Sun Ultra™ 20 M2 Workstation Service Manual

Sun Microsystems, Inc.
www.sun.com

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Preface

The *Sun Ultra 20 M2 Workstation Service Manual* provides a detailed description of the hardware and software applications used to support the Sun Ultra 20 M2 Workstation. This book is intended for system administrators, network administrators, or service technicians who have knowledge of workstation hardware and software.

How this Document is Organized

Chapter 1 provides an overview of the Sun Ultra 20 M2 Workstation.

Chapter 2 describes how to connect external cables and power on or off the workstation.

Chapter 3 provides visual inspection and troubleshooting procedures.

Chapter 4 describes how to run diagnostics and remove or replace the diagnostic partition.

Chapter 5 describes how to remove and replace components.

Appendix A contains information on system specifications.

Appendix B contains information on BIOS POST codes.

Shell Prompts

Shell	Prompt
C shell	*machine-name*`%`
C shell superuser	*machine-name*`#`
Bourne shell and Korn shell	`$`
Bourne shell and Korn shell superuser	`#`

Typographic Conventions

Typeface*	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail.`
`AaBbCc123`	What you type, when contrasted with on-screen computer output	`%` **`su`** `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be superuser to do this. To delete a file, type `rm` *filename*.

* The settings on your browser might differ from these settings.

Related Documentation

The document set for the Sun Ultra 20 M2 Workstation is described in the *Where To Find Sun Ultra 20 M2 Workstation Documentation* sheet that is packed with your system. All documents are posted at the product's documentation site; see the following URL:

http://www.sun.com/documentation

Translated versions of some of these documents are available at the product's documentation site in Simplified Chinese, Traditional Chinese, French, German, Italian, Japanese, Korean, and Spanish.

English documentation is revised more frequently and might be more up-to-date than the translated documentation.

Documentation, Warranty, Support, and Training URLs

Sun Function	URL	Description
Hardware Documentation	http://www.sun.com/documentation	Sun hardware documentation
Software Documentation	http://docs.sun.com	Solaris OS and other software documentation
Warranty	http://www.sun.com/service/support/warranty/index.html	View specific details regarding your warranty
Support	http://www.sun.com/support/	Obtain technical support, including patches
Training	http://www.sun.com/training/	Learn about Sun courses and educational offerings

Ordering Components

You can order additional components and replacement parts for the Sun Ultra 20 M2 Workstation. Contact your local Sun sales representative for more information. For the most up-to-date component information, see the Sun Ultra 20 M2 Workstation components list at:

http://sunsolve.sun.com/handbook_pub/

Third-Party Web Sites

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Safety Information

Read the following documents for safety information:

- *Important Safety Information for Sun Hardware Systems*, 816-7190
- *Sun Ultra 20 M2 Workstation Safety and Compliance Guide*, 819-2149

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http://www.sun.com/hwdocs/feedback/

Please include the title and part number of your document with your feedback: *Sun Ultra 20 M2 Workstation Service Manual*, 819-6584-11.

CHAPTER 1

Sun Ultra 20 M2 Workstation Hardware Features

This chapter provides an overview of the Sun Ultra 20 M2 Workstation hardware features, and includes the following sections:

1.1 Front Panel

FIGURE 1-1 illustrates the front panel of the Sun Ultra 20 M2 Workstation. TABLE 1-1 lists the components called out in the figure.

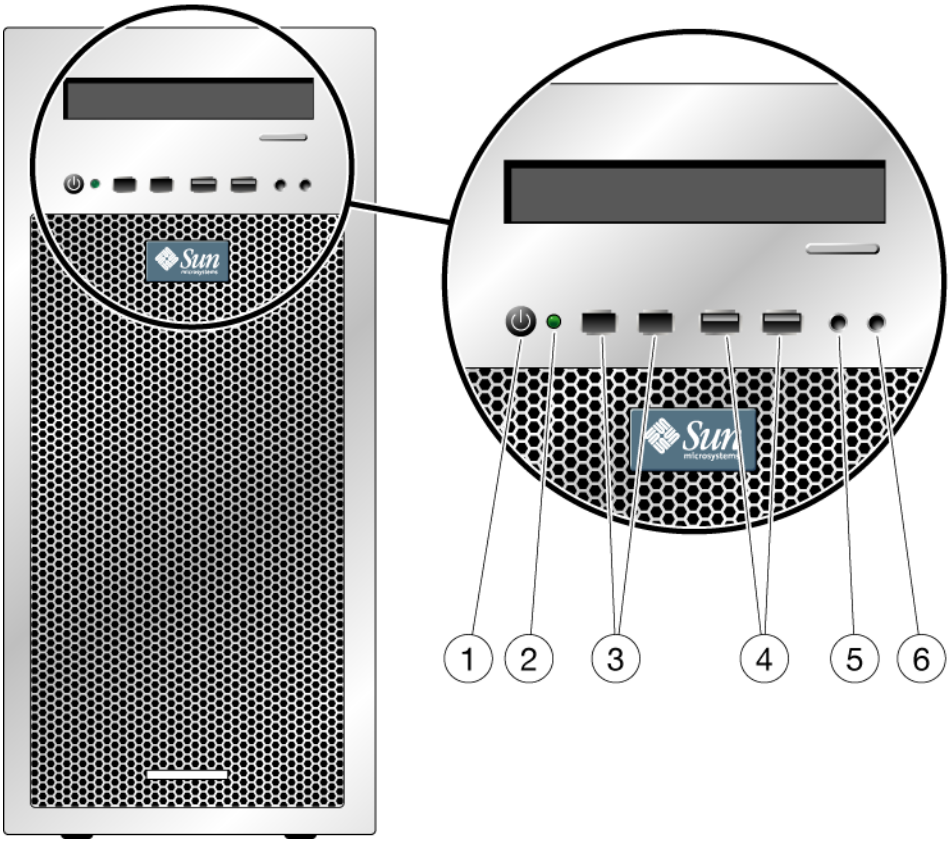


FIGURE 1-1 Front Panel Components

TABLE 1-1 Front Panel Components

Label	Button/LED/Port	Label	Button/LED/port
1	Power button	4	Two USB 2.0 ports
2	Power LED	5	Microphone-in jack
3	Two 1394 ports	6	Headphone-out jack

1.2 Back Panel

FIGURE 1-2 depicts the back panel of the Sun Ultra 20 M2 Workstation. TABLE 1-2 lists the components called out in the figure.

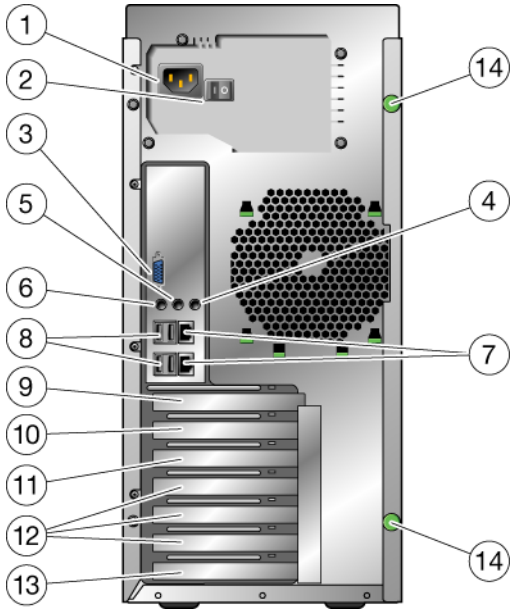


FIGURE 1-2 Back Panel Components

TABLE 1-2 Back Panel Components

Label	Connector/Slot	Label	Connector/Slot
1	Power connector	8	Four USB 2.0 connectors
2	Power switch	9	PCI Express x16 graphics slot
3	Onboard DB15 VGA graphics connector (for ES 1000 graphics controller)	10	PCI Express x1 slot
4	Line-in jack	11	PCI Express x16 mechanical slot (x8 electrical)
5	Line-out jack	12	Three PCI 33-MHz 32-bit slots
6	Microphone jack	13	Cover plate, no slot
7	Two Ethernet connectors		

1.3 Internal Components and Cables

FIGURE 1-3 shows the location for major system components and connectors. TABLE 1-3 lists the components called out in the figure.

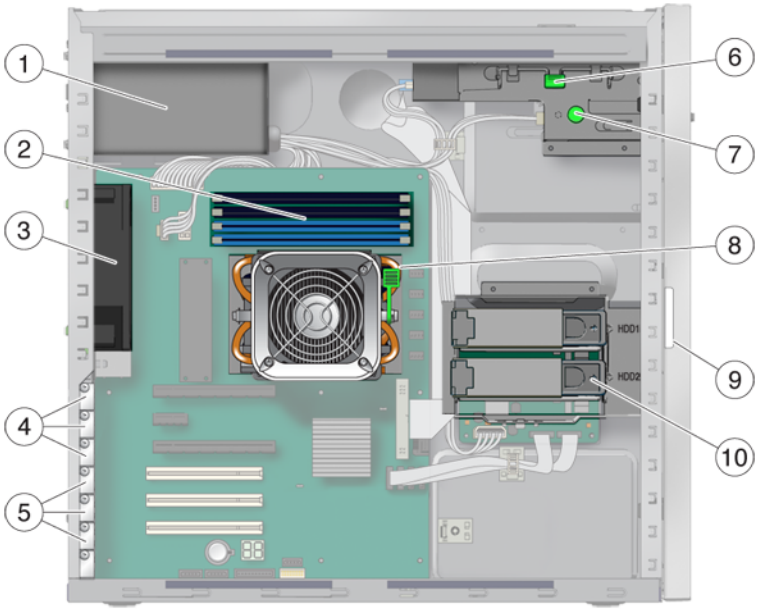


FIGURE 1-3 Internal System Components

TABLE 1-3 Internal System Components

Label	Component	Label	Component
1	Power supply	6	DVD release lever
2	Memory (DIMMs)	7	I/O board release thumbscrew
3	System fan	8	Heatsink release lever
4	PCI Express slots (3) numbered PCI-E slot 0 (top) to PCI-E slot 2	9	System serial number
5	PCI slots (3) numbered PCI slot 0 (top) to PCI slot 2	10	Hard disk drive(s)

FIGURE 1-4 shows the cable connections on the motherboard. TABLE 1-4 lists the components called out in the figure.

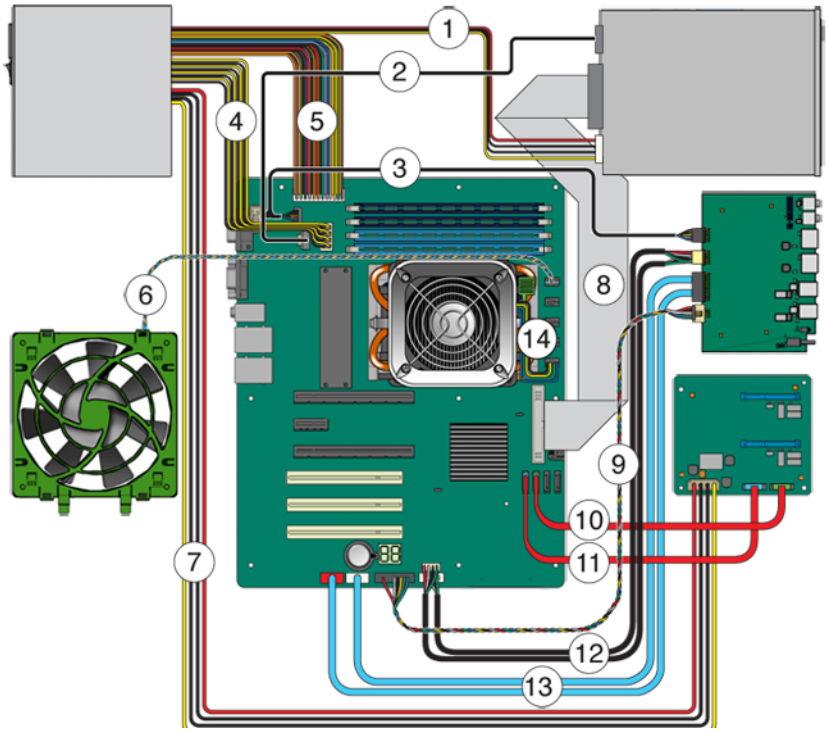


FIGURE 1-4 Power Supply and Component Cable Connections to Motherboard

TABLE 1-4 Power Supply and Component Cable Connections to Motherboard

Label	Cable Connection	Label	Cable Connection
1	Power supply 3 to DVD drive	8	DVD drive to motherboard IDE
2	DVD drive analog to motherboard J8	9	I/O board J5 to motherboard USB 3
3	I/O board J1 to motherboard J7	10	Storage backplane HDD2 to motherboard SATA 2
4	Power supply P2 to motherboard PWR2	11	Storage backplane HDD1 to motherboard SATA 1
5	Power supply P1 to motherboard PWR1	12	I/O board J12 to motherboard FPB
6	System fan to motherboard SYS_FAN	13	I/O board J8 to motherboard 1394-1 and 1394-2
7	Power supply P4 to storage backplane J3	14	CPU fan to motherboard CPU_FAN

CHAPTER 2

Unpacking, Cabling, and Powering the Sun Ultra 20 M2 Workstation

This chapter describes how to connect cables and power the Sun Ultra 20 M2 Workstation on and off. The chapter includes the following sections.

2.1 Planning the Installation Process

Use the following flowchart to assist you with installing the Sun Ultra 20 M2 Workstation.

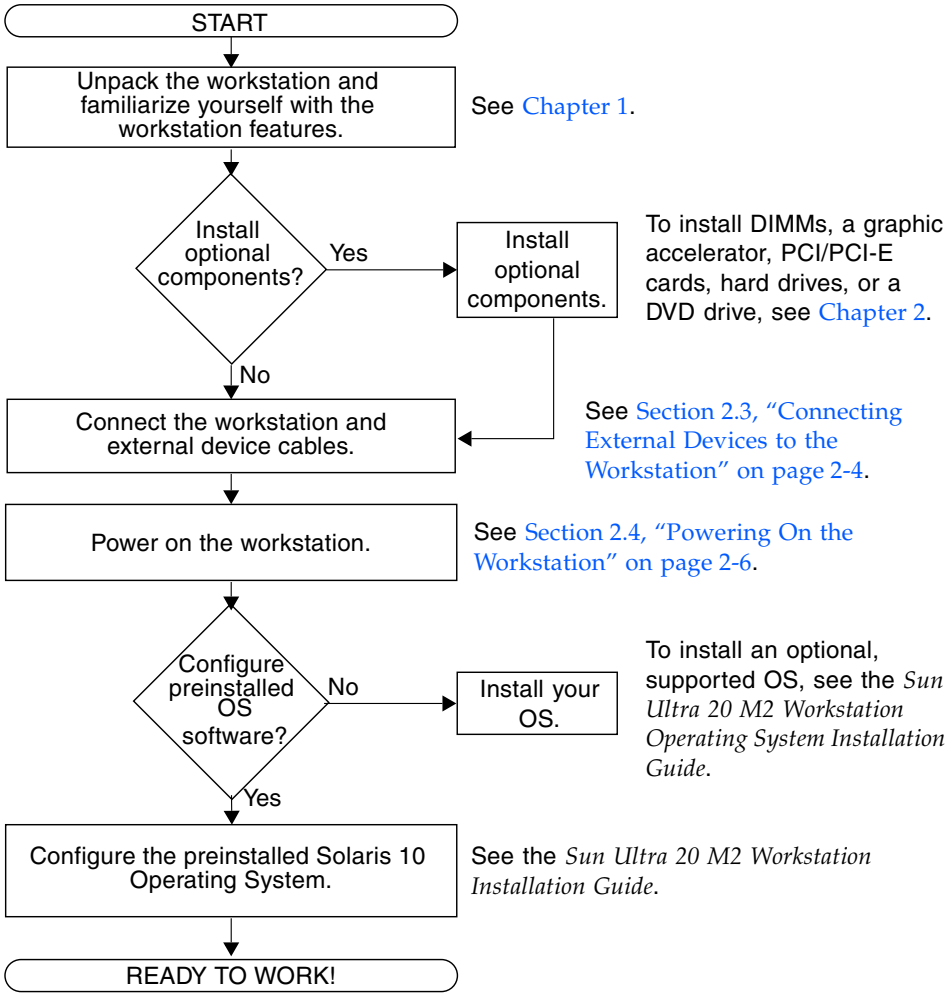


FIGURE 2-1 Process Flow for Setting Up the Sun Ultra 20 M2 Workstation

2.2 Checking Package Contents

Carefully unpack all workstation components from the packing cartons. The following items are contained in the package.

TABLE 2-1 Items Included in the Sun Ultra 20 M2 Workstation Box

Hardware	• Sun Ultra 20 M2 Workstation • DMS-59 cable (if the workstation is configured with an NVS285 graphics card)
Documentation*	• *Sun Ultra 20 M2 Workstation Installation Manual* • *Where to Find Sun Ultra 20 M2 Workstation Documentation* (lists available online documents for this product) • Sun safety and license documents • Welcome letter
CD-ROM	• Sun Ultra 20 M2 Workstation Tools and Drivers CD (includes drivers and diagnostics software)

* Depending on the system configuration ordered, some systems might not include documentation or the Tools and Drivers CD.

A country kit is optional, ships in a separate package, and includes a power cable, keyboard, and mouse.

2.3 Connecting External Devices to the Workstation

FIGURE 2-2 illustrates the external device cable connections to the workstation.

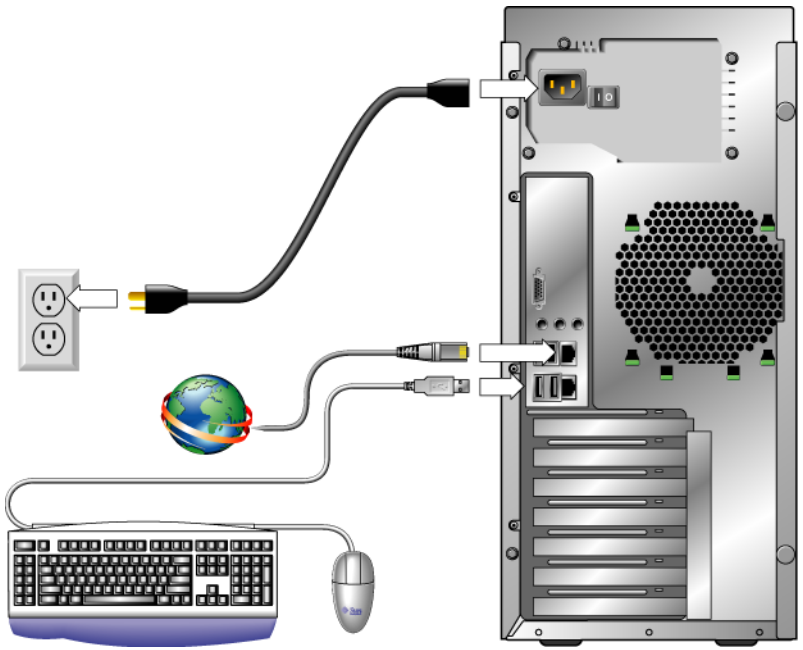


FIGURE 2-2 External Cable Connections

Perform this procedure to connect external devices to the workstation.

1. **Connect the workstation power cord to a grounded electrical outlet.**
2. **Connect the keyboard to a USB connector on the back or front panel.**
3. **Connect the mouse to the USB connector on the underside of the keyboard or to a USB connector on the front or back panel.**
4. **Connect the Ethernet cable to either Ethernet connector on the Sun Ultra 20 M2 Workstation, and connect the other end of the cable to an Ethernet RJ-45 jack.**

5. **Connect the monitor cable as follows:**
   - If a PCI Express graphics card is not installed in the top PCI-E slot, connect the monitor to the onboard video connector. See the top of FIGURE 2-3.
   - If a PCI Express graphics card is installed in the top PCI-E slot, connect the monitor to the graphics card connector. See the bottom of FIGURE 2-3.

     Your graphics card might require a DVI cable to connect to your monitor.

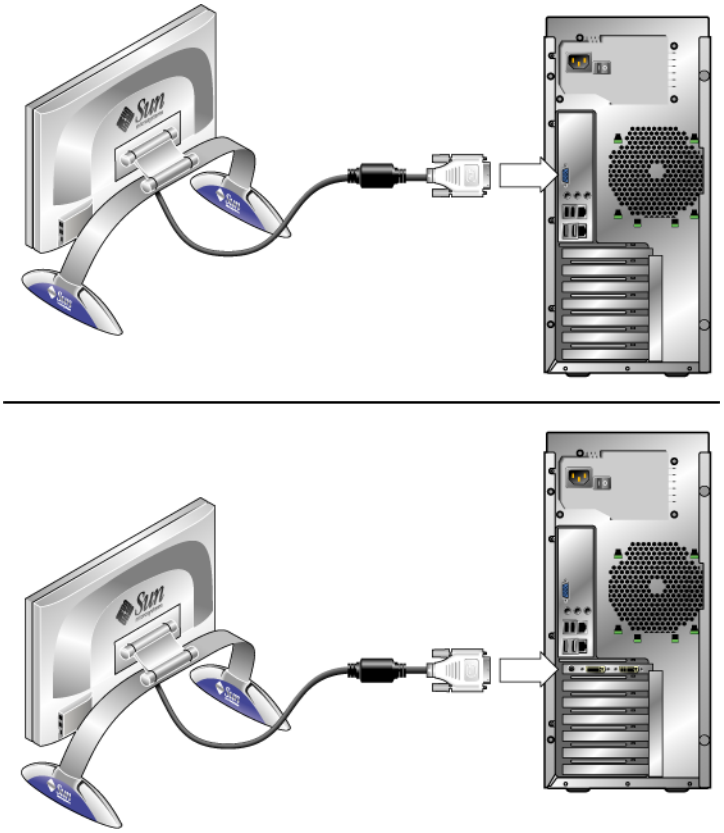


FIGURE 2-3 Connecting the Monitor to the System

6. **Connect any additional external devices to the workstation's other connectors.**

2.4 Powering On the Workstation

Perform this procedure to power on the workstation.

1. **Turn on the power to the monitor and to all external devices.**
2. **Turn the power switch on the rear of the workstation to the On (|) position.**
3. **Press and release the power switch on the front panel.**
4. **After several seconds, verify that the platform power LED next to the power switch is lit.**

   The platform power LED lights after the workstation begins the internal booting process.
5. **If you need to change the system parameters in the BIOS, press the F2 key during the POST process to access the BIOS Setup Utility.**

Caution – Be careful when making changes to the system BIOS, as some changes can cause your system to malfunction.

2.5 Powering Off the Workstation

1. **Save your data and close any open applications.**
2. **Read both of the following power-off options, and then follow one of the options to turn off the workstation.**
   - Power off the workstation by using the operating system shutdown command or menu option.

     In most cases, this initiates an orderly shutdown of the operating system and shuts off the workstation power.

Caution – To avoid data loss, use the first option whenever possible.

   - If the first option does not shut off the workstation power, press and hold the power button for approximately four seconds.

     This option shuts down the power to the workstation but does *not* initiate an orderly shutdown of the operating system. This option might result in data loss.

If the proceeding options do not power off the workstation, turn the power switch on the back panel to the Off (**0**) position.

After powering off the workstation, wait at least four seconds before powering on the workstation again.

CHAPTER 3

Troubleshooting

This chapter describes visual inspection and troubleshooting procedures, and provides contact information if you require technical assistance. The following sections are included in this chapter:

3.1 Troubleshooting Overview

Before troubleshooting your specific workstation problem, collect the following information:

- What events occurred prior to the failure?
- Was any hardware or software modified or installed?
- Was the workstation recently installed or moved?
- How long has the workstation exhibited symptoms?
- What is the duration or frequency of the problem?

After you assess the problem and note your current configuration and environment, you can choose from several ways to troubleshoot your workstation.

- Visually inspect your system as described in Section 3.2, "Visual Inspection" on page 3-2.
- See the troubleshooting procedures described in Section 3.3, "Troubleshooting Procedures" on page 3-3.
- Execute diagnostics tests as described in Chapter 4.

If you are not able to resolve the problem, contact Sun technical support. Support numbers and web sites are listed in Section 3.4, "Obtaining Technical Assistance" on page 3-8.

3.2 Visual Inspection

Improperly set controls and loose or improperly connected cables are common causes of problems with hardware components. When investigating a system problem, first check all external switches, controls, and cable connections.

If an external visual inspection does not resolve your problem, visually inspect the system's interior hardware for problems such as a loose card, cable connector, or mounting screw.

3.2.1 Performing an External Visual Inspection

1. **Turn off the system and any attached peripherals (if applicable).**
2. **Verify that all power cables are properly connected to the system, the monitor, and peripherals, and check their power sources.**
3. **Inspect connections to any attached devices, including network cables, keyboard, monitor, and mouse.**

3.2.2 Performing an Internal Visual Inspection

1. **Shut down the operating system, if necessary, and turn off the platform power on the front of the workstation.**
2. **Turn off the AC power on the back of the workstation.**
3. **Turn off any attached peripherals, but do not disconnect the power cables.**
4. **Remove the left side access panel, following the procedures in** Section 5.2, "Opening the Workstation" on page 5-2**.**

Caution – Some components, such as the heatsink, can become extremely hot during system operations. Allow these components to cool before handling them.

5. **Verify that the components are fully seated in their sockets or connectors and that the sockets are clean.**
6. **Verify that all cables inside the system are firmly attached to their appropriate connectors.**
7. **Replace the left side access panel.**
8. **Reconnect the system and any attached peripherals to their power sources, and then power them on.**

3.3 Troubleshooting Procedures

TABLE 3-1 contains possible problems that might arise during the use of your workstation. Possible solutions are listed for each problem. If the solutions listed here do not fix the problem, run the appropriate diagnostic test (see Chapter 4).

As you work, keep notes in case you need to call Sun technical support:

TABLE 3-1 Troubleshooting Procedures

Problem	Possible solution
Workstation does not power on when the front-panel Power button is pressed.	• Is the Power button LED illuminated on the front of the system? Ensure that the power cord is connected to the system and to a grounded power receptacle. • Does the wall outlet have power? Test by connecting another device. • Does the system beep when the system is powered on? The system beeps when no keyboard or a malfunctioning keyboard is plugged in. • Does the monitor sync within 5 minutes after the power-on? The green LED on the monitor stops flashing and remains illuminated. • Is the monitor connected to the onboard video connector or PCI Express video card? Connect the monitor to the active video connector.
Workstation halts during POST without displaying error messages.	Check the BIOS POST LED display on the motherboard. See Appendix B for detailed information on the POST codes.
Workstation powers on, but the monitor does not.	• Is the Power button for the monitor turned on? • Is the monitor power cord connected to a wall outlet? • Does the wall outlet have power? Test by connecting another device. • Is the monitor connected to the onboard video connector or PCI Express video connector?
Workstation does not power off when the front-panel Power button is pressed.	• Try all of the power-off options described in Section 2.5, "Powering Off the Workstation" on page 2-6. • If the workstation still does not power off, disconnect the power cable from the back of the chassis.
Workstation appears to be in low-power mode, but the Power button LED does not blink.	The power-indicator LED blinks only when all workstation components are in low-power mode. A tape drive might be connected to your workstation. Because tape drives do not enter low-power mode, the power-indicator LED does not blink.
The network status indicator does not light up.	• Check the cabling and network equipment to make sure that all cables are correctly seated. • Reinstall the network drivers.

TABLE 3-1 Troubleshooting Procedures *(Continued)*

Problem	Possible solution
Newly installed memory is not detected.	• Make sure that the memory is properly seated on the DIMM sockets. • Move the memory to the other DIMM socket to determine whether the socket is defective. • Make sure that you are using, 512 MB, 1 GB, or 2GB Unbuffered DDR2 667 SDRAM modules with 3.05 cm max. height. • Make sure that the memory is installed in pairs.
System cannot read the disk information.	Check to see that the disk is properly seated. If that does not resolve the issue, do the following: 1. Turn off the workstation by pressing the Power button. 2. Remove the left side access panel. 3. Check to make sure that the power and data cables are connected to the backplane of the disk drive and that the pins in the cable and connector are not bent. 4. Replace the left side access panel. 5. Turn on the workstation.
CD or DVD does not eject from the media tray when you press the Eject button.	• Move the mouse or press any key on the keyboard. The drive might be in the low power mode. • Use the utility software installed on your workstation to eject the CD.
System cannot read CD or DVD information.	Check the following: • Are you using the correct type of CD or DVD? • Do other CDs or DVDs work in this drive? • Is the CD or DVD properly inserted in the drive? • Is the CD or DVD clean and unscratched? • Are the cables connected to the DVD drive?
Keyboard or mouse does not respond to actions.	• Are the keyboard and mouse Type 7? Verify the model on the underside of the keyboard. • Verify that the mouse and keyboard cables are connected to the onboard USB 2.0 connectors on the workstation. • Verify that the workstation is powered on and that the front Power LED is illuminated.

TABLE 3-1 Troubleshooting Procedures *(Continued)*

Problem	Possible solution
Hung or frozen workstation: No response from mouse or keyboard or any application.	Are the keyboard and mouse Type 7? Verify the model on the underside of the keyboard. Try to access your system from a different workstation on the network. 1. From a terminal window, type: **`ping`** *hostname* 2. If there is no response, remotely log in from another system, using `telnet` or `rlogin`, and ping the system again. 3. Attempt to kill processes until the system responds. If the above procedures do not work: 1. Press the Power button to power off the system. 2. Wait 20 to 30 seconds and power on the system. See Section 2.5, "Powering Off the Workstation" on page 2-6 for more detailed information.

TABLE 3-1 Troubleshooting Procedures *(Continued)*

Problem	Possible solution
There is no video display on the monitor screen.	Check the following: Try to access your system from a different workstation on the network. 1. From a terminal window, type: **`ping`** *hostname* 2. If there is no response, remotely log in from another system, using `telnet` or `rlogin`, and ping the system again. 3. Attempt to kill processes until the system responds. If the above procedures do not work: 1. Press the Power button to power off the system. 2. Wait 20 to 30 seconds and power on the system. See Section 2.5, "Powering Off the Workstation" on page 2-6 for more detailed information. • Is the cable connected to the onboard video connector or PCI Express video connector? • Is the monitor power cord connected to the power outlet? • Does the wall outlet have power? Test it by connecting another device. • Is the video card seated correctly in its connector? • Are the internal cables properly connected to the video card? • Does the monitor work when connected to another system? • If you have another monitor, does it work when connected to the original system? • Verify that the BIOS settings are correct.
An external device connected to a USB connector does not work.	• Reduce the number of external devices connected to a USB hub. • Connect the device to a USB hub and connect the hub to the USB ports on the workstation. • Refer to the documentation that is packaged with the device.
External device is not working.	• Check the documentation packaged with the device to determine whether you must install device drivers. • Ensure that the cables for the external device are firmly connected, and that the pins in the cable and connector are not bent. • Power off the system, re-attach the external device, and power on the system.

3.4 Obtaining Technical Assistance

If the troubleshooting procedures in this chapter fail to solve your problem, you can receive additional technical support at the Sun web sites and telephone numbers listed in TABLE 3-2.

TABLE 3-2 Sun Web Sites and Telephone Numbers

Workstation Documents and Support Resources	URL or Telephone Number
PDF files for all the current Sun Ultra 20 M2 Workstation documents.	http://www.sun.com/documentation/
Solaris OS and other software documents. This web site has full search capabilities.	http://docs.sun.com/documentation/
Discussion and troubleshooting forums.	http://supportforum.sun.com/
Support, diagnostic tools, and alerts for all Sun products.	http://www.sun.com/bigadmin/
Links to software patches. Lists some system specifications, troubleshooting and maintenance information, and other tools.	http://www.sunsolve.sun.com/handbook_pub/
Sun service program phone numbers.	1-800-872-4786 (1-800-USA-4Sun) Select Option 1
International telephone numbers for Sun service support.	http://www.sun.com/service/contacting/solution.html
Warranty and contract support contacts. Links to other service tools.	http://www.sun.com/service/warrantiescontracts/index.html
Warranties for every Sun product.	http://www.sun.com/service/support/warranty

CHAPTER 4

Running Diagnostics

The Pc-Check diagnostics software detects and tests motherboard components, ports, slots, and installed components on the Sun Ultra 20 M2 Workstation. Pc-Check is included on the Sun Ultra 20 M2 Workstation Tools and Drivers CD.

If you encounter a hardware-related error message (such as a memory error or hard disk error) on your Sun Ultra 20 M2 Workstation, run one of the following tests:

- Advanced Diagnostics Test: Specific hardware component tests
- Immediate Burn-in Test: Sun-supplied diagnostic scripts for the Sun Ultra 20 M2 Workstation

The following sections describe how to start and use the diagnostics, and provide detailed descriptions of menu items and tests.

4.1 Understanding the Diagnostic Partition

A diagnostic partition is required for the test scripts to write their log files. Without a diagnostic partition, the only output is the display on the diagnostic screens.

The diagnostic partition is preinstalled on the Sun Ultra 20 M2 Workstation. You do not need to reinstall the diagnostic partition unless you removed it.

If you removed the diagnostic partition, you can re-create it using the Create Diagnostic Partition option on the Tools and Drivers CD. See Section 4.7, "Create Diagnostic Partition" on page 4-11 for instructions.

4.2 Starting Pc-Check Diagnostics

Prerequisites

- Your workstation must be running a Sun-supported Linux or Solaris™ OS. Refer to the *Sun Ultra 20 M2 Workstation Operating System Installation Guide* for a list of supported operating systems.
- You must access and execute Pc-Check from the Sun Ultra 20 M2 Workstation Tools and Drivers CD.

Do the following steps to access the Pc-Check Diagnostics main menu.

1. **Insert the Sun Ultra 20 M2 Workstation Tools and Drivers CD into your DVD drive and reboot the system.**

   The system boots to the Sun Ultra 20 M2 Workstation Tools and Drivers CD main menu.

2. **Type 1 to run the Hardware Diagnostics Software.**

   The system information loads, the Diagnostics main menu opens, and the following menu options display:

   - System Information Menu
   - Advanced Diagnostics Tests
   - Immediate Burn-in Testing
   - Deferred Burn-in Testing
   - Create Diagnostic Partition
   - Show Results Summary
   - Print Results Report
   - About PC-CHECK
   - Exit to DOS

Each entry in the Diagnostics main menu is described in the following sections.

- To test a specific hardware component, select Advanced Diagnostics Test.
- To run one of the Sun-supplied test scripts, select Immediate Burn-in Testing.

Navigation instructions are shown at the bottom of each screen.

- Use the keyboard's arrow keys to navigate through menus.
- Press the Enter key to select a menu option.
- Press the ESC key to exit a menu (or submenu).

4.3 System Information Menu

TABLE 4-1 describes each option in the System Information menu.

TABLE 4-1 System Information Menu Options

Option	Description
System Overview	Includes basic information about your system, motherboard, BIOS, processor, memory cache, drives, video, modem, network, buses, and ports.
Hardware ID Image Menu	Enables you to create a document showing information about your system, including comparisons between the updates and the newest versions of your system. XML is the format used to create and display this information, though you can also choose a text format (.txt) as well.
System Management Information	Provides information obtained from the system about the BIOS type, system, motherboard, enclosure, processors, memory modules, cache, slots, system event log, memory array, memory devices, memory device mapped addresses, and system boot.
PCI Bus Information	Includes details about specific devices from `pci-config` space within the system, similar to the System Management Information section.
IDE Bus Information	Shows the master/slave devices on the primary and secondary IDE controllers.
PCMCIA/CardBus Info	Not relevant to the Sun Ultra 20 M2 Workstation.
Interrupt Vectors	Details and lists device interrupt vector information.
IRQ Information	Shows hardware interrupt assignments.
Device Drivers	Shows device drivers loaded under Open DOS.

TABLE 4-1 System Information Menu Options *(Continued)*

Option	Description
APM Information	Tests the Advanced Power Management (APM) capabilities of the system. You can choose to change the power state, view the power status, indicate CPU usage, get a PM event, or change the interface mode.
I/O Port Browser	Shows the I/O port assignment for the hardware devices on the system.
Memory Browser	Enables you to view the mapped memory for the entire system.
Sector Browser	Reads sector information from the hard disks and DVD disks sector by sector.
CPU Frequency Monitor	Tests the processor speed.
CMOS RAM Utilities	Shows the CMOS settings of the system.
SCSI Utilities	Not applicable for the Sun Ultra 20 M2 Workstation.
Text File Editor	Opens a text editor.
Start-Up Options	Enables you to set up options for diagnostics testing.

4.4 Advanced Diagnostics

TABLE 4-2 gives the name and a brief description of each option in the Advanced Diagnostics Tests menu.

TABLE 4-2 Advanced Diagnostics Tests Menu Options

Option	Description
Processor	Details information about the processor and includes a Processor Tests menu to test the processor on the system.
Memory	Details information about the memory and includes a Memory Tests menu to test the memory on the system. Also lists each type of memory in the system, such as system, cache, or video memory.
Motherboard	Details information about the motherboard and includes a Motherboard Tests menu to test the motherboard on the system.
Diskettes	Not relevant to Sun Ultra 20 M2 Workstation.

TABLE 4-2 Advanced Diagnostics Tests Menu Options *(Continued)*

Option	Description
Hard Disks	Details information about the hard disk and includes a Hard Disk Tests menu to test hard disks on the system. Refer to Section 4.4.1, "Hard Disk Drive Testing" on page 4-6, for detailed information about testing hard disks and script information.
CD-ROM/DVD	Includes a CD-ROM/DVD menu to test DVD devices on the system.
ATAPI Devices	Details information about devices attached to the IDE controllers on the system other than a DVD or hard disks (for example, zip drives).
Serial Ports	Not applicable for the Sun Ultra 20 M2 Workstation.
Parallel Ports	Not applicable for the Sun Ultra 20 M2 Workstation.
Modems	Not applicable for the Sun Ultra 20 M2 Workstation.
ATA	Includes an ATA test menu.
USB	Details information about the USB devices on the system and includes a USB Tests menu to test the USB.
FireWire	Details information about FireWire devices and includes a FireWire tests menu.
Network	Performs network register controller tests.
Keyboard	Includes a Keyboard Test menu with options for performing different tests on the keyboard.
Mouse	Details information about the mouse and includes a menu to test the mouse on the system.
Joystick	Provides details information about a third party joystick (not available from Sun) and includes a menu to test the joystick.
Audio	Details information about the audio devices on the system and includes an Audio Tests menu to test audio device information. A PCI audio card is required to run this test.
Video	Details information about the video card. Initially, the monitor might flicker, but then it brings up a Video Test Options menu that enables you to perform various video tests.
Printers	Not applicable to the Sun Ultra 20 M2 Workstation.
Firmware - ACPI	Details information about Advanced Configurable Power Interface (ACPI) and includes an ACPI Tests menu to test ACPI.

4.4.1 Hard Disk Drive Testing

Follow these steps to test the hard disk drive (HDD).

1. **From the Diagnostics main menu, choose Advanced Diagnostics Tests.**

   The Advanced Diagnostics menu displays.

2. **From the Advanced Diagnostics menu, choose Hard Disks.**

   The Select Drive menu displays.

3. **From the Select Drive menu, choose the hard disk you are testing.**

   The Hard Disk Diagnostics window opens, showing both the information for the hard disk you selected and the Hard Disk Tests menu.

   The Hard Disk Tests menu displays the following options:

   - Select Drive
   - Test Settings
   - Read Test
   - Read Verify Test
   - Non-Destructive Write Test
   - Destructive Write Test
   - Mechanics Stress Test
   - Internal Cache Test
   - View Error Log
   - Utilities Menu
   - Exit

   The Media Test options include the Read Test, the Read Verify Test, the Non-Destructive Write Test, and the Destructive Write Test. These tests are relevant to testing the media associated with the HDD hardware, such as the physical disk.

Caution – Running the Destructive Write Test destroys any data that is on the HDD.

The Device Test options include the Mechanics Stress Test and the Internal Cache Test. These tests are relevant to testing nonmedia-related devices associated with the HDD hardware, such as the head and internal cache.

As well as choosing any of these tests, you can also define several parameters of the test. You can change the parameters within the Test Settings option. TABLE 4-3 gives the options within Test Settings.

TABLE 4-3 Parameters for the HDD Tests

Option	Description
Media Test Settings	Enables you to select the test time duration, the percentage of the hard disk to test, and the sectors to be tested on the hard disk.
Device Test Settings	Enables you to select the test time durations of the devices and the test level.
Number of Retries	Enables you to select the number of times to retry testing a device before terminating the test.
Maximum Errors	Enables you to select the number of errors allowed before terminating the test.
Check SMART First	SMART stands for Smart Monitoring Analysis Reporting Test. SMART-enabled drives provide predictive failure analysis and diagnostic information.
HPA Protection	HPA stands for Host Protected Area.
Exit	Exits the menu.

4.5 Immediate Burn-In Testing

The Immediate Burn-In Testing option enables you to run burn-in test scripts on your workstation. Three scripts were created for testing your system:

- `quick.tst` – This script performs a non-detailed test of all hardware components, including those components that require user input, as well as a more in-depth memory test. You must interact with the Pc-Check software to progress through these interactive tests. These interactive tests cannot be run unattended and do not contain any "timeout" facilities. The interactive tests will wait until the user provides the correct input.
- `noinput.tst` – This script is used as a first triage of any hardware-related problems or issues. The script performs a non-detailed test of most hardware components, excluding those components that require user input (keyboard, mouse, sound, video). This test does not require user input.
- `full.tst` – This script performs the most detailed and comprehensive test on all hardware components, including those components which require user input. This script contains a more in-depth memory test than `quick.tst`, as well as external port tests (which might require loopback connectors). You must interact with the test utility to progress through these interactive tests.

Tip – Each of these scripts tests the operating status of your entire system. If you want to test only a certain percentage of your system's hard drives, refer to Section 4.4.1, "Hard Disk Drive Testing" on page 4-6 to change the test options.

When you select the Immediate Burn-in Testing menu option, the Continuous Burn-in Testing window displays. The screen includes the list of options shown in TABLE 4-4 for running the tests. When a `quick.tst`, `noinput.tst`, or `full.tst` script is loaded, the defaults indicated in the third column are automatically loaded.

TABLE 4-4 Continuous Burn-in Testing Options

Option	Default – General	Default Using `quick.tst`, `noinput.tst`, or `full.tst` Script	All Possible Choices
Pass Control	Overall Time	Overall Passes	Individual Passes, Overall Passes, or Overall Time
Duration	01:00	1	Type any number to choose the time duration of the test
Script File	N/A	`quick.tst`, `noinput.tst`, or `full.tst`	`quick.tst`, `noiniput.tst`, or `full.tst`

TABLE 4-4 Continuous Burn-in Testing Options *(Continued)*

Option	Default – General	Default Using `quick.tst`, `noinput.tst`, or `full.tst` Script	All Possible Choices
Report File	None	None	User-defined
Journal File	None	`D:\noinput.jrl`, `D:\quick.jrl`, or `D:\full.jrl`	User-defined
Journal Options	Failed Tests	All Tests, Absent Devices, and Test Summary	Failed Tests, All Tests, Absent Devices, and Test Summary
Pause on Error	N	N	Y or N
Screen Display	Control Panel	Control Panel	Control Panel or Running Tests
POST Card	N	N	Y or N
Beep Codes	N	N	Y or N
Maximum Fails	Disabled	Disabled	1-9999

To load one of the scripts available to test the devices on your system, do the following steps.

- **From the main menu, choose Immediate Burn-in Testing.**

  The top portion of the window lists the options described in TABLE 4-4, and the bottom portion of the window lists the following Burn-in menu options:

  - **Load Burn-in Script**

    Type one of the following:

    - **`quick.tst`**, **`noinput.tst`**, or **`full.tst`**
    - If you created and saved your own script, type **`d:\`***testname***`.tst`**

      Where *testname* is the name of the script that you created.

  - **Save Burn-in Script**

    To save a burn-in script that you created, type **`d:\`***testname***`.tst`**

    Where *testname* is the name of the script that you created.

  - **Change Options**

    Opens the Burn-in Options menu, which enables you to modify the various options listed in TABLE 4-4 for the currently loaded test script.

- **Select Tests**

  Opens a listing of the tests available for your workstation configuration and the currently loaded test script.

- **Perform Burn-in Tests**

  Starts to run the currently loaded burn-in test script.

4.6 Deferred Burn-In Testing

You can use the Deferred Burn-in Testing option to create and save your own scripts to run at a later time.

- **From the main menu, choose Deferred Burn-in Testing.**

  The top portion of the window lists the options described in TABLE 4-4, and the bottom portion of the window lists the following Burn-in menu options:

  - **Load Burn-in Script**

    Type one of the following:
    - **`quick.tst`**, **`noinput.tst`**, or **`full.tst`**
    - If you created and saved your own script, type **`d:\`***testname***`.tst`**

    Where *testname* is the name that you created.

  - **Save Burn-in Script**

    To save a burn-in script that you created, type **`d:\`***testname***`.tst`**

    Where *testname* is the name of the script that you created.

  - **Change Options**

    Opens the Burn-in Options menu, which enables you to modify the various options listed in TABLE 4-4 for the currently loaded test script.

  - **Select Tests**

    Opens a listing of all of the possible types of tests available for you to run for the currently loaded test script.

4.7 Create Diagnostic Partition

The diagnostic partition is preinstalled on the Sun Ultra 20 M2 Workstation. You need to reinstall the diagnostic partition only if you reformatted your hard drive. Using the Erase Primary Boot Hard Disk utility on the Tools and Drivers CD preserves the diagnostic partition (see the *Sun Ultra 20 M2 Workstation Operating System Installation Guide*).

The Create Diagnostic Partition option installs a diagnostic partition on the first bootable disk seen by the workstation. The first bootable disk is on the primary/master storage (for example, SATA) device.

The following sections explain how to create and access the diagnostic partition on the Sun Ultra 20 M2 Workstation:

4.7.1 Adding a Diagnostic Partition to the First Bootable Disk

From the boot loader, Pc-Check can view only the first or second hard disk on the system. The software automatically installs the diagnostic partition on the first bootable disk. To add the diagnostic partition on the first bootable disk:

1. **Insert the Tools and Drivers CD into the DVD drive tray.**
2. **Reboot the workstation.**
3. **At the Tools and Drivers CD main menu, type `1` to run Hardware Diagnostics.**

   The Hardware Diagnostics menu displays.

4. **From the main menu, choose Create Diagnostic Partition.**
   - If the first bootable disk is clear of partitions, the Sun Microsystems Partitioning Utility window appears. It states: "Your primary hard disk is not partitioned. Would you like to partition it now?"
     - Select Yes and press the Enter key.
     - A window appears stating, "Partitioning complete. Your machine will now be restarted."
   - If the first bootable disk is not clear of partitions, a window appears stating that the software is unable to create a hardware diagnostic partition because there are already partitions on the disk.

     If this happens, repeat this procedure after you remove the partitions as described in the *Sun Ultra 20 M2 Workstation Operating System Installation Guide*.
5. **Press the Enter key to reboot your workstation.**

4.7.2 Creating a Log File on the Diagnostic Partition

All the scripts that are loadable with the hardware diagnostics software are predefined with logging to the diagnostic partition enabled. The names of log files correspond to the name of the script. For example, a script named `noinput.tst` creates a log file named `noinput.jrl`.

The following instructions show an example of how to create and access a log file on the diagnostic partition for the `noinput.tst` script.

1. **Insert the Tools and Drivers CD into the DVD drive tray.**
2. **Reboot the workstation.**
3. **From the Tools and Drivers CD main menu, choose `1` to run the Hardware Diagnostics software.**

   The Hardware Diagnostics menu displays.
4. **From the Hardware Diagnostics main menu, choose Immediate Burn-In Testing.**
5. **Select Load Burn-in Script.**
6. **Do one of the following actions:**

   a. **Type `noinput.tst` and press the Enter key.**

   b. **If you are using a test you created yourself, type `d:\`*testname*`.tst` into the Load Burn-in Script field, where *testname* is the name of the test you created.**
7. **Select Perform Burn-in Tests to run the script.**
8. **When the tests are complete, press the Esc key to exit the Display Results window.**

9. **Select Exit to DOS and press the Enter key.**
10. **At the DOS prompt, type the following:**

```
C:> d:
```

11. **Type the following to list the contents of the diagnostic partition.**

```
D:> dir
```

The `noinput.jrl` log displays.

4.7.3 Accessing the Diagnostic Partition Under Red Hat Linux

Perform this procedure to access the diagnostic partition when you are running a Red Hat Linux OS.

1. **Remove the Tools and Drivers CD from the DVD drive tray.**
2. **Reboot the workstation and start the Red Hat Linux** OS**.**
3. **Become superuser.**
4. **To determine whether your diagnostic partition is configured to be mounted, type the following command:**

```
# ls /diagpart
```

   - If this command does not list the log files created by the hardware diagnostics software, then the OS was not configured to mount the diagnostic partition. Continue to Step 5.
   - If the command lists the log files created by the hardware diagnostics software, then the OS is configured to mount the diagnostic partition. All users have read access to this partition. Only the superuser has read/write access to this partition. You do not need to continue this procedure.

5. **Insert the Tools and Drivers CD into the DVD drive tray.**
6. **When the CD mounts, open a terminal window.**

7. **Type the following command:**

```
# cd mountpoint/drivers/linux/linux_version
```

Where *mountpoint* is the CD mountpoint and *linux_version* is the version of Linux that you installed. For example:

```
# cd /mnt/cdrom/drivers/linux/red_hat
```

8. **Type the following command to install the diagnostic partition:**

```
# ./install.sh
```

9. **Press the Enter key.**

The following lines appear if the diagnostic partition is mounted successfully:

```
Mounting Diagnostic Partition
Installation Successful
```

10. **Type the following command:**

```
# ls /diagpart
```

The contents of the diagnostic partition are listed.

4.7.4 Accessing the Diagnostic Partition Under the Solaris 10 Operating System

Perform this procedure to access the diagnostic partition when you are running the Solaris 10 Operating System.

1. **Remove the Tools and Drivers CD from the DVD drive tray.**
2. **Reboot the machine and start the Solaris 10 Operating System.**
3. **Log in as superuser.**

4. **Type the following command to determine if your diagnostic partition is configured to be mounted:**

```
# ls /diagpart
```

   - If this command does not list the log files created by the hardware diagnostics software, then the OS is not configured to mount the diagnostic partition. Continue to Step 5.
   - If this command lists the log files created by the hardware diagnostics software, then the OS is configured to mount the diagnostic partition. All users have read access to this partition. Only the superuser has read/write access to this partition. You do not need to continue this procedure.

5. **Insert the Tools and Drivers CD into the DVD drive tray.**
6. **When the CD mounts, open a terminal window.**
7. **Type the following to change directories:**

```
# cd /cdrom/cdrom0/drivers/sx86
```

8. **Type the following command to install the diagnostic partition:**

```
# ./install.sh
```

9. **Press the Enter key.**

   The following lines appear if the diagnostic partition is mounted successfully:

```
Mounting Diagnostic Partition
Installing Successful
```

10. **Type the following command to list the contents of the diagnostic partition.**

```
# ls /diagpart
```

4.7.5 Accessing the Diagnostic Partition Under Windows XP

If you are running Windows XP on the Sun Ultra 20 M2 Workstation, you cannot access the diagnostic partition using Windows XP.

The only way to retrieve the contents (log files) on the diagnostic partition is to attach a USB diskette drive to the Sun Ultra 20 M2 Workstation and complete the following procedure.

1. **Connect the USB diskette drive to any USB port on the Sun Ultra 20 M2 Workstation.**
2. **Insert the Tools and Drivers CD into the DVD drive tray.**
3. **Reboot the workstation.**
4. **At the Tools and Drivers CD main menu, type `4` to exit to DOS.**
5. **To change to the `d:` drive, type the following at the DOS command prompt.**

```
C:> d:
```

6. **Copy the log file to the diskette.**

   For example, to copy a file named `noinput.jrl` to the diskette, type:

```
D:> copy d:\noinput.jrl a:\
```

   The journal file is now saved to the diskette in the USB diskette drive.

4.8 Show Results Summary

The summary lists the tests run and shows the results. Pass, Fail, or N/A (not applicable) displays for each option.

TABLE 4-5 lists all possible options that are available with the Tools and Drivers CD. Some options might not appear when the Show Results Summary displays if they are not applicable to your workstation's configuration.

TABLE 4-5 Show Results Summary

Option	Description
Processor	This section shows the following tests conducted against the processor: Core Processor Tests, AMD 64-Bit Core Tests, Math Co-Processor Tests – Pentium Class FDIV and Pentium Class FIST, MMX Operation, 3DNow! Operation, SSE Instruction Set, SSE2 Instruction Set, and MP Symmetry.
Motherboard	This section shows the following tests conducted against the motherboard: DMA Controller Tests, System Timer Tests, Interrupt Test, Keyboard Controller Tests, PCI Bus Tests, and CMOS RAM/Clock Tests.
Memory, Cache Memory, and Video Memory	This section shows the following tests conducted against the various types of memory: Inversion Test Tree, Progressive Inv. Test, Chaotic Addressing Test, and Block Rotation Test.
Input Device	This section shows the following tests conducted against the input device: Verify Device, Keyboard Repeat, and Keyboard LEDs.
Mouse	This section shows the following tests conducted against the mouse: Buttons, Ballistics, Text Mode Positioning, Text Mode Area Redefine, Graphics Mode Positions, Graphics Area Redefine, and Graphics Cursor Redefine.
Video	This section shows the following tests conducted against the video: Color Purity Test, True Color Test, Alignment Test, LCD Test, and Test Cord Test.
Multimedia	This section shows the following tests conducted against the multimedia components: Internal Speaker Test, FM Synthesizer Test, PCM Sample Test, CD/DVD Drive Read Test, CD/DVD Transfer (KB/Sec), CD/DVD Transfer Rating, CD/DVD Drive Seek Test, CD/DVD Seek Time (ms), CD/DVD Test Disk Read, and CD/DVD Tray Test.
ATAPI Devices	This section shows the following tests conducted against ATAPI devices: Linear Read Test, Non-Destructive Write, and Random Read/Write Test.

TABLE 4-5 Show Results Summary *(Continued)*

Option	Description
Hard Disk	This section shows the following tests conducted against the hard disk: Read Test, Read Verify Test, Non-Destructive Write Test, Destructive Write Test, Mechanics Stress Test, and Internal Cache Test.
USB	This section shows the following tests conducted against the USB: Controller Tests and Functional Tests.
Hardware ID	The compare test is used to determine the machine ID for the system. This test is not available for the Sun Ultra 20 M2 Workstation.

4.9 Print Results Report

The Print Results Report option enables you to print the results of the diagnosis of your system. Ensure that your workstation is connected to a printer, and then type the required information to print the results.

4.10 About Pc-Check

The About Pc-Check window includes general information about Pc-Check software, including resident and nonresident components, such as mouse devices.

4.11 Exit to DOS

The Exit to DOS option exits Pc-Check and returns you to the DOS prompt.

CHAPTER 5

Maintaining the Workstation

This chapter provides instructions on how to add, replace, and configure the components in the Sun Ultra 20 M2 Workstation after it is set up. The following sections are included in this chapter:

The following procedures are for replacing customer-replaceable units (CRUs):

The following procedures should only be performed by trained field service technicians:

5.1 Electrostatic Discharge (ESD) Precautions

Electrostatic discharge (ESD) can damage your processor, disk drives, expansion boards, and other components. Always observe the following precautions before you install a system component:

- Do not remove a component from its protective packaging until you are ready to install it.
- Wear a wrist strap and attach it to the system chassis ground or to any metal part of the system before handling components.
- Turn off the power switch on the back of the chassis.

Caution – Do not operate the workstation for more than ten minutes when the left side access panel is removed. Improper cooling airflow might damage the system's components.

5.2 Opening the Workstation

This section describes how to remove the left side access panel and the front bezel.

5.2.1 Tools and Supplies Needed

- Phillips screwdriver
- Flat-head screwdriver
- Antistatic wrist strap (shipped with every CRU)

5.2.2 Powering Off the System and Removing the Left Side Access Panel

Before you remove, replace, or install any components, perform the following steps.

1. **Power off the system and all of the peripherals connected to it.**
2. **Turn the power switch on the back of the chassis to the Off position (0).**

Caution – Failure to properly turn off the system before you start installing components can cause serious component damage.

3. **To maintain system grounding, do not unplug the AC power cord from the back of the system unless the specific procedure instructs you to unplug it.**
4. **Loosen the two captive thumbscrews located on the rear edge of the left side access panel (see** FIGURE 5-1**).**
5. **Slide the access panel approximately 1.5 cm toward the back of the workstation.**
6. **Tilt the top edge of the panel out, then lift the panel upward.**
7. **Carefully set the panel aside.**

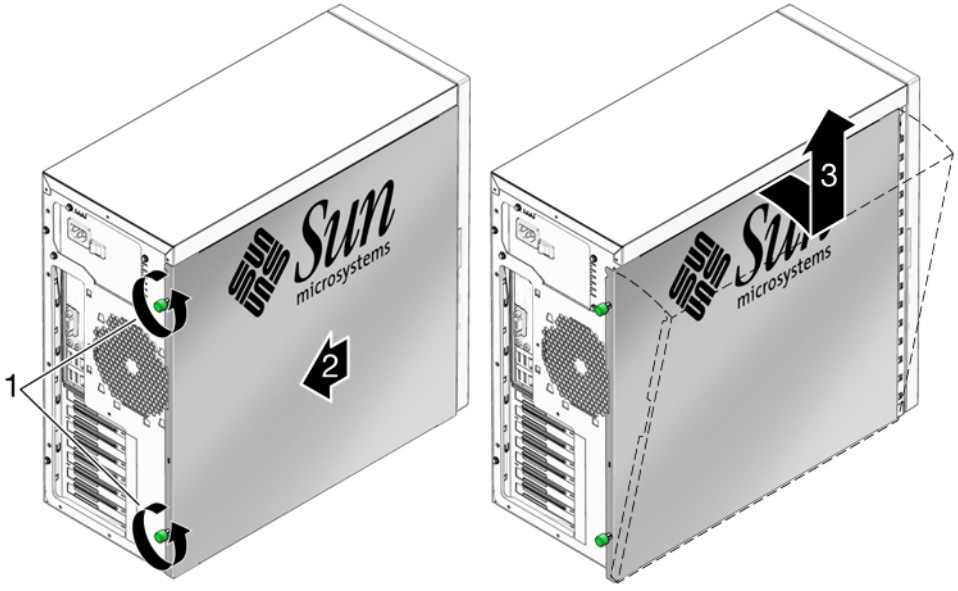


FIGURE 5-1 Removing the Side Access Panel

5.2.3 Removing the Front Bezel

Note – Do not remove the front bezel unless removal is required to complete the current maintenance procedure.

Follow these instructions to remove the front bezel.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Loosen the two left side bezel tabs (see** FIGURE 5-2**) by gently pressing the side of each tab inward and slightly forward.**

   The edge of the bezel nearest the tabs moves slightly away from the front of the chassis as the ridges holding each tab in place are released.

Caution – Be very careful when pulling the bezel away from the chassis. The bezel tabs and the chassis hooks might break if you apply too much force or attempt to swing the bezel open.

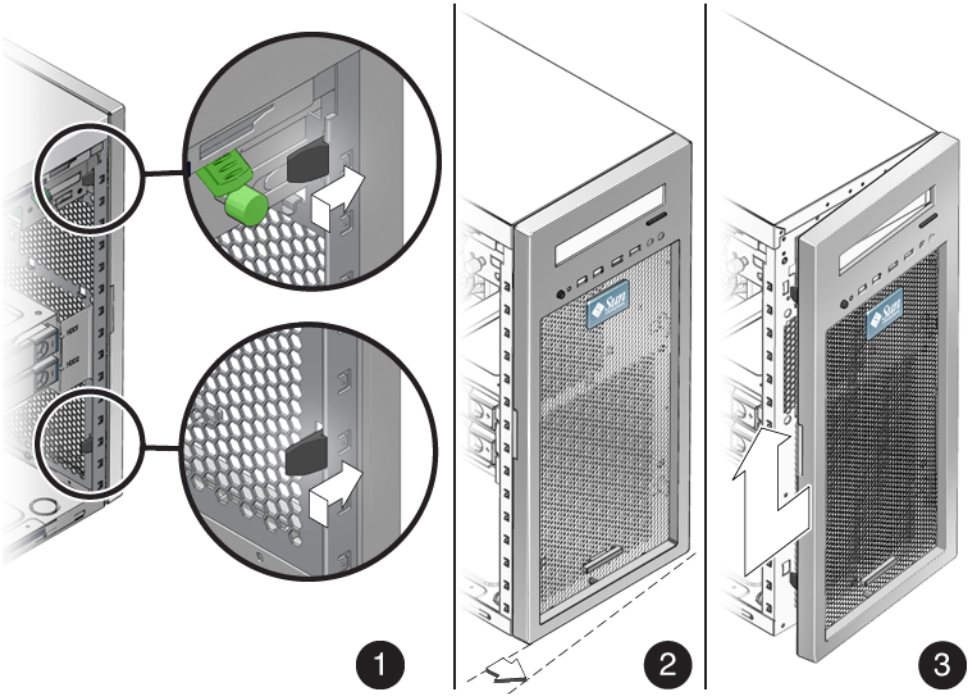


FIGURE 5-2 Removing the Front Bezel

3. **Gently move the left-front side of the bezel slightly to the left, then forward to disengage the three chassis hooks on the right side (see FIGURE 5-2).**
4. **Remove the bezel and set it aside.**

5.3 Closing the Workstation

This section describes how to install the left side access panel and the front bezel.

5.3.1 Postinstallation Instructions

Perform the following steps after installing a workstation component.

1. **Ensure that all the components are installed as described in the step-by-step instructions.**
2. **Reinstall any PCI cards, PCI-E cards, or peripherals that you removed.**
3. **Reinstall the system's front bezel and left side access panel. See the following sections:**
   - Section 5.3.2, "Installing the Front Bezel" on page 5-5.
   - Section 5.3.3, "Installing the Left Side Access Panel" on page 5-6
4. **Connect all external cables to the system, then connect the AC power cord.**

   See Section 2.3, "Connecting External Devices to the Workstation" on page 2-4.
5. **Power on the system.**

   See Section 2.4, "Powering On the Workstation" on page 2-6.

5.3.2 Installing the Front Bezel

Follow these steps to install the front bezel.

1. **Insert the right side bezel hooks into the right side chassis slots. See FIGURE 5-3.**
2. **Insert the left side bezel tabs into the chassis slots, and gently press the left side of the bezel toward the chassis until the tabs lock.**

Caution – Use care when installing the bezel. The bezel tabs and the chassis hooks might break if you apply too much force or attempt to swing the bezel closed.

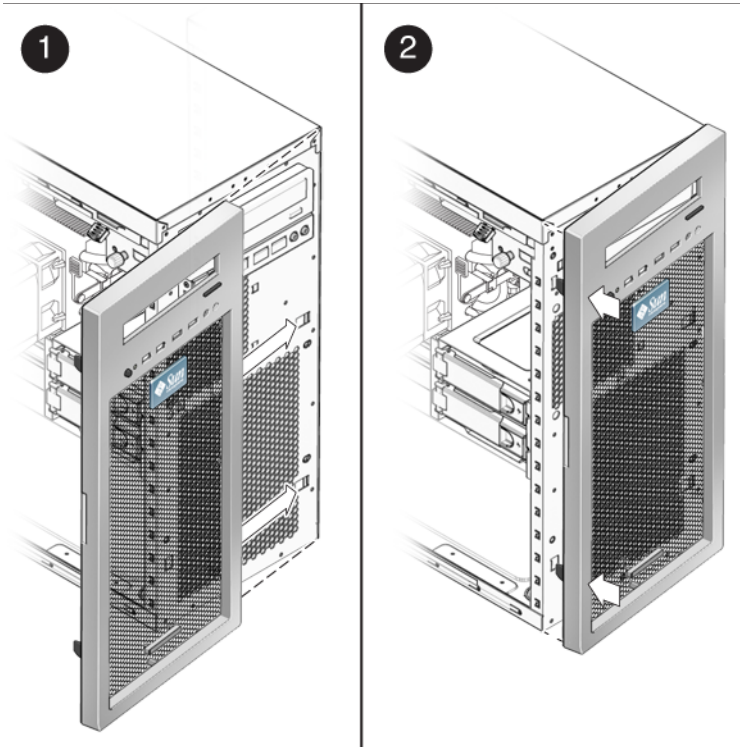


FIGURE 5-3 Installing the Front Bezel

5.3.3 Installing the Left Side Access Panel

Install the left side access panel after you finish inspecting or installing components.

1. **Ensure that all of the components are installed as described in the step-by-step instructions for the procedure you are following.**
2. **Reinstall any PCI cards, PCI-E cards, or peripherals that you removed.**
3. **Reinstall the front bezel.**
4. **Position the access panel so the lip on the inside bottom of the panel fits over the bottom chassis rail.**

5. **Pressing gently against the top of the access panel, slide the panel toward the front of the chassis. See** FIGURE 5-4**.**

   The access panel lies flat against the chassis, with no gaps between the two.

6. **Tighten the two captive thumbscrews located on the rear lip of the panel.**

   The access panel is installed flat against the chassis with the thumbscrews tightened.

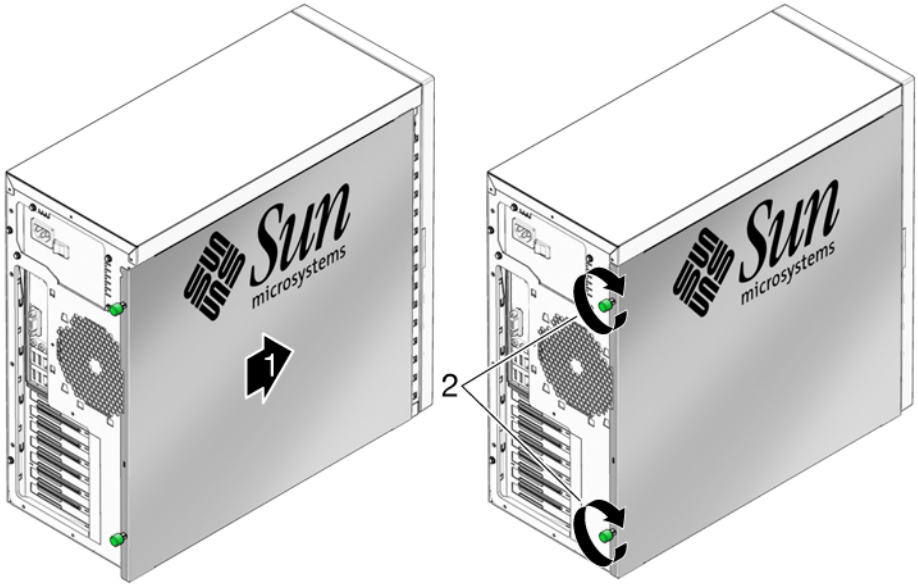


FIGURE 5-4 Installing the Left Side Access Panel

5.4 Removing or Adding a Hard Disk Drive

This section contains procedures to remove and replace a hard disk drive (HDD). Terms used in this section are defined as follows:

- **HDD**–A hard disk drive equipped with rails and a locking mechanism compatible with the HDD cage in the Sun Ultra 20 M2 Workstation.
- **HDD cage**–The metal assembly that holds HDDs within the system. The rails on the HDDs fit into guides on the HDD cage. The HDD cage is neither replaceable nor is it removed during maintenance procedures.
- **Storage backplane**–The storage backplane is located beneath the HDD cage. When correctly inserted into the HDD cage, the HDD makes contact with the connectors on the storage backplane. The storage backplane also has cables linking it to the power supply and to storage device connectors on the motherboard.
- **Hard drive assembly**–Installed HDDs, the HDD cage, and the storage backplane.

5.4.1 Removing a Hard Disk Drive

Note – The Sun Ultra 20 M2 Workstation accommodates up to two HDDs. If you are not removing an existing HDD, proceed to Section 5.4.2, "Installing a Hard Disk Drive" on page 5-10.

Follow this procedure to remove an HDD.

1. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Locate the HDD to be removed.**

4. **Push the plastic latch in the direction of the engraved arrow (away from the metal locking handle) until the HDD handle pops out (see** FIGURE 5-5**).**

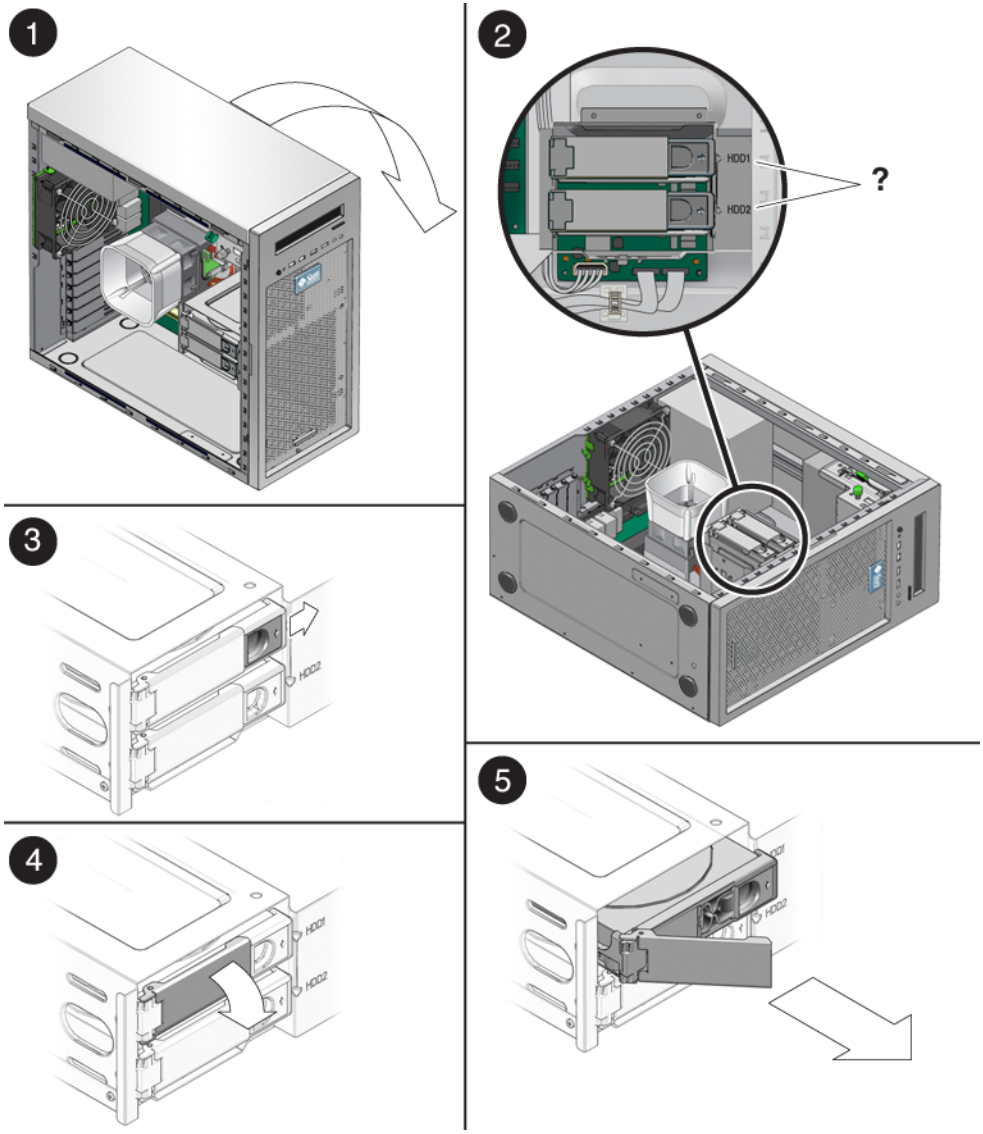


FIGURE 5-5 Removing a Hard Disk Drive

5. **Grasp the HDD handle and pull straight up to remove the HDD from the system.**
6. **Set the HDD on an antistatic surface.**

7. **Choose your next step.**
   - If you removed an HDD and want to replace it, see Section 5.4.2, "Installing a Hard Disk Drive" on page 5-10.
   - If you removed an HDD and are not replacing it at this time, close the system by performing the steps in Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.4.2 Installing a Hard Disk Drive

Perform this procedure to install an HDD.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Remove the new HDD from its antistatic packaging.**

Caution – Handle the HDD with care. Dropping or jarring the HDD can cause damage.

4. **Push the plastic latch in the direction of the engraved arrow (away from the metal handle) until the HDD handle pops out.**

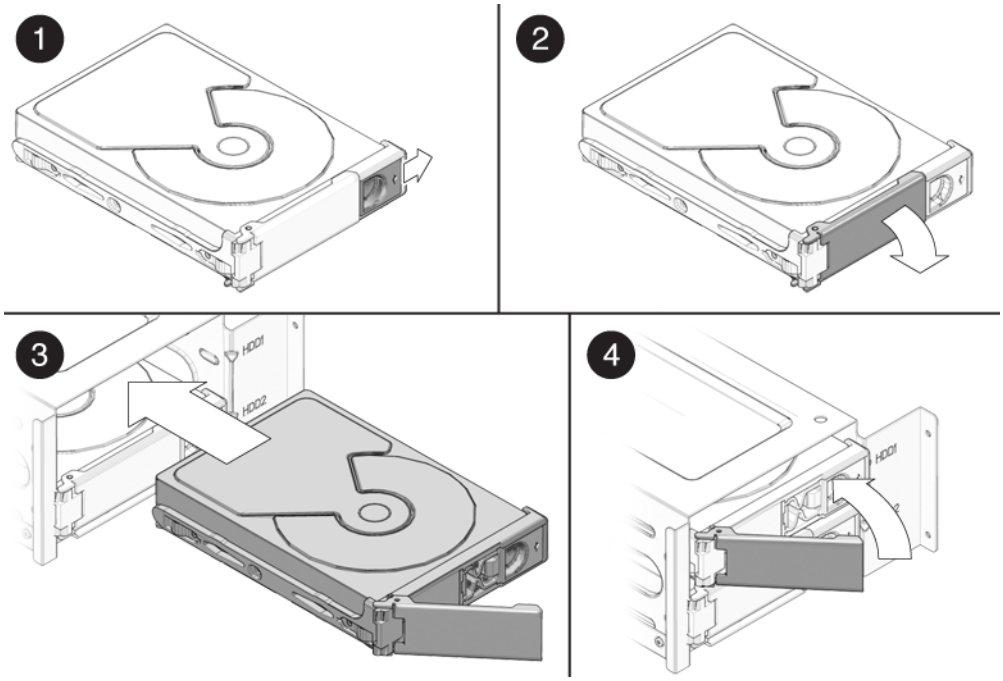


FIGURE 5-6 Installing a Hard Disk Drive

5. **Locate the HDD assembly and HDD cage guides.**

   You must install a boot drive in HDD1, the top slot. Install a secondary HDD in HDD2, the bottom slot.

6. **Align the HDD so the drive is centered with the HDD1 or HDD2 indicator on the HDD cage. Be sure that the labelled side of the HDD faces the top of the system.**

7. **Slide the HDD into the HDD cage until the metal locking handle begins to close.**

Note – Press on the plastic parts on either side of the metal locking handle to ensure that the handle engages the HDD cage.

---

8. **Press the metal locking handle closed until it locks the HDD into the HDD cage.**

   When correctly installed, the hard drive connector seats firmly into the storage backplane connector.

9. **Inspect the hard drive assembly to verify the following items:**
   - The metal locking handle is fully closed.
   - The HDD is seated in the backplane connector.
10. **To close the system, perform the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.5 Installing SAS Card, Cables, and Hard Drives

To replace the SATA drives with SAS drives, use the following procedure. You will need to order a SAS installation kit that includes a SAS PCIe card, and SAS HDDs.

The following procedure describes how to modify the current installation and install the SAS components:

1. **Power off the system, open and position the chassis, and remove the access panel.**

   See Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3.

2. **Remove the SATA HDDs from the drive bay.**

   See Section 5.4.1, "Removing a Hard Disk Drive" on page 5-8

3. **Move the HDD cables from the motherboard to the SAS card as follows:**

   a. **Release the HDD cables from the tiedowns (2 places).**

   b. **Disconnect the SATA1 (blue connector) cable from the motherboard SATA1 connector and install it on PHY0 of the SAS card.**

   c. **Disconnect the SATA2 (green connector) cable from the motherboard SATA2 connector and install it on PHY1 of the SAS card.**

Note – To ease the installation process, connect the cables to the SAS before inserting the card in the PCI slot.

---

4. **Locate the PCI-E2 slot.**

   PCI-E2 is the preferred slot. This x8 slot should be used because it is best to reserve PCI-E0 (x16) for the graphics card, but the card will work in either slot.

   See FIGURE 5-7 for PCI card locations.

5. **Using a No. 2 Phillips screwdriver, remove the chassis filler panel from the PCI card slot.**

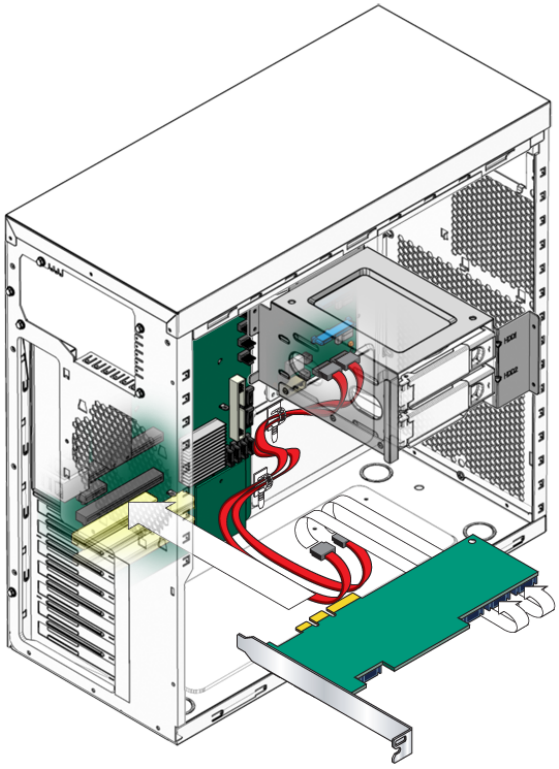
   See FIGURE 5-19. Save the screw for the next step.

6. **Insert the SAS card into the PCIe card slot and secure the card with a screw.**

   See FIGURE 5-7.

7. **To keep the cables out of the air stream, carefully resecure them in the tie-downs.**

FIGURE 5-7 Installing a SAS Card



8. **Install the SAS drives.**

   See Section 5.4.2, “Installing a Hard Disk Drive” on page 5-10.

9. **If you are finished working, reinstall the access panel, power on the system, and verify the installation.**

   Refer to Section 5.3.3, “Installing the Left Side Access Panel” on page 5-6.

10. **Install a new operating system for the new SAS configuration.**

    Refer to the Sun Ultra 20 M2 Workstation Operating System Installation Guide at:

    `http://www.sun.com/products-n-solutions/hardware/docs/Workstation_Products/Workstations/ultra_20m2/index.html`

Note – This step is necessary only if your SAS drive does not contain a preinstalled operating system.

5.6 Replacing the Storage Backplane

This section describes how to remove and install the storage backplane. For a definition of terms used in this section, see Section 5.4, "Removing or Adding a Hard Disk Drive" on page 5-8.

5.6.1 Removing the Storage Backplane

Perform this procedure to remove the storage backplane.

1. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Locate the HDD assembly (see** FIGURE 5-8**).**

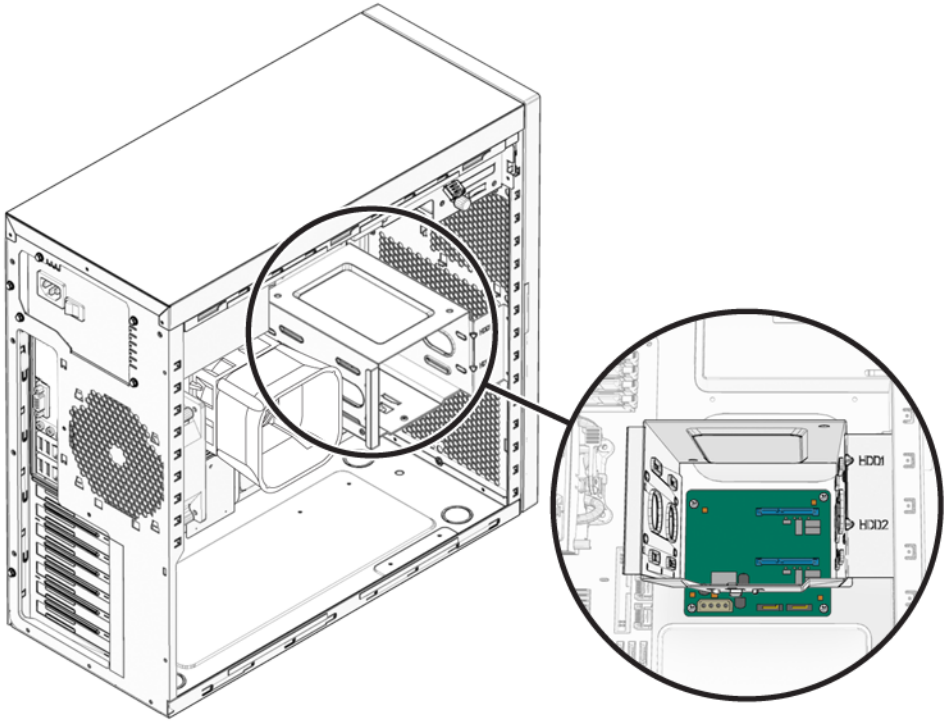


FIGURE 5-8 Location of the Storage Backplane

4. **Remove any installed HDDs and place them on an antistatic surface.**
   See Section 5.4.1, “Removing a Hard Disk Drive” on page 5-8.
5. **Disconnect the power and storage interface cables (see FIGURE 5-9).**

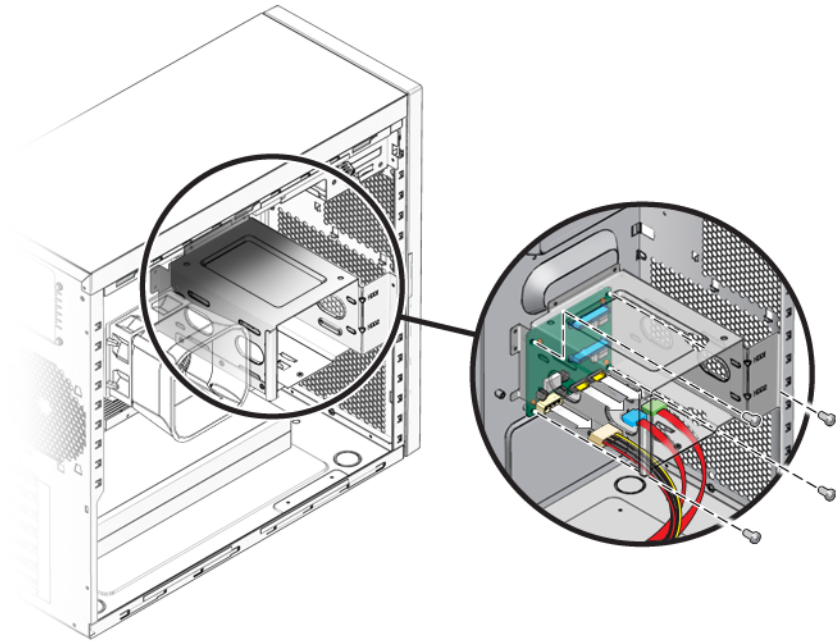


FIGURE 5-9 Removing the Storage Backplane

6. **Using a #2 Phillips screwdriver, remove the four screws securing the storage backplane to the chassis. Set the screws aside for later use (see FIGURE 5-9).**

Note – Do not attempt to remove the HDD cage.

---

7. **Remove the storage backplane and set it aside.**
8. **Proceed to Section 5.6.2, “Installing the Storage Backplane” on page 5-17 to install the new storage backplane.**

5.6.2 Installing the Storage Backplane

Perform this procedure to install a storage backplane.

1. **Ensure that the power switch on the back panel is in the Off position (0), and that the system is lying on its side with the left side access panel removed.**
2. **Remove the new storage backplane from its packaging.**
3. **Slide the storage backplane under the hard drive cage.**

   Position the screw holes over the holes in the chassis.

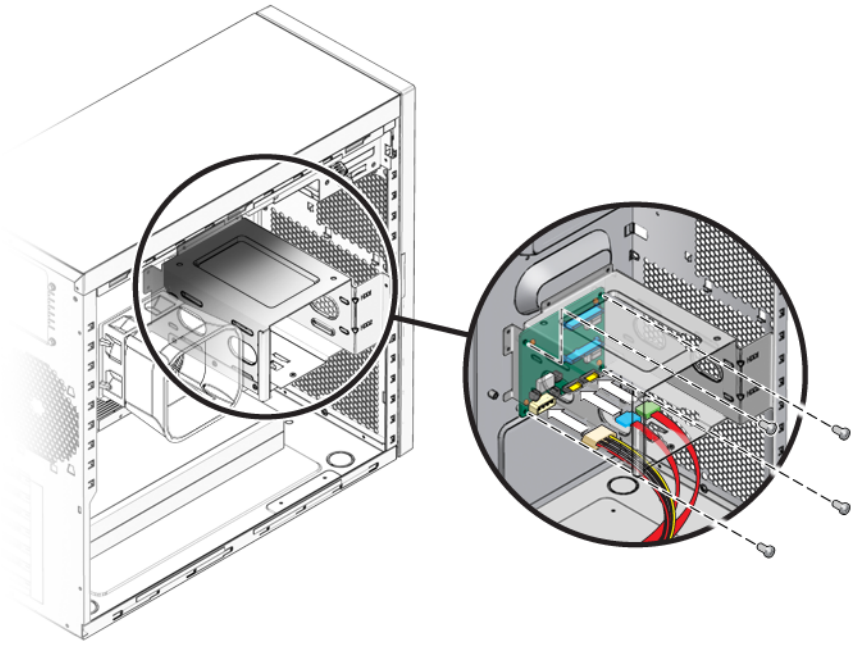


FIGURE 5-10 Installing the Storage Backplane

4. **Fasten the storage backplane to the hard drive cage.**

   Using a #2 Phillips screwdriver, install the four screws to secure the storage backplane to the hard drive cage. Torque the screws to 8- to 9-inch pounds.
5. **Connect and route the cables (see** FIGURE 5-10**).**

   a. **Connect the storage interface cables to the storage backplane connector.**

   b. **Connect the power supply power cable to disk backplane power connector.**

      Refer to the cabling diagram in the service label on the side of the chassis for information on cable routing.

6. **Install all hard drives into the hard drive cage.**

   See Section 5.4.2, “Installing a Hard Disk Drive” on page 5-10.

7. **Inspect the storage backplane, cables, and installed HDDs.**

   - Be sure that the power cable is seated in the storage backplane.
   - Be sure that the storage interface cables are seated in the storage backplane connectors.

8. **To close the system, perform the steps in** Section 5.3.1, “Postinstallation Instructions” on page 5-5**.**

5.7 Replacing the DVD Drive

This section describes the procedures to remove and replace the DVD drive.

5.7.1 Removing the DVD Drive

Perform this procedure to remove the DVD drive.

1. **Remove any media in the DVD drive.**
2. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
3. **Remove the front bezel (see** Section 5.2.3, "Removing the Front Bezel" on page 5-4**).**
4. **Disconnect the cables from the back of the DVD drive.**
5. **Push the drive retaining lever tab up to release the retaining hooks (see** FIGURE 5-11**).**

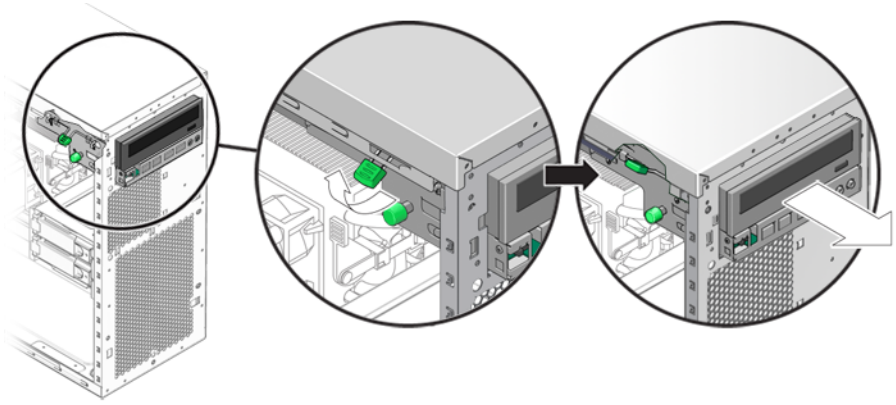


FIGURE 5-11 Removing the DVD Drive

6. **Gently pull out the DVD drive from the front of the chassis.**
7. **Place the DVD drive on an antistatic surface.**
8. **Install the new DVD drive as shown in** Section 5.7.2, "Installing the DVD Drive" on page 5-20**.**

5.7.2 Installing the DVD Drive

Perform this procedure to install the DVD drive.

1. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Remove the new DVD drive from its packaging.**
3. **Lifting the front end slightly, slide the 5.25-inch DVD drive into the drive bay. until the holes on the side align with the hooks on the drive retaining lever.**

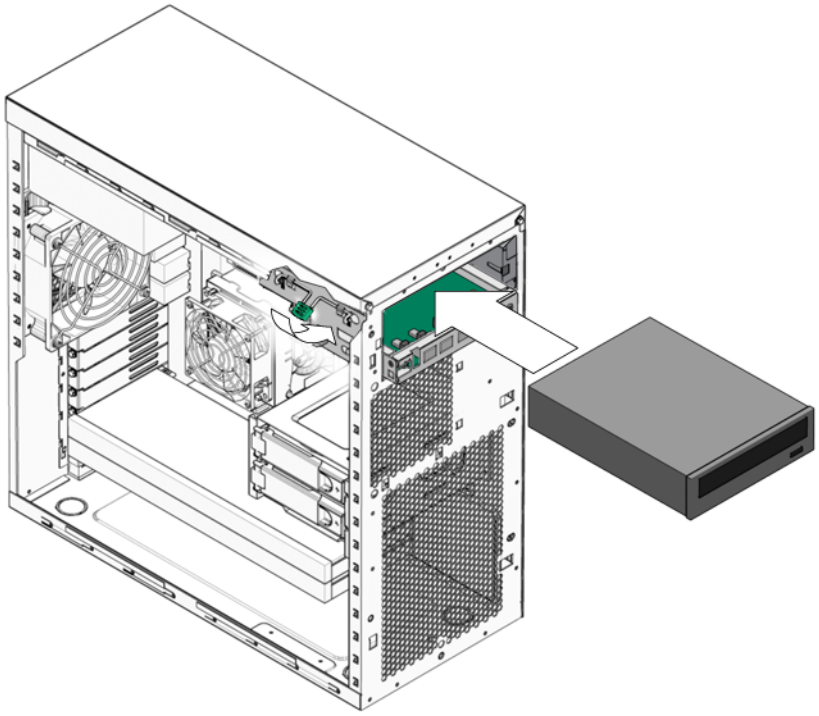


FIGURE 5-12 Installing the DVD Drive

4. **To lock the drive in the drive bay, rotate the drive retaining lever downward.**
5. **Verify that the drive is captured by the retaining hooks.**

6. **Connect the IDE, power, and jumper cables to the back of the DVD drive (see FIGURE 5-13).**

   Refer to the cabling diagram in the service label on the side of the chassis for information on correct cable routing.

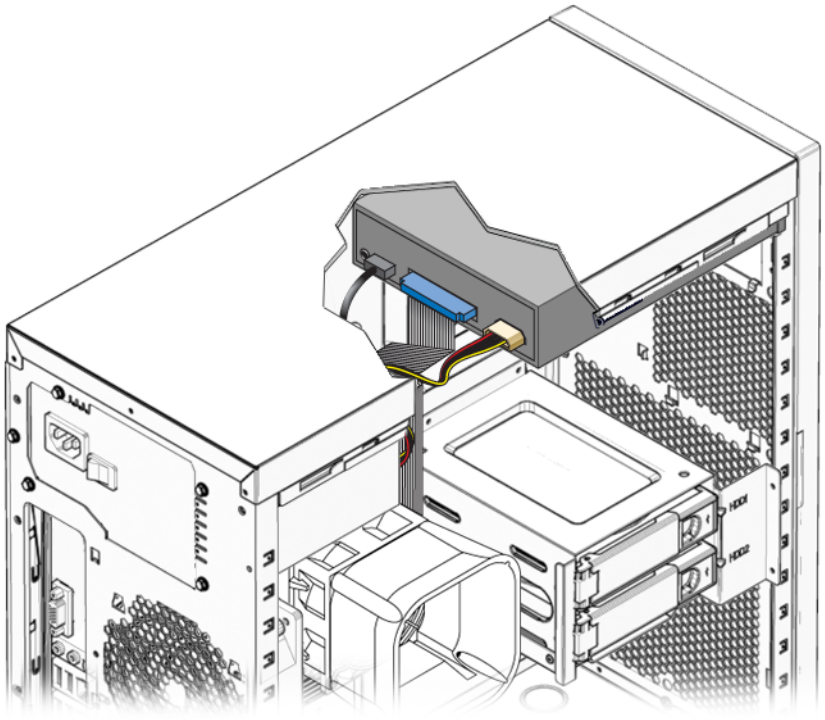


FIGURE 5-13 Location of Power and IDE Cables

7. **Replace the front bezel and left side cover of the workstation.**

8. **To close the system, perform the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5**.**

5.8 Removing or Installing DIMMs

This section contains instructions for removing and installing a dual inline memory module (DIMM).

Caution – DIMMs are sensitive to ESD. Be especially careful to follow ESD precautions when changing DIMMs (see Section 5.1, "Electrostatic Discharge (ESD) Precautions" on page 5-2).

5.8.1 Removing DIMMs

Perform this procedure to remove a DIMM.

1. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Identify the location from which you will remove a DIMM (see** FIGURE 5-14**).**

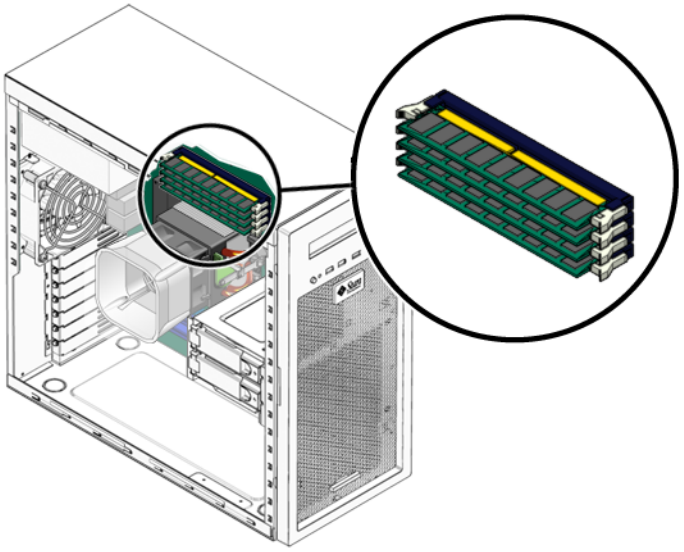


FIGURE 5-14 DIMM Locations

4. **Place your forefingers on the top of the DIMM.**
5. **Remove the DIMM by pressing down on the ejector bars at both ends of the DIMM socket (**FIGURE 5-15**).**

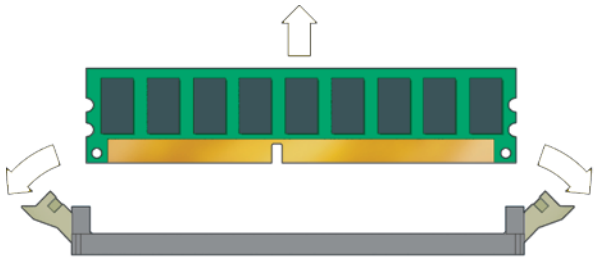


FIGURE 5-15 Removing a DIMM

6. **Set the DIMM aside on an antistatic surface.**
7. **Choose the next step.**
   - To install a new DIMM, see Section 5.8.2, "Installing DIMMs" on page 5-23.
   - If you are finished, replace the left side access panel.

5.8.2 Installing DIMMs

When you install a DIMM in the workstation, keep the following guidelines in mind:

- Memory modules must be installed and removed in pairs, observing sequential slot positions.
- DIMM slots are numbered 0 to 3. Slot 0 is closest to the CPU.
- Populate DIMM slots 2 and 3 first, followed by slots 0 and 1.

Perform this procedure to install DIMMs:

1. **Follow the instructions in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Identify the location into which you will install a DIMM (see** FIGURE 5-14**).**
4. **Align the DIMM with the proper slot.**

Note – Be sure to align the notch in the DIMM with the notch in the connector.

---

5. **Insert the DIMM into the slot.**

   Using both thumbs, press the DIMM straight down into the DIMM slot until both ejector levers click, locking the DIMM in the DIMM slot.

   - Insert DIMMs evenly, pressing straight down along the DIMM slot until they are locked into place.
   - The DIMM is seated when you hear a click and the DIMM ejector levers are in the vertical position.

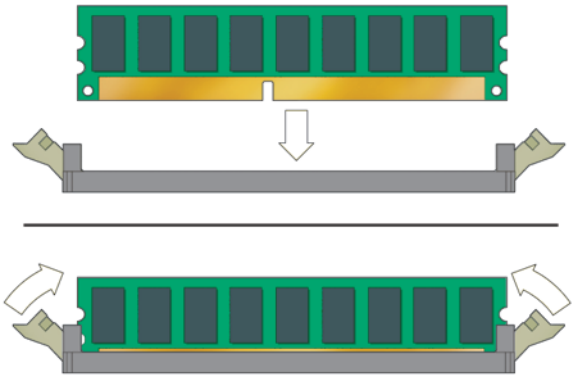


FIGURE 5-16 Installing a DIMM

6. **Repeat** Step 3 **through** Step 5 **for each DIMM that you want to replace.**
7. **To close the system, perform the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5**.**

5.8.3 Reconfiguring the System Memory

The system automatically detects the amount of memory installed. Run the BIOS setup to view the new value for total system memory, and make a note of it.

5.9 Removing and Installing a PCI-E Card

This section describes how to remove and install a PCI Express (PCI-E) card.

To remove and replace PCI cards, see Section 5.10, “Removing and Installing PCI Cards” on page 5-29.

5.9.1 Removing a PCI-E Card

Perform this procedure to remove a PCI-E card.

1. **Perform the steps listed in** Section 5.2.2, “Powering Off the System and Removing the Left Side Access Panel” on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Remove any cables connected to the card.**

   If you are removing an NVIDIA FX3500 card, remove the power supply cable from the power connector on the FX3500 card.

4. **Unfasten and open the PCI-E card retainer (see FIGURE 5-17).**

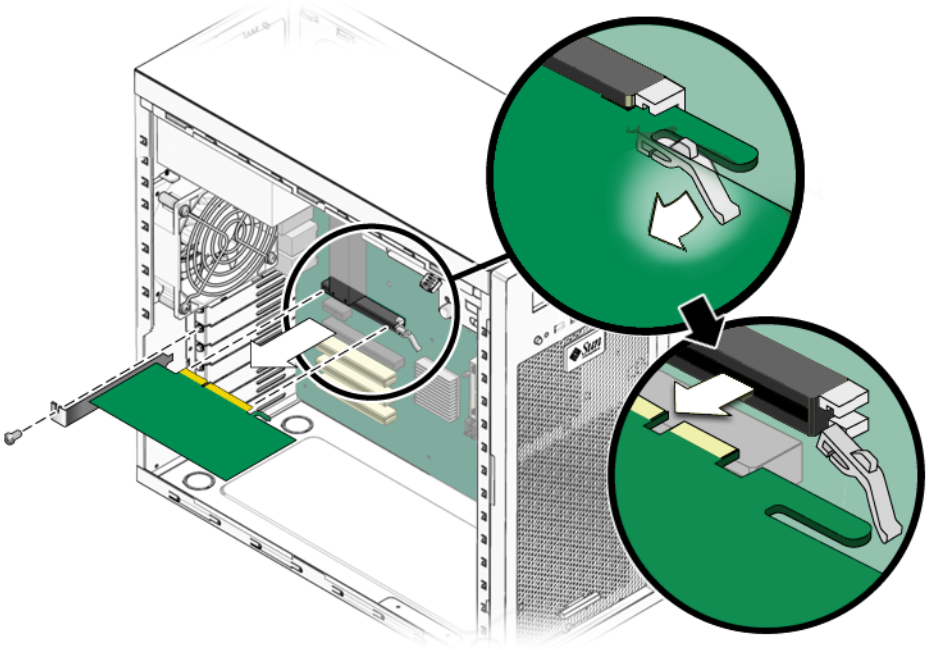


FIGURE 5-17 Removing a PCI-E Graphics Card

5. **Remove the PCI-E card.**

   Gently rock the card forward, and then lift it straight out of the card slot and set it aside on an antistatic surface.

6. **Choose your next step.**

   - If you are replacing the card, follow the instructions in Section 5.9.2, "Installing a PCI-E Card" on page 5-27.
   - If you are not replacing the graphics card, replace the slot filler panel, then close the system by performing the steps in Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.9.2 Installing a PCI-E Card

Note – See Section 1.3, "Internal Components and Cables" on page 1-4 for PCI-E slot locations and to Section A.3, "PCI-E and PCI Expansion Slots" on page A-4, for slot specifications.

Follow this procedure to install a card into a PCI-E slot.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Refer to the service label on the inside of the access panel to help you choose an empty card slot that is compatible with the card that you are installing.**
4. **Remove the metal bracket cover for the slot from the back panel.**
5. **Remove the card from its protective packaging, and lay the card on an antistatic surface until you are ready to install it.**
6. **Position the card in the selected slot. Ensure that the notch on the bottom right corner of the card engages the latch on the motherboard. (The middle PCI-E slot does not have a latch.) See** FIGURE 5-18**.**
7. **Press down on the card until it is completely seated in the slot.**

8. **If you are installing an NVIDIA FX3500 graphics card, connect the graphics power cable to the connector on the card. This might require moving the cable out of its cable tie.**

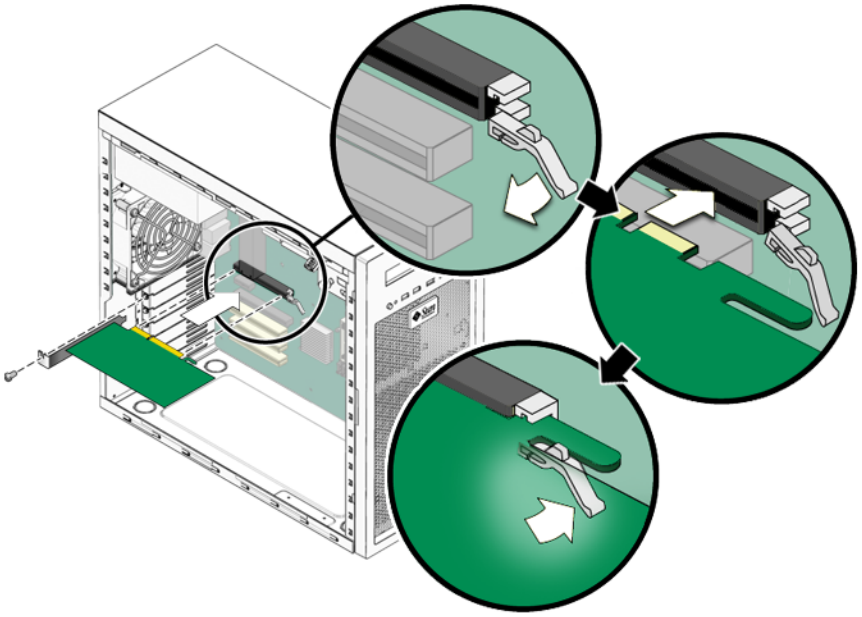


FIGURE 5-18 Installing a PCI-E Graphics Card

9. **Fasten the retaining screw into place. Torque the screws to 8- to 9-inch pounds.**
10. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5**.**

Note – The onboard ATI graphics controller automatically stops working when you install a graphics card into the PCI-E x16 slot (PCI-E slot 0). Therefore, a monitor connected to the onboard DB15 VGA graphics connector will not provide any output.

5.10 Removing and Installing PCI Cards

This section describes removing and installing standard PCI cards.

To remove and replace PCI-E cards, see Section 5.9, "Removing and Installing a PCI-E Card" on page 5-25.

5.10.1 Removing a PCI Card

This procedure describes how to remove a typical PCI card (including a host bus adapter). PCI cards might vary in the way in they are installed in the system.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Remove any cables connected to the card.**
4. **Unscrew the PCI card retainer screw** (see FIGURE 5-19)**.**

5. **Remove the PCI card.**

   Gently rock the PCI card forward, and then lift it straight out of the PCI card slot and set it aside on an antistatic surface.

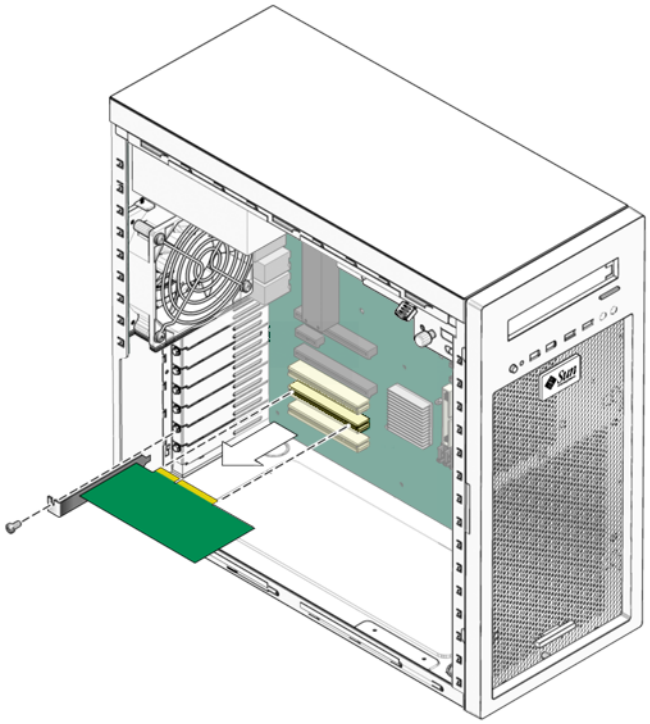


FIGURE 5-19 Removing a PCI Card

6. **Choose your next step:**

   - If you are not replacing the PCI card, replace the slot filler panel, then close the system by performing the steps in Section 5.3.1, "Postinstallation Instructions" on page 5-5.
   - If you are replacing the card, follow the instructions in Section 5.10.2, "Installing a PCI Card" on page 5-31.

5.10.2 Installing a PCI Card

Note the following if you are installing 33 Mhz PCI cards:

- Slot 0 can accept only a 32-bit full-length card (64-bit cards are too long).
- Slot 1 and Slot 2 can accept 32- or 64-bit full-length cards.

Note – Any 64-bit PCI cards that you install will run in 32-bit mode.

Follow this procedure to install a PCI card.

Note – See Section 1.3, "Internal Components and Cables" on page 1-4 for PCI slot locations and to Section A.3, "PCI-E and PCI Expansion Slots" on page A-4, for slot specifications.

---

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **See the service label on the access panel to determine a slot that is compatible with the card you are installing.**
4. **Remove the metal bracket cover for the slot from the back panel.**
5. **Remove the PCI card from its protective packaging, and lay the card on an antistatic surface until you are ready to install it.**

6. **Position the card over the selected slot (see** FIGURE 5-20**).**

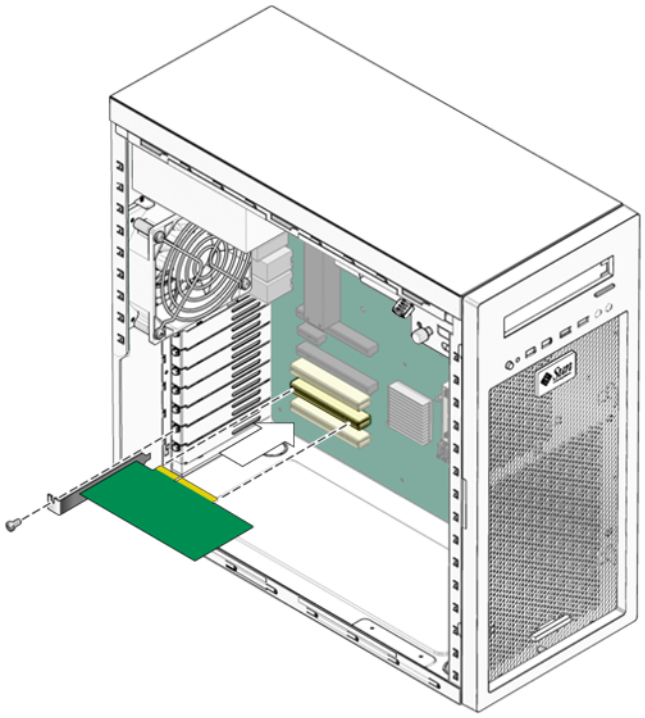


FIGURE 5-20 Installing a PCI card

7. **Press down on the card until it is completely seated in the slot.**
8. **Fasten the retaining screw into place. Torque the screws to 8- to 9-inch pounds.**
9. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.11 Replacing the System Battery

The battery specifications for the Sun Ultra 20 M2 Workstation are shown in TABLE 5-1.

TABLE 5-1 Battery Specifications

Specification	Value
Voltage	3 VDC
Type	CR 2032

Perform this procedure to remove and replace the system battery.

Caution – If you remove the system battery, you could erase all system-specific information saved in the CMOS.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Pinch the battery latch together (squeezing away from the battery) until the battery pops out of the motherboard socket (see** FIGURE 5-21**).**

4. **Lift the battery to remove it (see FIGURE 5-21).**

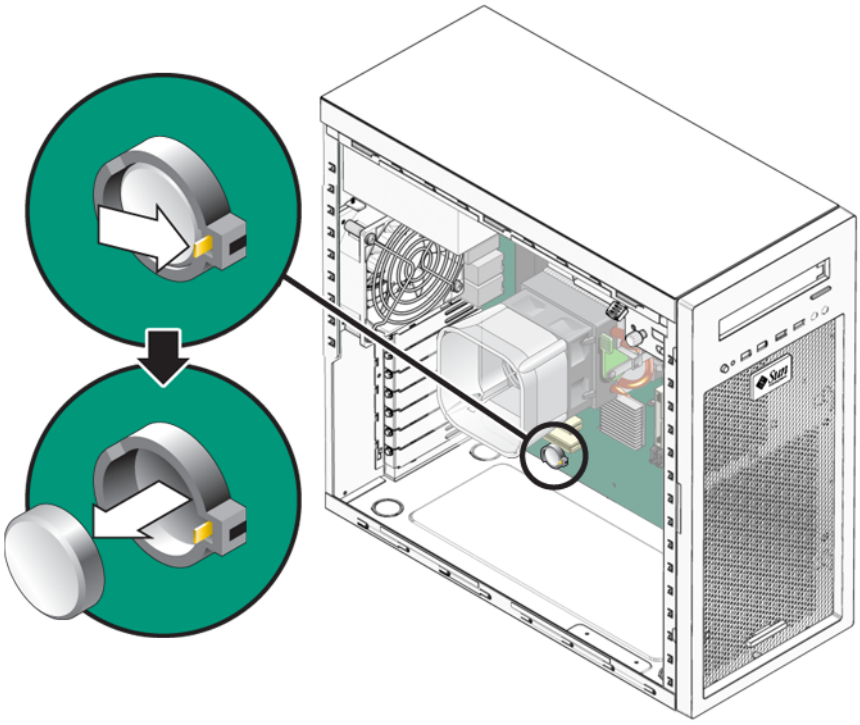


FIGURE 5-21 Removing the System Battery

5. **Insert a new battery with the positive sign (+) facing up (see FIGURE 5-22).**

   Tilt the battery into the battery connector, angling the battery under the battery latch. Slide the battery until it clicks into place.

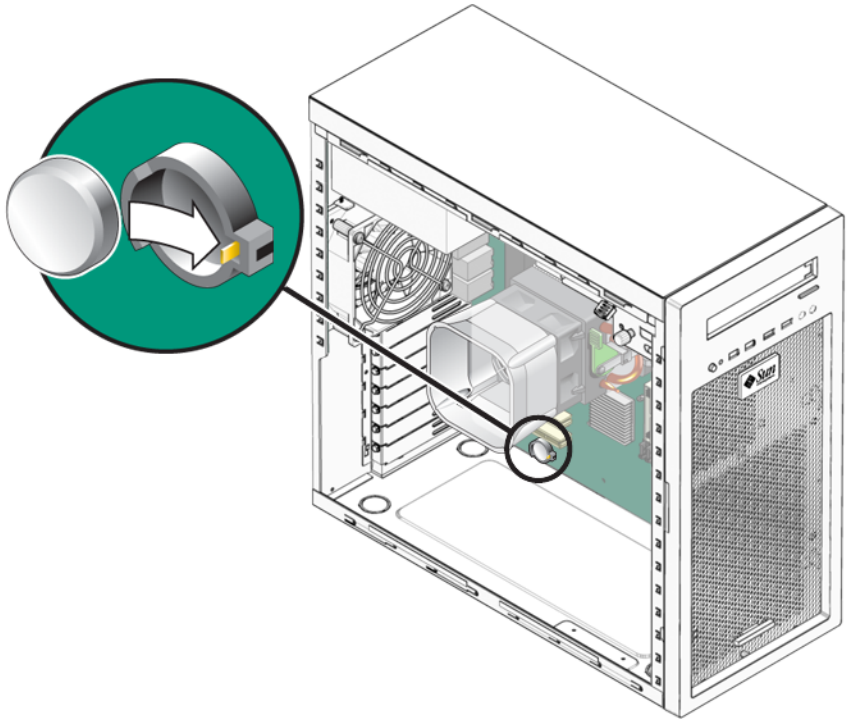


FIGURE 5-22 Installing a System Battery

6. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5

5.12 Replacing the System Fan

Perform this procedure to replace the system fan.

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Locate the system fan on the back inside panel of the workstation.**
3. **Disconnect the system fan's power connector from the SYS_FAN connector on the motherboard.**

   To locate the SYS_FAN connector, refer to the Service Label on the left side access panel or to Section 1.3, "Internal Components and Cables" on page 1-4.
4. **Release the fan's power cord from the cable management strap.**
5. **Gently lift the two latches on the bottom of the fan bracket until the latches clear the chassis.**
6. **Slide the fan assembly down to release the four hooks on the back of the bracket from the holes in the chassis (see** FIGURE 5-23**).**

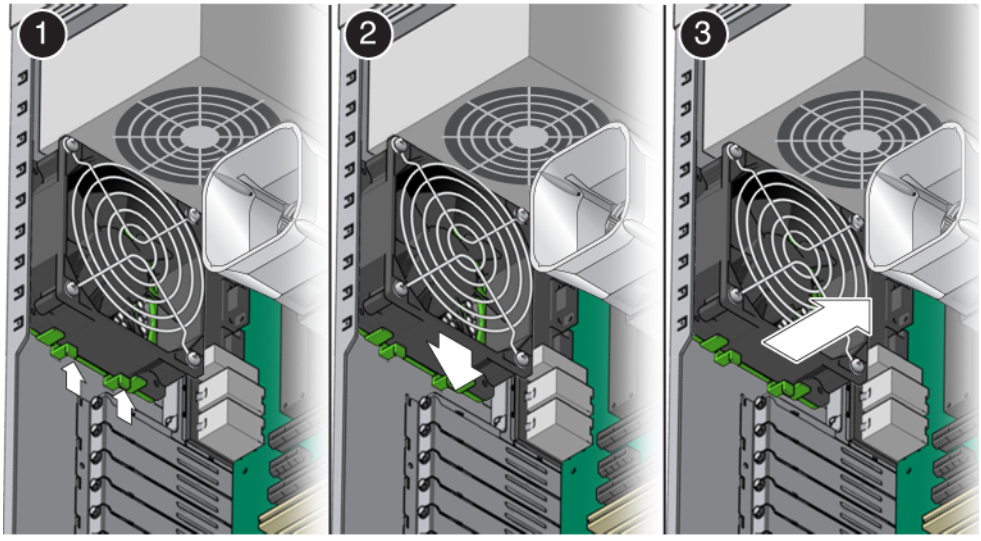


FIGURE 5-23 Removing the System Fan

7. **Pull the fan away from the chassis.**
8. **Remove the new fan from its package.**

9. **Locate the four corner holes in the chassis grill where the fan tabs will be installed.**

10. **Gently press the fan against the chassis, with the four hooks on the back of the fan bracket in the corner holes on the chassis grill.**

11. **Slide the fan up until the latches click into their locked position (see** FIGURE 5-24**).**

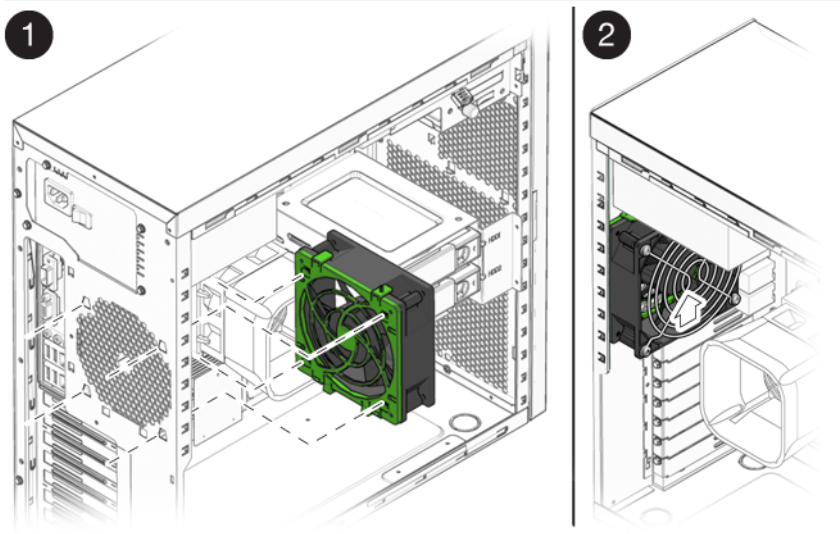


FIGURE 5-24 Installing the System Fan

12. **Route the fan's power cord through the cable management strap near the top right corner of the motherboard.**

13. **Connect the fan cable to the SYS_FAN connector on the motherboard.**

14. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.13 Replacing the Power Supply

This section describes removing and installing the power supply.

5.13.1 Removing the Power Supply

Perform this procedure to remove the power supply.

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Unplug the AC power cord from the system.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Locate the power supply (see** FIGURE 5-25**).**

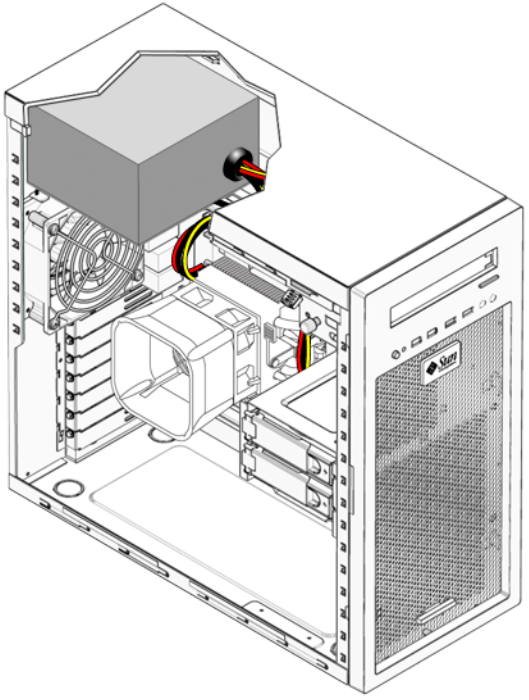


FIGURE 5-25 Location of the Power Supply

5. **Unfasten the connectors from the motherboard and release the cable management straps (see FIGURE 5-26).**

6. **Unfasten the power connectors attached to the motherboard, DVD drive, and storage backplane (see FIGURE 5-26 and TABLE 5-2).**

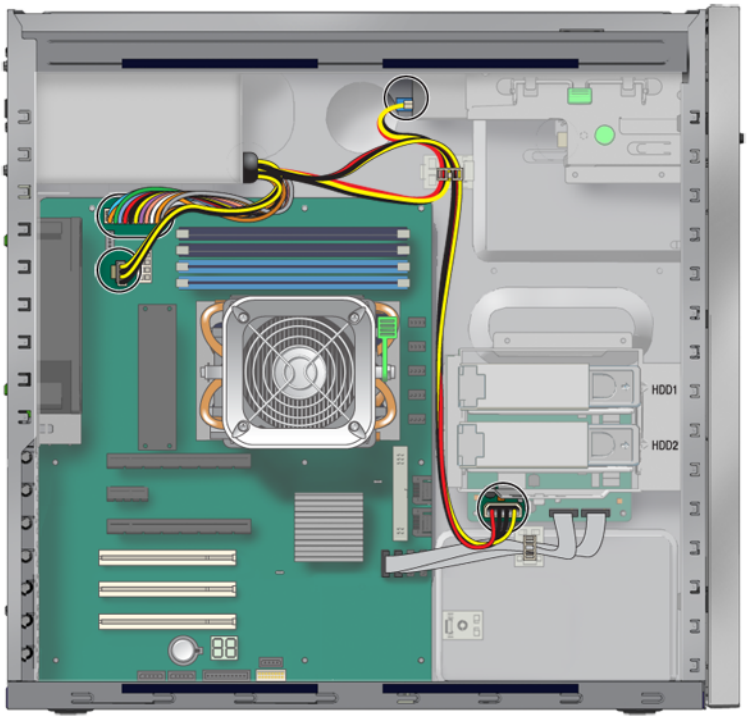


FIGURE 5-26 Locations of Power Supply Connections on the Motherboard

TABLE 5-2 Power Supply Cable Connections

Power cable	Connector	Power cable	Connector
P1	Motherboard PWR1	P3	DVD drive
P2	Motherboard PWR2	P4	Storage backplane

7. **Working from outside the back of the chassis, unfasten the four mounting screws.**

8. **Remove the power supply from the interior of the system chassis (see FIGURE 5-27).**

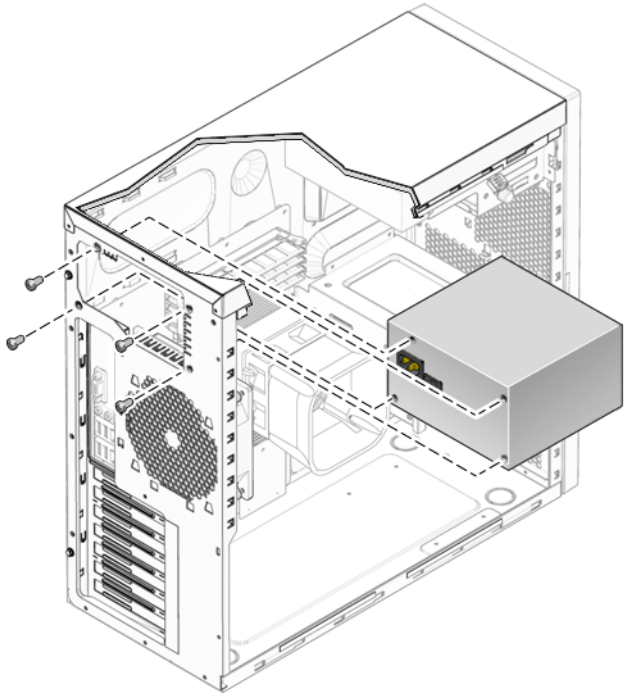


FIGURE 5-27 Removing the Power Supply From the Chassis

9. **Install the new power supply as shown as** Section 5.13.2, "Installing the Power Supply" on page 5-41.

5.13.2 Installing the Power Supply

Perform this procedure to install the power supply.

1. **Remove the new power supply from its package.**
2. **Locate where the power supply is to be installed, then place the power supply inside the chassis (see** FIGURE 5-28**).**
   a. **Align the power supply IEC-320 connector (power cord socket) and fan with the chassis back-panel opening.**
   b. **Position the power supply with the chassis power supply brackets.**
   c. **Rotate the power supply down and into the chassis.**

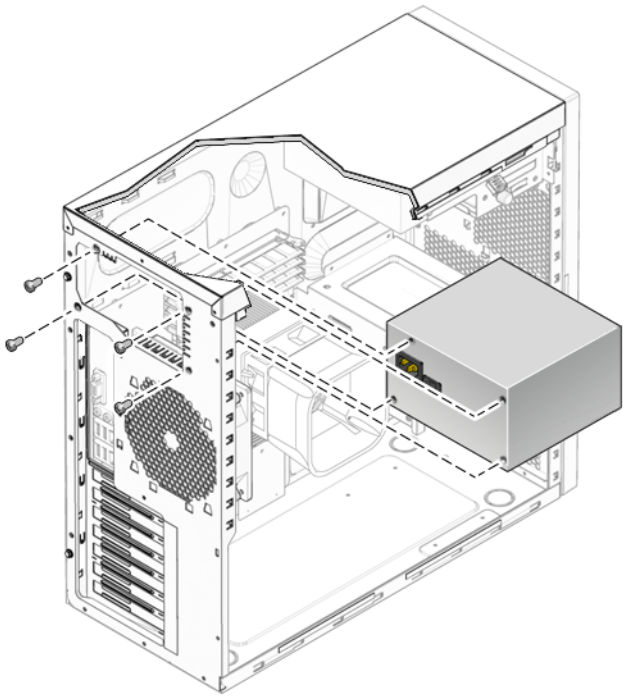


FIGURE 5-28 Installing the Power Supply Into the Chassis

3. **Fasten the four mounting screws on the back of the chassis to secure the power supply to the chassis.**
4. **Reconnect the power supply cables (see** FIGURE 5-26 **and** TABLE 5-2**), and then secure them with the cable management straps.**

Caution – When you connect the power supply cables, make sure that the cables do not interfere with the DIMMs. If the cables push against the DIMMs, the DIMMs might loosen from their connectors.

5. **Verify that the four mounting screws are secure, that all cables are reconnected, and that the cables are secured by the cable management straps.**
6. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5**.**

5.14 Replacing the I/O Board Assembly

The I/O board assembly sits beneath the DVD drive and contains the power switch, power LED, and external connectors for the front panel.

5.14.1 Removing the I/O Board Assembly

Perform this procedure to remove the I/O board assembly.

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Disconnect any audio, USB, and IEEE 1394 cables connected to the front of the workstation.**
3. **Remove the front bezel (see** Section 5.2.3, "Removing the Front Bezel" on page 5-4**).**
4. **Locate the back of the I/O board assembly within the workstation.**
5. **Disconnect all cables on the back of the I/O board.**

6. **Loosen the captive screw securing the I/O board to the metal frame (see FIGURE 5-29).**

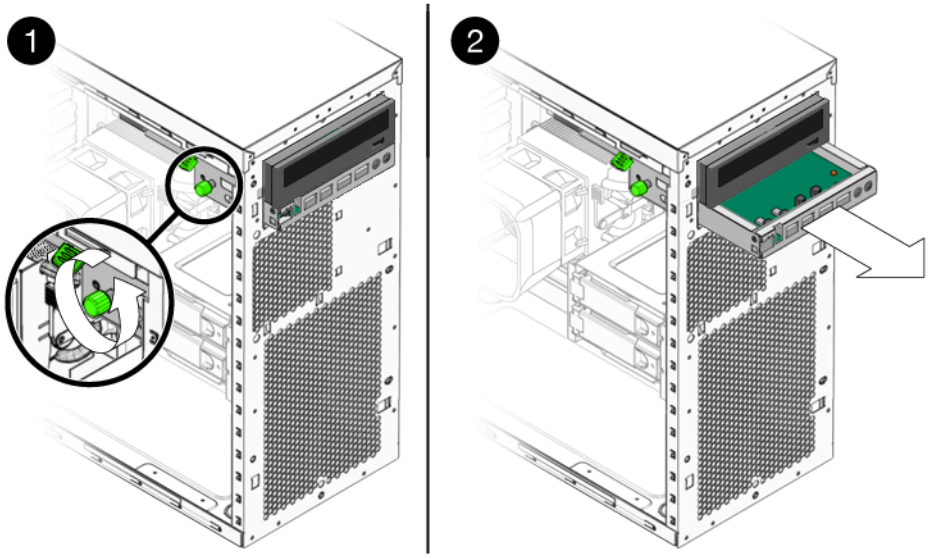


FIGURE 5-29 Removing the I/O Board Assembly

7. **Push the I/O board out the front of the chassis.**

8. **Install the new I/O board assembly as shown in** Section 5.14.2, "Installing the I/O Board Assembly" on page 5-44**.**

5.14.2 Installing the I/O Board Assembly

Perform this procedure to install the I/O board assembly.

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Place the system unit on a flat, stable surface.**
3. **Push the I/O board through the back of the metal I/O board frame until the front panel is flush with the bezel opening (see** FIGURE 5-30**). Wiggle side to side if the board binds as you install it.**

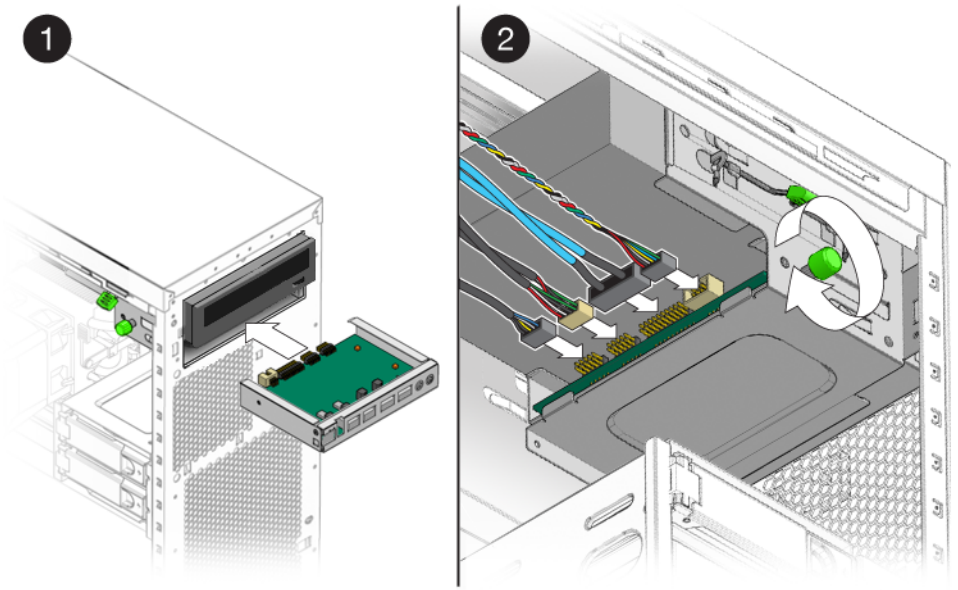


FIGURE 5-30 Installing the I/O Board Assembly

4. **Tighten the captive screw on the metal I/O board frame to secure the I/O board.**
5. **Connect the internal USB, Power/LED, 1394, and audio cables to the back of the I/O board.**

   The cables are color coded and keyed to ensure correct installation. See FIGURE 1-4 and the service label on the chassis cover for the locations of the I/O board connections.
6. **Replace the front bezel.**
7. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.15 Replacing System Cables

The following system cables have a connector at each end and can be removed or installed by the customer. All other cables are permanently attached to a system component at one end and must be removed or replaced along with the component. See Section 1.3, "Internal Components and Cables" on page 1-4 or the service label (located on the left side access panel) for connector locations.

Note – All cables are designed for easy connectivity. Cables cannot be inserted incorrectly unless forced.

- Front I/O board cables:
  - Audio cable
  - USB cable
  - IEEE 1394 cables
  - Power button/LED cable
- DVD drive cables:
  - IDE cable
  - Analog audio cable
- HDD cables

Each cable connector on the motherboard is labeled to help you identify the cable to which it should be connected.

Perform this procedure to remove and install system cables.

1. **Perform the steps listed in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Remove and replace any cables that need to be replaced.**

   As you install each cable, connect one end to the appropriate connector, then route the cable through the cable management straps before connecting the second connector. Note that HDD cables are not secured by the cable management straps.
4. **Ensure that all cable routing is correct and that all of the cable connectors are properly seated.**
5. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.16 Replacing the Heatsink and CPU

This section describes how to remove or replace a CPU and heatsink.

Note – The CPU is not a customer replaceable unit (CRU) and should be replaced only by trained field service technicians.

5.16.1 Removing the Heatsink and CPU

Perform this procedure to remove the heatsink and CPU.

Note – Before removing the CPU from the motherboard, create a backup file to preserve all important data.

---

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**

Caution – The heatsink can become extremely hot. Allow a few minutes for the heatsink to cool before attempting this procedure.

---

3. **Disconnect the CPU fan cable from its connector on the motherboard.**

4. **Pull up the lever on the right side of the heatsink/fan assembly to loosen the metal latch from the hook on the retaining bracket (see FIGURE 5-31).**

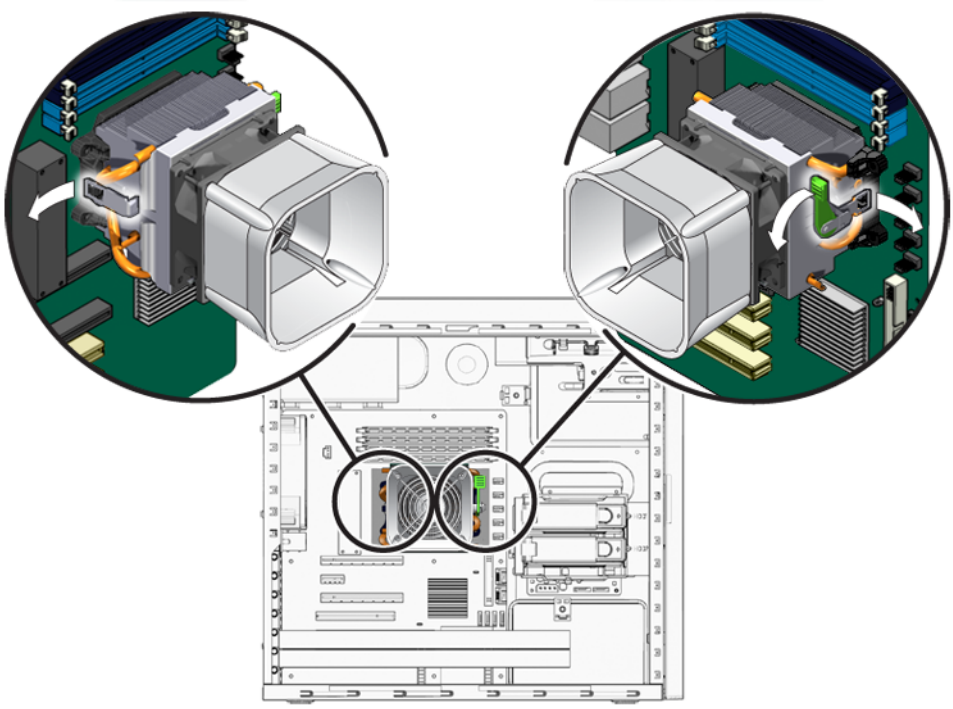


FIGURE 5-31 Unlatching the Heatsink/Fan Assembly

5. **Push down the metal latch on the left side of the assembly to loosen the latch from the hook on the retaining bracket (see FIGURE 5-31).**

6. **Twist the heatsink/fan assembly to the right or the left, in order to break the seal with the thermal grease.**

7. **Lift the heatsink/fan assembly straight up and withdraw it from the board (see FIGURE 5-32).**

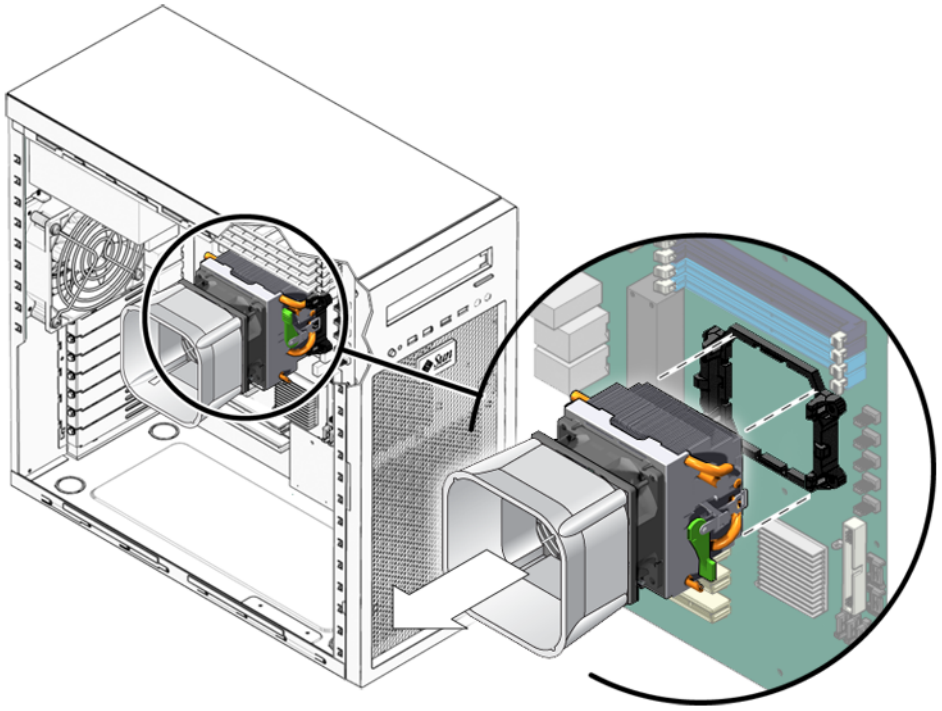


FIGURE 5-32 Removing the Heatsink/Fan Assembly From the Motherboard

8. **Place the heatsink upside down on a flat surface to prevent the thermal grease from contaminating other components.**

9. **Depress, and then pull up the CPU socket retainer lever up to the fully open position (see** FIGURE 5-33**).**

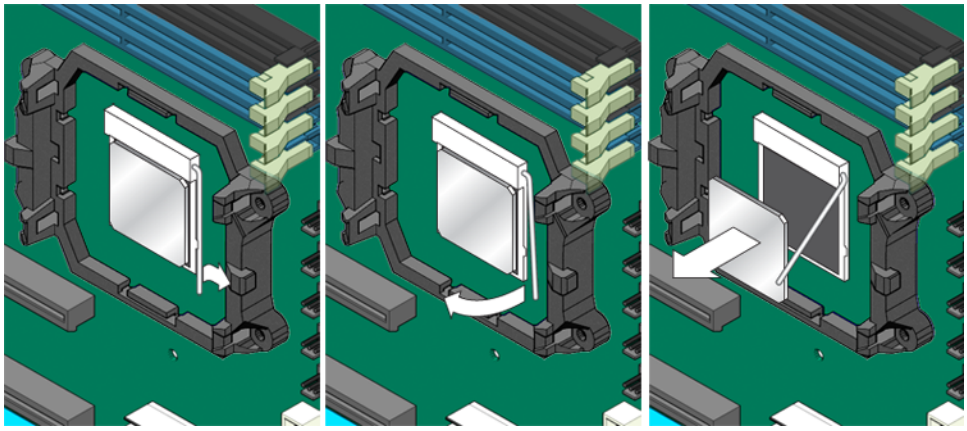


FIGURE 5-33 Removing the CPU From the Workstation

10. **Lift the CPU out of the socket, leaving the retainer lever in the open position.**
11. **Install the heatsink and CPU as shown in** Section 5.16.2, "Installing a Heatsink and CPU" on page 5-49**.**

5.16.2 Installing a Heatsink and CPU

Perform this procedure to install the heatsink and CPU.

Note – Observe the ESD precautions and preinstallation procedures described in Section 5.1, "Electrostatic Discharge (ESD) Precautions" on page 5-2.

---

1. **Ensure that the CPU socket retainer lever is in the fully open position. See** FIGURE 5-34**.**
2. **Align the CPU to its socket so that pin 1 of the CPU (indicated by the notched corner) is aligned with hole 1 of the socket (indicated by the arrow in the corner of the socket).**

3. **Insert the CPU into the socket.**

Note – When correctly aligned, the CPU should drop effortlessly into the socket. Do not attempt to force the CPU into the socket to seat it.

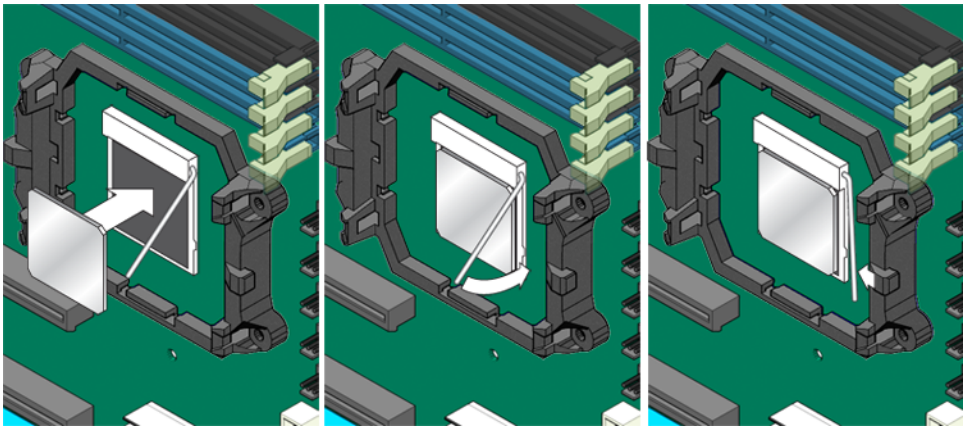


FIGURE 5-34 Installing the CPU

4. **When the CPU is positioned in the socket, press down on the socket retainer lever to lock the CPU in place.**

5. **Do this step only if you are installing a new CPU. Otherwise, go to** Step 6**.**

   a. **Clean any contamination from the top of surface of the CPU, using the supplied alcohol wipe.**

      The heatsink assembly already has thermal grease applied. You do not need to apply additional thermal grease.

   b. **Remove the plastic cover from the heatsink/fan assembly.**

6. **Do this step if you are installing an already-used CPU onto a new motherboard. Otherwise, go to** Step 7**.**

   a. **Remove the grease from the CPU and remove the thermal interface material from the heatsink using the alcohol wipe supplied with the motherboard.**

   b. **Use the syringe that is supplied with the motherboard to apply approximately 0.5 ml of thermal grease to the center of the top of the CPU.**

      Empty the entire syringe onto the chip.

   c. **Using the wrapper of the alcohol wipe or a finger inserted into a clean plastic bag, spread out the thermal grease to a thin, uniform thickness over the CPU.**

Caution – Do not use an unprotected finger to spread the thermal grease. The oil on your finger will degrade the performance of the thermal grease.

7. **Inspect the heatsink/fan assembly for dust and lint. Clean if necessary.**
8. **Carefully position the heatsink/fan assembly on the CPU, aligning it with the mounting hooks to reduce movement after it makes initial contact with the layer of thermal grease. See** FIGURE 5-35**.**

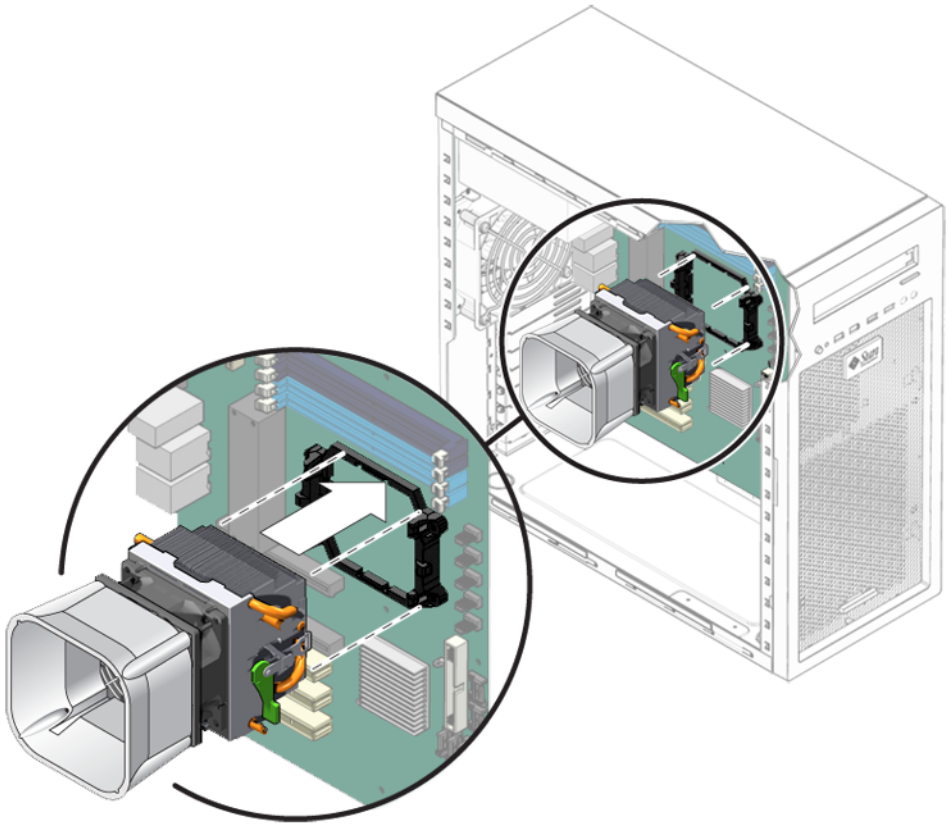


FIGURE 5-35 Installing the Heatsink/Fan Assembly

Caution – If you move the heatsink assembly too much during installation, the layer of thermal grease might not be distributed evenly, leading to component damage.

9. **Attach the retaining bracket hook to the metal latch on the left side of the heatsink/fan assembly (see** FIGURE 5-36**).**

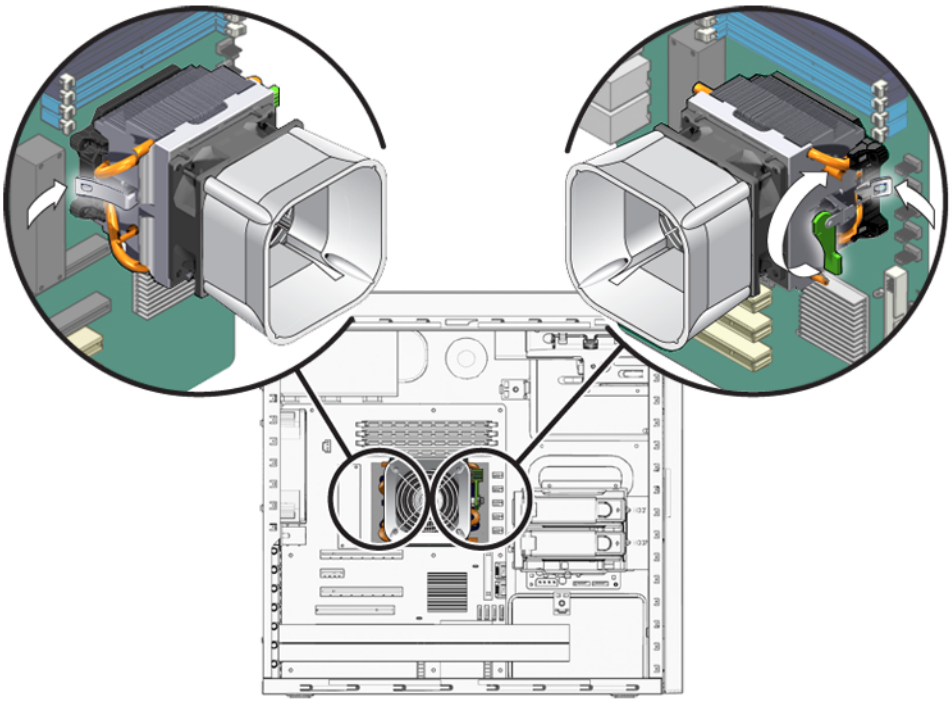


FIGURE 5-36 Securing the Heatsink/Fan Assembly Latches

10. **Push down on the lever on the right side of the heatsink/fan assembly to secure the metal latch to the hook on the retaining bracket.**
11. **Connect the CPU fan cable to the connector on the motherboard.**
12. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5.

5.17 Replacing the Motherboard

The following sections describe how to remove and install the Sun Ultra 20 M2 Workstation system motherboard.

Note – The motherboard is not a CRU and should only be replaced by trained field service technicians.

5.17.1 Removing the Motherboard

Perform this procedure to remove the motherboard.

1. **Follow the steps in** Section 5.2.2, "Powering Off the System and Removing the Left Side Access Panel" on page 5-3**.**
2. **Gently lay the system on its right side on a stable, nonslip surface.**
3. **Remove any PCI or PCI-E cards installed on the motherboard (see** Section 5.10.1, "Removing a PCI Card" on page 5-29**).**
4. **Remove DIMMS and CPU from the motherboard.**
5. **Disconnect all cables attached to the motherboard.**

6. **Remove the nine Phillips screws that fasten the motherboard to the chassis (see FIGURE 5-37).**

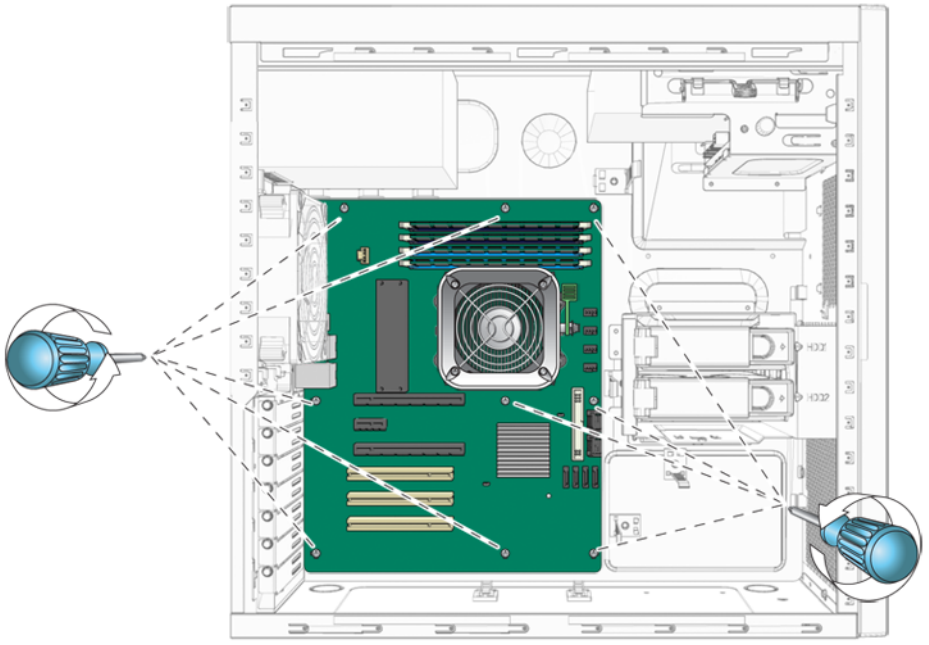


FIGURE 5-37 Removing the Nine Motherboard Screws

Note – Do not remove the four screws that secure the CPU heatsink/fan assembly mounting to the motherboard.

---

7. **Pull the motherboard away from the chassis (see FIGURE 5-38).**

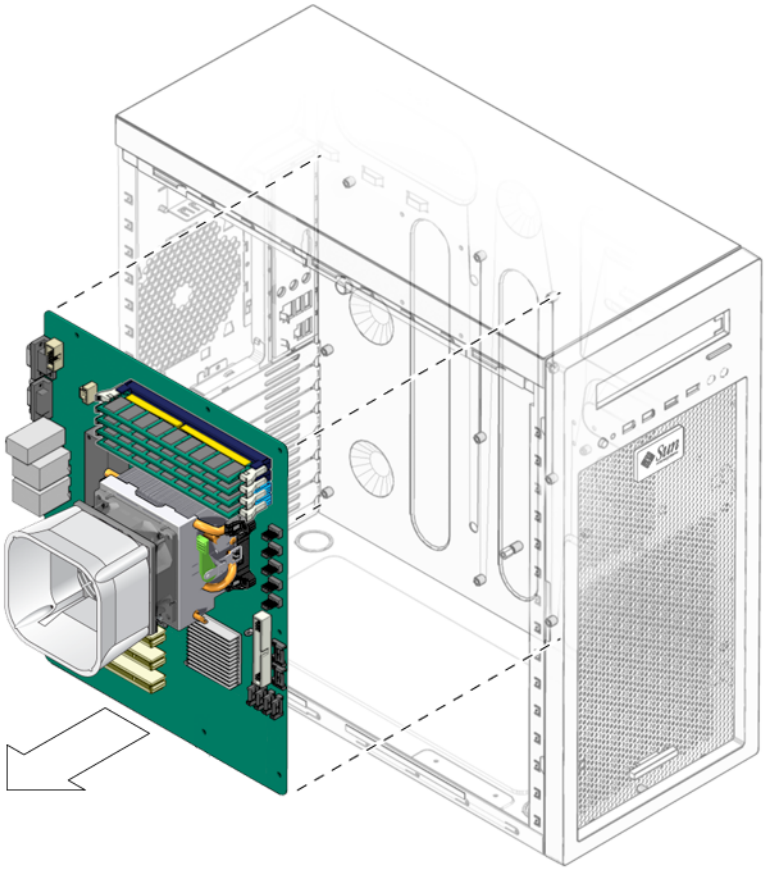


FIGURE 5-38 Removing the Motherboard From the Chassis

Refer to the following sections to remove and replace the CPU and memory:

- Section 5.16, “Replacing the Heatsink and CPU” on page 5-46
- Section 5.8, “Removing or Installing DIMMs” on page 5-22

5.17.2 Installing the Motherboard

Caution – Observe proper ESD precautions when handling a new motherboard.

1. **Install the CPU and DIMMs as necessary.**

   Refer to the following sections for information about removing and replacing the CPU and memory:

   - Section 5.16, "Replacing the Heatsink and CPU" on page 5-46
   - Section 5.8, "Removing or Installing DIMMs" on page 5-22

2. **Place the motherboard on the chassis so that the screw holes in the motherboard align with the screw holes on the chassis.**

3. **Secure the nine Phillips screws that fasten the motherboard to the chassis. Torque the screws to 8- to 9-inch pounds (see** FIGURE 5-39**).**

4. **Install any PCI cards or a PCI-E graphics card. See the following sections:**

   - Section 5.9.2, "Installing a PCI-E Card" on page 5-27
   - Section 5.10.2, "Installing a PCI Card" on page 5-31.

5. **Reconnect all internal system cables.**

   See Section 5.15, "Replacing System Cables" on page 5-45.

6. **Verify that all system components are securely installed or connected.**

7. **Close the system by performing the steps in** Section 5.3.1, "Postinstallation Instructions" on page 5-5**.**

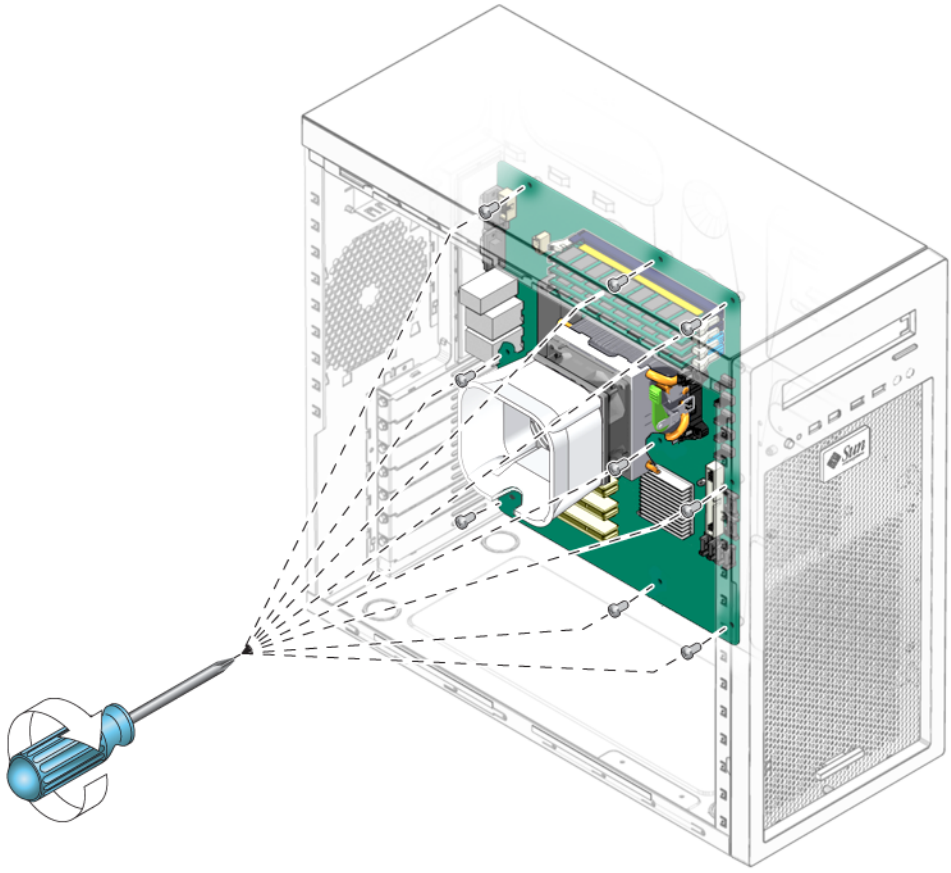


FIGURE 5-39 Installing the Motherboard

5.18 Updating the BIOS

This section contains instructions for flashing the system BIOS and resetting system specific BIOS settings.

5.18.1 Flashing the BIOS

Perform this procedure to flash the system BIOS.

1. **Note any BIOS settings that might have been altered for your local environment because flashing the BIOS will restore the default BIOS settings.**
2. **Download the latest Sun Ultra 20 M2 Workstation Tools and Drivers CD ISO image from the Sun web site.**

   http://www.sun.com/downloads

Caution – Ensure that you download the ISO image for the Sun Ultra 20 M2 Workstation.

---

3. **Burn the image to a CD.**
4. **Insert the CD into the system, then reboot the system.**
5. **When prompted, choose option 2 to flash the BIOS.**
6. **Respond to the prompts, then wait until the BIOS update completes.**
7. **Remove the Tools and Drivers CD from the DVD drive.**

5.18.2 Resetting Previous BIOS Settings

To set the BIOS for your local environment, perform this procedure after updating the BIOS.

1. **Reboot the system.**
2. **Press the F2 key to enter the BIOS configuration.**

   The BIOS Setup screen displays.
3. **Make any setting changes you require. In particular, ensure that RAID settings are enabled if required, and set the OS to the appropriate operating system. For more information, see the** *Sun Ultra 20 M2 Workstation Operating System Installation Guide.*
4. **Press the F10 key to save changes and exit.**

APPENDIX **A**

System Specifications

This appendix lists features and specifications for the Sun Ultra 20 M2 Workstation and includes the following sections:

Note – For maximum reliability and performance, install your Sun Ultra 20 M2 Workstation into a proper environment and ensure correct configuration as discussed in this appendix.

A.1 System Components and Features

TABLE A-1 shows the system's key components.

TABLE A-1 Sun Ultra 20 M2 Workstation Components

Component	Description
CPU	• One dual-core AMD Opteron processor • Processor frequencies: 1.8 GHz and faster • 1 MB Level 2 Cache per processor core
Memory	• Four DIMM slots • 512 MB, 1 GB, 2 GB unbuffered DDR2-667, unbuffered, ECC DIMM modules supported (see Section A.2, "Memory Configurations" on page A-3)
Media storage	DVD-ROM or DVD-Dual
Hard disk drives	Up to two SATA disk drives
Power supply	400W PSU
Network I/O	Onboard 10/100/1000BASE-T Gigabit Ethernet controller providing 2 RJ45 connectors on the back panel
Video	Onboard ATI graphics controller with DB15 VGA graphics connector
PCI-E I/O and PCI I/O (see Section A.3, "PCI-E and PCI Expansion Slots" on page A-4)	• One PCI Express x16 graphics slot • One PCI Express x1 expansion slot • One PCI Express x16 mechanical connector slot (PCI-E x8 electrical) • Three PCI 33 MHz 32-bit slots
Other I/O	• Six USB 2.0 connectors (two on the front and four on the back of the workstation) • Two IEEE 1394 connectors on the front panel • Line-in/line-out jacks on the back panel • Microphone-in jack on the front and back panels • Headphone-out jack on the front panel

A.2 Memory Configurations

TABLE A-2 lists the possible memory configurations for the Sun Ultra 20 M2 Workstation.

The system requires DDR2-667, unbuffered, ECC DIMMs installed in pairs (except the base 512 MB configuration). You can purchase DIMM kits at:

http://store.sun.com

DIMM slots are numbered from DIMM 0 to DIMM 3. Populate DIMM slots starting farthest from the CPU (that is, starting with slot 3).

TABLE A-2 Sun Ultra 20 M2 Workstation Memory Configurations

Total Memory	Supported DIMM Configuration 1	Supported DIMM Configuration 2
512 MB	1 x 512 MB	
1 GB	2 x 512 MB	
2 GB	2 x 1 GB	4 x 512 MB
3 GB	2 x 1 GB and 2 x 512 MB	
4 GB	2 x 2 GB	4 x 1 GB
5 GB	2 x 2 GB and 2 x 512 MB	
6 GB	2 x 2 GB and 2 x 1 GB	
8 GB	4 x 2 GB	

A.3 PCI-E and PCI Expansion Slots

TABLE A-3 lists the characteristics of the available PCI-E and PCI expansion slots.

TABLE A-3 Internal Expansion Slots

Slot	Connector Type	Length	Height	Description	Position
0	PCI-Express x16 (x16 electrical)	x16	Full	Nearest to power supply. For FX 3500, FX 1500, FX 560, or NVS 285 graphics accelerator, or any PCI-Express expansion cards such as NIC adapters.	Top
1	PCI-Express x1	x1	Full	Not for graphics accelerators. Intended for PCI-Express expansion cards such as NIC.	Middle
2	PCI-Express x16 mechanical (x8 electrical)	x16	Full	Not for graphics accelerators. Intended for PCI-Express expansion cards such as NIC.	Bottom
0	Conventional PCI (PCI v2.3 32-bit/33 Mhz, 5V)	Full	Full	Open slot. Accommodates only 32-bit cards. 64-bit cards will not fit on the motherboard.	Top
1	Conventional PCI (PCI v2.3 32-bit/33 Mhz, 5V)	Full	Full	Open slot. Accommodates 64-bit PCI cards, but cards operate in 32-bit mode.	Middle
2	Conventional PCI (PCI v2.3 32-bit/33 Mhz, 5V)	Full	Full	Open slot (farthest from power supply). Accommodates 64-bit PCI cards, but cards operate in 32-bit mode.	Bottom

A.4 Physical Specifications

TABLE A-4 lists the physical specifications for the Sun Ultra 20 M2 Workstation.

TABLE A-4 Sun Ultra 20 M2 Workstation Physical Specifications

Specification	British	Metric
Width	7.9 in.	200 mm

TABLE A-4 Sun Ultra 20 M2 Workstation Physical Specifications

Specification	British	Metric
Depth	18.5 in.	470 mm
Height	17.1 in.	435 mm
Weight (max with packaging)	34 lb	15.4 kg

A.5 Power Specifications

The maximum continuous power for the Sun Ultra 20 M2 Workstation is 400W.

TABLE A-5, TABLE A-6, and TABLE A-7 list additional power specifications for the system.

TABLE A-5 Input Voltage Range

Input Voltage	Minimum	Nominal	Maximum	Units
Range 1	90	115	132	Vrms
Range 2	180	230	264	Vrms

TABLE A-6 Input Frequency Range

Input Frequency	Minimum	Nominal	Maximum	Units
Range 1	57	60	63	Hz
Range 2	47	50	53	Hz

TABLE A-7 Input Current

Input Voltage	Maximum Input Current	Maximum Inrush Current
Range 1	10A	50 A_{peak}
Range 2	5A	100 A_{peak}

A.6 Environmental Specifications

TABLE A-8 lists the environmental specifications for the Sun Ultra 20 M2 Workstation.

TABLE A-8 Sun Ultra 20 M2 Workstation Environmental Specifications

Specification	State	British	Metric
Humidity	Operating	7%–93% RH noncondensing, 100.4˚ F max wet bulb	7%–93% RH noncondensing, 38˚ C max wet bulb
	Nonoperating	93% RH, noncondensing, 109.4˚ F max wet bulb	93% RH, noncondensing, 43˚ C max wet bulb
Vibration	Operating	0.25G in all axes, 5–500 Hz sine	
	Nonoperating	1.2G in all axes, 5–500 Hz sine	
Shock	Operating	4.5G, 11 msec. half-sine	
Temperature	Operating	41˚ F to 95˚ F	5˚ C to 35˚ C
	Nonoperating	–40˚ F to 149˚ F	–40˚ C to 65˚ C
Maximum operating temperature rating		–1.8˚ F for every 985 ft in altitude	–1˚ C for every 300 m in altitude
Altitude	Operating	max 9,843 ft	max 3,000 m
	Nonoperating	max 39,370 ft	max 12,000 m

APPENDIX **B**

BIOS POST Codes

Typically, the BIOS displays warning or error messages on the video display in the event of hardware or configuration errors.

However, if the error is so severe that the BIOS halts immediately or cannot initialize the video, you can read the last executed POST code from the port 80 LED.

The port 80 LED is located on the motherboard (see FIGURE B-1). The BIOS POST codes are listed in TABLE B-1.

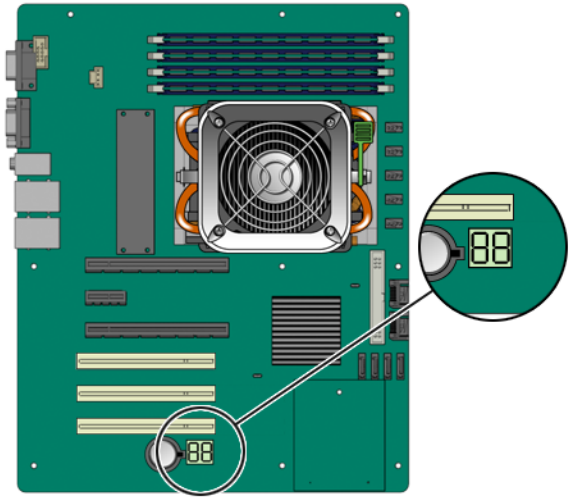


FIGURE B-1 Location of Port 80 LED

TABLE B-1 BIOS Port 80 POST Codes

Post Code	Description
CFh	Test CMOS R/W functionality.
C0h	Early chipset initialization: • Disable shadow RAM. • Disable L2 cache (socket 7 or below). • Program basic chipset registers.
C1h	Detect memory: • Auto-detection of DRAM size, type, and ECC. • Auto-detection of L2 cache (socket 7 or below).
C3h	Expand compressed BIOS code to DRAM.
C5h	Call chipset hook to copy BIOS back to E000 & F000 shadow RAM.
01h	Expand the Xgroup codes locating in physical address 1000:0.
02h	Reserved.
03h	Initial Superio_Early_Init switch.
04h	Reserved.
05h	1. Blank out screen. 2. Clear CMOS error flag.
06h	Reserved.
07h	1. Clear 8042 interface. 2. Initialize 8042 self-test.
08h	1. Test special keyboard controller for Winbond 977 series Super I/O chips. 2. Enable keyboard interface.
09h	Reserved.
0Ah	1. Disable PS/2 mouse interface (optional). 2. Auto-detect ports for keyboard and mouse followed by a port and interface swap (optional). 3. Reset keyboard for Winbond 977 series Super I/O chips.
0Bh	Reserved.
0Ch	Reserved.
0Dh	Reserved.
0Eh	Test F000h segment shadow to see whether it is read/write-able or not. If test fails, keep beeping the speaker.
0Fh	Reserved.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
10h	Auto-detect flash type to load appropriate flash R/W codes into the run -time area in F000 for ESCD & DMI support.
11h	Reserved.
12h	Use walking 1's algorithm to check out interface in CMOS circuitry. Also, set real-time clock power status, and then check for override.
13h	Reserved.
14h	Program chipset default values into chipset. Chipset default values are MODBINable by OEM customers.
15h	Reserved.
16h	Initial onboard clock generator if Early_Init_Onboard_Generator is defined. See also POST 26h.
17h	Reserved.
18h	Detect CPU information including brand, SMI type (Cyrix or Intel), and CPU level (586 or 686).
19h	Reserved.
1Ah	Reserved.
1Bh	Initial interrupts vector table. If no special specified, all hardware interrupts are directed to SPURIOUS_INT_HDLR and software interrupts to SPURIOUS_soft_HDLR.
1Ch	Reserved.
1Dh	Initial EARLY_PM_INIT switch.
1Eh	Reserved.
1Fh	Load keyboard matrix (notebook platform).
20h	Reserved.
21h	HPM initialization (notebook platform).
22h	Reserved.
23h	1. Check validity of RTC value. For example, a value of 5Ah is an invalid value for RTC minute. 2. Load CMOS settings into BIOS stack. If CMOS checksum fails, use default value instead.
24h	Prepare BIOS resource map for PCI and PnP use. If ESCD is valid, consider the ESCD's legacy information.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
25h	Early PCI initialization: • Enumerate PCI bus number. • Assign memory and I/O resource. • Search for a valid VGA device and VGA BIOS, and put it into C000:0.
26h	1. If Early_Init_Onboard_Generator is not defined, Onboard clock generator initialization. Disable respective clock resource to empty PCI and DIMM slots. 2. Init onboard PWM. 3. Init onboard H/W monitor devices.
27h	Initialize INT 09 buffer.
28h	Reserved.
29h	1. Program CPU internal MTRR (P6 and PII) for 0-640K memory address. 2. Initialize the APIC for Pentium class CPU. 3. Program early chipset according to CMOS setup. Example: onboard IDE controller. 4. Measure CPU speed.
2Ah	Reserved.
2Bh	Invoke video BIOS.
2Ch	Reserved.
2Dh	1. Initialize double-byte language font (optional). 2. Put information onscreen display, including award title, CPU type, CPU speed, and full screen logo.
2Eh	Reserved.
2Fh	Reserved.
30h	Reserved.
31h	Reserved.
32h	Reserved.
33h	Reset keyboard if Early_Reset_KB is defined. For example, Winbond 977 series Super I/O chips. See also POST 63h.
34h	Reserved.
35h	Test DMA Channel 0.
36h	Reserved.
37h	Test DMA Channel 1.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
38h	Reserved.
39h	Test DMA page registers.
3Ah	Reserved.
3Bh	Reserved.
3Ch	Test 8254.
3Dh	Reserved.
3Eh	Test 8259 interrupt mask bits for channel 1.
3Fh	Reserved.
40h	Test 8259 interrupt mask bits for channel 2.
41h	Reserved.
42h	Reserved.
43h	Test 8259 functionality.
44h	Reserved.
45h	Reserved.
46h	Reserved.
47h	Initialize EISA slot.
48h	Reserved.
49h	1. Calculate total memory by testing the last double word of each 64K page. 2. Program-write allocation for AMD K5 CPU.
4Ah	Reserved.
4Bh	Reserved.
4Ch	Reserved.
4Dh	Reserved.
4Eh	1. Program MTRR of M1 CPU. 2. Initialize the L2 cache for P6 class CPU and program CPU with proper cacheable range. 3. Initialize the APIC for P6 class CPU. 4. On MP platform, adjust the cacheable range to a smaller one in case the cacheable ranges between each CPU are not identical.
4Fh	Reserved.
50h	Initialize USB keyboard and mouse.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
51h	Reserved.
52h	Test all memory (clear all extended memory to 0).
53h	Clear the password according to H/W jumper (optional).
54h	Reserved.
55h	Display the number of processors (multiprocessor platform).
56h	Reserved.
57h	1. Display PnP logo. 2. Early ISA PnP initialization. Assign CSN to every ISA PnP device.
58h	Reserved.
59h	Initialize the combined Trend Anti-Virus code.
5Ah	Reserved.
5Bh	(Optional feature) Show message for entering AWDFLASH.EXE from FDD.
5Ch	Reserved.
5Dh	1. Initialize Init_Onboard_Super_IO. 2. Initialize Init_Onbaord_AUDIO.
5Eh	Reserved.
5Fh	Reserved.
60h	Okay to enter setup utility; users cannot enter the CMOS setup utility until this POST stage.
61h	Reserved.
62h	Reserved.
63h	Reset keyboard if Early_Reset_KB is not defined.
64h	Reserved.
65h	Initialize PS/2 Mouse.
66h	Reserved.
67h	Prepare memory size information for function call: INT 15h ax=E820h.
68h	Reserved.
69h	Turn on L2 cache.
6Ah	Reserved.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
6Bh	Program chipset registers according to items described in Setup & Auto-configuration table.
6Ch	Reserved.
6Dh	1. Assign resources to all ISA PnP devices. 2. Auto assign ports to onboard COM ports if the corresponding item in Setup is set to AUTO.
6Eh	Reserved.
6Fh	1. Initialize diskette controller. 2. Set up diskette-related fields in 40:hardware.
70h	Reserved.
71h	Reserved.
72h	Reserved.
73h	Reserved.
74h	Reserved.
75h	Detect and install all IDE devices: HDD, LS120, ZIP, CD-ROM, and so on
76h	(Optional Feature) Enter AWDFLASH.EXE if: • AWDFLASH.EXE is found on diskette drive. • ALT+F2 is pressed.
77h	Detect serial ports and parallel ports.
78h	Reserved.
79h	Reserved.
7Ah	Detect and install co-processor.
7Bh	Reserved.
7Ch	Init HDD write-protect.
7Dh	Reserved.
7Eh	Reserved.
7Fh	Switch back to text mode if full-screen logo is supported. • If errors occur, report errors and wait for keys. • If no errors occur or you press the F1 key to continue: Clear EPA or customization logo.
80h	Reserved.
81h	Reserved.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
E8POST.ASM starts.	
82h	1. Call chipset power management hook. 2. Recover the text font used by EPA logo (not for full screen logo). 3. If password is set, ask for password.
83h	Save all data in stack back to CMOS.
84h	Initialize ISA PnP boot devices.
85h	1. USB final initialization. 2. Switch screen back to text mode.
86h	Reserved.
87h	NET PC: Build SYSID Structure.
88h	Reserved.
89h	1. Assign IRQs to PCI devices. 2. Set up ACPI table at top of the memory.
8Ah	Reserved.
8Bh	1. Invoke all ISA adapter ROMs. 2. Invoke all PCI ROMs (except VGA).
8Ch	Reserved.
8Dh	1. Enable/disable parity check according to CMOS setup. 2. APM initialization.
8Eh	Reserved.
8Fh	Clear noise of IRQs.
90h	Reserved.
91h	Reserved.
92h	Reserved.
93h	Read HDD boot sector information for Trend Anti-Virus code.
94h	1. Enable L2 cache. 2. Program Daylight Saving. 3. Program boot-up speed. 4. Chipset final initialization. 5. Power management final initialization. 6. Clear screen and display summary table. 7. Program K6 write allocation. 8. Program P6 class write combining.

TABLE B-1 BIOS Port 80 POST Codes *(Continued)*

Post Code	Description
95h	Update keyboard LED and typematic rate.
96h	1. Build MP table. 2. Build and update ESCD. 3. Set CMOS century to 20h or 19h. 4. Load CMOS time into DOS timer tick. 5. Build MSIRQ routing table.
FFh	Boot attempt (INT 19h).

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