Maintenance & Service Guide

HP t820 Flexible Thin Client

Product notice

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

About This Book

WARNING! Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.

CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

NOTE: Text set off in this manner provides important supplemental information.

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1 Product features

Standard configuration features

Front panel components
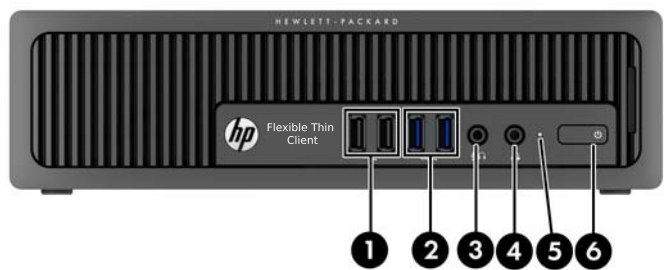
1	USB 2.0 Ports (black)	4	Headphone Connector
2	USB 3.0 Ports (blue)	5	Hard Drive Activity Light
3	Microphone/Headphone Connector	6	Dual-State Power Button

NOTE: When a device is plugged into the Microphone/Headphone Connector, a dialog box appears asking if you want to use the connector for a microphone Line-In device or a headphone. You can reconfigure the connector at any time by double-clicking the Audio Manager icon in the Windows® taskbar.

NOTE: The Power On Light is normally white when the power is on. If it is flashing red, there is a problem with the computer and it is displaying a diagnostic code. Refer to the to interpret the code.

Rear panel components
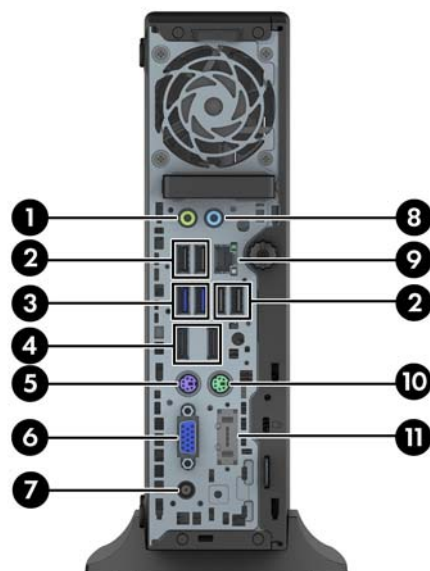
1		Line-Out Connector for powered audio devices (green)	7		Power Cord Connector
2		USB 2.0 Ports (black)	8		Line-In Audio Connector (blue)
3		USB 3.0 Ports (blue)	9		RJ-45 Network Connector
4		Dual-Mode DisplayPort Monitor Connectors	10		PS/2 Mouse Connector (green)
5		PS/2 Keyboard Connector (purple)	11		Fiber NIC (optional)
6		VGA Monitor Connector			

NOTE: When a device is plugged into the blue Line-In Audio Connector, a dialog box will pop up asking if you want to use the connector for a line-in device or a microphone. You can reconfigure the connector at any time by double-clicking the Audio Manager icon in the Windows taskbar.

If an MXM graphics card is installed, all of the video connectors may be used at the same time. However, for such a configuration, only the display connected to the upper DisplayPort will display POST messages.

The system board graphics can be disabled by changing settings in Computer Setup.

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 for use when contacting customer service for assistance.

2 Illustrated parts catalog

Computer major components

Item	Description	Spare part number
(1)	**Access panel**	732763-001
(2)	**Front bezel**	732764-001
(3)	**Stand**	612496-001
	System board (includes replacement thermal material)	
	For use in models with WES7	737729-001
	AC adapter	
	180W, standard	613766-001
	135W, standard	648964-001
	Memory modules (PC3-12800)	
	8-GB	689374-001

Item	Description	Spare part number
	4-GB	689373-001
	2-GB	689372-001
	Processors (include replacement thermal material)	
	Intel Pentium G3220 (3.0-GHz, 3-MB L3 cache, 54W)	742564-001
	Intel Core i5 4570s (2.9-GHz, 6-MB L3 cache, 65W)	732505-001

Drives

Description	Spare part number
mSATA drive	
32-GB	719566-001
16-GB	719565-001

Misc boards

Description	Spare part number
AMD Radeon HD 7650A 2GB MXM Graphics	708866-001
HP WLAN 802.11 a/b/g/n 2x2 PCIe NIC	695915-001

Misc parts
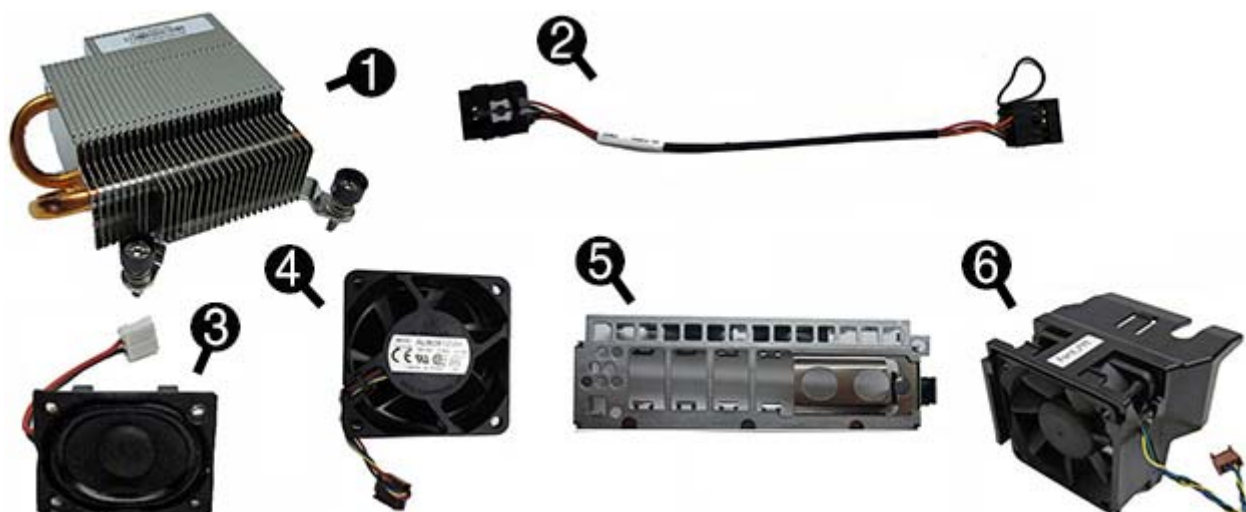
Item	Description	Spare part number
(1)	**Heat sink for use with the processor** (includes replacement thermal material)	587456-001
	Heat sink for use with the discrete graphics card (includes replacement thermal material; not illustrated)	689369-001
(2)	**Power switch assembly**	732767-001
(3)	**Speaker**	689384-001
(4)	**Fan, rear**	691352-001
(5)	**Front I/O panel**	732762-001
(6)	**Chassis fan, front**	732765-001
	SATA data cable, 25.2-inch	638814-001
	Solenoid lock	732772-001
	Drive cage	732761-001
	Mouse	
	PS2, optical	674315-001
	USB, optical	674316-001
	Keyboard	
	USB	724724-xx1
	PS/2	701423-xx1

Sequential part number listing

Spare part number	Description
587456-001	Heat sink for use with the processor (includes thermal material)
612496-001	Stand
613766-001	180-W power adapter, standard
638814-001	SATA data cable, 25.2-inch
638816-001	Hood sensor
648964-001	AC adapter, 135W, standard
674315-001	Mouse, PS2, optical
674316-001	Mouse, USB, optical
689369-001	Heat sink for use on models with discrete graphics cards (includes thermal material)
689372-001	Memory module, 2-GB, PC3-12800
689373-001	Memory module, 4-GB, PC3-12800
689374-001	Memory module, 8-GB, PC3-12800
689384-001	Speaker
691352-001	Chassis fan, rear
695915-001	HP WLAN 802.11 a/b/g/n 2x2 PCIe NIC
701423-xx1	Keyboard, PS/2
701424-xx1	Keyboard, USB
708866-001	AMD Radeon HD 7650A 2GB MXM Graphics
719565-001	16-GB mSATA drive
719566-001	32-GB mSATA drive
729624-001	Fiber NIC assembly, AT-2711FXa, PCIe
732505-001	Intel Core i5 4570s (2.9-GHz, 6-MB L3 cache, 65W)
732761-001	Drive cage
732762-001	Front I/O assembly
732763-001	Access panel
732764-001	Front bezel
732765-001	Front fan
732767-001	Power switch assembly
732772-001	Solenoid lock

Spare part number	Description
737729-001	System board for use in models with WES7 (includes replacement thermal material)
742564-001	Intel Pentium G3220 processor (3.0-GHz, 3-MB L3 cache, 54W)

3 Routine care and disassembly preparation

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

⚠ **CAUTION:** 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) may not appear to be affected at all and can work perfectly throughout a normal cycle. The device may function normally for a while, but it has been degraded in the internal layers, reducing its life expectancy.

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

Generating static

The following table shows that:

- Different activities generate different amounts of static electricity.

- Static electricity increases as humidity decreases.

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

NOTE: 700 volts can degrade a product.

Preventing electrostatic damage to equipment

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

- To avoid hand contact, transport products in static-safe containers such as tubes, bags, or boxes.

- Protect all electrostatic parts and assemblies with conductive or approved containers or packaging.

- Keep electrostatic sensitive parts in their containers until they arrive at static-free stations.

- Place items on a grounded surface before removing them from their container.

- Always be properly grounded when touching a sensitive component or assembly.

- Avoid contact with pins, leads, or circuitry.

- Place reusable electrostatic-sensitive parts from assemblies in protective packaging or conductive foam.

Personal grounding methods and equipment

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

- **Wrist straps** are flexible straps with a maximum of one-megohm ± 10% resistance in the ground cords. To provide proper ground, a strap must be worn snug against bare skin. The ground cord must be connected and fit snugly into the banana plug connector on the grounding mat or workstation.

- **Heel straps/Toe straps/Boot straps** can be used at standing workstations and are compatible with most types of shoes or boots. On conductive floors or dissipative floor mats, use them on both feet with a maximum of one-megohm ± 10% resistance between the operator and ground.

Static Shielding Protection Levels	
Method	**Voltage**
Antistatic plastic	1,500
Carbon-loaded plastic	7,500
Metallized laminate	15,000

Grounding the work area

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

- Cover the work surface with approved static-dissipative material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.

- Use static-dissipative mats, foot straps, or air ionizers to give added protection.

- Handle electrostatic sensitive components, parts, and assemblies by the case or PCB laminate. Handle them only at static-free work areas.

- Turn off power and input signals before inserting and removing connectors or test equipment.

- Use fixtures made of static-safe materials when fixtures must directly contact dissipative surfaces.

- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and Styrofoam.

- Use field service tools, such as cutters, screwdrivers, and vacuums, that are conductive.

Recommended materials and equipment

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

- Antistatic tape

- Antistatic smocks, aprons, or sleeve protectors

- Conductive bins and other assembly or soldering aids

- Conductive foam

- Conductive tabletop workstations with ground cord of one-megohm +/- 10% resistance

- Static-dissipative table or floor mats with hard tie to ground

- Field service kits

- Static awareness labels

- Wrist straps and footwear straps providing one-megohm +/- 10% resistance

- Material handling packages

- Conductive plastic bags

- Conductive plastic tubes

- Conductive tote boxes

- Opaque shielding bags

- Transparent metallized shielding bags

- Transparent shielding tubes

Operating guidelines

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 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.

Routine care

General cleaning safety precautions

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 in General cleaning safety precautions on page 14 before cleaning the computer.

To clean the computer case, follow the procedures described below:

- 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 as the alcohol will evaporate quickly and 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

Follow all safety precautions in General cleaning safety precautions on page 14 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 14.

When cleaning debris from under the keys, review all rules in General cleaning safety precautions on page 14 before following these procedures:

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

- Visible debris underneath or between the keys may be removed by vacuuming or shaking.

- Canned, pressurized air may be used to clean debris from under the keys. Caution should be used as 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.

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

- Cleaning under a key may be done 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

- 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 may 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 14.

Cleaning the mouse

Before cleaning the mouse, ensure 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 14.

Service considerations

Listed below are some of the considerations that you should keep in mind during the disassembly and assembly of the computer.

Tools and software requirements

To service the computer, you need the following:

- Torx T-15 screwdriver

- Torx T-15 screwdriver with small diameter shank (for certain front bezel removal)

- Flat-bladed screwdriver (may sometimes be used in place of the Torx screwdriver)

- Phillips #2 screwdriver

- Diagnostics software

- Tamper-resistant T-15 wrench

Screws

The screws used in the computer are not interchangeable. They may have standard or metric threads and may be of different lengths. If an incorrect screw is used during the reassembly process, it can damage the unit. HP strongly recommends that all screws removed during disassembly be kept with the part that was removed, then returned to their proper locations.

CAUTION: Metric screws have a black finish. U.S. screws have a silver finish and are used on hard drives only.

CAUTION: As each subassembly is removed from the computer, it should be placed away from the work area to prevent damage.

Cables and connectors

Most cables used throughout the unit are flat, flexible cables. These cables must be handled with care to avoid damage. 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 ensure that the cables are routed in such a way that they cannot be caught or snagged by parts being removed or replaced.

CAUTION: When servicing this computer, ensure that cables are placed in their proper location during the reassembly process. Improper cable placement can damage the computer.

Lithium coin cell battery

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

See the appropriate removal and replacement chapter for the chassis you are working on in this guide 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 in water or fire, or expose it to temperatures higher than 140°F (60°C). Do not attempt to recharge the battery.

NOTE: Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, their authorized partners, or their agents.

4 Removal and replacement procedures

Adherence to the procedures and precautions described in this chapter 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.

Preparation for disassembly

See Routine care and disassembly preparation on page 10 for initial safety procedures.

1. Remove/disengage any security devices that prohibit opening the computer.

2. Remove all removable media, such as compact discs or USB flash drives, from the computer.

3. Turn off the computer properly through the operating system, then turn off any external devices.

4. Disconnect the power cord from the power outlet and disconnect any external devices.

   CAUTION: Turn off the computer before disconnecting any cables.

   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. In some systems the cooling fan is on even when the computer is in the "Standby," or "Suspend" modes. The power cord should always be disconnected before servicing a unit.

5. If the computer is on a stand, remove the computer from the stand and lay the computer down.

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

Access panel

Description	Spare part number
Access panel	732763-001

To access internal components, you must remove the access panel:

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Loosen the thumbscrew on the rear of the computer (1), slide the access panel toward the rear of the computer, then lift it off (2).

To install the access panel, reverse the removal procedure.

Front bezel

Description	Spare part number
Front bezel	732764-001

1. Prepare the computer for disassembly ().

2. Remove the access panel ().

3. Lift up the three tabs on the side of the bezel (1), then rotate the bezel off the chassis (2).
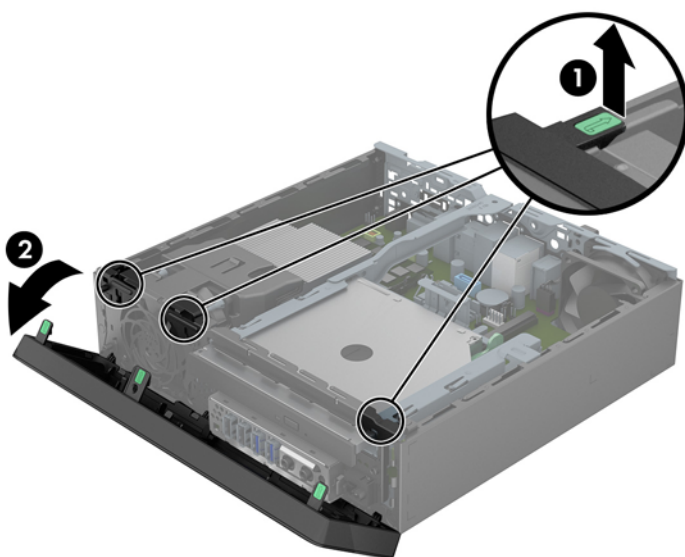
To install the front bezel, reverse the removal procedure.

Front bezel security

The front bezel can be locked in place by installing a security screw provided by HP. To install the security screw:

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front bezel (Front bezel on page 19).

4. Remove the black screw on the front of the chassis behind the bezel. The screw is labeled "BEZEL."
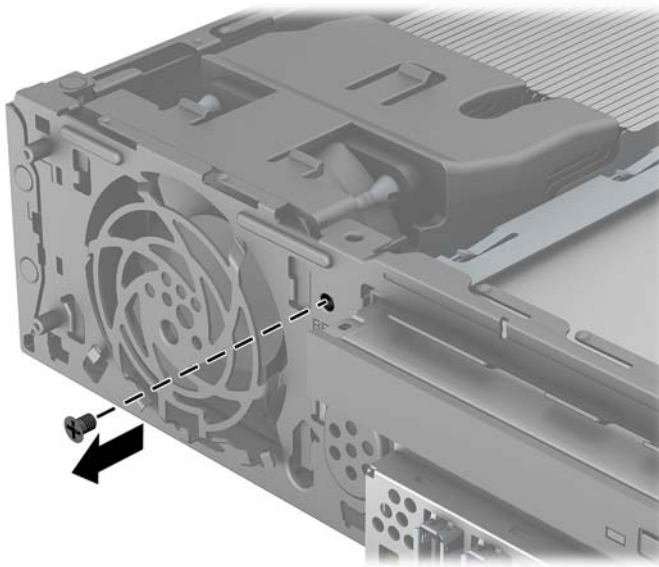
5. Replace the front bezel.

6. Install the security screw through the middle front bezel release tab and into the chassis to secure the front bezel in place.
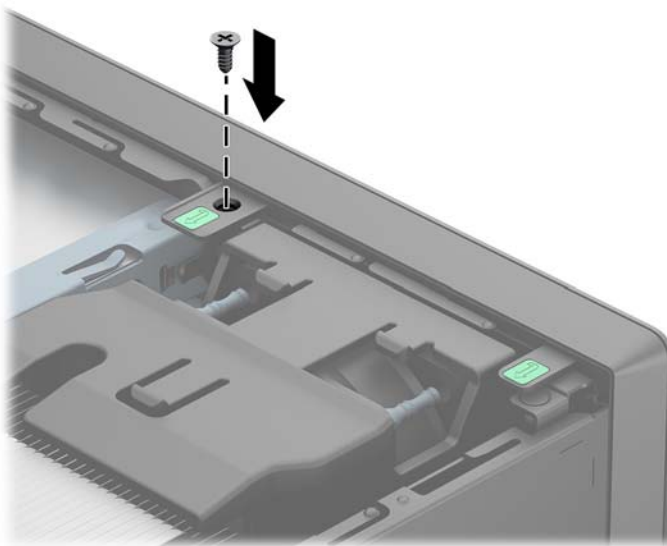
Memory

Description	Spare part number
8-GB, PC3-12800, SODIMM	689374-001
4-GB, PC3-12800, SODIMM	689373-001
2-GB, PC3-12800, SODIMM	689372-001

The computer comes with double data rate 3 synchronous dynamic random access memory (DDR3-SDRAM) small outline dual inline memory modules (SODIMMs).

SODIMMs

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 16-GB of memory.

DDR3-SDRAM SODIMMs

For proper system operation, the SODIMMs must be:

- industry-standard 204-pin
- unbuffered non-ECC PC3-12800 DDR3-1600 MHz-compliant
- 1.35 volt or 1.5 volt DDR3-SDRAM SODIMMs

The DDR3-SDRAM SODIMMs must also:

- support CAS latency 11 DDR3 1600 MHz (11-11-11 timing)
- contain the mandatory Joint Electronic Device Engineering Council (JEDEC) specification

In addition, the computer supports:

- 512-Mbit, 1-Gbit, and 2-Gbit non-ECC memory technologies
- single-sided and double-sided SODIMMS
- SODIMMs constructed with x8 and x16 devices; SODIMMs constructed with x4 SDRAM are not supported

NOTE: The system will not operate properly if you install unsupported SODIMMs.

Populating 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.
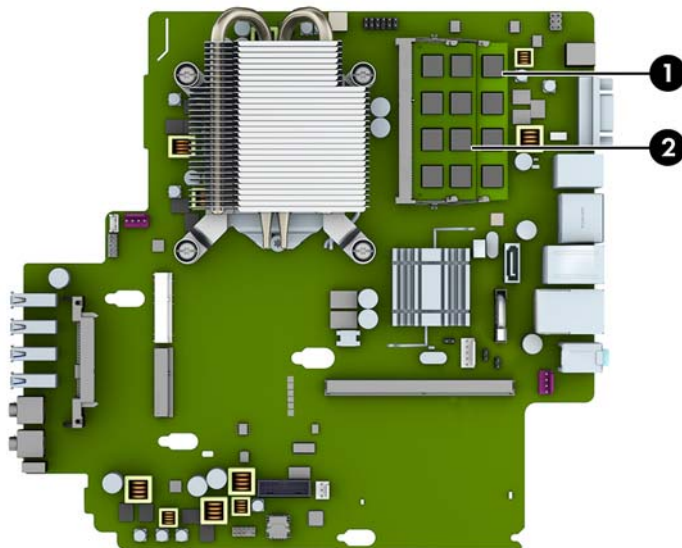
Item	Description	System Board Label	Socket Color
1	SODIMM1 socket, Channel B	DIMM1	Black
2	SODIMM3 socket, Channel A	DIMM3	Black

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

- The system will operate in single channel mode if the SODIMM sockets are populated in one channel only.

- The system will operate 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 will operate 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 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 SODIMM in the system.

Installing SODIMMs

⚠ **CAUTION:** 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-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 sockets 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, refer to Electrostatic discharge information on page 10.

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

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Locate the memory module sockets on the system board.

⚠ **WARNING!** To reduce risk of personal injury from hot surfaces, allow the internal system components to cool before touching.

4. To remove a SODIMM, press outward on the two latches on each side of the SODIMM **(1)** then pull the SODIMM out of the socket **(2)**.
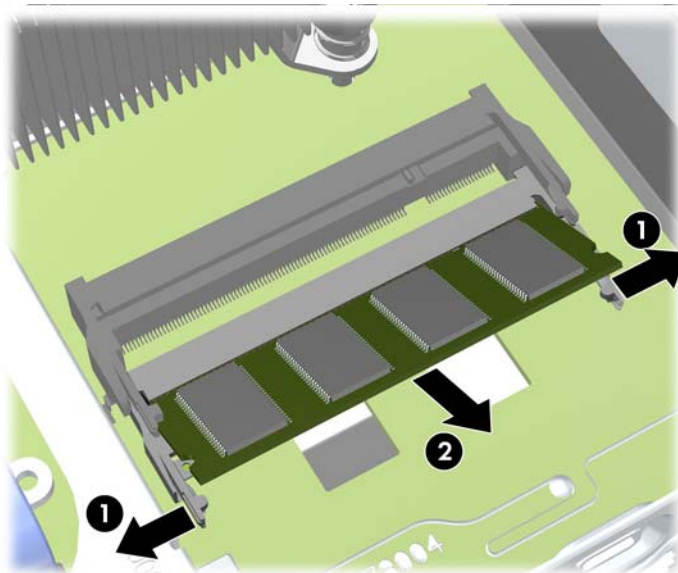
To install memory modules, reverse the removal procedure.

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

Front fan

Description	Spare part number
Front fan	732765-001

The front fan sits against the front on the left side of the chassis.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Disconnect the fan control cable from the red system board connector labeled CHFAN **(1)**.

4. Lift the fan straight up and out of the chassis **(2)**.

To install the front fan, reverse the removal procedure.

Speaker

Description	Spare part number
Speaker	689384-001

The speaker is secured to the front of the chassis between the fan and the I/O ports. Remove the screws from the outside and then remove the speaker from the inside.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front bezel (Front bezel on page 19).

4. Remove the front fan (Front fan on page 25).

5. Disconnect the speaker cable from the white system board connector labeled SPKR.

6. On the outside of the chassis, remove the two Torx T8 screws that secure the speaker to the chassis **(1)**, and then from the inside of the chassis, slide the speaker up to remove it **(2)**.

To install the speaker, reverse the removal procedure.

Heat sink

Description	Spare part number
Heat sink	587456-001

The heat sink is secured by four Torx screws. It does not have an attached fan.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Lift the front fan up and place it on top of the drive cage. You do not need to disconnect the fan cable from the system board.

4. Loosen the four Torx T15 screws that secure the heat sink to the system board, and then lift the heat sink from the system board.

⚠ **CAUTION:** Heat sink retaining screws should be removed in diagonally opposite pairs (as in an X) to even the downward forces on the processor to avoid damage that could require replacing the system board.

5. Lay the heat sink on its top in a safe area to prevent the thermal grease from contaminating the work surface.

If reusing the existing heat sink go to step 1.

If using a new heat sink, go to step 3.

1. If reusing the existing heat sink, clean bottom of the heat sink and apply the thermal material provided in the spares kit to the top of the processor.

2. Position the heat sink atop the processor.

3. If using a new heat sink, remove the protective covering from the bottom of the heat sink and place it in position atop the processor.

4. Secure the heat sink to the system board with the 4 captive screws.

⚠ **CAUTION:** Heat sink retaining screws should be tightened in diagonally opposite pairs (as in an X) to evenly seat the heat sink on the processor. This is especially important as the pins on the socket are very fragile and any damage to them may require replacing the system board.

Processor

Description	Spare part number
Intel Pentium G3220 (3.0-GHz, 3-MB L3 cache, 54W)	742564-001
Intel Core i5 4570s (2.9-GHz, 6-MB L3 cache, 65W)	732505-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front bezel (Front bezel on page 19).

4. Remove the heat sink (Heat sink on page 27).

5. Rotate the processor locking lever to its full open position **(1)**.

6. Raise and rotate the microprocessor retainer to its fully open position **(2)**.

7. Carefully lift the processor from the socket **(3)**.

⚠ **CAUTION:** Do NOT handle the pins in the processor socket. These pins are very fragile and handling them could cause irreparable damage. Once pins are damaged it may be necessary to replace the system board.
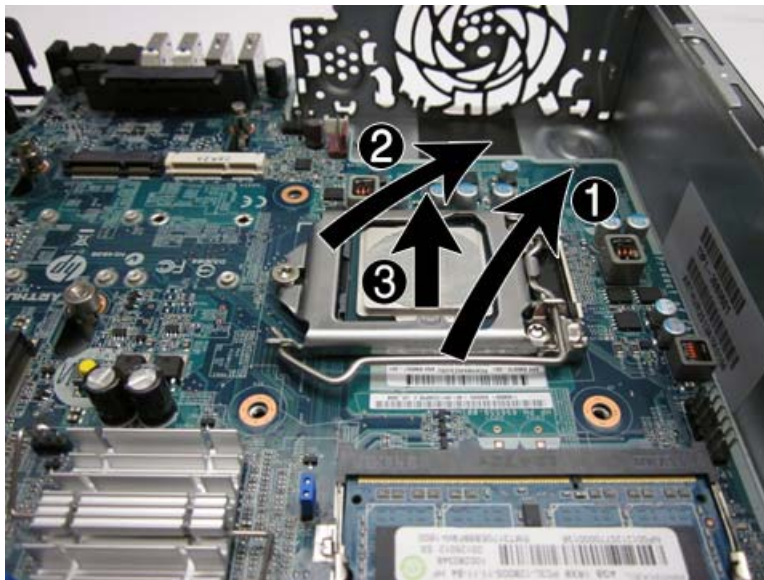
To install the processor, reverse the removal procedures.

📝 **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. The latest system BIOS can be found on the Web at: http://www8.hp.com/us/en/support-drivers.html.

Smart Cover Lock (solenoid lock)

Description	Spare part number
Solenoid lock	732772-001

NOTE: The Smart Cover Lock is an optional feature included on some models only.

The Smart Cover Lock is a software-controllable cover lock, controlled by the setup password. This lock prevents unauthorized access to the internal components. The computer ships with the Smart Cover Lock in the unlocked position.

If you enable the Smart Cover Lock and cannot enter your password to disable the lock, you will need a Smart Cover FailSafe Key to open the computer cover. You will need the key to access the internal computer components in any of the following circumstances:

- Power outage

- Startup failure

- PC component (for example, processor or power supply) failure

- Forgotten password

NOTE: The Smart Cover FailSafe Key is a specialized tool available from HP. Be prepared; order this key before you need it.

To obtain a FailSafe Key:

- Contact an authorized HP reseller or service provider. Order PN 166527-001 for the wrench-style key or PN 166527-002 for the screwdriver bit key.

- Refer to the HP Web site (http://www.hp.com) for ordering information.

- Call the appropriate number listed in the warranty.

The solenoid lock is mounted to the back of the computer. Remove it using one security screw on the outside of the computer.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. From the outside, rear side of the chassis, remove the silver security screw that secures the lock to the chassis.
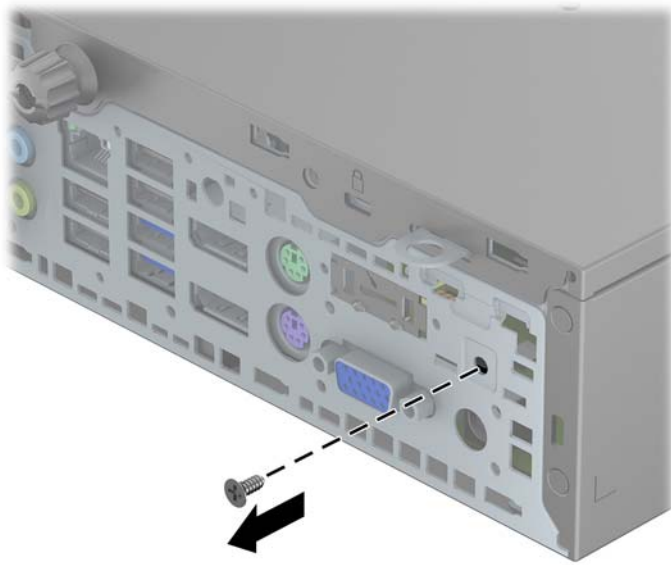
4. From the inside of the chassis, lift the lock up to gain access to the system board connector.

5. Disconnect the cable from the system board connector labeled HLOCK.
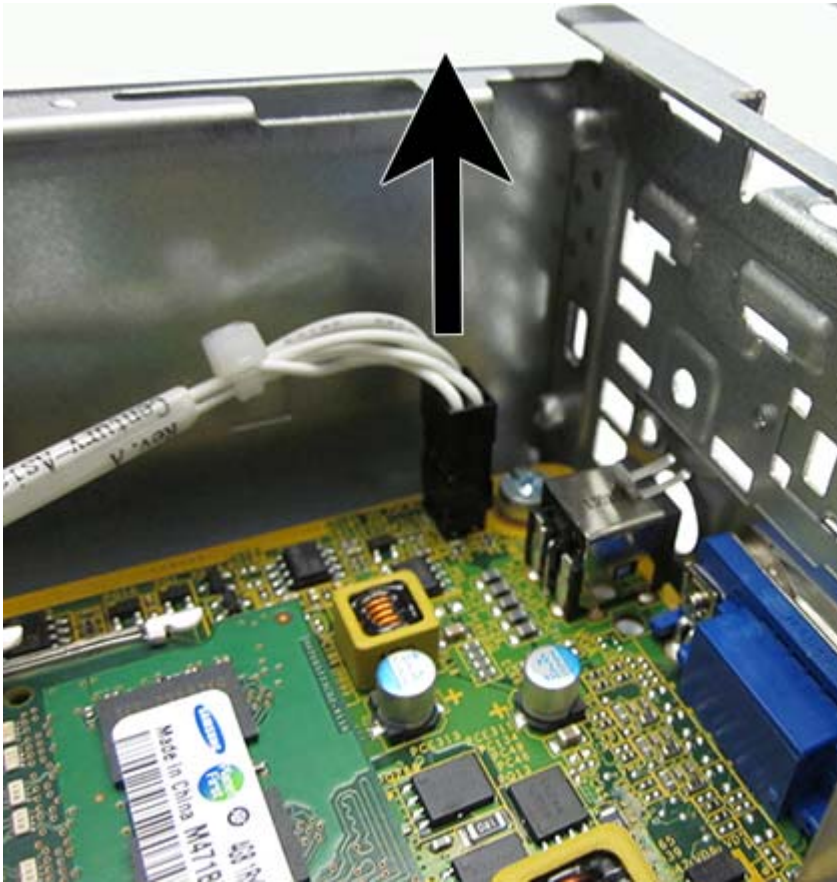
To install the Smart Cover Lock, reverse the removal procedure.

Refer to the following image for the location of the slots on the back of the chassis in which to install the lock. When installing, insert the top tabs into the top slots, and then rotate the lock downward. Then install the security screw on the outside of the computer. Plug the connector into the system board connector.
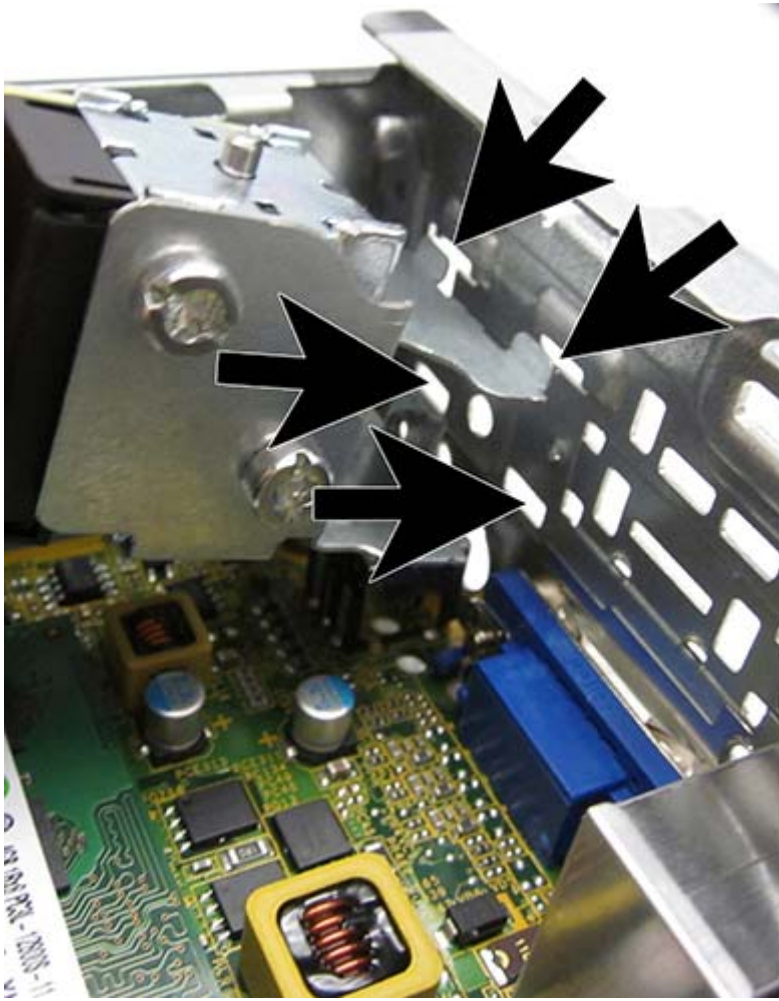
Drive cage (fiber NIC assembly holder)

Description	Spare part number
Drive cage	732761-001

The drive cage sits behind the USB ports on the front of the chassis.

On this thin client, the drive cage does not support drives. The only component the drive cage houses is the fiber NIC assembly.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the two Torx screws that secure cage to the chassis **(1)**, lift the tab **(2)** on the cage, slide the cage toward the rear of the unit **(3)**, and then pull the cage up and out of the chassis.
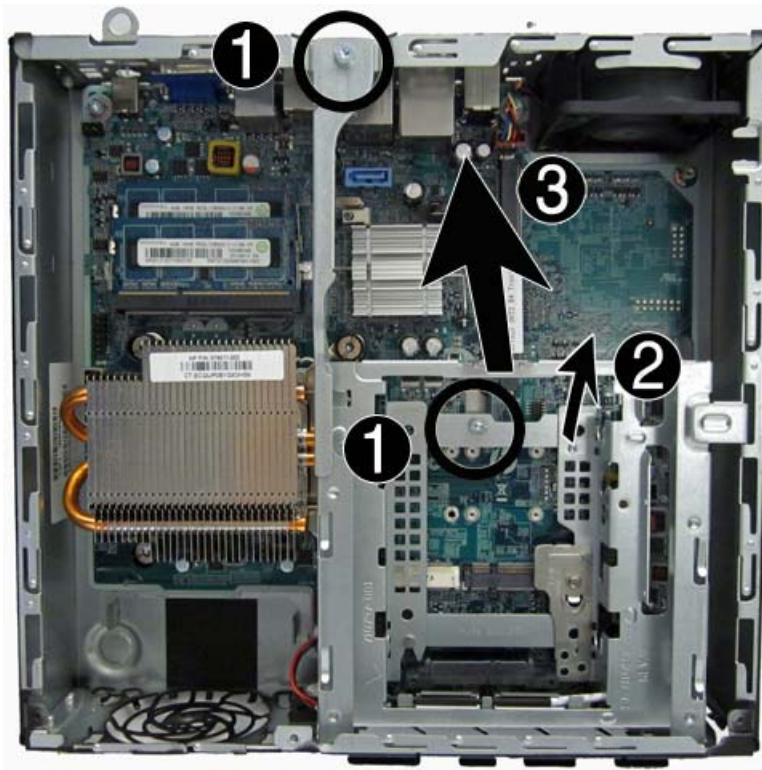
To install the drive cage, reverse the removal procedures.

mSATA drive

Description	Spare part number
32-GB mSATA drive	719566-001
16-GB mSATA drive	719565-001

The mSATA drive is installed onto the system board underneath the hard drive cage.

Remove the mSATA drive:

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

4. Remove the two Phillips screws **(1)** that secure the drive to the computer.

5. Slide the drive away to remove it from the socket **(2)**.
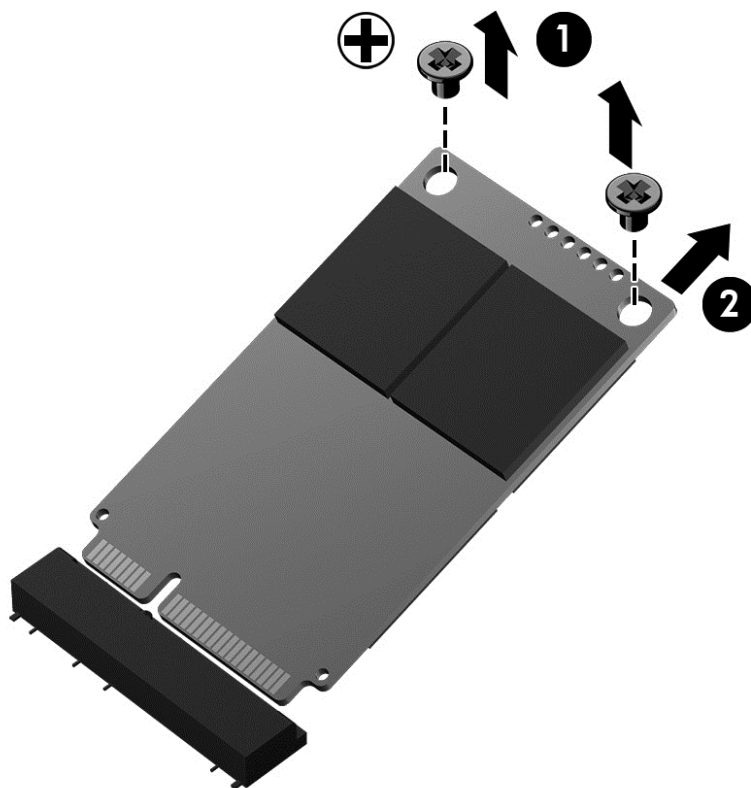
Reverse this procedure to install the mSATA drive.

Hood sensor

Description	Spare part number
Hood sensor	638816-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

4. Unplug the hood sensor cable from the white system board connector labeled HSENSE **(1)** and remove the cable from the white clip mounted on the inside chassis wall **(2)**.

5. Slide the hood sensor into the chassis to remove it from its slot **(3)**. Disengaging the hood sensor from the chassis may require use of a screwdriver or similar tool.
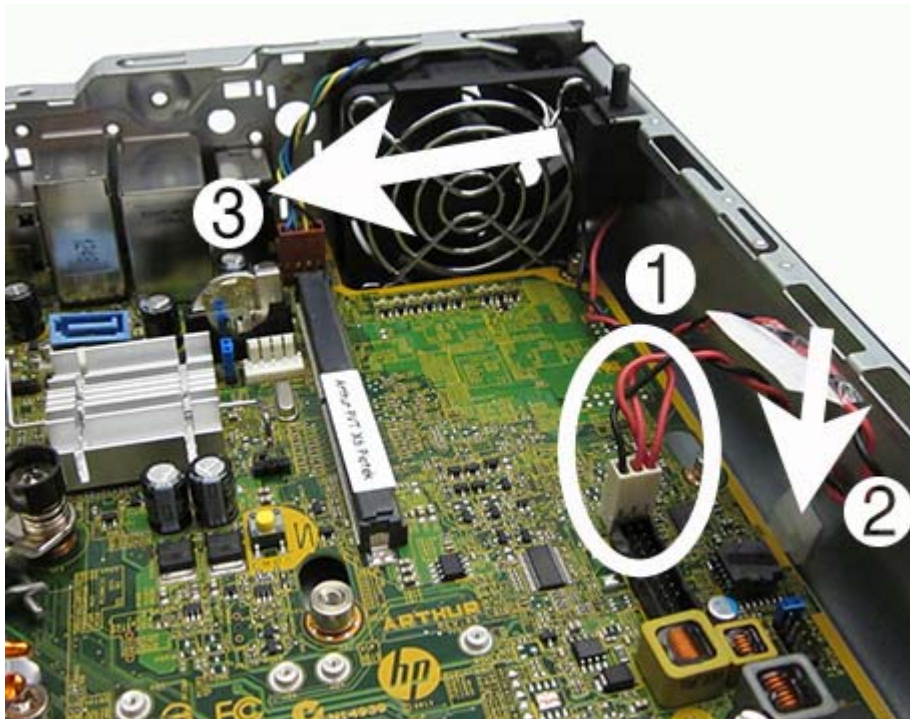
To install the hood sensor, reverse the removal procedures.

Installing the fiber NIC assembly

Description	Spare part number
Fiber NIC assembly	729624-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

4. Insert the Fiber NIC assembly into the hard drive carrier.
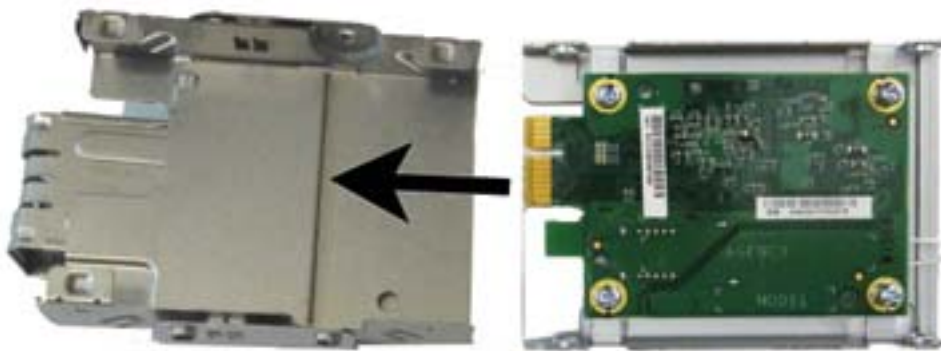
5. Insert the four Torx isolation screws to secure the assembly into the carrier.
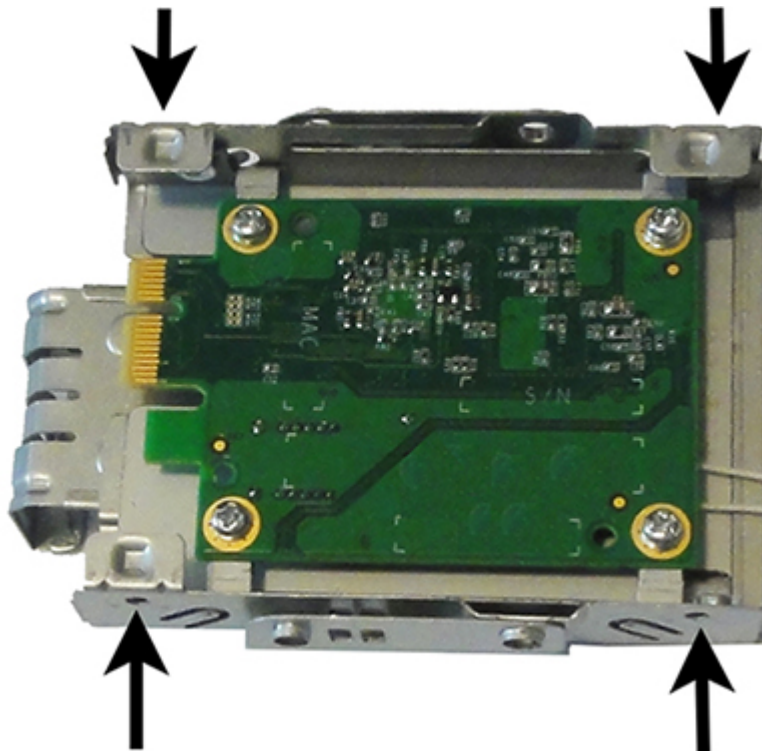
6. Insert the smaller fiber card into the PCI slot in the system board **(1)**, and rotate the board downward.
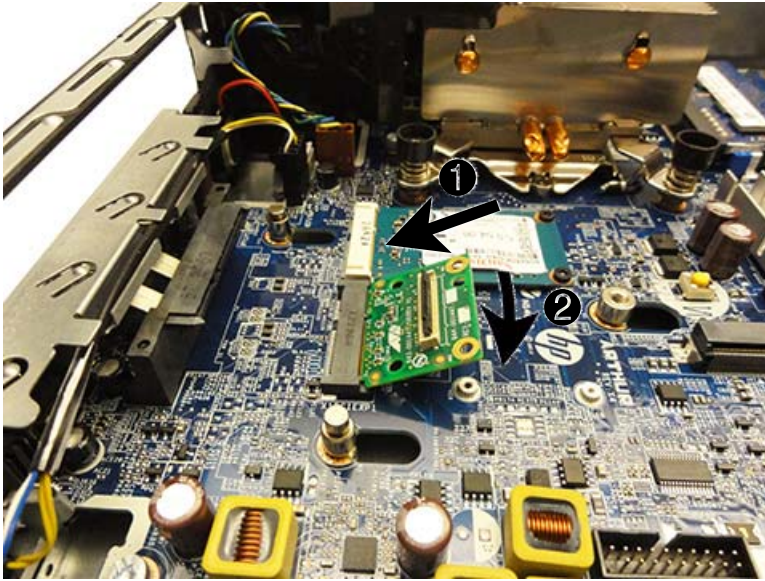
7. Insert the two Torx screws that secure the card onto the system board **(1)**, and the insert the FFC cable into the connector on the card.
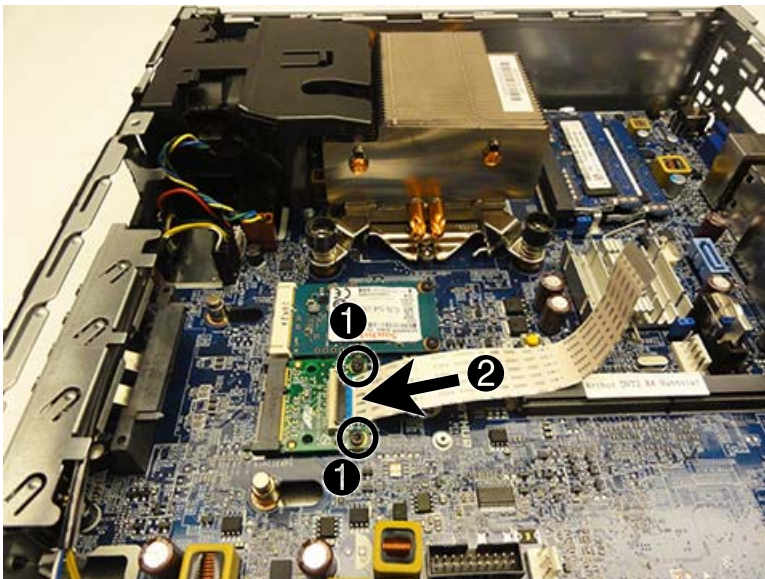
8. Install the hard drive carrier assembly into the hard drive cage. For more information, see Drive cage (fiber NIC assembly holder) on page 34.

9. Route the cable through the front of the hard drive carrier cage, and then insert the cable into the connector on the larger fiber card..

10. Install the clips in the two locations as shown in the following image, and then route the cables through the clips.

11. Disconnect the cable ends from the connector.
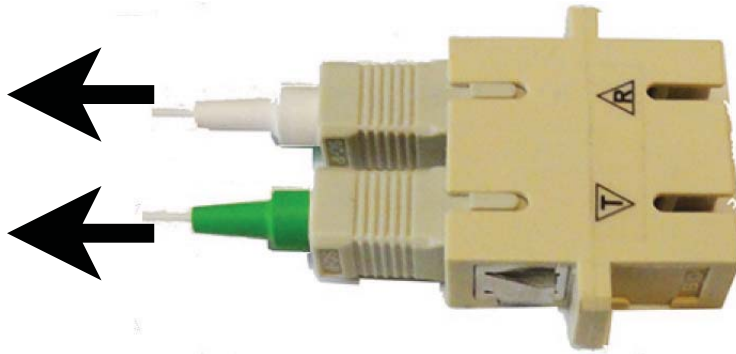
12. On the outside, rear of the computer, install the connector by inserting the connector through the slot on the computer, and then inserting the two Torx screws to secure the connector.
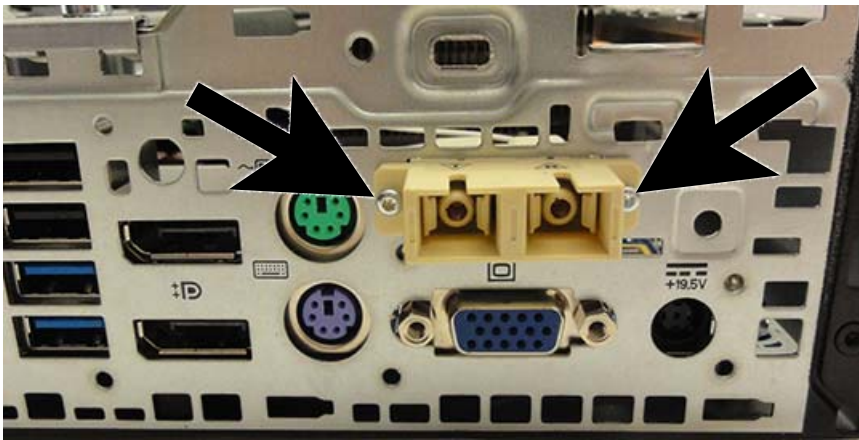
13. From the inside, rear of the computer, plug the cables into the connector. Plug the white cable into the port labeled 'R' and the green cable into the port labeled 'T'.
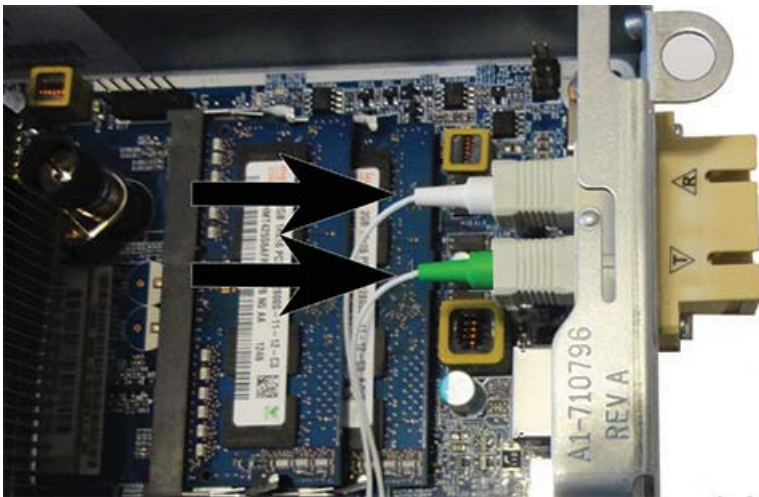
To remove the fiber NIC assembly, reverse the removal procedures.

WLAN module

Description	Spare part number
HP WLAN 802.11 a/b/g/n 2x2 PCIe NIC	695915-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

4. Disconnect the two antenna cables from the connectors on the module **(1)**.

5. Remove the two Phillips screws **(2)** that secure the module to the system board.

6. Lift the module to a 45 degree angle, and then remove the module from the connector by pulling it away at an angle **(3)**.
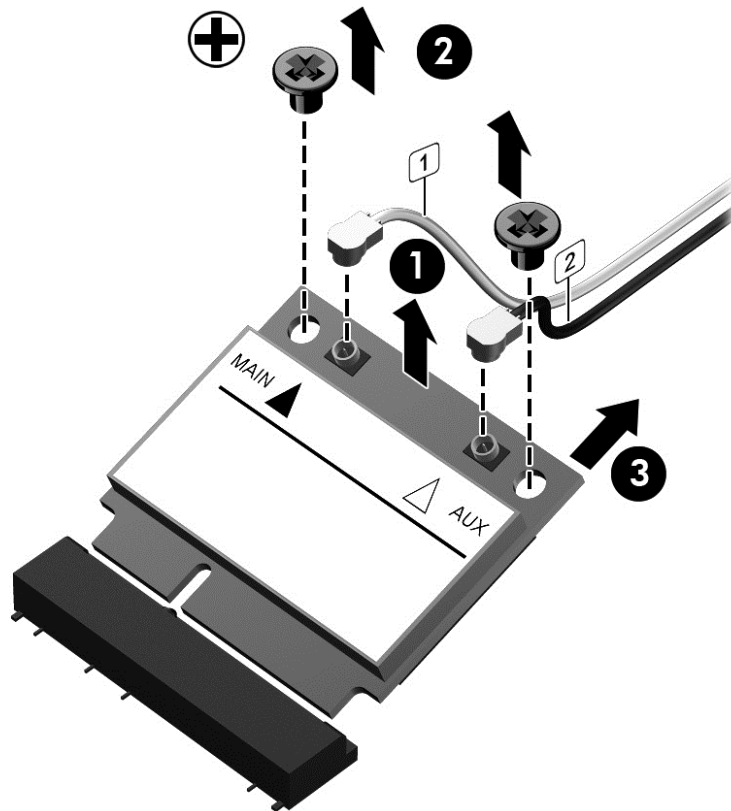
To install the WLAN module, reverse the removal procedure. Make sure the antenna cables are correctly routed.

Graphics board

Description	Spare part number
AMD Radeon HD 7650A 2GB MXM Graphics	708866-001

⚠ **CAUTION:** Be very careful when removing or replacing the system board to prevent damaging it.

1. Prepare the computer for disassembly ().

2. Remove the access panel ().

3. Remove the drive cage ().

4. Remove the two Torx T8 screws **(1)** that secure the graphics board to the system board, rotate the board upward to a 45-degree angle **(2)**, and the pull it away from the system board connector and out of the computer **(3)**.

📝 **NOTE:** Graphics card appearance may vary.
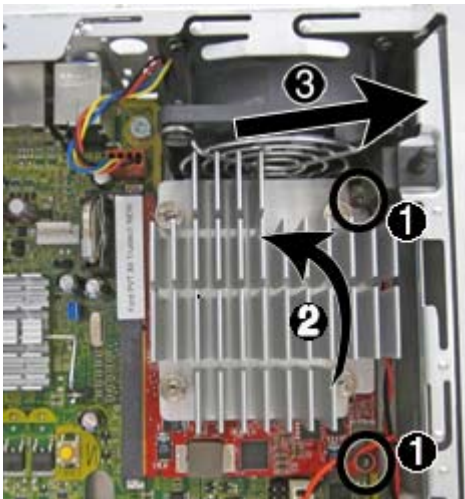
To install the graphics board, reverse the removal procedure.

If you need to remove the heat sink from the graphics board, loosen the four captive Torx screws that secure the heat sink from the graphics board, and then lift the heat sink from the graphics board.

Power switch

| Description	Spare part number
Power switch	732767-001

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front bezel (Front bezel on page 19).

4. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

5. Disconnect the power switch cable from the system board connector labeled PB/LED.

6. Remove the power switch cable from atop the front I/O bracket.

7. From the front of the computer, press down (or squeeze) on the top on the power switch **(1)**, and then rotate it down **(2)** to disengage it from the chassis.
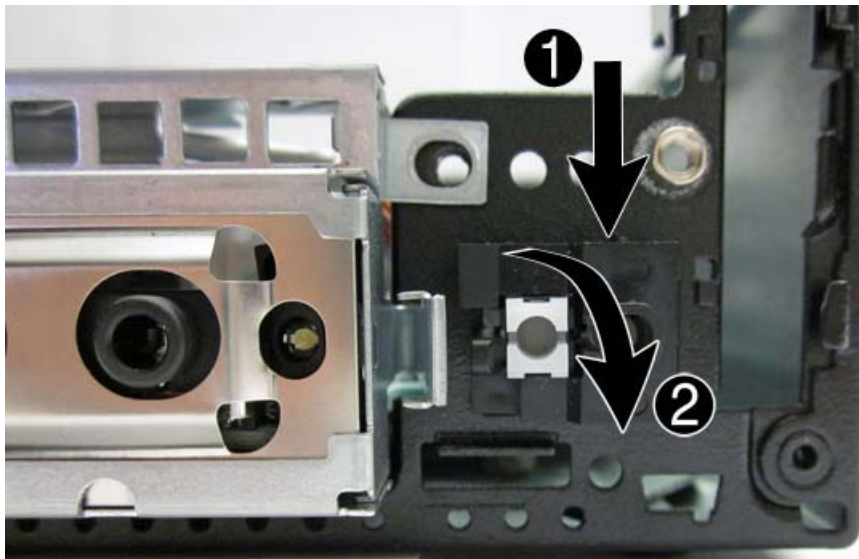
8. Pull the power switch and cable assembly out through the hole in the front of the chassis.

To install the power switch, reverse the removal procedure.

System board

Description	Spare part number
System board for use in models with WES7	737729-001
Front I/O panel	732762-001

⚠ **CAUTION:**   Be very careful when removing or replacing the system board to prevent damaging it.

When replacing the system board, make sure to remove the following components (as applicable) from the old system board and install them on the new system board:

- Memory modules (Memory on page 22).

- mSATA drive (mSATA drive on page 35).

- Processor (Processor on page 29).

- WLAN module (WLAN module on page 41).

- Graphics board (Graphics board on page 42).

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front fan (Front fan on page 25).

4. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

5. Remove the fiber NIC assembly (Installing the fiber NIC assembly on page 37).

6. Remove the heat sink (Heat sink on page 27).

7. Disconnect the rear fan cable from the system board.

8. Remove the power button cable from atop the front I/O panel.

9. Disconnect any remaining cables connected to the system board, noting their location for reinstallation.

10. Remove the front I/O panel:

    a. Remove the Torx T15 screw from the right side of the panel that secures it to the front of the chassis.

    b. Press the tab on right side of the panel **(1)**, and then swing the right side of the cage away from the chassis to remove it **(2)**.
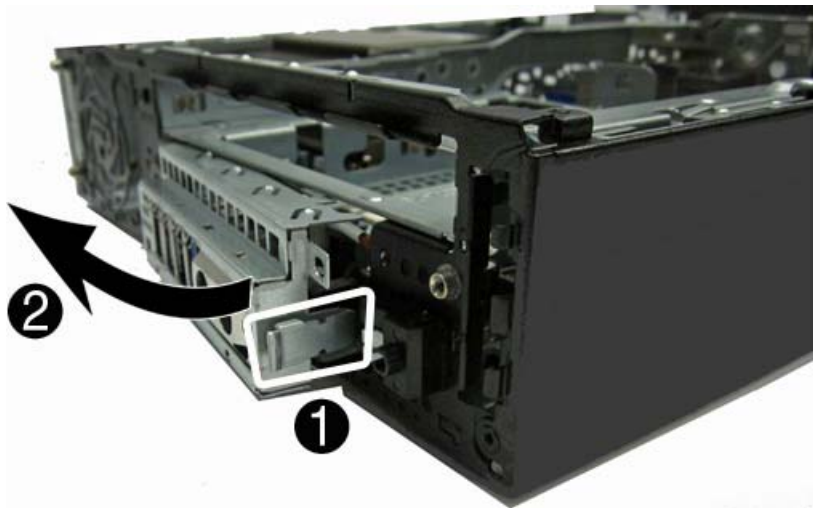
11. Remove the three remaining Torx T15 screws that secure the system board to the chassis.

12. Slide system board toward the front of the unit until the rear connectors are clear of their slots in the chassis **(1)**.

13. Lift the rear of the system board until it clears the chassis, and then remove the system board from the chassis **(2)**.
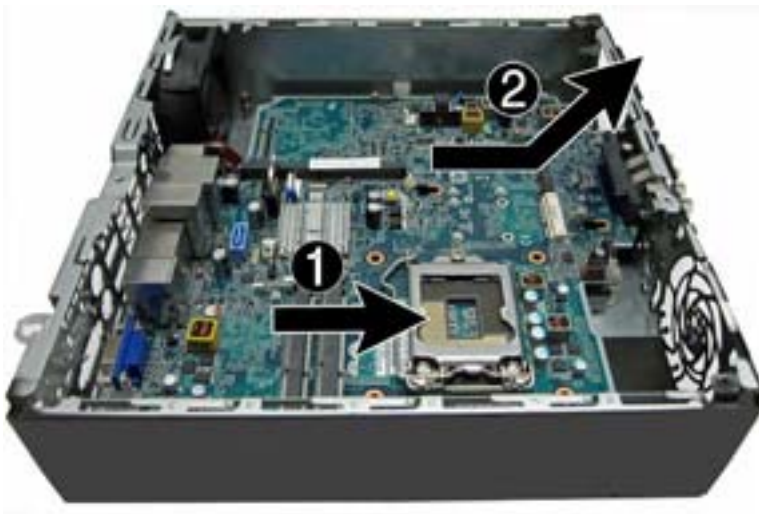
To install the system board, reverse the removal procedure.

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

Rear fan

Description	Spare part number
Rear fan	691352-001

The rear fan is secured to the rear right corner of the chassis. You must remove the system board before you can remove the rear fan.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front fan (Front fan on page 25).

4. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

5. Remove the fiber NIC assembly (Installing the fiber NIC assembly on page 37).

6. Remove the heat sink (Heat sink on page 27).

7. Remove the system board (System board on page 44).

8. From the outside of the chassis, remove the four Phillips screws that secure the fan to the chassis.
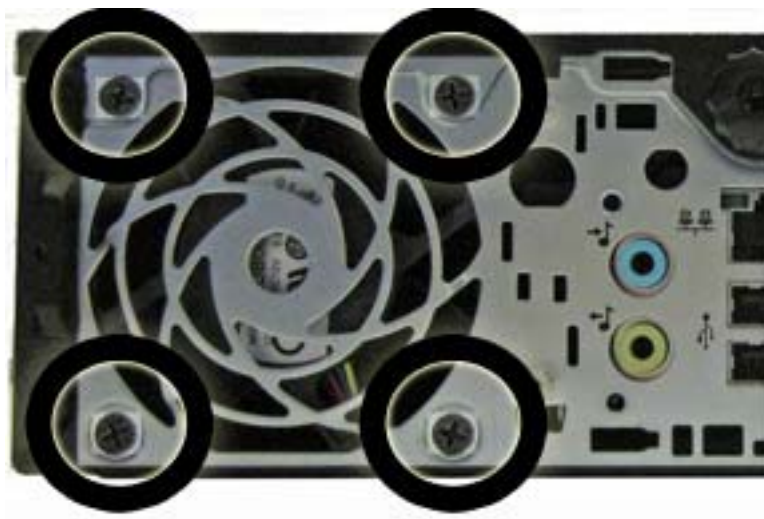
9. From the inside of the chassis, slide the fan out from underneath the chassis lip, and then remove the fan.

To install the rear fan, reverse the removal procedure.

Antennas

Two antennas are secured to chassis – one on the front, one on the back. You must remove all other components to remove the antennas.

1. Prepare the computer for disassembly (Preparation for disassembly on page 17).

2. Remove the access panel (Access panel on page 18).

3. Remove the front fan (Front fan on page 25).

4. Remove the drive cage (Drive cage (fiber NIC assembly holder) on page 34).

5. Remove the fiber NIC assembly (Installing the fiber NIC assembly on page 37).

6. Remove the heat sink (Heat sink on page 27).

7. Remove the system board (System board on page 44).

8. Remove the rear fan (Rear fan on page 47).

9. To remove the front antenna, from the inside of the front of the chassis, remove the antenna from the clips built into the base pan.

10. From the outside of the front of the chassis, remove the two Torx T8 screws **(1)** that secure the antenna to the chassis.

11. Pull the antenna out of the clips on the front of the chassis **(2)**, and then pull the antenna out of the hole it routes through **(3)**.
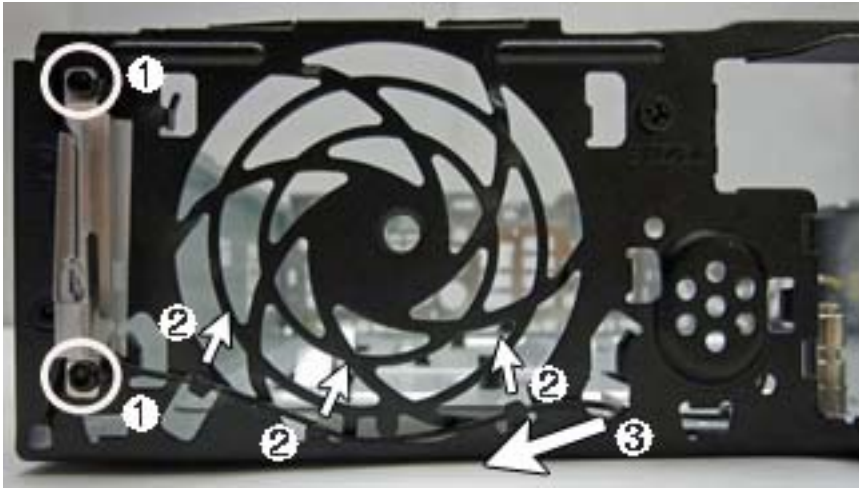
12. To remove the rear antenna, from the inside of the front of the chassis, remove the antenna from the plastic clips attached to the side of the chassis.

13. From the outside of the rear of the chassis, remove the two Torx T8 screws that secure the antenna to the chassis.

14. Pull the antenna through the hole it routes through.
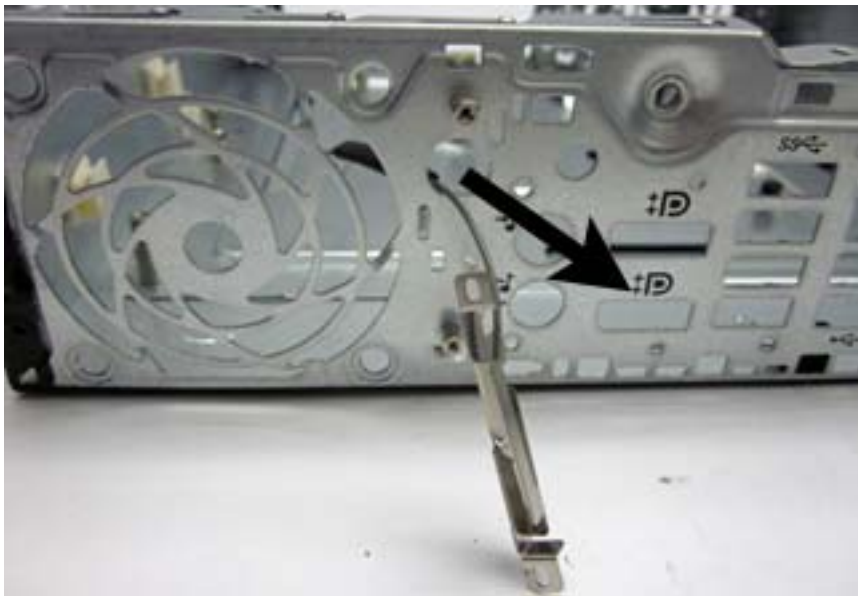
To install the rear fan, reverse the removal procedure.

Changing from desktop to tower configuration

The computer can be used in a tower orientation with the tower stand included with the computer.

1. Remove/disengage any security devices that prohibit opening the computer.

2. Remove all removable media, such as compact discs or USB flash drives, from the computer.

3. Turn off the computer properly through the operating system, then turn off any external devices.

4. Disconnect the power cord from the power outlet and disconnect any external devices.

   CAUTION: 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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Orient the computer so that its left side is facing down, and place the computer firmly down into the stand.
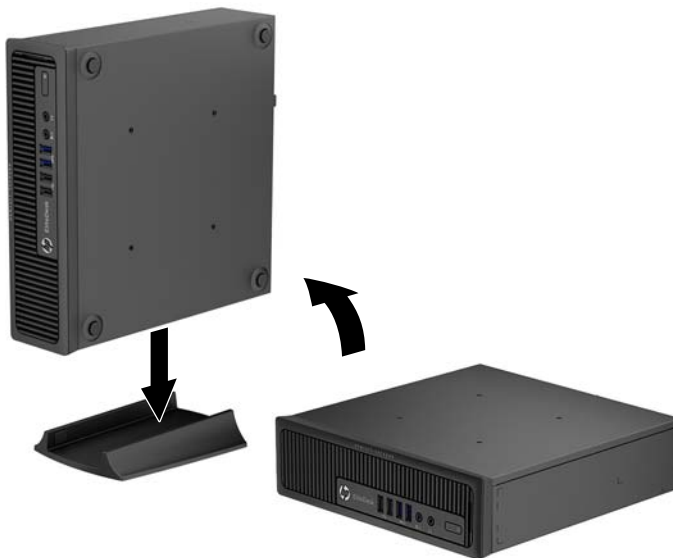
6. Reconnect the external equipment, plug the power cord into a power outlet, and turn the computer on.

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

   NOTE: An optional Quick Release mounting bracket is available from HP for mounting the computer to a wall, desk, or swing arm. When the mounting bracket is used, do not install the computer with the I/O ports oriented towards the ground.

Port cover

An optional rear port cover is available for the computer.

To install the port cover:

1. Thread the cables through the bottom hole on the port cover (1) and connect the cables to the rear ports on the computer.

2. Insert the hooks on the port cover into the slots on the rear of the chassis, then slide the cover to the right to secure it in place (2).
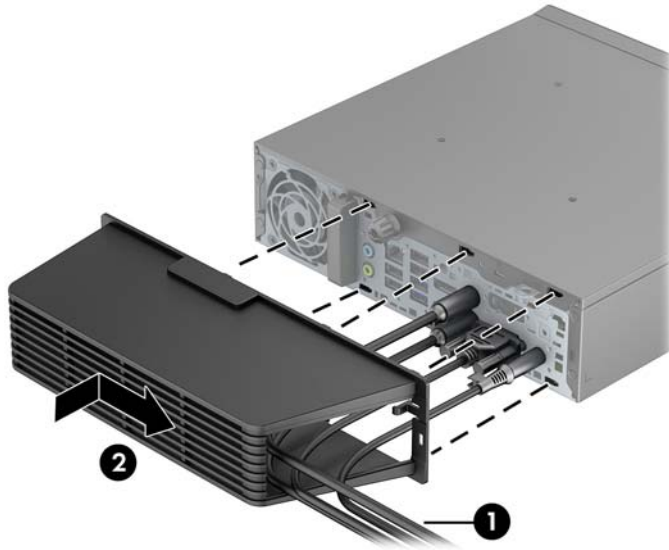
NOTE: For security purposes, you can install an optional cable lock to the chassis that locks the port cover and secures the computer.

The port cover is secured in place by a retention lever just inside the port cover opening. To remove the port cover, pull the lever back towards the port cover opening (1), then slide the cover to the left and off the computer (2).
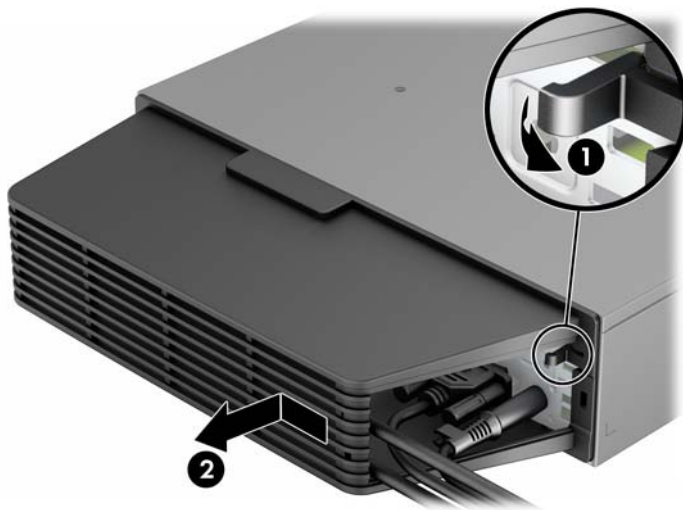
Power supply, external

The chassis uses an external power supply.

⚠ **WARNING!** To reduce potential safety issues, only the power supply provided with the computer, a replacement power supply provided by HP, or a power supply purchased as an accessory from HP should be used with the computer.

A   Battery replacement

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.

⚠ **CAUTION:**   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 compact discs or USB flash drives, from the computer.

3. Turn off the computer properly through the operating system, then turn off any external devices.

4. Disconnect the power cord from the power outlet and disconnect any external devices.

    ⚠ **CAUTION:**   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. You must disconnect the power cord to avoid damage to the internal components of the computer.

5. Remove the access panel.

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

> **NOTE:** On some computer models, it may be necessary to remove an internal component to gain access to the battery.

7. Depending on the type of battery holder on the system board, complete the following instructions to replace the battery.

Type 1

a. Lift the battery out of its holder.
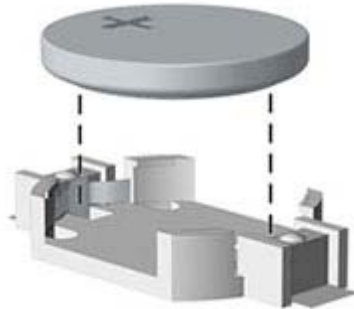
b. Slide the replacement battery into position, positive side up. The battery holder automatically secures the battery in the proper position.

Type 2

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

b. To insert the new battery, slide one edge of the replacement battery under the holder's lip with the positive side up. Push the other edge down until the clamp snaps over the other edge of the battery (2).

Type 3

a. Pull back on the clip (1) that is holding the battery in place, and remove the battery (2).

b. Insert the new battery and position the clip back into place.
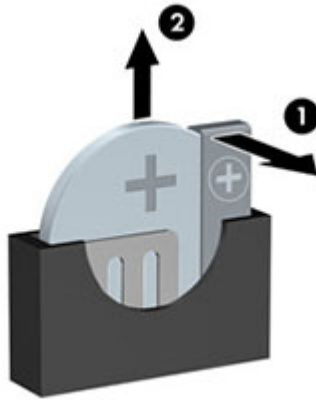
NOTE: After the battery has been replaced, use the following steps to complete this procedure.

8. Replace the access panel.

9. Plug in the computer and turn on power to the computer.

10. Reset the date and time, your passwords, and any special system setups using Computer Setup.

11. Lock any security devices that were disengaged when the access panel was removed.

B Computer Setup (F10) Utility, BIOS Settings

Computer Setup (F10) Utilities

Use Computer Setup (F10) Utility to do the following:

- Change factory default settings.

- Set the system date and time.

- Set, view, change, or verify the system configuration, including settings for processor, graphics, memory, audio, storage, communications, and input devices.

- Modify the boot order of bootable devices such as solid-state drives or USB flash media devices.

- Select Post Messages Enabled or Disabled to change the display status of Power-On Self-Test (POST) messages. Post Messages Disabled suppresses most POST messages, such as memory count, product name, and other non-error text messages. If a POST error occurs, the error is displayed regardless of the mode selected. To manually switch to Post Messages Enabled during POST, press any key (except F1 through F12).

- Establish an Ownership Tag, the text of which is displayed each time the system is turned on or restarted.

- 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 power-on.

- Establish a setup password that controls access to the Computer Setup (F10) Utility and the settings described in this section.

- Secure integrated I/O functionality, including the USB, audio, or embedded NIC, so that they cannot be used until they are unsecured.

- Enable or disable removable media boot ability.

- Replicate the system setup by saving system configuration information on a USB device and restoring it on one or more computers.

- Enable or disable DriveLock security (when supported by drive).

Using Computer Setup (F10) Utilities

Computer Setup can be accessed only by turning the computer on or restarting the system. To access the Computer Setup Utilities menu, complete the following steps:

1. Turn on or restart the computer.

2. Press either Esc or F10 while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   Pressing Esc displays a menu that allows you to access different options available at startup.

   NOTE: If you do not press Esc or F10 at the appropriate time, you must restart the computer and again press Esc or F10 when the monitor light turns green to access the utility.

   NOTE: You can select the language for most menus, settings, and messages using the Language Selection option in the ESC (Startup) Menu or using the F8 key in Computer Setup.

3. If you pressed Esc, press F10 to enter Computer Setup.

4. A choice of five headings appears in the Computer Setup Utilities menu: File, Storage, Security, Power, and Advanced.

5. 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, then press Enter. To return to the Computer Setup Utilities menu, press Esc.

6. To apply and save changes, select **File** > **Save Changes and Exit**.

   - If you have made changes that you do not want applied, select **Ignore Changes and Exit**.

   - To reset to factory settings or previously saved default settings (some models), select **Apply Defaults and Exit**. This option will restore the original factory system defaults.

CAUTION: Do NOT turn the computer power OFF while the BIOS is saving the Computer Setup (F10) changes because the CMOS could become corrupted. It is safe to turn off the computer only after exiting the F10 Setup screen.

Table B-1 Computer Setup (F10) Utility

Heading	Table
File	Computer Setup—File on page 60
Storage	Computer Setup—Storage on page 61
Security	Computer Setup—Security on page 62
Power	Computer Setup—Power on page 65
Advanced	Computer Setup—Advanced on page 66

Computer Setup—File

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

Table B-2 Computer Setup—File

Option	Description
System Information	Lists: ● Product name ● SKU number (some models) ● Processor type/speed/stepping ● Cache size (L1/L2) ● Installed memory size/speed, number of channels (single or dual) (if applicable) ● Integrated MAC address for embedded, enabled NIC (if applicable) ● System BIOS (includes family name and version) ● Chassis serial number ● Asset tracking number
About	Displays copyright notice.
Set Time and Date	Allows you to set system time and date.
Flash System ROM	Allows you to update the system ROM with a BIOS image file located on removable media.
Replicated Setup	**Save to Removable Media** Saves system configuration to a formatted USB flash media device. **Restore from Removable Media** Restores system configuration from a USB flash media device.
Default Setup	**Save Current Settings as Default** Saves the current system configuration settings as the default to be used whenever "Apply Defaults and Exit" is selected. **Restore Factory Settings as Default** Loads the original factory system configuration settings for use by a subsequent "Apply Defaults and Exit" action.
Apply Defaults and Exit	Applies the currently selected default settings.
Ignore Changes and Exit	Exits Computer Setup without applying or saving any changes.
Save Changes and Exit	Saves changes to system configuration or default settings and exits Computer Setup.

Computer Setup—Storage

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

Table B-3 Computer Setup—Storage

Option	Description
Device Configuration	Lists all installed BIOS-controlled storage devices. When a device is selected, detailed information and options are displayed. The following options may be presented: **Hard Disk**: Size, model, firmware version, serial number, connector color. ● SMART (ATA disks only)
Storage Options	**SATA Emulation** **CAUTION:** SATA emulation changes may prevent access to existing drive data and degrade or corrupt established volumes. Allows you to choose how the SATA controller and devices are accessed by the operating system. There are two supported options: IDE and AHCI (default). IDE - This is the most backwards-compatible setting of the three options. Operating systems usually do not require additional driver support in IDE mode. AHCI (default option) - Allows operating systems with AHCI device drivers loaded to take advantage of more advanced features of the SATA controller. **Removable Media Boot** Enables/disables ability to boot the system from removable media. Default is enabled.
Boot Order	Allows you to: ● Specify the order in which EFI boot sources (such as a internal drive, USB hard drive, or USB optical drive) are checked for a bootable operating system image. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source. EFI boot sources always have precedence over legacy boot sources. ● Specify the order in which legacy boot sources (such as a network interface card, internal drive, or USB optical drive) are checked for a bootable operating system image. Each device on the list may be individually excluded from or included for consideration as a bootable operating system source. ● 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). **NOTE:** You can use F5 to disable individual boot items, as well as disable EFI boot and/or legacy boot. MS-DOS drive lettering assignments may not apply after a non-MS-DOS operating system has started. **Shortcut to Temporarily Override Boot Order** 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 boot menu) and then F9 (Boot Order), or only F9 (skipping the boot menu) when the monitor light turns green. 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.

Computer Setup—Security

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

Table B-4 Computer Setup—Security

Option	Description
Setup Password	Allows you to set and enable a setup (administrator) password. **NOTE:** If the setup password is set, it is required to change Computer Setup options, flash the ROM, and make changes to certain plug and play settings under Windows.
Power-On Password	Allows you to set and enable a power-on password. 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.
Password Options (This selection appears only if a power-on password or setup password is set.)	Allows you to enable/disable: ● Lock Legacy Resources (determines whether or not Windows Device Manager is allowed to change resource settings for serial and parallel ports). ● Setup Browse Mode (appears if a setup password is set) (allows viewing, but not changing, the F10 Setup Options without entering setup password). Default is enabled. ● Password prompt on F9 & F12 (requires setup password to use these boot functions). Default is enabled. ● Network Server Mode. Default is disabled.
Device Security	Allows you to set Device Available/Device Hidden (default is Device Available) for: ● Embedded security device (some models) ● System audio ● USB 3.0 controller ● Network controller ● SATA Port 0 ● SATA Port 1 ● SATA Port 2

USB Security	Allows you to set Enabled/Disabled (default is Enabled) for:
	
	● Front USB Ports
	
	    ○ USB3 Port 1
	
	    ○ USB3 Port 2
	
	● Rear USB Ports
	
	    ○ USB Port 3
	
	    ○ USB Port 4

	◦ USB3 Port 1
	◦ USB3 Port 2
	● Accessory USB Ports
	◦ USB Port 1
Slot Security	Allows you to disable any PCI Express slot. Default is enabled.
Network Boot	Enables/disables the computer's ability to boot from an operating system installed on a network server. (Feature available on NIC models only; the network controller must be either a PCI expansion card or embedded on the system board.) Default is enabled.
System IDs	Allows you to set: ● Asset tag (18-byte identifier), a property identification number assigned by the company to the computer. ● Ownership tag (80-byte identifier) displayed during POST. ● Universal Unique Identifier (UUID) number. The UUID can only be updated if the current chassis serial number is invalid. (These ID numbers are normally set in the factory and are used to uniquely identify the system.) ● Keyboard locale setting for System ID entry.
Master Boot Record Security	Restores the backup Master Boot Record to the current bootable disk. Default is disabled. Only appears if all of the following conditions are true: ● MBR security is enabled ● A backup copy of the MBR has been previously saved ● The current bootable disk is the same disk from which the backup copy was saved **CAUTION:** Restoring a previously saved MBR after a disk utility or operating system has modified the MBR, may cause the data on the disk to become inaccessible. Only restore a previously saved MBR if you are confident that the current bootable disk's MBR has been corrupted or infected with a virus.

System Security (some models: these options are hardware dependent)	Data Execution Prevention (enable/disable) - Helps prevent operating system security breaches. Default is enabled.
	SVM CPU Virtualization (enable/disable). Controls the virtualization features of the processor. Changing this setting requires turning the computer off and then back on. Default is disabled.
	Embedded Security Device Support (some models) (enable/disable) - Permits activation and deactivation of the Embedded Security Device.
	NOTE: To configure the Embedded Security Device, a Setup password must be set.
	● Reset to Factory Settings (some models) (Do not reset/Reset) - Resetting to factory defaults will erase all security keys. Changing this setting requires turning the computer off and then back on. Default is Do not reset.
	CAUTION: The embedded security device is a critical component of many security schemes. Erasing the security keys will prevent access to data protected by the Embedded Security Device. Choosing Reset to Factory Settings may result in significant data loss.
	OS management of Embedded Security Device (some models) (enable/disable) - This option allows the user to limit operating system control of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. This option allows the user to limit OS control of the Embedded Security Device. Default is disabled.
	Reset of Embedded Security Device through OS (some models) (enable/disable) - This option allows the user to limit the operating system ability to request a Reset to Factory Settings of the Embedded Security Device. Changing this setting requires turning the computer off and then back on. Default is disabled.
	NOTE: To enable this option, a Setup password must be set.
DriveLock Security	Allows you to assign or modify a master or user password for 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 drive will remain inaccessible until one of the passwords is successfully provided during a subsequent cold-boot sequence.
	NOTE: This selection will only appear when at least one drive that supports the DriveLock feature is attached to the system.
	See the *Desktop Management Guide* for more information.

Computer Setup—Power

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

Table B-5 **Computer Setup—Power**

Option	Description

OS Power Management	• Idle Power Savings—Extended/Auto/Normal. Allows certain operating systems to decrease the processors power consumption when the processor is idle. Default is extended.
	
	• Runtime Power Management— Enable/Disable. 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.
	
	• Unique Sleep State Blink Rates—Enable/Disable. 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.
	
	  ◦ S0 (On) = Solid white LED.
	
	  ◦ S3 (Stand By)= 3 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (white LED) — repeated cycles of 3 blinks and a pause.
	
	  ◦ S4 (Hibernation)= 4 blinks at 1Hz (50% duty cycle) followed by a pause of 2 seconds (white LED) — repeated cycles of 4 blinks and a pause.
	
	  ◦ S5 (Soft Off) = LED is off.

Hardware Power Management	SATA Power Management – Enables or disables SATA bus and/or device power management. Default is enabled. S5 Maximum Power Savings – Turns off power to all nonessential hardware when system is off to meet EUP Lot 6 requirement of less than 0.5 Watt power usage. Default is disabled. PCI Express x16 Slot 1 – Sets Active State Power Management (ASPM) of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM. PCI Express x1 Slot 1 – Sets Active State Power Management (ASPM) of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM. Network Controller – Sets ASPM of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM. USB 3.0 Controller – Sets ASPM of the bus. ASPM lets you set lower power modes that activate when the bus is not being used. Options are Disabled, LOs, L1, LOs and L1. Default is ASPM.
Thermal	Fan idle mode—This bar graph controls the minimum permitted fan speed. **NOTE:** This setting only changes the minimum fan speed. The fans are still automatically controlled.

Computer Setup—Advanced

> 📝 **NOTE:** Support for specific Computer Setup options may vary depending on the hardware configuration.

Table B-6 Computer Setup—Advanced (for advanced users)

Option	Heading
Power-On Options	Allows you to set: ● POST mode (QuickBoot, Clear Memory, FullBoot, or FullBoot Every x Days). ● POST messages (enable/disable). Default is disabled. ● Press the ESC key for Startup Menu (Enable/Disable). Controls display of the message at the bottom of the POST screen during boot. It This option does not control the actual ESC hotkey function. Default is enabled. ● Option ROM Prompt (enable/disable). Enabling this feature will cause the system to display a message before loading option ROMs. Default is enabled. ● After Power Loss (off/on/previous state). Default is Power off. Setting this option to: ◦ Power off—causes the computer to remain powered off when power is restored. ◦ Power on—causes the computer to power on automatically as soon as power is restored. ◦ Previous state—causes the computer to power on automatically as soon as power is restored, if it was on when power was lost. **NOTE:** If you turn off power to the computer using the switch on a power strip, you will not be able to use the suspend/sleep feature or the Remote Management features. ● POST Delay (in seconds). Enabling this feature will add a user-specified delay to the POST process. This delay is sometimes needed for hard disks on some PCI cards that spin up very slowly, so slowly that they are not ready to boot by the time POST is finished. The POST delay also gives you more time to select F10 to enter Computer (F10) Setup. Default is None. ● Remote Wakeup Boot Source (remote server/local drive). Default is Local drive. ● Bypass F1 Prompt on Configuration Changes (Enable/Disable). Allows you to set the computer not to confirm when changes were made. Default is disabled.
BIOS Power-On	Allows you to set the computer to turn on automatically at a time you specify.
Onboard Devices	Allows you to set resources for or disable Legacy devices.

Table B-6 Computer Setup—Advanced (for advanced users) (continued)

Bus Options	On some models, allows you to enable or disable:
	● PCI SERR# Generation. Default is enabled.
	● PCI VGA Palette Snooping, which sets the VGA palette snooping bit in PCI configuration space; only needed when more than one graphics controller is installed. Default is disabled.
Device Options	Allows you to set:
	● Printer mode (Bi-Directional, EPP + ECP, Output Only). Default is EPP+ECP.
	● Num Lock State at Power-On (off/on). Default is off.
	● Integrated Graphics (Auto/Disable/Force). Use this option to manage integrated (UMA) graphics memory allocation. The value you choose is allocated permanently to graphics and is unavailable to the operating system. For example, if you set this value to 512M on a system with 2 GB of RAM, the system always allocates 512 MB for graphics and the other 1.5 GB for use by the BIOS and operating system. Default is Auto which sets memory allocation to 512 MB.
	If you select Force, the UMA Frame Buffer Size option displays, which lets you set the UMA memory size allocation between 32 MB and 1 GB.
	● Internal Speaker (some models) (does not affect external speakers). Default is enabled.
	● NIC Option ROM Download (PXE, disabled). The BIOS contains an embedded NIC option ROM to allow the unit to boot through the network to a PXE server. This is typically used to download a corporate image to a hard drive. The NIC option ROM takes up memory space below 1MB commonly referred to as DOS Compatibility Hole (DCH) space. This space is limited. This F10 option will allow users to disable the downloading of this embedded NIC option ROM thus giving more DCH space for additional PCI cards which may need option ROM space. The default will be to have the NIC option-ROM-enabled. Default is PXE.

Recovering the Configuration Settings

This method of recovery requires that you first perform the **Save to Removable Media** command with the Computer Setup (F10) Utility before **Restore** is needed.

NOTE: It is recommended that you save any modified computer configuration settings to a USB flash media device and save the device for possible future use.

To restore the configuration, insert the USB flash media device with the saved configuration and perform the **Restore from Removable Media** command with the Computer Setup (F10) Utility.

NOTE: Do not install the USB key that you use for Recovery in a USB3 (blue) port.

Changing BIOS Settings from the REPSETUP utility

Some BIOS settings may be changed locally within the operating system without having to go through the F10 utility[1]. This table identifies the items that can be controlled with this method.

BIOS Setting	Default Value	Other Values
Setup Language	English	Danish, Finnish, French, German, Italian, Japanese, Dutch, Norwegian, Portuguese, Swedish, Spanish
Removable Media Boot	Enable	Disable
SATA Emulation	IDE	AHCI
EFI Boot Order	USB Floppy/CD	USB Hard Drive, ATAPI CD-ROM Drive, ATAPI CD-ROM Drive, Other
Legacy Boot Order	USB Floppy/CD	Hard Drive, Network Controller, ATAPI CD-ROM Drive, PnP Device #1 - #10
Lock Legacy Resources	Disable	Enable
Network Server Mode	Disable	Enable
Setup Browse Mode	Disable	Enable
Password prompt on F9 & F12	Enable	Disable
Cover Removal Sensor	Disable	Notify User, Setup Password
Front USB Ports	Enable	Disable
Front USB Port 1 & 2	Disable	Enable
Rear USB Ports	Enable	Disable
Rear USB Port 1 & 2	Disable	Enable
Rear USB3 Port 1 & 2	Disable	Enable
Accessory USB Ports	Enable	Disable
Accessory USB Port 1	Disable	Enable
PCI Express x16 Slot 1	Disable	Enable
PCI Express x1 Slot 1	Disable	Enable
Embedded Security Device	Device available	Device hidden
System Audio	Device available	Device hidden
Network Controller	Device available	Device hidden
USB 3.0 Controller	Device available	Device hidden
SATA0	Device available	Device hidden
SATA1	Device available	Device hidden
SATA2	Device available	Device hidden

Network Service Boot	Disable	Enable
Enter Ownership Tag	na	na
Enter UUID	na	na
Data Execution Prevention	Disable	Enable
SVM CPU Virtualization	Disable	Enable
Activate Embedded Security On Next Boot	Disable	Enable
Embedded Security Activation Policy	F1 to Boot	Allow user to reject, No Prompts
OS management of Embedded Security Device	Disable	Enable
Reset of Embedded Security Device through OS	Disable	Enable
Master Boot Record Security	Disable	Enable
Runtime Power Management	Enable	Disable
Idle Power Savings	Extended	Normal, Auto
Unique Sleep State Blink Rates	Disable	Enable
S5 Maximum Power Savings	Disable	Enable
SATA Power Management	Disable	Enable
Fan Idle Mode	+	++, +++, ++++, +++++, ++++++
POST Mode	QuickBoot	FullBoot, FullBoot Every 07 Days, 14 Days, 21 Days, 28 Days, Clear Memory
POST Messages	Disable	Enable
Press ESC for Startup Menu Prompt	Enable	Disable
Option ROM Prompt	Enable	Disable
Remote Wakeup Boot Source	Local Hard Drive	Remote Server
After Power Loss	Off	On Previous State
POST Delay (in seconds)	None	5, 10, 15, 20
Bypass F1 Prompt on Configuration Changes	Disable	Enable
Sunday – Saturday	Disable	Enable
BIOS Power-On Time (hh:mm)	00:00	na
PCI SERR# Generation	Enable	Disable

PCI VGA Palette Snooping	Disable	Enable
Printer Mode	EPP+ECP	Bi-Directional, Output-Only
Num Lock State at Power-On	Off	On
Integrated Video	Auto	Disable, Force
UMA Size	512M	32M, 64M, 256M, 512M, 1G
Internal Speaker	Enable	Disable
NIC Option ROM Download	PXE	Disable
Default Setup	Leave Defaults As Is (No Update)	Save Current Settings as Default, Restore Factory Settings as Default
Apply Defaults and Exit	Do Not Apply	Apply
Power-On Password	na	na
Setup Password	na	na

NOTE: Settings that can be controlled from the operating system with repset can also be controlled remotely by sending the client an Altiris job that uses the repset tool to apply the setting changes.

C   Diagnostics and Troubleshooting

LEDs

Table C-1 Power and IDE Flash Activity LEDs

LED	Status
Power LED Off	When the unit is plugged into the wall socket and the Power LED is off, the unit is powered off. However, the network can trigger a Wake On LAN event in order to perform management functions.
Power LED On	Displays during boot sequence and while the unit is on. During boot sequence, hardware initialization is processed and startup tests are performed on the following: ● Processor initialization ● Memory detection and initialization ● Video detection and initialization **NOTE:** If one of the tests fails, the unit will simply stop, but the LED will stay on. If the video test fails, the unit beeps. There are no messages sent to video for any of these failed tests. **NOTE:** After the video is initialized, anything that fails will have an error message.
NOTE: RJ-45 LEDs are located inside the RJ-45 connector on the top, rear panel of the thin client. The LEDs are visible when the connector is installed. Blinking green indicates network activity, and amber indicates a 100MB speed connection.	
IDE LED is Off	When the unit is powered on and the flash activity light is off, then there is no access to the system flash.
IDE LED blinks white	Indicates the system is accessing the internal IDE flash.

Wake-on LAN

Wake-on LAN (WOL) allows a computer to be turned on or resumed from sleep or hibernation state by a network message. You can enable or disable WOL in Computer Setup using the **S5 Maximum Power Savings** setting.

To enable or disable WOL:

1. Turn on or restart the computer.

2. Press either Esc or F10 while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

   NOTE: If you do not press Esc or F10 at the appropriate time, you must restart the computer and again press Esc or F10 when the monitor light turns green to access the utility.

3. If you pressed Esc, press F10 to enter Computer Setup.

4. Navigate to **Power > Hardware Power Management**.

5. Set **S5 Maximum Power Savings** as follows:

   - Disable WOL = Enabled

   - Enable WOL = Disabled

6. Press F10 to accept any changes.

7. Select **File** > **Save Changes and Exit**.

Power-On Sequence

At power-on, the flash boot block code initializes the hardware to a known state, then performs basic power-on diagnostic tests to determine the integrity of the hardware. Initialization performs the following functions:

1. Initializes CPU and memory controller.

2. Initializes VGA software.

3. Initializes and configures all PCI devices.

4. Initializes the video to a known state.

5. Initializes USB devices to a known state.

6. Performs power-on diagnostics. For more information, see "Power-On Diagnostic Tests".

7. The unit boots the operating system.

Resetting the Administrator and power-on passwords

You can reset the Administrator and power-on passwords as follows:

1. Turn off the computer and disconnect the power cord from the power outlet.

2. Remove the side access panel and the metal side cover.

3. Remove the password jumper from the system board header labeled PSWD.

4. Replace the metal side cover and the side access panel.

5. Connect the computer to AC power, and then turn on the computer.

6. Turn off the computer and disconnect the power cord from the power outlet.

7. Remove the side access panel and the metal side cover.

8. Replace the password jumper.

9. Replace the metal side cover and the side access panel.

Power-On Diagnostic Tests

The Power-on diagnostics performs basic integrity tests of the hardware to determine its functionality and configuration. If a diagnostic test fails during hardware initialization the unit simply stops. There are no messages sent to video.

NOTE: You may try to restart the unit and run through the diagnostic tests a second time to confirm the first shutdown.

The following table lists the tests that are performed on the unit.

Table C-2 Power-On Diagnostic Test

Test	Description
Boot Block Checksum	Tests boot block code for proper checksum value
DRAM	Simple write/read pattern test of the first 640k of memory
Parallel Port	Initiates the port's driver and determines if the device is present
Serial Port	Tests the serial port using simple port verification test to determine if ports are present
Timer	Tests timer interrupt by using polling method
RTC CMOS battery	Tests integrity of RTC CMOS battery
NAND flash device	Tests for proper NAND flash device ID present

Interpreting POST Diagnostic Front Panel LEDs and Audible Codes

This section covers the front panel LED codes as well as the audible codes that may occur before or during POST that do not necessarily have an error code or text message associated with them.

⚠️ **WARNING!** 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 wall outlet and allow the internal system components to cool before touching.

📝 **NOTE:** Recommended actions in the following table are listed in the order in which they should be performed.

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

Table C-3 Diagnostic Front Panel LEDs and Audible Codes

Activity	Beeps	Possible Cause	Recommended Action
White Power LED On.	None	Computer on.	None
White Power LED flashes every two seconds.	None	Computer in Suspend to RAM mode (some models only) or normal Suspend mode.	None required. Press any key or move the mouse to wake the computer.
Red Power LED flashes two times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	2	Processor thermal protection activated: A fan may be blocked or not turning. OR The heat sink/fan assembly is not properly attached to the processor. OR The unit has vents blocked or is in a location where the ambient temperature is too high.	1. Ensure that the computer air vents are not blocked and the processor cooling fan is plugged in and running, if equipped. 2. Contact an authorized reseller or service provider.

Table C-3 Diagnostic Front Panel LEDs and Audible Codes (continued)

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes four times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	4	Power failure (power supply is overloaded). OR The incorrect external power supply adapter is being used on the unit.	**1.** Check if a device is causing the problem by removing ALL attached devices. Power on the system. If the system enters the POST, then power off and replace one device at a time and repeat this procedure until failure occurs. Replace the device that is causing the failure. Continue adding devices one at a time to ensure all devices are functioning properly. **2.** Replace the power supply. **3.** Replace the system board.
Red Power LED flashes five times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	5	Pre-video memory error.	**CAUTION:** To avoid damage to the memory modules or the system board, you must unplug the computer power cord before attempting to reseat, install, or remove a memory module. **1.** Reseat memory modules. **2.** Replace memory modules one at a time to isolate the faulty module. **3.** Replace third-party memory with HP memory. **4.** Replace the system board.
Red Power LED flashes six times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	6	Pre-video graphics error.	For systems with a graphics card: **1.** Reseat the graphics card. **2.** Replace the graphics card. **3.** Replace the system board. For systems with integrated graphics, replace the system board.

Table C-3 Diagnostic Front Panel LEDs and Audible Codes (continued)

Activity	Beeps	Possible Cause	Recommended Action
Red Power LED flashes eight times, once every second, followed by a two second pause. Beeps stop after fifth iteration but LEDs continue until problem is solved.	8	Invalid ROM based on bad checksum.	1. Reflash the system ROM with the latest BIOS image using the BIOS Recovery procedure. 2. Replace the system board.
System does not power on and LEDs are not flashing.	None	System unable to power on.	Press and hold the power button for less than 4 seconds. If the hard drive LED turns white, the power button is working correctly. Try the following: 1. Remove the power cord from the computer. 2. Open the computer and press the yellow CMOS button on the system board for 4 seconds (located near the front USB ports). 3. Verify that the AC cord is plugged into the power supply. 4. Close the unit and reattach the power cord. 5. Try to power on the computer. 6. Replace the unit.

POST Numeric Codes and Text Messages

This section covers those POST errors that have numeric codes associated with them. The section also includes some text messages that may be encountered during POST.

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

Table C-4 **Numeric Codes and Text Messages**

Control panel message	Description	Recommended action
103-System Board Failure	DMA or timers.	1. Clear CMOS. 2. Remove expansion boards. 3. Replace the system board.
110-Out of Memory Space for Option ROMs	Recently added PCI expansion card contains an option ROM too large to download during POST.	1. If a PCI expansion card was recently added, remove it to see if the problem remains. 2. In Computer Setup, set **Advanced** > **Device Options** > **NIC PXE Option ROM Download** to **DISABLE** to prevent PXE option ROM for the internal NIC from being downloaded during POST to free more memory for an expansion card's option ROM. Internal PXE option ROM is used for booting from the NIC to a PXE server.
161-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, or contact an authorized dealer or reseller for RTC battery replacement.
164-MemorySize Error	Memory amount has changed since the last boot (memory added or removed).	Press the F1 key to save the memory changes.
201-Memory Error	RAM failure.	1. Ensure memory modules are correctly installed. 2. Verify proper memory module type. 3. Remove and replace the identified faulty memory module(s). 4. If the error persists after replacing memory modules, replace the system board.
214-DIMM Configuration Warning	Populated DIMM Configuration is not optimized.	Rearrange the DIMMs so that each channel has the same amount of memory.

Table C-4 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
301-Keyboard Error	Keyboard failure.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
510-Flash Screen Image Corrupted	Flash Screen image has errors.	Reflash the system ROM with the latest BIOS image.
512-Chassis, Rear Chassis, or Front Chassis Fan not Detected	Chassis, rear chassis, or front chassis fan is not connected or may have malfunctioned.	1. Reseat chassis, rear chassis, or front chassis fan. 2. Reseat fan cable. 3. Replace chassis, rear chassis, or front chassis fan.
513-Front Chassis fan not detected	Front chassis fan is not connected or may have malfunctioned.	1. Reseat front chassis fan. 2. Reseat fan cable. 3. Replace front chassis fan.
912-Computer Cover Has Been Removed Since Last System Startup	Computer cover was removed since last system startup.	No action required.
921-Device in PCI Express slot failed to initialize	There is an incompatibility/problem with this device and the system or PCI Express Link could not be retrained to an x1.	Try rebooting the system. If the error reoccurs, the device may not work with this system
1720-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.)	1. Determine if hard drive is giving correct error message. Run the Drive Protection System test using F2 Diagnostics. 2. Apply hard drive firmware patch if applicable. (Available at http://www.hp.com/support.) 3. Back up contents and replace hard drive.
Invalid Electronic Serial Number	Electronic serial number is missing.	Enter the correct serial number in Computer Setup.

Table C-4 Numeric Codes and Text Messages (continued)

Control panel message	Description	Recommended action
Network Server Mode Active and No Keyboard Attached	Keyboard failure while Network Server Mode enabled.	1. Reconnect keyboard with computer turned off. 2. Check connector for bent or missing pins. 3. Ensure that none of the keys are depressed. 4. Replace keyboard.
Parity Check 2	Parity RAM failure.	Run Computer Setup and Diagnostic utilities.

Troubleshooting

Basic Troubleshooting

If the thin client is experiencing operating problems or will not power on, review the following items.

Table C-5 Power-On Troubleshooting

Issue	Procedures
The thin client unit is experiencing operating problems.	Ensure that the following connectors are securely plugged into the thin client unit: ● Power connector ● Keyboard ● Mouse ● Network RJ-45 connector ● Monitor
The thin client unit does not power on.	1. Verify that the power supply is good by installing it on a known working unit and testing it. If the power supply does not work on the test unit, replace the power supply. 2. If the unit does not work properly with the replaced power supply, have the unit serviced.
The thin client unit powers on and displays a splash screen, but does not connect to the server.	1. Verify that the network is operating and the network cable is working properly. 2. Verify that the unit is communicating with the server by having the System Administrator ping the unit from the server: ◦ If the thin client pings back, then the signal was accepted and the unit is working. This indicates a configuration issue. ◦ If the thin client does not ping back and the thin client does not connect to the server, re-image the unit.

Table C-5 Power-On Troubleshooting (continued)

No link or activity on the network RJ-45 LEDs or the LEDs do not illuminate blinking green after powering on the thin client unit. (The network LEDs are located inside the RJ-45 connector on the top, rear panel of the thin client. Indicator lights are visible when the connector is installed.)	**1.** Verify that the network is not down. **2.** Make sure the RJ-45 cable is good by installing the RJ-45 cable onto a known working device—if a network signal is detected then the cable is good. **3.** Verify the power supply is good by replacing the power cable to the unit with a known working power supply cable and testing it. **4.** If network LED's still do not light and you know the power supply is good, then re-image the unit. **5.** If network LED's still do not light, run the IP configuration procedure. **6.** If network LED's still do not light, have the unit serviced.
A newly connected unknown USB peripheral does not respond or USB peripherals connected prior to the newly connected USB peripheral will not complete their device actions.	An unknown USB peripheral may be connected and disconnected to a running platform as long as you do not reboot the system. If problems occur, disconnect the unknown USB peripheral and reboot the platform.
Video does not display.	**1.** Verify that the monitor brightness is set to a readable level. **2.** Verify the monitor is good by connecting it to a known working computer and ensure its front LED turns green (assuming the monitor is Energy Star compliant). If the monitor is defective, replace it with a working monitor and repeat testing. **3.** Re-image the thin client unit and power on the monitor again. **4.** Test the thin client unit on a known working monitor. If the monitor does not display video, replace the thin client unit.

Diskless (No-Flash) Unit Troubleshooting

This section is only for those units that do not have ATA Flash capability. Because there is no ATA Flash in this model the boot priority sequence is:

- USB device

- PXE

1. When the unit boots, the monitor should display the following information:

Table C-6 Diskless Unit Troubleshooting

Item	Information	Action
MAC Address	NIC portion of the system board is OK	If no MAC Address, the system board is at fault. Contact the Call Center for service.
GUID	General system board information	If no GUID information, the system board is at fault and should be replaced.

Table C-6 Diskless Unit Troubleshooting (continued)

Client ID	Information from server	If no Client ID information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.
MASK	Information from server	If no MASK information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.
DHCP IP	Information from server	If no DHCP IP information there is no network connection. This may be caused by a bad cable, the server is down, or a bad system board. Contact the Call Center for service for the bad system board.

2. If you are running in a Microsoft RIS PXE environment press the F12 key to activate the network service boot as soon as the DHCP IP information appears on the screen.

If the unit does not boot to the network the server is not configured to PXE.

If you missed the F12 cue, the system will try to boot to the ATA flash that is not present. The message on the screen will read: **ERROR: Non-system disk or disk error. Replace and press any key when ready.**

Pressing any key will restart the boot cycle.

Configuring a PXE Server

NOTE: All PXE software is supported by authorized service providers on a warranty or service contract basis. Customers that call the HP Customer Service Center with PXE issues and questions should be referred to their PXE provider for assistance.

Additionally, refer to the following:

– For Windows 2008 R2: http://support.microsoft.com/kb/891275

– For Windows 2012: http://technet.microsoft.com/en-us/library/cc766320(WS.10).aspx

The services listed below must be running, and they may be running on different servers:

1. Domain Name Service (DNS)

2. Remote Installation Services (RIS)

NOTE: Active Directory DHCP is not required, but is recommended.

D Restoring the Flash Image

System Requirements

To create a recovery device for the purpose of reflashing or restoring the software image on the ROM, you will need the following:

- A personal computer running Microsoft Windows XP Professional or Windows 7.

- One or more HP t820 Flexible Thin Clients

- 8-GB USB flash device for Microsoft Windows Embedded Standard 7 (WES 7) (if using the USB format).

  This restore method will not work with all USB flash devices. USB flash devices with multiple partitions generally do not support this restore method. The range of USB flash devices available on the market is constantly changing. Not all USB flash devices have been tested with the HP Thin Client Imaging Tool.

Before using the utility, you must download the appropriate image from http://www.hp.com.

Getting Started

There are two deployment options supported by this utility. You can choose to do one or more of the following using your personal computer:"

- Create a bootable flash image on a USB flash device.

- Unbundle the image to a directory for use in a custom deployment scenario or PXE image.

Download and run the Package-for-the-Web deliverable (an .exe file) that contains the original factory image for the thin client. The HP Thin Client Imaging Tool (CRStart.exe) runs automatically.

Choose one of the deployment options: Each option is described in the following paragraphs.

- USB Format

- Deployment

During the restore process, the thin client flash drive will be reformatted and all data on it will be erased before the system image is copied to it. To prevent loss of data, be sure that you have saved any user-created data from the flash drive. During the

first restart of the thin client following the restore process, it may take approximately 15 minutes to unbundle the software before the Windows Desktop is displayed.

Formatting a USB Flash Drive

⚠ **CAUTION:** To prevent loss of data, be sure that you have saved any user-created data from the USB drive to another drive.

1. Connect your USB flash device (drive key) to your personal computer. Ensure that only one USB flash device is connected to the system.

2. Click **USB Format**.

3. Select the USB drive from the list, using the up and down arrows to display the correct drive letter. (If the USB drive does not appear in the list, click **Update Drives**, then scroll through the list again.)

During the next step, the USB drive will be reformatted and all data on it will be erased before the bootable image is copied to it. To prevent loss of data, be sure that you have saved any data from the USB drive to another drive.

4. Click **Format**. Connect the bootable USB flash device to the thin client. Only one bootable USB device may be attached to the thin client during this process.

📝 **NOTE:** Do not use USB 3.0 devices.

5. Restart the thin client.

6. When prompted **Do you want to continue? [Y/N]** click **Y** to begin the image restore process on the thin client.

Unpacking the Image and Tools for Deployment

▲ Click **Deployment**.

The components that comprise the thin client recovery image (DSKIMG.BIN) are unbundled.

When this process is complete, the four most important files include: IBRPE.EXE (the image restoration utility), FLASH.IBR (the OS image), the ReadMe.TXT file, and boot.wim (the pre-install environment).

Deploying with PXE

1. Ensure that IBRPE.EXE and FLASH.IBR file exist.

2. Add the following command to execute IBRPE in WinPE environment: `[full path] \IBRPE.EXE [full path]\FLASH.IBR HD0`

To view the IBR command line options: At the command prompt, type `IBR.EXE /?` and press Enter.

See your documentation if using a different PXE server, such as Altiris Deployment Solution.

E   Device management

The t820 includes a license for HP Device Manager and has a Device Manager agent pre-installed. HP Device Manager is a thin client optimized management tool used to manage the full life cycle of HP thin clients to include Discover, Asset Management, Deployment and Configuration. For more information on HP Device Manager, please visit www.hp.com/go/hpdm.

If you wish to manage the t820 with other management tools such as Microsoft SCCM or LANDesk, go to www.hp.com/go/clientmanagement for more information.

F   Adding an Image Restore Tool

1. Ensure that the boot order is set to use the **Network** as the first boot device.

2. Ensure that IBR.exe (Image Restore) and Flash.dd are stored in the same directory on the server. (e.g., `c:\program files\altiris\express\deployment server\images`)

3. From the Altiris Deployment Server Console, click **File > New > Job** .

4. Enter a unique name for the job that you will use to deploy the original thin client image.

5. Click the name of the new job.

6. Near the upper right side of the screen, click **Add**.

7. Select **Run Script** from the menu.

8. Type [full path]images\ibr\exe-y\images\flash.xx hd0

9. Under **In which OS would you like to run this script?** Click **DOS**.

10. Click **Finish**.

11. You can now drag and drop the job onto the appropriate machine(s) or schedule it to run later, depending on your needs. Refer to the documentation for Altiris Deployment Solution (http://www.altiris.com/support/documentation) for more detailed information.

G   System BIOS

Updating or restoring a BIOS

HP Device Manager

HP Device Manager can be used to update the BIOS of a t820 thin client. Customers can use a pre-built BIOS add-on or can use the standard BIOS upgrade package along with an HP Device Manager File and Registry template. For more information on HP Device Manager File and Registry templates, review the *HP Device Manager User Guide* found at www.hp.com/go/hpdm.

Windows BIOS Flashing

You can use the BIOS Flash Update SoftPaq to restore or upgrade the system BIOS. Several methods for changing the BIOS firmware stored on your computer are available .

HPQFlash.exe is a utility designed to flash the System BIOS within a Microsoft Windows environment. To display the available options for this utility, type **[Path]\HPQFlash -?** at a command prompt or local search box. If the system has a BIOS Setup password enabled, then HPQFlash will prompt for you to enter the password before completing the flash process.

You can also run HPQFlash.exe from a USB storage device, including flash memory devices and external hard drives, as follows:

1.   Insert the device and take note of the assigned drive letter.

2.   Copy HPQFlash.exe and ROM.CAB to the root of the drive indicated by the drive letter, or a folder on that drive.

     You can then execute HPQFlash from its location on the USB device.

     If the system has a BIOS Setup password enabled, then HPQFlash will prompt for you to enter the password before completing the flash process.

For more information, view Readme.txt or HPQFlash.txt, both located in the HPQFlash folder in the SoftPaq.

Startup Menu / F10 Setup BIOS Flashing

A BIOS upgrade option is available through both the Startup Menu and the F10 Setup utility using the "Flash System ROM" feature.

1. Reboot the computer and press the Esc key to display the Startup Menu.

2. Use the arrow keys to select **Utilities**, and then select the **Flash System ROM** option.

1. Alternatively, reboot the PC and press F10 to access the BIOS Setup utility.

2. In the **File** menu, select **Flash System ROM**.

Either method requires that removable media be present that contains the BIOS binary image file in the root directory. You can find the binary image file in the DOS Flash folder. The image is named xxx_MMmm.bin, where "xxx" is the BIOS family, "MM" is the major version number, and "mm" is the minor version number. To create a CD for updating the BIOS, use a blank CD-R or CD-RW disk on a system with a CD-RW or DVD+RW drive, and write the binary to the disk using any CD-burning software. If a BIOS Setup password is set, the password is required before you can access the **Flash System ROM** menu. You are notified when the process completes. The new BIOS code will not take effect until you restart the PC.

USB Device BIOS Flashing in DOS

DOS Flash (DOSFlash.exe, FlshUefi.cpu) is the DOS-compatible System BIOS flash utility that you can use from a DOS bootable storage device (where "DOS" refers to any of a number of compatible operating systems such as FreeDOS, MS-DOS or DR-DOS). FlshUefi.cpu is the required driver for DOSFlash.exe. To flash the System BIOS from a bootable USB storage device, copy the contents of the DOS Flash folder to the USB device, boot the computer from the USB device, and execute the DOSFlash application.

To see a more complete description of the DOS flash utilities, view DOSFlash.txt located in the DOS Flash folder of the SoftPaq. This folder also contains the required binary image of the BIOS. The binary image file is named xxx_MMmm.bin where "xxx" is the BIOS family, "MM" is the major version number, and "mm" is the minor version number. You can copy this file to the root directory of any USB removable medium for use with the F10 setup "Flash System ROM" option or BootBlock Emergency Recovery Mode.

System Software Management (SSM) BIOS Flashing

Use this SoftPaq with System Software Manager (SSM) to update the System BIOS on target computers on a network. Place this SoftPaq in your SSM Filestore folder and then update the database. SSM is a free utility provided by Hewlett-Packard Company. For information on SSM, see http://www.hp.com/go/ssm.

HP Client Manager Software (HPCMS) BIOS Flashing

Use this Softpaq with HP Client Manager Software (HPCMS) and Altiris Notification Server to remotely target, distribute, and update the System BIOS on network PCs. Place this SoftPaq in your HPCMS Filestore folder and then update the database. HPCMS is a free managment application provided by Altiris and Hewlett-Packard Company. For more information, see http://www.hp.com/go/EasyDeploy.

Network BIOS Flashing

We designed the DOS Flash utility to support System BIOS flashing from a remote network boot using PXE. DOS Flash uses a small memory footprint that is compatible with the limited DOS memory available and the DOS extended environment that may exist while running Altiris eXpress. To see a

more complete description of the network BIOS flashing utilities, view the DOSFlash.txt file located in the DOS Flash folder.

BitLocker Drive Encryption / BIOS Measurements

If you have Windows BitLocker Drive Encryption (BDE) enabled on your system, we recommend that you temporarily suspend BDE before updating the BIOS. You should also obtain your BDE recovery password or recovery PIN before suspending BDE. After the you flash the BIOS, you can resume BDE.

To make a change to BDE, select **Start > Control Panel > BitLocker Drive Encryption**, click **Suspend Protection**or **Resume Protection**and then click **Yes**.

As a general rule, updating the BIOS will modify measurement values stored in the Platform Configuration Registers (PCRs) of the system's security module. Temporarily disable technologies that use these PCR values to ascertain platform health (BDE is one such example) prior to flashing the BIOS. Once you update the BIOS, re-enable the functions and restart the system so that you can take new measurements.

BootBlock Emergency Recovery Mode

In the event of a failed BIOS update (for example if power is lost while updating), the System BIOS may become corrupted. BootBlock Emergency Recovery Mode detects this condition and automatically searches the root directory of the hard drive and any USB media sources for a compatible binary image. Copy the binary (.bin) file in the DOS Flash folder to the root of the desired storage device, and then power on the system. Once the recovery process locates the binary image, it attempts the recovery process. The automatic recovery continues until it successfully restores or updates the BIOS. If the system has a BIOS Setup password, you may need to use the Startup Menu / Utilities submenu to flash the BIOS manually after providing the password. Sometimes there are restrictions on which BIOS versions are allowed to be installed on a platform. If the BIOS that was on the system had restrictions, then only allowable BIOS versions may be used for recovery.

H   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 between 100-120 or 220-240 volts 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

The requirements listed below 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 or 250 volts AC, as required by each country's power system.

3. The diameter of the wire must be a minimum of 0.75 mm_2 or 18AWG, and the length of the cord must be between 1.8 m (6 feet) and 3.6 m (12 feet).

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.

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

Country-specific requirements

Additional requirements specific to a country are shown in parentheses and explained below.

Country	Accrediting Agency	Country	Accrediting Agency
Australia (1)	EANSW	Italy (1)	IMQ
Austria (1)	OVE	Japan (3)	METI
Belgium (1)	CEBC	Norway (1)	NEMKO
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 HO5VV-F, 3-conductor, 0.75mm$_2$ conductor size. Power cord set fittings (appliance coupler and wall plug) must bear the certification mark of the agency responsible for evaluation in the country where it will be used.

2. The flexible cord must be Type SVT or equivalent, No. 18 AWG, 3-conductor. The wall plug must be a two-pole grounding type with a NEMA 5-15P (15A, 125V) or NEMA 6-15P (15A, 250V) configuration.

3. Appliance coupler, flexible cord, and wall 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 mm$_2$ conductor size. Wall plug must be a two-pole grounding type with a Japanese Industrial Standard C8303 (7A, 125V) configuration.

I   Statement of Volatility

HP confirms that Intel-based HP t820 Flexible Thin Client systems contain DDR3 volatile memory (memory amount depends on the customer configuration). In addition, the motherboard in the condition originally shipped without subsequent modification or the addition or installation of any applications, features, or functionality, contain the following nonvolatile memory: Real Time Clock battery backed-up configuration memory (256 Bytes), DIMM Serial Presence Detect (SPD) configuration data (256 Bytes per module, 128 Bytes programmable), Serial Peripheral Interface (SPI) ROM for System BIOS (16M Bytes) and Super I/O's: masked keyboard ROM (overall 2K Bytes). In addition, these units contain a Trusted Platform Module (TPM) that contains 16K Bytes of non-volatile memory for user data. The volatile memory will not hold any user data once power has been removed for 30 seconds or longer.

The following lists steps that should be taken to restore the Non Volatile memory found in the Intel-based HP t820 Flexible Thin Client systems.

1.   Download the latest BIOS (system ROM) from the HP website.

2.   Follow the instructions for flashing the BIOS.

3.   Shut down the computer.

4.   Power on the computer and enter the Computer Setup Utility as follows:

     a.   Press the Esc key when the "Press the ESC key for Startup Menu" prompt appears near the bottom of the screen.

     b.   Select **Computer Setup (F10)** from the Startup Menu list.

5.   From the main menu, select **Security**, and then select **System Security**. In the menu, if the **Embedded Security Device Support** option shows **Disable**, skip to step 8.

6.   To erase all security keys from the TPM:

     ▲   Under **Embedded Security Device** in the **System Security** menu, set **Reset to Factory Settings** to **Reset**.

     NOTE: Although the TPM security keys are cleared, data in the non-volatile memory indices may not be cleared. Data stored in these indices should not contain security sensitive information. If an application locks down and secures the non-volatile indices, these indices cannot be cleared.

7.   Press the F10 key to accept changes.

8.   To clear the secure boot key database.

9. Enter the F10 Setup Utility.

10. Go to the Security menu.

11. Select **Secure Boot Configuration**.

12. Use the arrow to select **Clear Secure boot keys** in the Key Management section.

13. Use the space key to select **Clear**.

14. Press F10 to accept changes.

15. From the main menu, select **File**, and then select **Save Changes and Exit**.

16. Enter the F10 Setup Utility.

17. If the Ownership Tag or Asset Tag is set, manually clear it by selecting **Security**, and then **System IDs**.

18. Select **File**, and the select **Save Changes and Exit**.

19. To clear the Setup or Power-On passwords and clear any other settings, power down the computer and remove the AC power cord and the computer hood.

20. Locate the green two pin password jumpers on header E49 (labeled PSWD) and remove it.

21. Remove the AC power, wait 10 seconds until the unit AC power drains out, then press the clear CMOS button on the system board. This is typically a yellow push button (labeled CMOS).

22. Replace the hood and AC power cord and turn the computer on. The passwords are now cleared and all other user-configurable, non-volatile memory settings are reset to their factory default values.

23. Enter the F10 Setup Utility.

24. To set default settings back to factory defaults, select **File**, select **Default Setup**, and then select **Restore Factory Settings as Default**.

25. Select **File**, and the select **Apply Defaults and Exit**.

26. Shut down the computer, remove the AC power cord, and then place the green jumper back on header E49. Replace the computer hood and power cord.

If Computrace is enabled on the computer, see the service provider for instruction to disable the feature.

J   Specifications

Chassis		
Height	2.60 in	6.6 cm
Width	9.90 in	25.1 cm
Depth (depth will increase if the computer is equipped with a port security bracket)	10.00 in	25.4 cm
Approximate Weight	6.8 lb	3.1 kg
Weight Supported (maximum distributed load in desktop position)	77 lb	35 kg
Temperature Range (values subject to change with increasing altitude above sea level)		
Operating	50° to 95° F	10° to 35° C
Nonoperating	-22° to 140° F	-30° to 60° C

NOTE: Operating temperature is derated 1.0° C per 300 m (1,000 ft) to 3,000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10° C (50° F)/Hr. The upper limit may be limited by the type and number of options installed.

Relative Humidity (noncondensing)		
Operating (28° C (82.4° F) max wet bulb)	10-90%	10-90%
Nonoperating (38.7° C (101.66° F) max wet bulb)	5-95%	5-95%
Maximum Altitude (unpressurized)		
Operating	10,000 ft	3,048 m
Nonoperating	30,000 ft	9,144 m
Power Supply		
Operating Voltage Range	90-264 VAC	
Rated Voltage Range[1]	100-240 VAC	
Rated Line Frequency	50-60 Hz	
Operating Line Frequency	47-63 Hz	

[1]   This system utilizes an active power factor corrected external 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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