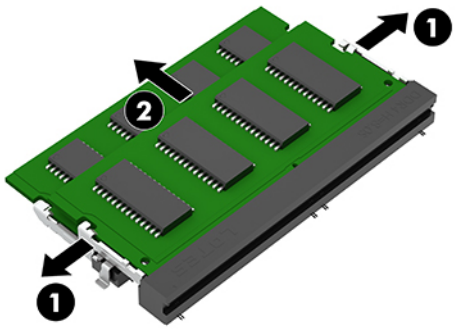
   For instructions, see Removing the computer access panel on page 9.
7. Tilt the fan up using the front tab and leave it in the up position.



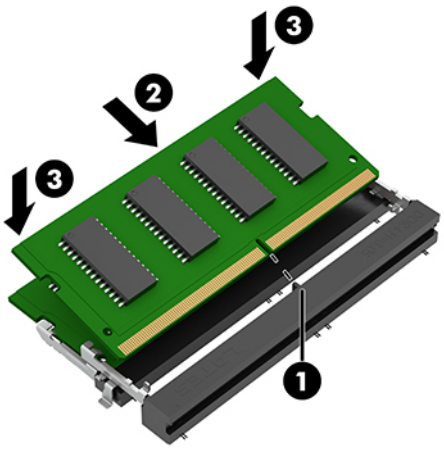
8. Locate the memory module locations (1) and (2) on the system board.



9. To remove a memory module, press outward on the two latches (1) on each side of the memory module, and then pull the memory module (2) out of the slot.

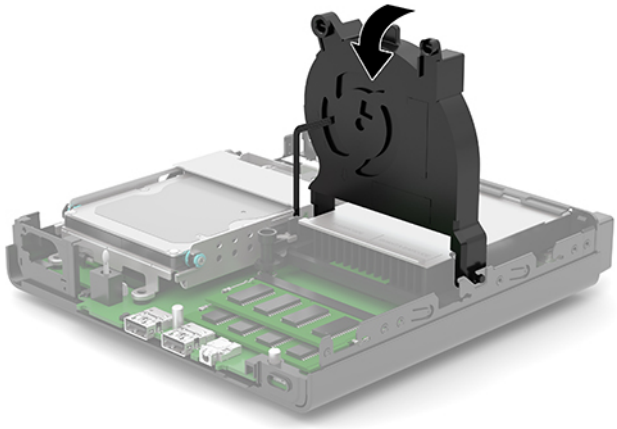


10. To install a memory module, match the notch (1) on the new memory module with the tab on the memory slot. Slide the memory module into the slot (2) at approximately a 30° angle, and then press the memory module (3) down so that the latches lock it in place.



NOTE: A memory module can be installed in only one way. Be sure to match the notch on the module with the tab on the memory module slot.

11. Tilt the fan down.



12. Replace the computer access panel.

    For instructions, see Replacing the computer access panel on page 10.

13. If the computer was on a stand, replace the stand.
14. Reconnect the AC power cord and any external devices, and then turn on the computer.
15. Lock any security devices that were disengaged when the computer access panel was removed.

The computer should automatically recognize the new memory when you turn on the computer.

Removing a hard drive

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.

Some models do not include a hard drive. The hard drive is optional.

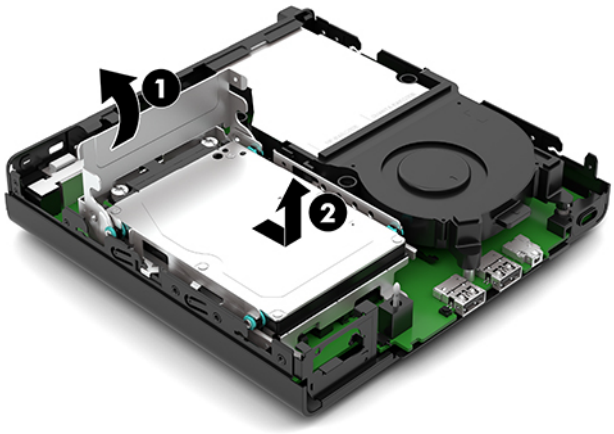
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

5. If the computer is on a stand, remove the computer from the stand.
6. Remove the computer access panel.

   For instructions, see Removing the computer access panel on page 9.

7. To remove the hard drive, rotate the hard drive latch (1) up to disengage the hard drive from the cage. Then slide the drive toward the rear of the chassis until it stops, and then lift the hard drive (2) up and out of the cage.

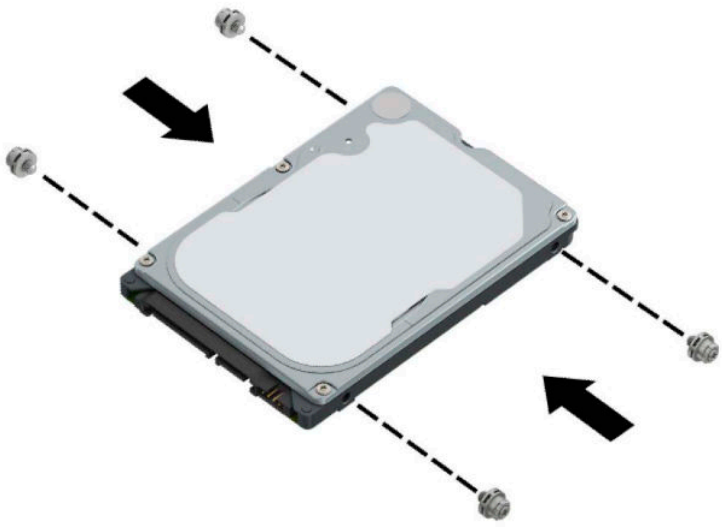


Installing a hard drive

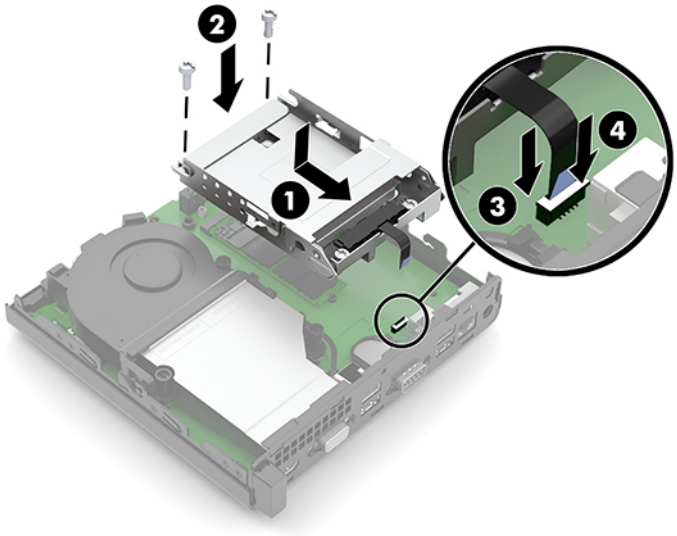
NOTE: See Removing a hard drive on page 15 for instructions on removing a hard drive.

1. If you are replacing a hard drive, transfer the four mounting screws from the old hard drive to the new hard drive.

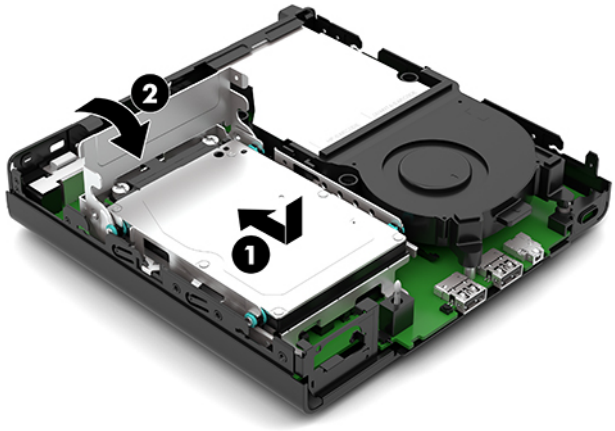
NOTE: Mounting screws can be purchased from HP.



2. If you are installing a hard drive rather than replacing a hard drive, you must install the hard drive cage. Place the hard drive cage (1) down into the chassis, and then slide it forward. Install the two screws (2) that secure the hard drive cage to the chassis, and then connect the hard drive cable (3) to the system board. Secure the cable by attaching the hard drive cable clamp (4) to the system board connector.



3. Align the hard drive mounting screws with the slots on the hard drive cage, press the hard drive down into the cage, and then slide the hard drive (1) forward. Then rotate the hard drive latch (2) down to engage the hard drive.



4. Replace the computer access panel.

   For instructions, see Replacing the computer access panel on page 10.

5. If the computer was on a stand, replace the stand.
6. Reconnect the AC power cord and any external devices, and then turn on the computer.
7. Lock any security devices that were disengaged when the computer access panel was removed.

Replacing an M.2 PCIe solid-state drive (SSD)

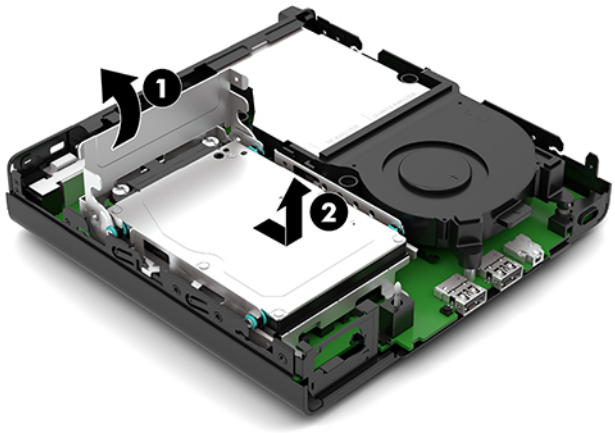
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

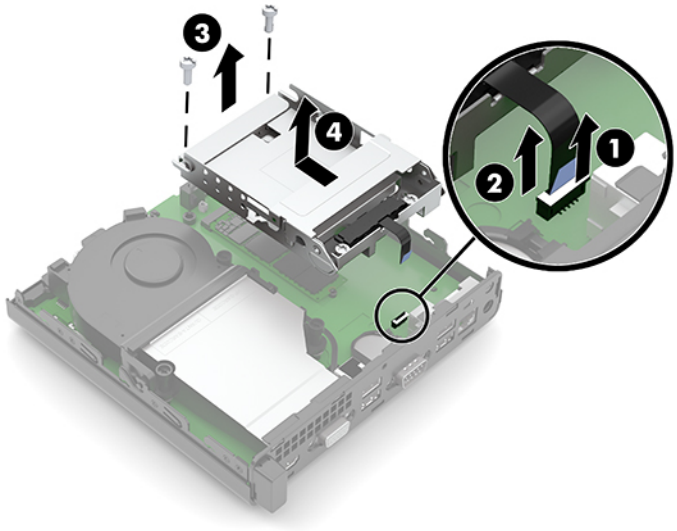
5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.

   For instructions, see Removing the computer access panel on page 9.
7. If your model has a hard drive installed, you must remove the hard drive and hard drive cage to access the M.2 SSD.

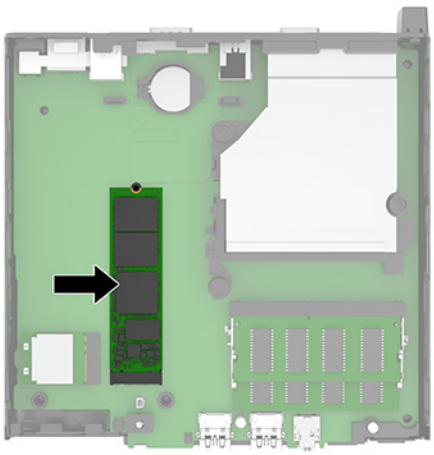
   a. Rotate the hard drive latch (1) up to disengage the hard drive from the cage. Then slide the drive toward the rear of the chassis until it stops, and then lift the hard drive (2) up and out of the cage.



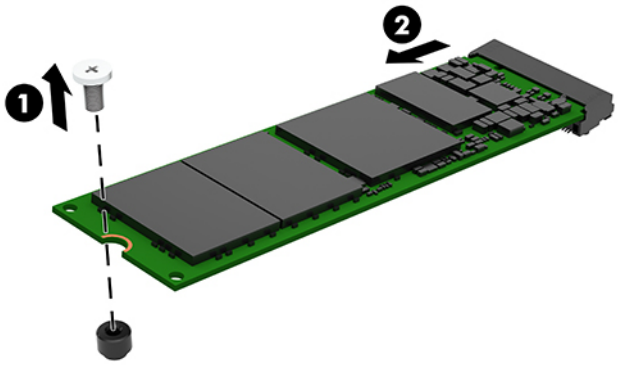
b. Remove the hard drive cable clamp (1) from the connector on the system board. Disconnect the hard drive cable (2) from the system board using the pull tab on the cable, and then remove the two screws (3) that secure the hard drive cage to the chassis. Slide the hard drive cage (4) back and lift it out of the chassis.



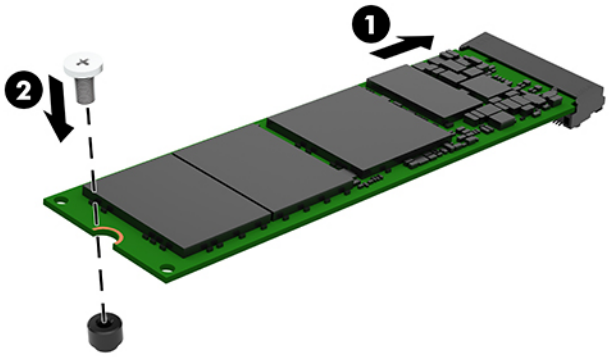
8. Locate the M.2 SSD on the system board.



9. Remove the screw (1) securing the SSD to the system board, and then pull the SSD from the socket (2) on the system board.

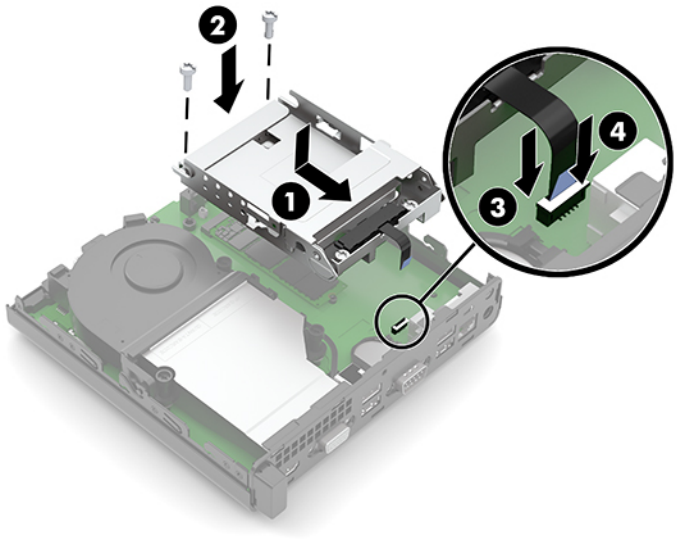


10. Slide the connector end of the new SSD into the socket (1) on the system board, and then secure the SSD with the screw (2).

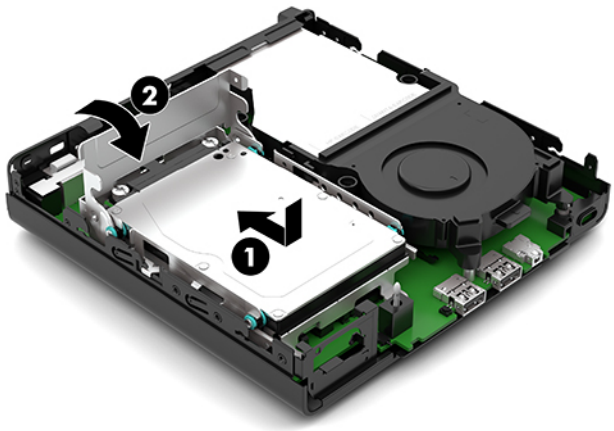


11. Replace the hard drive and hard drive cage if a hard drive was installed on your model.

    a. Place the hard drive cage (1) down into the chassis, and then slide it forward. Install the two screws (2) that secure the hard drive cage to the chassis, and then connect the hard drive cable (3) to the system board. Secure the cable by attaching the hard drive cable clamp (4) to the system board connector.



b. Align the hard drive mounting screws with the slots on the hard drive cage, press the hard drive down into the cage, and then slide the hard drive (1) forward. Then rotate the hard drive latch (2) down to engage the hard drive.



12. Replace the computer access panel.

    For instructions, see Replacing the computer access panel on page 10.

13. If the computer was on a stand, replace the stand.
14. Reconnect the AC power cord and any external devices, and then turn on the computer.
15. Lock any security devices that were disengaged when the computer access panel was removed.

Replacing the WLAN module

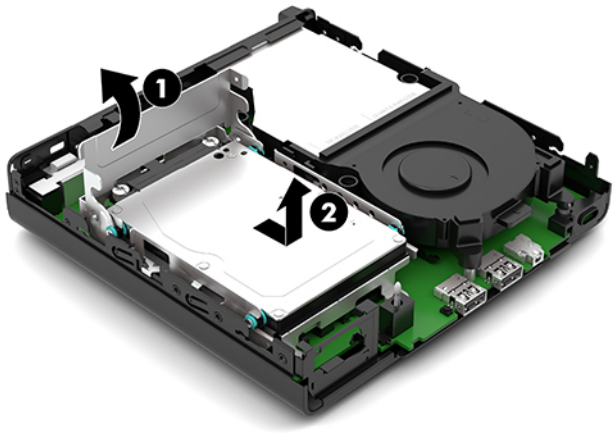
1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

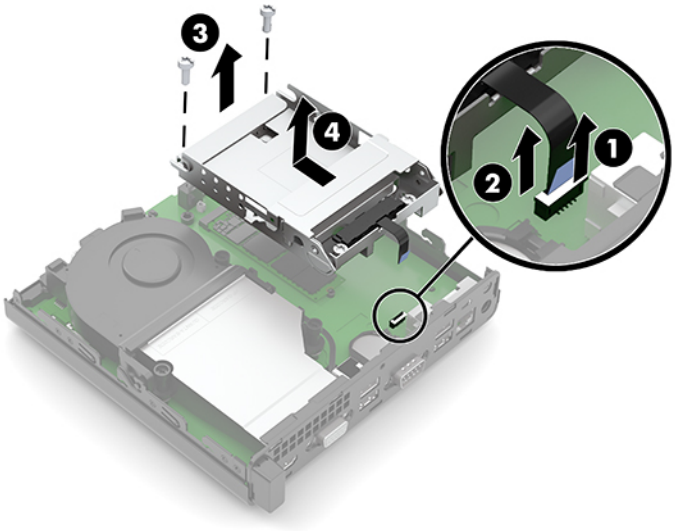
5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.

   For instructions, see Removing the computer access panel on page 9.
7. If your model has a hard drive installed, you must remove the hard drive and hard drive cage to access the WLAN module.

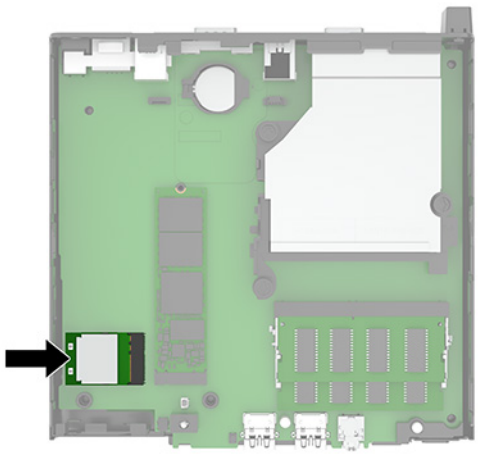
   a. Rotate the hard drive latch (1) up to disengage the hard drive from the cage. Then slide the drive toward the rear of the chassis until it stops, and then lift the hard drive (2) up and out of the cage.



b. Remove the hard drive cable clamp (1) from the connector on the system board. Disconnect the hard drive cable (2) from the system board using the pull tab on the cable, and then remove the two screws (3) that secure the hard drive cage to the chassis. Slide the hard drive cage (4) back and lift it out of the chassis.

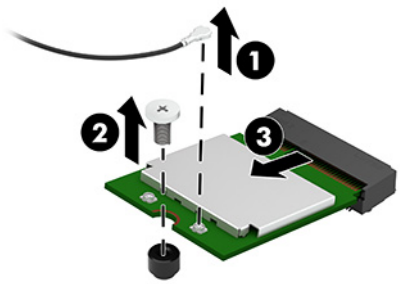


8. Locate the WLAN module on the system board.



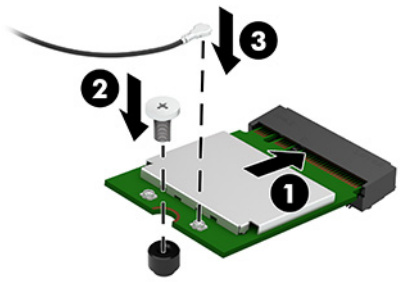
9. Disconnect the antenna cable (1) from the WLAN module. Remove the screw (2) securing the WLAN module to the system board, and then grasp the WLAN module by the sides and pull it out of the socket (3).

NOTE: You may need to use a small tool, such as a pair of tweezers or needle-nose pliers, to disconnect and connect the antenna cable.



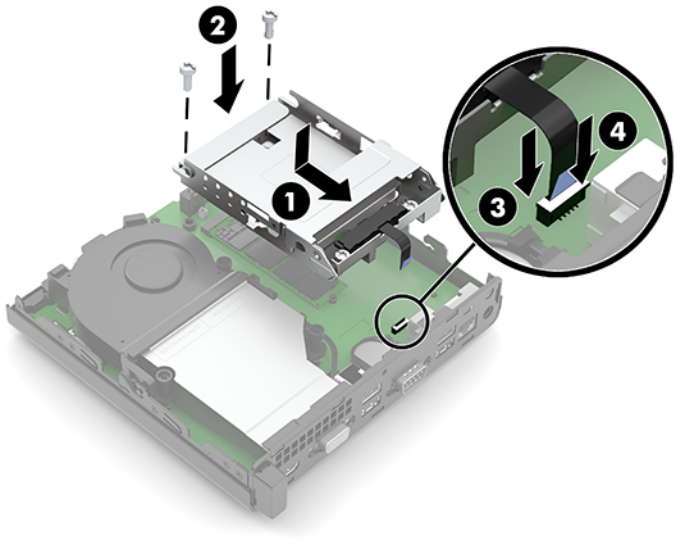
10. Insert the new WLAN module firmly into the socket (1) on the system board, and then secure the module to the system board using the screw (2) provided. Then attach the antenna cable (3) to the connector on the WLAN module.

NOTE: You may need to use a small tool, such as a pair of tweezers or needle-nose pliers, to disconnect and connect the antenna cable.

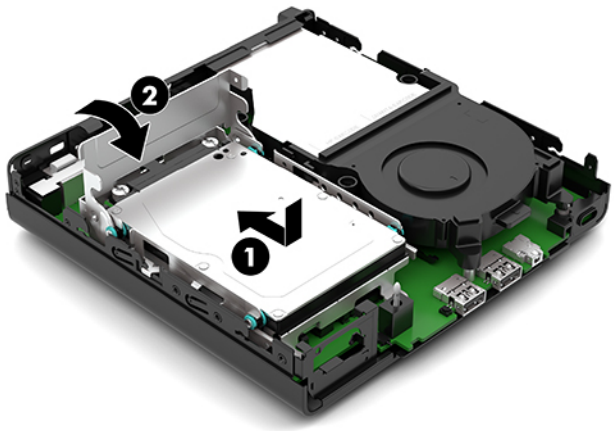


11. Replace the hard drive and hard drive cage if a hard drive was installed on your model.

    a. Place the hard drive cage (1) down into the chassis, and then slide it forward. Install the two screws (2) that secure the hard drive cage to the chassis, and then connect the hard drive cable (3) to the system board. Secure the cable by attaching the hard drive cable clamp (4) to the system board connector.



b. Align the hard drive mounting screws with the slots on the hard drive cage, press the hard drive down into the cage, and then slide the hard drive (1) forward. Then rotate the hard drive latch (2) down to engage the hard drive.



12. Replace the computer access panel.

    For instructions, see Replacing the computer access panel on page 10.

13. If the computer was on a stand, replace the stand.
14. Reconnect the AC power cord and any external devices, and then turn on the computer.
15. Lock any security devices that were disengaged when the computer access panel was removed.

Replacing the battery

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-volt 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 (140°F).

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

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

IMPORTANT: Before replacing the battery, it is important to back up the computer CMOS settings. When the battery is removed or replaced, the CMOS settings will be cleared.

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

NOTE: The lifetime of the lithium battery can be extended by plugging the computer into a live AC wall socket. The lithium battery is only used 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.

1. Remove/disengage any security devices that prohibit opening the computer.
2. Remove all removable media, such as a USB flash drive, from the computer.
3. Turn off the computer properly through the operating system, and turn off any external devices.
4. Disconnect the AC power cord from the AC outlet and disconnect any external devices.

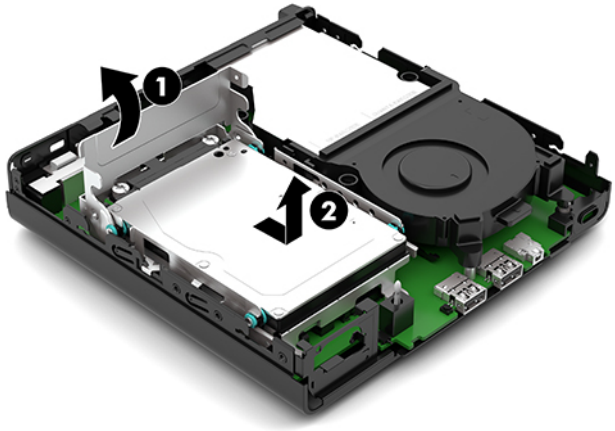
   IMPORTANT: Regardless of the power-on state, voltage is always present on the system board as long as the system is plugged into an active AC outlet. To prevent damage to internal components, you must disconnect the AC power cord from the power source before opening the computer.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.
6. Remove the computer access panel.

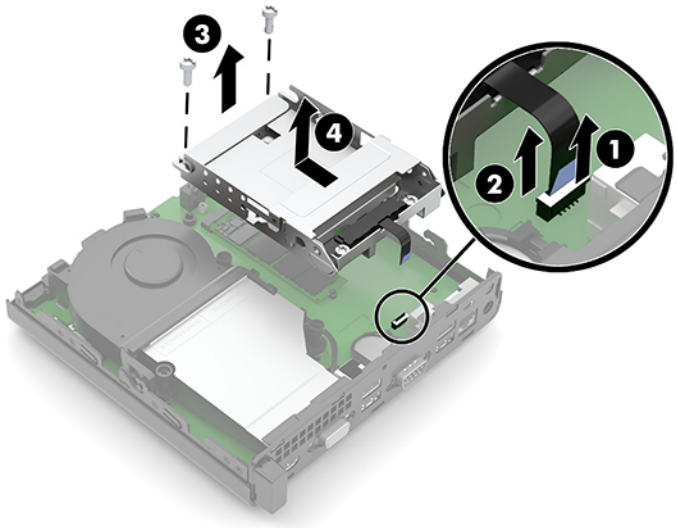
   For instructions, see Removing the computer access panel on page 9.

7. If your model has a hard drive installed, you must remove the hard drive and hard drive cage to access the battery.

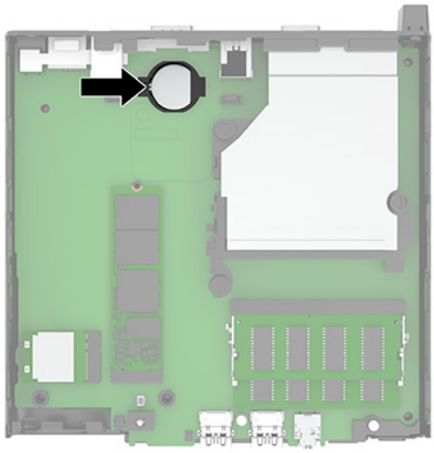
   a. Rotate the hard drive latch (1) up to disengage the hard drive from the cage. Then slide the drive toward the rear of the chassis until it stops, and then lift the hard drive (2) up and out of the cage.



b. Remove the hard drive cable clamp (1) from the connector on the system board. Disconnect the hard drive cable (2) from the system board using the pull tab on the cable, and then remove the two screws (3) that secure the hard drive cage to the chassis. Slide the hard drive cage (4) back and lift it out of the chassis.

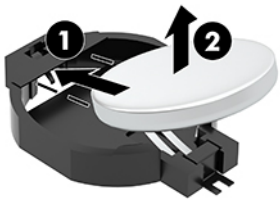


8. Locate the battery and battery holder on the system board.

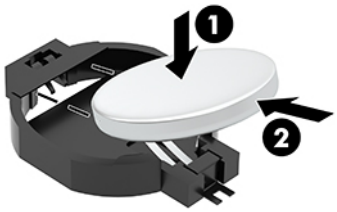


9. Slide the battery back (1) so that the edge of the battery pops up, and then pull the battery (2) out of the holder.

NOTE: You may need to use a small thin tool to press the battery back when removing it.

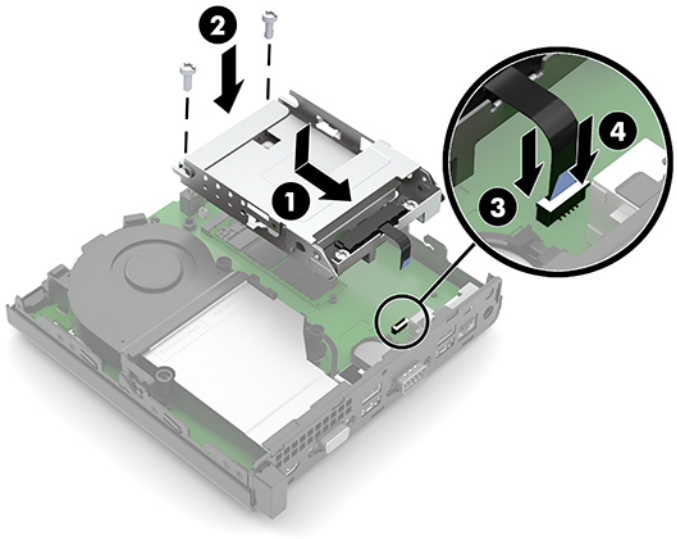


10. Place the replacement battery into the holder (1) positive side up. Then slide the battery (2) back and press it down into the holder.

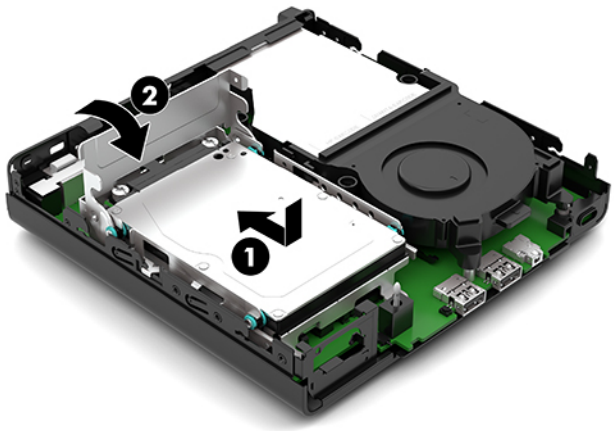


11. Replace the hard drive and hard drive cage if a hard drive was installed on your model.

    a. Place the hard drive cage (1) down into the chassis, and then slide it forward. Install the two screws (2) that secure the hard drive cage to the chassis, and then connect the hard drive cable (3) to the system board. Secure the cable by attaching the hard drive cable clamp (4) to the system board connector.



b. Align the hard drive mounting screws with the slots on the hard drive cage, press the hard drive down into the cage, and then slide the hard drive (1) forward. Then rotate the hard drive latch (2) down to engage the hard drive.



12. Replace the computer access panel.

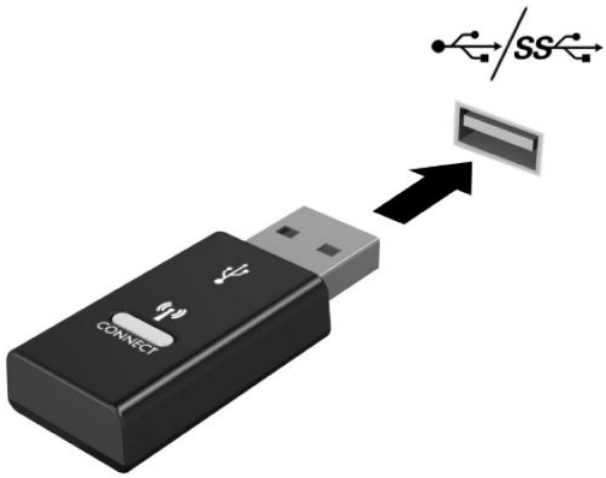
    For instructions, see Replacing the computer access panel on page 10.

13. If the computer was on a stand, replace the stand.
14. Reconnect the AC power cord and any external devices, and then turn on the computer.
15. Lock any security devices that were disengaged when the computer access panel was removed.
16. Reset the date and time, your passwords, and any special system setups using Computer Setup.

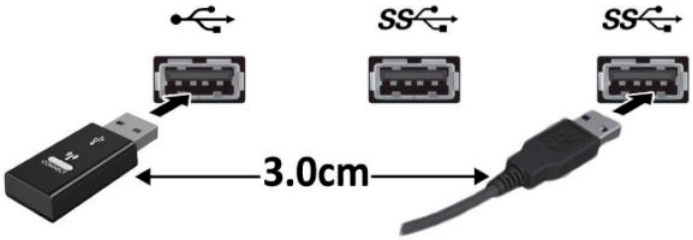
Synchronizing the optional wireless keyboard and mouse

The mouse and keyboard are synchronized at the factory. If they do not work, remove and replace the batteries. If the mouse and keyboard are still not synchronized, follow this procedure to manually re-synchronize the pair.

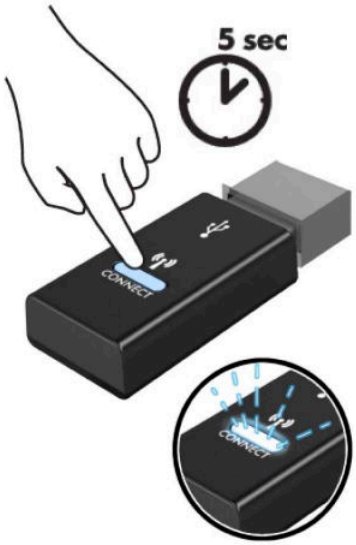
1. Connect the receiver to a USB port on the computer. If your computer only has USB SuperSpeed ports, connect the receiver to a USB SuperSpeed port.



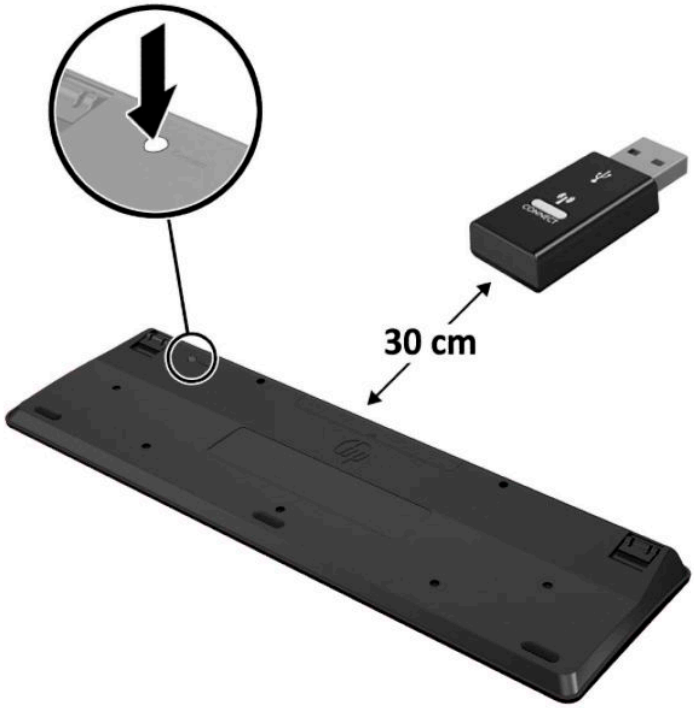
2. To avoid signal interference with a USB SuperSpeed device, distance the receiver at least 3.0 cm from the USB SuperSpeed device.



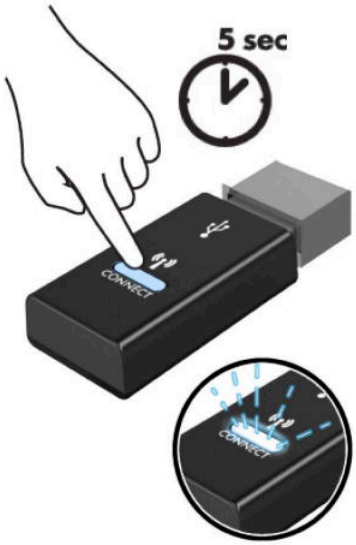
3. Press the Connect button on the receiver for approximately five seconds. The status light on the receiver flashes for approximately 30 seconds after the Connect button is pressed.



4. While the status light on the receiver is flashing, press the Connect button on the underside of the keyboard for five to ten seconds. After the Connect button is released, the status light on the receiver stops flashing, indicating that the devices have been synchronized.



5. Press the Connect button on the receiver for approximately five seconds. The status light on the receiver flashes for approximately 30 seconds after the Connect button is pressed.



6. While the status light on the receiver is flashing, press the Connect button on the underside of the mouse for five to ten seconds. After the Connect button is released, the status light on the receiver stops flashing, indicating that the devices have been synchronized.

NOTE: If the mouse and keyboard still do not work, remove and replace the batteries. If the mouse and keyboard are still not synchronized, synchronize the keyboard and mouse again.

A Electrostatic discharge

A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

Preventing electrostatic damage

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm +/- 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heelstraps, toestraps, or bootstraps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, contact an HP authorized dealer, reseller, or service provider.

NOTE: For more information on static electricity, contact an HP authorized dealer, reseller, or service provider.

B Computer operating guidelines, routine care and shipping preparation

Computer operating guidelines and routine care

Follow these guidelines to properly set up and care for the computer and monitor:

- 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.
- Never operate the computer with the access panel or any of the expansion card slot covers 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 re-circulated 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 above will 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.
- Turn off the computer before you do either of the following:
    - Wipe the exterior of the computer with a soft, damp cloth as needed. Using cleaning products may discolor or damage the finish.
    - 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.

Shipping preparation

Follow these suggestions when preparing to ship the computer:

1. Back up the hard drive files to an external storage device. Be sure that the backup media is not exposed to electrical or magnetic impulses while stored or in transit.

   NOTE: The hard drive locks automatically when the system power is turned off.

2. Remove and store all removable media.
3. Turn off the computer and external devices.
4. Disconnect the AC power cord from the AC outlet, then from the computer.
5. Disconnect the system components and external devices from their power sources, then from the computer.

   NOTE: Ensure that all boards are seated properly and secured in the board slots before shipping the computer.

6. Pack the system components and external devices in their original packing boxes or similar packaging with sufficient packing material to protect them.

C Accessibility

Accessibility

HP is working to weave diversity, inclusion and work/life into the fabric of our company, so it is reflected in everything we do. Here are some examples of how we are putting differences to work to create an inclusive environment focused on connecting people to the power of technology throughout the world.

Finding the technology tools you need

Technology can unleash your human potential. Assistive technology removes barriers and helps you create independence at home, at work, and in the community. Assistive technology helps increase, maintain, and improve the functional capabilities of electronic and information technology, including desktop and notebook computers, tablets, mobile phones, printers, and more. For more information, see Finding the best assistive technology on page 37.

Our commitment

HP is committed to providing products and services that are accessible for people with disabilities. This commitment supports our company's diversity objectives and helps us ensure that the benefits of technology are available to all.

Our accessibility goal is to design, produce, and market products and services that can be effectively used by everyone, including people with disabilities, either on a stand-alone basis or with appropriate assistive devices.

To achieve our goal, this Accessibility Policy establishes seven key objectives to guide our actions as a company. All HP managers and employees are expected to support these objectives and their implementation in accordance with their roles and responsibilities:

- Raise the level of awareness of accessibility issues within our company, and provide our employees with the training they need to design, produce, market, and deliver accessible products and services.
- Develop accessibility guidelines for products and services, and hold product development groups accountable for implementing these guidelines where competitively, technically, and economically feasible.
- Involve people with disabilities in the development of accessibility guidelines, and in the design and testing of products and services.
- Document accessibility features and make information about our products and services publicly available in an accessible form.
- Establish relationships with leading assistive technology and solution providers.

- Support internal and external research and development that will improve assistive technology relevant to our products and services.
- Support and contribute to industry standards and guidelines for accessibility.

International Association of Accessibility Professionals (IAAP)

IAAP is a not-for-profit association focused on advancing the accessibility profession through networking, education, and certification. The objective is to help accessibility professionals develop and advance their careers and to better enable organizations to integrate accessibility into their products and infrastructure.

HP is a founding member, and we joined to participate with other organizations to advance the field of accessibility. This commitment supports our company's accessibility goal of designing, producing, and marketing products and services that can be effectively used by people with disabilities.

IAAP will make our profession strong by globally connecting individuals, students, and organizations to learn from one another. If you are interested in learning more, go to http://www.accessibilityassociation.org to join the online community, sign up for newsletters, and learn about membership options.

Finding the best assistive technology

Everyone, including people with disabilities or age-related limitations, should be able to communicate, express themselves, and connect with the world using technology. HP is committed to increasing accessibility awareness within HP and with our customers and partners. Whether it's large fonts that are easy on the eyes, voice recognition that lets you give your hands a rest, or any other assistive technology to help with your specific situation—a variety of assistive technologies make HP products easier to use. How do you choose?

Assessing your needs

Technology can unleash your potential. Assistive technology removes barriers and helps you create independence at home, at work, and in the community. Assistive technology (AT) helps increase, maintain, and improve the functional capabilities of electronic and information technology, including desktop and notebook computers, tablets, mobile phones, printers, and more.

You may choose from many AT products. Your AT assessment should allow you to evaluate several products, answer your questions, and facilitate your selection of the best solution for your situation. You will find that professionals qualified to do AT assessments come from many fields, including those licensed or certified in physical therapy, occupational therapy, speech/language pathology, and other areas of expertise. Others, while not certified or licensed, may also provide evaluation information. You will want to ask about the individual's experience, expertise, and fees to determine if they are appropriate for your needs.

Accessibility for HP PC and tablet products

The following links provide information on accessibility features and assistive technology, if applicable, included in various HP products. These resources will help you select the specific assistive technology features and product(s) most appropriate for your situation.

- HP Elite x3–Accessibility Options (Windows 10 Mobile)
- HP PCs–Windows 7 Accessibility Options
- HP PCs–Windows 8 Accessibility Options
- HP PC's–Windows 10 Accessibility Options
- HP Slate 7 Tablets–Enabling Accessibility Features on Your HP Tablet (Android 4.1/Jelly Bean)

- HP SlateBook PCs–Enabling Accessibility Features (Android 4.3, 4.2/Jelly Bean)
- HP Chromebook PCs–Enabling Accessibility Features on Your HP Chromebook or Chromebox (Chrome OS)
- HP Shopping–peripherals for HP products

If you need additional support with the accessibility features on your HP product, see Contacting support on page 42.

Additional links to external partners and suppliers that may provide additional assistance:

- Microsoft Accessibility information (Windows 7, Windows 8, Windows 10, Microsoft Office)
- Google Products accessibility information (Android, Chrome, Google Apps)
- Assistive Technologies sorted by impairment type
- Assistive Technologies sorted by product type
- Assistive Technology vendors with product descriptions
- Assistive Technology Industry Association (ATIA)

Standards and legislation

Standards

Section 508 of the Federal Acquisition Regulation (FAR) standards was created by the US Access Board to address access to information and communication technology (ICT) for people with physical, sensory, or cognitive disabilities. The standards contain technical criteria specific to various types of technologies, as well as performance-based requirements which focus on functional capabilities of covered products. Specific criteria cover software applications and operating systems, web-based information and applications, computers, telecommunications products, video and multi-media, and self-contained closed products.

Mandate 376 – EN 301 549

The EN 301 549 standard was created by the European Union within Mandate 376 as the basis for an online toolkit for public procurement of ICT products. The standard specifies the functional accessibility requirements applicable to ICT products and services, together with a description of the test procedures and evaluation methodology for each accessibility requirement.

Web Content Accessibility Guidelines (WCAG)

Web Content Accessibility Guidelines (WCAG) from the W3C's Web Accessibility Initiative (WAI) helps web designers and developers create sites that better meet the needs of people with disabilities or age-related limitations. WCAG advances accessibility across the full range of web content (text, images, audio, and video) and web applications. WCAG can be precisely tested, is easy to understand and use, and allows web developers flexibility for innovation. WCAG 2.0 has also been approved as ISO/IEC 40500:2012.

WCAG specifically addresses barriers to accessing the web experienced by people with visual, auditory, physical, cognitive, and neurological disabilities, and by older web users with accessibility needs. WCAG 2.0 provides characteristics of accessible content:

- **Perceivable** (for instance, by addressing text alternatives for images, captions for audio, adaptability of presentation, and color contrast)
- **Operable** (by addressing keyboard access, color contrast, timing of input, seizure avoidance, and navigability)
- **Understandable** (by addressing readability, predictability, and input assistance)
- **Robust** (for instance, by addressing compatibility with assistive technologies)

Legislation and regulations

Accessibility of IT and information has become an area of increasing legislative importance. This section provides links to information on key legislation, regulations, and standards.

- United States
- Canada
- Europe
- United Kingdom
- Australia
- Worldwide

United States

Section 508 of the Rehabilitation Act specifies that agencies must identify which standards apply to the procurement of ICT, perform market research to determine the availability of accessible products and services, and document the results of their market research. The following resources provide assistance in meeting Section 508 requirements:

- www.section508.gov
- Buy Accessible

The U.S. Access Board is currently updating the Section 508 standards. This effort will address new technologies and other areas where the standards need to be modified. For more information, go to Section 508 Refresh.

Section 255 of the Telecommunications Act requires telecommunications products and services to be accessible to people with disabilities. FCC rules cover all hardware and software telephone network equipment and telecommunications equipment used in the home or office. Such equipment includes telephones, wireless handsets, fax machines, answering machines, and pagers. FCC rules also cover basic and special telecommunications services, including regular telephone calls, call waiting, speed dialing, call forwarding, computer-provided directory assistance, call monitoring, caller identification, call tracing, and repeat dialing, as well as voice mail and interactive voice response systems that provide callers with menus of choices. For more information, go to Federal Communication Commission Section 255 information.

21st Century Communications and Video Accessibility Act (CVAA)

The CVAA updates federal communications law to increase the access of persons with disabilities to modern communications, updating accessibility laws enacted in the 1980s and 1990s to include new digital, broadband, and mobile innovations. Regulations are enforced by the FCC and documented as 47 CFR Part 14 and Part 79.

- FCC Guide on the CVAA

Other U.S. legislation and initiatives

- Americans with Disabilities Act (ADA), Telecommunications Act, the Rehabilitation Act and others

Canada

The Accessibility for Ontarians with Disabilities Act was established to develop and implement accessibility standards to make goods, services, and facilities accessible to Ontarians with disabilities and to provide for the involvement of persons with disabilities in the development of the accessibility standards. The first standard of the AODA is the customer service standard; however, standards for transportation, employment, and information and communication are also being developed. The AODA applies to the Government of Ontario, the Legislative Assembly, every designated public sector organization, and to every other person or organization that provides goods, services, or facilities to the public or other third parties and that has at least one employee in Ontario; and accessibility measures must be implemented on or before January 1, 2025. For more information, go to Accessibility for Ontarians with Disability Act (AODA) .

Europe

EU Mandate 376 ETSI Technical Report ETSI DTR 102 612: "Human Factors (HF); European accessibility requirements for public procurement of products and services in the ICT domain (European Commission Mandate M 376, Phase 1)" has been released.

Background: The three European Standardization Organizations have set up two parallel project teams to carry out the work specified in the European Commission "Mandate 376 to CEN, CENELEC and ETSI, in Support of Accessibility Requirements for Public Procurement of Products and Services in the ICT Domain."

ETSI TC Human Factors Specialist Task Force 333 has developed ETSI DTR 102 612. Further details about the work performed by STF333 (e.g., Terms of Reference, specification of the detailed work tasks, time plan for the work, previous drafts, listing of comments received and means to contact the task force) can be found at the Special Task Force 333.

The parts relating to the assessment of suitable testing and conformity schemes were carried out by a parallel project, detailed in CEN BT/WG185/PT. For further information, go to the CEN project team website. The two projects are closely coordinated.

- CEN project team
- European Commission mandate for e-accessibility (PDF 46KB)
- Commission takes low profile on e-accessibility

United Kingdom

The Disability Discrimination Act of 1995 (DDA) was enacted to ensure that websites are accessible to blind and disabled users in the United Kingdom.

- W3C UK Policies

Australia

The Australian government has announced their plan to implement Web Content Accessibility Guidelines 2.0.

All Australian government websites will require Level A compliance by 2012, and Double A by 2015. The new standard replaces WCAG 1.0, which was introduced as a mandated requirement for agencies in 2000.

Worldwide

- JTC1 Special Working Group on Accessibility (SWG-A)
- G3ict: The Global Initiative for Inclusive ICT
- Italian accessibility legislation
- W3C Web Accessibility Initiative (WAI)

Useful accessibility resources and links

The following organizations may be good resources for information about disabilities and age-related limitations.

NOTE: This is not an exhaustive list. These organizations are provided for informational purposes only. HP assumes no responsibility for information or contacts you may encounter on the Internet. Listing on this page does not imply endorsement by HP.

Organizations

- American Association of People with Disabilities (AAPD)
- The Association of Assistive Technology Act Programs (ATAP)
- Hearing Loss Association of America (HLAA)
- Information Technology Technical Assistance and Training Center (ITTATC)
- Lighthouse International
- National Association of the Deaf
- National Federation of the Blind
- Rehabilitation Engineering & Assistive Technology Society of North America (RESNA)
- Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI)
- W3C Web Accessibility Initiative (WAI)

Educational institutions

- California State University, Northridge, Center on Disabilities (CSUN)
- University of Wisconsin - Madison, Trace Center
- University of Minnesota computer accommodations program

Other disability resources

- ADA (Americans with Disabilities Act) Technical Assistance Program
- Business & Disability network
- EnableMart
- European Disability Forum
- Job Accommodation Network
- Microsoft Enable
- U.S. Department of Justice - A Guide to disability rights Laws

HP links

Our contact webform

HP comfort and safety guide

HP public sector sales

Contacting support

NOTE: Support is in English only.

- Customers who are deaf or hard of hearing that have questions about technical support or accessibility of HP products:
  - Use TRS/VRS/WebCapTel to call (877) 656-7058 Monday through Friday, 6 a.m. to 9 p.m. Mountain Time.
- Customers with other disabilities or age-related limitations who have questions about technical support or accessibility of HP products, choose one of the following options:
  - Call (888) 259-5707 Monday through Friday, 6 a.m. to 9 p.m. Mountain Time.
  - Complete the Contact form for people with disabilities or age-related limitations.

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