Contents

Preface  xiii

1.  Sun Ultra 24 Workstation Hardware Features  1
    Front Panel   2
    Back Panel   3
    Internal Components and Connectors   4
        Internal Components   4
        Power Supply Cables and Connections.   5
        Component Cables and Connections   6

2.  Unpacking, Cabling, and Powering the Sun Ultra 24 Workstation   7
    Planning the Installation Process   8
    Checking Package Contents   9
    Connecting Devices and Cables to the Workstation   10
        ▼  To Connect Devices and Cables to the Workstation   10
    Powering On the Workstation   11
        ▼  To Power on the Workstation   11
    Powering Off the Workstation   12
        ▼  To Power Off the Workstation   12

3.  Troubleshooting   13
Troubleshooting Overview  13
Visual Inspection  14
   ▼ To Perform an External Visual Inspection  14
   ▼ To Perform an Internal Visual Inspection  14
Troubleshooting Procedures  15
Obtaining Technical Assistance  19

4. Running Diagnostics  21
Understanding the Diagnostic Partition  22
Starting Pc-Check Diagnostics  22
   ▼ To Access the Pc-Check Diagnostics Main Menu  22
System Information Menu  23
Advanced Diagnostics  25
   Hard Drive Testing  26
   ▼ To Test the Hard Drive  26
Immediate Burn In Testing  28
Deferred Burn In Testing  30
Create Diagnostic Partition  31
   Adding a Diagnostic Partition to the First Bootable Disk  31
   ▼ To Add the Diagnostic Partition on the First Bootable Disk  31
Creating a Log File on the Diagnostic Partition  32
   ▼ To Create a Log File on the Diagnostic Partition  32
Accessing the Diagnostic Partition Under Red Hat Linux  33
   ▼ To Access the Diagnostic Partition Under Red Hat Linux  33
Accessing the Diagnostic Partition Under the Solaris 10 Operating System  34
   ▼ To Access the Diagnostic Partition Under the Solaris 10 Operating System  34
Accessing the Diagnostic Partition Under Windows XP  35
   ▼ To Access the Diagnostic Partition Under Windows XP  36
5. **Maintaining the Workstation**  39

Electrostatic Discharge (ESD) Precautions  40

Opening the Workstation  40

  Tools and Supplies Needed  40

  Powering Off the System and Removing the Left-Side Access Panel  41

  ▼ To Power Off the System and Remove the Left-Side Access Panel  41

Removing the Front Bezel  42

  ▼ To Remove the Front Bezel  42

Closing the Workstation  43

  ▼ To Prepare for Service  44

  ▼ To Install the Front Bezel  44

  ▼ To Install the Left Side Access Panel  45

Removing or Adding a Hard Drive  46

  ▼ To Remove a Hard Drive  47

  ▼ To Install a Hard Drive  49

Installing SAS Card, Cables, and Hard Drives  50

  ▼ To Convert from SATA to SAS  50

Replacing the Storage Backplane  53

  ▼ To Remove the Storage Backplane  53

  ▼ To Install the Storage Backplane  56

Replacing the DVD Drive  57

  ▼ To Remove the DVD Drive  57

  ▼ To Install the DVD Drive  59

Removing and Installing DIMMs  60
Managing the System BIOS and MEBx  93

Accessing the System BIOS Setup Utility  94

▼ To Access the BIOS Setup Utility  94

Updating the System BIOS  94

▼ To Update the System BIOS  94

Recovering From a Corrupted BIOS  95

▼ To Recover the BIOS  95

Accessing Intel Management Engine BIOS Extension  96

▼ To Access Intel MEBx  96

Enabling ME FW Local Update  96

▼ To Enable ME FW Local Update  96

Setting ME Power Policies  97

▼ To Set ME Power Policies  97

Recovering the Intel ME Firmware  97

▼ To Recover the ME Firmware, Option 1  98

▼ To Recover the ME Firmware, Option 2  98

A. System Specifications  103

System Components and Features  104

Memory Configurations  105

PCle and PCI Expansion Slots  106

Physical Specifications  106

Power Specifications  107

Environmental Specifications  108

B. BIOS POST Codes  109

Index  119
Figures

FIGURE 1-1 Front Panel Components 2
FIGURE 1-2 Back Panel Components 3
FIGURE 1-3 Internal System Components 4
FIGURE 1-4 Power Supply and Component Cable Connections to Motherboard 5
FIGURE 1-5 Internal Component Cables and Connections 6
FIGURE 2-1 External Cable Connections 10
FIGURE 2-2 Connecting the Monitor to the System Image 11
FIGURE 5-1 Removing the Side Access Panel 42
FIGURE 5-2 Removing the Front Bezel 43
FIGURE 5-3 Installing the Front Bezel 45
FIGURE 5-4 Installing the Left Side Access Panel 46
FIGURE 5-5 Removing a Hard Drive 48
FIGURE 5-6 Installing a Hard Drive 49
FIGURE 5-7 Installing a SAS Card 52
FIGURE 5-8 Location of the Storage Backplane 54
FIGURE 5-9 Removing the Storage Backplane 55
FIGURE 5-10 Installing the Storage Backplane 56
FIGURE 5-11 Location of DVD Cables 58
FIGURE 5-12 Removing the DVD Drive 58
FIGURE 5-13 Installing the DVD Drive 59
# Tables

| TABLE 2-1 | Items Included in the Sun Ultra 24 Workstation Box | 9 |
| TABLE 3-1 | Troubleshooting Procedures | 16 |
| TABLE 3-2 | Sun Web Sites and Telephone Numbers | 19 |
| TABLE 4-1 | System Information Menu Options | 23 |
| TABLE 4-2 | Advanced Diagnostics Tests Menu Options | 25 |
| TABLE 4-3 | Parameters for the HD Tests | 27 |
| TABLE 4-4 | Continuous Burn In Testing Options | 29 |
| TABLE 4-5 | Show Results Summary | 37 |
| TABLE 5-1 | Battery Specifications | 70 |
| TABLE A-1 | Key System Components | 104 |
| TABLE A-2 | Sun Ultra 24 workstation Memory Configurations | 105 |
| TABLE A-3 | Internal Expansion Slots | 106 |
| TABLE A-4 | Sun Ultra 24 workstation Physical Specifications | 106 |
| TABLE A-5 | Input Voltage Range | 107 |
| TABLE A-6 | Input Frequency Range | 107 |
| TABLE A-7 | Input Current | 107 |
| TABLE A-8 | Sun Ultra 24 workstation Environmental Specifications | 108 |
| TABLE B-1 | BIOS Port 80 POST Codes | 110 |
Preface

The *Sun Ultra 24 Workstation Service Manual* provides a detailed description of the hardware and software applications used to support the Sun Ultra 24 workstation. This book is intended for system administrators, network administrators, or service technicians who have knowledge of workstation hardware and software.

Related Documentation

The document set for the Sun Ultra 24 workstation is described in the *Where to Find Sun Ultra 24 workstation Documentation* sheet that is packed with your system. All documents are posted at:

http://docs.sun.com/app/docs/prod/ultra24

Translated versions of some of these documents are available at:

http://docs.sun.com

Use the Language drop-down list to select a language and navigate to the Sun Ultra 24 Workstation document collection using the Desktop category link. Available translations for the Sun Ultra 24 Workstation include Simplified Chinese, Traditional Chinese, French, Japanese, Korean, Spanish, Italian, and German).

English documentation is revised more frequently and might be more up-to-date than the translated documentation.
Documentation, Warranty, Support, and Training URLs

<table>
<thead>
<tr>
<th>Sun Function</th>
<th>URL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Documentation</td>
<td><a href="http://www.docs.sun.com">http://www.docs.sun.com</a></td>
<td>Sun hardware documentation</td>
</tr>
<tr>
<td>Software Documentation</td>
<td><a href="http://www.docs.sun.com">http://www.docs.sun.com</a></td>
<td>Solaris OS and other software documentation</td>
</tr>
<tr>
<td>Warranty</td>
<td><a href="http://www.sun.com/service/support/warranty/index.html">http://www.sun.com/service/support/warranty/index.html</a></td>
<td>View specific details regarding your warranty</td>
</tr>
<tr>
<td>Support</td>
<td><a href="http://www.sun.com/support/">http://www.sun.com/support/</a></td>
<td>Obtain technical support, including patches</td>
</tr>
<tr>
<td>Training</td>
<td><a href="http://www.sun.com/training/">http://www.sun.com/training/</a></td>
<td>Learn about Sun courses and educational offerings</td>
</tr>
</tbody>
</table>

Ordering Components

You can order additional components and replacement parts for the Sun Ultra 24 Workstation. Contact your local Sun sales representative for more information. For the most up-to-date component information, see the Sun Ultra 24 workstation components list at:

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

Third-Party Web Sites

Sun is not responsible for the availability of third-party web sites mentioned in this document. Sun does not endorse and is not responsible or liable for any content, advertising, products, or other materials that are available on or through such sites or
resources. Sun will not be responsible or liable for any actual or alleged damage or loss caused by or in connection with the use of or reliance on any such content, goods, or services that are available on or through such sites or resources.

Safety Information

Read the following documents for safety information:

- *Important Safety Information for Sun Hardware Systems*
- *Sun Ultra 24 workstation Safety and Compliance Guide*
Sun Welcomes Your Comments

Sun is interested in improving its documentation and welcomes your comments and suggestions. You can submit your comments at:

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

Please include the title and part number of your document with your feedback:

Sun Ultra 24 Workstation Service Manual, 820-2480-12
Sun Ultra 24 Workstation Hardware Features

This chapter provides an overview of the Sun Ultra 24 workstation hardware features and includes the following sections:

- “Front Panel” on page 2
- “Back Panel” on page 3
- “Internal Components and Connectors” on page 4
Front Panel

**Figure 1-1** Front Panel Components

<table>
<thead>
<tr>
<th>Figure Legend</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Power Button</td>
<td>4  Two USB 2.0 ports</td>
</tr>
<tr>
<td>2  Power LED</td>
<td>5  Microphone-in jack</td>
</tr>
<tr>
<td>3  Two 1394 ports</td>
<td>6  Microphone-out jack</td>
</tr>
</tbody>
</table>
Back Panel

FIGURE 1-2  Back Panel Components

Figure Legend

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power Connector</td>
</tr>
<tr>
<td>2</td>
<td>Power switch</td>
</tr>
<tr>
<td>3</td>
<td>Audio connector</td>
</tr>
<tr>
<td>4</td>
<td>Audio connector</td>
</tr>
<tr>
<td>5</td>
<td>Audio connector</td>
</tr>
<tr>
<td>6</td>
<td>Audio connector</td>
</tr>
<tr>
<td>7</td>
<td>Audio connector</td>
</tr>
<tr>
<td>8</td>
<td>Audio connector</td>
</tr>
<tr>
<td>9</td>
<td>Four USB Ports</td>
</tr>
<tr>
<td>10</td>
<td>Ethernet port</td>
</tr>
<tr>
<td>11</td>
<td>Blank, unused</td>
</tr>
<tr>
<td>12</td>
<td>x16 PCIe slot</td>
</tr>
<tr>
<td>13</td>
<td>x1 PCIe slot</td>
</tr>
<tr>
<td>14</td>
<td>x16 PCIe slot</td>
</tr>
<tr>
<td>15</td>
<td>PCI slot</td>
</tr>
<tr>
<td>16</td>
<td>PCI slot</td>
</tr>
<tr>
<td>17</td>
<td>PCIe x8 (4,1) slot</td>
</tr>
<tr>
<td>18</td>
<td>Release screws (captive) for left side access cover</td>
</tr>
</tbody>
</table>
Internal Components and Connectors

Internal Components

**FIGURE 1-3** Internal System Components

Figure Legend

<table>
<thead>
<tr>
<th></th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply</td>
</tr>
<tr>
<td>2</td>
<td>Memory (DIMMs)</td>
</tr>
<tr>
<td>3</td>
<td>System fan</td>
</tr>
<tr>
<td>4</td>
<td>Heatsink and CPU</td>
</tr>
<tr>
<td>5</td>
<td>Blank unused slot</td>
</tr>
<tr>
<td>6</td>
<td>x16 PCIe slot</td>
</tr>
<tr>
<td>7</td>
<td>x1 PCIe slot</td>
</tr>
<tr>
<td>8</td>
<td>x16 PCIe slot</td>
</tr>
<tr>
<td>9</td>
<td>Two PCI slots</td>
</tr>
<tr>
<td>10</td>
<td>PCIe x8 (4,1) slot</td>
</tr>
<tr>
<td>11</td>
<td>DVD release lever</td>
</tr>
<tr>
<td>12</td>
<td>I/O board release screw (captive)</td>
</tr>
<tr>
<td>13</td>
<td>Hard drive cage</td>
</tr>
<tr>
<td>14</td>
<td>Hard drives</td>
</tr>
</tbody>
</table>
Power Supply Cables and Connections.

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

**Figure Legend**

1. Power supply to DVD drive
2. Storage Backplane
3. Power supply P1 to motherboard PWR1
4. Power supply P2 to motherboard PWR2
Component Cables and Connections

**FIGURE 1-5** Internal Component Cables and Connections

<table>
<thead>
<tr>
<th>Figure Legend</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply P1 to MB PWR1</td>
</tr>
<tr>
<td>2</td>
<td>Power supply P2 to MB PWR2</td>
</tr>
<tr>
<td>3</td>
<td>I/O Board J1 to MB FPB_Audio</td>
</tr>
<tr>
<td>4</td>
<td>System Fan to MB SYS_FAN</td>
</tr>
<tr>
<td>5</td>
<td>CPU Fan to MB CPU_FAN</td>
</tr>
<tr>
<td>6</td>
<td>DVD to MB SATA 0 (white)</td>
</tr>
<tr>
<td>7</td>
<td>I/O Board J5 to MB FPB_USB</td>
</tr>
<tr>
<td>8</td>
<td>I/O Board J8 to MB 13940-0 and 1394-1</td>
</tr>
<tr>
<td>9</td>
<td>I/O Board J12 to MB FPB_CONN</td>
</tr>
<tr>
<td>10</td>
<td>SATA 1 to Storage Backplane HDD1 (black)</td>
</tr>
<tr>
<td>11</td>
<td>SATA 2 to Storage Backplane HDD2 (blue)</td>
</tr>
<tr>
<td>12</td>
<td>SATA 3 to Storage Backplane HDD3 (green)</td>
</tr>
<tr>
<td>13</td>
<td>SATA 4 Storage Backplane HDD4 (red)</td>
</tr>
</tbody>
</table>
Unpacking, Cabling, and Powering the Sun Ultra 24 Workstation

This chapter describes how to connect cables and power the Sun Ultra 24 workstation on and off. The chapter includes the following sections.

- “Planning the Installation Process” on page 8
- “Checking Package Contents” on page 9
- “Connecting Devices and Cables to the Workstation” on page 10
- “Powering On the Workstation” on page 11
- “Powering Off the Workstation” on page 12
Planning the Installation Process

Use the following flowchart to assist you with installing the Sun Ultra 24 workstation.

**EXAMPLE 2-1**  Process Flow for Setting Up the Sun Ultra 24 Workstation

1. **START**
2. Unpack the workstation and familiarize yourself with the workstation features.  See Chapter 1.
3. Install optional components?
   - Yes: Install optional components.
   - No: Connect the workstation and external device cables.
4. Power on the workstation.
5. Configure preinstalled OS software?
   - Yes: Configure the preinstalled Solaris 10 Operating System.
   - No: Install your OS.
6. See the Sun Ultra 24 workstation Installation Guide.

**READY TO WORK!**
Checking Package Contents

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

**TABLE 2-1  Items Included in the Sun Ultra 24 Workstation Box**

<table>
<thead>
<tr>
<th>Category</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>• Sun Ultra 24 Workstation</td>
</tr>
<tr>
<td></td>
<td>• DMS-59 cable (if the workstation is configured with an NVS290 graphics card)</td>
</tr>
<tr>
<td>DVD</td>
<td>• Sun Ultra 24 Workstation Tools and Drivers DVD (includes drivers and diagnostic software)</td>
</tr>
<tr>
<td>Documentation*</td>
<td>• Sun Ultra 24 workstation Installation Manual</td>
</tr>
<tr>
<td></td>
<td>• Where to Find Sun Ultra 24 workstation Documentation (lists available online documents for this product)</td>
</tr>
<tr>
<td></td>
<td>• Sun safety and license documents</td>
</tr>
</tbody>
</table>

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

A country kit is optional, ships in a separate package and includes a power cable, keyboard, and mouse.
Connecting Devices and Cables to the Workstation

To Connect Devices and Cables to the Workstation

1. Connect the workstation power cord to a grounded electrical outlet (see FIGURE 2-1).

2. Connect the keyboard to a USB connector on the back or front panel (see FIGURE 2-1).

3. Connect the mouse to the USB connector on the underside of the keyboard or to a USB connector on the front or back panel (see FIGURE 2-1).

4. Connect the Ethernet cable to the Ethernet connector on the Sun Ultra 24 workstation and connect the other end of the cable to an Ethernet RJ-45 jack (see FIGURE 2-1).

5. Connect the monitor cable to the external port of the PCIe graphics card that is installed in the PCIe-2 slot (fourth slot from the bottom); see FIGURE 2-2. Your graphics card might require a DVI cable to connect to your monitor.
6. Connect any additional external devices to the workstation’s other connectors.

Powering On the Workstation

▼ 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 (igure) position.
3. Press and release the power switch on the front panel.
4. After several seconds, verify that the Platform Power LED next to the power switch is lit.
   The Platform Power LED lights after the workstation begins the internal booting process.
5. If you need to change the system parameters in the BIOS, press the F2 key during the POST process to access the BIOS Setup Utility.

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

Powering Off the Workstation

▼ To Power Off the Workstation

1. Save your data and close any open applications.

2. Read the following power-off options and then follow one of the options to turn off the workstation.
   - Power off the workstation by using the operating system shutdown command or menu option.
     In most cases, this initiates an orderly shutdown of the operating system and shuts off the workstation power.

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

- If the first option does not shut off the workstation power, press and hold the power button for approximately four seconds.
  This option shuts down the power to the workstation but does not initiate an orderly shutdown of the operating system. This option might result in data loss.

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

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

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

- Troubleshooting Overview
- “Visual Inspection” on page 14
- “Troubleshooting Procedures” on page 15
- “Obtaining Technical Assistance” on page 19

Troubleshooting Overview

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

Question: What events occurred prior to the failure?

Question: Was any hardware or software modified or installed?

Question: Was the workstation recently installed or moved?

Question: How long has the workstation exhibited symptoms?

Question: 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 “Visual Inspection” on page 14.
- See the troubleshooting procedures described in “Troubleshooting Procedures” on page 15.
Execute diagnostics tests as described in Chapter 4.

If you are not able to resolve the problem, contact Sun technical support. Support numbers and web sites are listed in “Obtaining Technical Assistance” on page 19.

---

Visual Inspection

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

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

▼ To Perform an External Visual Inspection

1. Shut down the operating system, if necessary, power off the platform power on the front of the workstation and power off attached peripherals (if applicable).
2. Verify that all power cables are properly connected to the system, the monitor and the peripherals and check that the power source for each is functional.
3. Inspect connections to any attached devices, including network cables, keyboard, monitor, and mouse.

▼ To Perform an Internal Visual Inspection

1. Shut down the operating system, if necessary, and turn off the platform power on the front of the workstation.
2. Turn off the AC power on the back of the workstation.
3. Turn off any attached peripherals, but do not disconnect the power cables.
4. Remove the left side access panel, following the procedures in “Opening the Workstation” on page 40.
Caution – Some components, such as the heatsink, can become extremely hot during system operations. Allow these components to cool before handling them.

5. Verify that the components are fully seated in their sockets or connectors and that the sockets are clean.

6. Verify that all cables inside the system are firmly attached to their appropriate connectors.

7. Replace the left side access panel.

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

Troubleshooting Procedures

TABLE 3-1 lists possible problems that might arise during the use of your workstation. Possible solutions are listed for each problem. If the solutions listed here do not fix the problem, run the appropriate diagnostic test (see Chapter 4).
As you work, keep notes in case you need to call Sun technical support:

**TABLE 3-1  Troubleshooting Procedures**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
</table>
| Workstation does not power on when the front panel Power button is pressed. | • Is the Power LED illuminated on the front of the system? Ensure that the power cord is connected to the system and to a grounded power receptacle.  
• Does the wall outlet have power? Test by connecting another device.  
• Does the system beep when the system is powered on? The system beeps when no keyboard or a malfunctioning keyboard is plugged in.  
• Does the monitor sync within 5 minutes after the power-on? The green LED on the monitor stops flashing and remains illuminated.  
• Is the monitor connected to the onboard video connector or PCI Express video card? Connect the monitor to the active video connector. |
| Workstation halts during POST without displaying error messages. | Check the BIOS POST LED display on the motherboard. See Appendix B for detailed information about the POST codes. |
| Workstation powers on, but the monitor does not. | • Is the Power button for the monitor turned on?  
• Is the monitor power cord connected to a wall outlet?  
• Does the wall outlet have power? Test by connecting another device.  
• Is the monitor connected to the onboard video connector or PCI Express video connector? |
| Workstation does not power off when the front panel Power button is pressed. | • Try all of the power-off options described in “Powering Off the Workstation” on page 12.  
• If the workstation still does not power off, disconnect the power cable from the back of the chassis. |
| Workstation appears to be in low-power mode, but the Power LED does not blink. | The Power 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 LED does not blink. |
| Unable to access the network. | • Check the cabling and network equipment to make sure that all cables are correctly seated.  
• Reinstall the network drivers. |
Newly installed memory is not detected.

- Make sure that the memory is properly seated on the DIMM sockets.
- Move the memory to the other DIMM socket to determine whether the socket is defective.
- Make sure that you are using 512 MB, 1 GB, or 2 GB registered DDR2 667 SDRAM modules with 3.05 cm maximum height.
- Make sure that the memory is installed in pairs.

System cannot read the disk information.

Check to see that the disk is properly seated. If that does not resolve the issue, do the following:
1. Turn off the workstation by pressing the Power button.
2. Remove the left side access panel.
3. Check to make sure that the power and data cables are connected to the backplane of the disk drive and that the pins in the cable and connector are not bent.
4. Replace the left side access panel.
5. Turn on the workstation.

DVD does not eject from the drive the Eject button is pressed.

- 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 DVD.

System cannot read DVD information.

Check the following:
- Are you using the correct type of DVD?
- Do other DVDs work in this drive?
- Is the DVD properly inserted in the drive?
- Is the DVD clean and unscratched?
- Are the cables connected to the DVD drive?

Keyboard or mouse does not respond to actions.

- Are the keyboard and mouse Type 7? Verify the model on the underside of the keyboard.
- Verify that the mouse and keyboard cables are connected to the onboard USB 2.0 connectors on the workstation.
- Verify that the workstation is powered on and that the front Power LED is illuminated.
### TABLE 3-1  Troubleshooting Procedures (Continued)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Solution</th>
</tr>
</thead>
</table>
| Hung or frozen workstation: no response from mouse or keyboard or any application. | Are the keyboard and mouse Type 7? Verify the model on the underside of the keyboard.  
Try to access your system from a different workstation on the network.  
1. From a terminal window, enter **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 “Powering On the Workstation” on page 11 for more detailed information. |
| There is no video display on the monitor screen.     | Check the following:  
Try to access your system from a different workstation on the network.  
1. From a terminal window, enter **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 these 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 “Powering On the Workstation” on page 11 for more detailed information.                          |

- 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.
Obtaining Technical Assistance

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

### Table 3-2: Sun Web Sites and Telephone Numbers

<table>
<thead>
<tr>
<th>Workstation Documents and Support Resources</th>
<th>URL or Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDF files for all the current Sun Ultra 24 workstation documents.</td>
<td><a href="http://docs.sun.com/app/docs/prod/ultra24">http://docs.sun.com/app/docs/prod/ultra24</a></td>
</tr>
<tr>
<td>Solaris OS and other software documents. This web site has full search capabilities.</td>
<td><a href="http://docs.sun.com/documentation/">http://docs.sun.com/documentation/</a></td>
</tr>
<tr>
<td>Sun service program phone numbers.</td>
<td>1-800-872-4786 (1-800-USA-4Sun); Select Option 1</td>
</tr>
</tbody>
</table>
### TABLE 3-2  Sun Web Sites and Telephone Numbers

<table>
<thead>
<tr>
<th>Workstation Documents and Support Resources</th>
<th>URL or Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranties for every Sun product.</td>
<td><a href="http://www.sun.com/service/support/warranty">http://www.sun.com/service/support/warranty</a></td>
</tr>
</tbody>
</table>
CHAPTER 4

Running Diagnostics

The Pc-Check diagnostics software detects and tests motherboard components, ports, slots, and installed components on the Sun Ultra 24 workstation. Pc-Check is included on the Sun Ultra 24 workstation Tools and Drivers DVD.

If you encounter a hardware-related error message (such as a memory error or hard disk error) on your Sun Ultra 24 workstation, run one of the following tests:

- Advanced Diagnostics Test: Specific hardware component tests
- Immediate Burn In Test: Sun-supplied diagnostic scripts for the Sun Ultra 24 workstation

The following sections describe how to start and use the diagnostics.

- “Understanding the Diagnostic Partition” on page 22
- “Starting Pc-Check Diagnostics” on page 22
- “System Information Menu” on page 23
- “Advanced Diagnostics” on page 25
- “Immediate Burn In Testing” on page 28
- “Deferred Burn In Testing” on page 30
- “Create Diagnostic Partition” on page 31
- “Show Results Summary” on page 36
- “Print Results Report” on page 38
- “About Pc-Check” on page 38
- “Exit to DOS” on page 38
Understanding the Diagnostic Partition

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

The diagnostic partition is preinstalled on the Sun Ultra 24 workstation. You do not need to reinstall the diagnostic partition unless you removed it.

If you removed the diagnostic partition, you can re-create it using the Create Diagnostic Partition option on the Tools and Drivers DVD. See “Create Diagnostic Partition” on page 31 for instructions.

Starting Pc-Check Diagnostics

Prerequisites

- Your workstation must be running a Sun-supported Linux or Solaris™ OS. Refer to the Sun Ultra 24 Workstation Operating System Installation Guide for a list of supported operating systems.
- You must access and execute Pc-Check from the Sun Ultra 24 workstation Tools and Drivers DVD.

To Access the Pc-Check Diagnostics Main Menu

1. Insert the Sun Ultra 24 workstation Tools and Drivers DVD into your DVD drive and reboot the system.
   The system boots to the Sun Ultra 24 workstation Tools and Drivers DVD main menu.

2. Type 1 to run the Hardware Diagnostics Software.
   The system information loads, the Diagnostics main menu opens, and the following menu options appear:
   - System Information Menu
   - Advanced Diagnostics Tests
   - Immediate Burn In Testing
   - Deferred Burn In Testing
   - Create Diagnostic Partition
The entries in the Diagnostics main menu are described in the following sections.

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

Navigation instructions are shown at the bottom of each screen.

- Use the keyboard’s arrow keys to navigate through menus.
- Press the Enter key to choose a menu option.
- Press the Escape key to exit a menu (or submenu).

### System Information Menu

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

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Overview</td>
<td>Includes basic information about your system, motherboard, BIOS, processor,</td>
</tr>
<tr>
<td></td>
<td>memory cache, drives, video, modem, network, buses, and ports.</td>
</tr>
<tr>
<td>Hardware ID Image menu</td>
<td>Enables you to create a document showing information about your system,</td>
</tr>
<tr>
<td></td>
<td>including comparisons between the updates and the newest versions of your</td>
</tr>
<tr>
<td></td>
<td>system. XML is the format used to create and display this information,</td>
</tr>
<tr>
<td></td>
<td>though you can also choose a text format (.txt) as well.</td>
</tr>
<tr>
<td>System Management Information</td>
<td>Provides information obtained from the system about the BIOS type, system,</td>
</tr>
<tr>
<td></td>
<td>motherboard, enclosure, processors, memory modules, cache, slots, system</td>
</tr>
<tr>
<td></td>
<td>event log, memory array, memory devices, memory device mapped addresses, and</td>
</tr>
<tr>
<td></td>
<td>system boot.</td>
</tr>
<tr>
<td>PCI Bus Information</td>
<td>Includes details about specific devices from pci-config space within the</td>
</tr>
<tr>
<td></td>
<td>system, similar to the System Management Information section.</td>
</tr>
<tr>
<td>IDE Bus Information</td>
<td>Shows the master-slave devices on the primary and secondary IDE controllers.</td>
</tr>
</tbody>
</table>
### System Information Menu Options (Continued)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCMCIA/CardBus Info</td>
<td>Not relevant to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Interrupt Vectors</td>
<td>Details and lists device interrupt vector information.</td>
</tr>
<tr>
<td>IRQ Information</td>
<td>Shows hardware interrupt assignments.</td>
</tr>
<tr>
<td>Device Drivers</td>
<td>Shows device drivers loaded under Open DOS.</td>
</tr>
<tr>
<td>APM Information</td>
<td>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.</td>
</tr>
<tr>
<td>I/O Port Browser</td>
<td>Shows the I/O port assignment for the hardware devices on the system.</td>
</tr>
<tr>
<td>Memory Browser</td>
<td>Enables you to view the mapped memory for the entire system.</td>
</tr>
<tr>
<td>Sector Browser</td>
<td>Reads sector information from the hard disks and DVD disks sector by sector.</td>
</tr>
<tr>
<td>CPU Frequency Monitor</td>
<td>Tests the processor speed.</td>
</tr>
<tr>
<td>CMOS RAM Utilities</td>
<td>Shows the CMOS settings of the system.</td>
</tr>
<tr>
<td>SCSI Utilities</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Text File Editor</td>
<td>Opens a text editor.</td>
</tr>
<tr>
<td>Start-Up Options</td>
<td>Enables you to set up options for diagnostics testing.</td>
</tr>
</tbody>
</table>
Advanced Diagnostics

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

**TABLE 4-2** Advanced Diagnostics Tests Menu Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Details information about the processor and includes a Processor Tests menu to test the processor on the system.</td>
</tr>
<tr>
<td>Memory</td>
<td>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.</td>
</tr>
<tr>
<td>Motherboard</td>
<td>Details information about the motherboard and includes a Motherboard Tests menu to test the motherboard on the system.</td>
</tr>
<tr>
<td>Diskettes</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Hard Disks</td>
<td>Details information about the hard disk and includes a Hard Disk Tests menu to test hard disks on the system. Refer to “Hard Drive Testing” on page 26, for detailed information about testing hard disks and script information.</td>
</tr>
<tr>
<td>CD-ROM/DVD</td>
<td>Includes a CD-ROM/DVD menu to test DVD devices on the system.</td>
</tr>
<tr>
<td>ATAPI Devices</td>
<td>N/A</td>
</tr>
<tr>
<td>Serial Ports</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Parallel Ports</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Modems</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>ATA</td>
<td>Includes an ATA test menu.</td>
</tr>
<tr>
<td>USB</td>
<td>Details information about the USB devices on the system and includes a USB Tests menu to test the USB.</td>
</tr>
<tr>
<td>FireWire</td>
<td>Details information about FireWire devices and includes a FireWire tests menu.</td>
</tr>
<tr>
<td>Network</td>
<td>Performs network register controller tests.</td>
</tr>
<tr>
<td>Keyboard</td>
<td>Includes a Keyboard Test menu with options for performing different tests on the keyboard.</td>
</tr>
</tbody>
</table>
Hard Drive Testing

To Test the Hard Drive

1. From the Diagnostics main menu, choose Advanced Diagnostics Tests.
   The Advanced Diagnostics menu appears.

2. From the Advanced Diagnostics menu, choose Hard Disks.
   The Select Drive menu appears.

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

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

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouse</td>
<td>Details information about the mouse and includes a menu to test the mouse on the system.</td>
</tr>
<tr>
<td>Joystick</td>
<td>Provides details information about a third-party joystick (not available from Sun) and includes a menu to test the joystick.</td>
</tr>
<tr>
<td>Audio</td>
<td>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.</td>
</tr>
<tr>
<td>Video</td>
<td>Details information about the video card. Initially, the monitor might flicker, but then it displays a Video Test Options menu that enables you to perform various video tests.</td>
</tr>
<tr>
<td>Printers</td>
<td>Not applicable to the Sun Ultra 24 workstation.</td>
</tr>
<tr>
<td>Firmware - ACPI</td>
<td>Details information about Advanced Configurable Power Interface (ACPI) and includes an ACPI Tests menu to test ACPI.</td>
</tr>
</tbody>
</table>
- Non-Destructive Write Test
- Destructive Write Test
- Mechanics Stress Test
- Internal Cache Test
- View Error Log
- Utilities Menu
- Exit

The Hard Disk Tests perform diagnostics on both the media and the device. The media diagnostic options are 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 HD hardware, such as the physical disk.

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

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

If errors occur during diagnostic testing, the errors are written to the error log. You can examine the error log using the View Error Log option.

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

**TABLE 4-3**  Parameters for the HD Tests

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Test Settings</td>
<td>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.</td>
</tr>
<tr>
<td>Device Test Settings</td>
<td>Enables you to select the test time durations of the devices and the test level.</td>
</tr>
<tr>
<td>Number of Retries</td>
<td>Enables you to select the number of times to retry testing a device before terminating the test.</td>
</tr>
<tr>
<td>Maximum Errors</td>
<td>Enables you to select the number of errors allowed before terminating the test.</td>
</tr>
</tbody>
</table>
Immediate Burn In Testing

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

- **quick.tst** – This script performs a non-detailed test of all hardware components, including those components that require user input, as well as a more in-depth memory test. You must interact with the Pc-Check software to progress through these interactive tests. These interactive tests cannot be run unattended and do not contain any “timeout” facilities. The interactive tests will wait until you provide the correct input.

- **noinput.tst** – This script is used as a triage of any hardware-related problems or issues. The script performs a non-detailed test of most hardware components, excluding those components that require user input (keyboard, mouse, sound, video). This test does not require user input.

- **full.tst** – This script performs the most detailed and comprehensive test on all hardware components, including those components which require user input. This script contains a more in-depth memory test than **quick.tst**, as well as external port tests (which might require loopback connectors). You must interact with the test utility to progress through these interactive tests.

**Tip** – Each of these scripts tests the operating status of your entire system. If you want to test only a certain percentage of your system’s hard drives, see “Hard Drive Testing” on page 26 for information about how to change the test options.

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

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check SMART First</td>
<td>SMART stands for Smart Monitoring Analysis Reporting Test. SMART-enabled drives provide predictive failure analysis and diagnostic information.</td>
</tr>
<tr>
<td>HPA Protection</td>
<td>HPA stands for Host Protected Area.</td>
</tr>
<tr>
<td>Exit</td>
<td>Exits the menu.</td>
</tr>
</tbody>
</table>
To load one of the scripts available to test the devices on your system:

- **From the main menu, choose Immediate Burn In Testing.**
  
  The top portion of the window lists the options described in TABLE 4-4, and the bottom portion of the window lists the following Burn In testing menu options:

  - **Load Burn In Script**
    
    Type one of the following:
    
    quick.tst, noinput.tst, or full.tst  
    
    If you created and saved your own script, type d:\testname.tst
    
    *testname*  The name of the script that you created.

  - **Save Burn In Script**
    
    To save a Burn In script that you created, type d:\testname.tst
    
    *testname*  The name of the script that you created.

### TABLE 4-4  Continuous Burn In Testing Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Default – General</th>
<th>Default Using quick.tst, noinput.tst, or full.tst Script</th>
<th>All Possible Choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass Control</td>
<td>Overall Time</td>
<td>Overall Passes</td>
<td>Individual Passes, Overall Passes, or Overall Time</td>
</tr>
<tr>
<td>Duration</td>
<td>01:00</td>
<td>1</td>
<td>Type any number to choose the time duration of the test</td>
</tr>
<tr>
<td>Script File</td>
<td>N/A</td>
<td>quick.tst, noinput.tst, or full.tst</td>
<td>quick.tst, noinput.tst, or full.tst</td>
</tr>
<tr>
<td>Report File</td>
<td>None</td>
<td>None</td>
<td>User-defined</td>
</tr>
<tr>
<td>Journal File</td>
<td>None</td>
<td>D:\noinput.jrl, D:\quick.jrl, or D:\full.jrl</td>
<td>User-defined</td>
</tr>
<tr>
<td>Journal Options</td>
<td>Failed Tests</td>
<td>All Tests, Absent Devices, and Test Summary</td>
<td>Failed Tests, All Tests, Absent Devices, and Test Summary</td>
</tr>
<tr>
<td>Pause on Error</td>
<td>N</td>
<td>N</td>
<td>Y or N</td>
</tr>
<tr>
<td>Screen Display</td>
<td>Control Panel</td>
<td>Control Panel</td>
<td>Control Panel or Running Tests</td>
</tr>
<tr>
<td>POST Card</td>
<td>N</td>
<td>N</td>
<td>Y or N</td>
</tr>
<tr>
<td>Beep Codes</td>
<td>N</td>
<td>N</td>
<td>Y or N</td>
</tr>
<tr>
<td>Maximum Fails</td>
<td>Disabled</td>
<td>Disabled</td>
<td>1-9999</td>
</tr>
</tbody>
</table>
■ Change Options
Opens the Burn In Options menu, which enables you to modify the various options listed in TABLE 4-4 for the currently loaded test script.

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

■ Perform Burn In Tests
Starts to run the currently loaded Burn In test script.

---

Deferred Burn In Testing

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

● From the main menu, choose Deferred Burn In Testing.

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

■ Load Burn In Script
Type one of the following:
quick.tst, noinput.tst, or full.tst
If you created and saved your own script, type d:\testname.tst
testname  The name that you created.

■ Save Burn In Script
To save a Burn In script that you created, type d:\testname.tst
testname  The name of the script that you created.

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

■ Select Tests
Opens a listing of all of the possible types of tests available for you to run for the currently loaded test script.
Create Diagnostic Partition

The diagnostic partition is preinstalled on the Sun Ultra 24 workstation. You need to reinstall the diagnostic partition only if you reformatted your hard drive. Using the Erase Primary Boot Hard Disk utility on the Tools and Drivers DVD preserves the diagnostic partition (see the *Sun Ultra 24 Workstation Operating System Installation Guide*).

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

The following sections explain how to create and access the diagnostic partition on the Sun Ultra 24 workstation:

- “Adding a Diagnostic Partition to the First Bootable Disk” on page 31
- “Creating a Log File on the Diagnostic Partition” on page 32
- “Accessing the Diagnostic Partition Under Red Hat Linux” on page 33
- “Accessing the Diagnostic Partition Under the Solaris 10 Operating System” on page 34
- “Accessing the Diagnostic Partition Under Windows XP” on page 35

Adding a Diagnostic Partition to the First Bootable Disk

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

▼ To Add the Diagnostic Partition on the First Bootable Disk

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

   The Hardware Diagnostics menu appears.
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?”

5. Select Yes and press the Enter key.

A window appears stating:

   “Partitioning complete. Your machine will now be restarted.”

- If the first bootable disk is not clear of partitions, a window appears stating that the software is unable to create a hardware diagnostic partition because there are already partitions on the disk.

   If this happens, repeat this procedure after you remove the partitions as described in the Sun Ultra 24 workstation Operating System Installation Guide.

6. Press the Enter key to reboot your workstation.

Creating a Log File on the Diagnostic Partition

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

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

▼ To Create a Log File on the Diagnostic Partition

1. Insert the Tools and Drivers DVD into the DVD drive.

2. Reboot the workstation.

3. From the Tools and Drivers DVD main menu, choose 1 to run the Hardware Diagnostics software.

   The Hardware Diagnostics menu appears.

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:
   ■ Type `noinput.tst` and press the Enter key.
   ■ If you are using a test you created yourself, type `d:\testname.tst` in the Load Burn In Script field. `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 Escape key to exit the Display Results window.

9. Select Exit to DOS and press the Enter key.

10. At the DOS prompt, type the following:
    
    ```
    C:> d:
    ```

11. Type the following to list the contents of the diagnostic partition.
    
    ```
    D:> dir
    The noinput.jrl log appears.
    ```

Accessing the Diagnostic Partition Under Red Hat Linux

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

▼ To Access the Diagnostic Partition Under Red Hat Linux

1. Remove the Tools and Drivers DVD from the DVD drive.

2. Reboot the workstation and start the Red Hat Linux OS.

3. Log in as superuser.

4. To determine whether your diagnostic partition is configured to be mounted, type the following command:
   
   ```
   # ls /diagpart
   ```
   ■ If this command does not list the log files created by the hardware diagnostics software, then the OS was not configured to mount the diagnostic partition. Continue to Step 5.
If the command lists the log files created by the hardware diagnostics software, then the OS is configured to mount the diagnostic partition. All users have read access to this partition. Only the superuser has read/write access to this partition. You do not need to continue this procedure.

5. Insert the Tools and Drivers DVD into the DVD drive.

6. When the DVD mounts, open a terminal window.

7. Type the following command:

   ```bash
   # cd mountpoint/drivers/linux/linux_version
   mountpoint  The DVD mountpoint
   linux_version  The version of Linux that you installed. For example:
   # cd /mnt/cdrom/drivers/linux/red_hat
   ```

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

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

9. Press the Enter key.

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

   ```
   Mounting Diagnostic Partition
   Installation Successful
   ```

10. Type the following command:

    ```bash
    # ls /diagpart
    ```

    The contents of the diagnostic partition are listed.


Accessing the Diagnostic Partition Under the Solaris 10 Operating System

To Access the Diagnostic Partition Under the Solaris 10 Operating System

1. Remove the Tools and Drivers DVD from the DVD drive.

2. Reboot the machine and start the Solaris 10 Operating System.

3. Log in as superuser.
4. Type the following command to determine if your diagnostic partition is configured to be mounted:

```bash
# ls /diagpart
```

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

5. Insert the Tools and Drivers DVD into the DVD drive.

6. When the DVD mounts, open a terminal window.

7. Type the following to change directories:

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

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

```bash
#.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:

```bash
# ls /diagpart
```

### Accessing the Diagnostic Partition Under Windows XP

If you are running Windows XP on the Sun Ultra 24 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 24 workstation and complete the following procedure.
To Access the Diagnostic Partition Under Windows XP

1. Connect the USB diskette drive to any USB port on the Sun Ultra 24 workstation.

2. Insert the Tools and Drivers DVD into the DVD drive.

3. Reboot the workstation.

4. At the Tools and Drivers DVD main menu, type 4 to exit to DOS.

5. To change to the d: drive, enter 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, enter:
   
   ```
   D:> copy d:\noinput.jrl a:\ 
   ```

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

Show Results Summary

The summary lists the tests run and shows the results. Pass, Fail, or N/A (not applicable) appears for each option.
**TABLE 4-5** lists all possible options that are available with the Tools and Drivers DVD. Some options might not appear when the Show Results Summary appears if they are not applicable to your workstation’s configuration.

**TABLE 4-5** Show Results Summary

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>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.</td>
</tr>
<tr>
<td>Motherboard</td>
<td>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.</td>
</tr>
<tr>
<td>Memory, Cache Memory, and Video Memory</td>
<td>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.</td>
</tr>
<tr>
<td>Input Device</td>
<td>This section shows the following tests conducted against the input device: Verify Device, Keyboard Repeat, and Keyboard LEDs.</td>
</tr>
<tr>
<td>Mouse</td>
<td>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.</td>
</tr>
<tr>
<td>Video</td>
<td>This section shows the following tests conducted against the video: Color Purity Test, True Color Test, Alignment Test, LCD Test, and Test Cord Test.</td>
</tr>
<tr>
<td>Multimedia</td>
<td>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.</td>
</tr>
<tr>
<td>ATAPI Devices</td>
<td>N/A</td>
</tr>
<tr>
<td>Hard Disk</td>
<td>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.</td>
</tr>
<tr>
<td>USB</td>
<td>This section shows the following tests conducted against the USB: Controller Tests and Functional Tests.</td>
</tr>
<tr>
<td>Hardware ID</td>
<td>The compare test is used to determine the machine ID for the system. This test is not available for the Sun Ultra 24 workstation.</td>
</tr>
</tbody>
</table>
Print Results Report

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

About Pc-Check

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

Exit to DOS

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

This chapter provides instructions on how to add, replace, and configure the components in the Sun Ultra 24 workstation after it is set up. The following sections are included in this chapter:

- "Electrostatic Discharge (ESD) Precautions" on page 40
- "Opening the Workstation" on page 40
- "Closing the Workstation" on page 43

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

- "Removing or Adding a Hard Drive" on page 46
- "Installing SAS Card, Cables, and Hard Drives" on page 50
- "Replacing the Storage Backplane" on page 53
- "Replacing the DVD Drive" on page 57
- "Removing and Installing DIMMs" on page 60
- "Removing and Installing a PCIe Card" on page 63
- "Removing and Installing PCI Cards" on page 66
- "Replacing the System Battery" on page 70
- "Replacing the System Fan" on page 72
- "Replacing the Power Supply" on page 74
- "Replacing the I/O Board Assembly" on page 78
- "Replacing System Cables" on page 80

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

- "Replacing the Heatsink and CPU" on page 81
- "Replacing the Motherboard" on page 88
- "Managing the System BIOS and MEBx" on page 93
Electrostatic Discharge (ESD) Precautions

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

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

Caution – Do not operate the workstation for more than 10 minutes when the left side access panel is removed. Improper cooling airflow might damage the system’s components.

Opening the Workstation

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

Tools and Supplies Needed

- No. 2 Phillips screwdriver
- No. 2 Long Phillips screwdriver (>6 inch)
- Flat-head screwdriver
- Antistatic wrist strap (shipped with every CRU)
Powering Off the System and Removing the Left-Side Access Panel

To Power Off the System and Remove the Left-Side Access Panel

1. Power off the system and all the peripherals connected to it.

2. Turn the power switch on the back of the chassis to the Off position (0).

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

3. To maintain system grounding, do not unplug the AC power cord from the back of the system unless the specific procedure instructs you to unplug it.

4. Loosen the two captive thumbscrews located on the rear edge of the left side access panel (see FIGURE 5-1).

5. Slide the access panel approximately 1.5 cm toward the back of the workstation.

6. Tilt the top edge of the panel out, then lift the panel upward.

7. Carefully set the panel aside.
Removing the Front Bezel

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

▼ To Remove the Front Bezel

1. **Perform the steps listed in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.**
2. **Unlatch the three left side bezel tabs (see FIGURE 5-2) by gently pressing the side of each tab inward and slightly forward.**

   The edge of the bezel nearest the tabs moves slightly away from the front of the chassis as the ridges holding each tab in place are released.
Caution – Be very careful when pulling the bezel away from the chassis. The bezel tabs and the chassis hooks might break if you apply too much force or attempt to swing the bezel open.

FIGURE 5-2 Removing the Front Bezel

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

4. Remove the bezel and set it aside.

Closing the Workstation

This section describes how to install the left side access panel and the front bezel and prepare the workstation for service.
To Prepare for Service

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

2. Reinstall any PCI cards, PCIe cards, or peripherals that you removed.

3. Reinstall the system’s front bezel and left side access panel. See the following sections:
   ■ “To Install the Front Bezel” on page 44.
   ■ “To Install the Left Side Access Panel” on page 45

4. Connect all external cables to the system and then connect the AC power cord.
   See “Connecting Devices and Cables to the Workstation” on page 10.

5. Power on the system.
   See “Powering On the Workstation” on page 11.

To Install the Front Bezel

1. Insert the right side bezel hooks into the right side chassis slots. See FIGURE 5-3.

2. Insert the left side bezel tabs into the chassis slots and gently press the left side of the bezel toward the chassis until the tabs lock.

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

1. Ensure that all the components are installed as described in the step-by-step instructions for the procedure you are following.

2. Reinstall any PCI cards, PCIe cards, or peripherals that you removed.

3. Reinstall the front bezel.

4. Position the access panel so that the lip on the inside bottom of the panel fits over the bottom chassis rail.

5. Pressing gently against the top of the access panel, slide the panel toward the front of the chassis. See FIGURE 5-4.
   The access panel lies flat against the chassis, with no gaps between the two.

6. Tighten the two captive thumbscrews located on the rear lip of the panel.
   The access panel is installed flat against the chassis with the thumbscrews tightened.
Removing or Adding a Hard Drive

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

- **HD** – A hard drive equipped with rails and a locking mechanism compatible with the HD cage in the Sun Ultra 24 workstation.
- **HD cage** – The metal assembly that holds the system hard drives. The rails on the HD cage fit into guides on the HD cage. The HD cage is not replaceable, nor is it removed during maintenance procedures.
- **Storage backplane** – The storage backplane is located beneath the HD cage. When correctly inserted into the HD cage, the HD makes contact with the connectors on the storage backplane. The storage backplane also has cables linking it to the power supply and to storage device connectors on the motherboard.
- **Hard drive assembly** – Installed hard drives, the HD cage, and the storage backplane.
To Remove a Hard Drive

**Note** – The Sun Ultra 24 workstation accommodates up to four hard drives. If you are not removing an existing HD, proceed to “To Install a Hard Drive” on page 49.

1. **Follow the instructions in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, non-slip surface.

3. Locate the HD to be removed.

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

**FIGURE 5-5** Removing a Hard Drive
5. Grasp the HD handle and pull straight up to remove the HD from the system.

6. Set the HD on an antistatic surface.

7. Choose your next step.
   - If you removed an HD and want to replace it, see “To Install a Hard Drive” on page 49.
   - If you removed an HD and are not replacing it at this time, close the system by performing the steps in “To Prepare for Service” on page 44.

▼ To Install a Hard Drive

1. Perform the steps listed in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Remove the new HD from its antistatic packaging.

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

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

   **FIGURE 5-6** Installing a Hard Drive
5. Locate the HD assembly and HD cage guides.
   You must install a boot drive in HD0, the top slot. Install a second HD in HD1, the second slot. You can install up to four hard drives. The third and fourth HD slots are designated as HD2 and HD3, respectively.

6. Align the HD so the drive is centered with the HD1 or HD2 indicator on the HD cage. Be sure that the labelled side of the HD faces the top of the system.

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

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

8. Press the metal locking handle closed until it locks the HD into the HD cage.
   When correctly installed, the hard drive connector seats firmly into the storage backplane connector.

9. Inspect the hard drive assembly to verify the following items:
   - The metal locking handle is fully closed.
   - The HD is seated in the backplane connector.

10. To close the system, perform the steps in “To Prepare for Service” on page 44.

---

**Installing SAS Card, Cables, and Hard Drives**

To replace the SATA drives with SAS drives, you will need to order a SAS installation kit which includes a SAS PCIe card, and SAS hard drives.

**▼ To Convert from SATA to SAS**

1. Power off the system, open and position the chassis and remove the access panel.
   See “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Remove the SATA hard drives from the drive bay.
   See “To Remove a Hard Drive” on page 47.
3. Move the HD cables from the motherboard to the SAS card as follows:
   a. Release the HD cables from the tiedowns (two places).
   b. Disconnect the SATA1 (black connector) cable from the motherboard SATA1 connector and install it on PHY0 of the SAS card.
   c. Disconnect the SATA2 (blue connector) cable from the motherboard SATA2 connector and install it on PHY1 of the SAS card.
   d. Disconnect the SATA3 (green connector) cable from the motherboard SATA3 connector and install it on PHY2 of the SAS card.
   e. Disconnect the SATA4 (red connector) cable from the motherboard SATA4 connector and install it on PHY3 of the SAS card.

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

4. Locate the PCIe-3 slot.
   You must install the SAS card in the PCIe-3 slot. The PCIe-3 slot is the bottom x8 slot.
   See FIGURE 5-7 for PCI card locations.

5. Using a No. 2 Phillips screwdriver, remove the chassis filler panel from the PCI card slot.
   See FIGURE 5-18. Save the screw for the next step.

6. Insert the SAS card into the PCIe card slot and secure the card with a screw.
   See FIGURE 5-7.

7. To keep the cables out of the air stream, carefully secure them in the tie-downs.
8. Install the SAS drives.
   See “To Install a Hard Drive” on page 49.

9. If you are finished working, reinstall the access panel, power on the system, and verify the installation.
   See “To Install the Left Side Access Panel” on page 45.

10. Install a new operating system for the new SAS configuration.
    Refer to the Sun Ultra 24 Workstation Operating System Installation Guide at:
    http://www.docs.sun.com/
Note – Installing a new operating system is necessary only if your SAS drive does not contain a preinstalled OS.

Replacing the Storage Backplane

This section describes how to remove and install the storage backplane. For a definition of terms used in this section, see “Removing or Adding a Hard Drive” on page 46.

▼ To Remove the Storage Backplane

1. Follow the instructions in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Locate the HD assembly (see FIGURE 5-8).
4. Remove any installed hard drives and place them on an antistatic surface. 
   See “To Remove a Hard Drive” on page 47.

5. Disconnect the power and storage interface cables (see FIGURE 5-9).
6. Using a No. 2 Phillips screwdriver, remove the five screws securing the storage backplane to the chassis. Set the screws aside for later use (see FIGURE 5-9).

**Note** – Do not attempt to remove the HD cage.

7. Remove the storage backplane by pulling it up through the storage cage.

8. Proceed to “To Install the Storage Backplane” on page 56 to install the new storage backplane.
To Install the Storage Backplane

1. Ensure that the power switch on the back panel is in the Off position (0) and that the system is lying on its side with the left side access panel removed.

2. Remove the new storage backplane from its packaging.

3. Set the storage backplane under the storage cage.
   Position the screw holes over the holes in the chassis.

4. Fasten the storage backplane to the hard drive cage.
   Using a No. 2 Phillips screwdriver, install the four screws to secure the storage backplane to the hard drive cage. Torque the screws to 8 to 9 inch-pounds.

5. Connect and route the cables (see FIGURE 5-10).
   a. Connect the storage interface cables to the storage backplane connector.
b. Connect the power supply power cable to disk backplane power connector. Refer to the cabling diagram in the service label on the side of the chassis for information about cable routing.

6. **Install all hard drives into the hard drive cage.**
   
   See “To Install a Hard Drive” on page 49.

7. **Inspect the storage backplane, cables, and installed hard drives.**
   - Be sure that the power cable is seated in the storage backplane.
   - Be sure that the storage interface cables are seated in the storage backplane connectors.

8. **To close the system, perform the steps in “To Prepare for Service” on page 44.**

---

**Replacing the DVD Drive**

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

▼ **To Remove the DVD Drive**

1. Remove any media in the DVD drive.

2. **Follow the instructions in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.**

3. **Remove the front bezel (see “Removing the Front Bezel” on page 42).**

4. **Disconnect the cables from the back of the DVD drive (see FIGURE 5-11).**
5. Push the drive retaining lever tab up to release the retaining hooks (see FIGURE 5-12).

6. Gently pull out the DVD drive from the front of the chassis.
7. Place the DVD drive on an antistatic surface.

8. Install the new DVD drive as shown in “To Install the DVD Drive” on page 59.

▼ To Install the DVD Drive

1. Follow the instructions in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Remove the new DVD drive from its packaging.

3. Lifting the front end slightly, slide the 5.25-inch DVD drive into the drive bay until the holes on the side align with the hooks on the drive retaining lever.

FIGURE 5-13 Installing the DVD Drive

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

6. Connect the SATA, power, and jumper cables to the back of the DVD drive (see FIGURE 5-11).
   Refer to the cabling diagram in the service label on the side of the chassis for information about correct cable routing.

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

8. To close the system, perform the steps in “To Prepare for Service” on page 44.

---

Removing and Installing DIMMs

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

---

Caution – DIMMs are sensitive to ESD. Be especially careful to follow ESD precautions when changing DIMMs (see “Electrostatic Discharge (ESD) Precautions” on page 40).

▼ To Remove DIMMs

1. Follow the instructions in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Identify the location from which you will remove a DIMM (for DIMM location, see “Internal Components and Connectors” on page 4).

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

![Removing a DIMM](image)

6. Set the DIMM aside on an antistatic surface.

7. Choose the next step.
   - If you are installing a new DIMM, see “Installing DIMMs” on page 61.
   - If you are finished, replace the left side access panel.

**Installing DIMMs**

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

- DIMM slots are numbered 0 to 3. Slot 0 is closest to the CPU
- DIMMs must be installed and removed in pairs
- Populate DIMM slot 1 and DIMM slot 3, then DIMM slot 0 and DIMM slot 2
- For a single DIMM configuration use DIMM slot 1

▼ **To Install DIMMs**

1. Follow the instructions in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Identify the location into which you will install a DIMM.

4. Align the DIMM with the proper slot.
**Note** – Be sure to align the notch in the DIMM with the notch in the connector.

5. Place the DIMM in the slot.

6. Evenly press the DIMM straight down into the DIMM slot until both ejector levers lift and click, locking the DIMM in the DIMM slot.

**Note** – The DIMM is seated when you hear a click and the DIMM ejector levers are in the vertical position.

7. Repeat Step 3 through Step 6 for each DIMM that you want to replace.

8. To close the system, perform the steps in “To Prepare for Service” on page 44.

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.
Removing and Installing a PCIe Card

**Note** – For information about how to remove and replace PCI cards, see “Removing and Installing PCI Cards” on page 66.

▼ To Remove a PCIe Card

1. Perform the steps listed in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Remove any cables connected to the card.

4. Unfasten and open the PCIe card retainer (see FIGURE 5-16).

**FIGURE 5-16** Removing a PCIe Graphics Card
5. Remove the PCIe card.
Gently rock the card forward and then lift it straight out of the card slot and set it aside on an antistatic surface.

6. Choose your next step.
■ If you are replacing the card, follow the instructions in “To Install a PCIe Card” on page 65.
■ If you are not replacing the graphics card, replace the slot filler panel and then close the system by performing the steps in “To Prepare for Service” on page 44.

▼ To Install a PCIe Card

**Note** – See “Internal Components and Connectors” on page 4 for PCIe slot locations and to “PCIe and PCI Expansion Slots” on page 106, for slot specifications.

1. Perform the steps listed in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Refer to the service label on the inside of the access panel to help you choose an empty card slot that is compatible with the card that you are installing.

4. Remove the metal bracket cover for the slot from the back panel.

5. Remove the card from its protective packaging and lay the card on an antistatic surface until you are ready to install it.

6. Position the card in the selected slot. Ensure that the notch on the bottom right corner of the card engages the latch on the motherboard. (The middle PCIe slot does not have a latch.) See FIGURE 5-17.

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

8. If you are installing a graphics card that requires supplemental power, connect the graphics power cable to the connector on the card.
This might require moving the cable out of its cable tie.
9. Fasten the retaining screw into place. Torque the screws to 8 to 9 inch-pounds.

10. Close the system by performing the steps in “To Prepare for Service” on page 44.

Removing and Installing PCI Cards

*Note* – For information about how to remove and replace PCIe cards, see “Removing and Installing a PCIe Card” on page 63.

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

▼ To Remove a PCI Card

1. **Perform the steps listed in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.
2. Gently lay the system on its right side on a stable, nonslip surface.

3. Remove any cables connected to the card.

4. Unscrew the PCI card retainer screw (see FIGURE 5-18).

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

FIGURE 5-18 Removing a PCI Card

6. Choose your next step:
   - If you are not replacing the PCI card, replace the slot filler panel and then close the system by performing the steps in “To Prepare for Service” on page 44.
   - If you are replacing the card, follow the instructions in “To Install a PCI Card” on page 68.
To Install a PCI Card

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

**Note** – See “Internal Components and Connectors” on page 4 for PCI slot locations and “PCIe and PCI Expansion Slots” on page 106, for slot specifications.

1. **Perform the steps listed in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. See the service label on the access panel to determine a slot that is compatible with the card you are installing.

4. Remove the metal bracket cover for the slot from the back panel.

5. Remove the PCI card from its protective packaging and lay the card on an antistatic surface until you are ready to install it.
6. Position the card over the selected slot (see FIGURE 5-19).

FIGURE 5-19 Installing a PCI card

7. Press down on the card until it is completely seated in the slot.
8. Fasten the retaining screw into place. Torque the screws to 8 to 9 inch-pounds.
9. Close the system by performing the steps in “To Prepare for Service” on page 44.
Replacing the System Battery

The battery specifications for the Sun Ultra 24 workstation are shown in TABLE 5-1.

TABLE 5-1  Battery Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>3 VDC</td>
</tr>
<tr>
<td>Type</td>
<td>CR 2032</td>
</tr>
</tbody>
</table>

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

1. Perform the steps listed in "Powering Off the System and Removing the Left-Side Access Panel" on page 41.

2. Use a flat-blade screwdriver to lift and abruptly release the battery latch. This action releases and removes the battery (see FIGURE 5-20).
3. Install the new battery.

4. With the positive sign (+) facing up, push the battery into the battery connector until it clicks into place (see FIGURE 5-21).

5. Close the system by performing the steps in “To Prepare for Service” on page 44.
Replacing the System Fan

▼ To Replace the System Fan

1. **Follow the steps in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Locate the system fan on the back inside panel of the workstation.

3. Disconnect the system fan’s power connector from the SYS_FAN connector on the motherboard.

   To locate the SYS_FAN connector, refer to the service label on the left side access panel or to “Internal Components and Connectors” on page 4.

4. Release the fan’s power cord from the cable management strap.

5. Gently lift the two latches on the bottom of the fan bracket until the latches clear the chassis.

6. Slide the fan assembly down to release the four hooks on the back of the bracket from the holes in the chassis (see FIGURE 5-22).
FIGURE 5-22 Removing the System Fan

7. Pull the fan away from the chassis.

8. Remove the new fan from its package.

9. Locate the four corner holes in the chassis grill where the fan tabs are installed.

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

11. Slide the fan up until the latches click into their locked position (see FIGURE 5-23).
12. Route the fan’s power cord through the cable management strap near the top right corner of the motherboard.

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

14. Close the system by performing the steps in “To Prepare for Service” on page 44.

Re REPLACING THE POWER SUPPLY

This section describes removing and installing the power supply.
To Remove the Power Supply

1. Follow the steps in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Unplug the AC power cord from the system.

3. Gently lay the system on its right side on a stable, nonslip surface.

4. Locate the power supply (see FIGURE 5-24).

FIGURE 5-24 Location of the Power Supply

5. Unfasten the connectors from the motherboard and release the cable management straps.
6. Unfasten the power connectors attached to the motherboard, DVD drive and storage backplane (see power connector locations, see FIGURE 1-4).

7. While supporting the power supply, unfasten the four mounting screws (see FIGURE 5-25).

8. Remove the power supply from the interior of the system chassis.

FIGURE 5-25 Removing the Power Supply From the Chassis

9. Install the new power supply as shown as “To Install the Power Supply” on page 76.

▼ To Install the Power Supply

1. Remove the new power supply from its package.

2. Locate where the power supply is to be installed, then place the power supply inside the chassis (see FIGURE 5-26).
   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.
3. Fasten the four mounting screws on the back of the chassis to secure the power supply to the chassis.

4. Reconnect the power supply cables and then secure them with the cable management straps.

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

5. Verify that the four mounting screws are secure, that all cables are reconnected and that the cables are secured by the cable management straps.

6. Close the system by performing the steps in “To Prepare for Service” on page 44.
Replacing the I/O Board Assembly

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

▼ To Remove the I/O Board Assembly

1. Follow the steps in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Disconnect any audio, USB, and IEEE 1394 cables connected to the front of the workstation.

3. Remove the front bezel (see “Removing the Front Bezel” on page 42).

4. Locate the back of the I/O board assembly within the workstation.

5. Disconnect all cables on the back of the I/O board.

6. Loosen the captive screw securing the I/O board to the metal frame (see FIGURE 5-27).

**FIGURE 5-27** Removing the I/O Board Assembly
7. Push the I/O board out the front of the chassis.

8. Install the new I/O board assembly as shown in “To Install the I/O Board Assembly” on page 79.

▼ To Install the I/O Board Assembly

1. If necessary perform the steps in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Place the system unit on a flat, stable surface.

3. Push the I/O board through the back of the metal I/O board frame until the front panel is flush with the bezel opening (see FIGURE 5-28). Wiggle it side to side if the board binds as you install it.

FIGURE 5-28 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, IEEE 1394, and audio cables to the back of the I/O board.
   The cables are color coded and keyed to ensure correct installation. See FIGURE 1-5 and the service label on the chassis cover for the locations of the I/O board connections.
6. Replace the front bezel.

7. Close the system by performing the steps in “To Prepare for Service” on page 44.

---

Replacing System Cables

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

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

- Front I/O board cables:
  - Audio cable
  - USB cable
  - IEEE 1394 cables
  - Power button/LED cable
- DVD drive cables:
  - SATA cable
  - HDD cable harness

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

▼ To Replace the System Cables

1. Perform the steps listed in “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. Remove and replace any cables that need to be replaced.

As you install each cable, connect one end to the appropriate connector, then route the cable through the cable management straps before connecting the second connector.
4. Ensure that all cable routing is correct and that all of the cable connectors are properly seated.

5. Close the system by performing the steps in “To Prepare for Service” on page 44.

---

### Replacing the Heatsink and CPU

This section describes how to remove and install the heatsink and CPU.

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

**Required Tools:**
- A long blade Phillips screwdriver (minimum 4–5 inches)
- Antistatic wrist strap and mat

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

---

#### To Remove the Heatsink and CPU

**Caution** – Parts of the heatsink assembly might be extremely hot. To prevent accidental burns or damage to the heatsink, always handle the heatsink by the black plastic mounting bracket. Allow the heatsink to cool for a few minutes before attempting this procedure.

1. **Follow the steps in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.

2. Gently lay the system on its right side on a stable, nonslip surface.

3. **Disconnect the heatsink’s CPU fan cable from its connector on the motherboard.**
   - The CPU fan connector is labeled CPU_FAN.
4. Remove the heatsink assembly by alternately loosening (2-3 turns) the four screws that secure the assembly to the motherboard (see FIGURE 5-29).

Continue to alternately loosen each screw until the heatsink assembly is no longer secured to the motherboard.

The heatsink assembly is also mounted to the top surface of the CPU by a layer of thermal grease, which acts as an adhesive.

FIGURE 5-29 Unlatching the Heatsink-Fan Assembly

5. Grasp the heatsink by its plastic mounting bracket and, while gently pulling upward, slowly wiggle the assembly back and forth to break the adhesive seal of the thermal grease.

6. Remove the heatsink-fan assembly from the chassis (see).

7. Place the heatsink on its side and on a flat surface to prevent the thermal grease from contaminating other components.

You can see the CPU.

8. Depress the CPU socket retainer lever and slightly pull the lever outward (away from the CPU) to free the lever from its retaining clip (see FIGURE 5-30).

9. When you have released the lever from the retaining clip, lift the lever to its fully open (upright) position.

This action releases the pressure on the hinged CPU socket retainer.
10. Lift the unhinged side of the CPU socket retainer to its fully open (upright) position.

This action exposes the CPU. The CPU is mounted to a PCB that is keyed (notched) on two opposite sides.

**FIGURE 5-30** Removing the CPU From the Workstation

11. Grasp the notched edges of the CPU PCB and lift it out of the socket.

Set the CPU on an antistatic mat or surface.

12. To install the heatsink and CPU, use the procedure shown in “To Install a Heatsink and CPU” on page 84.

▼ To Install a Heatsink and CPU

---

**Note** – Observe the ESD precautions and preinstallation procedures described in “Electrostatic Discharge (ESD) Precautions” on page 40.

---

1. Ensure that the CPU socket retainer lever and hinged socket retainer are in the fully open (upright) position (see **FIGURE 5-31**).

2. Remove the new CPU from its antistatic packaging.

   The CPU is mounted on a PCB that is notched on two opposite sides.

3. Hold the CPU by its notched sides.

4. Position the CPU over the CPU socket so that the notches on the PCB align with the keys on the socket.
5. Carefully set the CPU onto the socket.
   When correctly positioned the CPU lies flat in the socket, and the notches on the CPU are aligned with the keys on the socket, restricting movement of the CPU within the socket.

Caution – Irreparable damage to the motherboard can occur if downward force is applied to the socket. Do not attempt to force the CPU into the socket to seat it.

FIGURE 5-31  Installing the CPU

6. When the CPU is positioned in the socket, lower the hinged socket retainer to cover the CPU.

7. Lower the socket retainer lever, pressing it downward securing it under the lever retaining clip.

8. Do this step only if you are installing a new CPU. Otherwise, go to Step 9.
   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.

9. Do this step if you are installing an already-used CPU onto a new motherboard. Otherwise, go to Step 10.
   a. Remove the grease from the CPU and the heatsink using the supplied alcohol wipe.
   b. Use the supplied syringe 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 the clean edge of a plastic bag, spread the thermal grease until it covers the top of the CPU in a thin, uniform layer.

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

10. Inspect the heatsink-fan assembly for dust and lint. Clean if necessary.

11. Carefully position the heatsink-fan assembly over the CPU, aligning the screws with the holes in the motherboard.

12. Lower the heatsink-fan assembly onto the top of the CPU, avoiding any side-to-side movement. See FIGURE 5-32.
FIGURE 5-32 Installing the Heatsink-Fan Assembly

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

13. Press down slightly on the top of the heatsink-fan assembly while alternately tightening (3–5 turns) each of the four screws.

Continue doing this until the heatsink-fan assembly is secured to the motherboard and you can no longer tighten the screws (see FIGURE 5-33).

**Caution** – Irreparable damage can occur to the motherboard if you attempt to overtighten the heatsink-fan assembly screws.

FIGURE 5-33 Securing the Heatsink/Fan Assembly Latches

14. Connect the CPU fan cable to the connector on the motherboard.
15. Return the system to the upright position.
16. Close the system by performing the steps in “To Prepare for Service” on page 44.

Replacing the Motherboard

The following sections describe how to remove and install the Sun Ultra 24 workstation system motherboard.

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

▼ To Remove the Motherboard

1. **Follow the steps in** “Powering Off the System and Removing the Left-Side Access Panel” on page 41.
2. Gently lay the system on its right side on a stable, nonslip surface.
3. **Remove any PCI or PCIe cards installed on the motherboard (see “To Remove a PCI Card” on page 66).**
4. Remove the DIMMs and the CPU from the motherboard.
5. Disconnect all cables attached to the motherboard.
6. Remove the nine Phillips screws that fasten the motherboard to the chassis (see FIGURE 5-34).

FIGURE 5-34 Removing the Nine Motherboard Screws

7. Pull the motherboard away from the chassis.

See the following sections for information about how to remove and replace the CPU and memory:

- “Replacing the Heatsink and CPU” on page 81
- “Removing and Installing DIMMs” on page 60

▼ To Install the Motherboard

A motherboard FRU contains two components, the motherboard and the heatsink mounting bracket. To complete this procedure you must mount the bracket onto the backside of the motherboard before you install the motherboard into the workstation chassis.

Caution – Observe proper ESD precautions when handling a new motherboard.
1. **Remove the motherboard from the anti-static packaging.**
   You need to use the internal ESD EPE (pink) foam packaging material as part of this procedure.

2. **Place the motherboard face down onto the ESD EPE foam packaging material.**
   The foam protects the components on the top side of the motherboard and offers additional ESD protection.

3. **Locate the four bracket mounting holes on the backside of the motherboard** (see **FIGURE 5-35**).

   **FIGURE 5-35** The Four Bracket Mounting Holes on the Backside of the Motherboard

4. **Remove the mounting bracket from the package.**
   One side of the mounting bracket has four threaded standoffs and a protective paper-backing.

5. **Peel the protective paper-backing from the bracket** (see **FIGURE 5-36**, panel 1).
   This exposes an adhesive surface on the bracket.
6. Align the four threaded standoffs on the bracket with the four holes on the back side of the motherboard.

7. Place the bracket on to the backside of the motherboard, taking care to seat the threaded standoffs inside the bracket mounting holes (see FIGURE 5-36, panel 2).

8. Gently apply enough pressure to the mounting bracket so that the adhesive on the bracket contacts and adheres to the backside of the motherboard.

**Caution** – Excessive force can cause irreparable damage to the motherboard and components on the top side of the motherboard.

9. Turn the motherboard over and place it in the chassis so that the nine screw holes in the motherboard align with the nine threaded standoffs inside the chassis.

10. Fasten the motherboard to the chassis using the nine Phillips screws and a #2 Phillips screwdriver (see FIGURE 5-37).

    Use a torque tool to torque the screws to 8 to 9 inch-pounds.
11. **Install the CPU and heatsink.**
   Refer to the following sections for information about removing and replacing the CPU and heatsink:
   “Replacing the Heatsink and CPU” on page 81

12. **Install the DIMMs as necessary.**
   Refer to the following sections for information about removing and replacing the memory:
   - “Removing and Installing DIMMs” on page 60

13. **Install any PCI cards or a PCIe graphics card.** See the following sections:
   - “To Install a PCIe Card” on page 65
   - “To Install a PCI Card” on page 68

14. **Reconnect all internal system cables.**
   See “Replacing System Cables” on page 80.

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

16. **Close the system by performing the steps in “To Prepare for Service” on page 44.**
Managing the System BIOS and MEBx

This section contains procedures for accessing, updating, and recovering the system BIOS. It also contains procedures for accessing and configuring the Intel® Management Engine BIOS extension (MEBx).

- “Accessing the System BIOS Setup Utility” on page 94
- “Updating the System BIOS” on page 94
- “Recovering From a Corrupted BIOS” on page 95
- “Accessing Intel Management Engine BIOS Extension” on page 96
- “Enabling ME FW Local Update” on page 96
- “Setting ME Power Policies” on page 97
Accessing the System BIOS Setup Utility

This procedure describes how to access the system’s BIOS Setup utility. The BIOS Setup utility allows you to customize your workstation to your environment and configuration.

▼ To Access the BIOS Setup Utility

1. Power on or reboot the system and watch the screen for the prompt to press F2 to enter the BIOS Setup utility.
   The prompt appears.
2. Press the F2 key.
   The BIOS Setup utility screen appears.
3. Use the arrow keys to navigate the utility and make configuration changes.
4. Press the F10 key to save changes and exit or press Esc to exit without saving.
   The workstation reboots.

Updating the System BIOS

Use this procedures to update the system BIOS. BIOS updates contain fixes, patches, security updates, new drivers, and enhancements. For optimum workstation performance, Sun recommends that you update your system to the latest BIOS version. See the Sun Ultra 24 Workstation Product Notes for BIOS update availability, BIOS version information, and up-to-date information about BIOS, hardware, and software issues.

▼ To Update the System BIOS

1. Access the BIOS Setup utility (see “Accessing the System BIOS Setup Utility” on page 94).

1. Make note of any customized BIOS settings.
   The BIOS contains default values which you can change to customize the workstation for your environment or hardware configuration. Updating the BIOS will reset these settings to version’s default values.
2. Exit the BIOS Setup utility.
3. Download the latest Sun Ultra 24 workstation Tools and Drivers DVD ISO image from the Sun web site:
   http://www.sun.com/downloads

   **Caution** – Ensure that you download the ISO image for the Sun Ultra 24 workstation.

4. Burn the image to a DVD.

5. **Enable ME FW Local Update.** See "Enabling ME FW Local Update" on page 96.

6. Insert the DVD into the system and then reboot the system.

7. When prompted, choose option 2 to flash the BIOS.

8. Respond to the prompts and then wait until the BIOS update is complete.


10. Remove the Tools and Drivers DVD from the DVD drive.

### Recovering From a Corrupted BIOS

If your BIOS becomes corrupted, you will not be able to use the workstation until you recover the BIOS. Use this procedure to recover from a corrupted system BIOS.

**To Recover the BIOS**

1. **Copy the file** `/BIOS/BIOSxxx.ROM` **from the Tools and Drivers DVD to the root directory of a USB flash drive.**

2. **On the flash drive,** rename the file `BIOSxxx.ROM` to `AMIBOOT.ROM`.

3. Insert USB flash drive into an available USB port on the workstation.

4. Power on the workstation, press and hold the Ctrl + Home keys and watch the USB flash drive’s access light.

5. When the flash drive’s access light starts to blink, release the keys.

6. Follow the onscreen instructions to recover system BIOS.
Accessing Intel Management Engine BIOS Extension

Use this procedure to access the MEBx and configure the Management Engine (ME).

▼ To Access Intel MEBx

1. Power on or reboot the workstation.
   Watch the output for the prompt to press Ctrl-P to enter the MEBx (Management Engine BIOS Extension).

2. When the prompt appears, press Ctrl-P.
   A password prompt appears.

3. Enter the default ME password:
   admin
   The Intel MEBx main menu appears.

   Tip – To change the default password move the cursor to Change Intel ME Password and press Enter.

Enabling ME FW Local Update

▼ To Enable ME FW Local Update

1. Access the Intel MEBx (see “To Access Intel MEBx” on page 96).

2. Move the cursor to Intel ME Configuration and press Enter.
   The following message appears:
   System resets after configuration changes. Continue?: (Y/N)

   3. Type Y and press Enter.

   4. Move the cursor to Intel ME Firmware Local Update and press Enter.

   5. Move the cursor to Enabled and press Enter.
Setting ME Power Policies

▼ To Set ME Power Policies

1. Access the Intel MEBx (see “To Access Intel MEBx” on page 96).

2. Move the cursor to Intel ME Configuration and press Enter.
   The following message appears:

   System resets after configuration changes. Continue?: (Y/N)

3. Type Y and press Enter.

4. Move the cursor to Intel ME Configuration and press Enter.

5. Move the cursor to Intel ME ON in Host Sleep States and press Enter.

6. Move the cursor to Desktop: ON in S0, S3 and press Enter.

7. Press Esc to exit MEBx.
   The workstation saves the change and reboots.

Recovering the Intel ME Firmware

If your Intel Management Engine (ME) firmware becomes corrupted, you might see the false error messages related to system components. Use the procedures in this section to recover from a corrupted ME firmware.

To resolve this issue, you need to recover the ME firmware using the procedure, To Recover the ME Firmware, Option 1. If this procedure doesn’t work, use To Recover the ME Firmware, Option 2.
▼ To Recover the ME Firmware, Option 1

1. Download the latest Sun Ultra 24 Workstation Tools and Drivers DVD ISO image (v1.2 or later) from:
   http://www.sun.com/desktop/workstation/ultra24/downloads.jsp

2. Burn a DVD from the ISO image.

3. Boot the workstation using the Tools and Drivers DVD.
   The Tools and Drivers DVD main menu appears.

4. Select option 3, Firmware Update.
   This step recovers the firmware and reboots the workstation.

▼ To Recover the ME Firmware, Option 2

If option 1 recovery procedure doesn’t work, use this procedure to recover the ME firmware.

Caution – Electronic components in your workstation are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy the components located on these devices. Do not touch the components without antistatic precautions. Do not touch the metal contacts. Always use antistatic precautions and wear an ESD wrist strap.

1. Set up the workstation for operation.

Caution – Possibility of electric shock. Do not operate the workstation without the covers installed.

2. Boot from the Tools and Drivers DVD.
   The Tools and Drivers DVD main menu appears.

3. Select option number 4 to go to DOS.
   A window opens and a DOS prompt appears.

4. Depending on your version of Tools and Drivers CD, flash the firmware using one of the following batch files:
   ■ For Tools and Drivers CD v1.2 or lower:
     > flash\me\latest\flash.bat
     —or—

For Tools and Drivers CD v1.3

> `flash\me\latest\patch.bat`

The ME firmware flash update process begins.

5. **When the update is finished, power off the workstation using the front power button.**

6. **Remove the side cover and locate jumper J25 on the workstation motherboard.**

   J25 is a three position jumper located near the inside end of slot PCI 0. Jumper J25 is located next to jumper J26. **FIGURE 5-38** shows a photograph and a graphic representation of the location of J25 and J26, the pin numbering, and the jumper cap residing at the factory setting.

   ■ If a video card is blocking access to jumper J25, do the following:

   a. **Turn off the AC power to the workstation using the power switch on the rear panel.**

   b. **Remove the video card.**

   c. **Turn on the AC power to the workstation using the power switch on the rear panel.**

**FIGURE 5-38** The Location of J25

7. **Pull the jumper cap on J25 from pin position 1-2 (factory setting) and move the cap to pin position 2-3.** **FIGURE 5-39** shows the jumper cap on J25 set to pin position 2-3.
8. Wait 60 seconds and then move the jumper cap back to pin position 1-2 (see FIGURE 5-40).

9. Power off the workstation and restore the video card to the original configuration.

10. Install the covers, attach all cables and prepare the workstation for operation.

11. Power on the workstation and watch the output for the prompt to press Ctrl-P to enter the Intel ME Setup.

12. When the prompt appears, press Ctrl-P.
   A password prompt appears.

13. Enter the following ME password:
    
    P@ssw0rd
    The Intel ME BIOS Setup main menu appears.

14. Move the cursor to Intel ME Configuration and press Enter.
    The following message appears:
    
    System resets after configuration changes. Continue?: (Y/N)

15. Type Y and press Enter.
16. Move the cursor to Intel ME Firmware Power Control and press Enter.

17. Move the cursor to Intel ME ON in Host Sleep States and press Enter.

18. Move the cursor to Desktop: ON in S0, S3 and press Enter.

19. Press the Esc key to exit the Intel ME BIOS Setup utility.

The utility saves your changes and the workstation reboots.
System Specifications

This appendix lists features and specifications for the Sun Ultra 24 workstation and includes the following sections:

- “System Components and Features” on page 104
- “Memory Configurations” on page 105
- “PCIe and PCI Expansion Slots” on page 106
- “Physical Specifications” on page 106
- “Power Specifications” on page 107
- “Environmental Specifications” on page 108

Note – For maximum reliability and performance, install your Sun Ultra 24 workstation into a proper environment and ensure correct configuration as discussed in this appendix.
## System Components and Features

*TABLE A-1* shows the system’s key components.

### TABLE A-1  Key System Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
</table>
| **CPU**            | • One Intel Core2 Duo or Core2 Quad processor  
• Processor frequencies: 2.0 GHz and faster  
• Level 2 Cache from 4 MB to 8 MB per processor |
| **Memory**         | • 8 GB maximum memory  
• Four DIMM slots  
• 512 MB, 1 GB, 2 GB registered DDR2-667, registered, ECC DIMM modules supported (see “Memory Configurations” on page 105) |
| **Media storage**  | DVD-ROM or DVD-Dual                                                                                                                         |
| **Hard Drives**    | Up to four SATA-II disk drives                                                                                                               |
| **Power supply**   | 530W PSU                                                                                                                                   |
| **Network I/O**    | Onboard 10/100/1000BASE-T Gigabit Ethernet controller with one RJ45 connector on the back panel                                           |
| **Video**          | PCIe based graphics card                                                                                                                   |
| **PCIe I/O and PCI I/O** | • Two PCI Express x16 slots  
• One PCI Express x8 mechanical slot (x4 electrical)  
• One PCI Express x1 slot  
• One PCI Express  
• Two PCI 33 MHz 32-bit slots |
| **Other I/O**      | • Six USB 2.0 connectors (two on the front and four on the back of the workstation)  
• Two IEEE 1394 connectors on the front panel  
• Six audio connectors on the back panel (lined up in two rows of three)  
• Microphone-in jack on the front and back panels  
• Headphone-out jack on the front panel |
Memory Configurations

TABLE A-2 lists the possible memory configurations for the Sun Ultra 24 workstation.

The system requires DDR2-667, registered, ECC DIMMs installed in pairs (except for single-DIMM configurations). You can purchase DIMM kits at:

http://store.sun.com

DIMM slots are number from DIMM 0 (closest to CPU) to DIMM 3 (farthest from CPU). You should populate DIMMs in the following order: DIMM slot 3 (black), DIMM slot 1 (black), DIMM slot 2 (blue), and DIMM slot 0 (blue).

<table>
<thead>
<tr>
<th>Total Memory</th>
<th>Supported DIMM Configuration 1</th>
<th>Supported DIMM Configuration 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>512 MB</td>
<td>1 x 512 MB</td>
<td></td>
</tr>
<tr>
<td>1 GB</td>
<td>2 x 512 MB</td>
<td></td>
</tr>
<tr>
<td>2 GB</td>
<td>2 x 1 GB</td>
<td>4 x 512 MB</td>
</tr>
<tr>
<td>3 GB</td>
<td>2 x 1 GB and 2 x 512 MB</td>
<td></td>
</tr>
<tr>
<td>4 GB</td>
<td>2 x 2 GB</td>
<td>4 x 1 GB</td>
</tr>
<tr>
<td>5 GB</td>
<td>2 x 2 GB and 2 x 512 MB</td>
<td></td>
</tr>
<tr>
<td>6 GB</td>
<td>2 x 2 GB and 2 x 1 GB</td>
<td></td>
</tr>
<tr>
<td>8 GB</td>
<td>4 x 2 GB</td>
<td></td>
</tr>
</tbody>
</table>
PCiE and PCI Expansion Slots

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

<table>
<thead>
<tr>
<th>Slot</th>
<th>Connector Type</th>
<th>Length</th>
<th>Height</th>
<th>Description</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Plate, no slot</td>
<td></td>
<td></td>
<td>Nearest to power supply.</td>
<td>Top</td>
<td></td>
</tr>
<tr>
<td>PCiE 0</td>
<td>PCiE slot 0 x16</td>
<td>x16</td>
<td>Full</td>
<td>Secondary graphics card slot</td>
<td></td>
</tr>
<tr>
<td>PCiE 1</td>
<td>PCiE x1 slot</td>
<td>x1</td>
<td>Full</td>
<td>Not for graphics accelerators. Intended for PCiE expansion cards such as network interface cards (NIC).</td>
<td></td>
</tr>
<tr>
<td>PCiE 2</td>
<td>PCiE x16 slot (default graphics output)</td>
<td>x16</td>
<td>Full</td>
<td>Primary graphics card slot</td>
<td></td>
</tr>
<tr>
<td>PCI 0</td>
<td>PCI 32-bit/33 MHz slot</td>
<td>Full</td>
<td>Full</td>
<td>32-bit 33MHz, accommodates 64-bit PCI cards, but cards operate in 32-bit mode</td>
<td></td>
</tr>
<tr>
<td>PCI 1</td>
<td>PCI 32-bit/33 MHz slot</td>
<td>Full</td>
<td>Full</td>
<td>32-bit 33MHz, accommodates 64-bit PCI cards, but cards operate in 32-bit mode</td>
<td></td>
</tr>
<tr>
<td>PCiE 3</td>
<td>PCiE x8 mechanical slot (x4 electrical)</td>
<td>x8</td>
<td>Full</td>
<td>Connector is x8, slot is electrically x4</td>
<td>Bottom</td>
</tr>
</tbody>
</table>

Physical Specifications

**TABLE A-4** lists the physical specifications for the Sun Ultra 24 workstation.

<table>
<thead>
<tr>
<th>Specification</th>
<th>British</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>7.9 in.</td>
<td>200 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>18.5 in.</td>
<td>470 mm</td>
</tr>
<tr>
<td>Height</td>
<td>17.1 in.</td>
<td>435 mm</td>
</tr>
<tr>
<td>Weight (maximum with packaging)</td>
<td>34 lb</td>
<td>15.4 kg</td>
</tr>
</tbody>
</table>
Power Specifications

The maximum continuous power for the Sun Ultra 24 workstation is 530W.

**TABLE A-4, TABLE A-5, and TABLE A-6** list additional power specifications for the system.

**TABLE A-5**  Input Voltage Range

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1</td>
<td>90</td>
<td>115</td>
<td>132</td>
<td>Vrms</td>
</tr>
<tr>
<td>Range 2</td>
<td>180</td>
<td>230</td>
<td>264</td>
<td>Vrms</td>
</tr>
</tbody>
</table>

**TABLE A-6**  Input Frequency Range

<table>
<thead>
<tr>
<th>Input Frequency</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1</td>
<td>57</td>
<td>60</td>
<td>63</td>
<td>Hz</td>
</tr>
<tr>
<td>Range 2</td>
<td>47</td>
<td>50</td>
<td>53</td>
<td>Hz</td>
</tr>
</tbody>
</table>

**TABLE A-7**  Input Current

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Maximum Input Current</th>
<th>Maximum Inrush Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1</td>
<td>10A</td>
<td>50 A&lt;sub&gt;peak&lt;/sub&gt;</td>
</tr>
<tr>
<td>Range 2</td>
<td>5A</td>
<td>100 A&lt;sub&gt;peak&lt;/sub&gt;</td>
</tr>
</tbody>
</table>
TABLE A-8 lists the environmental specifications for the Sun Ultra 24 workstation.

**TABLE A-8** Sun Ultra 24 workstation Environmental Specifications

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

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

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

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

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFh</td>
<td>Test CMOS R/W functionality.</td>
</tr>
</tbody>
</table>
| C0h       | Early chipset initialization:  
|           | • Disable shadow RAM.  
|           | • Disable L2 cache (socket 7 or below).  
|           | • Program basic chipset registers. |
| C1h       | Detect memory:  
|           | • Auto detection of DRAM size, type, and ECC.  
|           | • Auto detection of L2 cache (socket 7 or below). |
| C3h       | Expand compressed BIOS code to DRAM. |
| C5h       | Call chipset hook to copy BIOS back to E000 & F000 shadow RAM. |
| 01h       | Expand the Xgroup codes locating in physical address 1000:0. |
| 02h       | Reserved. |
| 03h       | Initial Superio_Early_Init switch. |
| 04h       | Reserved. |
| 05h       | 1. Blank out screen.  
|           | 2. Clear CMOS error flag. |
| 06h       | Reserved. |
| 07h       | 1. Clear 8042 interface.  
|           | 2. Initialize 8042 self-test. |
**TABLE B-1  BIOS Port 80 POST Codes (Continued)**

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
</table>
| 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/writable or not. If test fails, keep beeping the speaker. |
| 0Fh       | Reserved. |
| 10h       | Autodetect flash type to load appropriate flash R/W codes into the runtime area in F000 for ESCD & DMI support. |
| 11h       | Reserved. |
| 12h       | Use walking 1’s algorithm to check out interface in CMOS circuitry. Also, set real-time clock power status, and then check for override. |
| 13h       | Reserved. |
| 14h       | Program chipset default values into chipset. Chipset default values are MODBINable by OEM customers. |
| 15h       | Reserved. |
| 16h       | Initial onboard clock generator if Early_Init_Onboard_Generator is defined. See also POST 26h. |
| 17h       | Reserved. |
| 18h       | Detect CPU information including brand, SMI type (Cyrix or Intel), and CPU level (586 or 686). |
| 19h       | Reserved. |
| 1Ah       | Reserved. |
| 1Bh       | Initial interrupts vector table. All hardware interrupts are directed to SPURIOUS_INT_HDLR and software interrupts to SPURIOUS_soft_HDLR. |
| 1Ch       | Reserved. |
| 1Dh       | Initial EARLY_PM_INIT switch. |
TABLE B-1  BIOS Port 80 POST Codes  (Continued)

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Eh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>1Fh</td>
<td>Load keyboard matrix (notebook platform).</td>
</tr>
<tr>
<td>20h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>21h</td>
<td>HPM initialization (notebook platform).</td>
</tr>
<tr>
<td>22h</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>
| 23h       | 1. Check validity of RTC value. For example, a value of 5Ah is an invalid value for RTC minute.  
          | 2. Load CMOS settings into BIOS stack. If CMOS checksum fails, use default value instead. |
| 24h       | Prepare BIOS resource map for PCI and PnP use. If ESCD is valid, consider the ESCD’s legacy information. |
| 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. Initialize onboard PWM.  
          | 3. Initialize onboard H/W monitor devices. |
| 27h       | Initialize INT 09 buffer. |
| 28h       | Reserved.   |
| 29h       | 1. Program CPU internal MTRR (P6 and PII) for 0–640K memory address.  
          | 2. Initialize the APIC for Pentium class CPU.  
          | 3. Program early chipset according to CMOS setup. Example: onboard IDE controller.  
          | 4. Measure CPU speed. |
| 2Ah       | Reserved.   |
| 2Bh       | Invoke video BIOS. |
| 2Ch       | Reserved.   |
| 2Dh       | 1. Initialize double-byte language font (optional).  
          | 2. Display information on screen, including award title, CPU type, CPU speed, and full-screen logo. |
| 2Eh       | Reserved.   |
### TABLE B-1 BIOS Port 80 POST Codes (Continued)

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Fh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>30h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>31h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>32h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>33h</td>
<td>Reset keyboard if Early_Reset_KB is defined. For example, Winbond 977 series Super I/O chips. See also POST 63h.</td>
</tr>
<tr>
<td>34h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>35h</td>
<td>Test DMA channel 0.</td>
</tr>
<tr>
<td>36h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>37h</td>
<td>Test DMA channel 1.</td>
</tr>
<tr>
<td>38h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>39h</td>
<td>Test DMA page registers.</td>
</tr>
<tr>
<td>3Ah</td>
<td>Reserved.</td>
</tr>
<tr>
<td>3Bh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>3Ch</td>
<td>Test 8254.</td>
</tr>
<tr>
<td>3Dh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>3Eh</td>
<td>Test 8259 interrupt mask bits for channel 1.</td>
</tr>
<tr>
<td>3Fh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>40h</td>
<td>Test 8259 interrupt mask bits for channel 2.</td>
</tr>
<tr>
<td>41h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>42h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>43h</td>
<td>Test 8259 functionality.</td>
</tr>
<tr>
<td>44h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>45h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>46h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>47h</td>
<td>Initialize EISA slot.</td>
</tr>
<tr>
<td>48h</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>
| 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.   |
### TABLE B-1  BIOS Port 80 POST Codes  (Continued)

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4Bh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>4Ch</td>
<td>Reserved.</td>
</tr>
<tr>
<td>4Dh</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>
| 4Eh       | 1. Program MTRR of M1 CPU.  
            | 2. Initialize the L2 cache for P6 class CPU and program CPU with proper cacheable range. 
            | 3. Initialize the APIC for P6 class CPU.  
            | 4. On MP platform, adjust the cacheable range to a smaller one in case the cacheable ranges between each CPU are not identical. |
| 4Fh       | Reserved.   |
| 50h       | Initialize USB keyboard and mouse. |
| 51h       | Reserved.   |
| 52h       | Test all memory (clear all extended memory to 0). |
| 53h       | Clear the password according to H/W jumper (optional). |
| 54h       | Reserved.   |
| 55h       | Display the number of processors (multiprocessor platform). |
| 56h       | Reserved.   |
| 57h       | 1. Display PnP logo.  
            | 2. Early ISA PnP initialization. Assign CSN to every ISA PnP device. |
| 58h       | Reserved.   |
| 59h       | Initialize the combined Trend Anti-Virus code. |
| 5Ah       | Reserved.   |
| 5Bh       | (Optional feature) Show message for entering AWDFLASH.EXE from FDD. |
| 5Ch       | Reserved.   |
| 5Dh       | 1. Initialize Init_Onboard_Super_IO.  
<pre><code>        | 2. Initialize Init_Onbaord_AUDIO. |
</code></pre>
<p>| 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.   |</p>
<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>63h</td>
<td>Reset keyboard if Early_Reset_KB is not defined.</td>
</tr>
<tr>
<td>64h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>65h</td>
<td>Initialize PS/2 Mouse.</td>
</tr>
<tr>
<td>66h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>67h</td>
<td>Prepare memory size information for function call: INT 15h ax=E820h.</td>
</tr>
<tr>
<td>68h</td>
<td>Reserved.</td>
</tr>
<tr>
<td>69h</td>
<td>Turn on L2 cache.</td>
</tr>
<tr>
<td>6Ah</td>
<td>Reserved.</td>
</tr>
<tr>
<td>6Bh</td>
<td>Program chipset registers according to items described in Setup &amp; Auto-configuration table.</td>
</tr>
<tr>
<td>6Ch</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>
| 6Dh       | 1. Assign resources to all ISA PnP devices.  
|           | 2. Autoassign ports to onboard COM ports if the corresponding item in setup is set to AUTO. |
| 6Eh       | Reserved. |
| 6Fh       | 1. Initialize diskette controller.  
|           | 2. Set up diskette-related fields in 40:hardware. |
| 70h       | Reserved. |
| 71h       | Reserved. |
| 72h       | Reserved. |
| 73h       | Reserved. |
| 74h       | Reserved. |
| 75h       | Detect and install all IDE devices: HD, LS120, ZIP, CD-ROM, and so on. |
| 76h       | (Optional feature) Enter AWDFLASH.EXE if:  
|           | • AWDFLASH.EXE is found on diskette drive.  
|           | • Alt+F2 is pressed. |
| 77h       | Detect serial ports and parallel ports. |
| 78h       | Reserved. |
| 79h       | Reserved. |
| 7Ah       | Detect and install coprocessor. |
| 7Bh       | Reserved. |
TABLE B-1  BIOS Port 80 POST Codes  (Continued)

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7Ch</td>
<td>Initialize HD write-protect.</td>
</tr>
<tr>
<td>7Dh</td>
<td>Reserved.</td>
</tr>
<tr>
<td>7Eh</td>
<td>Reserved.</td>
</tr>
</tbody>
</table>
| 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. |
| E8h       | E8POST.ASM starts. |
| 82h       | 1. Call chipset power management hook.  
|           | 2. Recover the text font used by EPA logo (not for full-screen logo).  
|           | 3. If password is set, ask for password. |
| 83h       | Save all data in stack back to CMOS. |
| 84h       | Initialize ISA PnP boot devices. |
| 85h       | 1. USB final initialization.  
|           | 2. Switch screen back to text mode. |
| 86h       | Reserved. |
| 87h       | NET PC: Build SYSID Structure. |
| 88h       | Reserved. |
| 89h       | 1. Assign IRQs to PCI devices.  
|           | 2. Set up ACPI table at top of the memory. |
| 8Ah       | Reserved. |
| 8Bh       | 1. Invoke all ISA adapter ROMs.  
|           | 2. Invoke all PCI ROMs (except VGA). |
| 8Ch       | Reserved. |
| 8Dh       | 1. Enable or disable parity check according to CMOS setup.  
|           | 2. APM initialization. |
| 8Eh       | Reserved. |
| 8Fh       | Clear noise of IRQs. |
| 90h       | Reserved. |
| 91h       | Reserved. |
| 92h       | Reserved. |
TABLE B-1   BIOS Port 80 POST Codes  *(Continued)*

<table>
<thead>
<tr>
<th>Post Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>93h</td>
<td>Read HD boot sector information for Trend Anti-Virus code.</td>
</tr>
</tbody>
</table>
| 94h       | 1. Enable L2 cache.  
            | 2. Program daylight savings time.  
            | 3. Program boot-up speed.  
            | 4. Chipset final initialization.  
            | 5. Power management final initialization.  
            | 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). |
Index

A
access panel removal, 45
accessing
  BIOS Setup Utility, 94
the diagnostic partition
    Red Hat, 33
    Solaris 10 OS, 34
    Windows XP, 35
adding
  hard drives, 49
  PCI cards, 68
  PCIe cards, 63

B
back panel, 3
battery, 70
bezel
  installing, 44
  removing, 42
BIOS
  detecting system memory, 62
  failure during POST, 16
  port 80 POST codes, 109
  POST LED, 16
  settings after update, 94
  setup utility, 12
  updating, 93

C
cables
  identifying and locating, 5
  replacing, 80

components
  access panel
    installing, 45
    removing, 41
  battery, 70
  bezel
    installing, 44
    removing, 42
  cables
    locating, 5
    replacing, 80
  connecting external, 10
  front panel, 2
  heatsink and CPU
    installing, 84
    removing, 82
  I/O board assembly
    installing, 79
  internal view, 4
  locating, 2, ?? to 5
  motherboard
    installing, 89
    removing, 88
  power supply
    installing, 76
  rear panel, 3

D
diagnostic partition
  accessing
    Red Hat Linux, 33
    Solaris 10, 34
    Windows XP, 35
adding, 31
log file, 32
removing, 31
diagnostics
advanced diagnostics option, 25
defered burn in testing option, 30
hard disk testing, 26
immediate burn in testing option, 28
main menu options, 22
PC-CHECK information, 38
print results reports option, 38
show results summary option, 36
shut down option, 38
system information menu options, 23
DIMMs
adding or replacing, 60 to 62
valid configurations, 105
DVD drive, replacing, 57 to 60
E
environmental specifications, 108
ESD precautions, 40
expansion slots, 106
external devices, connecting, 10
F
fan, replacing, 72 to 74
front panel, 2
G
graphics card
replacing, 63 to 66
H
hard drives
adding or replacing, 46 to 50
cables, 81
heatsink and CPU
installing, 84
removing, 82
I
I/O board assembly
front panel view, 2
installing, 79
IEEE 1394, 81, 104
installation
bezel removal, 42, 44
opening the workstation, 40 to 43
postinstallation instructions, 44
preinstallation instructions, 41
removing access panel, 45
M
maintenance procedures
access panel installation, 45
bezel installation, 44
bezel removal, 42
postinstallation precautions, 44
preinstallation instructions, 41
tools, 40
memory
adding or replacing, 60 to 62
reconfiguring, 62
valid configurations, 105
motherboard
installing, 89
replacing, 88 to 92
O
opening the workstation, 40 to 43
P
PCI
adding and removing cards, 66 to 69
slot locations, 4
slot specifications, 106
PCle
adding and removing cards, 63 to 66
slot locations, 4
slot specifications, 106
physical specifications, 106
POST codes, BIOS, 109
power supply
cable routing, 5
installing, 76
power specifications, 107
powering off, 12
powering on, 11
precautions for installation, ESD, 40
R
rear panel, 3
replacing
  battery, 70
  DIMMs, 60 to 62
  graphics card, 63 to 66
  heatsink and CPU, 81 to 88
  I/O board assembly, 78 to 80
  motherboard, 88 to 92
  PCIe cards, 63 to 66
  power supply, 74 to 77
  system cables, 80
  system fan, 72 to 74

S
SATA, 81
specifications
  environmental, 108
  physical, 106
  power, 107
storage backplane, replacing, 53 to 57
support
  obtaining, 19
system setup flowchart, 8
system specifications
  environmental, 108
  expansion slots, 106
  key components, 104
  memory configurations, 105
  physical, 106
  power, 107
system, components and features, 104

T
technical assistance, 19
tools and supplies, 40
troubleshooting, 13 to 20
  procedures, 15 to 19
  visual inspection, 14

U
updating BIOS, 93
USB, 81, 104

V
visual inspection
  external, 14
  internal, 14