Sun Ultra™ 20 Workstation User Guide

Sun Microsystems, Inc.
www.sun.com

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Preface

The *Sun Ultra 20 Workstation User Guide* provides a detailed description of the hardware and software applications used to support the Sun Ultra 20 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 contains an overview of the Sun Ultra 20 Workstation.

Chapter 2 contains information on troubleshooting the workstation.

Chapter 3 contains information on diagnostics.

Chapter 4 contains information on removing and replacing components.

Appendix A contains information on system specifications.

Appendix B contains information on using multiple monitors with the Sun Ultra 20 Workstation.

Appendix C 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 Workstation is described in the *Where To Find Documentation* sheet that is packed with your system, and all documents are posted at the product's documentation site. See the following URL:

http://www.sun.com/products-n-solutions/hardware/docs/Workstation_Products/Workstations/ultra_20/index.html

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, Russian, Spanish, and Swedish.

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 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

Third-Party Web Sites

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Please include the title and part number of your document with your feedback: *Sun Ultra 20 Workstation User Guide*, 819-2146-13.

CHAPTER 1

Introduction to the Sun Ultra 20 Workstation

This chapter provides an overview of the Sun Ultra 20 Workstation, as well as power-on and power-off procedures and information on adding more components.

The following sections are included in this chapter:

1.1 Features

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

TABLE 1-1 Sun Ultra 20 Workstation Features

Component	Description
CPU	• One single- or dual-core AMD Opteron processor • Processor frequencies: 1.8 GHz and faster • Up to 1 MB level 2 cache
Memory	• Four DIMM slots • 256 MB, 512 MB, or 1 GB unbuffered DDR 400 SDRAM (3.05 cm max. height) modules supported
Media storage	DVD-ROM or DVD-RW
Hard disk drives	Up to two SATA disk drivers
Power supply	400W PSU
Network I/O	Onboard 10/100/1000BASE-T Gigabit Ethernet controller
Video	Onboard ATI graphics controller with DB15 VGA graphics connector
PCI I/O	• One PCI Express x16 graphics slot • Two PCI Express x1 expansion slots • Four 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 (FireWire) connectors on the front panel • Line-in/line-out jacks on the back panel • Microphone-in jack on the front panel • Headphone-out jack on the front panel • Onboard PCI graphics controller with 8 MB memory
Hardware RAID	Hardware RAID 0 and 1 for internal SATA disks • RAID 0 – stripped • RAID 1 – mirrored

1.2 Operating System and Software

The following sections describe the preinstalled and supported software for the Sun Ultra 20 Workstation.

1.2.1 Preinstalled Operating System and Software

Solaris™ 10 Operating System, Sun™ Studio 10, Sun Java™ Studio Creator, and Sun Java™ Studio Enterprise software are preinstalled on your system.

For information on configuring the preinstalled Solaris 10 and other software for the Sun Ultra 20 Workstation, refer to the *Sun Ultra 20 Workstation Getting Started Guide*, 819-2148.

For detailed information on Solaris 10 and other software, see the Sun software documentation site at:

http://docs.sun.com

1.2.2 Supported Operating System Software

Your Sun Ultra 20 Workstation has the Solaris 10 Operating System preinstalled. If you want to install another operating system on your workstation, the following additional operating systems (or later versions) are supported for the Sun Ultra 20 Workstation:

- Solaris 10 Operating System
- Red Hat Enterprise Linux 3 WS Update 6, 32-bit and 64-bit
- Red Hat Enterprise Linux 4 WS Update 2, 32-bit and 64-bit
- SUSE Linux Enterprise System 9 SP 3 32-bit and 64-bit
- Windows XP, 32-bit (SP2) and 64-bit (WHQL certified)

Instructions for installing these operating systems are available in the media sets that are packaged with the operating system software. For an updated list of supported operating systems, refer to the the following web site:

http://www.sun.com/ultra20

If you want to run Red Hat Enterprise Linux WS or SUSE Linux Enterprise System on the Sun Ultra 20 Workstation, you can order it from the from the following web site:

http://wwws.sun.com/software/linux/index.html

Before installing an operating system, refer to the *Sun Ultra 20 Workstation Getting Started Guide*, 819-2148, for further information on updates and drivers that must be installed.

1.2.3 Supplemental CD Software

The Sun Ultra 20 Workstation Supplemental CD, included with the workstation, contains the following software:

- Supplemental drivers to support preinstalled or user-installed operating systems. See the *Sun Ultra 20 Workstation Getting Started Guide*, 819-2148, for information on installing these drivers.
- Eurosoft Pc-Check diagnostics software, which provides various diagnostics testing options for the Sun Ultra 20 Workstation. See Section , “Diagnostics” on page 3-1 for more information.
- Erase Primary Boot Hard Disk utility to erase the preinstalled operating system
- XpReburn utility to add drivers to an existing XP installation CD
- Open DOS

1.3 Hardware System Overview

The following sections describe the hardware orientation and features of your Sun Ultra 20 Workstation.

1.3.1 External Components

This section describes the front and back panels of the Sun Ultra 20 Workstation.

FIGURE 1-1 illustrates the front panel of the Sun Ultra 20 Workstation.

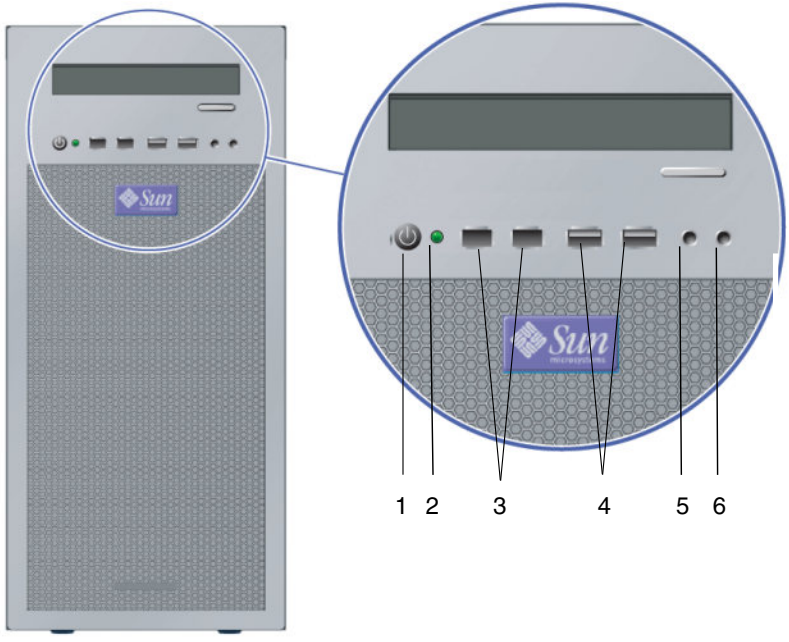

FIGURE 1-1 Front Panel

TABLE 1-2 Front Panel

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

FIGURE 1-2 depicts the back panel of the Sun Ultra 20 Workstation.

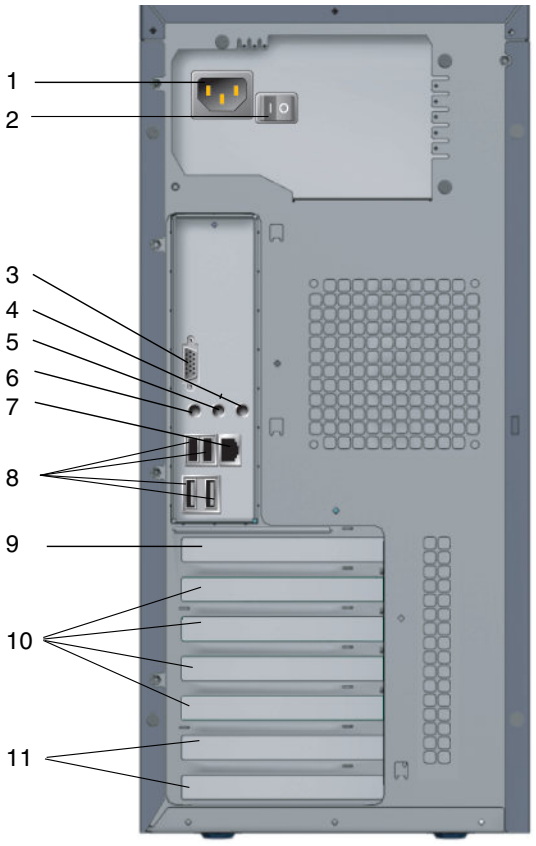

FIGURE 1-2 Back Panel

TABLE 1-3 Back Panel

Label	Connector/Slot	Label	Connector/Slot
1	Power connector	7	Ethernet connector
2	Power switch	8	Four USB connectors
3	Onboard DB15 VGA graphics connector	9	PCI Express x16 graphics slot
4	Microphone jack	10	Four PCI slots
5	Line-in jack	11	Two PCI Express x1 slots
6	Line-out jack		

1.3.2 Internal Components

FIGURE 1-3 shows the locations of the components inside the Sun Ultra 20 Workstation.

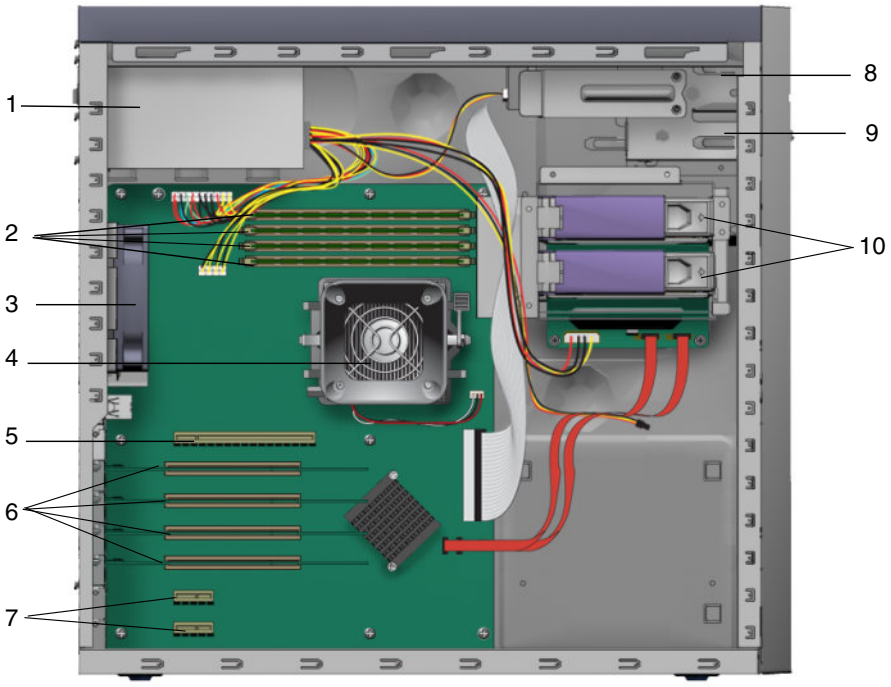

FIGURE 1-3 Sun Ultra 20 Workstation System Components

TABLE 1-4 System Components

Label	Component	Label	Component
1	Power supply	6	Four PCI 33 Mhz slots
2	Four DIMM slots	7	Two PCI Express x1 slots
3	System fan	8	DVD drive
4	Heatsink/fan/CPU	9	I/O board
5	PCI Express x16 graphics slot	10	Hard disk drives (up to 2)

1.4 Powering the Workstation On and Off

1.4.1 Powering On the Workstation

After making sure that you set up the system properly and connected all the required cables explained in the *Sun Ultra 20 Workstation Getting Started Guide*, 819-2148, you can now power on your system.

Tip – If you are installing optional internal components such as additional memory DIMMs, PCI cards, optical drives, or hard drives, install those components before you power on the workstation. See Chapter 4 for remove and replace procedures. If you are not installing optional components, you are ready to power on the workstation.

Follow these steps 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 workstation Power button on the front panel** (FIGURE 1-1)**.**
4. **After several seconds, verify that the platform power LED next to the Power button is lit.**

   The platform power LED lights after the workstation begins the internal booting process (FIGURE 1-1).

5. **After the system finishes booting, configure the preinstalled Solaris 10 Operating System or install another supported operating system.**

   See the *Sun Ultra 20 Workstation Getting Started Guide*, 819-2148, for more information on configuring the preinstalled operating system or installing an additional operating system.

   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.

1.4.2 Powering Off the Workstation

1. **Save your data and close any open applications.**
2. **Read all of the following power-off options before powering off the workstation:**
   - Power off the workstation by using the operating system shut down command or menu option.

     In most cases, this will power down the operating system, then turn off the power to the workstation.
   - If the workstation power does not shut off through the operating system command or this command is not available, press and release the Power button (location shown in FIGURE 1-2).

     This initiates an orderly shutdown of the operating system and powers off the workstation.

Caution – To avoid data loss, use one of the first two options whenever possible.

   - If the workstation power is not shut off with one of the first two options, press and hold the Power button for approximately four seconds.

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

If the proceeding options fail to power off the workstation, see Chapter 2, Section , "Troubleshooting" on page 2-1 for more options.

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

1.4.3 Power Interruptions

If the power to the system is interrupted for less than ten seconds, do the following to ensure that the standby power is completely shut off:

1. **Unplug the AC power cord from the workstation or turn off the power switch on the back panel of the workstation.**
2. **Wait ten or more seconds.**
3. **Plug the power AC cord into the workstation.**
4. **Power on the workstation.**

1.5 Customer-Orderable Components

You can order additional components and replacement parts for the Sun Ultra 20 Workstation.

Contact your local Sun sales representative for more information. For the most up-to-date component information, see the Sun Ultra 20 Workstation components list at the following web site:

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

CHAPTER 2

Troubleshooting

This chapter contains information on troubleshooting procedures, power-on self-test (POST) codes and technical support contacts.

The following sections are included in this chapter:

2.1 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 2.2, "Visual Inspection" on page 2-2.
- View the troubleshooting procedures in Section 2.3, "Troubleshooting Procedures" on page 2-4, to see if any of them solve the problem.

- See troubleshooting procedures described in Section 2.3, “Troubleshooting Procedures” on page 2-4.
- Execute diagnostics test as described in Chapter 3, Section , “Diagnostics” on page 3-1.

If you are not able to resolve the problem, contact Sun technical support. Support numbers and web sites are listed in Section 2.4, “Technical Assistance” on page 2-7.

2.2 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 the external switches, controls, and cable connections. See Section 2.2.1, “Performing an External Visual Inspection” on page 2-2.

If this does not resolve your problem, then visually inspect the system’s interior hardware for problems such as a loose card, cable connector, or mounting screw. See Section 2.2.2, “Performing an Internal Visual Inspection” on page 2-2.

2.2.1 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, as well as any devices attached to the serial port.**

2.2.2 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 panel, following the procedures in** Section 4.2, “Installation Precautions” on page 4-1**.**

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 panel.**
8. **Reconnect the system and any attached peripherals to their power sources, and then power them on.**

2.3 Troubleshooting Procedures

TABLE 2-1 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 3).

TABLE 2-1 Troubleshooting Procedures

Problem	Possible solution
Workstation does not power on when the front-panel Power button is pressed.	Keep notes on the following situations in case you need to call Sun technical support: • 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? Ensure that the keyboard is plugged in. • Test with another keyboard that you know is functional. Does the system beep when you connect the keyboard and power on the system? • 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 connector?
Workstation halts during POST without displaying error messages.	Check the BIOS POST LED display on the motherboard. See Appendix C 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?
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.

TABLE 2-1 Troubleshooting Procedures *(Continued)*

Problem	Possible solution
Workstation does not power off when the front-panel Power button is pressed.	• Try all of the power-off options shown in Section 1.4.2, "Powering Off the Workstation" on page 1-9. • If the workstation still does not power off, disconnect the power cable from the back of the chassis.
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.
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.
System cannot read the disk information.	Do the following: 1. Turn off the workstation by pressing the Power button. 2. Remove the left-side panel. 3. Check to make sure that the power and data cables are connected to the disk drive and that the pins in the cable and connector are not bent. 4. Replace the left-side panel. 5. Turn on the workstation.
System cannot read CD or DVD information.	Check the following: • Are you using the correct type of CD/DVD? • Is the CD/DVD properly inserted in the drive? • Is the CD/DVD clean and unscratched? • Are the cables connected to the DVD drive?
Keyboard or mouse does not respond to actions.	• 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.
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.

TABLE 2-1 Troubleshooting Procedures *(Continued)*

Problem	Possible solution
Hung or frozen workstation: No response from mouse or keyboard or any application.	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 1.4.2, "Powering Off the Workstation" on page 1-9 for more detailed information.
There is no video display on the monitor screen.	Check the following: • 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.
External device is not working.	• Check the documentation packaged with the device to see if any device drivers must be installed. • 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, reattach the external device, and power on the system.
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 256 MB, 512 MB, or 1 GB DDR 400 SDRAM modules with 3.05 cm max. height. • Make sure that the memory is installed in pairs.

2.4 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 2-2.

TABLE 2-2 Sun Web Sites and Telephone Numbers

Workstation Documents and Support Resources	URL or Telephone Number
PDF files for all the current Sun Ultra 20 Workstation documents.	http://www.sun.com/documentation/
Solaris 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 3

Diagnostics

This chapter assists you with using the Diagnostics section of the Sun Ultra 20 Workstation Supplemental CD that is packaged with your system. Diagnostic output is accessible on systems that are running supported Linux or Solaris operating systems. If you are having specific problems with your system, use the Pc-Check Diagnostics software to diagnose and solve these issues.

The following sections are included in this chapter:

3.1 Pc-Check Diagnostics Overview

Sun Ultra 20 Workstation diagnostics are contained in the DOS-based Pc-Check utility. This program can only be accessed and executed from the Sun Ultra 20 Workstation Supplemental CD. Pc-Check was designed to detect and test all motherboard components, ports and slots.

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

- Advanced Diagnostics Test: A specific hardware component test
- Immediate Burn-in Test: A Sun-supplied Sun Ultra 20 diagnositic script

The following steps show how to access these test options from the Sun Ultra 20 Workstation Supplemental CD.

To access the Pc-Check Diagnostics main menu:

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

   The system boots to the Sun Ultra 20 Workstation Supplemental CD main menu.

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

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

   - 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

   To run a specific hardware component test, select "Advanced Diagnostics Test".

   To run one of the Sun-supplied test scripts, select "Immediate Burn-in Testing".

   All navigation is performed by the arrow keys located on keyboard, the Enter key to select a menu selection, and the ESC key to exit a menu (or submenu). Navigation instructions are shown at the bottom of each screen.

   The following sections in this chapter describe the menu items and tests in detail.

3.2 System Information Menu

TABLE 3-1 describes each option in the System Information menu.

TABLE 3-1 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 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.
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.

TABLE 3-1 System Information Menu Options *(Continued)*

Option	Description
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 Workstation.
Text File Editor	Opens a file editor.
Start-Up Options	Enables you to set up options for diagnostics testing.

3.3 Advanced Diagnostics

TABLE 3-2 gives the name and a brief description of each option in the Advanced Diagnostics Tests Menu.

TABLE 3-2 Advanced Diagnostics 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 Workstation.
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 3.3.1, "Hard Disk Testing" on page 3-6, 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.

TABLE 3-2 Advanced Diagnostics Menu Options *(Continued)*

Option	Description
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 Workstation.
Parallel Ports	Not applicable for the Sun Ultra 20 Workstation.
Modems	Not applicable for the Sun Ultra 20 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	Details information about the joystick, 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	Printers are not available for the Sun Ultra 20 Workstation.
Firmware - ACPI	Details information about Advanced Configurable Power Interface (ACPI), and includes an ACPI Tests menu to test ACPI.

3.3.1 Hard Disk Testing

To test the hard disk:

1. **From the main menu, choose Advanced Diagnostics Tests.**
2. **From the Advanced Diagnostics menu, choose Hard Disks.**
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 hard drive hardware, such as the physical disk.

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

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 hard drive 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. Your options within Test Settings include the following:

- **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**

3.4 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. The user 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 may require loopback connectors). The user must interact with the test utility to progress through these interactive tests.

Tip – Each of these scripts test 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 3.3.1, "Hard Disk Testing" on page 3-6 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 3-3 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 3-3 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	Enter 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`.
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:

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

  The top portion of the window lists the options described in TABLE 3-3, and the bottom portion of the window lists the following Burn-in menu options:

  - **Load Burn-in Script**

    Enter one of the following:

    - **`quick.tst`**, **`noinput.tst`**, or **`full.tst`**
    - If you created and saved your own script, enter **`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, enter **`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 3-3 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.

3.5 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 3-3, and the bottom portion of the window lists the following Burn-in menu options:

  - **Load Burn-in Script**

    Enter one of the following:

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

    Where *testname* is the name that you created.

- **Save Burn-in Script**

  To save a burn-in script that you created, enter **`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 3-3 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.

3.6 Create Diagnostic Partition

The diagnostic partition is preinstalled on the Sun Ultra 20 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 Supplemental CD preserves the diagnostic partition.

The Create Diagnostic Partition option installs a diagnostic partition on the first bootable disk seen by the Sun Ultra 20 Workstation. The first bootable disk is on the primary/master SATA device.

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

- Section 3.6.1, "Removing Existing Partitions From a Hard Disk" on page 3-12
- Section 3.6.2, "Adding a Diagnostic Partition to the First Bootable Disk" on page 3-13
- Section 3.6.3, "Creating a Log File on the Diagnostic Partition" on page 3-13
- Section 3.6.4, "Accessing the Diagnostic Partition Under Red Hat Linux" on page 3-14
- Section 3.6.5, "Accessing the Diagnostic Partition Under the Solaris 10 Operating System" on page 3-16
- Section 3.6.6, "Accessing the Diagnostic Partition Under Windows XP" on page 3-17

3.6.1 Removing Existing Partitions From a Hard Disk

The Create Diagnostic Partition option creates a diagnostic partition on a hard disk only if that hard disk is completely free of any partitions. You need to delete any existing partitions from a hard disk if you plan on using the hard disk to create a diagnostic partition on it.

Caution – Removing all hard disk partitions destroys all data on the disk.

There are two ways to remove existing partitions from the hard disk:

- Use the Erase Primary Boot Hard Disk utility (Option 3 on the Supplemental CD main menu).
- Use the following procedure:

1. **Insert the Supplemental CD into the DVD tray.**
2. **Reboot the workstation.**
3. **From the Supplemental CD main menu, type `4` to exit to DOS.**
4. **Type `fdisk` at the command prompt and press the Enter key.**
5. **Type `4` to select an alternate fixed disk.**

   The second hard disk as seen from `fdisk` is the first bootable disk of the system. The first hard disk as seen from `fdisk` is the bootable Supplemental CD.

Caution – When performing the following tests, be careful not to delete any operating system partitions that you want to keep. Removing hard disk partitions destroys all data on the disk.

6. **Type `2` to delete the DOS partition.**
7. **Type `1` or `2` depending on the type of partition you want to delete.**
8. **Type the number of the partition you want to delete.**
9. **Type `Y` to erase the data and the partition.**
10. **Repeat Step 6 through Step 9 until all partitions are removed.**
11. **Press the Esc key to exit, and press any key to reboot the workstation.**

3.6.2 Adding a Diagnostic Partition to the First Bootable Disk

Pc-Check can view the only first or second hard disk on the system from the boot loader. 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 Supplemental CD into the DVD tray.**
2. **Reboot the workstation.**
3. **At the Supplemental CD main menu, type `1` to run Hardware Diagnostics.**
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 Enter.
     - 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, go to Section 3.6.1, "Removing Existing Partitions From a Hard Disk" on page 3-12 to clear the partitions from the disk.
     - Repeat Step 1 through Step 4 of this procedure.
5. **Press Enter to reboot your workstation.**

3.6.3 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 corresponds 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 Supplemental CD into the DVD tray.**
2. **Reboot the workstation.**
3. **From the Supplemental CD main menu, choose `1` to run the Hardware Diagnostics software.**

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 Enter.**
   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 Enter.**
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.

3.6.4 Accessing the Diagnostic Partition Under Red Hat Linux

To access the diagnostic partition when you are running a Red Had Linux operating system:

1. **Remove the Supplemental CD from the DVD tray.**
2. **Reboot the workstation and start the Linux Red Hat operating system.**
3. **Become superuser.**
4. **Determine if your diagnostic partition is configured to be mounted by typing the following command:**

```
# ls /diagpart
```

- If this command fails to list the log files created by the hardware diagnostics software, then the operating system was not configured to mount the diagnostic partition. Continue to Step 5.
- If this command succeeds in listing the log files created by the hardware diagnostics software, then the operating system 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 Supplemental CD into the DVD tray.**
6. **When the CD is mounted, open up 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 to install the diagnostic partition:**

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

9. **Press Enter.**

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.

3.6.5 Accessing the Diagnostic Partition Under the Solaris 10 Operating System

To access the diagnostic partition when you are running the Solaris 10 Operating System:

1. **Remove the Supplemental CD from the DVD tray.**
2. **Reboot the machine and start the Solaris 10 Operating System.**
3. **Become superuser.**
4. **Type the following command to determine if your diagnostic partition is configured to be mounted:**

```
# ls /diagpart
```

   - If this command fails to list the log files created by the hardware diagnostics software then the operating system is not configured to mount the diagnostic partition. Continue to Step 5.
   - If this command succeeds in listing the log files created by the hardware diagnostics software, then the operating system 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 Supplemental CD into the DVD tray.**
6. **When the CD is mounted, open a terminal window.**
7. **Type the following:**

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

8. **Type the following 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
```

3.6.6 Accessing the Diagnostic Partition Under Windows XP

If you are running Windows XP on the Sun Ultra 20 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 Workstation and complete the following procedure:

1. **Connect the USB diskette drive to any USB port on the Sun Ultra 20 Workstation.**
2. **Insert the Supplemental CD into the DVD tray.**
3. **Reboot the workstation.**
4. **At the Supplemental CD main menu, type `3` to exit to DOS.**
5. **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.

3.7 Show Results Summary

The summary lists the tests run and shows the results. Pass, Fail, or N/A is listed for each option.

The following is a complete listing of all possible options that are available with the Supplemental CD. If your own system does not have all of these options, they might not be listed when the Show Results Summary displays.

- **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.

- **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 Workstation.

3.8 Print Results Report

The Print Results Report option enables you to print results of the diagnosis of your system.

Ensure that your workstation is connected to a printer, and then enter the required information to print the results.

3.9 About Pc-Check

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

3.10 Exit to DOS

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

CHAPTER 4

Maintaining the Workstation

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

4.1 Tools and Supplies Needed

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

4.2 Installation Precautions

Before removing the system's left-side access panel, read the following sections. These sections contain important ESD precautions, along with preinstallation and postinstallation instructions.

4.2.1 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 button on the back of the chassis before removing or replacing any of the system components.

4.2.2 Preinstallation Instructions

Always perform the following steps before you install any component:

1. **Turn off the system and all of the peripherals connected to it.**
2. **Turn off the power button on the back of the chassis and leave the AC power cord plugged in.**

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

Caution – Follow the ESD precautions described in Section 4.2.1, "ESD Precautions" on page 4-2 when handling a system component.

3. **Open the workstation.**

   See Section 4.3, "Opening the Workstation" on page 4-4, for the appropriate procedure for opening the workstation.

4.2.3 Postinstallation Instructions

Perform the following steps after installing a workstation component:

1. **Ensure that all of the components are installed as described in the step-by-step instructions.**

   See Section 4.5, "Component Replacement Procedures" on page 4-8.

2. **Reinstall any PCI cards or peripherals that you had previously removed.**

   See Section 4.5, "Component Replacement Procedures" on page 4-8.

3. **Reinstall the system's left-side panel and front bezel.**

   See Section 4.3, "Opening the Workstation" on page 4-4.

4. **Connect all external cables to the system.**

5. **Power on the system.**

   See Section 1.4.1, "Powering On the Workstation" on page 1-8.

Caution – If the left-side panel and hard disk drives were removed, do not operate the workstation for more than ten minutes. Improper cooling airflow might damage the system's components.

4.3 Opening the Workstation

Caution – Before you proceed, turn off your system and all of the peripherals connected to it. Refer to Section 4.2.2, "Preinstallation Instructions" on page 4-2.

4.3.1 Removing the Access Panel

You must remove the left-side access panel to gain access to the system's internal components.

1. **Turn off the system and all of the peripherals connected to it.**
2. **Loosen the two captive thumbscrews located on the edge of the left-side panel closest to the back panel.**
3. **Slide the panel toward the back of the workstation. Tilt the top edge of the panel out and then up to remove it from the chassis.**

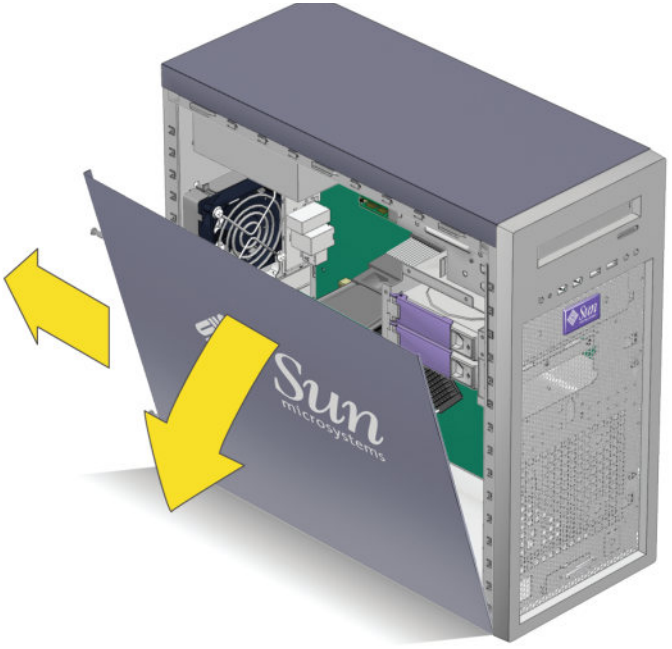

FIGURE 4-1 Removing the Side Panel

4.3.2 Removing the Front Bezel

1. **Remove the left-side access panel.**
2. **Loosen the four bezel tabs (see** FIGURE 4-2**).**

   Facing the left-front side of the bezel and starting with the topmost tab, carefully push each bezel-mounting tab about a millimeter and forward slightly.

   As you do this, you can see the edge of the bezel nearest the tab move slightly away from the front of the chassis.

Caution – Be very careful when pulling the bezel away from the chassis. Applying too much force might cause the bezel to break.

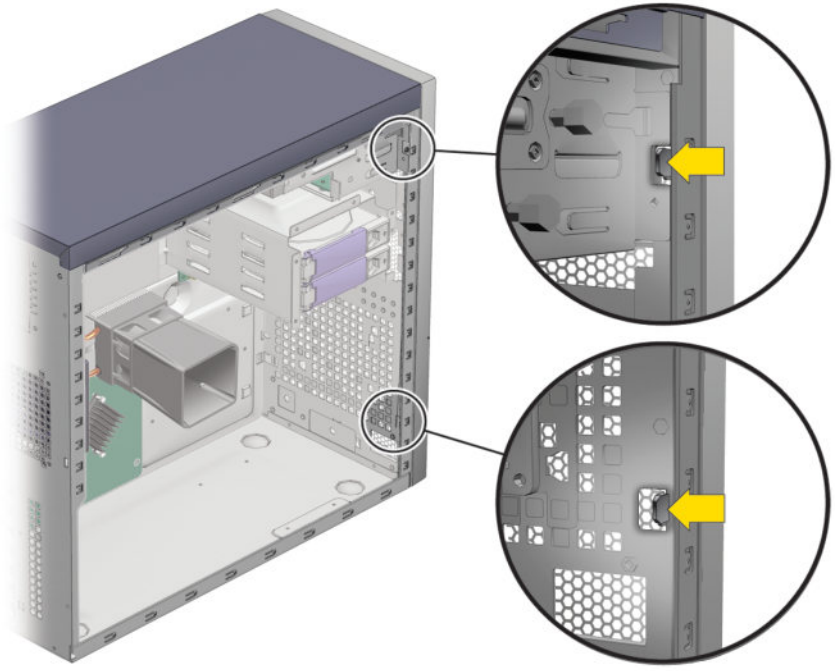

FIGURE 4-2 Releasing the Bezel Tabs

3. **Release the bezel.**

   a. **Move the left-front side of the bezel slightly forward, disengaging the left-side tabs from the chassis.**

   b. **Gently shift the bezel to the left, releasing it from the right-front chassis hooks and the chassis (see** FIGURE 4-3**).**

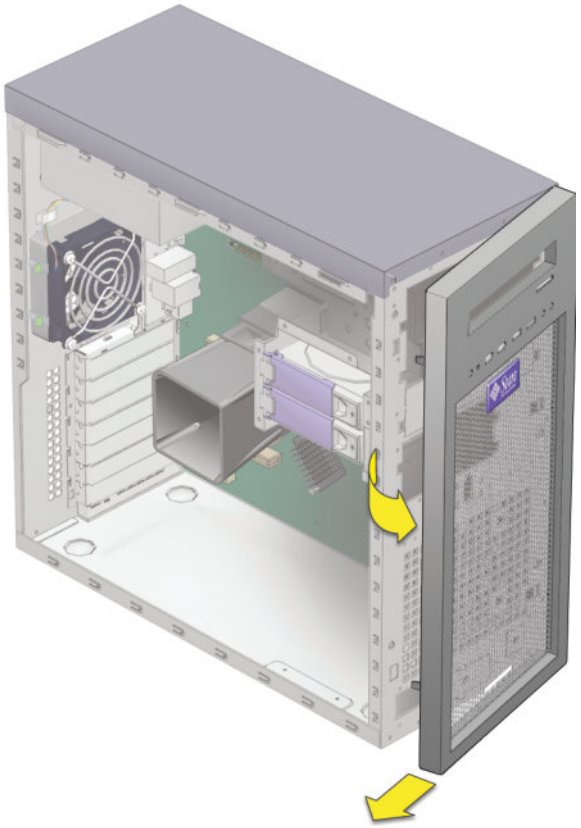

FIGURE 4-3 Removing the Bezel

   c. **Set the bezel aside.**

4.4 Location of Components

See FIGURE 4-4 to locate components before performing the remove and replace procedures.

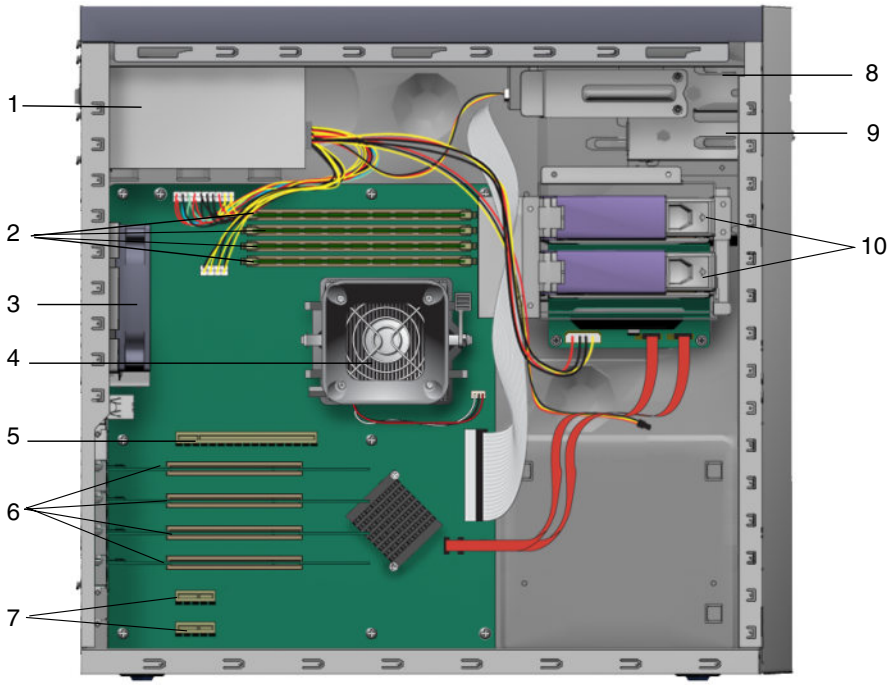

FIGURE 4-4 Sun Ultra 20 Workstation System Components

TABLE 4-1 System Components

Label	Component	Label	Component
1	Power supply	6	4 PCI 33 Mhz slots
2	4 DIMM slots (DIMM 1 is closest to the CPU)	7	2 PCI Express x1 slots
3	System fan	8	DVD drive
4	Heatsink/fan/CPU	9	I/O board
5	PCI Express x16 graphics slot	10	Hard disk drives (HDD 1 is the top drive, HDD 2 is the bottom drive)

4.5 Component Replacement Procedures

The following sections contain instructions for components that can be replaced by customers and field service personnel.

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

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

4.5.1 Replacing or Adding Hard Disk Drives

4.5.1.1 Removing a Hard Disk Drive

Note – The Sun Ultra 20 Workstation can accommodate up to two hard drives. If you are not removing an existing drive, proceed to Section 4.5.1.2, "Installing a Hard Disk Drive" on page 4-10.

To remove a hard disk drive:

1. **Turn off the power button on the back panel and open the chassis.**
2. **Locate the hard drive to be removed.**
3. **Unlock the hard drive handle by pushing the button to the right until the handle pops out (see** FIGURE 4-5**).**

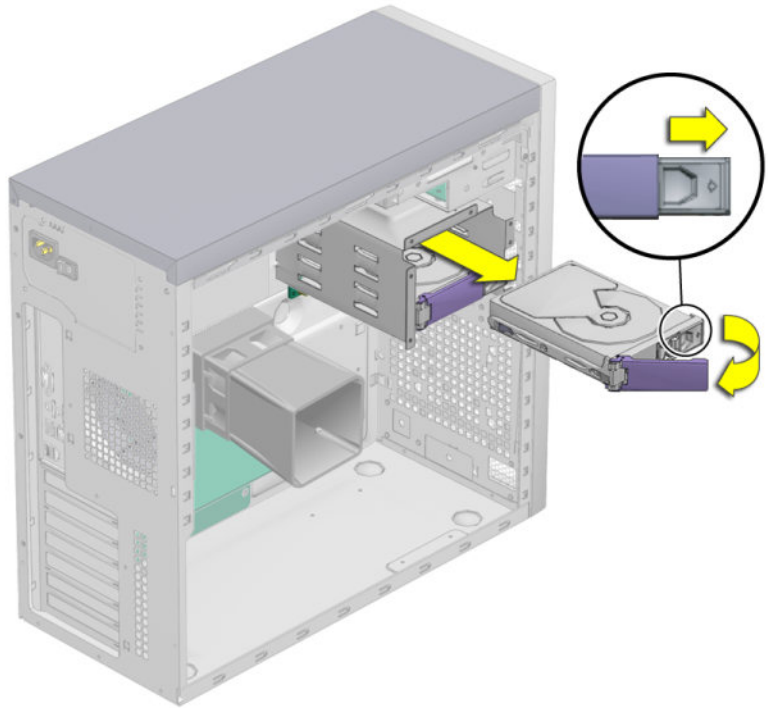

FIGURE 4-5 Removing a Hard Drive

4. **Disconnect the hard drive from the hard drive assembly by pulling the hard drive by the handle.**
5. **Set the hard drive aside on an antistatic mat.**
6. **Choose your next step:**
   - If you removed the hard drive to replace it, proceed to Section 4.5.1.2, "Installing a Hard Disk Drive" on page 4-10, to install the new hard drive.
   - If you removed the hard drive and will not replace it at this time, replace the left-side access panel and power on the system.

4.5.1.2 Installing a Hard Disk Drive

To install a hard disk drive:

1. **Turn off the power button on the back panel and open the chassis.**
2. **Remove the hard drive from its antistatic packaging.**
3. **Push the handle release button to the right until the hard drive handle pops open.**

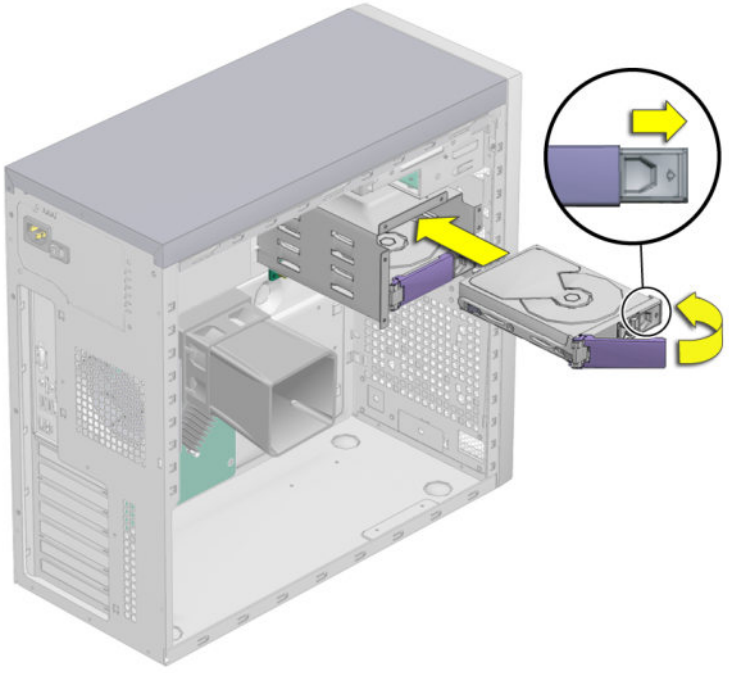

FIGURE 4-6 Installing a Hard Drive

4. **Locate the hard drive assembly and hard drive assembly guides.**

   If you are installing a second hard drive, install it in the remaining free slot in the hard drive assembly. The boot hard drive must be installed in hard drive slot HDD1 (top). The second hard drive bay is hard drive slot HDD2 (bottom).

5. **Align the hard drive with the hard drive assembly guides and slide the hard drive into the hard drive assembly until the hard drive handle begins to close.**

6. **Press the hard drive handle closed until it locks the hard drive in the hard drive assembly.**

   This seats the hard drive connector into the SATA backplane connector.

7. **Inspect the hard drive and related component fasteners to verify the following:**
   - The hard drive handle is locked.
   - The hard drive assembly is seated in the backplane connector.

8. **Replace the left-side access panel.**

4.5.2 Replacing the SATA Backplane

The SATA backplane is located behind the hard drive cage. The SATA backplane, the hard drives, and the hard drive bracket are collectively the hard drive assembly.

The hard drive assembly is installed in the hard drive bay. The hard drive power and interface cables connect to the hard drives through the SATA backplane.

This section describes removal and installation of the SATA backplane. Topics include:

- Section 4.5.2.1, “Removing the SATA Backplane” on page 4-12
- Section 4.5.2.2, “Installing the SATA Backplane” on page 4-14

4.5.2.1 Removing the SATA Backplane

To remove a SATA backplane:

1. **Turn off the power button on the back panel open the chassis, and locate the SATA backplane (see** FIGURE 4-7**).**

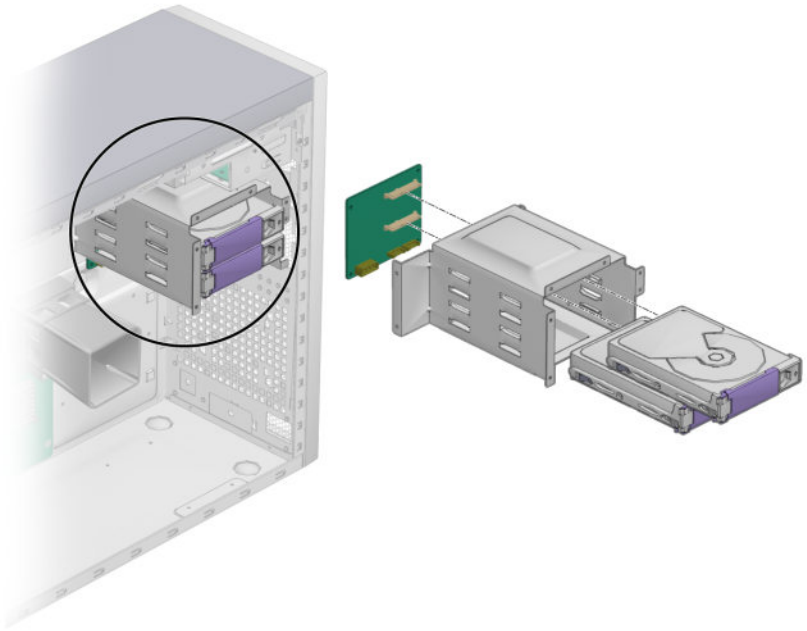

FIGURE 4-7 Location of the SATA Backplane

2. **Remove all installed hard drives.**

   See Section 4.5.1.1, “Removing a Hard Disk Drive” on page 4-9.

3. **Set the hard drive(s) on an antistatic mat.**

4. **Disconnect the cables (see** FIGURE 4-8**).**

   a. **Disconnect the power cable from the SATA backplane.**

   b. **Disconnect the SATA data cables from the SATA backplane.**

   c. **Temporarily mark the cables to ensure proper orientation when replacing the part.**

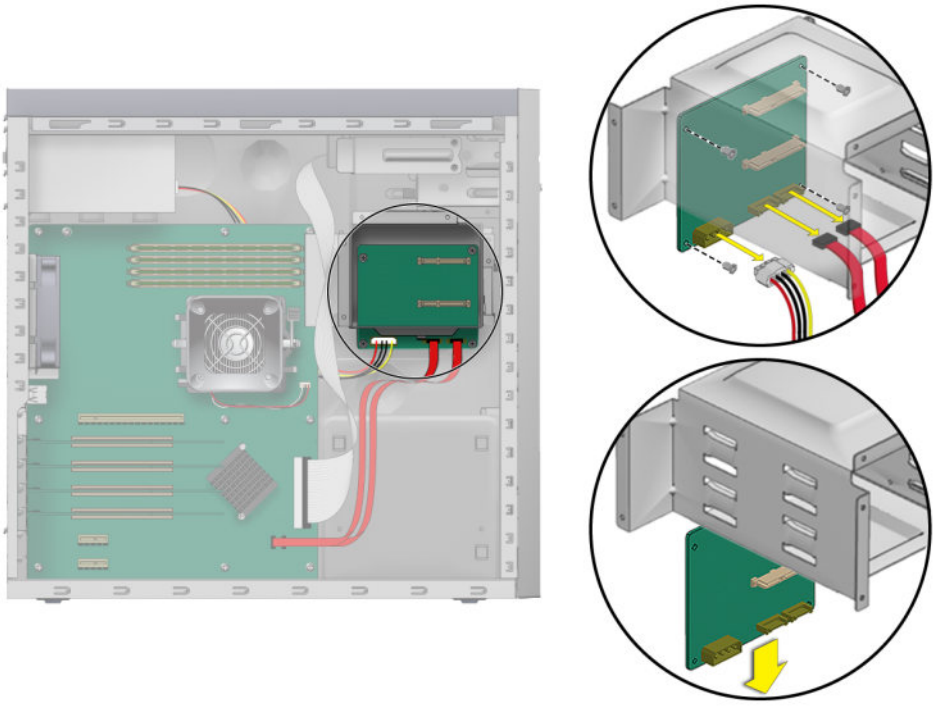

FIGURE 4-8 Removing the SATA Backplane

5. **Unfasten the SATA backplane from the chassis (see** FIGURE 4-8**).**

   Using a No. 2 Phillips screwdriver, remove the four screws that secure the SATA backplane to the chassis. Set the screws aside in a container.

6. **Slide the SATA backplane out of the hard drive bracket and set it aside.**

7. **Proceed to** Section 4.5.2.2, "Installing the SATA Backplane" on page 4-14 **to install the new SATA backplane.**

4.5.2.2 Installing the SATA Backplane

To install the SATA backplane:

1. **Open the chassis.**
2. **Remove the new SATA backplane from its packaging.**
3. **Slide the SATA backplane under the hard drive bracket.**
   Position the screw holes over the holes in the chassis.

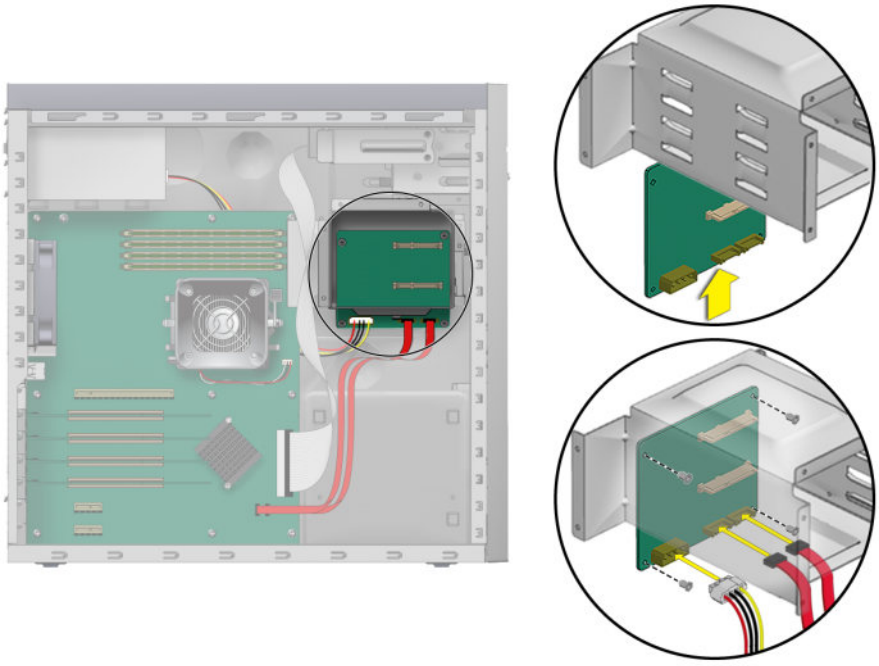

FIGURE 4-9 Installing the SATA Backplane

4. **Fasten the SATA backplane to the hard drive bracket.**
   Using a No. 2 Phillips screwdriver, install the four screws that secure the SATA backplane to the hard drive bracket. Torque the screws to inch pounds.

5. **Connect and route the cables (see** FIGURE 4-9**).**

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

   b. **Connect the power supply power cable to connector P4.**

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

6. **Slide the hard drive bracket into the hard drive bay until the latch clicks.**

   You are finished replacing the SATA backplane.

7. **Install all hard drives into the hard drive bracket.**

   See Section 4.5.1.2, “Installing a Hard Disk Drive” on page 4-10.

8. **Inspect the SATA backplane and the related component fasteners.**
   - Be sure that the hard drive handles are flush and locked.
   - Be sure that the hard drives are seated the backplane connector.

9. **Inspect the SATA backplane and the related component cabling.**
   - Be sure that the power cable is seated in the SATA backplane.
   - Be sure that the SATA interface cable is seated in the SATA backplane connector.
   - Be sure that the interface cable is routed through the routing clip on the SATA backplane cover.

10. **Replace the left-side panel of the workstation.**

4.5.3 Replacing a DVD Drive

4.5.3.1 Removing a DVD Drive

To remove a DVD drive:

1. **Remove any media in the DVD drive.**
2. **Turn off the power button on the back of the system and power off all of the peripherals connected to the workstation.**
3. **Remove the left-side access panel.**
4. **Remove the front bezel (see** Section 4.3.2, “Removing the Front Bezel” on page 4-5**).**

5. **Disconnect the cables from the back of the DVD drive.**
6. **Push the drive retaining lever tab up to release the lever from its retaining hooks (see** FIGURE 4-10**).**

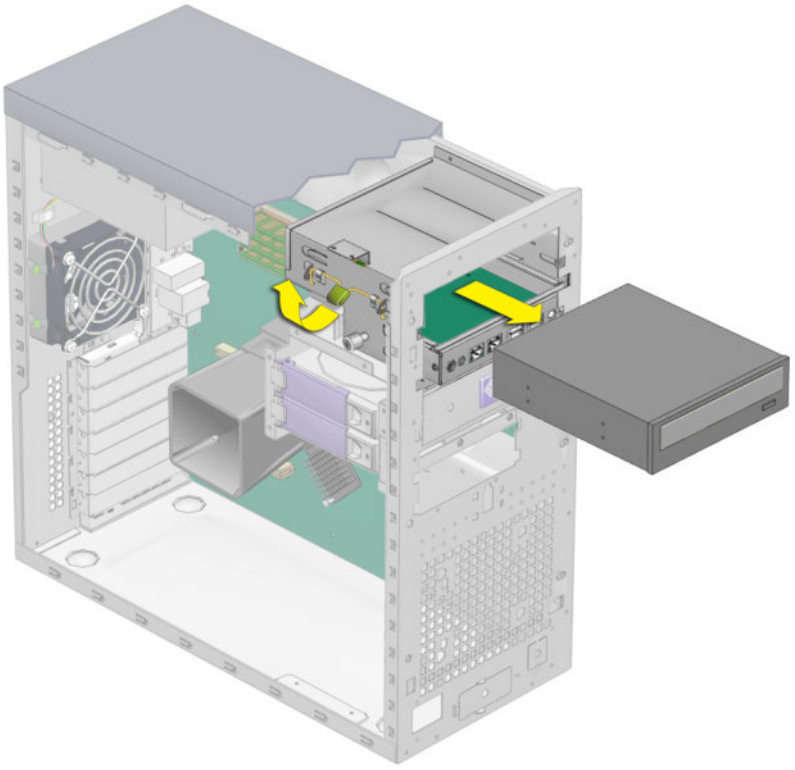

FIGURE 4-10 Removing the DVD Drive

7. **Gently pull out the DVD drive from the front of the chassis.**
8. **Place the DVD drive on a static-dissipating work surface or inside an anti-static bag.**
9. **Install the new DVD drive as shown in** Section 4.5.3.2, “Installing a DVD Drive” on page 4-17**.**

4.5.3.2 Installing a DVD Drive

To install a DVD drive:

1. **Remove the DVD drive from its packaging.**
2. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
3. **Remove the left-side access panel.**
4. **Slide the 5.25-inch drive with preinstalled carrier into the drive bay.**

   Ensure that the holes in the drive case are aligned with the holes in the chassis drive bay, from which the drive retaining lever pin was withdrawn.

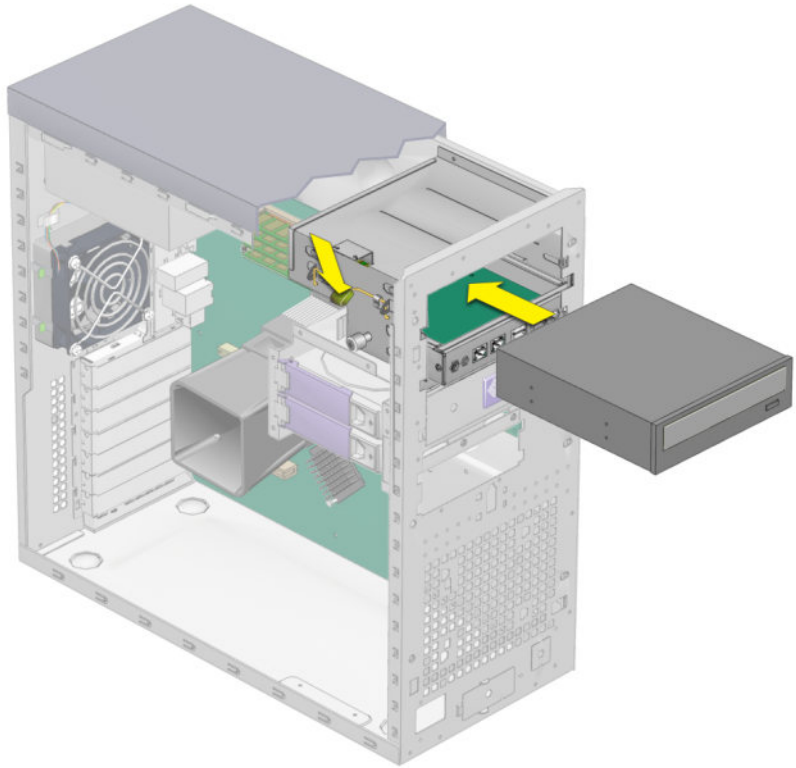

FIGURE 4-11 Installing the DVD Drive

5. **Lock the drive in the bay by rotating the drive retaining lever downward until 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 4-12).**

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

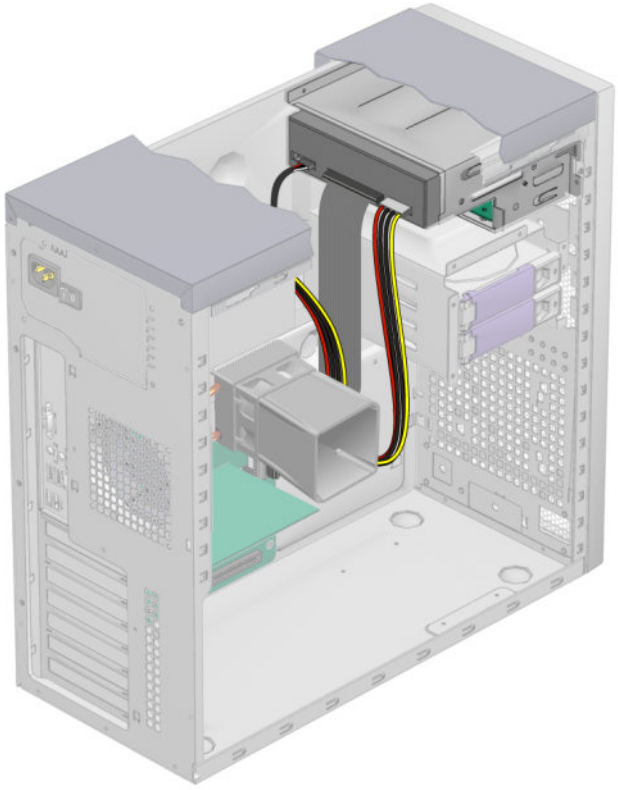

FIGURE 4-12 Location of Power and IDE Cables

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

4.5.4 Replacing or Adding DIMMs

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

Caution – Before removing any DIMMs from the motherboard, create a backup file to preserve any important data.

4.5.4.1 Detecting Faulty DIMMs

To determine which DIMM modules are not functioning properly so that they can be replaced:

1. **Boot the machine with the supplemental CD in the disk drive.**
2. **Run the** `PC-Check` **diagnostic tool that comes with the supplemental CD.**
3. **Choose option 1,** hardware diagnostic tests**.**
4. **Select** advanced diagnostic tests**; then select** memory**.**

   This shows all the system memory.
5. **Ensure that all the memory tests are selected by selecting** test set **in the memory test menu.**

   All tests should be highlighted in yellow, with a dot to the left of each.
6. **Exit the screen by pressing the** Esc **key.**
7. **Select** test system memory**.**

   This begins testing all the memory in the system. If a DIMM module is faulty, `PC-Check` indicates which one failed and highlights it in red.
8. **Make a note of any failed DIMM modules.**
9. **Shut down the machine and switch off the AC power from the back.**
10. **To remove the faulty module and replace it with a new one, continue to** Section 4.5.4.2, “Removing a DIMM” on page 4-19**.**

4.5.4.2 Removing a DIMM

To remove a DIMM:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**

2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Identify the location from which you will remove a DIMM (see** FIGURE 4-13**).**

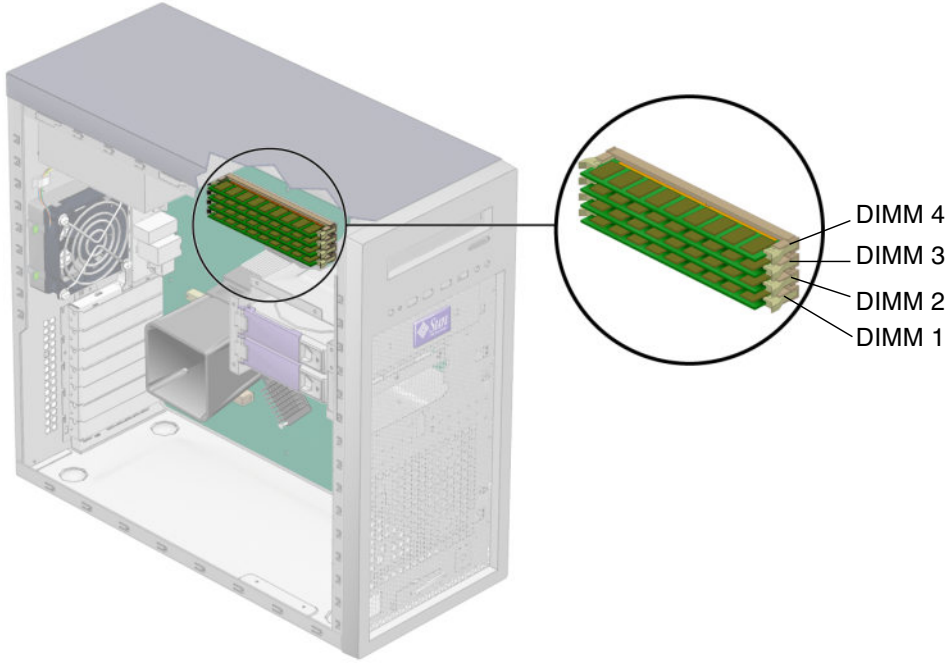

FIGURE 4-13 DIMM Locations

5. **Place your forefingers on the top of the DIMM.**
6. **Remove the DIMM by pressing down on the ejector bars at both ends of the DIMM socket (**FIGURE 4-14**).**

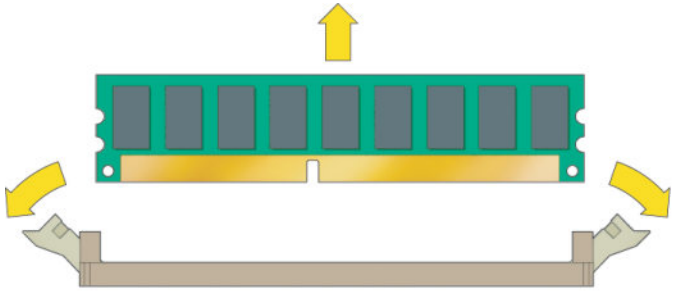

FIGURE 4-14 Removing a DIMM

7. **Set the DIMM aside on an antistatic mat.**
8. **Install a new DIMM as shown in** Section 4.5.4.3, "Installing a DIMM" on page 4-21**.**

4.5.4.3 Installing a DIMM

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.
- Populate DIMM sockets 1 and 2 first, followed by sockets 3 and 4.

Note – An exception to this guideline is when a DIMM module fails and becomes replaced with a unit shipped from Sun Microsystems. In that case, the DIMM modules may be replaced individually.

To install a DIMM:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Identify the DIMM slots.**
5. **Align the DIMM with the proper slot.**

6. **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.

   - The DIMMs must be inserted evenly, 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.

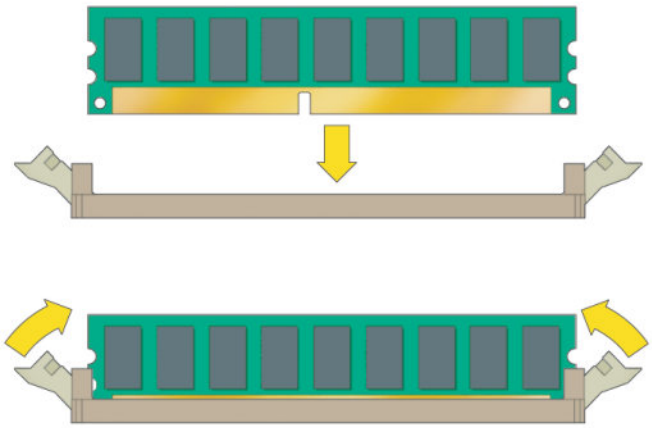

FIGURE 4-15 Installing a DIMM

7. **Repeat Step 4 through Step 6 for each DIMM that you want to replace.**
8. **Replace the left-side access panel.**

4.5.4.4 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.

4.5.5 Replacing a PCI or Graphics Card

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

4.5.5.1 Removing a PCI or Graphics Card

If you are adding a new card and not replacing a PCI or graphics card, go to Section 4.5.5.2, "Installing a PCI or Graphics Card" on page 4-25.

To remove a PCI or graphics card:

1. **Turn off the system and all of the peripherals connected to it, then unplug the AC power cord from the system.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Remove any cables connected to the card.**
5. **Follow the instructions for the type of card you are removing:**
   - For a PCI card (see FIGURE 4-16):

   a. Unscrew the PCI card retainer.

   b. 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 mat.

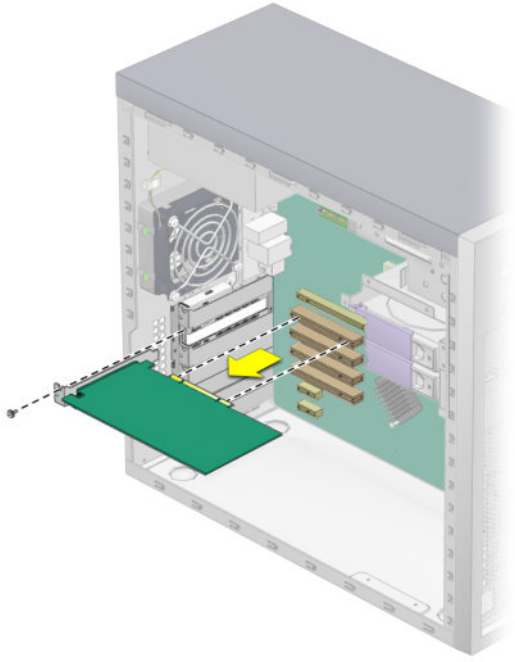

FIGURE 4-16 Removing a PCI Card

- For a PCI Express graphics card (see FIGURE 4-17):

a. If you are removing a NVIDIA FX3450 card, remove the power supply PCI cable from the power connector on the FX3450 card.

b. Unfasten and open the PCI card retainer.

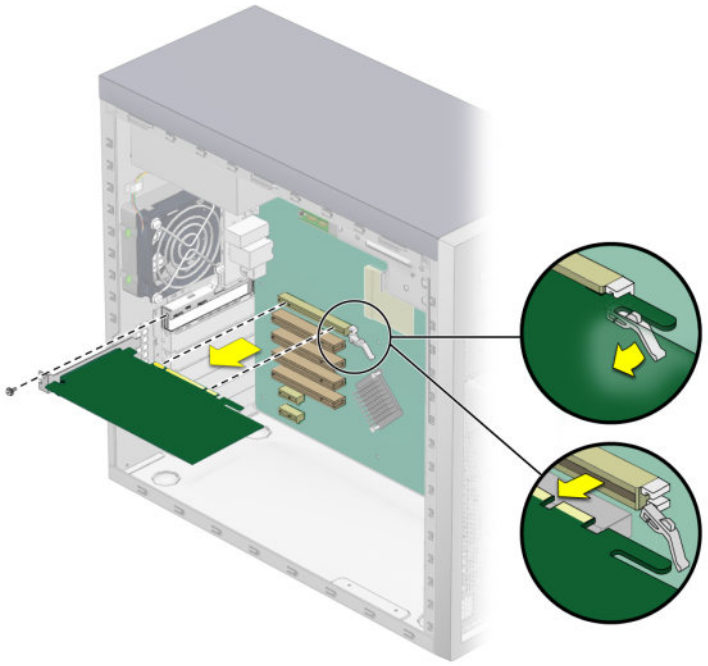

FIGURE 4-17 Removing a Graphics Card

c. Pull the latch that secures the card to the slot away from the card.

d. Remove the graphics card.

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

6. **Choose your next step:**
   - If you are not replacing the PCI or graphics card, replace the slot filler panel and the left-side access panel.
   - If you are replacing the card, follow the instructions in Section 4.5.5.2, "Installing a PCI or Graphics Card" on page 4-25.

4.5.5.2 Installing a PCI or Graphics Card

Note the following if you are installing 33 Mhz PCI cards (see FIGURE 4-18 and TABLE 4-2):

- Slot 1, Slot 3, and Slot 4 can accept 32- or 64-bit half-length cards.
- Slot 2 is restricted to 32-bit cards, 6-inches or shorter.
- Slot 4 is the only slot that can accept a 64-bit–long PCI card; however, standard configurations do not have a PCI card support guide for this slot. Long card configurations were not tested.

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

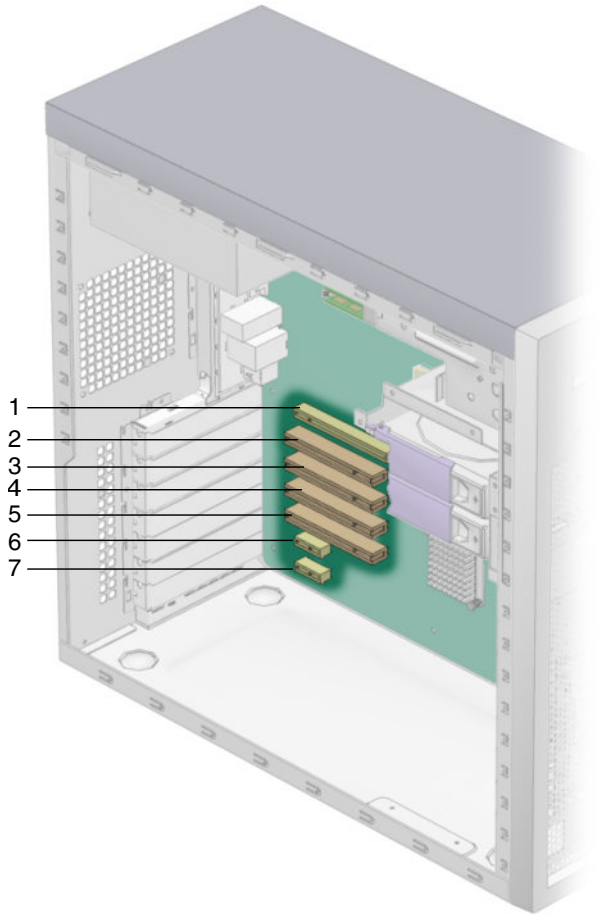

FIGURE 4-18 Locations of PCI and Graphics Card Slots

TABLE 4-2 PCI and Graphics Cards Slots

Illustration Label	Slot/Connector Label	Graphics Card	Illustration Label	Slot/Connector Label	Graphics Card
1	PCI-E 1	PCI Express x16 graphics card slot	5	PCI 4	PCI 33 Mhz, slot 4
2	PCI 1	PCI 33 Mhz, slot 1	6	PCI-E 2	PCI Express x1, slot 1
3	PCI 2	PCI 33 Mhz, slot 2	7	PCI-E 3	PCI Express x1, slot 2
4	PCI 3	PCI 33 Mhz, slot 3			

To install a PCI or graphics card:

1. **Turn off the power switch on the back of the system and the power to all of the peripherals connected to the system.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Refer to the service label, attached to the inside of the access panel, to help you choose an empty card slot that is compatible with the card that you are installing.**
5. **Pull out the slot cover.**

   Keep it for reassembly later.
6. **Remove the PCI or graphics card from its protective packaging, and lay the card on an antistatic surface until you are ready to install it.**
7. **Follow the instructions for the type of card you are installing:**
   - For a PCI card (see FIGURE 4-19):

   a. Position the card over the selected slot.

   b. Press down on the card until it is completely seated in the slot.

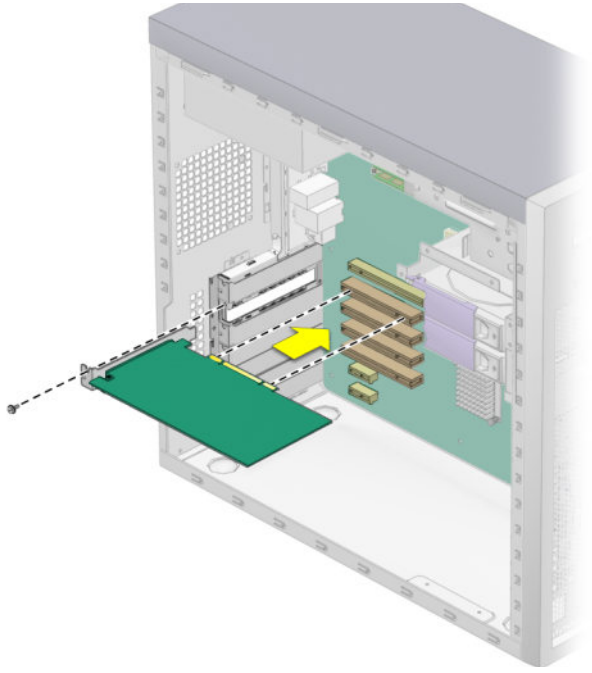

FIGURE 4-19 Installing a PCI card

- For a PCI Express graphics card (see FIGURE 4-20):

a. Pull the tab at the right side of the slot away from the slot.

b. 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.

c. Press down on the card until it is completely seated in the slot.

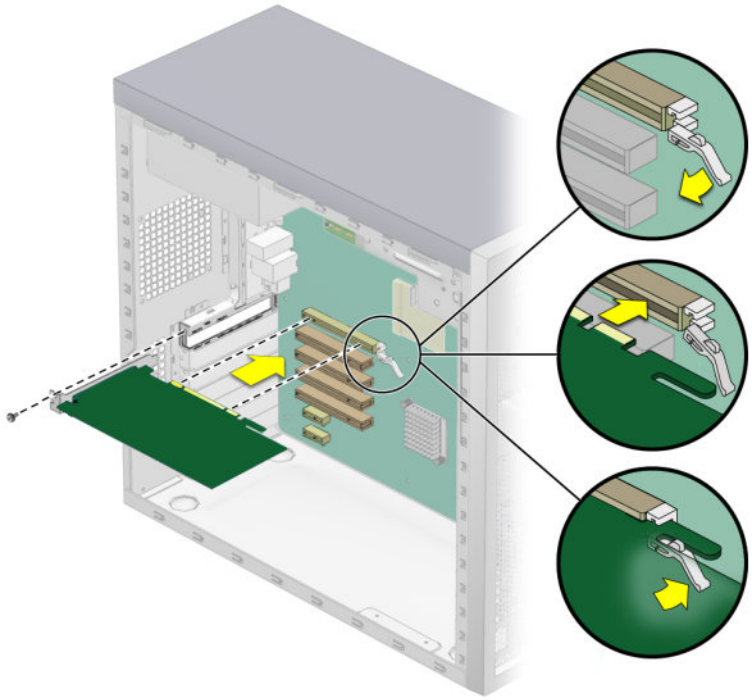

FIGURE 4-20 Installing a Graphics Card

8. **Fasten the retaining screw into place. Torque the screws to 8- to 9-inch pounds.**
9. **If you are installing a NVIDIA FX3450 card, attach the power supply PCI cable to the power connector on the FX3450 card.**
10. **Replace the left-side access panel.**

4.5.6 Replacing the System Battery

The battery specifications for the Sun Ultra 20 Workstation are shown in TABLE 4-3.

TABLE 4-3 Battery Specifications

Specification	Value
Voltage	3 VDC
Type	CR 2032

To remove and install the battery:

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

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Pinch the battery latch together until the battery pops out of the motherboard socket (see FIGURE 4-21).**
5. **Lift the battery to remove it (see FIGURE 4-21).**

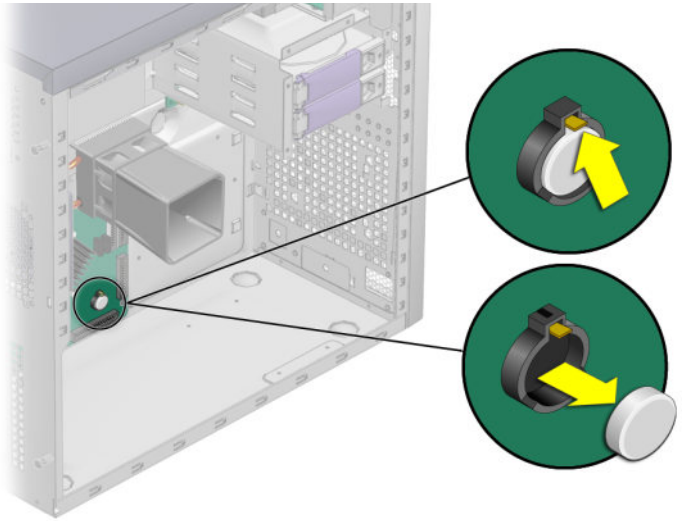

FIGURE 4-21 Removing the System Battery

6. **Insert a new battery with the positive sign (+) facing up (see** FIGURE 4-22**).**

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

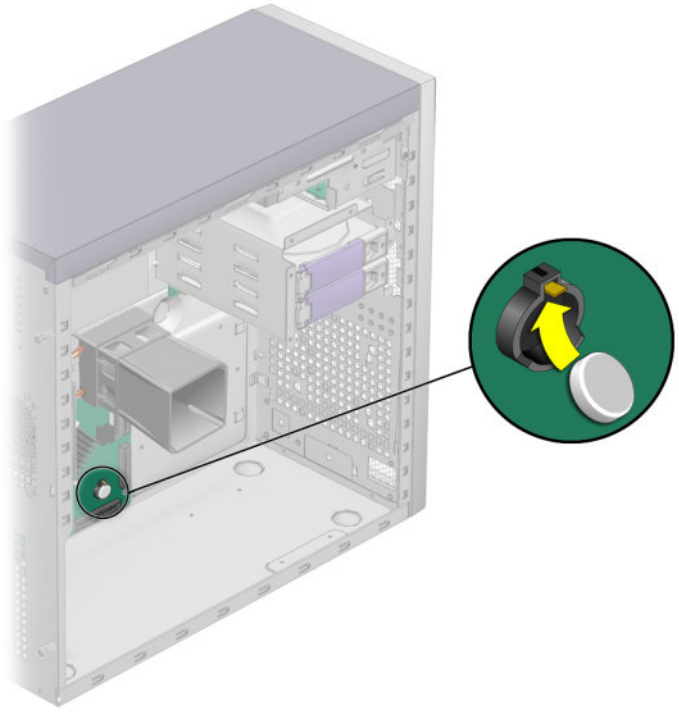

FIGURE 4-22 Installing a System Battery

7. **Replace the left-side access panel.**

4.5.7 Replacing the System Fan

4.5.7.1 Removing the System Fan

To remove the system fan:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Remove the left-side access panel.**
3. **Locate the system fan on the back inside panel of the workstation.**

FIGURE 4-23 Position of the System Fan

4. **Disconnect the system fan's power connector from the Fan 1 connector on the motherboard.**

5. **Push forward the two latches on the left side of the fan bracket, and pull the fan to the left to release the four hooks on the back of the bracket from the holes in the chassis (see** FIGURE 4-24**).**

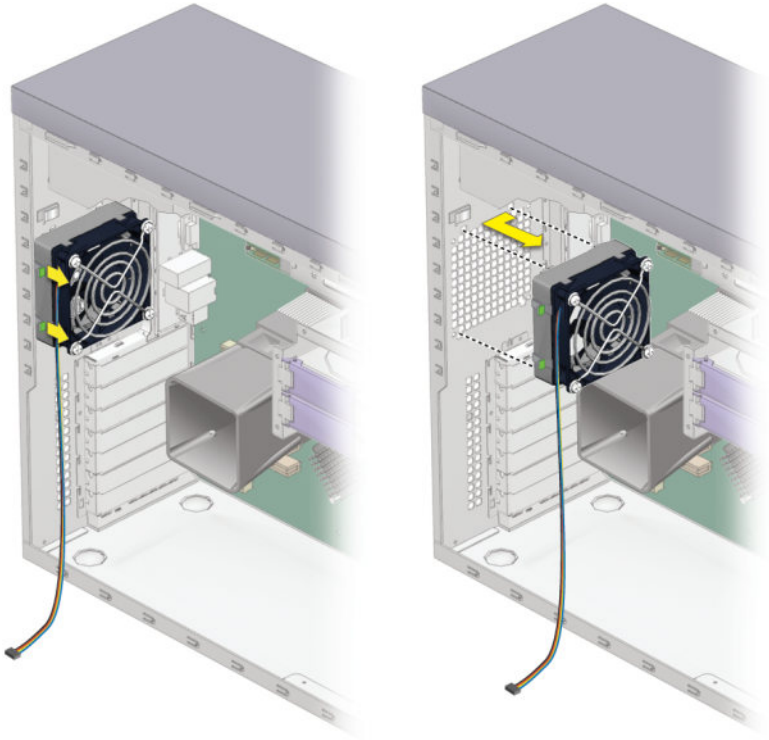

FIGURE 4-24 Removing the System Fan

6. **Pull the fan away from the chassis.**

4.5.7.2 Installing the System Fan

1. **Remove the left-side access panel, if necessary.**
2. **Remove the new fan from its package.**
3. **Locate the four corner holes in the chassis grill where the fan tabs will be installed.**

4. **Push forward the two latches on the left side of the fan bracket, and attach the four hooks on the back of the bracket to the four corner holes in the back chassis grill (see** FIGURE 4-25**).**

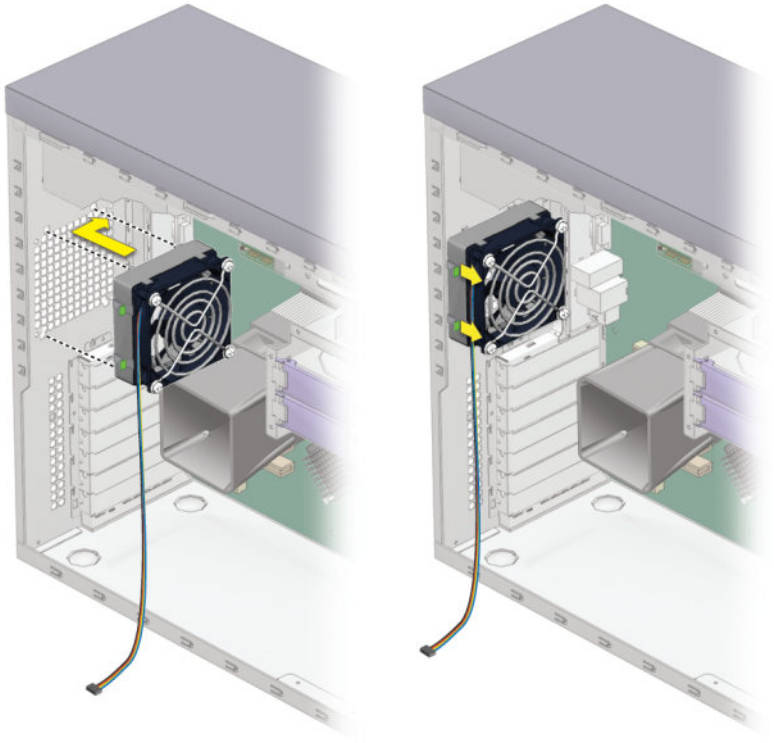

FIGURE 4-25 Installing the System Fan

5. **Release the latches on the left of the fan after the fan is secured to the chassis.**

6. **Connect the fan cable to the Fan 1 connector on the motherboard.**

   Refer to FIGURE 4-34 or the service label on the system cover for the location of the Fan 1 connector.

4.5.8 Replacing the Power Supply

4.5.8.1 Removing the Power Supply

To remove the power supply:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation, and then unplug the AC power cord from the system.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface, and locate the power supply (see** FIGURE 4-26**).**

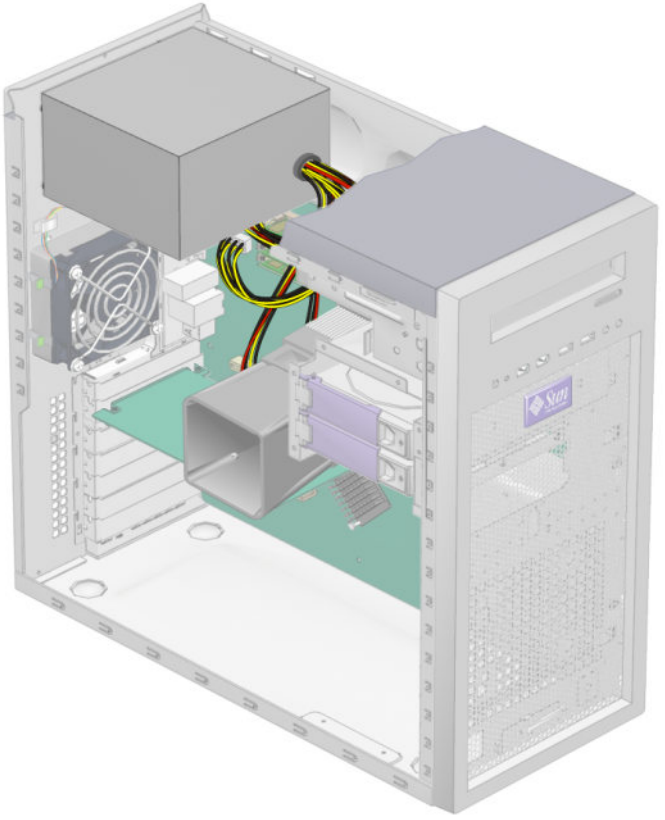

FIGURE 4-26 Locations of Power Supply and Cables

4. **Unfasten the connectors from the motherboard and release the cable management strap (see FIGURE 4-27).**

5. **Unfasten the power connectors attached to the motherboard, DVD drive and SATA backplane (see FIGURE 4-27 and TABLE 4-4).**

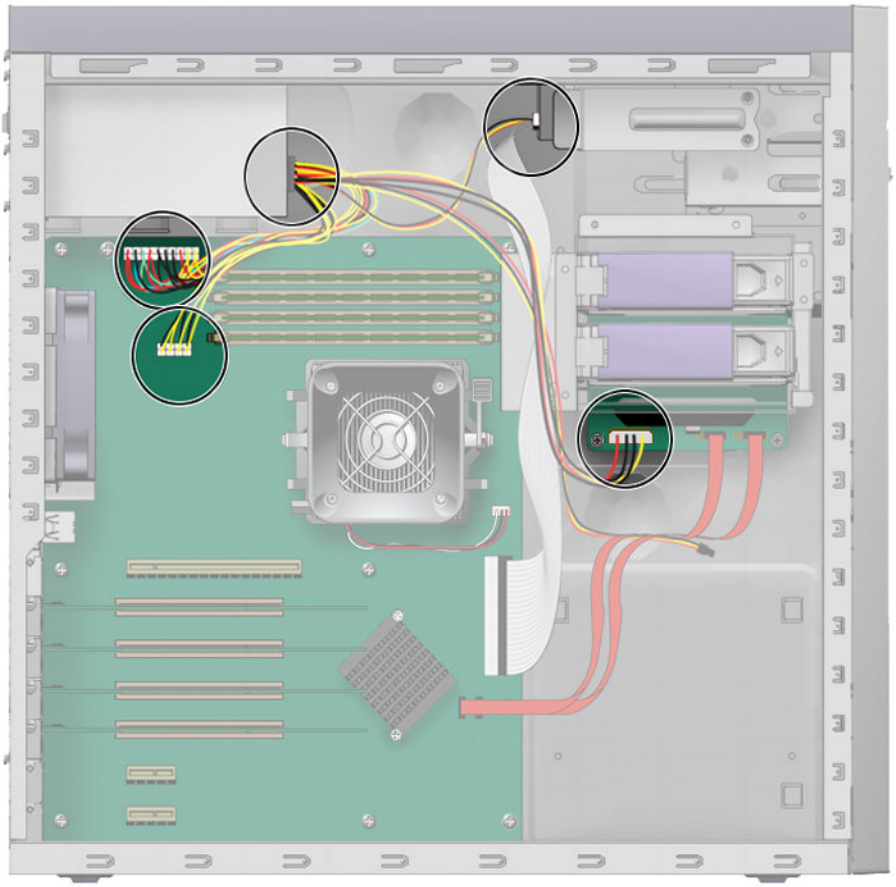

FIGURE 4-27 Locations of Power Supply Connections on the Motherboard

TABLE 4-4 Power Supply Cable Connections

Power cable	Connector	Power cable	Connector
P1	Motherboard PW1	P3	DVD drive
P2	Motherboard PW2	P4	SATA backplane

6. **Working from outside the back of the chassis, unfasten the four mounting screws and withdraw the power supply through the interior of the system chassis (see FIGURE 4-28).**

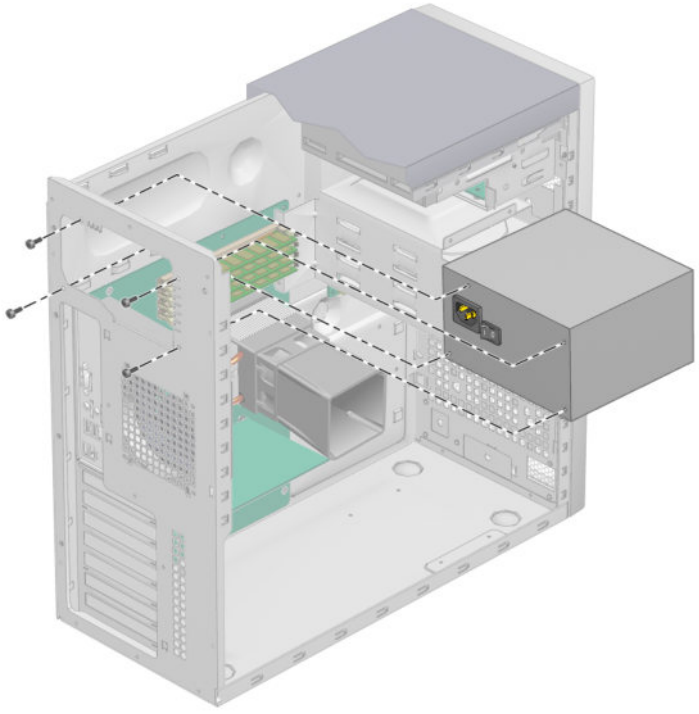

FIGURE 4-28 Removing the Power Supply From the Chassis

7. **Install the new power supply as shown as** Section 4.5.8.2, "Installing the Power Supply" on page 4-37**.**

4.5.8.2 Installing the Power Supply

To install the power supply:

1. **Remove the left-side access panel, if necessary.**
2. **Gently lay the system on its right side on a stable, non-slip surface.**
3. **Remove the new power supply from its package.**
4. **Locate where the power supply is to be installed, and place the power supply inside the chassis (see FIGURE 4-29).**
   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.**

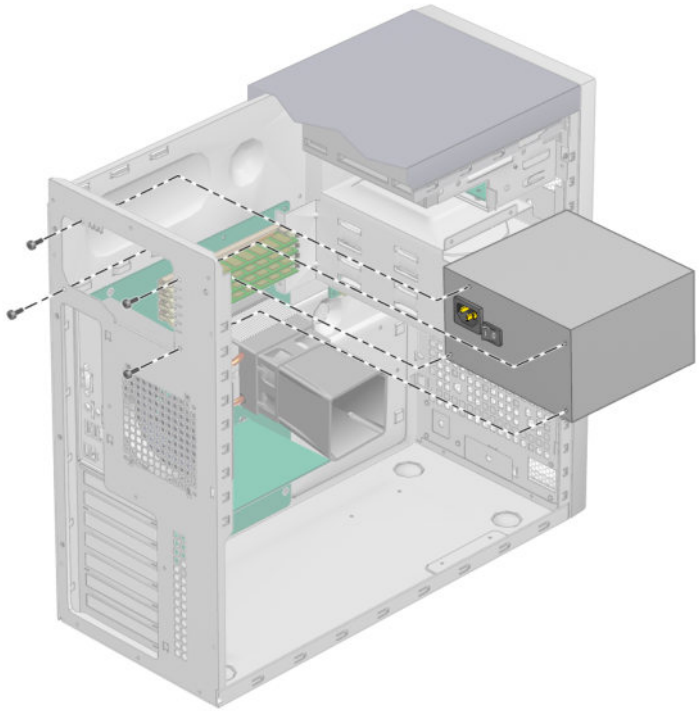

FIGURE 4-29 Installing the Power Supply Into the Chassis

5. **Fasten the power supply to the chassis.**

6. **Reconnect the power supply cables (see FIGURE 4-27 and TABLE 4-4) and secure them with the cable management tie.**

Caution – When installing power supply cables, make sure that the cables do not interfere with the DIMMs. If the cables push against the DIMMs after they are installed, they could cause the DIMMs to become loosened from the connectors.

7. **Replace the left-side access panel.**

4.5.9 Replacing the I/O Board Assembly

4.5.9.1 Removing the I/O Board Assembly

To remove the I/O board assembly:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Disconnect any audio, USB, and IEEE 1394 cables connected to the front of the workstation.**
3. **Remove the bezel (see Section 4.3.2, "Removing the Front Bezel" on page 4-5).**

FIGURE 4-30 Position of the I/O Board Assembly in the Chassis

4. **Remove the left-side access panel and locate the back of I/O board assembly.**
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 4-31).**

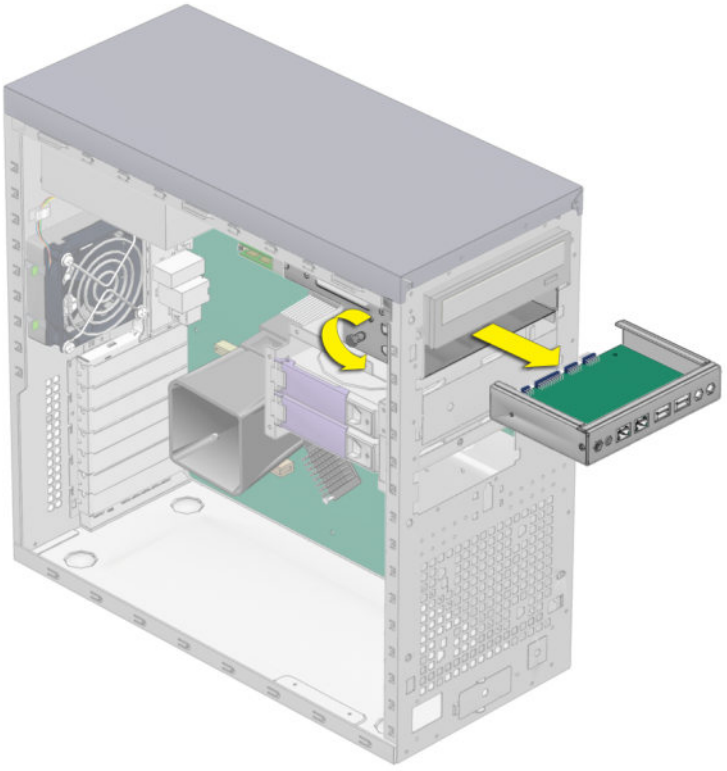

FIGURE 4-31 Removing I/O Board

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

8. **Install the new I/O board assembly as shown in** Section 4.5.9.2, "Installing the I/O Board Assembly" on page 4-41**.**

4.5.9.2 Installing the I/O Board Assembly

To install the I/O board assembly:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
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 4-32**).**

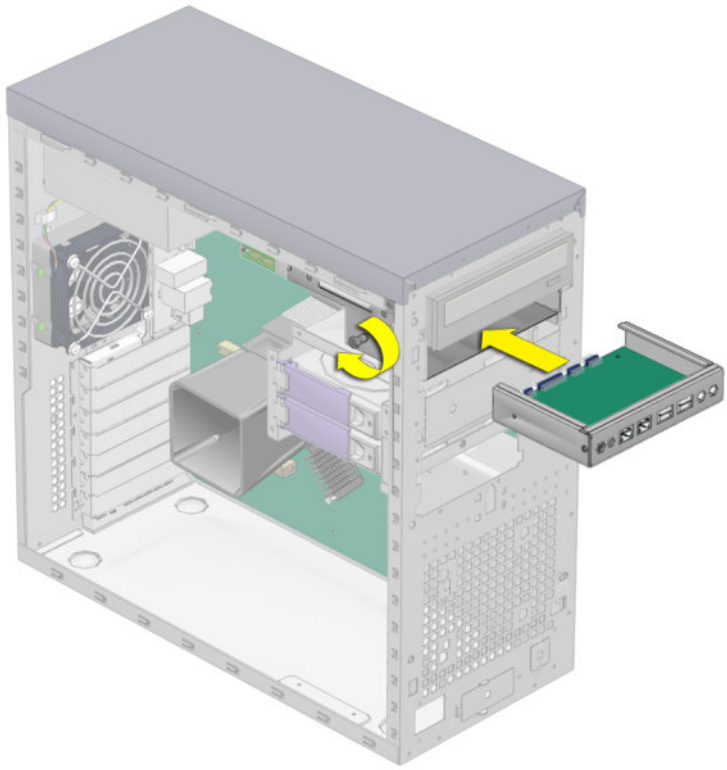

FIGURE 4-32 Installing the I/O Board Assembly

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, FireWire, and audio cables to the back of the I/O board.**

   See FIGURE 4-33 and FIGURE 4-34 and the service label on the chassis cover for the locations of the I/O board connections.

6. **Replace the left-side access panel.**

7. **Connect cables to the front-panel connectors as necessary.**

Note – These connectors are not keyed. Make sure that you reinstall them in the proper orientation. Be careful not to bend the pins.

4.5.10 Replacing System Cables

The following system cables have a connector at each end, and so 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 FIGURE 4-33 for locations of connectors.

- Front I/O board cables:
  - Audio cable
  - USB cable
  - IEEE 1394 cables
  - Power button/LED cable
- DVD cables:
  - IDE cable
  - Audio cable
- SATA cables (SATA backplane)

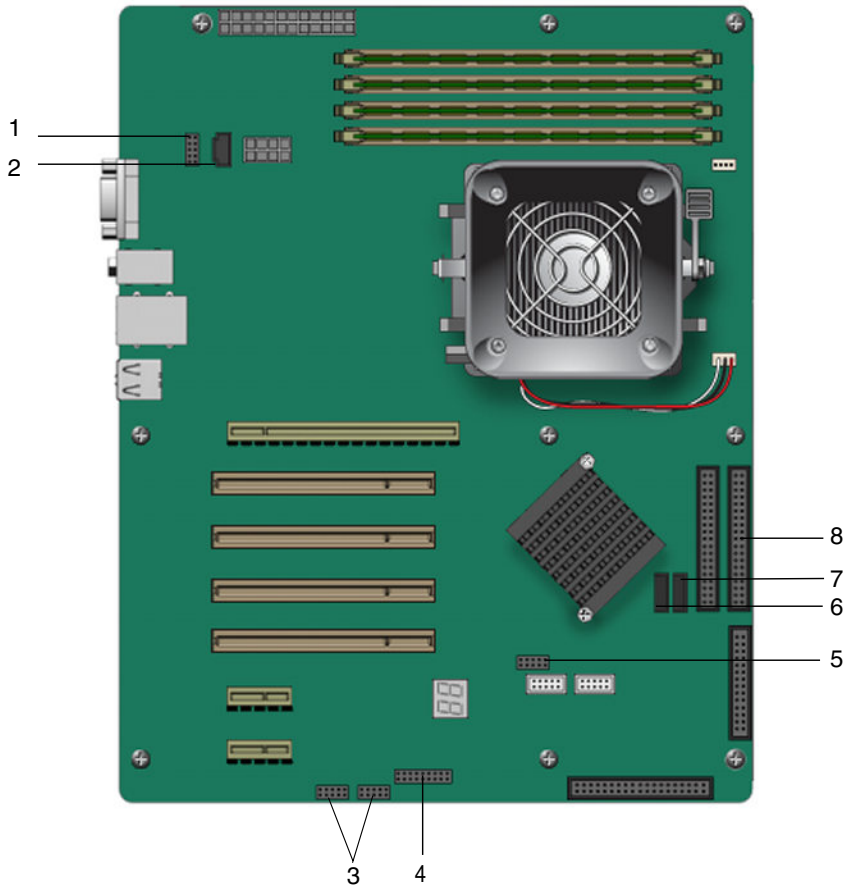

FIGURE 4-33 Motherboard Cable Locations

TABLE 4-5 Cable Connections

Label	Motherboard connector	Component connection	Label	Motherboard connector	Component Connection
1	J8	I/O board audio	5	USB 4	I/O board J5
2	J9	DVD drive audio	6	SATA 1	SATA backplane J2
3	F1394-1 and 2	I/O board J8	7	SATA 2	SATA backplane J4
4	J45	I/O board J1	8	PRI-IDE	DVD drive

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

To remove and install system cables:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Replace any cables that need to be replaced (see** FIGURE 4-34**).**

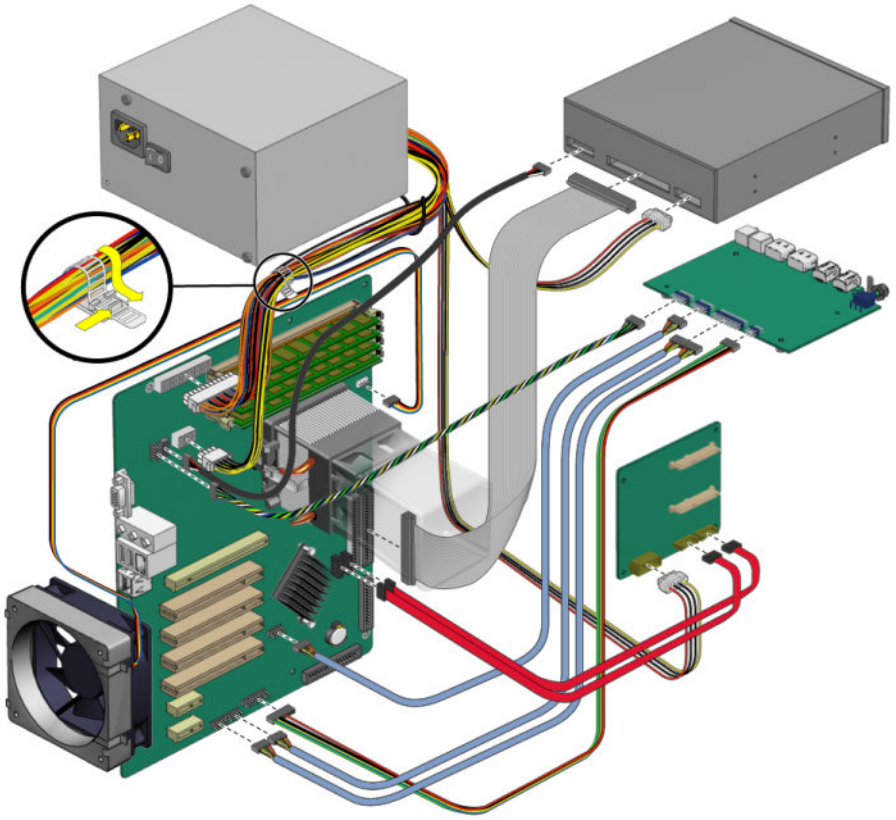

FIGURE 4-34 Cabling Diagram

5. **Ensure that all cable routing is correct, and that all of the cable connectors are properly seated, before reinstalling the left-side access panel.**

4.5.11 Replacing a CPU

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

Note – The CPU is not a CRU and should be replaced only by trained field service technicians. The exception is the AMD Opteron model 180. See the following section for details.

4.5.11.1 AMD Opteron Model 180 CPU

If you are installing an AMD Opteron model 180 CPU, you must use the heatsink/fan assembly that is included with the model 180 CPU.

The model 180 processor can be installed without a field service technician present. Make sure to carefully follow this installation procedure to avoid damaging the processor

You will note that the heatsink/fan assembly that is included with the CPU looks different than the assembly depicted in the remove and install procedures (see FIGURE 4-35). Otherwise, the procedure for installing the CPU and heatsink/fan assembly is the same as the procedure in the following sections.

Caution – Failure to use the supplied heatsink for the Opteron 180 will cause insufficient cooling, leading to premature failure of the processor.

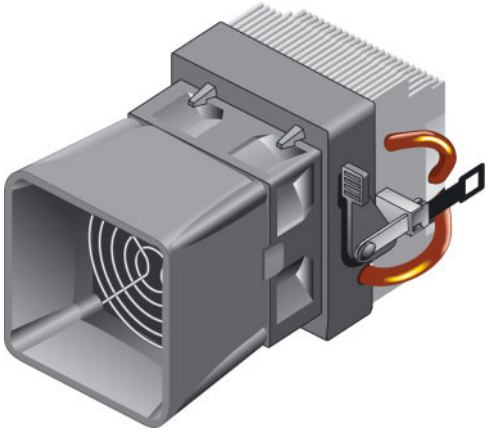

FIGURE 4-35 Heatsink/fan Assembly for AMD Opteron 180 Processor

4.5.11.2 Removing a Heatsink and CPU

To remove a heatsink and CPU:

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

---

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Disconnect the power cord.**
3. **Remove the left-side access panel.**
4. **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.

---

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

6. **Pull up the black lever on the right side of the heatsink/fan assembly to loosen the metal latch from the hook on the retaining bracket (see FIGURE 4-36).**

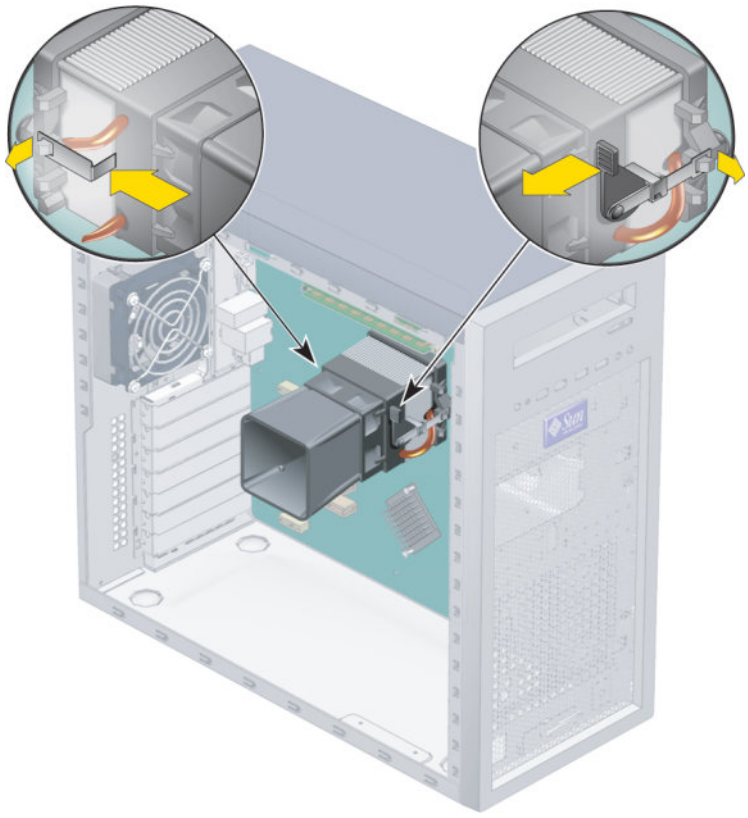

FIGURE 4-36 Unlatching the Heatsink/Fan Assembly

7. **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 4-36).**

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

9. **Lift the heatsink/fan assembly straight up and withdraw it from the board (see** FIGURE 4-37**).**

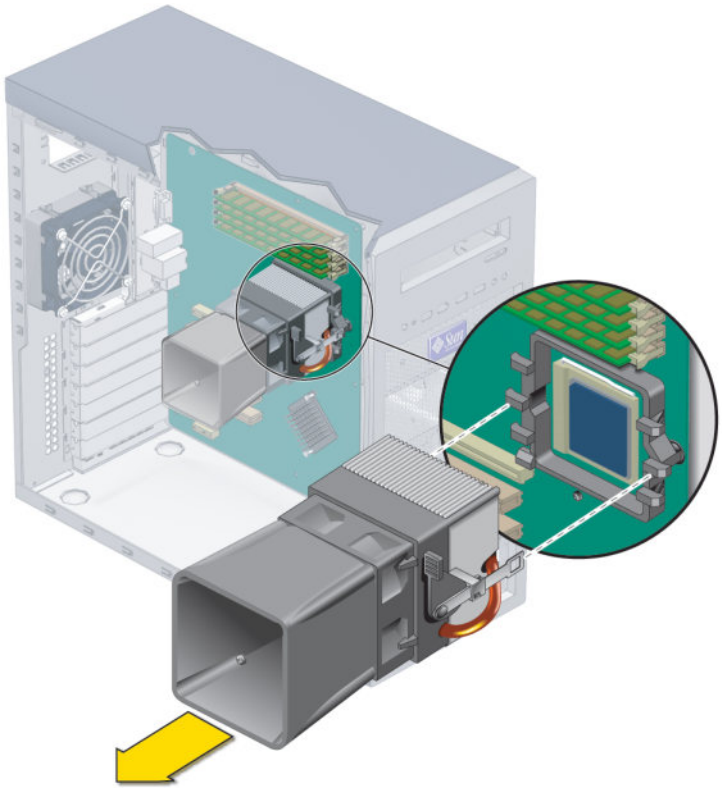

FIGURE 4-37 Removing the Heatsink/Fan Assembly From the Motherboard

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

11. **Depress, and then pull up the CPU socket retainer lever up to the fully open, perpendicular position (see FIGURE 4-38).**

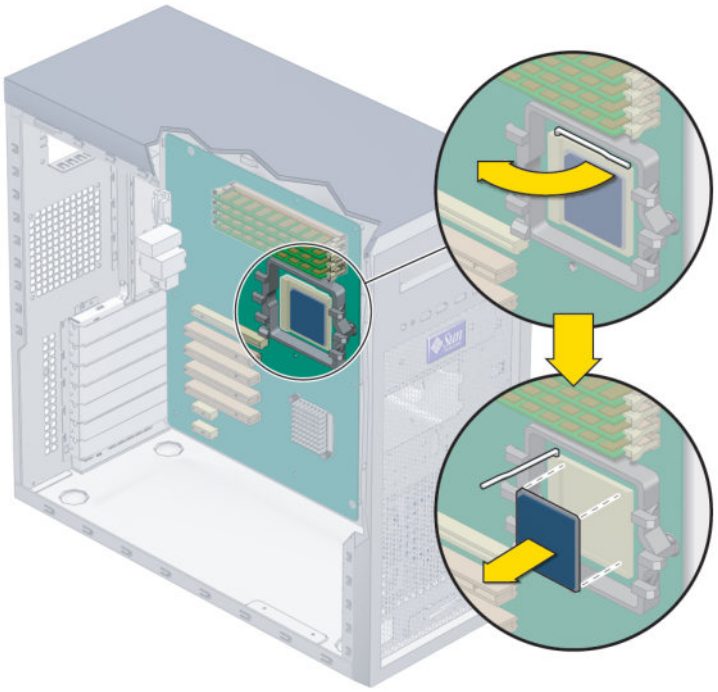

FIGURE 4-38 Removing the CPU From the Workstation

12. **Lift the CPU out of the socket, leaving the retainer lever in the open position.**

13. **Install the heatsink and CPU as shown in** Section 4.5.11.3, "Installing a Heatsink and CPU" on page 4-50**.**

4.5.11.3 Installing a Heatsink and CPU

To install a heatsink and CPU:

Note – Observe the ESD precautions and preinstallation procedures described in Section 4.2.1, "ESD Precautions" on page 4-2.

---

1. **Ensure that the CPU socket retainer lever is in the fully open, upright position.**
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.

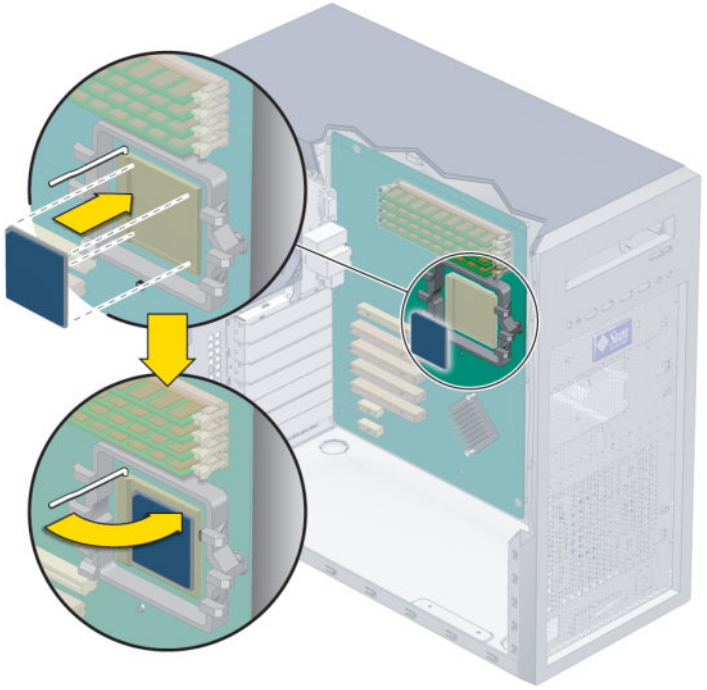

FIGURE 4-39 Installing the CPU

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

5. **Do one of the following:**

   - If you are installing a new CPU:

   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.**

   - If you are replacing an already used CPU on a new motherboard:

   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, as the oils on your finger will degrade the performance.

6. **Inspect the heatsink/fan assembly for dust and lint. Clean if necessary.**

Caution – If you are installing an Opteron model 180 processor, make sure to use the heatsink supplied with the processor. Failure to use the supplied heatsink for the Opteron 180 will cause insufficient cooling, leading to premature failure of the processor.

7. **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.**

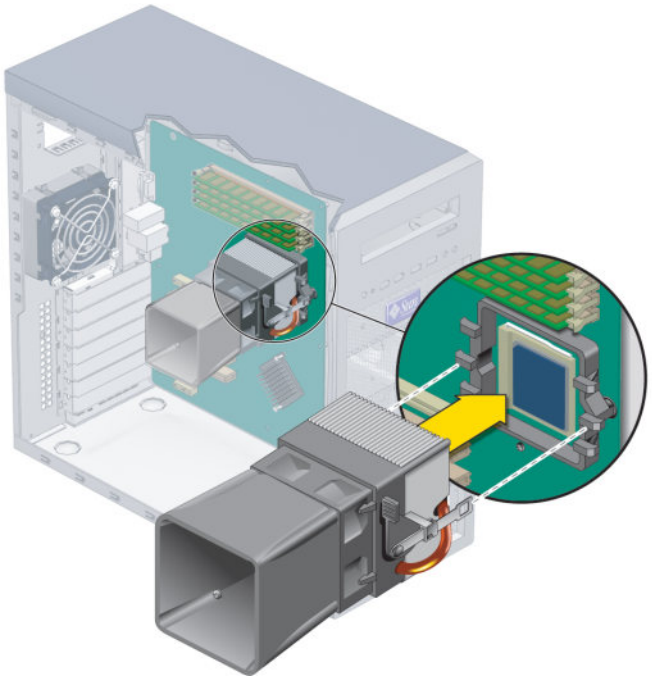

FIGURE 4-40 Installing the Heatsink/Fan Assembly

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

8. **Attach the retaining bracket hook to the metal latch on the left side of the heatsink/fan assembly.**

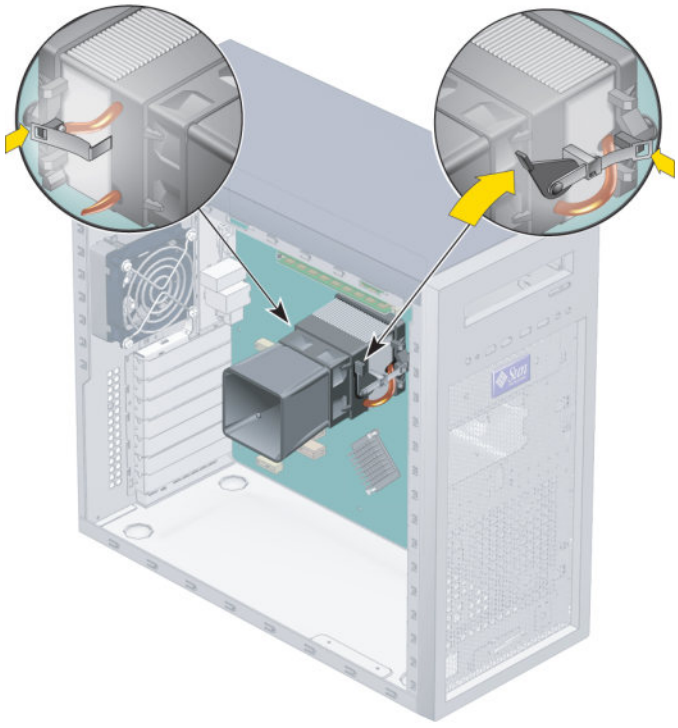

FIGURE 4-41 Securing the Heatsink/Fan Assembly Latches

9. **Push down on the black lever on the right side of the heatsink/fan assembly to secure the metal latch to the hook on the retaining bracket.**
10. **Connect the CPU fan cable to the connector on the motherboard.**
11. **Replace the left-side access panel.**

4.5.12 Replacing the Motherboard

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

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

4.5.13 Removing the Motherboard

To remove the motherboard:

1. **Turn off the power button on the back panel and all of the peripherals connected to the workstation.**
2. **Remove the left-side access panel.**
3. **Gently lay the system on its right side on a stable, nonslip surface.**
4. **Remove any PCI cards installed on the motherboard (see** Section 4.5.5, "Replacing a PCI or Graphics Card" on page 4-22**).**
5. **Disconnect all cables attached to the motherboard.**
6. **Remove the eight Phillips screws that fasten the motherboard to the chassis (see** FIGURE 4-42**).**

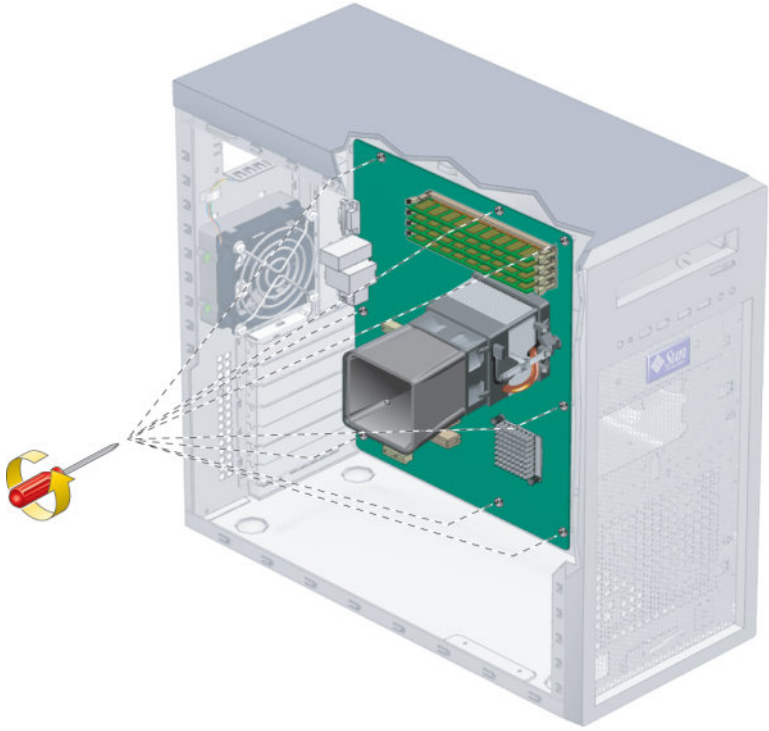

FIGURE 4-42 Removing the Motherboard Screws

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 4-43).**

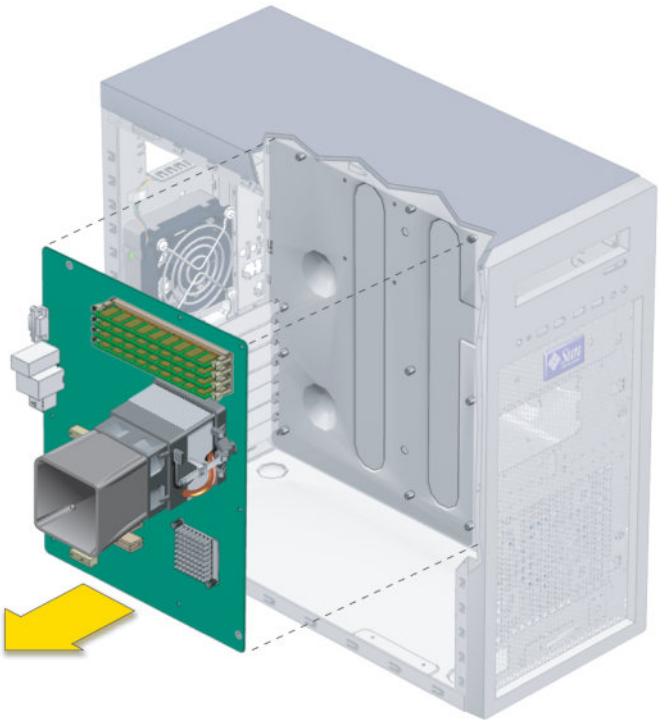

FIGURE 4-43 Removing the Motherboard From the Chassis

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

- Section 4.5.11, "Replacing a CPU" on page 4-45
- Section 4.5.4, "Replacing or Adding DIMMs" on page 4-19

4.5.14 Installing the Motherboard

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

1. **Replace the CPU or DIMMs as necessary.**

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

   - Section 4.5.11, "Replacing a CPU" on page 4-45
   - Section 4.5.4, "Replacing or Adding DIMMs" on page 4-19

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

3. **Secure the eight Phillips screws that fasten the motherboard to the chassis. Torque the screws to 8- to 9-inch pounds (see** FIGURE 4-44**).**

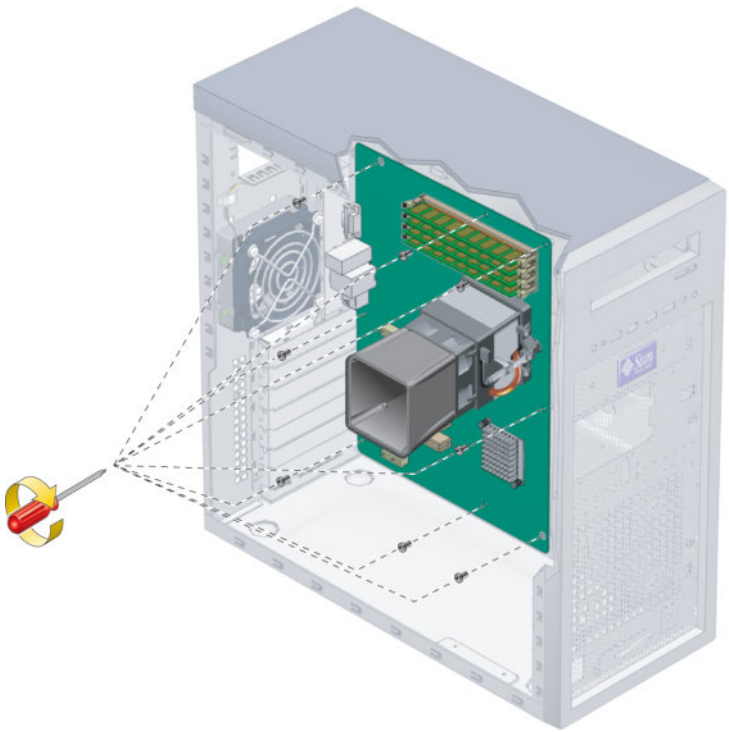

FIGURE 4-44 Installing the Motherboard

4. **Replace any PCI or graphics cards.**

   See Section 4.5.5, “Replacing a PCI or Graphics Card” on page 4-22.

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

   See Section 4.5.10, “Replacing System Cables” on page 4-42.

6. **Replace the system cover.**

7. **Replace any external cables, and power on the workstation.**

APPENDIX **A**

System Specifications

For maximum reliability and performance, install your workstation into a proper environment and ensure correct configuration as discussed in this appendix.

A.1 Physical Specifications

TABLE A-1 lists the physical specifications for the Sun Ultra 20 Workstation.

TABLE A-1 Sun Ultra 20 Workstation Physical Specifications

Specification	British	Metric
Width	7.9 in.	200 mm
Depth	18.5 in.	470 mm
Height	17.1 in.	435 mm
Weight (max with packaging)	34 lbs	15.4 kg

A.2 Power Specifications

The maximum continuous power for the Sun Ultra 20 Workstation is 530W.

Additional power specifications for the workstation are shown in TABLE A-2, TABLE A-3 and TABLE A-4.

TABLE A-2 Input Voltage Range

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

TABLE A-3 Input Frequency Range

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

TABLE A-4 Input Current

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

A.3 Environmental Specifications

Environmental specifications for the Sun Ultra 20 Workstation are shown in TABLE A-5.

TABLE A-5 Sun Ultra 20 Workstation Environmental Specifications

Specification	State	British	Metric
Humidity	Operating	7%–93% RH non-condensing, 100.4° F max wet bulb	7%–93% RH non-condensing, 38° C max wet bulb
	Nonoperating	93% RH, non-condensing, 109.4° F max wet bulb	93% RH, non-condensing, 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
Altitude	Operating	max 9,843 ft	max 3,000 m
	Nonoperating	max 39,370 ft	max 12,000 m

APPENDIX **B**

Setting Up Multiple Monitor Access

Your Sun Ultra 20 Workstation has an onboard 2D ATI graphics controller. The workstation is also designed to accomodate high performance graphic cards using the PCI Express x16 slot.

- The onboard ATI graphics controller and DB15 graphics connector work automatically if the PCI Express x16 slot is empty.
- The onboard ATI graphics controller and the DB15 graphics connector automatically stop working if a graphics card is installed in the PCI Express x16 slot. This is the case when:
  - Your workstation has a preinstalled 3D NVIDIA graphics card
  - You install a graphics card in the PCI Express x16 slot

  If a graphics card is installed in the PCI Express x16 slot, connect your monitor(s) to the DVI connectors on the NVIDIA or other graphics card.

If you want the ATI graphics controller to work along with a graphics card in the PCI Express x16 slot, refer to the appropriate subsection for specific configuration instructions.

- Section B.1, “Enabling the Onboard ATI Graphics Controller for Linux or Windows XP” on page B-2
- Section B.2, “Enabling the Onboard ATI Graphics Controller After Solaris Installation” on page B-3
- Section B.3, “Enabling the Onboard ATI Graphics Controller Before Solaris Installation” on page B-4

B.1 Enabling the Onboard ATI Graphics Controller for Linux or Windows XP

To enable the onboard ATI graphics controller for Linux or Windows XP when a PCI Express x16 3D graphics card is installed:

1. **Power on the system and press the F2 key at the Solaris logo screen.**

   The BIOS Setup menu displays.

2. **Select PnP/PCI Configurations in the main menu.**

3. **Select the Init Display First option.**

4. **Change the display order so that PCI is the first display option.**

   This sets the onboard ATI adapter as the primary output device. If a 3D graphics card is installed, it functions as the secondary device.

5. **Press the F10 key to save your changes and exit.**

6. **Connect a second monitor to the onboard video connector.**

7. **For a Windows XP system, you will need to download the ATI drivers from the following URL:**

   http://support.ati.com/

Note – Both graphics cards are available as display devices, but you must configure them correctly. Configuring the graphics cards is an advanced operation. Refer to the README for the NVIDIA drivers for information specific to your operating system

---

B.2 Enabling the Onboard ATI Graphics Controller After Solaris Installation

To enable the ATI graphics controller along with a PCI Express x16 3D graphics card when the Solaris 10 Operating System is already installed on your workstation:

1. **Log into the system as root user.**
2. **Type the following commands to move the file:**

   `/etc/rc2.d/S99dtlogin` to `/etc/rc2.d/s99dtlogin`

```
# cd /etc/rc2.d
# mv S99dtlogin s99dtlogin
```

3. **Reboot the workstation, then press the F2 key at the Solaris logo screen.**

   The BIOS Setup menu displays.

4. **Change the BIOS configuration as follows to enable the onboard ATI graphics controller:**

   a. **Select PnP/PCI Configurations in the main menu.**

   b. **Select the Init Display First option.**

   c. **Change the display order so that PCI is the first display option.**

      This sets the ATI graphics controller as the primary output device. If a 3D card is installed, it functions as the secondary device.

   d. **Press the F10 key to save your changes and exit.**

5. **Connect a second monitor to the onboard video connector.**
6. **Reboot the workstation.**
7. **Open a terminal window and log into the system as superuser.**
8. **Type the following command:**

```
# /usr/X11/bin/Xorg -configure
```

`Xorg` probes the hardware on the system and create an xorg configuration file called `xorg.conf.new` in the root directory.

9. **Copy the xorg configuration file to the** `/etc/X11` **directory by typing.**

```
# cp /xorg.conf.new /etc/X11
```

10. **Rename the file from** `xorg.conf.new` **to** `xorg.conf`**.**

```
# cd /etc/X11
# mv xorg.conf.new xorg.conf
```

11. **Type the following commands to rename the s99dtlogin file:**

```
# cd /ect/rc2.d
# mv s99dtlogin S99dtlogin
```

12. **Reboot the workstation.**

Note – Both graphics cards are available as display devices, but you must configure them correctly. Configuring the graphics cards is an advanced operation. Refer to the README for the NVIDIA drivers for information specific to your operating system

---

B.3 Enabling the Onboard ATI Graphics Controller Before Solaris Installation

To enable the ATI graphics controller along with a PCI Express x16 3D graphics card after the Solaris 10 Operating System image was removed from the workstation, but before you reinstall the OS:

1. **Reboot the workstation and press the F2 key at the Solaris logo screen.**

   The BIOS Setup menu displays.

2. **Make changes in the BIOS to enable the onboard ATI graphics controller:**

   a. **Select PnP/PCI Configurations in the main menu.**

   b. **Select the Init Display First option.**

c. **Change the display order so that PCI is the first display option.**

   This ensures that the ATI graphics controller is enabled as the primary output device. If a 3D card is installed, it functions as the secondary device.

d. **Press the F10 key to save your changes and exit.**

e. **Save your data and exit the BIOS.**

3. **Connect a second monitor to the onboard video connector.**
4. **Reboot the workstation and install the Solaris 10 operating system.**
5. **After the operating system installation is complete, open a terminal window and log into the workstation as superuser.**
6. **Type the following commands:**

```
# /etc/rc2.d/S99dtlogin stop
# /usr/X11/bin/Xorg -configure
```

`Xorg` probes the hardware on the system and create an xorg configuration file called `xorg.conf.new` in the root directory.

7. **Copy the** `xorg.conf.new` **file to the** `/etc/X11` **directory by typing:**

```
# cp /xorg.new /etc/X11
```

8. **Rename the file from** `xorg.conf.new` **to** `xorg.conf`**:**

```
# cd /etc/X11
# mv xorg.conf.new xorg.conf
```

9. **Reboot the workstation.**

Note – Both graphics cards are available as display devices, but you must configure them correctly. Configuring the graphics cards is an advanced operation. Refer to the README for the NVIDIA drivers for information specific to your operating system

---

APPENDIX C

BIOS POST Codes

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

However, in some cases the error might be so severe that the BIOS halts immediately or the BIOS might be unable to initialize video. In these cases, it can be useful to determine the last POST task that the BIOS was executing. This is indicated by the value written to port 80.

You can read the port 80 POST codes from the LED on the Sun Ultra 20 Workstation motherboard. The location of this LED is circled in FIGURE C-1. The BIOS post codes are listed in TABLE C-1.

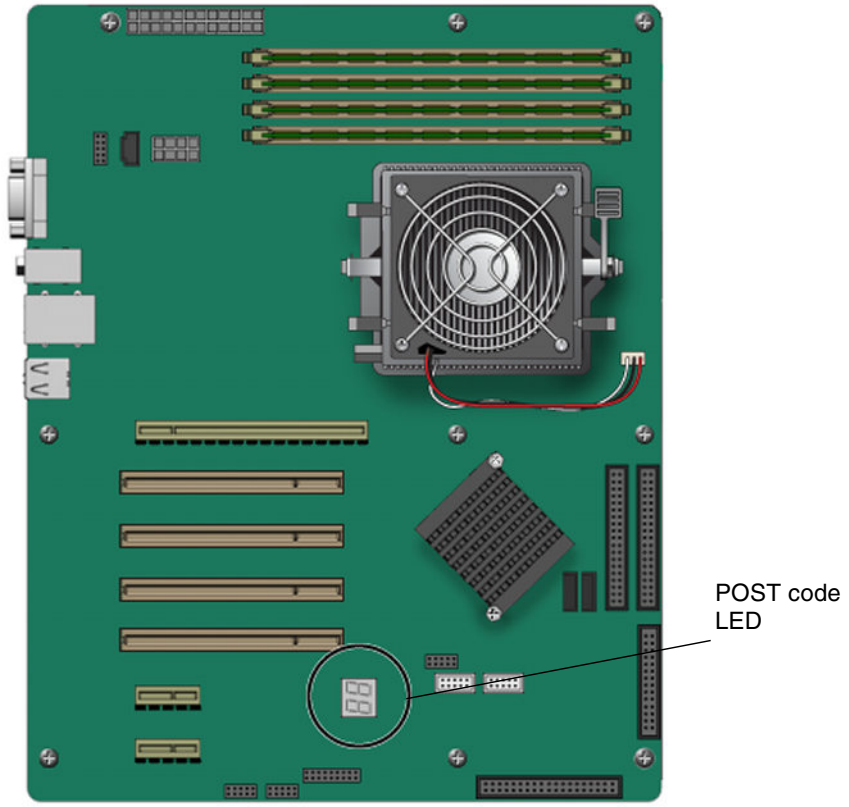

FIGURE C-1 Location of Port 80 Code LED

TABLE C-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.

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

Post Code	Description
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.
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.

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

Post Code	Description
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–e.g. 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.
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.

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

Post Code	Description
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–e.g. 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.
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.

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

Post Code	Description
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 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 smaller one in case the cacheable ranges between each CPU are not identical.
4Fh	Reserved.
50h	Initialize USB keyboard and mouse.
51h	Reserved.
52h	Test all memory (clear all extended memory to 0).
53h	Clear password according to H/W jumper (optional).
54h	Reserved.
55h	Display 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.

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

Post Code	Description
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.
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.

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

Post Code	Description
74h	Reserved.
75h	Detect and install all IDE devices: HDD, LS120, ZIP, CDROM….
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.
E8POST.ASM starts.	
82h	1. Call chipset power management hook. 2. Recover the text fond 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.

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

Post Code	Description
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.
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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