



Troubleshooting Guide

HP t5550/t5565/t5570 Thin Clients

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Troubleshooting Guide

Thin Client

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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 Description

The following features are common to all HP thin clients:

- No hard drives or diskette drives
- 5 minute hardware setup time
- central deployment and management using HP Management Solutions

The following features are specific to the HP t5550/t5565/t5570 Thin Clients:

- VIA Nano u3500 1-GHz processor
- VIA VX900 chipset
- Single Channel DDR3 at 800 MHz; 1 GB minimum RAM expandable to 4 GB
- IDE Flash module, minimum 512 MB (CE, ThinPro), 2 GB (WES). 4 GB maximum standard
- Broadcom 57780 LAN (Embedded)
- Mini PCI-E Internal Wireless LAN (option) with external antenna (Atheros a/b/g/n)
- VESA mounts - Quick Release support
- 2 Secure USB 2.0 internal ports
- Kensington Lock slot
- 65W, 19V power supply
- I/O ports: DVI-I and DVI-D, 2 front USB, 2 secure Internal USB, 2 rear USB, 1 serial port, 1 parallel port, PS2 keyboard and mouse, 1 Gb RJ45, front Audio jacks – Mic in, Line/Headphone out
- Preinstalled support for Citrix, VMware, and Microsoft client virtualization environments
- HP Easy Tools

Operating systems

The t5570 thin client uses Windows Embedded Standard (WES) 2009.

The t5565 thin client uses HP Thin Pro.

The t5550 thin client uses Windows CE 6.0.

Product features

For more information, refer to the model-specific QuickSpecs at http://h18004.www1.hp.com/products/quickspecs/QuickSpecs_Archives/QuickSpecs_Archives.html.

Serial Number Location

Every thin client includes a unique serial number located as shown in the following illustration. Have this number available when contacting HP customer service for assistance.

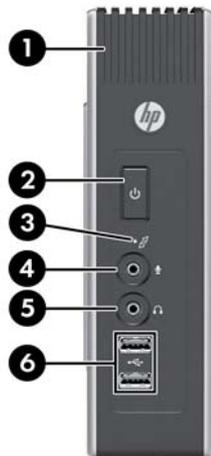
Figure 1-1 Serial number location



Front Panel Components

For more information, <http://www.hp.com> and search for your specific thin client model to find the model-specific QuickSpecs.

Figure 1-2 Front panel components



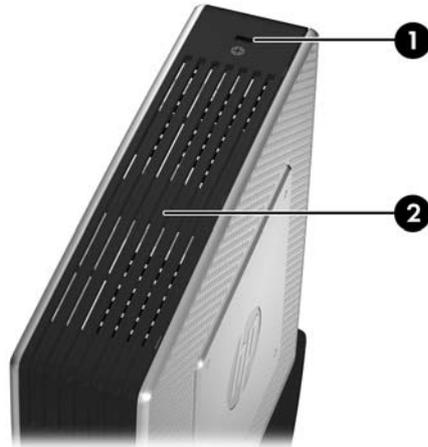
(1)	Secure USB compartment	(4)	Line-in (microphone) connector
(2)	Power button	(5)	Line-out (headphone) audio connector
(3)	Flash drive activity LED	(6)	Universal serial bus (USB) connectors (2)

Top Components

For more information, <http://www.hp.com> and search for your specific thin client model to find the model-specific QuickSpecs.

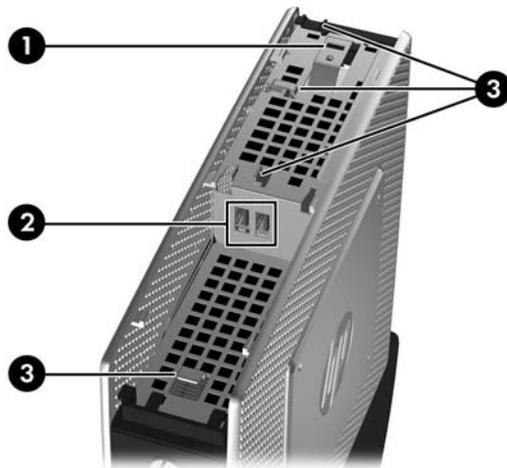
The secure USB compartment allows you to use two USB devices in a secured location.

Figure 1-3 Top components, external view



-
- | | |
|-----|-----------------|
| (1) | Cable lock slot |
|-----|-----------------|
-
- | | |
|-----|------------------------|
| (2) | Secure USB compartment |
|-----|------------------------|
-

Figure 1-4 Top components, internal view

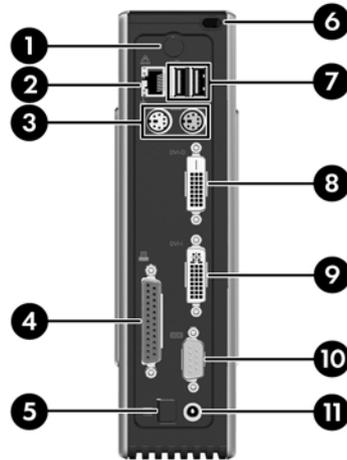


-
- | | |
|-----|-----------------|
| (1) | Cable lock slot |
|-----|-----------------|
-
- | | |
|-----|----------------------------------|
| (2) | Secure USB compartment ports (2) |
|-----|----------------------------------|
-
- | | |
|-----|-------------------------------|
| (3) | USB cable management features |
|-----|-------------------------------|
-

Rear Panel Components

For more information, <http://www.hp.com> and search for your specific thin client model to find the model-specific QuickSpecs.

Figure 1-5 Rear panel components



(1)	Wireless antenna*	(7)	Universal serial bus (USB) connectors (2)
(2)	Ethernet RJ-45 connector	(8)	DVI-D connector
(3)	PS/2 connectors (2)	(9)	DVI-I connector
(4)	Parallel connector	(10)	Serial connector
(5)	Power cord retention slot	(11)	Power connector
(6)	Secure USB compartment cable routing slot		

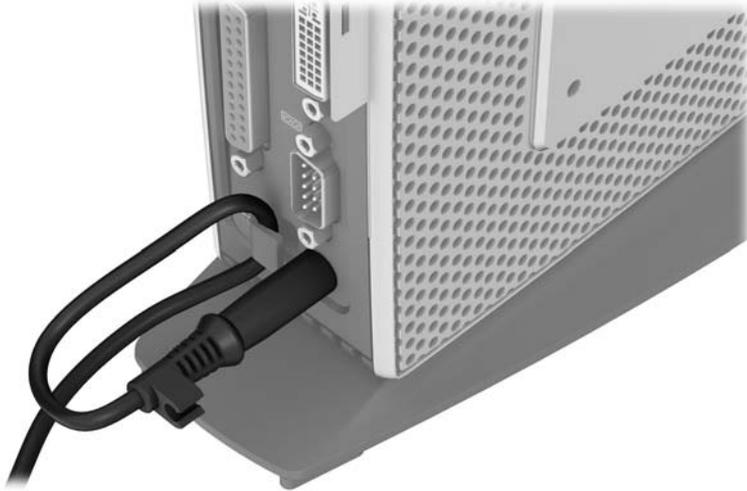
*Available on some models. Refer to the model-specific QuickSpecs at www.hp.com for details.

The wireless antenna allows you to send and receive wireless signals to communicate with wireless local area networks (WLAN).

Using the Power Cord Retention Slot

To prevent accidental disconnection, press a loop of the power cord into the power cord retention slot.

Figure 1-6 Power cord retention slot



2 Hardware Changes

General Hardware Installation Sequence

To ensure the proper installation thin client hardware components:

1. Back up any data, if necessary.
2. If the thin client is powered on:
 - a. Turn off the computer properly through the operating system, then turn off any external devices.
 - b. Disconnect the power cord from the power outlet and disconnect any external devices.
 - c. Disconnect any external devices or cables, such as an antenna or cable lock.

△ **WARNING!** 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.

WARNING! To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telecommunications or telephone connectors into the network interface controller (NIC) receptacles.

△ **CAUTION:** Static electricity can damage the electronic components of the thin client or optional equipment. Before beginning these procedures, ensure that you are discharged of static electricity by briefly touching a grounded metal object. See [Electrostatic Discharge on page 62](#) for more information.

3. Remove the secure USB compartment cover. See [Removing and Replacing the Secure USB Compartment Cover on page 10](#) for more information.
4. Remove the stand, if it is installed. See [Removing the Stand on page 10](#) for more information.
5. Remove the side access panel and metal side cover. See [Removing and Replacing the Side Access Panel and Metal Side Cover on page 12](#) for more information.
6. Remove any hardware that you will replace.

7. Install or replace equipment. For removal and replacement procedures, see the following sections:

- [Installing the USB Device on page 14](#)
- [Removing and Replacing the Battery on page 15](#)
- [Installing a Secondary Flash Memory Module on page 17](#)

 **NOTE:** Option kits include more detailed installation instructions.

8. Replace the side access panel and metal side cover. See [Removing and Replacing the Side Access Panel and Metal Side Cover on page 12](#).

9. Replace the secure USB compartment cover. See [Removing and Replacing the Secure USB Compartment Cover on page 10](#).

10. Reconnect any external devices and power cords.

11. Turn on the monitor, the thin client, and any devices you want to test.

12. Load any necessary drivers.

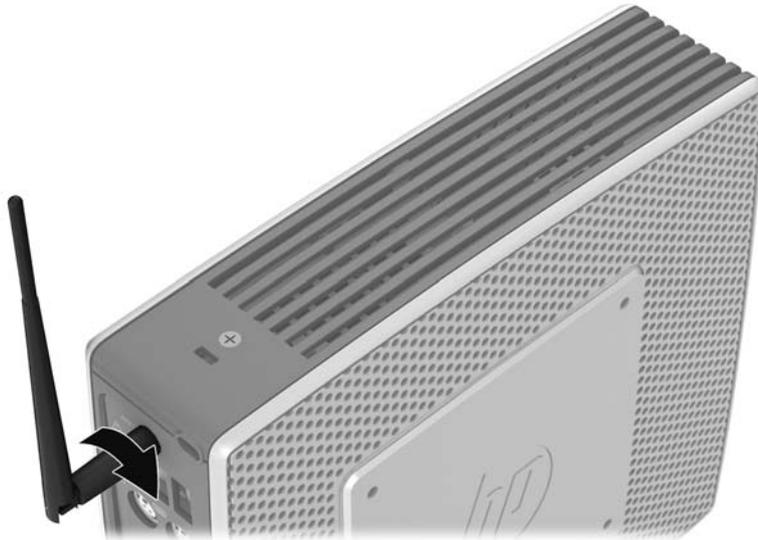
 **NOTE:** You can download select hardware drivers from HP. Go to <http://www.hp.com> and search for your specific thin client model.

13. Reconfigure the thin client, if necessary.

Installing the Antenna (Wireless Models)

- Screw the antenna in place on the rear of the thin client.

Figure 2-1 Installing the antenna



-
- △ **CAUTION:** To prevent damage to the antenna mounting, do not overtighten the antenna.
-

Installing the Rubber Feet

You may want to use your thin client in a horizontal orientation. You can install self-adhesive rubber feet at the corners of the left side of the unit. The rubber feet help keep the unit safely in place.

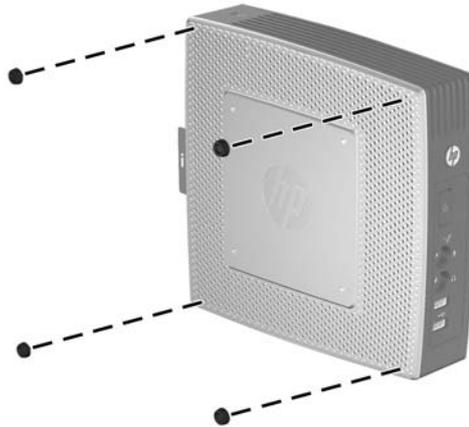
-
- △ **CAUTION:** If you use the thin client in a horizontal orientation without the rubber feet, it may slide and result in equipment damage.
-

To install the rubber feet:

1. Remove the feet from their backing.

2. Align the feet with their holes and press them in securely.

Figure 2-2 Installing the rubber feet



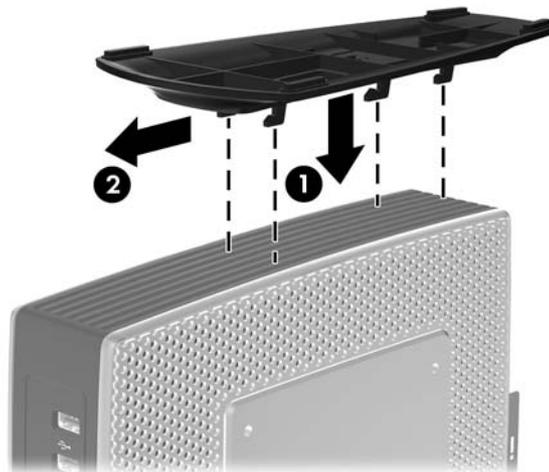
Installing the Stand

If you want to use the thin client in a vertical orientation, you will need to install the stand for stability.

To install the stand:

1. Turn unit upside down.
2. Position the stand with the wide part toward the front of the unit. Align the tabs on the stand with the slots on the bottom of the unit.
3. Insert the tabs into the slots (1) and slide the stand toward the front of the unit until it locks into place (2).

Figure 2-3 Installing the stand

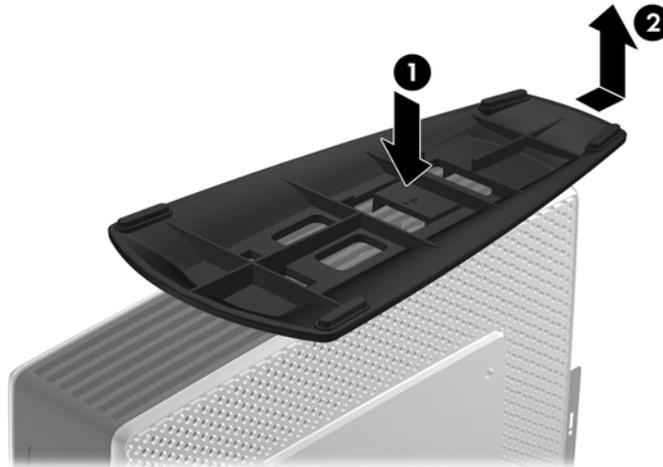


Removing the Stand

To remove the stand:

1. Turn unit upside down.
2. Press down on the tab (1), and then slide the stand toward the rear of the unit and pull it up to remove it from the unit (2).

Figure 2-4 Removing the stand



Removing and Replacing the Secure USB Compartment Cover

The secure USB compartment allows you to install two USB devices in a secure location inside the thin client. The cable management feature allows you to install a USB mouse and a USB keyboard in this compartment. See [Installing the USB Device on page 14](#) for more information. Along with providing a hidden location, the secure USB compartment can be locked by the optional security cable lock.

△ **CAUTION:** The ambient temperature inside of the secure USB compartment can reach up to 55° C (131° F) in worst case conditions. Make sure the specifications for any device you install in the compartment indicate the device can tolerate a 55° C (131° F) ambient environment.

📖 **NOTE:** In addition to following these instructions, follow the detailed instructions that accompany the accessory you are installing.

Before beginning the installation process, review [General Hardware Installation Sequence on page 6](#) for procedures you should follow before and after installing or replacing hardware.

Removing the Secure USB Compartment Cover

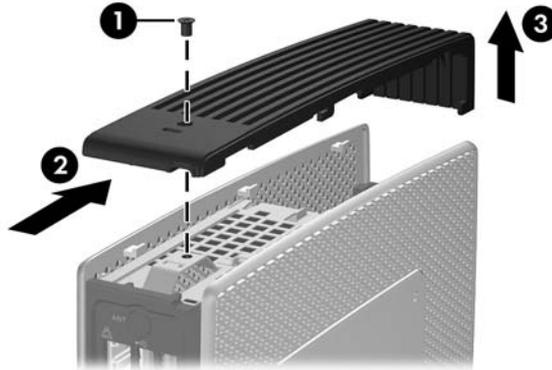
Use the following procedure to remove the secure USB compartment cover.

△ **WARNING!** Before removing the secure USB compartment cover, ensure that the thin client is turned off and the power cord is disconnected from the electrical outlet.

To remove the secure USB compartment cover:

1. Toward the rear of the thin client's compartment cover, remove the screw that secures the compartment cover to the unit (1).
2. Push the compartment cover about .6 cm (1/4 inch) toward the front of the unit (2) and lift it off the unit (3).

Figure 2-5 Removing the secure USB compartment cover

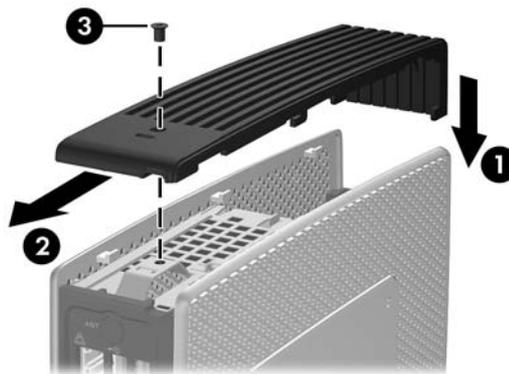


Replacing the Secure USB Compartment Cover

To replace the secure compartment cover:

1. Place the cover on top of the unit so it is offset about 0.6 cm (1/4 inch) toward the front of the unit, allowing the tabs on the cover to align with the slots on the chassis (1).
2. Slide the cover toward the back of the unit until the cover is flush with the chassis (2).
3. Replace the screw (3).

Figure 2-6 Replacing the secure compartment cover



Removing and Replacing the Side Access Panel and Metal Side Cover

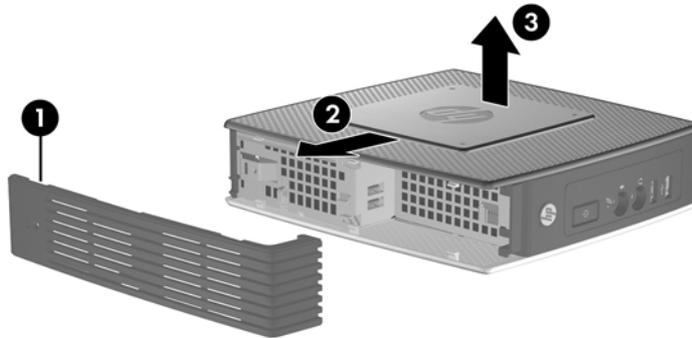
Removing the Side Access Panel and Metal Side Cover

⚠ WARNING! Before removing the side access panel, ensure that the thin client is turned off and the power cord is disconnected from the electrical outlet.

To remove the access panel:

1. Remove the secure compartment cover (1). For more information, see [Removing the Secure USB Compartment Cover on page 10](#).
2. Remove the stand, if it is installed (2). See [Removing the Stand on page 10](#) for more information.
3. Lay the unit flat on a stable surface with the right side up and the left side down.
4. Slide the access panel about 3 mm (1/8 inch) toward the top of the unit (2), and then lift the access panel up and off the unit (3).

Figure 2-7 Removing the side access panel



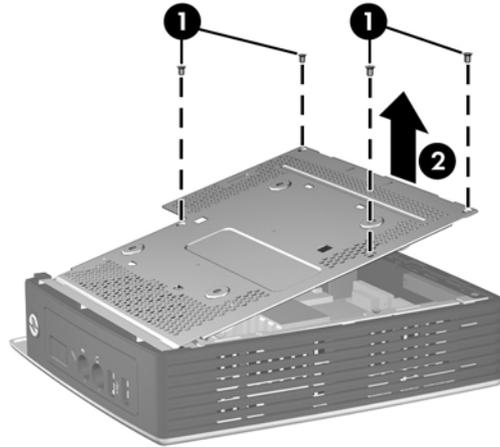
To remove the metal side cover:

📄 NOTE: You must remove the metal side cover to access internal components such as the battery or the memory.

1. Remove the four screws that secure the metal side cover to the chassis (1).

2. Lift the metal side cover, rear side first, off the unit (2).

Figure 2-8 Removing the metal side cover

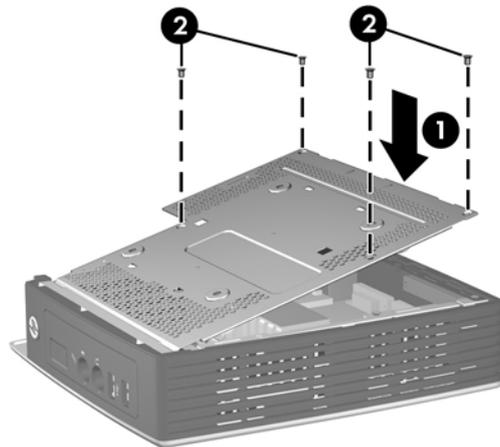


Replacing the Metal Side Cover and Side Access Panel

To replace the metal side cover:

1. Slip the front edge of the metal side cover under the lip on the chassis, lower the front edge, and then press the metal side cover down into place (1).
2. Insert and tighten the four screws (2).

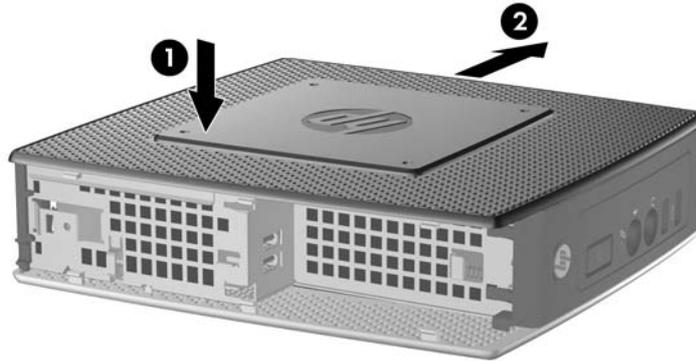
Figure 2-9 Replacing the metal side cover



To replace the access panel:

1. Align the tabs on the access panel with the slots in the chassis and place the access panel on the side of the unit, offset about 3 mm (1/8 inch) toward the top of the unit (1).

2. Slide the access panel toward the bottom of the unit until it is flush with the bottom of the chassis (2).



3. Replace the secure compartment cover. For more information, see [Replacing the Secure USB Compartment Cover on page 11](#).

Installing Thin Client Options

Various options can be installed on the thin client:

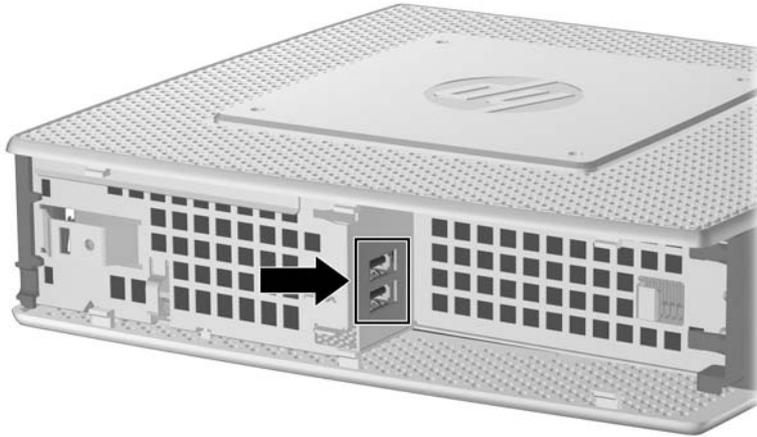
- [Installing the USB Device on page 14](#)
- [Removing and Replacing the Battery on page 15](#)
- [Installing a Secondary Flash Memory Module on page 17](#)
- [External Drives on page 18](#)

Installing the USB Device

Before beginning the replacement process, review [General Hardware Installation Sequence on page 6](#) for procedures you should follow before and after installing or replacing hardware.

- Insert the USB device into the USB port in the secure USB compartment. See the following illustration for the location of the ports in the secure USB compartment.

Figure 2-10 USB ports in the secure USB compartment



If you install a USB mouse and a USB keyboard in the secure USB compartment, route the cables around and through the clips, then out the secure cable routing slot, as shown in the following illustration.

Figure 2-11 Using the secure cable routing slot



Removing and Replacing the Battery

Before beginning the replacement process, review [General Hardware Installation Sequence on page 6](#) for procedures you should follow before and after installing or replacing hardware.

- △ **WARNING!** Before removing the side access panel, ensure that the thin client is turned off and the power cord is disconnected from the electrical outlet.

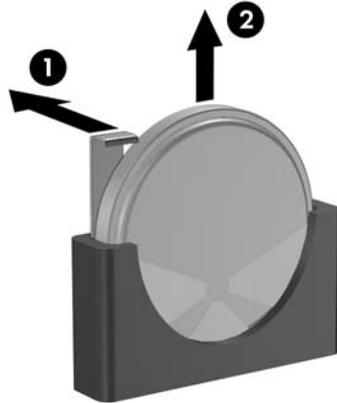
To remove and replace the battery:

1. Locate the battery on the system board.

2. To release the battery from its holder, gently push the metal guard that extends above one edge of the battery very slightly toward the rear of the unit, then lift the battery out (1).

 **NOTE:** Be careful not to bend the metal guard.

Figure 2-12 Removing and replacing the internal battery



3. To insert the new battery, align the replacement battery with the positive side toward the rear of the unit. Slide one edge of the battery into the slot and push down until the guard snaps over the edge of the battery (2).

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> and search for “recycle”.



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, an authorized HP partner, or their agents.



廢電池請回收

The Taiwan EPA requires dry battery manufacturing or importing firms, in accordance with Article 15 or the Waste Disposal Act, to indicate the recovery marks on the batteries used in sales, giveaways, or promotions. Contact a qualified Taiwanese recycler for proper battery disposal.

Installing a Secondary Flash Memory Module

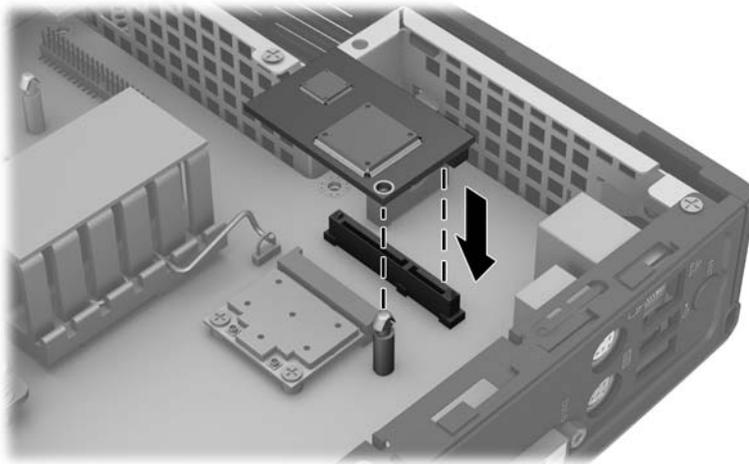
Before beginning the installation process, review [General Hardware Installation Sequence on page 6](#) for procedures you should follow before and after installing or replacing hardware.

- △ **WARNING!** You must remove the right side panel to access the system board. Before removing the side access panel, ensure that the thin client is turned off and the power cord is disconnected from the electrical outlet.
- △ **CAUTION:** 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. When handling a memory module, be careful not to touch any of the contacts. Doing so may damage the module.

To install the secondary flash memory module:

1. Locate the secondary flash memory module socket on the system board.

Figure 2-13 Installing the Secondary Flash Memory Module



2. Insert the flash memory module into the socket on the system board.

📄 **NOTE:** A flash memory module can be installed in only one way. Line up the hole in the flash memory module with the retention post on the system board.

3. Press the module connectors firmly into the flash memory module socket, making sure that the retention post on the system board comes up through the hole in the module.

External Drives

Various external USB drives are available as options for these thin clients. For more information about these drives, visit <http://www.hp.com> and search for your specific thin client model, or refer to the instructions that accompany the option.

For more information about available options, visit the HP Web site <http://www.hp.com> and search for your specific thin client model.

3 BIOS Settings, (F10) Utility

Using the BIOS Settings

Changing BIOS Settings from the repset utility

Some BIOS settings may be changed locally within the operating system without having to go through the F10 utility¹. This table identifies the items that can be controlled with this method.

BIOS Setting	Default Value	Other Values
1st Boot Device	USB	ATA Flash, Network, Disabled
2nd Boot Device	ATA Flash	USB, Network, Disabled
3rd Boot Device	Network	ATA Flash, USB, Disabled
Boot Up NumLock	Off	On
F12 Boot	Enabled	Disabled
Integrated Audio	Enabled	Disabled
Network Controller	Enabled	Disabled
Serial Port 1	3F8/IRQ4, other values = 2F8/IRQ3, 3E8/IRQ4, 2E8/IRQ3	Disabled
Parallel Port	378/IRQ7, other values = 278/IRQ5, 3BC/IRQ7	Disabled
PWRON After PWR-Fail	Former State	On, Off
Wake-on-PME	Enabled	Disabled
BIOS Wake Up	Disabled	Enabled, days of the week & time
Asset Tag No	000000000000000000	User input (18 chars)
Setup Password	blank	User input (8 chars max)
Power-On Password	blank	User input (8 chars max)
Parallel Mode	ECP/EPP	Standard, EPP, ECP
ECP Mode Use DMA	DMA3	DMA1
USB Controller	Enabled	Disabled
External USB Ports	Enabled	Disabled

Halt On	All, but Keyboard	No Errors
Security Option	Setup	Always
USB Keyboard Support	Enabled	Disabled
USB Mouse Support	Disabled	Enabled

 **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.

Changing BIOS Settings Using the F10 Utility

1. Turn on or restart the thin client.
2. As soon as the thin client is turned on, press **F10** when the “press F10” prompt appears on the screen to enter the Setup Utility.

 **NOTE:** If you do not press **F10** at the appropriate time, you must restart the thin client and again press **F10** when the **F10=Setup** message displays in the task bar at the bottom of the screen. When the F10 POST Screen display is set to zero seconds, it may be necessary to press and hold **F10** on the keyboard, then power on the thin client.

3. The Setup Utility screen is divided into five menu headings and five task actions.

The Menu Headings are: System Information, Standard CMOS Features, Advanced BIOS Features, Integrated Peripherals, Power Management Setup

The Task Actions are: Load Factory Defaults, Set Administrative Password, Set User Password, Save & Exit Setup, Exit without Saving

Use the arrow keys (up and down or left and right) to select the appropriate heading, and then press **Enter**. To return to the Setup Utility menu, press the **Esc** key.

4. To apply and save changes, select **Save & Exit Setup**.

If you have made changes that you do not want applied, select **Exit without Saving**.

To reset to original factory settings, select **Load Factory Defaults**.

 **CAUTION:** Do NOT turn the thin client power off while the ROM is saving the 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 3-1 Setup (F10) Utility Main Menu

Heading	Table
System Information	Setup Utility—System Information on page 21
Standard CMOS Features	Setup Utility—Standard CMOS Features on page 21
Advanced BIOS Features	Setup Utility—Advanced BIOS Features on page 21

Table 3-1 Setup (F10) Utility Main Menu (continued)

Integrated Peripherals	Setup Utility—Integrated Peripherals on page 22
Power Management Setup	Setup Utility—Power Management Setup on page 23

Setup Utility—System Information

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

Table 3-2 Setup Utility—System Information

Option	Description
Product Name	(view only)
Processor Type	(view only)
Processor Speed	(view only)
Amount of flash memory	(view only)
Memory size	(view only)
System ROM	(view only)
Integrated MAC	(view only)
UUID	(view only)
Chassis Serial #	(view only)
Asset Tracking Number	(view only)
Asset Tag	Enter asset tracking number.

Setup Utility—Standard CMOS Features

Table 3-3 Setup Utility—Standard CMOS Features

Option	Description
Date (mm:dd:yy)	Allows you to set system date
Time (hh:mm:ss)	Allows you to set system time.
IDE Primary Master	Indicates ATA Flash settings.
Halt On	Allows you to select system response of All Errors, No Errors, or All But Keyboard when POST Error has been detected. Default is All But Keyboard.

Setup Utility—Advanced BIOS Features

Table 3-4 Setup Utility—Advanced BIOS Features

Option	Description
--------	-------------

Table 3-4 Setup Utility—Advanced BIOS Features (continued)

Quick Power-on Self Test	Allows the system to skip certain tests while booting. This will decrease the time needed to boot the system. Enabled/Disabled. Default is Enabled
1st Boot Device	Select Boot Device Priority. Default is USB.
2nd Boot Device	Select Boot Device Priority. Default is ATA Flash.
3rd Boot Device	Select Boot Device Priority. Default is Network.
Boot Up Numlock Status	Select power on state for Numlock. Default is OFF.
Security Option	Select whether the Password is required every time the system boots or only when you enter Setup. Default is Setup.
POST Delay (secs)	Set a delay that is added to POST to allow more time to press F10 to enter the Setup Utility. Default is None.
F12 Boot	Enable/Disable F12 network boot. Default is Enabled.

Setup Utility—Integrated Peripherals

Table 3-5 Setup Utility—Integrated Peripherals

Option	Description
Integrated Audio	Enable or Disable Onboard AC97 Audio controller. Default is Enabled.
Network Controller	Enable or Disable Onboard LAN device. Default is enabled.
USB Controller	Enable or Disable USB controller. Default is enabled.
Advanced USB Options	Enable or Disable USB external ports. Default is enabled.
USB External Ports	Default is enabled.
USB Keyboard Support	Allows use of USB keyboard under DOS. Default is enabled.
USB Mouse Support	Allows use of USB Mouse under DOS. Default is disabled.
Serial Port 1	Select serial port base IO port address and IRQ. Default is 3F8/IRQ4.
Parallel Port	Select parallel port base IO port address and IRQ. Default is 378/IRQ7.
Parallel Mode	Select parallel port transfer mode of Standard, EPP, ECP, or ECP/EPP. Default is ECP/EPP.
ECP Mode Use DMA	Select DMA channel of 1 or 3 if parallel is operated in ECP mode. Default is 3.

Setup Utility—Power Management Setup

Table 3-6 Setup Utility—Power Management Setup

Option	Description
PWRON After PWR-Fail	When power is lost and comes back, the option determines what power state the system should go to. Options are Off, On, and Former-Sts. Default is Former-Sts.
Wake on PME	Enable/disable system wakeup capability for OnBoard LAN device and PCI card. Default is enabled.
BIOS Wake up	Enable RTC alarm wakeup. Default is disabled.
Day of Week	Select the alarm RTC wakeup day of Sunday through Saturday.
Time of Day	Select the alarm RTC wakeup time of day (hh:mm).
Eup Lot6	Enable or disable EuP (Energy Using Product) Lot6 power consumption mode. Default is disabled.

Setup Utility—Utility Task Actions

Table 3-7 Setup (F10) Utility Task Actions

Heading	Table
Load Factory Defaults	Select Yes or No (Y/N)
Set Administrator Password	Allows you to set, change, and disable the administrator password.
Set User Password	Allows you to set, change, and disable the user password. NOTE: When the user password is set, it prevents unauthorized access to the user's setup. User password provides read-only access to Setup options.
Save & Exit Setup	Saves data to CMOS, then exit the Setup Utility.
Exit without Saving	Exit the Setup Utility without saving any changes.

4 Diagnostics and Troubleshooting

LEDs

Table 4-1 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	<p>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:</p> <ul style="list-style-type: none">• Processor initialization• Memory detection and initialization• Video detection and initialization <p>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.</p> <p>NOTE: After the video is initialized, anything that fails will have an error message.</p>
<p>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.</p>	
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 Green	Indicates the system is accessing the internal IDE flash.

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 on page 25](#).
7. The unit boots the operating system.

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 t5000 units.

Table 4-2 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

Beep Codes

If there are no video errors, the system goes directly to POST messages.

Beep Code	Description
1 long, 2 short	A video error has occurred and the BIOS cannot initialize the video screen to display any additional information.
1 long, 3 short	System running in boot block recovery mode.

POST Error Messages

Table 4-3 POST Error Messages

POST Error Message	Description
BIOS ROM checksum error - System halted	The checksum of the BIOS code in the BIOS chip is incorrect, indicating the BIOS code may have become corrupt. To restore a corrupt BIOS, refer to System BIOS on page 60 or call your local HP Call Center for a diagnosis. For phone numbers of an HP Call Center near you, visit the following Web site: http://www.hp.com/cgi-bin/hpsupport/index.pl
CMOS battery failed	The CMOS battery is no longer functional. For information on replacing the battery, refer to Removing and Replacing the Battery on page 15 .
CMOS checksum error - Defaults loaded	Checksum of CMOS is incorrect, so the system loads the default equipment configuration. A checksum error may indicate that CMOS has become corrupt. A weak battery may have caused this error. Replace the battery if necessary. For more information, refer to Removing and Replacing the Battery on page 15 .
CPU at nnnn	Displays the running speed of the CPU.
Press ESC to skip memory test	The user may press Esc to skip the full memory test.
Hard Disk Install Failure	Cannot find or initialize the hard drive controller or the drive. Make sure the controller is installed correctly. If no hard drives are installed, be sure the Hard Drive selection in Setup is set to NONE .
Keyboard error or no keyboard present	Cannot initialize the keyboard. Make sure the keyboard is attached correctly and no keys are pressed during POST. To purposely configure the system without a keyboard, set the error halt condition in Setup to HALT ON ALL, BUT KEYBOARD . The BIOS then ignores the missing keyboard during POST.
Memory Test	This message displays during a full memory test, counting down the memory areas being tested.
Memory Test Fail	If POST detects an error during memory testing, additional information appears giving specifics about the type and location of the memory error.
Override enabled - Defaults loaded	If the system cannot boot using the current CMOS configuration, the BIOS can override the current configuration with a set of BIOS defaults designed for the most stable, minimal performance system operations.
Press TAB to show POST screen	Press the Tab key during POST to display messages hidden by the HP logo.
Error: Non-System disk or disk error	The BIOS was unable to find a suitable boot device. For the t5000 Series, this may mean an uninitialized or corrupt ATA Flash. Reflash the unit. For more information, refer to Restoring the Flash Image on page 47 .

Troubleshooting

Basic Troubleshooting

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

Table 4-4 Power-On Troubleshooting

Issue	Procedures
The thin client unit is experiencing operating problems.	<p data-bbox="703 478 1458 541">Ensure that the following connectors are securely plugged into the thin client unit:</p> <ul data-bbox="703 562 1458 814" style="list-style-type: none"><li data-bbox="703 562 1458 594">• Power connector<li data-bbox="703 615 1458 646">• Keyboard<li data-bbox="703 667 1458 699">• Mouse<li data-bbox="703 720 1458 751">• Network RJ-45 connector<li data-bbox="703 772 1458 804">• Monitor
The thin client unit does not power on.	<ol data-bbox="703 825 1458 1003" style="list-style-type: none"><li data-bbox="703 825 1458 919">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.<li data-bbox="703 940 1458 1003">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.	<ol data-bbox="703 1014 1458 1329" style="list-style-type: none"><li data-bbox="703 1014 1458 1087">1. Verify that the network is operating and the network cable is working properly.<li data-bbox="703 1108 1458 1329">2. Verify that the unit is communicating with the server by having the System Administrator ping the unit from the server:<ul data-bbox="751 1182 1458 1329" style="list-style-type: none"><li data-bbox="751 1182 1458 1245">◦ If the thin client pings back, then the signal was accepted and the unit is working. This indicates a configuration issue.<li data-bbox="751 1266 1458 1329">◦ If the thin client does not ping back and the thin client does not connect to the server, re-image the unit.
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.)	<ol data-bbox="703 1339 1458 1759" style="list-style-type: none"><li data-bbox="703 1339 1458 1371">1. Verify that the network is not down.<li data-bbox="703 1392 1458 1486">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.<li data-bbox="703 1507 1458 1570">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.<li data-bbox="703 1591 1458 1654">4. If network LEDs still do not light and you know the power supply is good, then re-image the unit.<li data-bbox="703 1675 1458 1707">5. If network LEDs still do not light, run the IP configuration procedure.<li data-bbox="703 1728 1458 1759">6. If network LEDs still do not light, have the unit serviced.

Table 4-4 Power-On Troubleshooting (continued)

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.	<ol style="list-style-type: none">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

To troubleshoot the unit:

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

Table 4-5 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.
Client ID	Information from server	If no Client ID information there is no network connection. This may be caused by a bad cable, down server, 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, down server, 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, down server, or a bad system board. Contact the Call Center for service for the bad system board.

If you are running in an MS RIS PXE environment go to step 2.

If you are running in a Linux environment go to step 3.

2. If you are running in an MS 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.

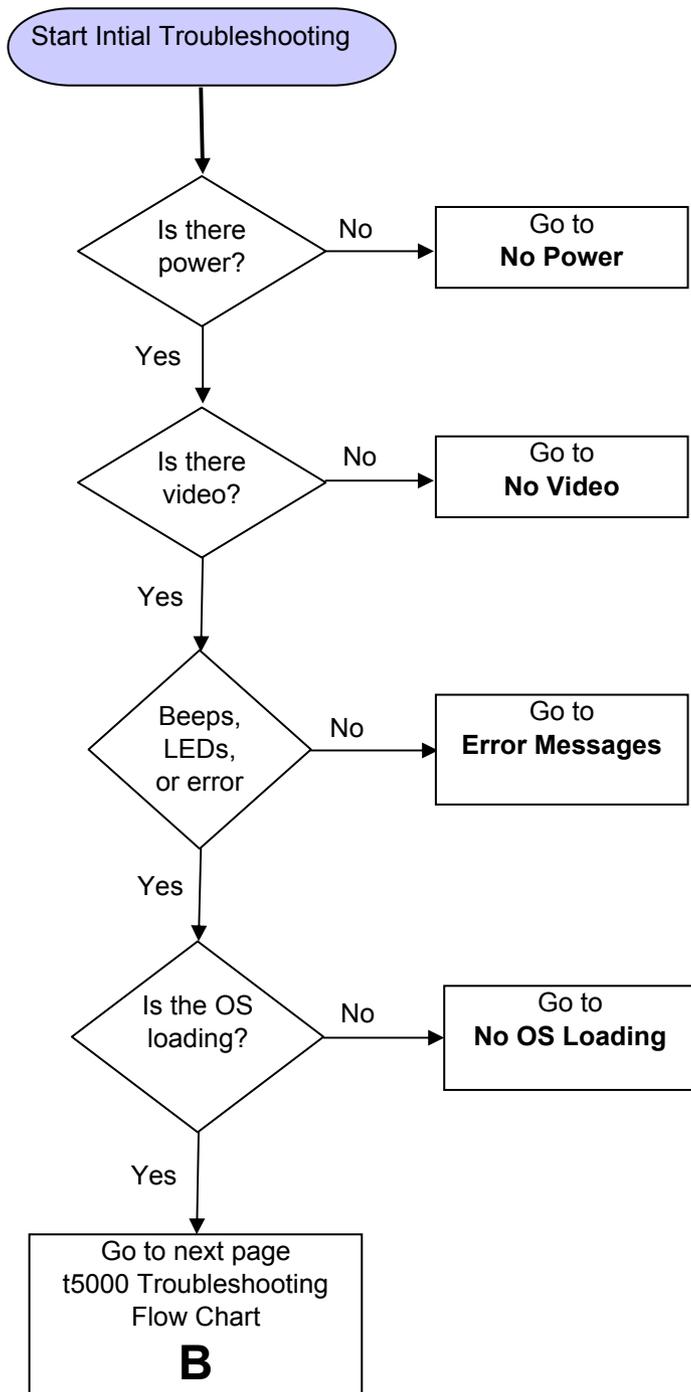
If you missed the F12 cue, the system will try to boot to the ATA flash that is not present. The message on the screen will read: **ERROR: Non-system disk or disk error. Replace and press any key when ready.**

Pressing any key will restart the boot cycle.

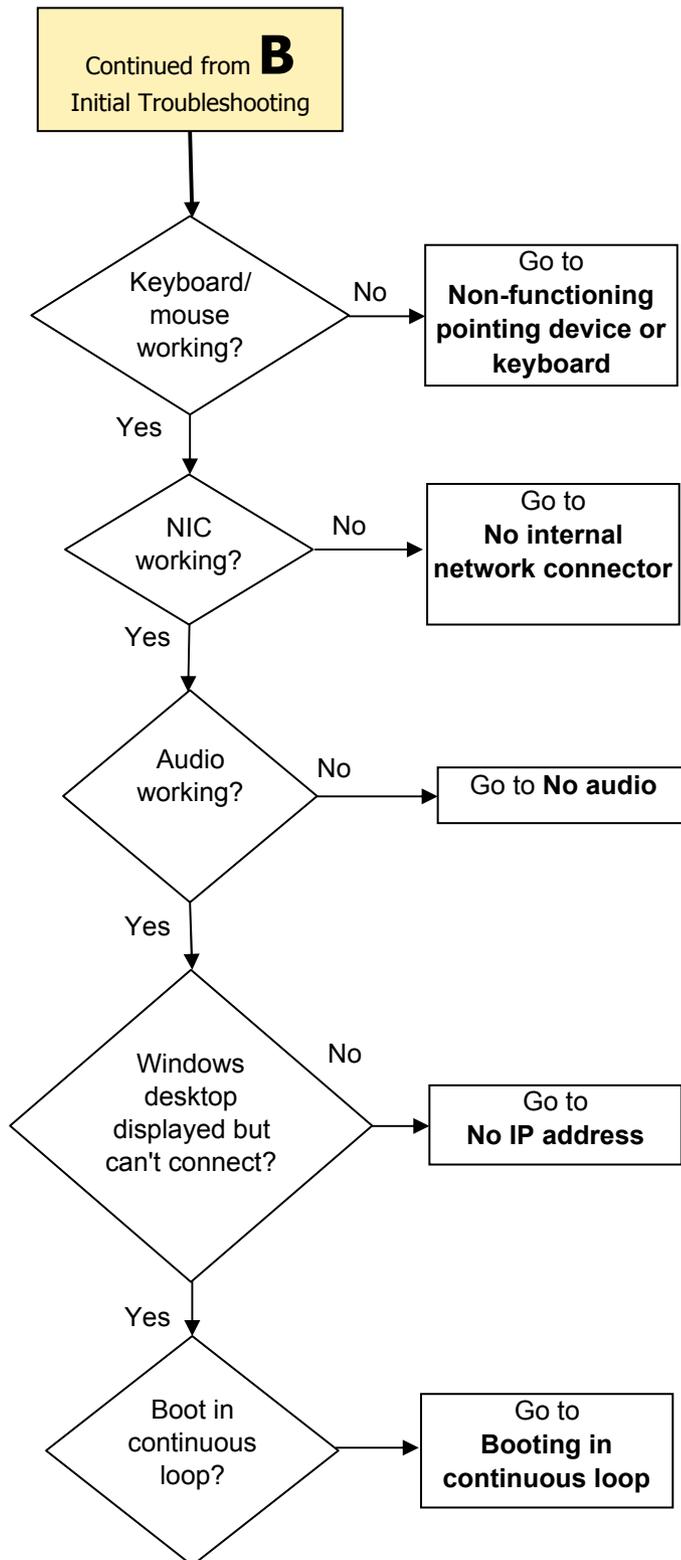
3. If you are running in a Linux environment, an error message will appear on the screen if there is no Client IP. **ERROR: Non-system disk or disk error. Replace and press any key when ready.**

Troubleshooting Flowcharts

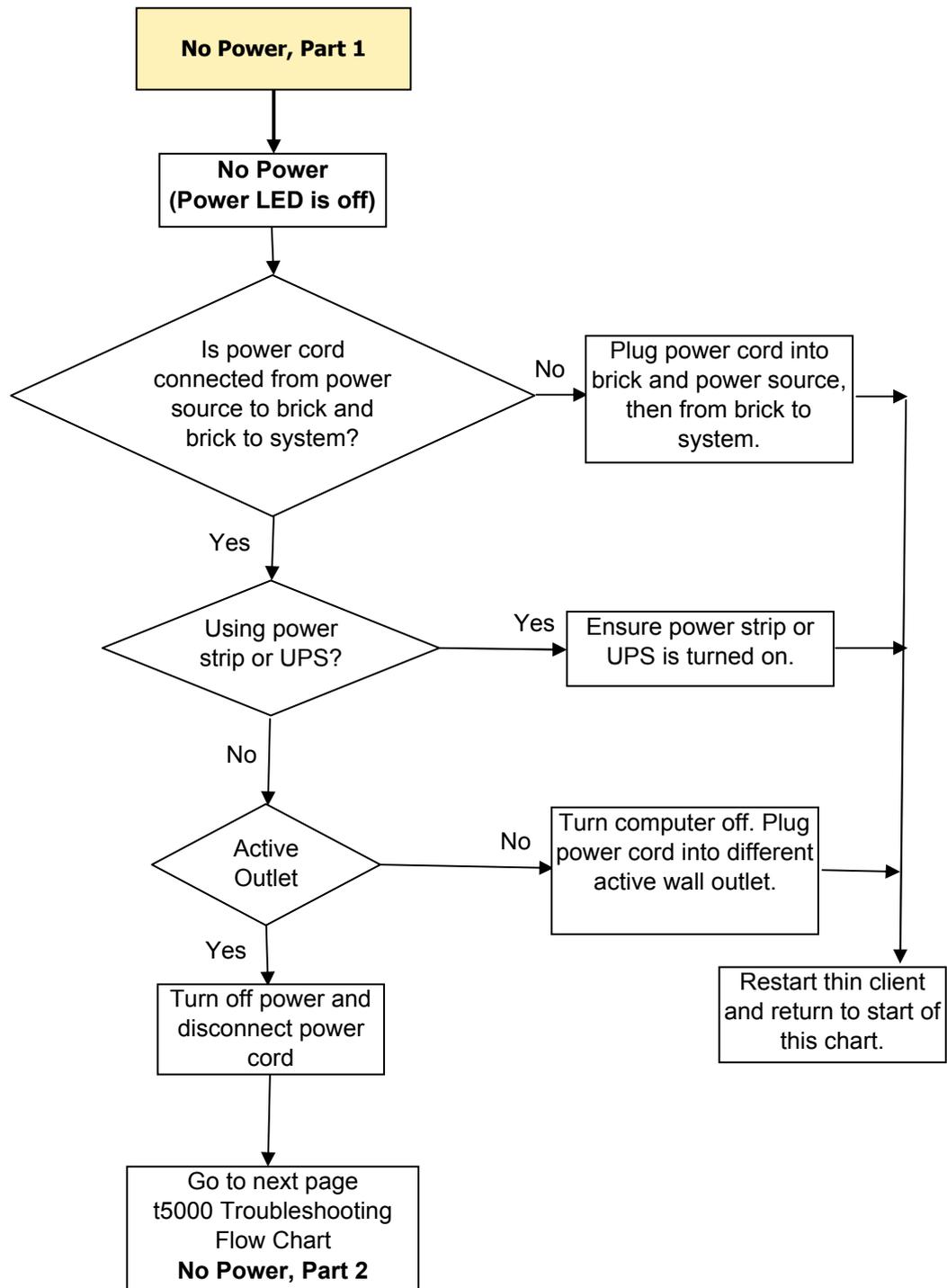
Initial Troubleshooting



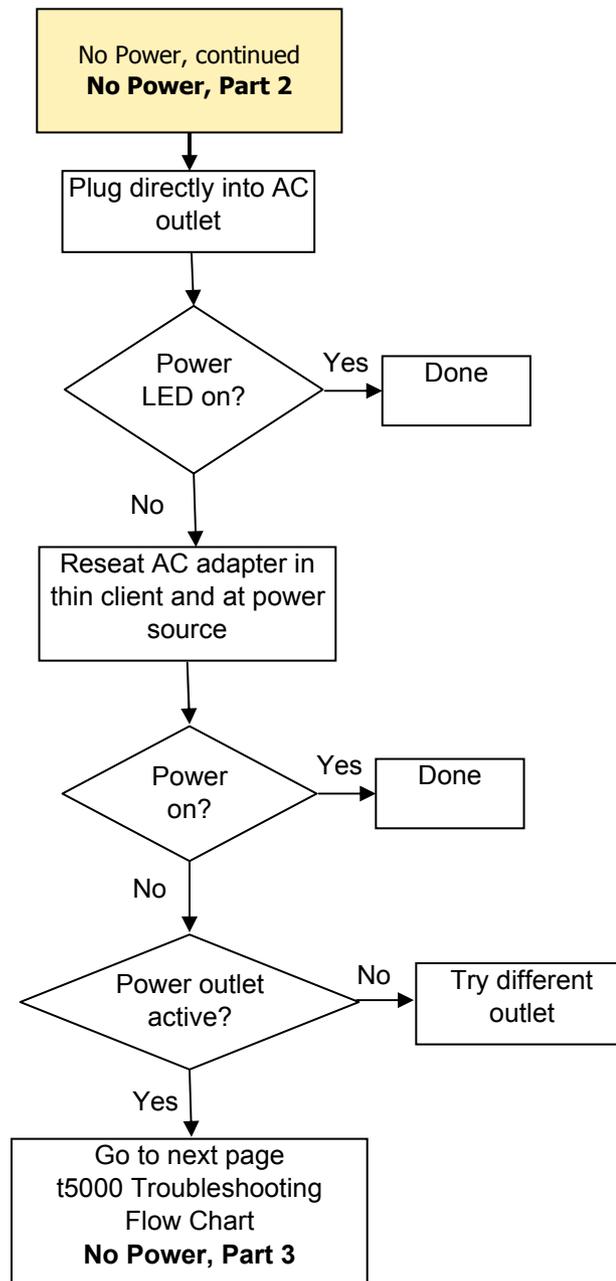
Initial Troubleshooting Part 2



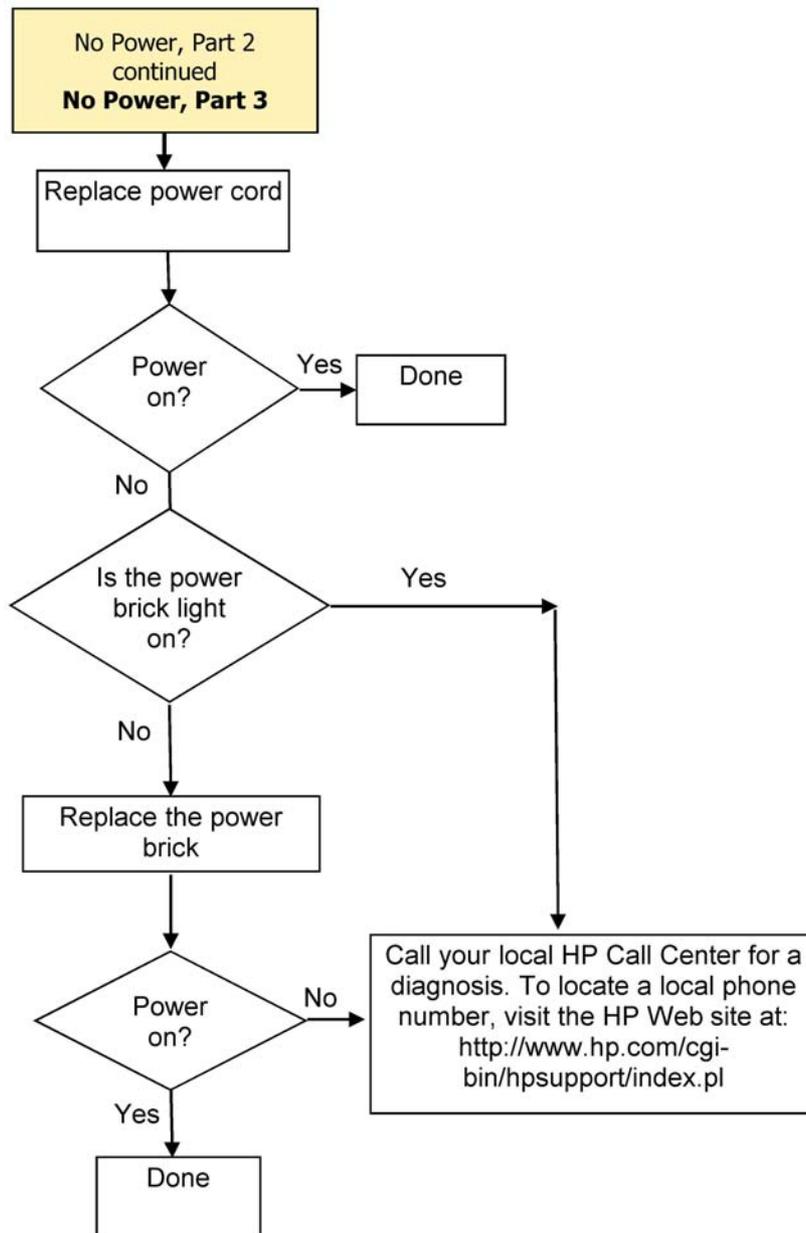
No Power, Part 1



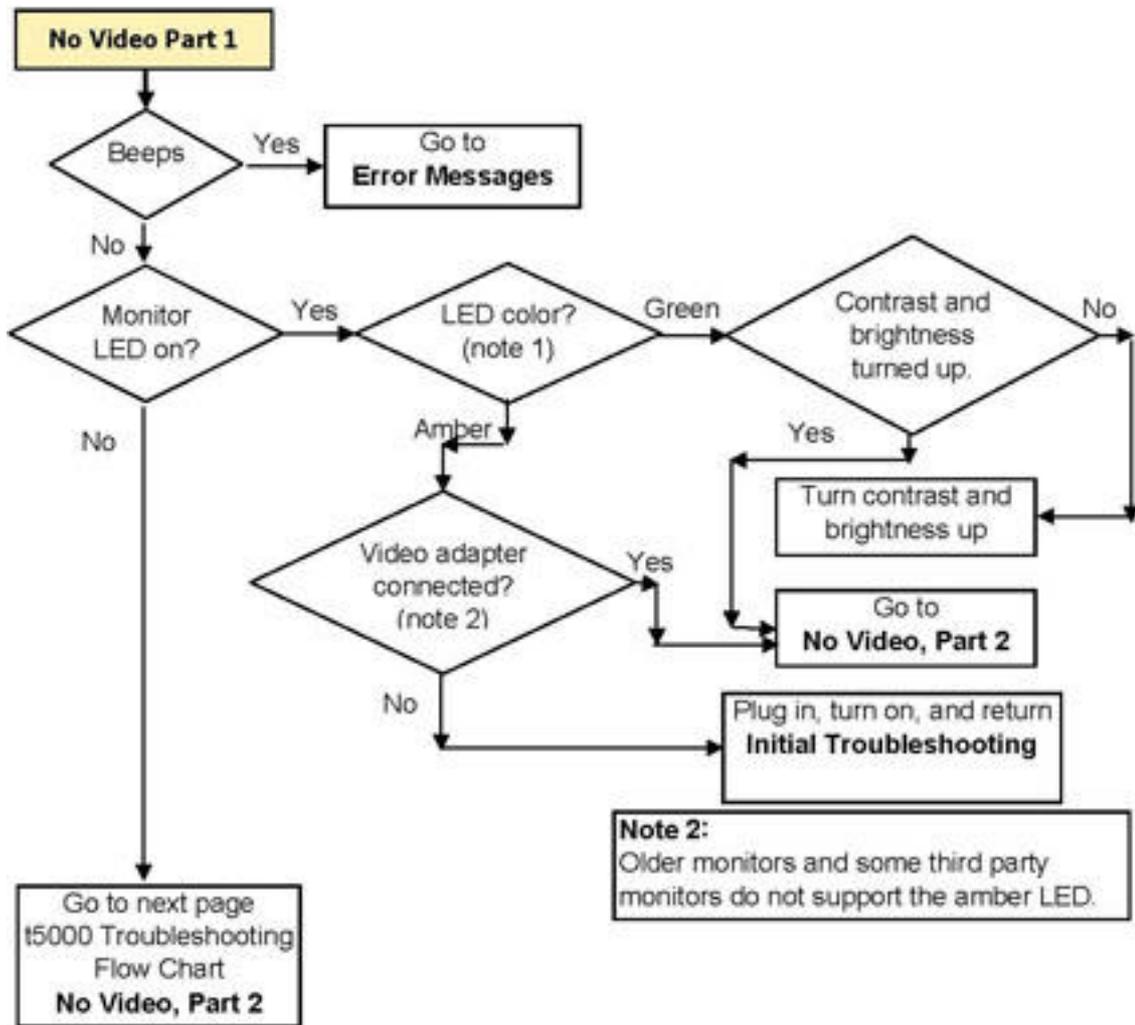
No Power, Part 2



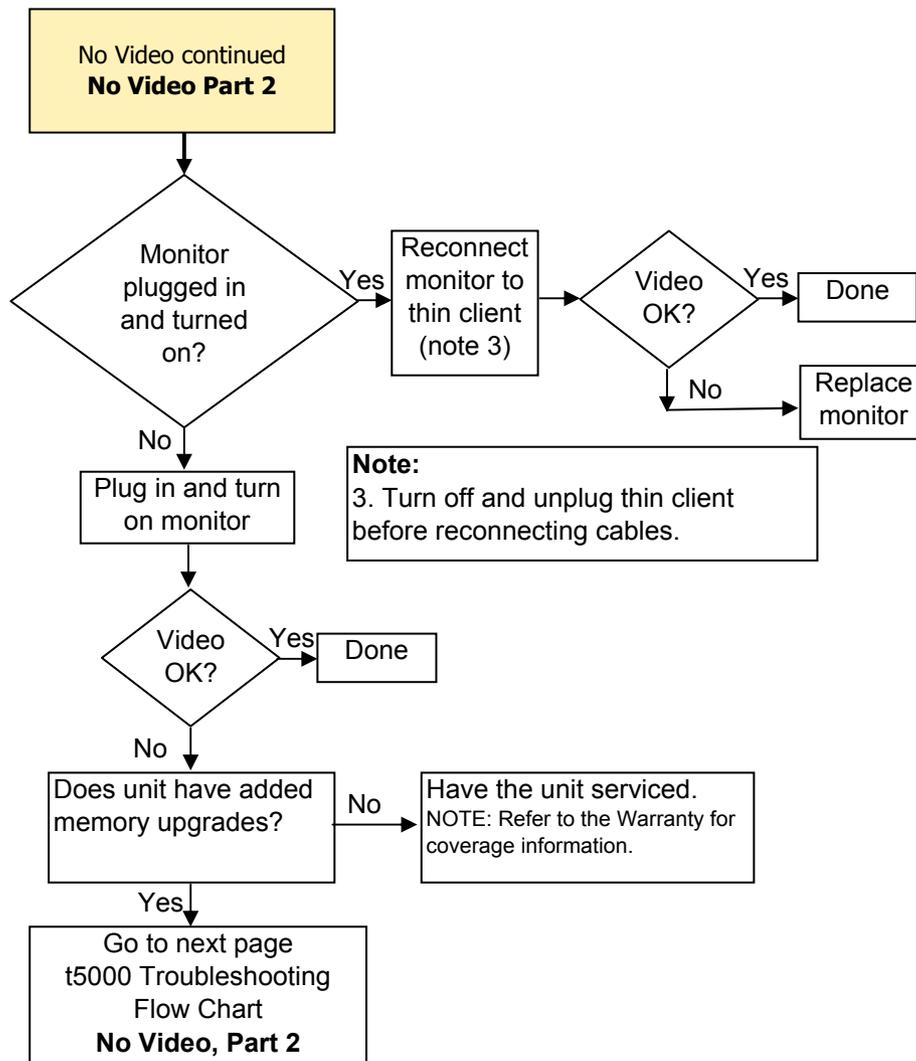
No Power, Part 3



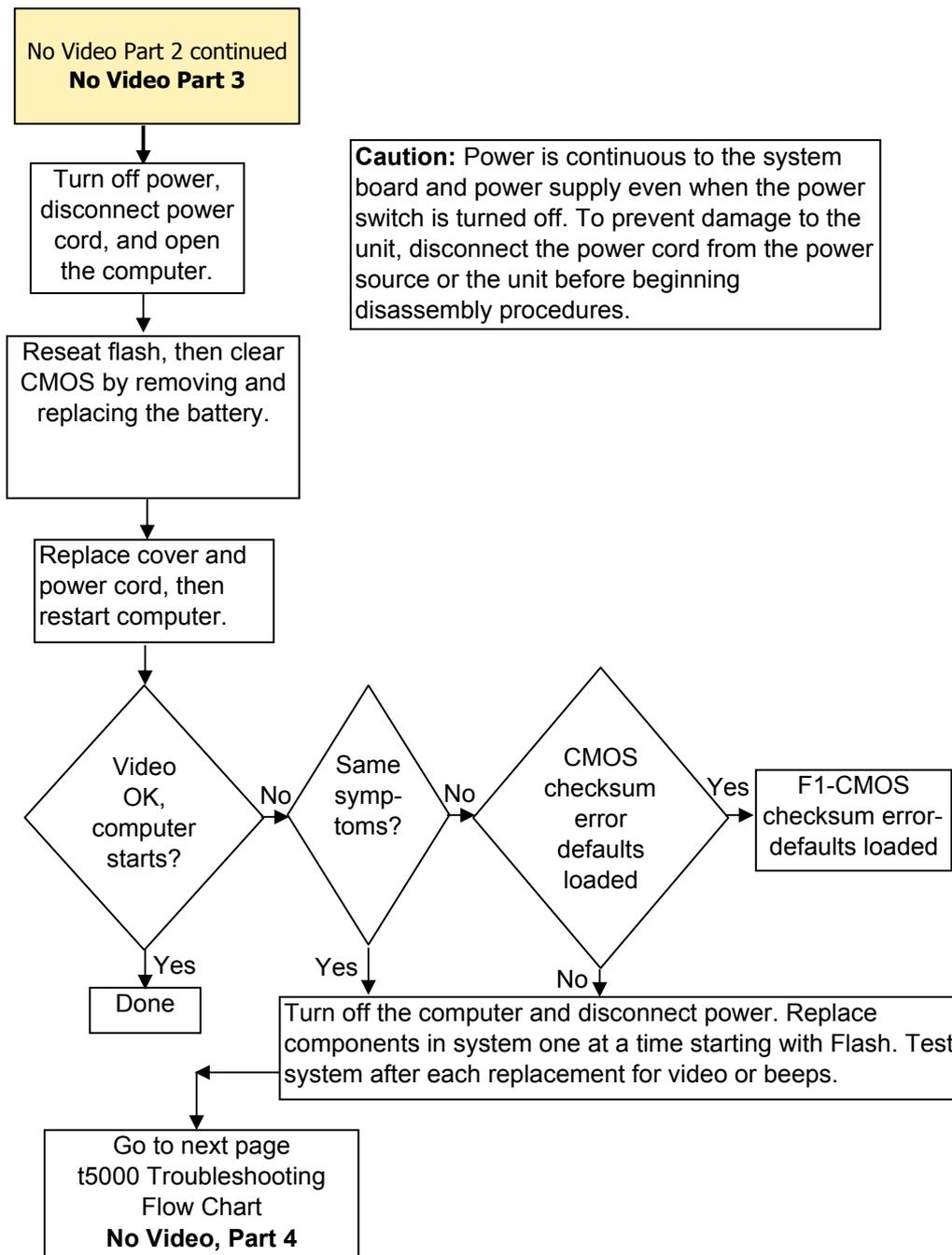
No Video, Part 1



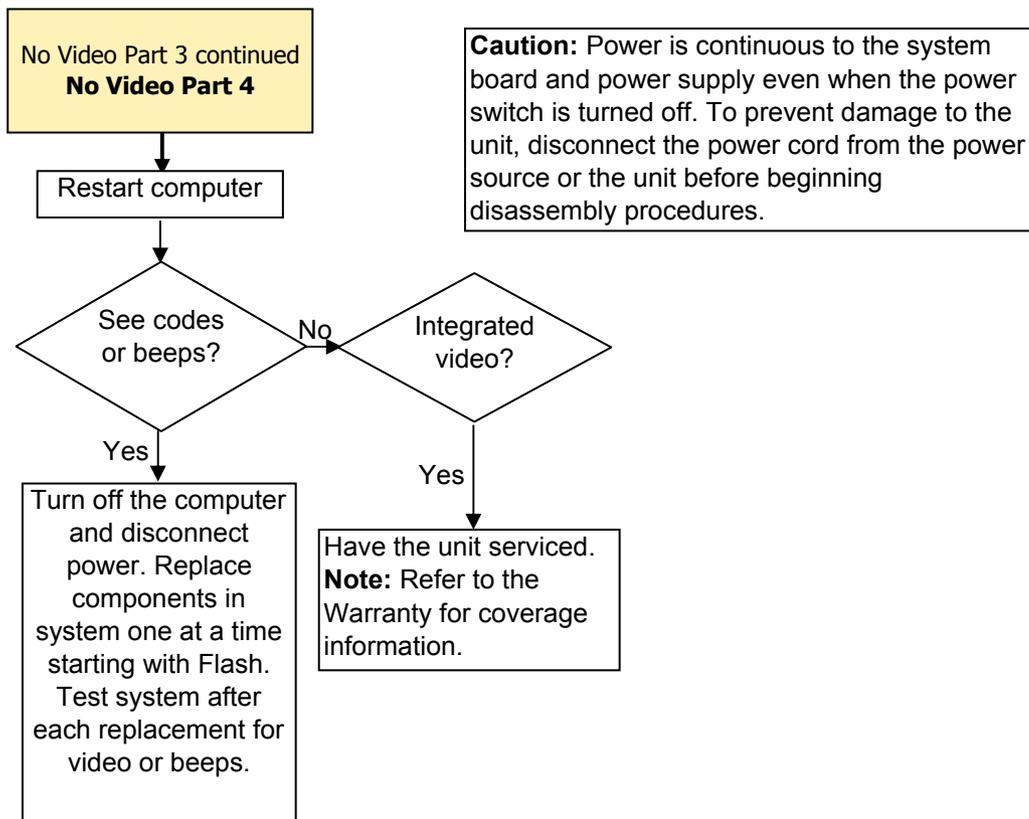
No Video, Part 2



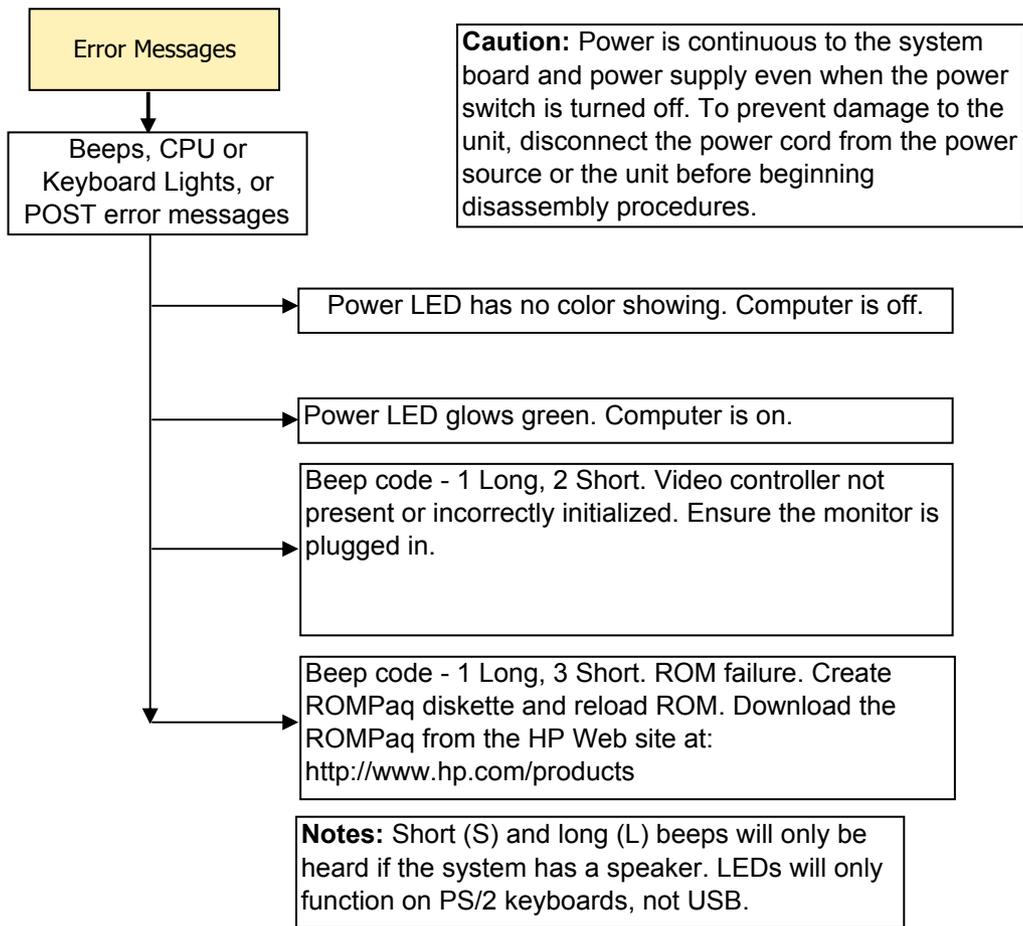
No Video, Part 3



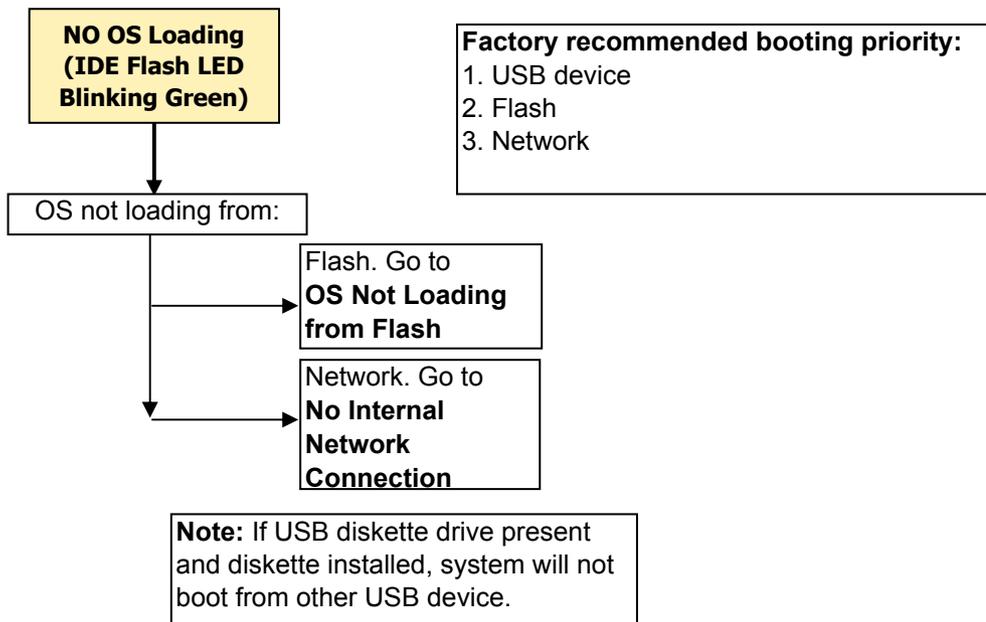
No Video, Part 4



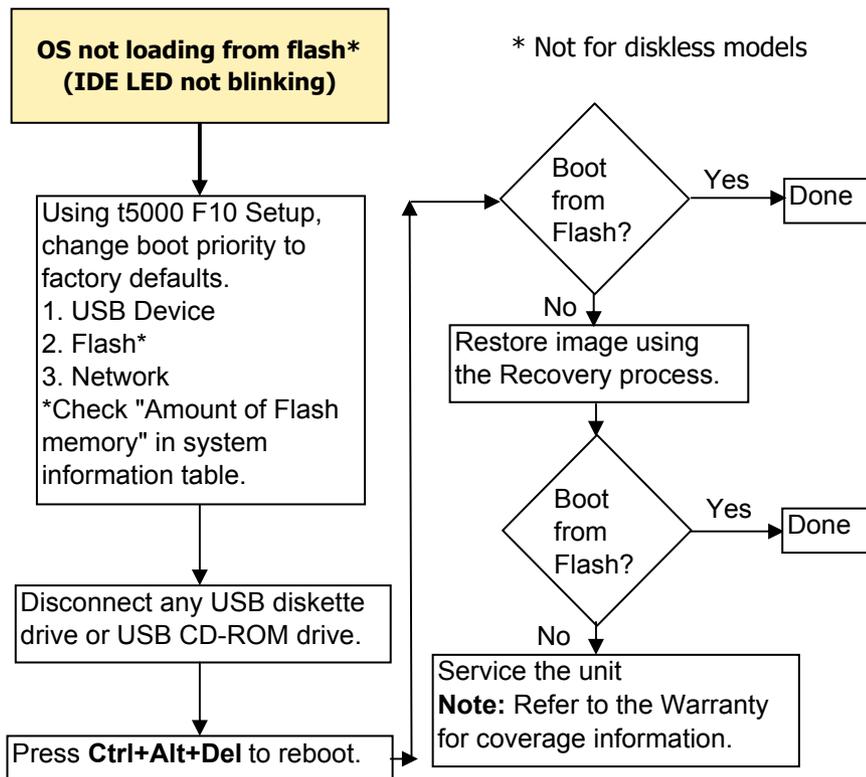
Error Messages



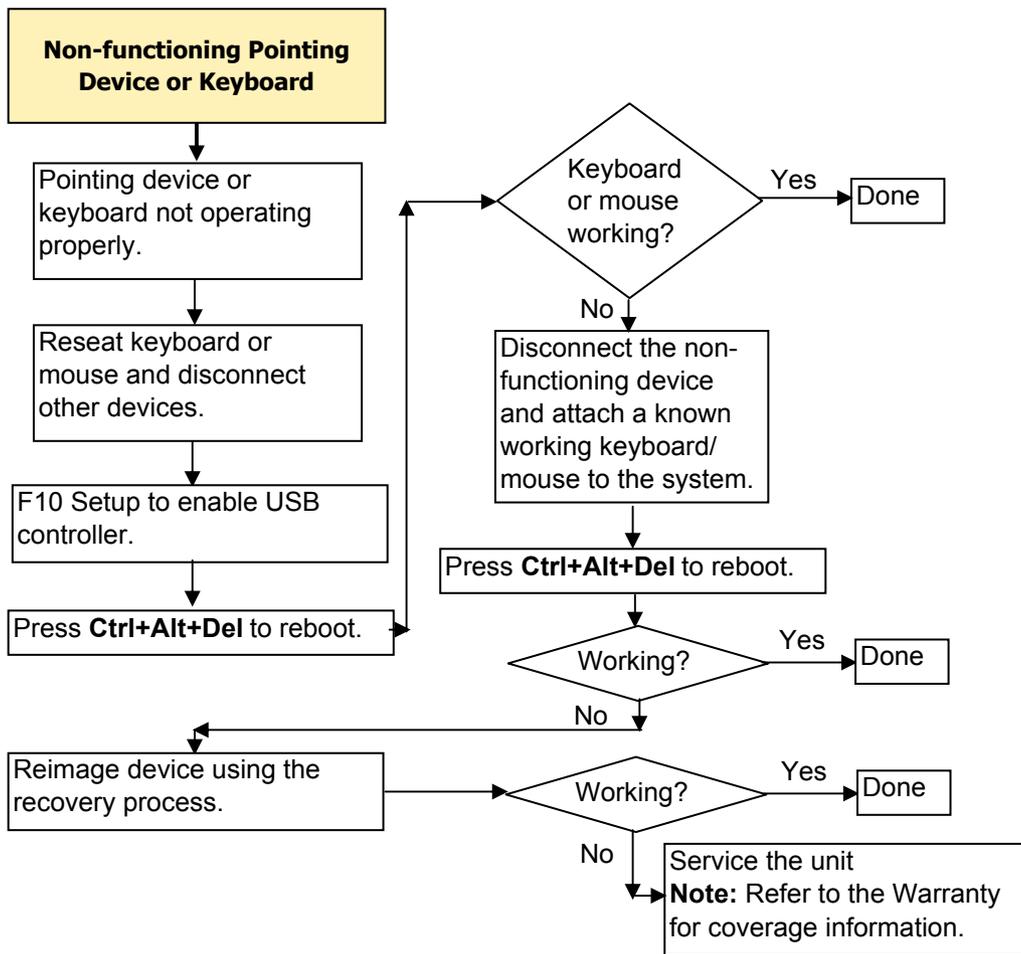
NO OS Loading



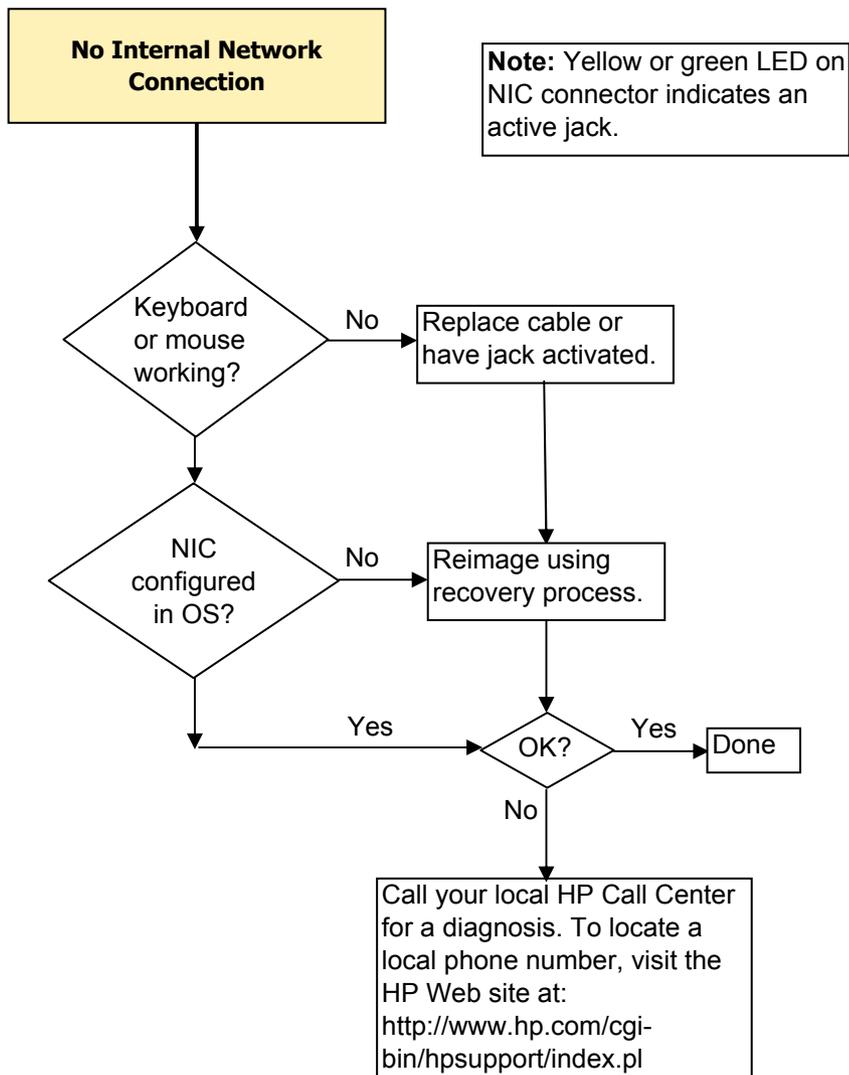
OS Not Loading from Flash



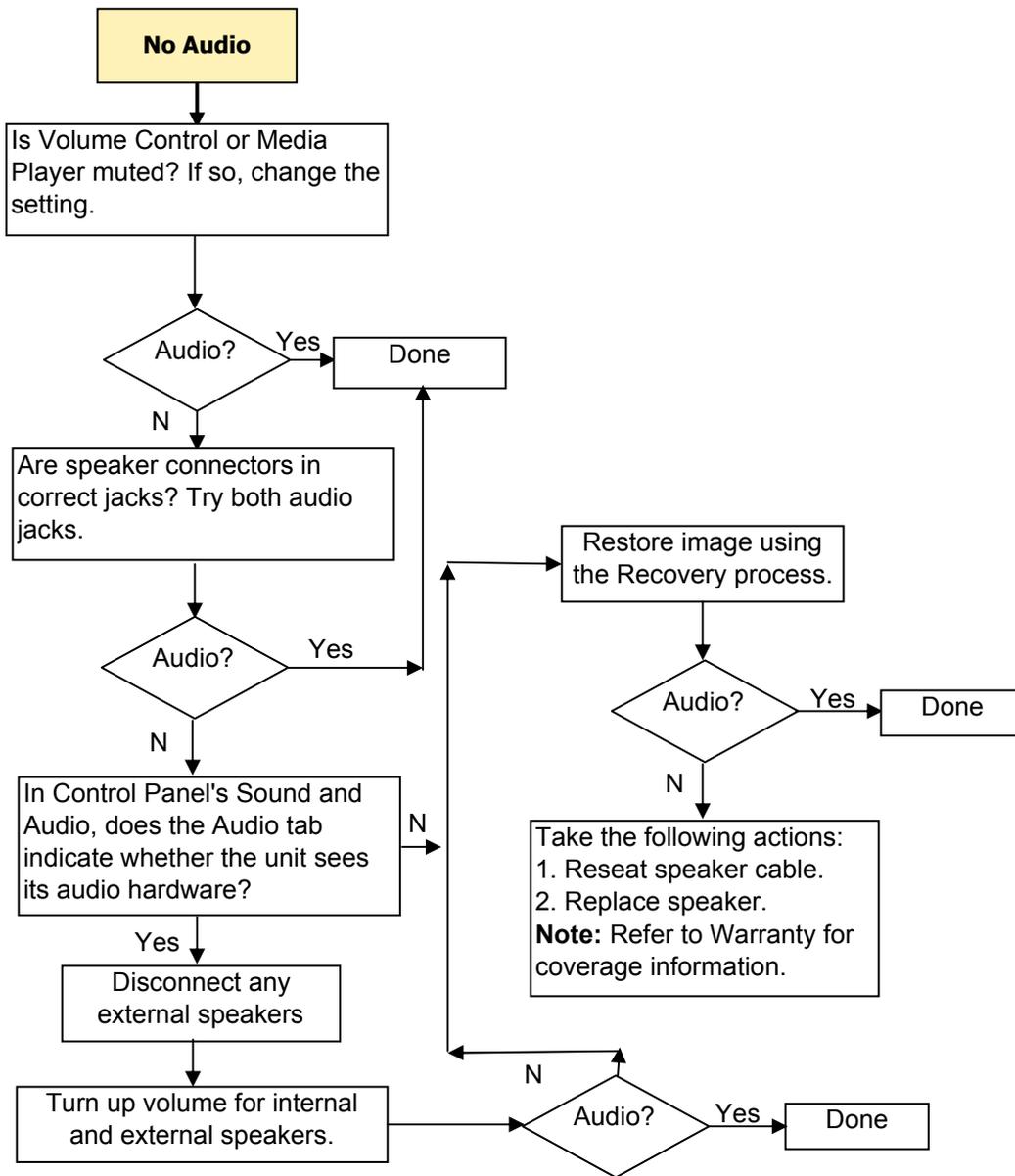
Non-Functioning Pointing Device or Keyboard



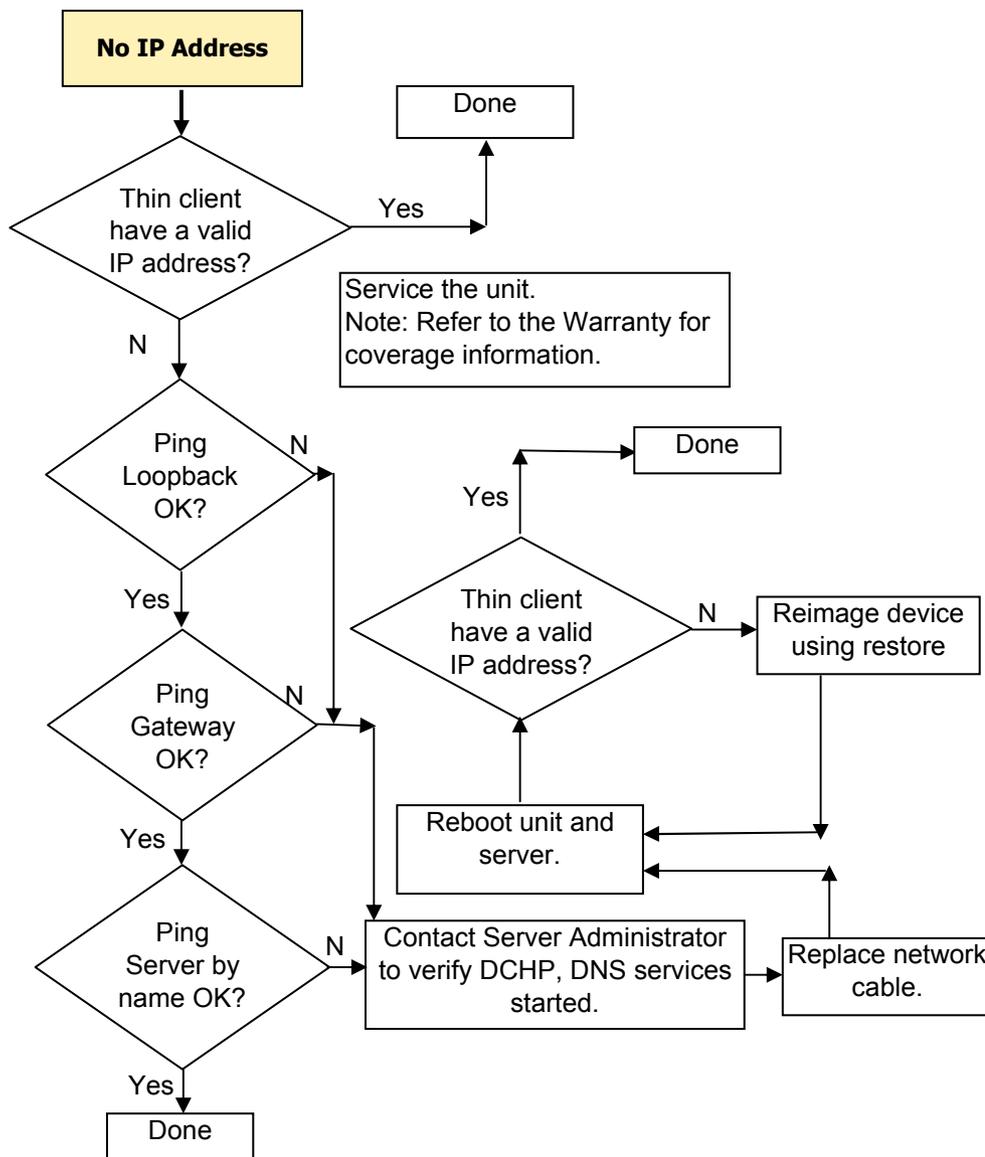
No Internal Network Connection



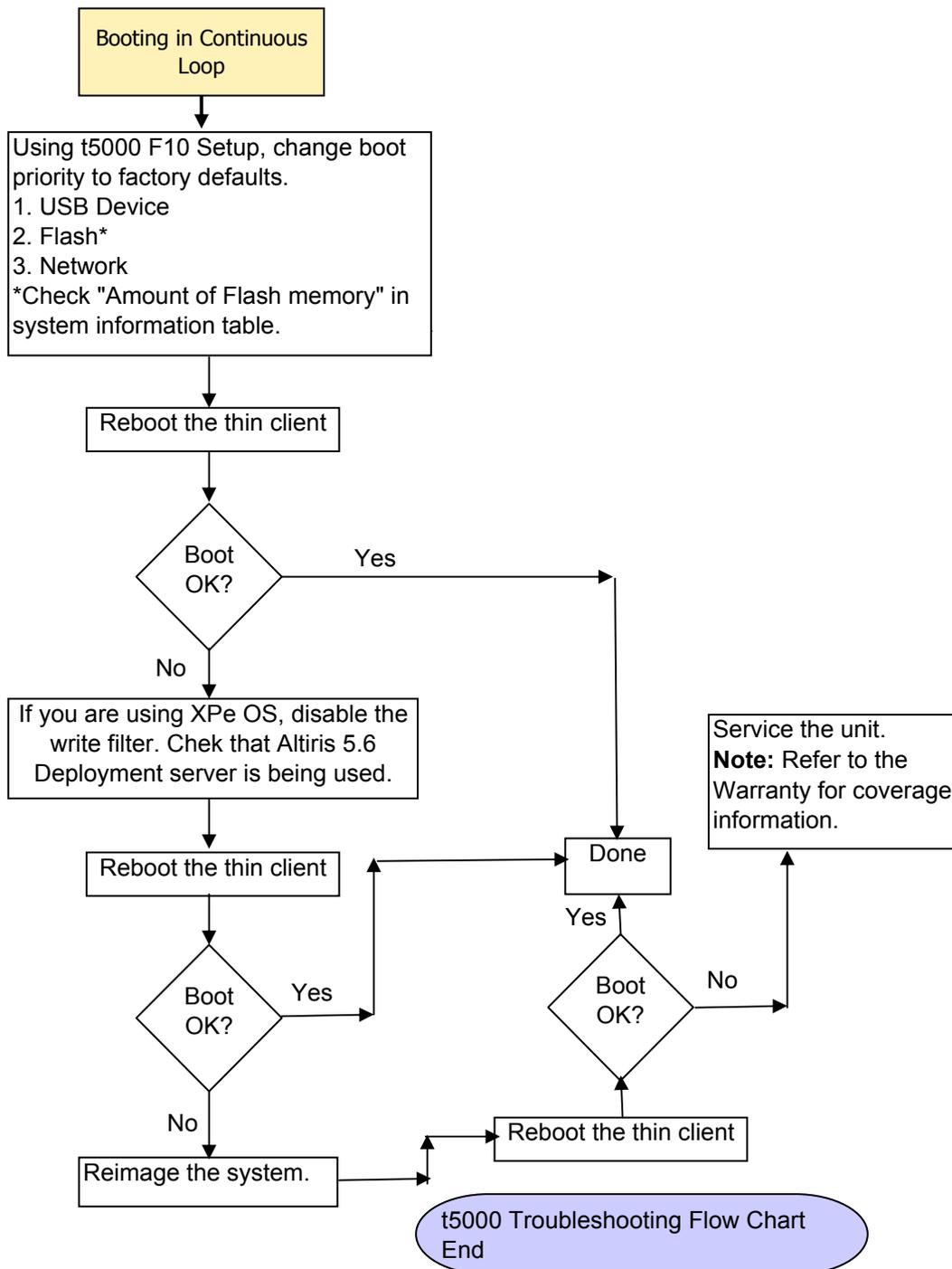
No Audio



No IP Address



Booting in Continuous Loop



5 Restoring the Flash Image

System Requirements

To create a recovery device for the purpose of reflashing or restoring the software image on the DOM (Disk On Module or ATA Flash), you will need the following:

- A computer running Microsoft Windows 2000 Professional or Microsoft Windows XP Professional
- One or more HP Compaq t5000 Series Thin Clients
- CD-R or CD-RW drive (if using the ISO Image option)
- 512-MB USB flash device for Windows XP Embedded or Windows Embedded Standard (WES) (if using the USB format) or Linux.

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 Compaq Thin Client Imaging Tool.

- USB CD-ROM drive for thin client (if using the ISO Image option)

Before using the utility, you must download the appropriate image from <http://www.hp.com/sbso/bussupport.html>.

Getting Started

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

- Generate an ISO image to use with CD creation software to create a bootable CD for deployment using a USB CD-ROM drive.
- 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 Compaq Thin Client Imaging Tool (CRStart.exe) runs automatically.

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

- ISO Image
- 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.

Creating an ISO Image

1. Click **ISO Image**.
2. When prompted, enter a file name for the generated ISO file.

Once this process is complete, use the generated ISO file to create a bootable restore CD with your CD creation software.

3. Connect a USB CD-ROM drive to the thin client. **Only one bootable USB device may be attached to the thin client during this process.**
4. Insert the bootable restore CD into the CD-ROM drive.
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.

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 drive to your computer. Ensure that only one USB flash drive 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.

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

1. Click **Deployment**.
2. When prompted, select the destination directory for the imaging tools and image.

The components that comprise DSKIMG.BIN are then unbundled. When this process is complete, there are three new files: IBR.EXE (the image restoration utility), FLASH.xx (the OS image), and README.TXT

 **NOTE:** Linux uses the file name FLASH.DD while other operating system images use FLASH.IMG

Deploying with PXE

1. Ensure that IBR.exe and Flash.img are stored in the same directory on the server.
2. Add `[full path]\IBR.exe -y [full path]\Flash.img hd0` to the PXE command file, and then run it.

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

Refer to [Configuring a PXE Server on page 53](#) for instructions about setting up a PXE Server using Microsoft RIS. See your documentation if using a different PXE server, such as Altiris Deployment Solution.

A Specifications

Table A-1 HP t5550/t5565/t5570 Thin Client

Dimensions		
Width	58.42 mm	2.30 in.
Height (without stand)	209.55 mm	8.25 in
Height (with stand)	219.70 mm	8.65 in
Depth	215.90 mm	8.50 in.
Approximate Weight		
	1.36 kg	3.00 lb
Temperature Range (fanless design)*		
Operating**	10° to 40° C	50° to 104° F
(max. rate of change is 10° C per hour or 18° F per hour)		
Nonoperating	-30° to 60° C	-22° to 140° F
(max. rate of change is 20° C per hour or 36° F per hour)		
*Specifications are at sea level with altitude derating of 1° C/300m (1.8° F/1000ft) to a maximum of 3Km (10,000ft), with no direct, sustained sunlight. Upper limit may be limited by the type and number of options installed.		** The operating temperature range when the thin client is attached to a flat panel using the HP Quick Release is 50° to 95° F (10° to 35° C).
Relative Humidity (non-condensing)		
Operating	10–90%	10–90%
(max. wet bulb temperature is 28° C or 84.2° F)		
Nonoperating	5–95%	5–95%
(max. wet bulb temperature is 38.7° C or 101.6° F)		

Table A-1 HP t5550/t5565/t5570 Thin Client (continued)

Maximum Altitude (unpressurized)		
Operating	3048 m	10,000 ft
(max. allowed rate of change is 457m per minute or 1500 ft per minute)		
Nonoperating	9144 m	30,000 ft
(max. allowed rate of change is 457m per minute or 1500 ft per minute)		
Power Supply		
Operating Voltage Range	100–240 VAC	100–240 VAC
Rated Line Frequency	50–60 Hz	50–60 Hz
Power Output (maximum)		
	65 W	65 W
Rated Output Current (maximum)		
	3.42 A	3.42 A
Output Voltage		
	+19 V DC	+19 V DC

B 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



NOTE: Linux uses the file name FLASH.DD while other operating system images use FLASH.IMG

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.

C Configuring a PXE Server

Prerequisites

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

- Domain Name Service (DNS)
- Active Directory DHCP
- Remote Installation Services (RIS) on Microsoft Windows 2000 Server

This documentation covers RIS setup, and assumes that servers 1, 2, and 3 (above) are already set up. The RIS PXE Server must be equipped with two or more hard drives. Remote Installation Services and Windows 2000 Server cannot be installed on the same drive; nor will RIS work on a double partition of Windows 2000 Server. You must first format the drive on which RIS is installed using NTFS.

Installing Remote Installation Services (RIS PXE Server)

1. From the Windows 2000 Server, log on to the domain using an account that has Administrator privileges on the server.
2. From the Windows Control Panel, double-click on **Add/Remove Programs**.
3. Double-click **Add/Remove Windows Components**.
4. Select **Remote Installation Services**, and then click **Next** (Insert Windows 2000 Server CD into the CD-ROM drive, if prompted).
5. Restart the computer after the wizard has finished installing the service.

Authorizing Remote Installation Services (RIS PXE Server)

If you have installed RIS on a server other than the server running DHCP, authorize PXE with DHCP as follows:

1. Record the IP address of the RIS PXE Server.
2. Log on to the DHCP Server as administrator.
3. From the Control Panel, double-click **Administrative Tools**.

4. Double-click **DHCP**.
5. Right-click **DHCP** (just above the domain name) and select **Manage Authorized Servers**.
6. Click **Authorize**.
7. Type the IP address of your RIS PXE server, and then click **OK**.
8. Click **OK**.
9. Log off from the DHCP Server.

Configuring Remote Installation Services

Use the default option to have RIS install on second hard drive (D:\ or E:\).

1. Click **Start > Run**.
2. Type `Rissetup.exe` and click **Next**.
3. Click **Next**.
4. Select **Respond to client computers requesting service**.
5. Click **Next**.
6. Insert the Windows 2000 Professional CD into the CD-ROM drive and enter the path to the CD-ROM drive (usually drive D:\ or E:\).
7. Click **Next**.
8. Click **Next**.
9. Click **Next**.
10. When the installation is complete, click **Finish**.

Set User Permissions on the Active Directory Server

On the active directory server:

1. Click **Start > Programs > Administrative Tools**.
2. Click **Active Directory Users and Computers**.
3. Right-click on the appropriate domain name.
4. Click **Delegate Control**.
5. Click **Next**.
6. Click **Add** to add users.
7. Highlight **Everyone** and click **Add**.
8. Click **OK**.

9. Click **Next**.
10. Select **Join a Computer to the Domain**.
11. Click **Next**.
12. Click **Finish**.

RIS Menu

1. Install the RIS menu of your choice.
2. Configure the RIS menu.
3. Refer to the help file provided by the RIS menu for instructions on creating a network bootable diskette and RIS menu for PXE.

Creating Network Bootable Disk to Map Drives

Create a network boot disk to map drives.

Refer to the Microsoft Web site for instructions about creating a network bootable diskette.

For More Information

HP Compaq t5000 Series Documentation (including white papers discussing software deployment methods):

<http://welcome.hp.com/country/us/en/support.html?pageDisplay=support>. Type your model number into the **for product** box and navigate to the **Manuals** link.

Altiris Deployment Solution Documentation:

<http://www.altiris.com/support/documentation/>

D FTP Update

HP FTP Image Update Client is a utility that allows image update from an FTP share to an HP thin client system running the Windows Embedded Standard (WES) operating system.

FTP Image Update is only provided on the t5570 WES image.

For FTP Image Update to function properly, it requires the following available free space on the client:

- Approximately 200MB of flash
- Approximately 250MB of RAM

FTP Image Update over wireless is not supported

For greater usage flexibility and to take advantage of all the features provided in the latest image, HP recommends at least:

- 1 GB of flash
- 1 GB of RAM

Server Requirements

DCHP Server

Option 137 should contain a string value specifying an FTP share where the XPe images and WinPE image are stored.

For example, if the XPe images and WinPE image are stored in `ftp://ftpserver/ftpfolder`, then the option DHCP option 137 should contain the following string:

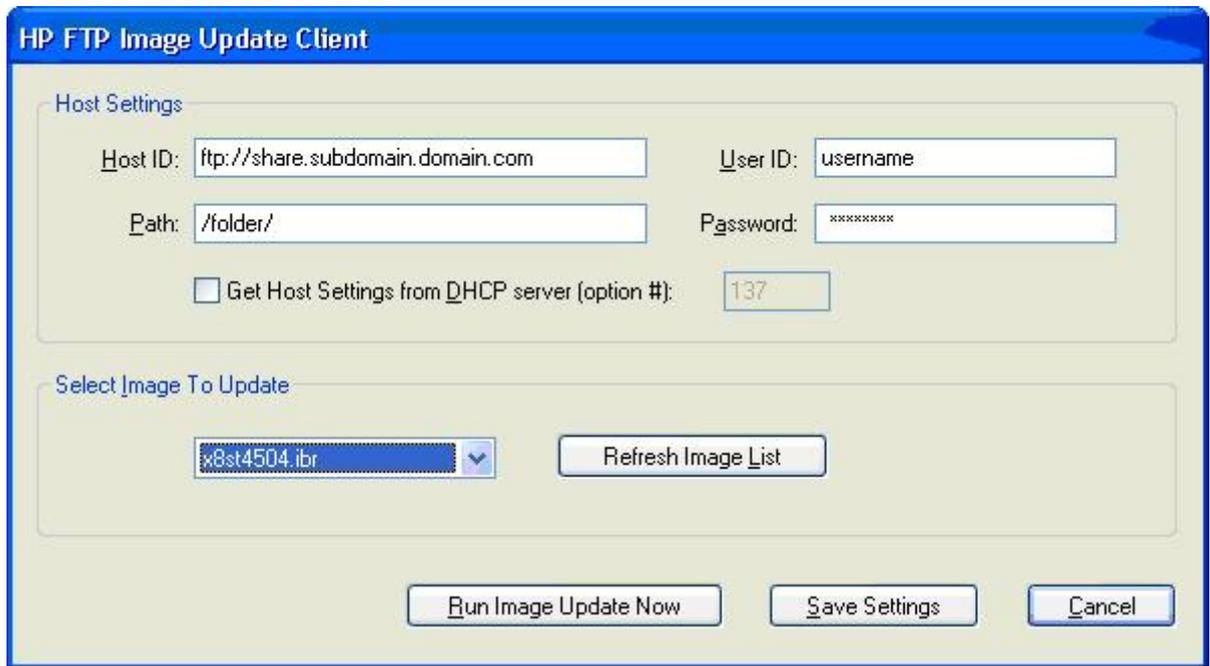
- `ftp://username:password@ftpserver/ftpfolder`, if the FTP share is protected
- or –
- `ftp://ftpserver/ftpfolder`, if the FTP share allows anonymous access

FTP Server

The XPe images (in .IBR format) and the WinPE image provided by HP must reside in the same folder on the FTP server.

Description

The HP FTP Image Update Client can only be run by an administrator on an HP thin client system which has license to run XP Embedded operating system.



Host Settings

There are two ways to specify host settings:

1. You can manually enter settings by clearing the **Get Host Settings from DHCP server** check box and filling in appropriate information to the **Host ID**, **Path**, **User ID**, and **Password** boxes.

If the FTP share allows anonymous read access, then you can leave the **User ID** and **Password** boxes empty.

If the XPe images and WinPE image are stored in the default (root) folder on the FTP server, then you can leave the **Path** box empty or fill the box with */*.

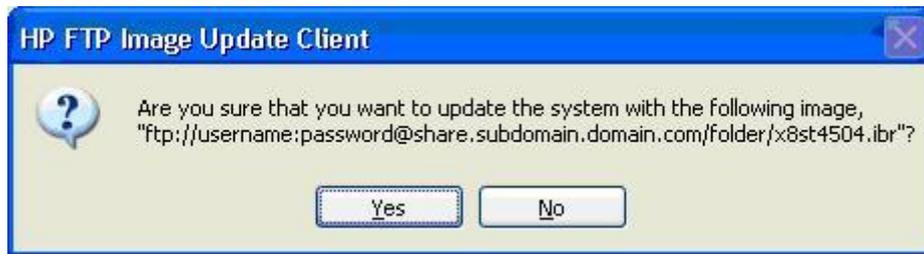
2. Automatically through a DHCP option by selecting the **Get Host Settings from DHCP server** check box.

These host settings can be saved and committed by clicking on the **Save Settings** button. When the applet is invoked again, the settings will be retrieved and the corresponding controls are automatically populated.

Select Image to Update

Once the host settings are entered, either manually or automatically through DHCP, then click the **Refresh Image List** button to make the applet query the FTP share for all XPe images whose targeted BIOS families match the one of the current thin client system, and fill in the drop-list combo box to the left of the button. You can choose any of the listed images to update/image the system.

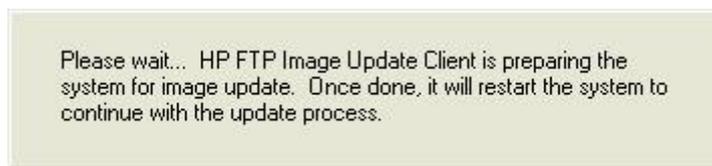
When ready, you can click the **Run Image Update Now** button to proceed with the image update using the selected image. A confirmation dialog similar to the following is displayed.



Click **No** to abort the operation. If you click **Yes**, the HP FTP Image Update Client confirms that the flash drive has at least 200MB free to host the WinPE image. If the flash drive does not, the following error message is displayed.



If the flash device has enough memory, the update client starts the download of the WinPE image, modifies the boot loader to boot to WinPE in the next system restart, and then restarts the system to continue to the WinPE phase.



Once WinPE is loaded, IBRPE is spawned to image the system's flash drive using the selected image from the FTP share. When the imaging completes, IBRPE automatically restarts the system to enter the FBA phase.

```
X:\Windows\System32\cmd.exe - \IBRPE\THINSTATE.CMD
HP Thin Client Imaging Tool, Version 6.00.2008.0519
Copyright (c) 2008 Hewlett-Packard Development Company, L.P.

This utility will FORMAT your flash disk and ERASE ALL DATA currently on the
disk. It will then RESTORE the original operating system software, device
drivers, and other HP-provided software that came with the computer.

Please do not power off your system during this process.

3% completed.
```

E System BIOS

Restoring a Corrupt BIOS

If the BIOS on the thin client is corrupt, the BIOS must be restored before the thin client will boot to the operating system. To restore the BIOS, you will need the following:

- An external USB diskette drive or USB flash drive connected to the thin client
- HP Compaq Thin Client t5000 Series System BIOS Softpaq (for the product being restored) on diskette or USB flash drive

 **NOTE:** The BIOS recovery procedure works the same from USB floppy diskette or USB flash drive.

To restore a corrupted BIOS, complete the following instructions:

1. Place the latest BIOS image file on a USB flash drive or floppy diskette.
2. Rename the BIOS image file to **786R9.ROM** for the restore process to work.
3. Insert the USB flash drive or floppy drive with diskette into a port on the corrupted system.
4. Power the system on and observe the USB device activity light flashes indicating the process has started.

The system will display a message showing the recovery process has started and when it has finished.

5. When the process is complete, the system reboots. Remove the USB device.

 **NOTE:** The process takes about 45 seconds using a flash drive or about 1.5 minutes using a floppy drive.

 **WARNING!** Do not turn off power or attempt to reboot the thin client during the recovery process.

Updating a BIOS

To update the system BIOS, download the Softpaq (for the product being updated) from the HP Web site at: <http://www.hp.com/>, select **Software and Driver Downloads**, and then enter the model number of your thin client.

The Softpaq contains utilities for restoring or updating the system BIOS. Included in the Softpaq are several methods for changing or updating the BIOS version on your computer. The tools and appropriate BIOS images are contained in the following Softpaq directories:

- DOS Flash – DOS utility that can be used locally or with a Preboot eXecution Environment (PXE) management application to update the system BIOS.
- WFlash – Windows-based utility used to locally update the system BIOS on individual PCs through the Windows environment.
- CEFlash – CE.net-based utility to locally update the system BIOS on individual PCs through the CE.net environment.
- LFlash – Linux-based utility to locally update the system BIOS on individual PCs through the Linux environment.

To determine the BIOS family, version, and date on the thin client, press **F10** during system power-on to run the F10 Setup utility, then select **System Information**.

To update the system BIOS, complete the following instructions:

1. Download the Softpaq to a directory on your hard drive. The downloaded file is a self-extracting executable.
2. From that drive and directory, execute the downloaded file and follow the on-screen instructions.
3. Copy the appropriate utility to a diskette or USB flash drive to transfer to the thin client.

⚠ **WARNING!** Do not turn off power or attempt to reboot the computer during the upgrade process

F Electrostatic Discharge

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

Preventing Electrostatic Damage

To prevent electrostatic damage, observe the following precautions:

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

Grounding Methods

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

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

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

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

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