Sun Fire™ X4500/X4540 Servers Diagnostics Guide

Sun Microsystems, Inc.
www.sun.com

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Contents

Preface

The *Sun Fire™ X4500/X4540 Server Diagnostics Guide* contains information and procedures to troubleshoot and diagnose problems with Sun Fire X4500/X4540 Servers.

Before You Read This Document

It is important that you review the safety guidelines in the *Sun Fire X4500 Server Safety and Compliance Guide* (819-4776).

Related Documentation

For a description of the document set for the Sun Fire X4500/X4540 servers, see the *Where To Find Documentation* sheet that is packed with your system and also posted at the product's documentation site. See the following URLs:

`http://docs.sun.com/app/docs/prod/sf.x4500#hic`

`http://docs.sun.com/app/docs/prod/sf.x4540#hic`

Translated versions of some of these documents are available at the web site described above in French, Simplified Chinese, and Japanese. English documentation is revised more frequently and might be more up-to-date than the translated documentation.

For Sun hardware documentation, Solaris™ and other software documentation, see the following URL:

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Sun Fire X4500/X4540 Servers Diagnostics Guide, part number 819-4363-12

PART I Sun Fire X4500 Server Diagnostics Guide

This part contains the *Sun Fire X4500 Server Diagnostics Guide* and has the following chapters:

CHAPTER 1

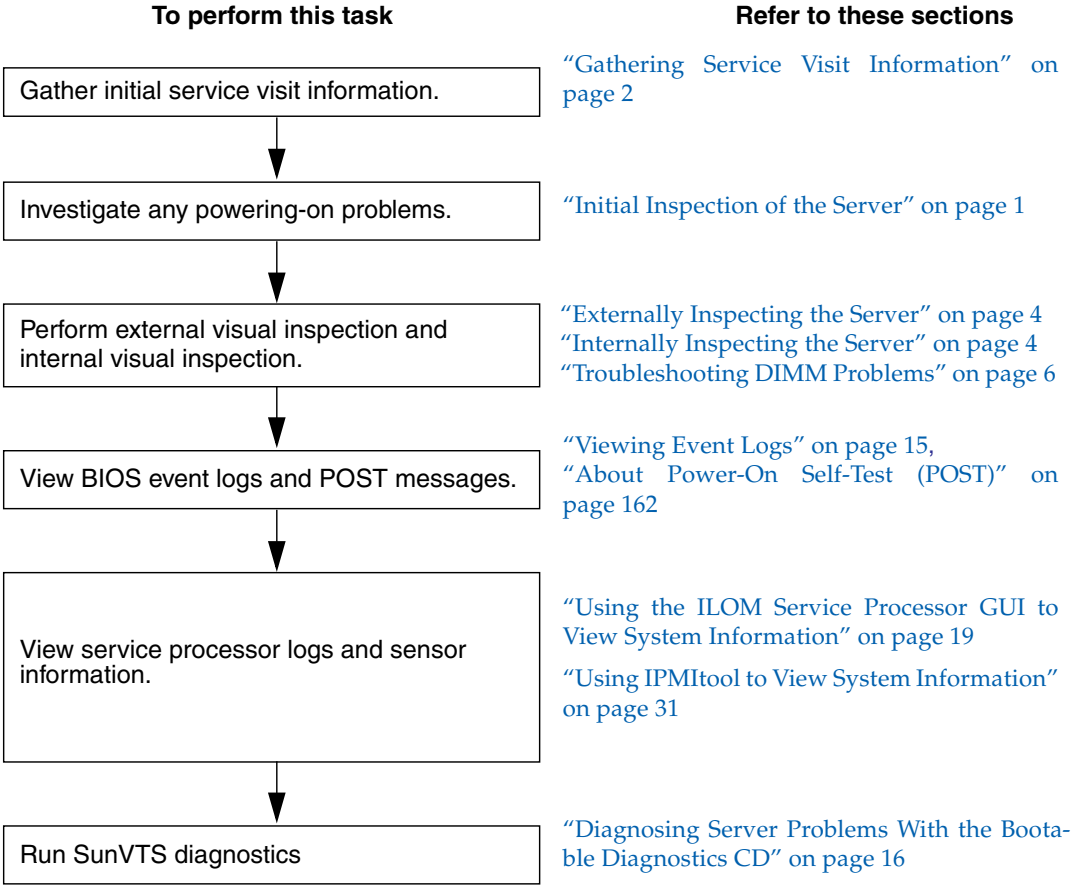
Initial Inspection of the Server

This chapter includes the following topics:

Service Visit Troubleshooting Flowchart

Use the following flowchart as a guideline for using the subjects in this book to troubleshoot the server.

FIGURE 1-1 Troubleshooting Flowchart



Gathering Service Visit Information

The first step in determining the cause of the problem with the server is to gather whatever information you can from the service-call paperwork or the onsite personnel. Use the following general guideline steps when you begin troubleshooting.

To gather service visit information:

1. **Collect information about the following items:**
   - Events that occurred prior to the failure

- Whether any hardware or software was modified or installed
- Whether the server was recently installed or moved
- How long the server exhibited symptoms
- The duration or frequency of the problem

2. **Document the server settings before you make any changes.**

   If possible, make one change at a time in order to isolate potential problems. In this way, you can maintain a controlled environment and reduce the scope of troubleshooting.

3. **Note the results of any change that you make.**

   Include any errors or informational messages.

4. **Check for potential device conflicts before you add a new device.**

5. **Check for version dependencies, especially with third-party software.**

Troubleshooting Power Problems

If the server will not power on:

1. **Check that AC power cords are attached firmly to the server's power supplies and to the AC sources.**

   Use of the cable clamps will ensure that the AC power cords are attached to the server's power supplies.

2. **Check that the component covers are firmly in place.(Including the hard disk drive access cover, system controller cover, and fan access cover.)**

   An intrusion switch on the system controller shuts the server down when the hard disk drive access cover is removed.

3. **Investigate the following conditions that can trigger an automatic shutdown sequence:**

   A power-off sequence is initiated either by a request from the board management controller (BMC) or a fault condition.

   The conditions that trigger the BMC to issue a shutdown request are:

   - An over-temperature condition for more than 1 second
   - Multiple fan failures.

   The fault conditions that trigger a shutdown are:

   - All power supplies have failed or have been removed.

- A power supply has been out of spec for more than 100 mS.
- The hot-swap circuit has faulted.
- An over-temperature condition has occurred.

Note – Any power supply that is out of spec causes a reset, but only power supplies that remain out of spec for more than 100 mS cause a shutdown.

Externally Inspecting the Server

To perform a visual inspection of the external system:

1. **Inspect the external status indicator LEDs, which can indicate component malfunction.**

   For the LED locations and descriptions of their behavior, see "Front Panel Features" on page 172.

2. **Verify that nothing in the server environment is blocking air flow or making a contact that could short out power.**

3. **If the problem is not evident, continue with the next section,** "Internally Inspecting the Server" on page 4**.**

Internally Inspecting the Server

To perform a visual inspection of the internal system:

1. **Choose a method for shutting down the server from main power mode to standby power mode.**
   - **Graceful shutdown –** Use a non-conducting ballpoint pen or stylus to press and release the Power button on the front panel. This causes Advanced Configuration and Power Interface (ACPI) enabled operating systems to perform an orderly shutdown of the operating system. Servers not running ACPI-enabled operating systems will shut down to standby power mode immediately.
   - **Emergency shutdown –** Use a ballpoint pen or stylus to press and hold the Power button for four seconds to force main power off and enter standby power mode.

When main power is off, the Power/OK LED on the front panel blinks once every three seconds, indicating that the server is in standby power mode. See FIGURE 1-2.

Caution – When you use the Power button to enter standby power mode, power is still directed to the graphics-redirect and service processor (GRASP) board and power supply fans, indicated when the Power/OK LED is blinking. To completely power off the server, disconnect the AC power cords from the back panel of the server.

FIGURE 1-2 Sun Fire X4500 Server Front Panel

Figure Legend

1	Locate button
2	Power/OK LED
3	USB ports (2)

2. **Remove the component covers, including hard disk drive cover, system controller cover, and fan cover, as required.**

   For instructions on removing the component covers, refer to the *Sun Fire X4500 Server Service Manual*, 819-4359.

3. **Inspect the internal status indicator LEDs, which can indicate component malfunction.**

   For the LED locations and descriptions of their behavior, see "Internal Status Indicator LEDs" on page 175.

Note – You can hold down the Locate button on the server back panel or front panel for 5 seconds to initiate a "push-to-test" mode that illuminates all other LEDs both inside and outside of the chassis for 15 seconds.

---

4. **Verify that there are no loose or improperly seated components.**
5. **Verify that all cable connectors inside the system are firmly and correctly attached to their appropriate connectors.**
6. **Verify that any after-factory components are qualified and supported.**

   For a list of supported PCI cards and DIMMs, refer to the *Sun Fire X4500 Server Service Manual*, 819-4359.

7. **Check that the installed DIMMs comply with the supported DIMM population rules and configurations, as described in** "Troubleshooting DIMM Problems" on page 6**.**
8. **Replace the component covers.**
9. **To restore main power mode to the server (all components powered on), use a ballpoint pen or stylus to press and release the Power button on the server front panel. See** FIGURE 1-2**.**

   When main power is applied to the full server, the Power/OK LED next to the Power button lights and remains lit.

10. **If the problem with the server is not evident, you can try viewing the power-on self test (POST) messages and BIOS event logs during system startup. Continue with** "Viewing Event Logs" on page 159**.**

Troubleshooting DIMM Problems

Use this section to troubleshoot problems with memory modules, or DIMMs.

Note – For information on Sun's DIMM replacement policy for x64 servers, contact your Sun Service representative.

How DIMM Errors Are Handled By the System

This section describes system behavior for the two types of DIMM errors: uncorrectable errors (UCEs) and correctable errors (CEs); it also describes BIOS DIMM error messages.

Uncorrectable DIMM Errors

For all operating systems (OS's), the behavior is the same for UCEs:

1. When UCE occurs, the memory controller causes an immediate reboot of the system.
2. During reboot, the BIOS checks the NorthBridge memory controller's Machine Check registers and determines that the previous reboot was due to an UCE, then reports this message in POST after the memtest stage:

   ```
   A Hypertransport Sync Flood occurred on last boot
   ```

3. Memory reports this event in the service processor's system event log (SEL) as shown in the sample IPMItool output below:

```
# ipmitool -H 10.6.77.249 -U root -P changeme -I lanplus sel list
f000 | 02/16/2006 | 03:32:38 | OEM #0x12 |
f100 | OEM record e0 | 00000000040f0c0200200000a2
f200 | OEM record e0 | 0100000004000000000000000
f300 | 02/16/2006 | 03:32:50 | Memory | Uncorrectable ECC | CPU 1 DIMM 0
f400 | 02/16/2006 | 03:32:50 | Memory | Memory Device Disabled | CPU 1 DIMM 0
f500 | 02/16/2006 | 03:32:55 | System Firmware Progress | Motherboard
initialization
f600 | 02/16/2006 | 03:32:55 | System Firmware Progress | Video initialization
f700 | 02/16/2006 | 03:33:01 | System Firmware Progress | USB resource
configuration
```

Correctable DIMM Errors

At this time, CEs are not logged in the server's system event logs.

Note – When running Solaris 10, the Fault Management Architecture (FMA) will manage memory CE's by providing fault monitoring and diagnosis.

BIOS DIMM Error Messages

The BIOS displays and logs three types of DIMM error messages:

- `NODE-`*n* `Memory Configuration Mismatch`

  The following conditions causes this error message:

  - DIMMs mode is not paired (running in 64-bit mode instead of 128-bit mode)
  - DIMMs speed are not same.
  - DIMMs do not support ECC.
  - DIMMs are not registered.
  - MCT stopped due to errors in the DIMM.
  - DIMM module type (buffer) is mismatched.
  - DIMM generation (I or II) is mismatched.
  - DIMM CL/T is mismatched.
  - Banks on a two-sided DIMM are mismatched.
  - DIMM organization is mismatched (128-bit).
  - SPD is missing Trc or Trfc information.`NODE-n Paired DIMMs Mismatch`

- `NODE-n Paired DIMMs Mismatch`

  The following condition displays this error message:

  - DIMMs pairs are not the same or Checksum is mismatched.

- `NODE-n DIMMs Manufacturer Mismatch`

  The following conditions display this error message:

  - DIMMs manufacturer is not supported.

    Only Samsung, Micron, Infineon, and SMART DIMMs are supported.

DIMM Fault LEDs

In the Sun Fire X4500 server, there are eight DIMM slots on the CPU board. The server has an internal status LEDs for the CPU board. DIMM and CPU fault LEDs on the CPU board provide further indications of which component has a fault condition.

These CPU and DIMM fault LEDs can be lit for up to one minute by a capacitor on the CPU board, even after the CPU board is removed from the server. To light the fault LEDs from the capacitor, push the small button on the CPU board labeled, “Press to see fault.”

See FIGURE 1-3 for the LED and button locations.

The DIMM ejector levers contain LEDs that can indicate a faulty DIMM:

- DIMM fault LED is off: The DIMM is operating properly.
- DIMM fault LED is on (amber): The DIMM is faulty and should be replaced.
- The CPU fault LED can indicate a faulty CPU (on CPU 0 or CPU 1):
- CPU fault LED is off: The CPU is operating properly.
- CPU fault LED is on (amber): The CPU is faulty and should be replaced.
- Battery Fault LED is on (amber): The battery is faulty and should be replaced.

Note – The CPU fault and DIMM LEDs continue to indicate a failure until the system is powered up. The Battery LED continues to indicate a failure until the service processor is started.When a UE is detected by the BIOS the DIMM LEDs will also illuminate.

For more information on CPU fault indicators and replacing CPUs, refer to the *Sun Fire X4500 Server Service Manual* (819-4359).

FIGURE 1-3 CPU Module LED and Button Locations

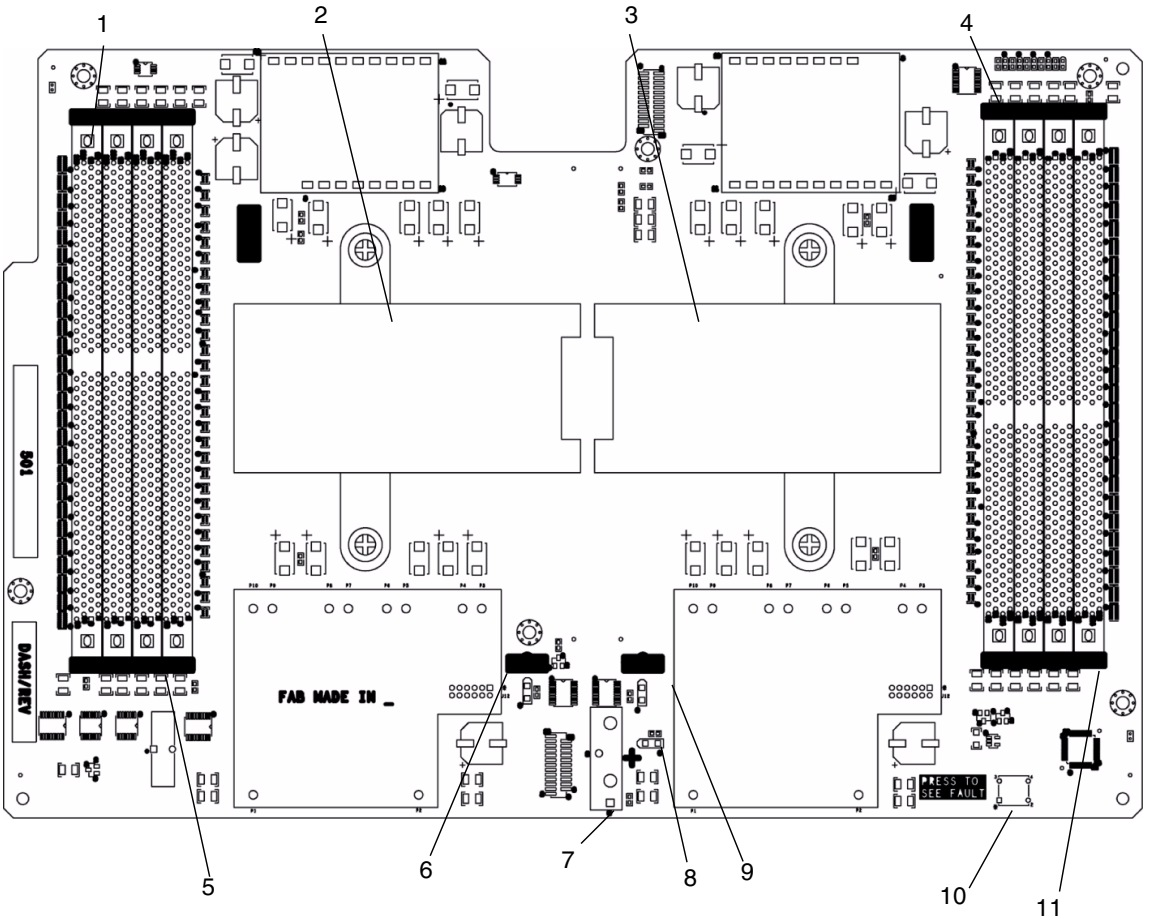


Figure Legend

1	DIMM 0 2 1 3
2	CPU 1 (under heatsink)
3	CPU 0 (under heatsink)
4	DIMM 3 1 2 0
5	DIMM fault LEDs
6	CPU 1 fault LED
7	Battery
8	Battery fault LED

Figure Legend

9	CPU 0 fault LED
10	Press to see fault
11	DIMM fault LED

DIMM Population Rules

The DIMM population rules for the Sun Fire X4500 server are as follows:

- Each CPU can support a maximum of four DIMMs.
- The DIMM slots are paired and the DIMMs must be installed in pairs (0 and 1, 2 and 3). See FIGURE 1-3.
- CPUs with only a single pair of DIMMs must have those DIMMs installed in that CPUs white DIMM slots (0 and 1). See FIGURE 1-3.
- Only PC3200 ECC Registered DIMMs are supported.
- Each pair of DIMMs must be identical (same manufacturer, size, and speed).

Supported DIMM Configurations

TABLE 1-1 lists the supported DIMM configurations for the Sun Fire X4500 server.

TABLE 1-1 Supported DIMM Configurations

Slot 3	Slot 2	Slot 1	Slot 0	Total Memory Per CPU
0	2 GB	0	2 GB	4 GB
2 GB	2 GB	2 GB	2 GB	8 GB

Isolating and Correcting DIMM ECC Errors

If your log files report an ECC error or a problem with a DIMM, complete the steps below until you can isolate the fault.

In this example, the log file reports an error with the DIMM in CPU0, slot 1. The fault LEDs on CPU0, slots 1 and 3 are lit.

To isolate and correct DIMM ECC errors:

1. **If you have not already done so, shut down your server to standby power mode and remove the system controller cover.**

   Refer to the *Sun Fire X4500 Server Service Manual*, 819-4359.

2. **Inspect the installed DIMMs to ensure that they comply with the** "DIMM Population Rules" on page 11 **and the** "Supported DIMM Configurations" on page 11**.**

3. **Inspect the fault LEDs on the DIMM slot ejectors and the CPU fault LEDs on the CPU board. See** FIGURE 1-3**.**

   If any of these LEDs are lit, they can indicate the component with the fault.

4. **Disconnect the AC power cords from the server.**

Caution – Before handling components, attach an ESD wrist strap to a chassis ground (any unpainted metal surface). The system's printed circuit boards and hard disk drives contain components that are extremely sensitive to static electricity.

5. **Replace the CPU that has the problem.**

   Refer to the *Sun Fire X4500 Server Service Manual*, 819-4359.

6. **Remove the DIMMs from the CPU board.**

   Refer to the *Sun Fire X4500 Server Service Manual*, 819-4359.

7. **Visually inspect the DIMMs for physical damage, dust, or any other contamination on the connector or circuits.**

8. **Visually inspect the DIMM slot for physical damage. Look for cracked or broken plastic on the slot.**

9. **Dust off the DIMMs, clean the contacts, and reseat them.**

10. **If there is no obvious damage, exchange the individual DIMMs between the two slots of a given pair. Ensure that they are inserted correctly with ejector latches secured. Using the slot numbers from the example:**

    a. **Remove the DIMMs from CPU0, slots 1 and 3.**

    b. **Reinstall the DIMM from slot 1 into slot 3.**

    c. **Reinstall the DIMM from slot 3 into slot 1.**

11. **Reconnect AC power cords to the server.**

12. **Power on the server and run the diagnostics test again.**

13. **Review the log file.**

- If the error now appears in CPU0, slot 3 (opposite to the original error in slot 1), the problem is related to the individual DIMM. In this case, return both DIMMs (the pair) to the Support Center for replacement.
- If the error still appears in CPU0, slot 1 (as the original error did), the problem is not related to an individual DIMM. Instead, it might be caused by CPU0 or by the DIMM slot. Continue with the next step.

14. **Shut down the server again and disconnect the AC power cords.**

15. **Remove both DIMMs of the pair and install them into paired slots on the second CPU board that did not indicate a DIMM problem.**

    Using the slot numbers in the example, install the two DIMMs from CPU0, slots 1 and 3 into CPU1, slots 1 and 3 or CPU1, slots 0 and 2.

16. **Reconnect AC power cords to the server.**

17. **Power on the server and run the diagnostics test again.**

18. **Review the log file.**
    - If the error now appears under the CPU that manages the DIMM slots you just installed, the problem is with the DIMMs. Return both DIMMs (the pair) to the Support Center for replacement.
    - If the error remains with the original CPU, there is a problem with that CPU.

CHAPTER 2

Using SunVTS Diagnostic Software

This chapter contains information about the Sun diagnostic software tools .

This chapter includes the following topics:

Running SunVTS Diagnostic Tests

The Sun Fire X4500 servers are shipped with a Bootable Diagnostics CD that contains SunVTS™ software.

SunVTS is the Sun Validation Test Suite, which provides a comprehensive diagnostic tool that tests and validates Sun hardware by verifying the connectivity and functionality of most hardware controllers and devices on Sun platforms. SunVTS software can be tailored with modifiable test instances and processor affinity features.

The following tests are supported on x86 platforms. The current x86 support is for the 32-bit operating system only.

- CD DVD Test (cddvdtest)
- CPU Test (cputest)
- Disk and Diskette Drives Test (disktest)
- Data Translation Look-Aside Buffer (dtlbtest)
- Floating Point Unit Test (fputest)
- Network Hardware Test (nettest)
- Ethernet Loopback Test (netlbtest)
- Physical Memory Test (pmemtest)

- Serial Port Test (serialtest)
- System Test (systest)
- Universal Serial Bus Test (usbtest)
- Virtual Memory Test (vmemtest)

SunVTS software has a sophisticated graphical user interface (GUI) that provides test configuration and status monitoring. The user interface can be run on one system to display the SunVTS testing of another system on the network. SunVTS software also provides a TTY-mode interface for situations in which running a GUI is not possible.

SunVTS Documentation

For the most up-to-date SunVTS documentation, go to:

http://docs.sun.com/app/docs/coll/1140.2

Diagnosing Server Problems With the Bootable Diagnostics CD

SunVTS 6.2 or later software is preinstalled on these Sun Fire X4500 servers. The server is also shipped with the Sun Fire X4500 Server Bootable Diagnostics CD (705-1439). This CD is designed so that the server will boot from the CD. This CD boots the Solaris™ operating system and starts SunVTS software. Diagnostic tests run and write output to log files that the service technician can use to determine the problem with the server.

Requirements

To use the Sun Fire X4500 Server Bootable Diagnostics CD, you must have a keyboard, mouse, and monitor attached to the server on which you are performing diagnostics.

Using the Bootable Diagnostics CD

To use the Sun Fire X4500 Server Bootable Diagnostics CD to perform diagnostics:

1. **With the server powered on, insert the Sun Fire X4500 Server Bootable Diagnostics CD (705-1439) into the DVD-ROM drive.**
2. **Reboot the server, but press F2 during the start of reboot so that you can change the BIOS setting for boot-device priority.**
3. **When the BIOS Main menu appears, navigate to the BIOS Boot menu.**

   Instructions for navigating within the BIOS screens are printed on the BIOS screens.
4. **On the BIOS Boot menu screen, select Boot Device Priority.**

   The Boot Device Priority screen appears.
5. **Select the DVD-ROM drive to be the primary boot device.**
6. **Save and exit the BIOS screens.**
7. **Reboot the server.**

   When the server reboots from the CD in the DVD-ROM drive, the Solaris Operating System boots and SunVTS software starts and opens its first GUI window.
8. **In the SunVTS GUI, press Enter or click the Start button when you are prompted to start the tests.**

   The test suite will run until it encounters an error or the test is completed.

Note – The CD will take approximately nine minutes to boot.

---

9. **When SunVTS software completes the test, review the log files generated during the test.**

   SunVTS provides access to four different log files:

   - SunVTS **test error log** contains time-stamped SunVTS test error messages. The log file path name is `/var/opt/SUNWvts/logs/sunvts.err`. This file is not created until a SunVTS test failure occurs.
   - SunVTS **kernel error log** contains time-stamped SunVTS kernel and SunVTS probe errors. SunVTS kernel errors are errors that relate to running SunVTS, and not to testing of devices. The log file path name is `/var/opt/SUNWvts/logs/vtsk.err`. This file is not created until SunVTS reports a SunVTS kernel error.
   - SunVTS **information log** contains informative messages that are generated when you start and stop the SunVTS test sessions. The log file path name is `/var/opt/SUNWvts/logs/sunvts.info`. This file is not created until a SunVTS test session runs.
   - Solaris **system message log** is a log of all the general Solaris events logged by `syslogd`. The path name of this log file is `/var/adm/messages`.

a. Click the Log button.

The Log file window is displayed.

b. Specify the log file that you want to view by selecting it from the Log File window.

The content of the selected log file is displayed in the window.

c. With the three lower buttons you can do the following actions:

- **Print the log file –** A dialog box appears for you to specify your printer options and printer name.
- **Delete the log file –** The file remains displayed, but will be gone the next time you try to display it.
- **Close the Log file window –** The window is closed.

Note – To save the log files: You must save the log files to another networked system or a removable media device. When you use the Bootable Diagnostics CD, the server boots from the CD. Therefore, the test log files are not on the server's hard disk drive and they will be deleted when you power cycle the server.

CHAPTER 3

Using the ILOM Service Processor GUI to View System Information

This appendix contains information about using the Integrated Lights Out Manager (ILOM) service processor (SP) GUI to view monitoring and maintenance information for your server. It includes the following sections:

For more information on using the ILOM SP GUI to maintain the server (for example, configuring alerts), refer to the *Integrated Lights Out Manager Administration Guide*, 819-1160.

- If any of the logs or information screens indicate a DIMM error, see "Troubleshooting DIMM Problems" on page 6 and "How DIMM Errors Are Handled by the System" on page 125.
- If the problem with the server is not evident after viewing ILOM SP logs and information, continue with "Running SunVTS Diagnostic Tests" on page 120.

Making a Serial Connection to the SP

To make a serial connection to the SP:

1. **Connect a serial cable from the RJ-45 Serial Management port on your ILOM SP to a terminal device.**
2. **Press ENTER on the terminal device to establish a connection between that terminal device and the ILOM SP.**

Note – If you are connecting to the serial port on the SP before it has been powered up or during its power-up sequence, you will see bootup messages displayed.

The service processor eventually displays a login prompt. For example:

```
SUNSP0003BA84D777 login:
```

The first string in the prompt is the default host name for the ILOM SP. It consists of the prefix `SUNSP` and the MAC address of the ILOM SP. The MAC address for each ILOM SP is unique.

3. **Log in to the SP and type the default user name, root, with the default password, changeme.**

   Once you have successfully logged in to the SP, it displays its default command prompt.

   ```
   ->
   ```

4. **To start the serial console, type the following commands:**

   ```
   cd /SP/console
   start
   ```

5. **Determine whether you successfully connected to the SP:**
   - If you could *not* connect to the SP, there is likely a problem with the graphics-redirect and service processor (GRASP) board. Replace this board and then repeat Step 1 through Step 4. Refer to the *Sun Fire X4500 Server Service Manual*, 819-4359, for instructions.
   - If you successfully connected to the SP, continue with the following procedures:
     - "Viewing ILOM SP Event Logs" on page 21
     - "Viewing Replaceable Component Information" on page 24
     - "Viewing Temperature, Voltage, and Fan Sensor Readings" on page 26

Viewing ILOM SP Event Logs

Events are notifications that occur in response to some actions. The IPMI system event log (SEL) provides status information about the Sun Fire X4500 server's hardware and software to the ILOM software, which displays the events in the ILOM web GUI. To view event logs:

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

   a. **Type the IP address of the server's SP into your web browser.**

      The Sun Integrated Lights Out Manager Login screen is displayed.

   b. **Type your user name and password.**

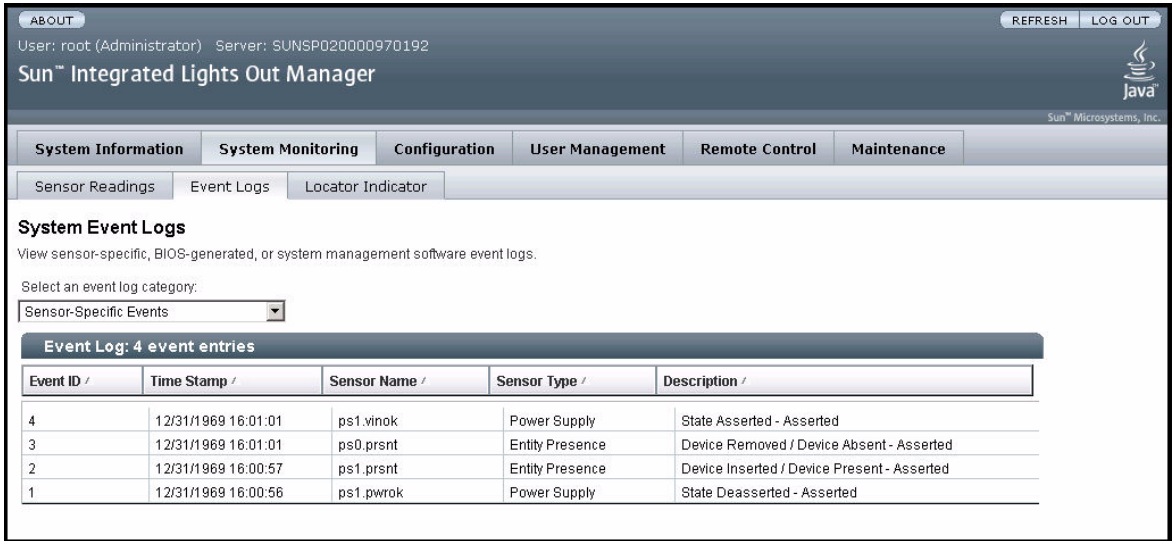
      When you first try to access the ILOM SP, you are prompted to type the default user name and password. The default user name and password are:

      Default user name: **`root`**
      Default password: **`changeme`**

2. **From the System Monitoring tab, select Event Logs.**

   The System Event Logs page is displayed. See FIGURE 3-1 for a page that shows sample information.

FIGURE 3-1 System Event Logs Page



3. **Select a category of event that you want to view in the log from the drop-down menu.**

   You can select from the following types of events:

   - Sensor-specific events. These events relate to a specific sensor for a component, for example, a fan sensor or a power supply sensor.
   - BIOS-generated events. These events relate to error messages generated in the BIOS.
   - System management software events. These events relate to events that occur within the ILOM software.

   After you have selected a category of event, the Event Log table is updated with the specified events. The fields in the Event Log are described in TABLE 3-1.

TABLE 3-1 Event Log Fields

Field	Description
Event ID	The number of the event, in sequence from number 1.
Time Stamp	The day and time the event occurred. If the Network Time Protocol (NTP) server is enabled to set the SP time, the SP clock will use Universal Coordinated Time (UTC). For more information about time stamps, see "Interpreting Event Log Time Stamps" on page 23.
Sensor Name	The name of a component for which an event was recorded. The sensor name abbreviations correspond to the following components: sys: System or chassis • p0: Processor 0 • p1: Processor 1 • io: I/O board • ps: Power supply • fp: Front panel • ft: Fan tray • mb: Motherboard
Sensor Type	The type of sensor for the specified event.
Description	A description of the event.

4. **To clear the event log, click the Clear Event Log button.**

   A confirmation dialog box is displayed.

5. **Click OK to clear all entries in the log.**

6. **If the problem with the server is not evident after viewing ILOM SP logs and information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

Interpreting Event Log Time Stamps

The system event log time stamps are related to the service processor clock settings. If the clock settings change, the change is reflected in the time stamps.

When the service processor reboots, the SP clock is set to Thu Jan 1 00:00:00 UTC 1970. The SP reboots as a result of the following:

- A complete system unplug/replug power cycle
- An IPMI command; for example, `mc reset cold`
- A command-line interface (CLI) command; for example, `reset /SP`
- ILOM web GUI operation; for example, from the Maintenance tab, selecting Reset SP
- An SP firmware upgrade

After an SP reboot, the SP clock is changed by the following:

- When the host is booted. The host's BIOS unconditionally sets the SP time to that indicated by the host's RTC. The host's RTC is set by the following operations:
  - When the host's CMOS is cleared as a result of changing the host's RTC battery or inserting the CMOS-clear jumper on the system controller. The host's RTC starts at Jan 1 00:01:00 2002.
  - When the host's operating system sets the host's RTC. The BIOS does not consider time zones. Solaris and Linux software respect time zones and will set the system clock to UTC. Therefore, after the OS adjusts the RTC, the time set by the BIOS will be UTC.
  - When the user sets the RTC using the host BIOS Setup screen.
- Continuously via NTP if NTP is enabled on the SP. NTP jumping is enabled to recover quickly from an erroneous update from the BIOS or user. NTP servers provide UTC time. Therefore, if NTP is enabled on the SP, the SP clock will be in UTC.
- Via the CLI, ILOM web GUI, and IPMI

Viewing Replaceable Component Information

Depending on the component you select, information about the manufacturer, component name, serial number, and part number can be displayed.

To view replaceable component information:

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

   a. **Type the IP address of the server's SP into your web browser.**

      The Sun Integrated Lights Out Manager Login screen is displayed.

   b. **Type your user name and password.**

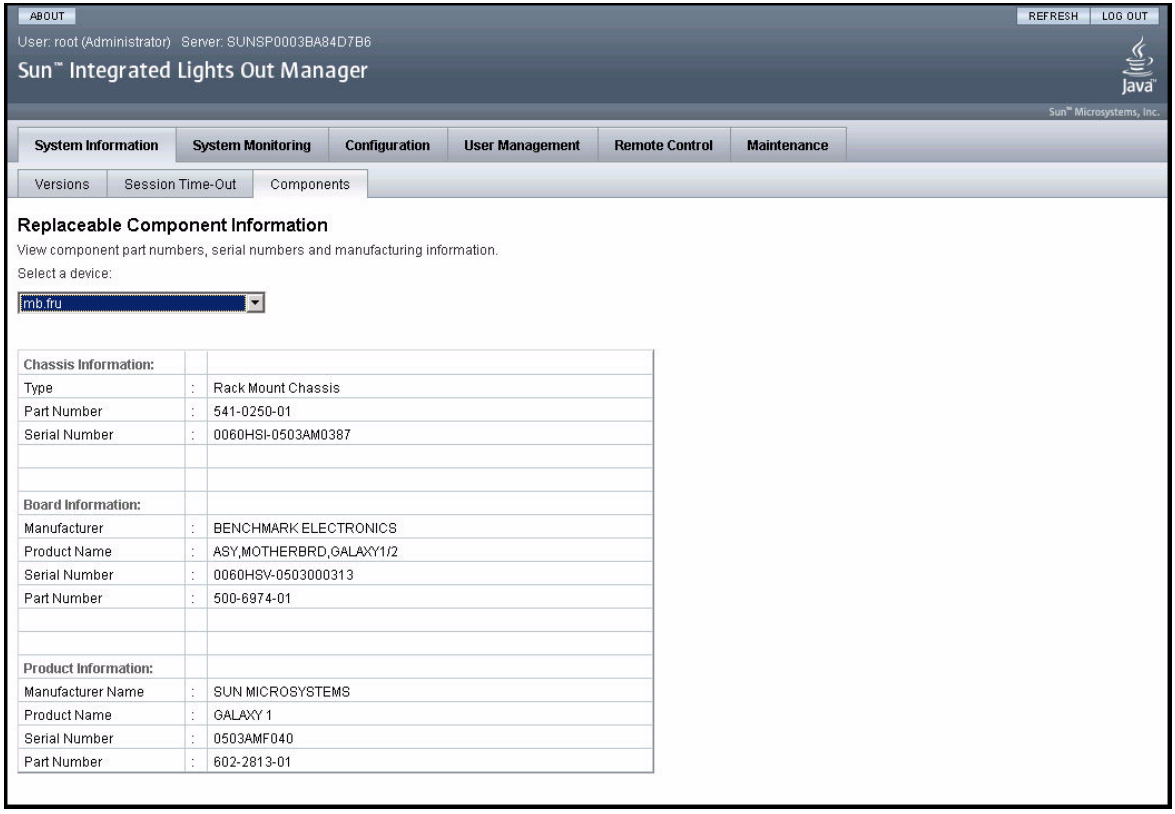
      When you first try to access the ILOM Service Processor, you are prompted to type the default user name and password. The default user name and password are:

      Default user name: **`root`**
      Default password: **`changeme`**

2. **From the System Information tab, select Components.**

   The Replaceable Component Information page is displayed. See FIGURE 3-2.

FIGURE 3-2 Replaceable Component Information Page



3. **Select a component from the drop-down list.**

   Information about the selected component is displayed.

4. **If the problem with the server is not evident after viewing replaceable component information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

Viewing Temperature, Voltage, and Fan Sensor Readings

This section describes how to view the Sun Fire X4500 server temperature, voltage, and fan sensor readings.

There are a total of six temperature sensors that are monitored. They all generate IPMI events that will be logged in to the system event log (SEL) when an upper threshold is exceeded. Three of these sensor readings are used to adjust the fan speeds and perform other actions, such as illuminating LEDs and powering off the chassis. These sensors and their respective thresholds are as follows:

- Front panel ambient temperature (fp.t_amb)
  - Upper non-critical: 30 degrees C
  - Upper critical: 35 degrees C
  - Upper non-recoverable: 40 degrees C
- CPU 0 (p0.t_core) and CPU 1 (p1.t_core) die temperatures
  - Upper non-critical: 55 degrees C
  - Upper critical: 65 degrees C
  - Upper non-recoverable: 75 degrees C

There are three other temperature sensors:

- I/O board ambient temperature (io.t_amb)
- system controller ambient temperature (mb.t_amb)
- Power distribution board ambient temperature (pdb.t_amb)

▼ To View Sensor Readings:

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

   a. **Type the IP address of the server's SP into your web browser.**

      The Sun Integrated Lights Out Manager Login screen is displayed.

b. Type your user name and password.

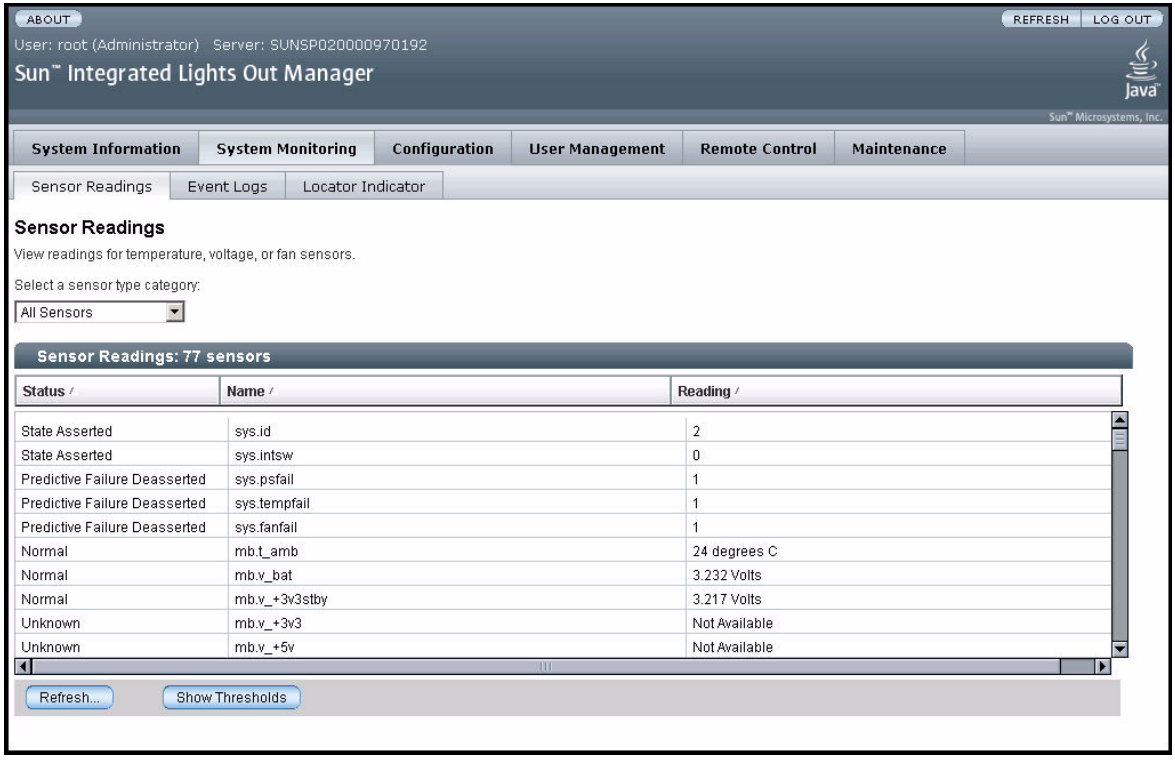
When you first try to access the ILOM Service Processor, you are prompted to type the default user name and password. The default user name and password are:

Default user name: **root**
Default password: **changeme**

2. **From the System Monitoring tab, select Sensor Readings.**

The Sensor Readings page is displayed. See FIGURE 3-3.

FIGURE 3-3 Sensor Readings Page



3. **Select the type of sensor readings that you want to view from the drop-down menu.**

You can select All Sensors, Temperature Sensors, Voltage Sensors, or Fan Sensors.

The sensor readings are displayed. The Sensor Readings fields are described in TABLE 3-2.

TABLE 3-2 Sensor Readings Fields

Field	Description
Status	Reports the status of the sensor, including State Asserted, State Deasserted, Predictive Failure, Device Inserted/Device Present, Device Removed/Device Absent, Unknown, and Normal.
Name	Reports the name of the sensor. The names correspond to the following components: • sys: System or chassis • bp: Back panel • fp: Front panel • mb: Motherboard • io: I/O board • p0: Processor 0 • p1: Processor 1 • ft0: Fan tray 0 • ft1: Fan tray 1 • pdb: Power distribution board • ps0: Power supply 0 • ps1: Power supply 1
Reading	Reports the rpm, temperature, and voltage measurements.

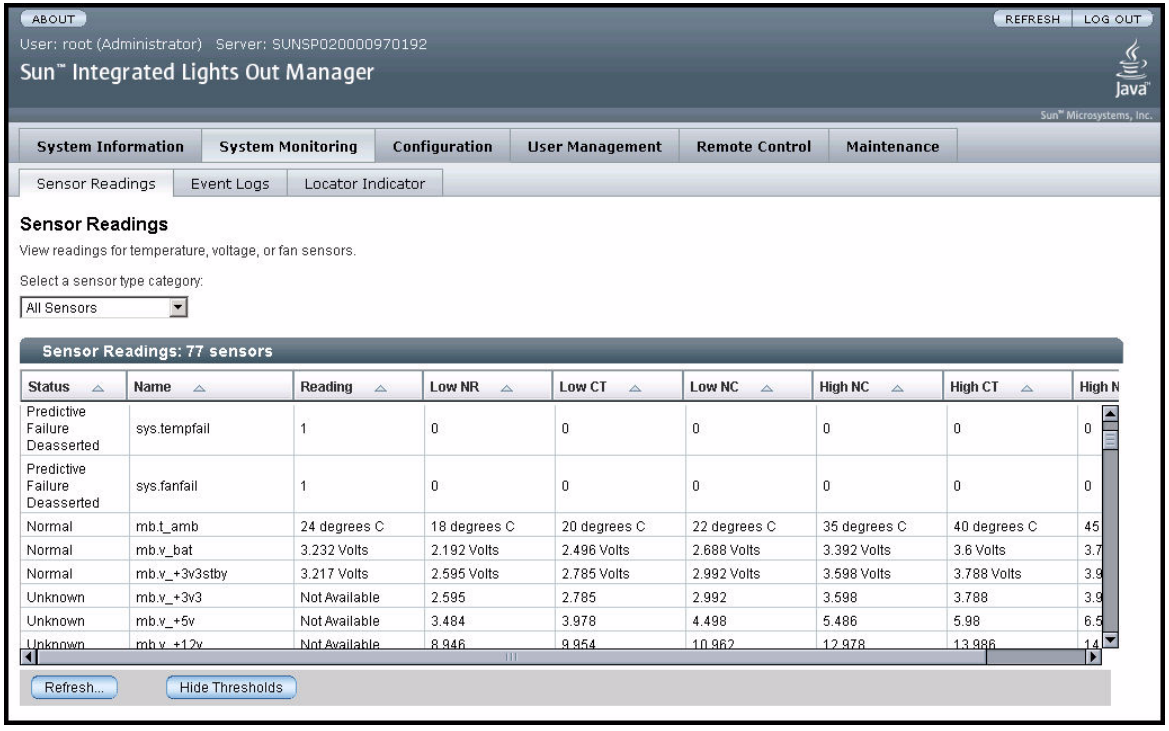
4. **Click the Refresh button to update the sensor readings to their current status.**
5. **Click the Show Thresholds button to display the settings that trigger alerts.**

   The Sensor Readings table is updated. See the example in FIGURE 3-4.

   For example, if system temperature reaches 30 C, the service processor will send an alert. Sensor thresholds include the following:

   - Low/High NR: Low or high non-recoverable
   - Low/High CR: Low or high critical
   - Low/High NC: Low or high non-critical

FIGURE 3-4 Sensor Readings Page With Thresholds Displayed



6. **Click the Hide Thresholds button to revert to the sensor readings.**

   The sensor readings are redisplayed, without the thresholds.

7. **If the problem with the server is not evident after viewing sensor readings information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

CHAPTER 4

Using IPMItool to View System Information

This appendix contains information about using the Intelligent Platform Management Interface (IPMI) to view monitoring and maintenance information for your server. It the following sections:

About IPMI

IPMI is an open-standard hardware management interface specification that defines a specific way for embedded management subsystems to communicate. IPMI information is exchanged through baseboard management controllers (BMCs), which are located on IPMI-compliant hardware components. Using low-level hardware intelligence instead of the operating system has two main benefits: first, this configuration allows for out-of-band server management, and second, the operating system is not burdened with transporting system status data.

Your Sun Fire X4500 Service Processor (SP) is IPMI v2.0 compliant. You can access IPMI functionality through the command line with the IPMItool utility either in-band or out-of-band. Additionally, you can generate an IPMI-specific trap from the web interface or manage the server's IPMI functions from any external management solution that is IPMI v1.5 or v2.0 compliant. For more information about the IPMI v2.0 specification, go to:

http://www.intel.com/design/servers/ipmi/spec.htm#spec2

About IPMItool

IPMItool is included on the Sun Fire X4500 server Tools and Drivers CD (705-1438). IPMItool is a simple, command-line interface that is useful for managing IPMI-enabled devices. You can use this utility to perform IPMI functions with a kernel device driver or over a LAN interface. IPMItool enables you to manage system hardware components, monitor system health, and monitor and manage system environmentals, independent of the operating system.

Locate IMPItool and its related documentation on your Sun Fire X4500 Server Tools and Drivers CD, or download this tool at:

http://ipmitool.sourceforge.net/

IPMItool Man Page

After you install the IPMItool package, you can access detailed information about command usage and syntax from the `man` page that is installed. From a command line, type the following command:

```
man ipmitool
```

Connecting to the Server With IPMItool

To connect over a remote interface, you must supply a user name and password. The default user with administrator-level access is **root** with password **changeme**. You must use the `-U` and `-P` parameters to pass both user name and password on the command line, as shown in the following example:

ipmitool -I lanplus -H *<IPADDR>* **-U root -P changeme chassis status**

Note – If you experience command-syntax problems with your particular operating system, you can use the **ipmitool -h** command and parameter to determine which parameters can be passed with the `ipmitool` command on your operating system. Also, refer to the IPMItool man page by typing **man ipmitool**.

Note – In the example commands shown in this appendix, the default username, **root**, and default password, **changeme** are shown. You should type the user name and password that has been set for the server.

Enabling the Anonymous User

In order to enable the Anonymous/NULL user, you must alter the privilege level on that account. Altering the privilege level lets you connect without supplying a `-U` user option on the command line. The default password for this user is **anonymous**.

To enable the anonymous user, type the following commands:

ipmitool -I lanplus -H *<IPADDR>* **-U root -P changeme channel setaccess 1 1 privilege=4**
ipmitool -I lanplus -H *<IPADDR>* **-P anonymous user list**

Changing the Default Password

You can also change the default passwords for a particular user ID. First, get a list of users and find the ID for the user you wish to change. Then, supply it with a new password, as shown in the following command sequence:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user list
ID        NameCallin  Link Auth  IPMI Msg   Channel Priv Limit
1         false   false      true       NO ACCESS
2         root false   false      true       ADMINISTRATOR
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user set password
2 newpass
ipmitool -I lanplus -H <IPADDR> -U root -P newpass chassis status
```

Configuring an SSH Key

You can use IPMItool to configure an SSH key for a remote shell user. To do this, first determine the user ID for the desired remote SP user with the user list command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user list
```

Then supply the user ID and the location of the RSA or DSA public key to use with the **ipmitool sunoem sshkey** command. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem sshkey set
2 id_rsa.pub
Setting SSH key for user id 2.......done
```

You can also clear the key for a particular user, for example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem sshkey del
2
Deleted SSH key for user id 2
```

Using IPMItool to Read Sensors

For more information about supported IPMI 2.0 commands and the sensor naming for this server, refer to the *Integrated Lights Out Manager Administration Guide*.

Reading Sensor Status

You can read sensor status, ranging from a broad overview that lists all sensors, to querying individual sensors and returning detailed information on them.

For information on the physical locations of the sensors in the system, see "Sun Fire X4500 Sensor Locations" on page 87.

Reading All Sensors

To view a list of all sensors in the servers and their status, use the `sdr list` command with no arguments. This command returns a large table that includes every sensor in the server and its status.

The five fields of the output lines, as read from left to right, are:

1. IPMI sensor ID (16-character maximum)
2. IPMI sensor number
3. Sensor status, indicates thresholds that have been exceeded
4. Entity ID and instance
5. Sensor reading

For example:

TABLE 4-1 `fp.t_amb | 0Ah | ok | 12.0 | 22 degrees C`

Reading Specific Sensors

You can refine the output to see only specific sensors by setting the **`sdr list`** command with an optional argument to limit the output to sensors of a specific type. The default output is a long list of sensors. TABLE 4-2 describes the available sensor arguments.

TABLE 4-2 IPMItool Sensor Arguments

Argument	Description	Sensors
`all`	All sensor records	All sensors
`full`	Full sensor records	Temperature, voltage, and fan sensors
`compact`	Compact sensor records	Digital Discrete: failure and presence sensors
`event`	Event-only records	Sensors used only for matching with SEL records
`mcloc`	MC locator records	Management Controller sensors
`generic`	Generic locator records	Generic devices: LEDs
`fru`	FRU locator records	FRU devices

For example, to see only the temperature, voltage, and fan sensors, type the following command, with the `full` argument.

`ipmitool -I lanplus -H` *<IPADDR>* **`-U root -P changeme sdr elist full`**

```
fp.t_amb         | 0Ah | ok  | 12.0 | 22 degrees C
ps.t_amb         | 11h | ok  | 10.0 | 21 degrees C
ps0.f0.speed     | 15h | ok  | 10.0 | 11000 RPM
ps1.f0.speed     | 19h | ok  | 10.1 | 0 RPM
mb.t_amb         | 1Ah | ok  |  7.0 | 25 degrees C
mb.v_bat         | 1Bh | ok  |  7.0 | 3.18 Volts
mb.v_+3v3stby    | 1Ch | ok  |  7.0 | 3.17 Volts
mb.v_+3v3        | 1Dh | ok  |  7.0 | 3.34 Volts
mb.v_+5v         | 1Eh | ok  |  7.0 | 5.04 Volts
mb.v_+12v        | 1Fh | ok  |  7.0 | 12.22 Volts
mb.v_-12v        | 20h | ok  |  7.0 | -12.20 Volts
mb.v_+2v5core    | 21h | ok  |  7.0 | 2.54 Volts
mb.v_+1v8core    | 22h | ok  |  7.0 | 1.83 Volts
mb.v_+1v2core    | 23h | ok  |  7.0 | 1.21 Volts
io.t_amb         | 24h | ok  | 15.0 | 21 degrees C
p0.t_core        | 2Bh | ok  |  3.0 | 44 degrees C
p0.v_+1v5        | 2Ch | ok  |  3.0 | 1.56 Volts
p0.v_+2v5core    | 2Dh | ok  |  3.0 | 2.64 Volts
p0.v_+1v25core   | 2Eh | ok  |  3.0 | 1.32 Volts
p1.t_core        | 34h | ok  |  3.1 | 40 degrees C
p1.v_+1v5        | 35h | ok  |  3.1 | 1.55 Volts
p1.v_+2v5core    | 36h | ok  |  3.1 | 2.64 Volts
```

```
p1.v_+1v25core   | 37h | ok  |  3.1 | 1.32 Volts
ft0.fm0.f0.speed | 43h | ok  | 29.0 | 6000 RPM
ft0.fm1.f0.speed | 44h | ok  | 29.1 | 6000 RPM
ft0.fm2.f0.speed | 45h | ok  | 29.2 | 6000 RPM
ft1.fm0.f0.speed | 46h | ok  | 29.3 | 6000 RPM
ft1.fm1.f0.speed | 47h | ok  | 29.4 | 6000 RPM
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

You can also generate a list of all sensors for a specific entity. Use the list output to determine which entity you are interested in seeing, then use the **`sdr entity`** command to get a list of all sensors for that entity. This command accepts an entity ID and an optional entity instance argument. If an entity instance is not specified, it will display all instances of that entity.

The entity ID is given in the fourth field of the output, as read from left to right. For example, in the output shown in the previous example, all the fans are entity 29. The last fan listed (29.5) is entity 29, with instance 5:

```
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

For example, to see all fan-related sensors, type the following command with the entity 29 argument.

`ipmitool -I lanplus -H` *<IPADDR>* **`-U root -P changeme sdr entity 29`**

```
ft0.fm0.fail     | 3Dh | ok  | 29.0 | Predictive Failure Deasserted
ft0.fm0.led      | 00h | ns  | 29.0 | Generic Device @20h:19h.0
ft0.fm1.fail     | 3Eh | ok  | 29.1 | Predictive Failure Deasserted
ft0.fm1.led      | 00h | ns  | 29.1 | Generic Device @20h:19h.1
ft0.fm2.fail     | 3Fh | ok  | 29.2 | Predictive Failure Deasserted
ft0.fm2.led      | 00h | ns  | 29.2 | Generic Device @20h:19h.2
ft1.fm0.fail     | 40h | ok  | 29.3 | Predictive Failure Deasserted
ft1.fm0.led      | 00h | ns  | 29.3 | Generic Device @20h:19h.3
ft1.fm1.fail     | 41h | ok  | 29.4 | Predictive Failure Deasserted
ft1.fm1.led      | 00h | ns  | 29.4 | Generic Device @20h:19h.4
ft1.fm2.fail     | 42h | ok  | 29.5 | Predictive Failure Deasserted
ft1.fm2.led      | 00h | ns  | 29.5 | Generic Device @20h:19h.5
ft0.fm0.f0.speed | 43h | ok  | 29.0 | 6000 RPM
ft0.fm1.f0.speed | 44h | ok  | 29.1 | 6000 RPM
ft0.fm2.f0.speed | 45h | ok  | 29.2 | 6000 RPM
ft1.fm0.f0.speed | 46h | ok  | 29.3 | 6000 RPM
ft1.fm1.f0.speed | 47h | ok  | 29.4 | 6000 RPM
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

Other queries can include a particular type of sensor. The command in the following example returns a list of all Temperature type sensors in the SDR.

`ipmitool -I lanplus -H` *<IPADDR>* **`-U root -P changeme sdr type temperature`**

```
sys.tempfail      | 03h | ok  | 23.0 | Predictive Failure Deasserted
mb.t_amb          | 05h | ok  |  7.0 | 25 degrees C
fp.t_amb          | 14h | ok  | 12.0 | 25 degrees C
ps.t_amb          | 1Bh | ok  | 10.0 | 24 degrees C
io.t_amb          | 22h | ok  | 15.0 | 23 degrees C
p0.t_core         | 2Ch | ok  |  3.0 | 35 degrees C
p1.t_core         | 35h | ok  |  3.1 | 36 degrees C
```

Using IPMItool to View the ILOM SP System Event Log

The ILOM SP System Event Log (SEL) provides storage of all system events. You can view the SEL with IPMItool. This topic includes the following sections:

Viewing the SEL With IPMItool

Two separate IPMI commands allow you to see different levels of detail in the ILOM SP SEL.

- To view the ILOM SP SEL with a minimal level of detail, type the `sel list` command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel list
100 | Pre-Init Time-stamp | Entity Presence #0x16 | Device Absent
200 | Pre-Init Time-stamp | Entity Presence #0x26 | Device Present
300 | Pre-Init Time-stamp | Entity Presence #0x25 | Device Absent
400 | Pre-Init Time-stamp | Phys Security  #0x01   | Gen Chassis
intrusion
500 | Pre-Init Time-stamp | Entity Presence  #0x12    | Device Present
```

Note – When you use this command, an event record shows a sensor number, but does not display the name of the sensor for the event. For example, in line 100 in the sample output above, the sensor number `0x16` is displayed. For information about how to map sensor names to the different sensor number formats that might be displayed, see "Sensor Numbers and Sensor Names in SEL Events" on page 40.

- To view the ILOM SP SEL with a detailed event output, type the **`sel elist`** command (instead of **`sel list`**). The **`sel elist`** command cross-references event records with sensor data records to produce descriptive event output. It takes longer to execute because it has to read from both the SEL and the Static Data Repository (SDR). For increased speed, generate an SDR cache before using the `sel elist command`. See "Using the Sensor Data Repository (SDR) Cache" on page 40. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel elist first 3
100 | Pre-Init Time-stamp   | Temperature fp.t_amb | Upper Non-
critical going high | Reading 31 > Threshold 30 degrees C
200 | Pre-Init Time-stamp   | Power Supply ps1.pwrok | State
Deasserted
300 | Pre-Init Time-stamp   | Entity Presence ps1.prsnt | Device
Present
```

Qualifiers allow you to refine and limit the SEL output. To see only the first NUM records, add that as a qualifier to the command. To see the last NUM records, use that qualifier. For example, to see the last three records in the SEL, type the following command:

`ipmitool -I lanplus -H` *<IPADDR>* **`-U root -P changeme sel elist last 3`**

```
800 | Pre-Init Time-stamp   | Entity Presence ps1.prsnt | Device
Absent
900 | Pre-Init Time-stamp | Phys Security sys.intsw | Gen Chassis
intrusion
a00 | Pre-Init Time-stamp   | Entity Presence ps0.prsnt | Device
Present
```

To view more detailed information on a particular event, you can use the `sel get` *ID* command, in which you specify an SEL record ID. For example:

`ipmitool -I lanplus -H` *<IPADDR>* **`-U root -P changeme sel get 0x0a00`**

```
SEL Record ID : 0a00
Record Type : 02
Timestamp : 07/06/1970 01:53:58
Generator ID : 0020
EvM Revision : 04
Sensor Type : Entity Presence
Sensor Number : 12
Event Type : Generic Discrete
Event Direction : Assertion Event
Event Data (RAW) : 01ffff
Description : Device Present
Sensor ID : ps0.prsnt (0x12)
Entity ID : 10.0
Sensor Type (Discrete): Entity Presence
States Asserted : Availability State
          [Device Present]
```

In the example above, this event shows that Power Supply #0 is detected and present.

Clearing the SEL With IPMItool

To clear the SEL, type the **`sel clear`** command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel clear
Clearing SEL. Please allow a few seconds to erase.
```

Using the Sensor Data Repository (SDR) Cache

When working with the ILOM SP, certain operations can be expensive in terms of execution time and the amount of data transferred. Typically, issuing the **`sdr elist`** command requires the entire SDR to be read from the SP. Similarly, the **`sel elist`** command needs to read both the SDR and the SEL from the SP in order to cross-reference events and display useful information.

To speed up these operations, it is possible to pre-cache the static data in the SDR and feed it back into IPMItool. This can have a dramatic effect in the processing time for some commands. In order to generate an SDR cache for later use, type the **`sdr dump`** command. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sdr dump
galaxy.sdr
Dumping Sensor Data Repository to 'galaxy.sdr'
```

After you have generated a cache file, it can be supplied to future invocations of IPMItool with the `-S` option. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme -S galaxy.sdr sel
elist
100 | Pre-Init Time-stamp | Entity Presence ps1.prsnt | Device Absent
200 | Pre-Init Time-stamp | Entity Presence io.f0.prsnt | Device
Absent
300 | Pre-Init Time-stamp | Power Supply ps0.vinok | State Asserted
...
```

Sensor Numbers and Sensor Names in SEL Events

Depending on which IPMI command you use, the sensor number that is displayed for an event might appear in slightly different formats. See the following examples:

- The sensor number for the sensor ps1.prsnt (power supply 1 present) can be displayed as either `1Fh` or `0x1F`.
- `38h` is equivalent to `0x38`.
- `4Bh` is equivalent to `0x4B`.

The output from certain commands might not display the sensor name along with the corresponding sensor number. To see all sensor names in your server mapped to the corresponding sensor numbers, you can use the following command:

```
ipmitool -H 129.144.82.21 -U root -P changeme sdr elist
sys.id           | 00h | ok  | 23.0 | State Asserted
sys.intsw        | 01h | ok  | 23.0 |
sys.psfail      | 02h | ok  | 23.0 | Predictive Failure Asserted
...
```

In the sample output above, the sensor name is in the first column and the corresponding sensor number is in the second column.

For a detailed explanation of each sensor, listed by name, refer to the *Integrated Lights Out Manager Supplement*.

Viewing Component Information With IPMItool

You can view information about system hardware components. The software refers to these components as field-replaceable unit (FRU) devices.

To read the FRU inventory information on these servers, you must first have the FRU ROMs programmed. After programming is done, you can see a full list of the available FRU data by using the **`fru print`** command, as shown in the following example (only two FRU devices are shown in the example, but all devices would be shown).

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme fru print
FRU Device Description : Builtin FRU Device (ID 0)
          Board Mfg             : BENCHMARK ELECTRONICS
          Board Product         : ASSY,SERV PROCESSOR,X4X00
          Board Serial          : 0060HSV-0523000195
          Board Part Number     : 501-6979-02
          Board Extra           : 000-000-00
          Board Extra           : HUNTSVILLE,AL,USA
          Board Extra           : b302
          Board Extra           : 06
```

```
          Board Extra           : GRASP
          Product Manufacturer  : SUN MICROSYSTEMS
          Product Name          : ILOM
FRU Device Description : sp.net0.fru (ID 2)
          Product Manufacturer  : MOTOROLA
          Product Name          : FAST ETHERNET CONTROLLER
          Product Part Number   : MPC8248 FCC
          Product Serial        : 00:03:BA:D8:73:AC
          Product Extra         : 01
          Product Extra         : 00:03:BA:D8:73:AC
...
```

Viewing and Setting Status LEDs

In the Sun Fire X4500/X4540 Serverss, all LEDS are activity-oriented. In activity-oriented LEDS, the SP is responsible for the I2C commands that assert and deassert each GPIO pin for each flash cycle.

Use the following IPMItool command to read LED status:

ipmitool -I lanplus -H <*IPADDR*> **sunoem led get** <*sensor ID*>

Use the following IPMItool command to set LED status:

ipmitool -I lanplus -H <*IPADDR*> **sunoem led set** <*sensor ID*> <*LED mode*>

Both of these commands can operate on all sensors at once by substituting **all** for the sensor ID. That way, you can easily get a list of all LEDs and their status with one command.

See "LED Sensor IDs" on page 42 and "LED Modes" on page 44 for information about the variables in these commands.

LED Sensor IDs

All LEDs in this server are represented by two sensors:

- A Generic Device Locator record describes the location of the sensor in the system. It has an `.led` suffix and is the name that is fed into the **led set** and **led get** commands. You can get a list of all of these sensors by issuing the **sdr list generic** command.
- A Digital Discrete fault sensor monitors the status of the LED pin and is asserted when the LED is active. These sensors have a `.fail` suffix and are used to report events to the SEL.

Each LED has both a descriptor and a status reading sensor, and the two are linked; that is, if you use the `.led` sensor to turn on a particular LED, then the status change is represented in the associated `.fail` sensor. Also, for some of these, an event is generated in the SEL. For LEDs that blink on failure instead of steady-on, the events are not generated (this is because it would display an event every time the LED flashed in the blink cycle).

TABLE 4-3 lists the LED sensor IDs in these servers. See "Identifying Status and Fault LEDs" on page 171 for diagrams of the LED locations.

TABLE 4-3 LED Sensor IDs

LED Sensor ID	Description
sys.power.led	System Power (front+back)
sys.locate.led	System Locate (front+back)
sys.alert.led	System Alert (front+back)
sys.psfail.led	System Power Supply Failed
sys.tempfail.led	System Over Temperature
sys.fanfail.led	System Fan Failed
bp.power.led	Back Panel Power
bp.locate.led	Back Panel Locate
bp.alert.led	Back Panel Alert
fp.power.led	Front Panel Power
fp.locate.led	Front Panel Locate
fp.alert.led	Front Panel Alert
io.hdd0.led	Hard Disk 0 Failed
io.hdd1.led	Hard Disk 1 Failed
io.hdd2.led	Hard Disk 2 Failed
io.hdd3.led	Hard Disk 3 Failed
io.f0.led	I/O Fan Failed
p0.led	CPU 0 Failed
p0.d0.led	CPU 0 DIMM 0 Failed
p0.d1.led	CPU 0 DIMM 1 Failed
p0.d2.led	CPU 0 DIMM 2 Failed
p0.d3.led	CPU 0 DIMM 3 Failed
p1.led	CPU 1 Failed

TABLE 4-3 LED Sensor IDs *(Continued)*

LED Sensor ID	Description
p1.d0.led	CPU 1 DIMM 0 Failed
p1.d1.led	CPU 1 DIMM 1 Failed
p1.d2.led	CPU 1 DIMM 2 Failed
p1.d3.led	CPU 1 DIMM 3 Failed
ft0.fm0.led	Fan Tray 0 Module 0 Failed
ft0.fm1.led	Fan Tray 0 Module 1 Failed
ft0.fm2.led	Fan Tray 0 Module 2 Failed
ft1.fm0.led	Fan Tray 1 Module 0 Failed
ft1.fm1.led	Fan Tray 1 Module 1 Failed
ft1.fm2.led	Fan Tray 1 Module 2 Failed

LED Modes

You supply the modes in TABLE 4-4 to the **`led set`** commands to specify the mode in which you want the LED to be placed.

TABLE 4-4 LED Modes

Mode	Description
OFF	LED off
ON	LED steady-on
STANDBY	100 ms on, 2900 ms off
SLOW	1 Hz blink rate
FAST	4 Hz blink rate

LED Sensor Groups

Because each LED has its own sensor and can be controlled independently, there is some overlap in sensors. In particular, there are separate LEDs defined for the power, locate, and alert LEDs on the front and back panels.

It is desirable to have these sensors “linked” so that both the front and back panel LEDs can be controlled at the same time. This is handled through the use of Entity Association Records. These are records in the SDR that contain a list of entities that are considered part of a group.

For each Entity Association Record we also define another Generic Device Locator as a logical entity to indicate to system software that it refers to a group of LEDS rather than a single physical LED. TABLE 4-5 describes the LED sensor groups.

TABLE 4-5 LED Sensor Groups

Group Name	Sensors in Group
sys.power.led	bp.power.led fp.power.led
sys.locate.led	bp.locate.led fp.locate.led
sys.alert.led	bp.alert.led fp.alert.led

For example, to set both the front and back panel Power/OK LEDs to a standby blink rate, you could type the following command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem led set
sys.power.led standby
Set LED fp.power.led to STANDBY
Set LED bp.power.led to STANDBY
```

You could turn off the back panel Power/OK LED but leave the front panel Power/OK LED blinking by typing the following command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem led set
bp.power.led off
Set LED bp.power.led to OFF
```

Using IPMItool Scripts For Testing

For testing purposes, it is often useful to change the status of all (or at least several) LEDs at once. You can do this by constructing an IPMItool script and executing it with the **exec** command.

The following example shows a script to turn on all fan module LEDS:

```
sunoem led set ft0.fm0.led on
sunoem led set ft0.fm1.led on
sunoem led set ft0.fm2.led on
```

```
sunoem led set ft1.fm0.led on
sunoem led set ft1.fm1.led on
sunoem led set ft1.fm2.led on
```

If this script file were then named `leds_fan_on.isc`, you would use it in a command as follows:

ipmitool -I lanplus -H *<IPADDR>* **-U root -P changeme exec leds_fan_on.isc**

CHAPTER 5

Event Logs and POST Codes

This appendix contains information about the BIOS event log, the BMC system event log, the power-on self test (POST), and console redirection. For more information on the BIOS event log and post codes, refer to the *Sun Fire X4500 Server Service Manual* (819-4359).

This appendix includes the following sections:

Viewing Event Logs

Use this procedure to view the BIOS event log and the BMC system event log.

1. **To turn on main power mode (all components powered on), use a ball-point pen or stylus to press and release the Power button on the server front panel. See** FIGURE 8-4**.**

   When main power is applied to the full server, the Power/OK LED next to the Power button lights and remains lit.

2. **Enter the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

   The BIOS Main menu screen is displayed.

3. **View the BIOS event log:**

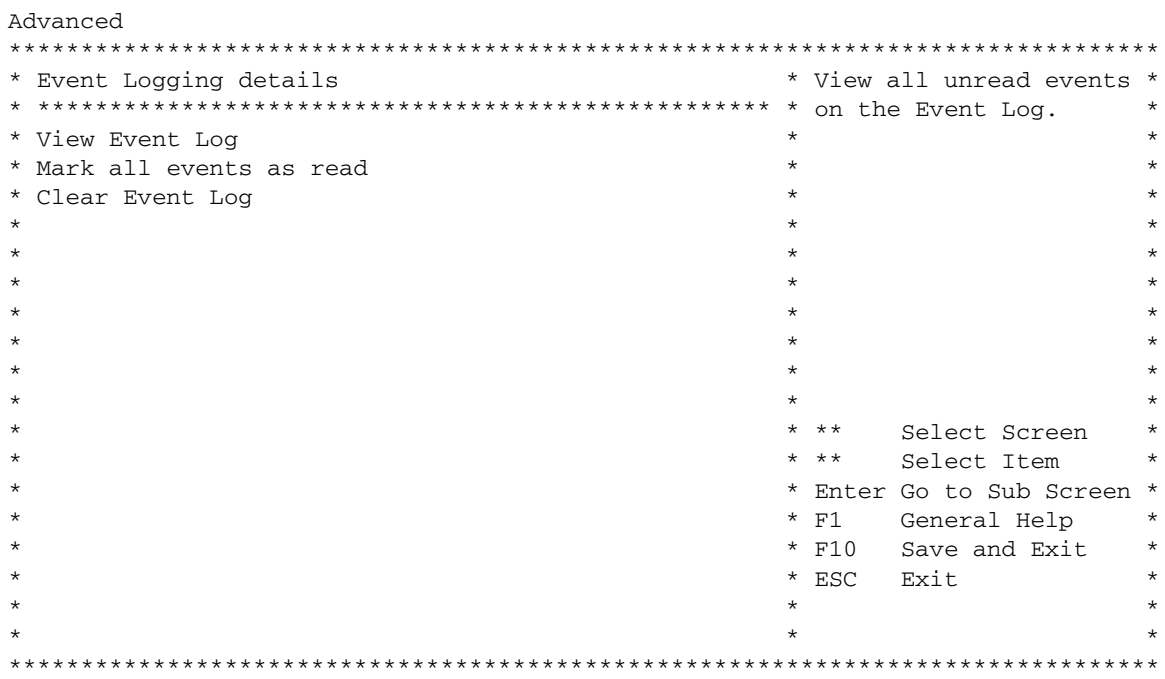
   a. **From the BIOS Main Menu screen, select Advanced.**

      The Advanced Settings screen is displayed:

```
Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit
*************************************************************************
* Advanced Settings                                * Options for CPU      *
* ************************************************ *                      *
* WARNING: Setting wrong values in below sections   *                      *
*          may cause system to malfunction.         *                      *
*                                                   *                      *
* * CPU Configuration                               *                      *
* * IDE Configuration                               *                      *
* * SuperIO Configuration                           *                      *
* * ACPI Configuration                              *                      *
* * Event Log Configuration                         *                      *
* * Hyper Transport Configuration                   *                      *
* * IPMI 2.0 Configuration                          *                      *
* * MPS Configuration                               * **    Select Screen  *
* * PCI express Configuration                       *                      *
* * AMD PowerNow Configuration                      * **    Select Item    *
* * Remote Access Configuration                     * Enter Go to Sub Screen *
* * USB Configuration                               * F1    General Help   *
*                                                   * F10   Save and Exit  *
*                                                   * ESC   Exit           *
* ************************************************************************
```

b. From the Advanced Settings screen, select Event Log Configuration.

The Advanced Menu Event Logging Details screen is displayed.



c. From the Event Logging Details screen, select View Event Log.

All unread events are displayed.

4. View the BMC system event log:

a. From the BIOS Main Menu screen, select Advanced.

The Advanced Settings screen is displayed. See below.

b. From the Advanced Settings screen, select IPMI 2.0 Configuration.

The Advanced Menu IPMI 2.0 Configuration screen is displayed:

```
Advanced
*******************************************************************************
* IPMI 2.0 Configuration                          * View all events in the *
* ********************************************** * BMC Event Log.         *
* Status Of BMC                  Working          *                        *
* * View BMC System Event Log                     * It will take up to     *
* Reload BMC System Event Log                     * 60 Seconds approx.      *
* Clear BMC System Event Log                      * to read all            *
* * LAN Configuration                             * BMC SEL records.       *
* * PEF Configuration                             *                        *
* BMC Watch Dog Timer Action     [Disabled]       *                        *
*                                                 *                        *
*                                                 *                        *
*                                                 *                        *
*                                                 * **    Select Screen    *
*                                                 * **    Select Item      *
*                                                 * Enter Go to Sub Screen *
*                                                 * F1    General Help     *
*                                                 * F10   Save and Exit    *
*                                                 * ESC   Exit             *
*                                                 *                        *
*                                                 *                        *
*******************************************************************************
```

c. From the IPMI 2.0 Configuration screen, select View BMC System Event Log.

The log takes about 60 seconds to generate, then it is displayed on the screen.

5. **If the problem with the server is not evident, continue with** "Using the ILOM Service Processor GUI to View System Information" on page 49**, or** "Using IPMItool to View System Information" on page 61**.**

Power-On Self-Test (POST)

The system BIOS provides a rudimentary power-on self-test. The basic devices required for the server to operate are checked, memory is tested, the *Marvell 885X6081* disk controller and attached disks are probed and enumerated, and the two Intel dual-gigabit Ethernet controllers are initialized.

The progress of the self-test is indicated by a series of POST codes. These codes are displayed at the bottom right corner of the system's VGA screen (once the self-test has progressed far enough to initialize the system video). However, the codes are

displayed as the self-test runs and scroll off of the screen too quickly to be read. An alternate method of displaying the POST codes is to redirect the output of the console to a serial port (see "Redirecting Console Output" on page 51).

How BIOS POST Memory Testing Works

The BIOS POST memory testing is performed as follows:

1. The first megabyte of DRAM is tested by the BIOS before the BIOS code is shadowed (that is, copied from ROM to DRAM).
2. Once executing out of DRAM, the BIOS performs a simple memory test (a write/read of every location with the pattern `55aa55aa`).

Note – This memory test is performed only if Quick Boot is *not* enabled from the Boot Settings Configuration screen. Enabling Quick Boot causes the BIOS to skip the memory test. See "Changing POST Options" on page 53 for more information.

Note – Because the Sun Fire X4500 server can contain up to 32GB of memory, the memory test can take several minutes. You can escape from POST testing by pressing any key during POST.

---

3. The BIOS polls the memory controllers for both correctable and uncorrectable memory errors and logs those errors into the service processor.

Redirecting Console Output

Use the following instructions to access the service processor and redirect the console output so that the BIOS POST codes can be read.

To redirect console output.

1. **Initialize the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

   The BIOS Main menu screen is displayed.

2. **Select the Advanced menu tab.**

   The Advanced Settings screen is displayed.

3. **Select IPMI 2.0 Configuration.**

   The IPMI 2.0 Configuration screen is displayed.

4. **Select the LAN Configuration menu item.**

   The LAN Configuration screen is displayed.

5. **Determine the server's IP address:**

   a. **Select the IP Assignment option that you want to use (**`DHCP` **or** `Static`**).**

   - If you choose `DHCP`, the server's IP address is retrieved from your network's DHCP server and displayed using the following format:
     `Current IP address in BMC : xxx.xxx.xxx.xxx`
   - If you choose `Static` to assign the IP address manually, perform the following steps:

     i. **Type the IP address in the IP Address field.**

        You can also enter the subnet mask and default gateway settings in their respective fields.

     ii. **Select Commit and press Return to commit the changes.**

     iii. **Select Refresh and press Return to see your new settings displayed in the** `Current IP address in BMC` **field.**

6. **Start a web browser and type the service processor's IP address in the browser's URL field.**

7. **When you are prompted for a user name and password, type the following:**

- User Name: **`root`**
- Password: **`changeme`**

The Sun Integrated Lights Out Manager main GUI screen is displayed.

8. **Click the Remote Control tab.**

9. **Click the Redirection tab.**

10. **Set the color depth for the redirection console at either 6 or 8 bits.**

11. **Click the Start Redirection button.**

12. **When you are prompted for a user name and password, type the following:**

- User Name: **`root`**
- Password: **`changeme`**

The current POST screen is displayed.

Changing POST Options

These instructions are optional, but you can use them to change the operations that the server performs during POST testing.

▼ To Change POST Options

1. **Initialize the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

   The BIOS Main menu screen is displayed.

2. **Select Boot.**

   The Boot Settings screen is displayed.

```
Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit
*********************************************************************************
* Boot Settings                                    * Configure Settings     *
* ************************************************ * during System Boot.    *
* * Boot Settings Configuration                    *                         *
*                                                  *                         *
* * Boot Device Priority                           *                         *
* * Hard Disk Drives                               *                         *
* * Removable Drives                               *                         *
* * CD/DVD Drives                                  *                         *
*                                                  *                         *
*                                                  *                         *
*                                                  *                         *
*                                                  *                         *
*                                                  * **    Select Screen    *
*                                                  * **    Select Item      *
*                                                  * Enter Go to Sub Screen *
*                                                  * F1    General Help     *
*                                                  * F10   Save and Exit    *
*                                                  * ESC   Exit             *
*                                                  *                         *
*                                                  *                         *
*********************************************************************************
```

3. **Select Boot Settings Configuration.**

   The Boot Settings Configuration screen is displayed.

```
Boot
*********************************************************************************
* Boot Settings Configuration                      * Allows BIOS to skip    *
* ************************************************ * certain tests while    *
* Quick Boot                    [Disabled]         * booting. This will     *
* System Configuration Display  [Disabled]         * decrease the time      *
* Quiet Boot                    [Disabled]         * needed to boot the     *
* Language                      [English]          * system.                *
* AddOn ROM Display Mode        [Force BIOS]       *                        *
* Bootup Num-Lock               [On]               *                        *
* Wait For 'F1' If Error        [Disabled]         *                        *
* Interrupt 19 Capture          [Disabled]         *                        *
*                                                  *                        *
*                                                  * **    Select Screen    *
*                                                  * **    Select Item      *
*                                                  * +-    Change Option    *
*                                                  * F1    General Help     *
*                                                  * F10   Save and Exit    *
*                                                  * ESC   Exit             *
*                                                  *                        *
*********************************************************************************
```

4. **On the Boot Settings Configuration screen, select options that you can enable or disable:**

   - **Quick Boot –** This option is disabled by default. If you enable this, the BIOS skips certain tests while booting, such as the extensive memory test. This decreases the time it takes for the system to boot.
   - **System Configuration Display –** This option is disabled by default. If you enable this, the System Configuration screen is displayed before booting begins.
   - **Quiet Boot –** This option is disabled by default. If you enable this, the Sun Microsystems logo is displayed instead of POST codes.
   - **Language –** This option is reserved for future use. Do not change.
   - **Add On ROM Display Mode –** This option is set to Force BIOS by default. This option has effect only if you have also enabled the Quiet Boot option, but it controls whether output from the Option ROM is displayed. The two settings for this option are as follows:
   - **Force BIOS –** Remove the Sun logo and display Option ROM output.
   - **Keep Current –** Do not remove the Sun logo. The Option ROM output is not displayed.

- **Boot Num-Lock –** This option is On by default (keyboard Num-Lock is turned on during boot). If you set this to off, the keyboard Num-Lock is not turned on during boot.
- **Wait for F1 if Error –** This option is disabled by default. If you enable this, the system will pause if an error is found during POST and will only resume when you press the F1 key.
- **Interrupt 19 Capture –** This option is reserved for future use. Do not change.
- **Default Boot Order –** The letters in the brackets represent the boot devices. To see the letters defined, position your cursor over the field and read the definition in the right side of the screen.

POST Codes

TABLE 5-1 contains descriptions of each of the POST codes, listed in the same order in which they are generated. These POST codes appear as a four-digit string that is a combination of two-digit output from primary I/O port 80 and two-digit output from secondary I/O port 81. In the POST codes listed in TABLE 5-1, the first two digits are from port 81 and the last two digits are from port 80.

TABLE 5-1 POST Codes

Post Code	Description
00d0	After Power On Reset (POR), PCI configuration space initialization, Enabling 8111's SMBus.
00d1	Keyboard controller BAT, Waking up from PM, Saving power-on CPUID in scratch CMOS.
00d2	Disable cache, full memory sizing, and verify that flat mode is enabled.
00d3	Memory detections and sizing in boot block, cache disabled, IO APIC enabled.
01d4	Test base 512KB memory. Adjust policies and cache first 8MB.
01d5	Bootblock code is copied from ROM to lower RAM. BIOS is now executing out of RAM.
01d6	Key sequence and OEM specific method is checked to determine if BIOS recovery is forced. If next code is E0, BIOS recovery is being executed. Main BIOS checksum is tested.
01d7	Restoring CPUID; moving bootblock-runtime interface module to RAM; determine whether to execute serial flash.
01d8	Uncompressing runtime module into RAM. Storing CPUID information in memory.
01d9	Copying main BIOS into memory.
01da	Giving control to BIOS POST.
0004	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. If the CMOS checksum is bad, update CMOS with power-on default values.

TABLE 5-1 POST Codes *(Continued)*

Post Code	Description
00c2	Set up boot strap processor for POST. This includes frequency calculation, loading BSP microcode, and applying user requested value for GART Error Reporting setup question.
00c3	Errata workarounds applied to the BSP (#78 & #110).
00c6	Re-enable cache for boot strap processor, and apply workarounds in the BSP for errata #106, #107, #69, and #63 if appropriate.
00c7	HT sets link frequencies and widths to their final values.
000a	Initializing the 8042 compatible Keyboard Controller.
000c	Detecting the presence of Keyboard in KBC port.
000e	Testing and initialization of different Input Devices. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1.
8600	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.
de00	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.
8613	Initialize PM regs and PM PCI regs at Early-POST. Initialize multi host bridge, if system supports it. Setup ECC options before memory clearing. Enable PCI-X clock lines in the 8131.
0024	Uncompress and initialize any platform specific BIOS modules.
862a	BBS ROM initialization.
002a	Generic Device Initialization Manager (DIM) - Disable all devices.
042a	ISA PnP devices - Disable all devices.
052a	PCI devices - Disable all devices.
122a	ISA devices - Static device initialization.
152a	PCI devices - Static device initialization.
252a	PCI devices - Output device initialization.
202c	Initializing different devices. Detecting and initializing the video adapter installed in the system that has optional ROMs.
002e	Initializing all the output devices.
0033	Initializing the silent boot module. Set the window for displaying text information.
0037	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.

TABLE 5-1 POST Codes *(Continued)*

Post Code	Description
4538	PCI devices - IPL device initialization.
5538	PCI devices - General device initialization.
8600	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.

POST Code Checkpoints

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. TABLE 5-2 describes the type of checkpoints that might occur during the POST portion of the BIOS. These two-digit checkpoints are the output from primary I/O port 80.

TABLE 5-2 POST Code Checkpoints

Post Code	Description
03	Disable NMI, Parity, video for EGA, and DMA controllers. At this point, only ROM accesses are to the GPNV. If boot block (BB) size is more than 64K, you must turn on ROM Decode below addresss FFFF0000h. It should allow USB to run in E000 segment. The HT must program the NB specific initialization and OEM specific initialization can program if it need at beginning of BIOS POST, like overriding the default values of Kernel Variables.
04	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. Verify CMOS checksum manually by reading storage area. If the CMOS checksum is bad, update CMOS with power-on default values and clear passwords. Initialize status register A. Initializes data variables that are based on CMOS setup questions. Initializes both the 8259-compatible PICs in the system.
05	Initializes the interrupt controlling hardware (generally PIC) and interrupt vector table.
06	Do R/W test to CH-2 count reg. Initialize CH-0 as system timer. Install the POSTINT1Ch handler. Enable IRQ-0 in PIC for system timer interrupt. Traps INT1Ch vector to "POSTINT1ChHandlerBlock."
C0	Early CPU Init Start--Disable Cache--Init Local APIC.
C1	Set up boot strap processor information.
C2	Set up boot strap processor for POST. This includes frequency calculation, loading BSP microcode, and applying user requested value for GART Error Reporting setup question.
C3	Errata workarounds applied to the BSP (#78 & #110).
C5	Enumerate and set up application processors. This includes microcode loading and workarounds for errata (#78, #110, #106, #107, #69, #63).

TABLE 5-2 POST Code Checkpoints *(Continued)*

Post Code	Description
C6	Re-enable cache for boot strap processor, and apply workarounds in the BSP for errata #106, #107, #69, and #63 if appropriate. In case of mixed CPU steppings, errors are sought and logged, and an appropriate frequency for all CPUs is found and applied. NOTE: APs are left in the CLI HLT state.
C7	The HT sets link frequencies and widths to their final values. This routine gets called after CPU frequency has been calculated to prevent bad programming.
0A	Initializes the 8042 compatible Keyboard Controller.
0B	Detects the presence of PS/2 mouse.
0C	Detects the presence of Keyboard in KBC port.
0E	Testing and initialization of different Input Devices. Also, update the Kernel Variables. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1. Uncompress all available language, BIOS logo, and Silent logo modules.
13	Initializes PM regs and PM PCI regs at Early-POST, Initializes multi host bridge, if system support it. Setup ECC options before memory clearing. REDIRECTION causes corrected data to written to RAM immediately. CHIPKILL provides 4 bit error det/corr of x4 type memory. Enable PCI-X clock lines in the 8131.
20	Relocate all the CPUs to a unique SMBASE address. The BSP will be set to have its entry point at A000:0. If less than 5 CPU sockets are present on a board, subsequent CPUs entry points will be separated by 8000h bytes. If more than 4 CPU sockets are present, entry points are separated by 200h bytes. CPU module will be responsible for the relocation of the CPU to correct address. NOTE: APs are left in the INIT state.
24	Uncompress and initialize any platform-specific BIOS modules.
30	Initializes System Management Interrupt.
2A	Initializes different devices through DIM.
2C	Initializes different devices. Detects and initializes the video adapter installed in the system that have optional ROMs.
2E	Initializes all the output devices.
31	Allocate memory for ADM module and uncompress it. Give control to ADM module for initialization. Initializes language and font modules for ADM. Activate ADM module.
33	Initializes the silent boot module. Sets the window for displaying text information.
37	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.
38	Initializes different devices through DIM.
39	Initializes DMAC-1 and DMAC-2.
3A	Initialize RTC date/time.
3B	Test for total memory installed in the system. Also, Check for DEL or ESC keys to limit memory test. Display total memory in the system.

TABLE 5-2 POST Code Checkpoints *(Continued)*

Post Code	Description
3C	By this point, RAM read/write test is completed, program memory holes or handle any adjustments needed in RAM size with respect to NB. Test if HT Module found an error in BootBlock and CPU compatibility for MP environment.
40	Detect different devices (Parallel ports, serial ports, and coprocessor in CPU, ... etc.) successfully installed in the system and update the BDA, EBDA, ... etc.
50	Programming the memory hole or any kind of implementation that needs an adjustment in system RAM size if needed.
52	Updates CMOS memory size from memory found in memory test. Allocates memory for Extended BIOS Data Area from base memory.
60	Initializes NUM-LOCK status and programs the KBD typematic rate.
75	Initializes Int-13 and prepare for IPL detection.
78	Initializes IPL devices controlled by BIOS and option ROMs.
7A	Initializes remaining option ROMs.
7C	Generate and write contents of ESCD in NVRam.
84	Log errors encountered during POST.
85	Display errors to the user and gets the user response for error.
87	Execute BIOS setup if needed/requested.
8C	After all device initialization is done, programmed any user selectable parameters relating to NB/SB, such as timing parameters, non-cacheable regions and the shadow RAM cacheability, and do any other NB/SB/PCIX/OEM specific programming needed during Late-POST. Background scrubbing for DRAM, and L1 and L2 caches are set up based on setup questions. Get the DRAM scrub limits from each node.
8D	Build ACPI tables (if ACPI is supported).
8E	Program the peripheral parameters. Enable/Disable NMI as selected.
90	Late POST initialization of system management interrupt.
A0	Check boot password if installed.
A1	Clean-up work needed before booting to OS.
A2	Takes care of runtime image preparation for different BIOS modules. Fill the free area in F000h segment with 0FFh. Initializes the Microsoft IRQ Routing Table. Prepares the runtime language module. Disables the system configuration display if needed.
A4	Initialize runtime language module.
A7	Displays the system configuration screen if enabled. Initialize the CPUs before boot, which includes the programming of the MTRRs.
A8	Prepare CPU for OS boot including final MTRR values.
A9	Wait for user input at config display if needed.

TABLE 5-2 POST Code Checkpoints *(Continued)*

Post Code	Description
AA	Uninstall POST INT1Ch vector and INT09h vector. Deinitializes the ADM module.
AB	Prepare BBS for Int 19 boot.
AC	Any kind of Chipsets (NB/SB) specific programming needed during End- POST, just before giving control to runtime code booting to OS. Programmed the system BIOS (0F0000h shadow RAM) cacheability. Ported to handle any OEM specific programming needed during End-POST. Copy OEM specific data from POST_DSEG to RUN_CSEG.
B1	Save system context for ACPI.
00	Prepares CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLIHLT state.
61-70	OEM POST Error. This range is reserved for chipset vendors and system manufacturers. The error associated with this value may be different from one platform to the next.

CHAPTER 6

Status Indicator LEDs

This appendix contains information about the locations and behaviors of the status and fault LEDs on the server. The information is organized to describe external LEDs that can be viewed on the outside of the server and internal LEDs that can be viewed only with the component covers, including hard disk drive cover, system controller cover, and fan cover removed.

This appendix includes the following:

External Status Indicator LEDs

See the following figures and tables for information about the LEDs that are viewable on the outside of the server.

- FIGURE 6-1 describes the front panel.
- FIGURE 6-2 and TABLE 6-1 describe the front panel and control indicators.
- TABLE 6-2 and TABLE 6-2 describe the rear panel.
- FIGURE 6-6 describe the LED and button location.

Exterior Features, Controls, and Indicators

This section shows, and describes the features and the controls and indicators on the front and rear panels of the Sun Fire X4500 server.

Front Panel

FIGURE 6-1 shows the front panel. FIGURE 6-2 shows a close up of the controls and indicators. TABLE 6-1 lists and describes the controls and indicators.

FIGURE 6-1 Sun Fire X4500 Server Front Panel LEDs

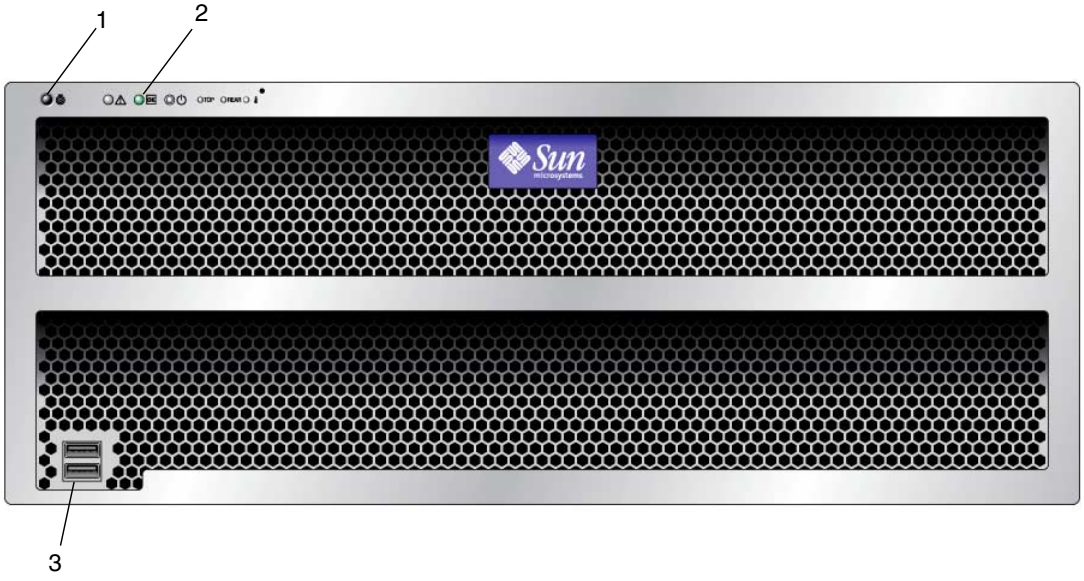


FIGURE 6-2 Sun Fire X4500 Server Front Panel Controls and Indicators

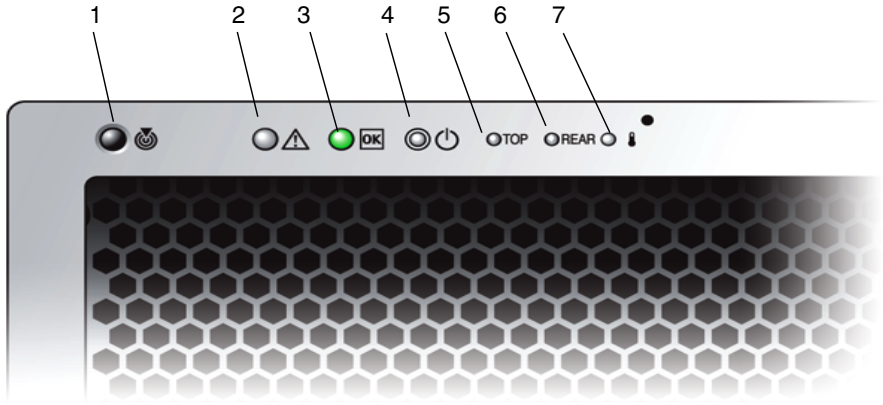


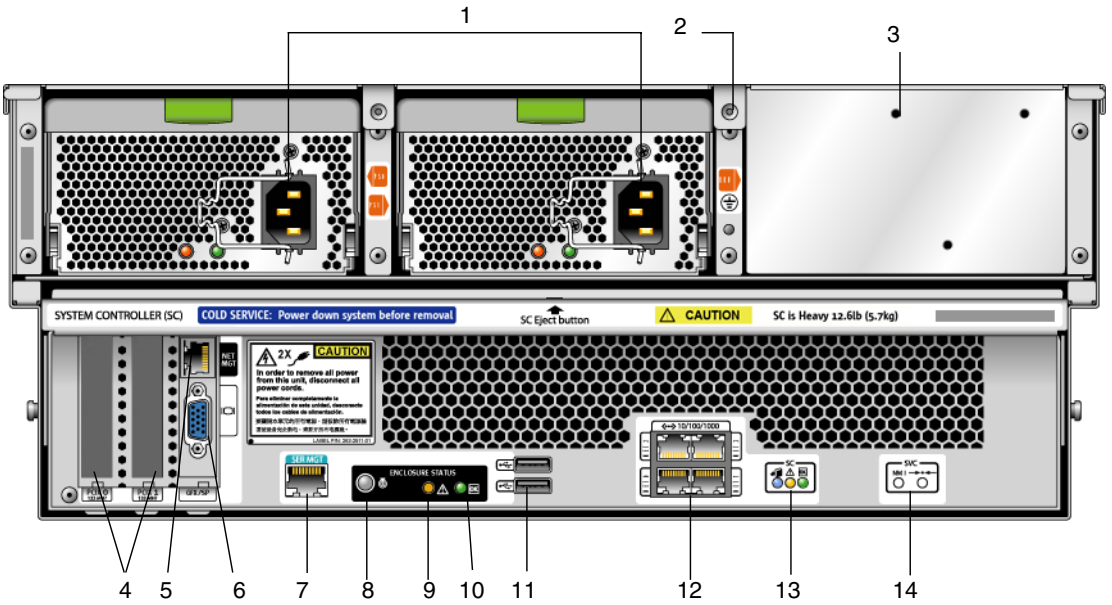
TABLE 6-1 Front Panel Controls and Indicators

#	Name	Color	Description
1	Locate button/LED	White	Operators can turn this LED On remotely to help then locate the server in a crowded server room. Press to turn off. Pressing the Locate LED/Switch for five seconds turns all indicators ON for 15 seconds.
2	System Fault	White	On – When service action is required.
3	Power/Operation	Green	Steady – Power is On. Blink – Standby power is On but main power is Off. Off – Power is Off.
4	System power button	Grey	Press to power on main power for all server components.
5	Top failure LED	Amber	On – HDD or fan fault.
6	Rear failure LED	Amber	On – Power supply, or system controller fault (service is required).
7	Over Temperature LED	Amber	On – When system is over temperature.

Rear Panel

TABLE 6-2 shows the features of the rear panel. TABLE 6-2 lists and describes each feature.

FIGURE 6-3 Sun Fire X4500 Server Rear Panel



Internal Status Indicator LEDs

The Sun Fire X4500 server has internal status board LEDs for the CPU board, the CPU and DIMM slots on the CPU board. See the following figures and tables for information about the LEDs that are viewable on the outside of the server.

- TABLE 6-2 and TABLE 6-3 describes the internal LEDs.
- FIGURE 6-4 describe the disk drive and fan tray LEDs.
- TABLE 6-2 describe the disk drive and fan tray LEDs.
- FIGURE 6-6 describe the LED and button location.

The system includes internal LEDs on the disk drives, the fan trays, and the PCI slots.

TABLE 6-3 lists the internal LEDs:

TABLE 6-2 Internal LEDs

Name	Color	Function
DiskDrives		
Status	Green	Blinking, data is transfering, unit is OK.
Fault	Amber	Fault, service action is required.
Ready to Remove	Blue	Unit is ready to remove. Service action allowed.
		Fan Trays
Status	Green	Unit is OK.
Fault	Amber	Fault, service action is required.
CPU. See FIGURE 6-6. LEDs are active only when the Remind button is pressed.		
DIMM Failure	Amber	Blinks to indicate that the system has found a fault with the DIMM. Restart system to clear fault.
CPU Failure	Amber	Blinks to indicate that the system has found a fault with a CPU. Restart system to clear fault.
Battery Failure	Amber	Blinks to indicate that the system has found a fault with the battery. Start service processor to clear fault.

Disk Drive and Fan Tray LEDs

FIGURE 6-4 shows the location of the internal LEDs. FIGURE 6-5 shows a close-up view of the disk drive and fan trays, including the symbols that identify the LEDs.

FIGURE 6-4 Disk Drive and Fan Tray LEDs

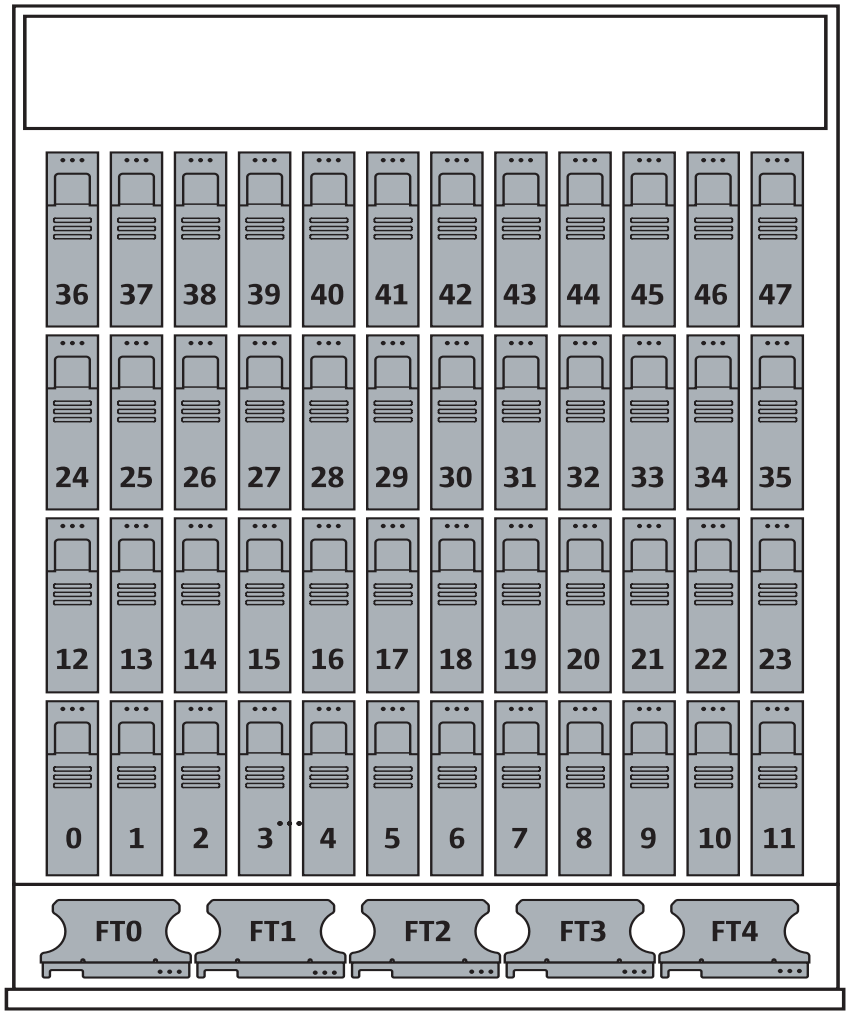
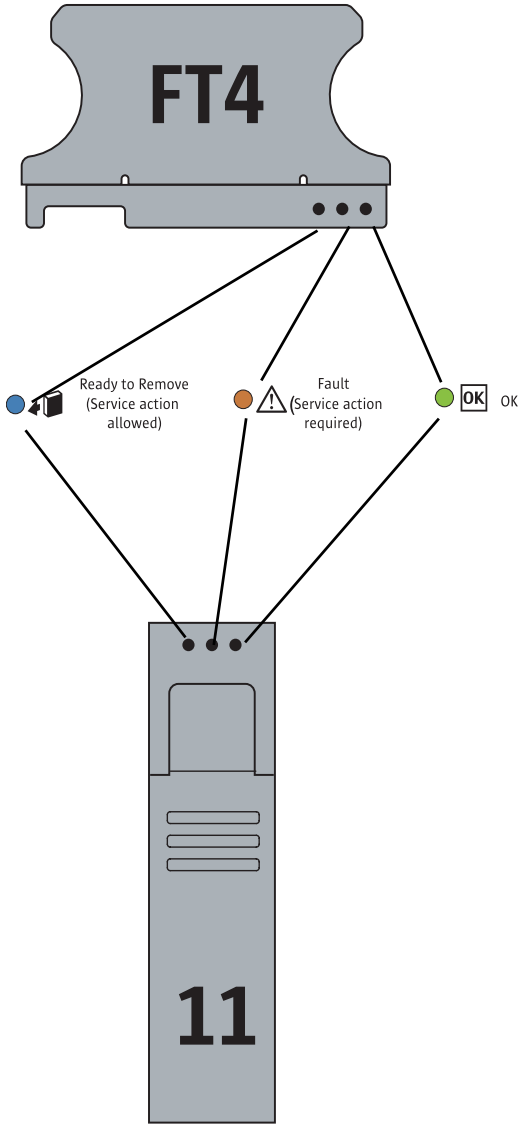


FIGURE 6-5 Disk Drive and Fan Tray LEDs



CPU Board LEDs

The CPU board has three types of LEDs. They are listed in TABLE 6-3 and appear in FIGURE 6-6.

The CPU LEDs are active only when the Remind button is depressed. They blink to indicate a failure; otherwise they stay Off.

Note – The CPU and DIMM LEDs continue to indicate a failure until the system is powered on. The Battery LED continues to indicate a failure until the service processor is started.

FIGURE 6-6 CPU Module LED and Button Locations

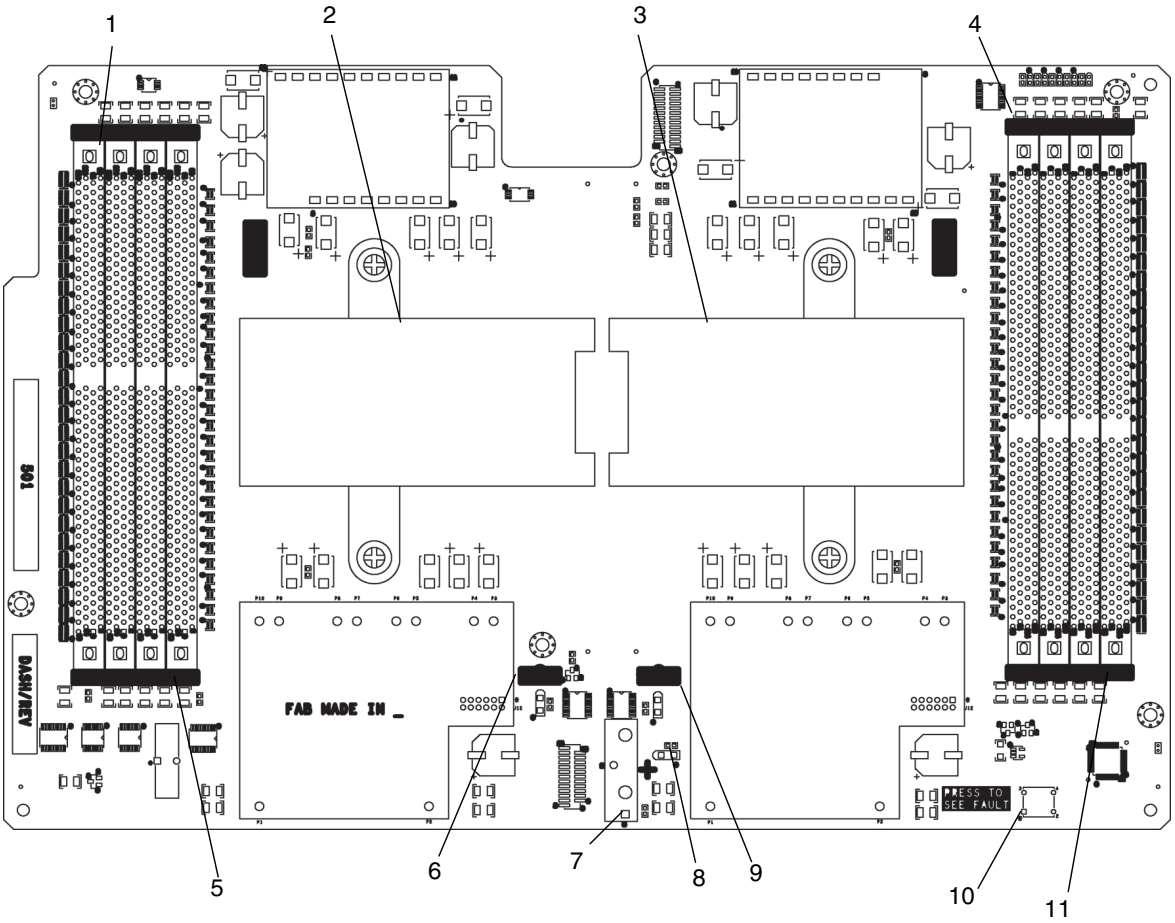


Figure Legend

1	DIMM 0 2 1 3
2	CPU 1 (under heatsink)
3	CPU 0 (under heatsink)

Figure Legend

4	DIMM 3 1 2 0
5	DIMM fault LEDs
6	CPU 1 fault LED
7	Battery
8	Battery fault LED
9	CPU 0 fault LED
10	Press to see fault
11	DIMM fault LED

CHAPTER 7

hd Utility

This appendix includes information about the following topics:

Overview of the hd Utility

The Sun Fire X4500 Server supports 48 internal SATA drives. A physical map of these drives is located on the Sun Fire X4500 Server chassis label.

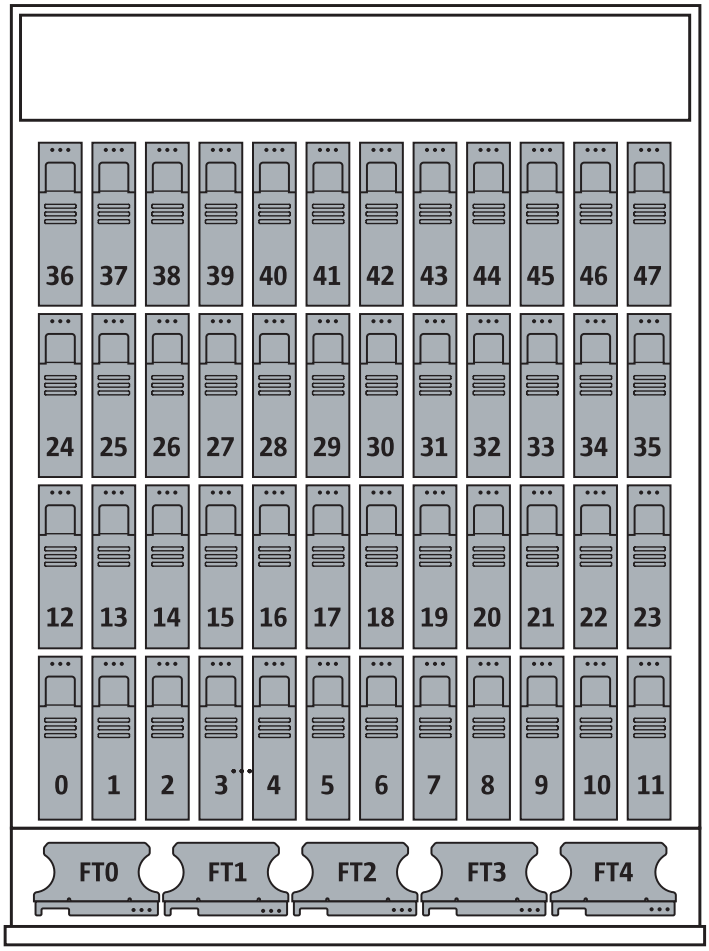
The hd utility is included in the SUNWhd package and is preinstalled on your server. The hd utility is a hard disk drive utility for the x86 systems, such as the Sun Fire X4500 Server. It is used to determine the logical-to-physical device mapping of your Sun Fire X4500 Server. You need to understand this mapping to administer the system, manage the hard drives, and troubleshoot the server.

The hd utility output enables you to locate all the disks visually based on the physical topology of the Sun Fire X4500 server drives by providing a color-coded hard drive location map. The utility's output gives you a what-you-see-is-what-you-get (WYSIWYG) physical location map of the Sun Fire X4500 server's drives. The hd utility provides the following features:

- Displays of all the available storage devices on the system
- Color-coded hard drive location maps
- Remote analysis

This utility has a run-time color mode to help you distinguish the status of a hard drive. It is a complementary tool to Solaris OS disk maintenance and configuration administration programs like `format`(1M) and `cfgadm`(1M). The `hd` utility output can also help you to identify which drives have not been enumerated. FIGURE 7-1 shows the Sun Fire X4500 server drive layout.

FIGURE 7-1 Server Disk Drive and Fan Tray Layout



Using the hd Utility

To use hd utility you must have the hd package installed. This package is preinstalled in /opt/SUNWhd/hd/bin/hd. For additional commands related to hd, see the following man pages for additional commands: format(1M), cfgadm(1M), devfsadm(1M), and fdisk(1M).

hd Utility Mapping

You can use the drive mapping output from hd Utility for remote analysis. The utility also probes and displays all of the available storage devices in the system with their logical device name, serial number, vendor, model, and drive temperatures.

Here is sample output from the hd utility:

FIGURE 7-2 Sample hd utility Hard Disk Drive Map

```
-----------------------Sun Fire X4500 Server--------Rear-----------
36:   37:   38:   39:   40:   41:   42:   43:   44:   45:   46:   47:
c6t3  c6t7  c5t3  c5t7  c8t3  c8t7  c7t3  c7t7  c1t3  c1t7  c0t3  c0t7
^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
24:   25:   26:   27:   28:   29:   30:   31:   32:   33:   34:   35:
c6t2  c6t6  c5t2  c5t6  c8t2  c8t6  c7t2  c7t6  c1t2  c1t6  c0t2  c0t6
^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
12:   13:   14:   15:   16:   17:   18:   19:   20:   21:   22:   23:
c6t1  c6t5  c5t1  c5t5  c8t1  c8t5  c7t1  c7t5  c1t1  c1t5  c0t1  c0t5
^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
0:    1:    2:    3:    4:    5:    6:    7:    8:    9:   10:   11:
c6t0  c6t4  c5t0  c5t4  c8t0  c8t4  c7t0  c7t4  c1t0  c1t4  c0t0  c0t4
^b+   ^b+   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
-------*-----------*----Sun Fire X4500 Server----*---Front-----*----
```

hd Command Options and Parameters

The hd utility makes a distinction between controllers, slots, and storage devices that are physically present in the machine and visible to the Solaris OS.

The hd command provides configuration and status information about the Sun Fire X4500 server's hard drives by using specific command options and parameters. These options and parameters can be combined to display the information of your choosing. Some of the options available include displaying color mode (-c), summary, (-s), diagnose, (-d), identifying platform type, (-p), and obtaining configuration and status help messages (-h). FIGURE 7-3 shows a complete listing of hd Utility commands.

hd Man page

FIGURE 7-3 Sample hd Utility Man page

```
[ -c(olor mode) ] [ -s(ummary) ] [ -p(latform) ] [ -b(ypass) to
print SunFireX4500 map ] [ -d(iagnose) ] [ -f { syslog_file } ]
[ -w { pci_drive_path } ] [ -m { adjacent | cross | front2back
| diagonal } Mapping pairs ] [ -h(elp) ] [ -a (fdisk partition
type) ] [ -q (list SunFireX4500 with index in seQuential list)
] [ -g (list drive slot number in seQuential list with
temperature )] [ -l (List SunFireX4500 available disk in
physical orders) ] [ -r (List SMART data for all disks in drive
slot number)] [ -R (List SMART data's indivdual id in landscape
view for all disks) ] [ -e <cXtY> (List SMART data for specified
disk) ] [ -j (List SunFireX4500 HBA controller numbers and pci
nodes) ]
```

Options Parameters

Use the hd command to determine the status of a hard disk by mapping the drive location using the parameters shown in TABLE 7-1. The following options are supported for the functions shown:

TABLE 7-1 hd Options

Option	Description
-c	**Displays status in color mode. There are three status rows for each device:** Physical slot/location that matches the chassis label. Logical location that matches Solaris OS storage device name.

TABLE 7-1 `hd` Options *(Continued)*

Option	Description	
	`cXtY`	Drive runtime status.
	The following syntax is used:	
	Up arrow (^)	Indicates the device.
	Green	Device is enumerated.
	++	Device is present and accessible.
	Red	Device is not enumerated or no drive in physical slot/location.
	--	Device is not accessible, absent, empty, or down.
	.	Devices under the controller are not enumerated. The controller is not enumerated until there is a drive in the slots.
	Yellow	Device has warning messages. Available in diagnose mode.
	##	Device has warning messages from the storage subsystem.
	Blue	Indicates bootable drive slot.
	b	Drive slot is bootable if an OS is installed on the drive.
`-s`	Provides a summary list all the storage devices, device types and count of all storage devices. If the system is a not a Sun Fire X4500 server, and the subsystem supports the feature, it lists the storage devices with their logical device names, serial numbers, vendor, model, and drive temperatures.	
`-p`	Identifies x64 platform type based on the x64 storage host controllers.	
`-b`	Displays x64 Sun Fire X4500 server platform mapping type regardless of platform type in bypass mode.	
`no option`	Probes the system in regular mode. This is the default mode for the utility. The utility maps all hard drives in the Solaris OS logical device name to physical slot numbers that are shown on the Sun Fire X4500 server chassis label. There are three status rows for each device: • Physical slot or location that matches the chassis label. • Logical location that matches the Solaris OS storage device name. • `cXtY` Drive runtime status	
	The following syntax is used:	
	Up arrow (^)	Indicates the device.
	++	Device is present and accessible.
	--	Device is not accessible, absent, or empty.

TABLE 7-1 `hd` Options *(Continued)*

Option	Description	
	.	Devices under the controller are not enumerated. The controller is not enumerated until there are drives in the slots connected to the controller.
	##	Devices received warning messages from the storage subsystem.
	b	Drive slot is bootable if an OS is installed on the drive.
`-d`	Diagnoses the system by scanning the `syslog` (`dmesg`) for any disk's warning messages. If there is a disk-related warning message, the utility maps the physical location of the drive with the `##` warning message in the device status row. It appears in yellow if the `-c` option is used. It prints the disk warning message, which includes a timestamp indicating when the event happened.	
`-f`	Allows you to specify any previous `syslog` file (usually the `/var/adm/messages.n`) with any disk warning messages.	
`-m`	Maps the various possible pairs of drives for the Sun Fire X4500 server system. This command option is useful for testing drive-to-drive interaction from one drive to another drive in separate locations in the Sun Fire X4500 server. For performance, and other file system software, there are various ways to construct the pool of drives. This option provides distinct pairings based on the current probed logical and physical maps in the system. Supported map types are as follows:	
	• Adjacent	Drive pairs that are on adjacent Marvell™ host controllers
	• Cross	Drive pairs that are on alternate Marvell host controllers
	• Front2back	Drive pairs that are on the front and back rows
	• Diagonal	Drive pairs that are on diagonal locations
`-w`	Translates Solaris OSraw storage PCI device path to `cXtY` device name as used by most of the applications.	
`-h`	Provides help.	
`-a`	Lists the `fdisk(1m)` partition type. This option scans the disks for `fdisk` partitions that are recognized by x64 Solaris OS. Because the x64 platform also runs Linux and Windows, some of the disks could have non-Solaris `fdisk` partitions. For example, systems with dual booted operating systems.	
`-q`	This option is for the Sun Fire X4500 server only. It provides a list of Sun Fire X4500 hard drive physical slot numbers, logical names, and status (present or absent). This capability is useful for scripting environments. For example, some applications could include `hd -q` in noninteractive mode to determine if a specific drive in a specific physical slot is accessible before configuring RAID.	

TABLE 7-1 `hd` Options *(Continued)*

Option	Description
`-l`	Lists the Sun Fire X4500 accessible disks in sequential order. This option does not include the physical slot number.
`-B`	Lists the Sun Fire X4500 bootable slot numbers, Solaris OS logical disk names, and status (present or absent).
`-r`	Lists the SMART data for all disks in a drive slot number.
`-R`	Lists the SMART data individual ID in landscape view for all disks.
`-e <cXtY>`	Lists the SMART data for a specified disk.
`-j`	Lists the SunFire X4500 server HBA controller numbers and PCI nodes.

Example Using the `hd` Utility

The following command starts the utility in color mode and summarizes all the storage devices in the system.

```
# ./hd -c -s
```

Here is an example of output listing a summary of all storage devices:

FIGURE 7-4 `hd` Utility Summary

```
platform = Sun Fire X4500 Server
Device      Serial        Vendor   Model             Revision Temperature
------      ------        ------   -----             -------- -----------
c0t0d0s2    K41BT4C7M6PS  HITACHI  HDS7225SBSUN250G  V44O     None
c0t4d0s2    K41BT4C7N4HS  HITACHI  HDS7225SBSUN250G  V44O     None
c1t0d0s2    K41BT4C7MTSS  HITACHI  HDS7225SBSUN250G  V44O     None
c1t4d0s2    K41BT4C7NXHS  HITACHI  HDS7225SBSUN250G  V44O     None
c2t0d0s2                  AMI      Virtual CDROM     1.00     None
c3t0d0s2                  AMI      Virtual Floppy    1.00     None
c4t0d0s2                  TEAC     DV-W516GA         C4S2     None
c5t0d0s2    K41BT4C7NVYS  HITACHI  HDS7225SBSUN250G  V44O     None
c5t4d0s2    K41BT4C7MP2S  HITACHI  HDS7225SBSUN250G  V44O     None
c6t0d0s2    K41BT4C7P2BS  HITACHI  HDS7225SBSUN250G  V44O     None
c6t4d0s2    K41BT4C7NG1S  HITACHI  HDS7225SBSUN250G  V44O     None
c7t0d0s2    K41BT4C7N54S  HITACHI  HDS7225SBSUN250G  V44O     None
c7t4d0s2    K41BT4C7NVES  HITACHI  HDS7225SBSUN250G  V44O     None
c8t0d0s2    K41BT4C7MKRS  HITACHI  HDS7225SBSUN250G  V44O     None
c8t4d0s2    K41BT4C7N49S  HITACHI  HDS7225SBSUN250G  V44O     None
-----------------------Sun Fire X4500 Server--------Rear-----------
```

FIGURE 7-4 *(Continued)*`hd` Utility Summary

```
 36:   37:   38:   39:   40:   41:   42:   43:   44:   45:   46:   47:
 c6t3  c6t7  c5t3  c5t7  c8t3  c8t7  c7t3  c7t7  c1t3  c1t7  c0t3  c0t7
 ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
 24:   25:   26:   27:   28:   29:   30:   31:   32:   33:   34:   35:
 c6t2  c6t6  c5t2  c5t6  c8t2  c8t6  c7t2  c7t6  c1t2  c1t6  c0t2  c0t6
 ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
 12:   13:   14:   15:   16:   17:   18:   19:   20:   21:   22:   23:
 c6t1  c6t5  c5t1  c5t5  c8t1  c8t5  c7t1  c7t5  c1t1  c1t5  c0t1  c0t5
 ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
 0:    1:    2:    3:    4:    5:    6:    7:    8:    9:   10:   11:
 c6t0  c6t4  c5t0  c5t4  c8t0  c8t4  c7t0  c7t4  c1t0  c1t4  c0t0  c0t4
 ^b+   ^b+   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
 -------*-----------*----Sun Fire X4500 Server----*---Front-----*----
 Summary:
 Vendor           Model                    Count
 ------           -----                    -----
 HITACHI          HDS7225SBSUN250G         12
 AMI              Virtual CDROM             1
 AMI              Virtual Floppy            1
 TEAC             DV-W516GA                 1
 Total Storage Devices = 15
```

The following command displays the x64/platform type:

```
# hd -p
platform = Sun Fire X4500 Server
```

The following command displays the `cXtY` device name from the Solaris PCI storage device path:

```
# hd -w /pci@3,0/pci1022,7458@a/pci11ab,11ab@1/disk@0,0
c7t0 = /pci@3,0/pci1022,7458@a/pci11ab,11ab@1/disk@0,0
```

The following command displays the `fdisk` partition for each `cXtY` device name with a summary:

```
# hd -c -s -a
platform = Sun Fire X4500
```

Here is an example of output listing the `fdisk` partition for each `cXtY` device name:

TABLE 7-2 Output From `hd` Utility of an `fdisk` Partition Listing

Device	Serial	Vendor	Model	Revision	Temperature	Type
c0t4d0p0	K41BT4C7NXHS	HITACHI	HDS7225SBSUN250G	V44O	None	Solaris2

TABLE 7-2 *(Continued)*Output From `hd` Utility of an `fdisk` Partition Listing

```
c5t0d0p0  K41BT4CG0PEE  HITACHI  HDS7225SBSUN250G  V44O     None      Solaris2
c5t4d0p0  K41BT4C7MULS  HITACHI  HDS7225SBSUN250G  V44O     None      Solaris2
c6t4d0p0  K41BT4CB6J5E  HITACHI  HDS7225SBSUN250G  V44O     None      None
c4t0d0p0  K41BT4CEMKHE  HITACHI  HDS7225SBSUN250G  V44O     None      OtherOS
c7t0d0p0  K41BT4C7NVYS  HITACHI  HDS7225SBSUN250G  V44O     None      Solaris2
c6t0d0p0  K41BT4CEE9NE  HITACHI  HDS7225SBSUN250G  V44O     None      Solaris2
c0t0d0p0  K41BT4CE447E  HITACHI  HDS7225SBSUN250G  V44O     None      OtherOS
c7t4d0p0  K41BT4CE87AE  HITACHI  HDS7225SBSUN250G  V44O     None      OtherOS
c4t4d0p0  K41BT4C838MS  HITACHI  HDS7225SBSUN250G  V44O    None     LinuxNative
Solaris LinuxNative
c1t0d0p0  VN03ZAG1WYWD  HITACHI  HDS7250SASUN500G  K2AO     None      IFS:NTFS
c1t4d0p0  K41BT4C7N4HS  HITACHI  HDS7225SBSUN250G  V44O     None      None
c5t1d0p0  VN03ZAGAVSUD  HITACHI  HDS7250SASUN500G  K2AO     None      None
-----------------------SunFireX4500--------Rear-------------------------
36:   37:   38:   39:   40:   41:   42:   43:   44:   45:   46:   47:
c5t3  c5t7  c4t3  c4t7  c7t3  c7t7  c6t3  c6t7  c1t3  c1t7  c0t3  c0t7
^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
24:   25:   26:   27:   28:   29:   30:   31:   32:   33:   34:   35:
c5t2  c5t6  c4t2  c4t6  c7t2  c7t6  c6t2  c6t6  c1t2  c1t6  c0t2  c0t6
^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
12:   13:   14:   15:   16:   17:   18:   19:   20:   21:   22:   23:
c5t1  c5t5  c4t1  c4t5  c7t1  c7t5  c6t1  c6t5  c1t1  c1t5  c0t1  c0t5
^++   ^++   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--   ^--
0:    1:    2:    3:    4:    5:    6:    7:    8:    9:   10:   11:
c5t0  c5t4  c4t0  c4t4  c7t0  c7t4  c6t0  c6t4  c1t0  c1t4  c0t0  c0t4
^b+   ^b+   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++   ^++
-------*-----------*----SunFireX4500----*---Front-----*-----------*
Summary:
Vendor          Model                   Count
------          -----                   -----
HITACHI         HDS7225SBSUN250G        12
HITACHI         HDS7250SASUN500G         2
Total Storage Devices = 14
Partition Type                                  Count
--------------                                  -----
Solaris2                                            6
None                                                3
OtherOS                                             3
LinuxNative Solaris LinuxNative                     1
IFS:NTFS                                            1
Total partition type = 14
```

The following command displays the Sun Fire X4500 hard drive's physical slot number, logical name, and status (present or absent).

TABLE 7-3 Command to Display Hard Drive Physical Slot Numbers

```
# hd -q
```

Here is an example of output listing the SunFire X4500 hard drive's physical slot number, logical name, and status:

FIGURE 7-5 `hd` Utility Output Listing Drive Slot Number and Status

Physical Slot Number	Logical Name	Status
0	c5t4	present
1	c4t0	present
3	c4t4	present
4	c7t0	present
5	c7t4	present
6	c6t0	present
7	c6t4	present
8	c1t0	present
9	c1t4	present
10	c0t0	present
11	c0t4	present
12	c5t1	present
13	c5t5	present
14	c4t1	absent
15	c4t5	absent
16	c7t1	absent
17	c7t5	absent
18	c6t1	absent
19	c6t5	absent
20	c1t1	absent
21	c1t5	absent
22	c0t1	absent
23	c0t5	absent
24	c5t2	absent
25	c5t6	absent
26	c4t2	absent
27	c4t6	absent
28	c7t2	absent
29	c7t6	absent
30	c6t2	absent
31	c6t6	absent
32	c1t2	absent
33	c1t6	absent
34	c0t2	absent

FIGURE 7-5 *(Continued)*`hd` Utility Output Listing Drive Slot Number and Status

Physical Slot Number	Logical Name	Status
35	c0t6	absent
36	c5t3	absent
37	c5t7	absent
38	c4t3	absent
39	c4t7	absent
40	c7t3	absent
41	c7t7	absent
42	c6t3	absent
43	c6t7	absent
44	c1t3	absent
45	c1t7	absent
46	c0t3	absent
47	c0t7	absent

The following command displays the SunFire X4500 hard drive controller number and the corresponding PCI device nodes. This is useful in determining the HBA controller number based on the PCI device node from syslog messages.

```
# hd -j
0 /devices/pci@0,0/pci1022,7458@1/pci11ab,11ab@1 c0
1 /devices/pci@0,0/pci1022,7458@2/pci11ab,11ab@1 c1
2 /devices/pci@1,0/pci1022,7458@3/pci11ab,11ab@1 c4
3 /devices/pci@1,0/pci1022,7458@4/pci11ab,11ab@1 c5
4 /devices/pci@2,0/pci1022,7458@7/pci11ab,11ab@1 c6
5 /devices/pci@2,0/pci1022,7458@8/pci11ab,11ab@1 c7
```

Sun Fire X4500 Disk Mapping

When you reinstall the OS, the hard disk names change depending on the ILOM version and USB CD storages devices present at the time of OS installation.

Pre-ILOM 2.0.2.5 and ILOM 2.0.2.5 and Later

The following applies to the hard drive and device mapping for systems with pre-ILOM 2.0.2.5 and ILOM 2.0.2.5 and later installed:

- **Pre-ILOM 2.0.2.5: Remote CD-ROM is *always mapped* to c2 and remote floppy device is *always mapped* to c3.**

- **ILOM 2.0.2.5 or later: Remote CD-ROM and remote floppy devices *are only mapped if enabled in the JavaRConsole*. If one device is enabled, it will have the c2 number. If both are enabled, numbers c2 and c3 will both be used.**
- Disk device path: `/dev/cxtydz`, where *c* is the Controller number, *t* is the target number, and *d* is the disk number.
- Channel numbers are assigned dynamically at the time of OS installation, and become static thereafter.
- Channel number assigning skips empty channels (controllers).

Note – Only a fully populated system with all 48 disks is supported.

- Channel numbers change when a USB storage device is present at the time of OS installation.
- Solaris channel numbering with at least 1 HD per controller at install time:
  - All disks on Controller 0 have a `c0` number.
  - All disks on Controller 1 have a `c1` number.
  - Remote USB devices, such as a CD-ROM or floppy, physically installed or present by mapping through JavaRConsole, will be inserted after Controller 1 and have numbers c**2**, c**3**, etc.
  - All disks on Controller 2 will have a c***x*** number, where ***x*** is 1+ the number of added USB devices. For example, on a system with 2 devices, Controller 2 will have a c**4** name, and on a system with 3 devices, Controller 2 have a c**5** name.
  - All disks on remaining controllers will have a c***x*** number where ***x*** is 1 more than the previous controller.

Pre-ILOM 2.0.2.5 and No USB Devices

TABLE 7-4 Sun Fire X4500 Disk Mapping, No USB Storage Devices, Pre-ILOM 2.0.2.5

USB (CD-ROM)	USB (Floppy)	USB Device	Controller 3		Controller 2		Controller 5		Controller 4		Controller 1		Controller 0	
			36	37	38	39	40	41	42	43	44	45	46	47
			c**5**t3	c**5**t7	c**4**t3	c**4**t7	c**7**t3	c**7**t7	c**6**t3	c**6**t7	c**1**t3	c**1**t7	c**0**t3	c**0**t7
			24	25	26	27	28	29	30	31	32	33	34	35
--	--	--	c**5**t2	c**5**t6	c**4**t2	c**4**t6	c**7**t2	c**7**t6	c**6**t2	c**6**t6	c**1**t2	c**1**t6	c**0**t2	c**0**t6
			12	13	14	15	16	17	18	19	20	21	22	23
			c**5**t1	c**5**t5	c**4**t1	c**4**t5	c**7**t1	c**7**t5	c**6**t1	c**6**t5	c**1**t1	c**1**t5	c**0**t1	c**0**t5
			0	1	2	3	4	5	6	7	8	9	10	11
			c**5**t0	c**5**t4	c**4**t0	c**4**t4	c**7**t0	c**7**t4	c**6**t0	c**6**t4	c**1**t0	c**1**t4	c**0**t0	c**0**t4
c**2**	c**3**	--	c**5**		c**4**		c**7**		c**6**		c**1**		c**0**	

Pre-ILOM 2.0.2.5 and One USB Device

TABLE 7-5 Sun Fire X4500 Disk Mapping, One USB Storage Device, Pre-ILOM 2.0.2.5

USB (CD-ROM)	USB (Floppy)	USB Device	Controller 3		Controller 2		Controller 5		Controller 4		Controller 1		Controller 0	
			36	37	38	39	40	41	42	43	44	45	46	47
			c**6**t3	c**6**t7	c**5**t3	c**5**t7	c**8**t3	c**8**t7	c**7**t3	c**7**t7	c**1**t3	c**1**t7	c**0**t3	c**0**t7
			24	25	26	27	28	29	30	31	32	33	34	35
--	--	c**4**t*y*	c**6**t2	c**6**t6	c**5**t2	c**5**t6	c**8**t2	c**8**t6	c**7**t2	c**7**t6	c**1**t2	c**1**t6	c**0**t2	c**0**t6
			12	13	14	15	16	17	18	19	20	21	22	23
			c**6**t1	c**6**t5	c**5**t1	c**5**t5	c**8**t1	c**8**t5	c**7**t1	c**7**t5	c**1**t1	c**1**t5	c**0**t1	c**0**t5
			0	1	2	3	4	5	6	7	8	9	10	11
			c**6**t0	c**6**t4	c**5**t0	c**5**t4	c**8**t0	c**8**t4	c**7**t0	c**7**t4	c**1**t0	c**1**t4	c**0**t0	c**0**t4
c**2**	c**3**	c**4***	c**6**		c**5**		c**8**		c**7**		c**1**		c**0**	

Asterisk (*) denotes a USB device that is not installed on configuration shown in TABLE 7-4.

ILOM 2.0.2.5 or Later and No USB Device

When no USB devices are present, there is a direct 1:1 physical controller number to `/dev/cXtY` mapping. For example, Controller **2** has a `c2` name, Controller **3** has a `c3` name, and Controller **4** has a `c4` name, etc.

TABLE 7-6 Sun Fire X4500 Disk Mapping, No USB Storage Device, ILOM 2.0.2.5

USB (CD-ROM)	USB (Floppy)	USB Device	Controller 3		Controller 2		Controller 5		Controller 4		Controller 1		Controller 0	
			36	37	38	39	40	41	42	43	44	45	46	47
			c3t3	c3t7	c2t3	c2t7	c5t3	c5t7	c4t3	c4t7	c1t3	c1t7	c0t3	c0t7
			24	25	26	27	28	29	30	31	32	33	34	35
--	--	--	c3t2	c3t6	c2t2	c2t6	c5t2	c5t6	c4t2	c4t6	c1t2	c1t6	c0t2	c0t6
			12	13	14	15	16	17	18	19	20	21	22	23
			c3t1	c3t5	c2t1	c2t5	c5t1	c5t5	c4t1	c4t5	c1t1	c1t5	c0t1	c0t5
			0	1	2	3	4	5	6	7	8	9	10	11
			c3t0	c3t4	c2t0	c2t4	c5t0	c5t4	c4t0	c4t4	c1t0	c1t4	c0t0	c0t4
--	--	--	c3		c2		c5		c4		c1		c0	

ILOM 2.0.2.5 or Later and One USB Device

When the ILOM version is 2.0.2.5 or later, the remote floppy and remote CD-ROM are now treated as USB storage devices and are only mapped when they are enabled in the javaRConsole. The channel numbers change depending on how many total USB storage devices are present at the time of OS installation. All USB devices gets

enumerated between physical Controller 1 and Controller 2, which causes a shift in naming when compared to systems without any USB storage devices. For example, a USB DVD gets the c**2** name and Controller 2 gets the c**3** name:

TABLE 7-7 Sun Fire X4500 Disk Mapping, One USB Storage Device, ILOM 2.0.2.5

USB Device	USB Device	USB Device	Controller 3		Controller 2		Controller 5		Controller 4		Controller 1		Controller 0	
			36	37	38	39	40	41	42	43	44	45	46	47
		c**2**t*y*	c**4**t3	c**4**t7	c**3**t3	c**3**t7	c**6**t3	c**6**t7	c**5**t3	c**5**t7	c**1**t3	c**1**t7	c**0**t3	c**0**t7
			24	25	26	27	28	29	30	31	32	33	34	35
--	--	c**2**t*y*	c**4**t2	c**4**t6	c**3**t2	c**3**t6	c**6**t2	c**6**t6	c**5**t2	c**5**t6	c**1**t2	c**1**t6	c**0**t2	c**0**t6
			12	13	14	15	16	17	18	19	20	21	22	23
		c**2**t*y*	c**4**t1	c**4**t5	c**3**t1	c**3**t5	c**6**t1	c**6**t5	c**5**t1	c**5**t5	c**1**t1	c**1**t5	c**0**t1	c**0**t5
			0	1	2	3	4	5	6	7	8	9	10	11
		c**2**t*y*	c**4**t0	c**4**t4	c**3**t0	c**3**t4	c**6**t0	c**6**t4	c**5**t0	c**5**t4	c**1**t0	c**1**t4	c**0**t0	c**0**t4
--	--	c**2***	c**4**		c**3**		c**6**		c**5**		c**1**		c**0**	

Asterisk (*) denotes the device name c2 mapped to the only USB device on the system.

ILOM 2.0.2.5 or Later and Three USB Storage Devices

The following disk mapping applies to a system with *three* USB storage devices present. For example, three USB DVD gets c**2**, c**3**, and c**4** names at the time of OS installation:

TABLE 7-8 Sun Fire X4500 Disk Mapping, Three USB Storage Device, ILOM 2.0.2.5

USB (CD-ROM)	USB (Floppy)	USB Device	Controller 3		Controller 2		Controller 5		Controller 4		Controller 1		Controller 0	
			36	37	38	39	40	41	42	43	44	45	46	47
			c**6**t3	c**6**t7	c**5**t3	c**5**t7	c**8**t3	c**8**t7	c**7**t3	c**7**t7	c**1**t3	c**1**t7	c**0**t3	c**0**t7
			24	25	26	27	28	29	30	31	32	33	34	35
c**2**ty	c**3**ty	c**4**ty	c**6**t2	c**6**t6	c**5**t2	c**5**t6	c**8**t2	c**8**t6	c**7**t2	c**7**t6	c**1**t2	c**1**t6	c**0**t2	c**0**t6
			12	13	14	15	16	17	18	19	20	21	22	23
			c**6**t1	c**6**t5	c**5**t1	c**5**t5	c**8**t1	c**8**t5	c**7**t1	c**7**t5	c**1**t1	c**1**t5	c**0**t1	c**0**t5
			0	1	2	3	4	5	6	7	8	9	10	11
			c**6**t0	c**6**t4	c**5**t0	c**5**t4	c**8**t0	c**8**t4	c**7**t0	c**7**t4	c**1**t0	c**1**t4	c**0**t0	c**0**t4
c**2***	c**3***	c**4***	c**6**		c**5**		c**8**		c**7**		c**1**		c**0**	

Asterisk (*) denotes the device names c2, c3, and c4 mapped to the three USB devices on the system.

APPENDIX **A**

Sun Fire X4500 Sensor Locations

This appendix lists the locations of the sensors of the Sun Fire X4500 server:

TABLE A-1

Name of Sensor	Location of Sensor
dbp.t_amb	Disk Backplane
ft0.prsnt	Fan board
ft0.f0.speed	Fan board
ft0.f1.speed	Fan board
ft1.prsnt	Fan board
ft1.f0.speed	Fan board
ft1.f1.speed	Fan board
ft2.prsnt	Fan board
ft2.f0.speed	Fan board
ft2.f1.speed	Fan board
ft3.prsnt	Fan board
ft3.f0.speed	Fan board
ft3.f1.speed	Fan board
ft4.prsnt	Fan board
ft4.f0.speed	Fan board
ft4.f1.speed	Fan board
ps0.prsnt	Power supply
ps0.pwrok	Power supply
ps0.vinok	Power supply

TABLE A-1

Name of Sensor	Location of Sensor
ps1.prsnt	Power supply
ps1.pwrok	Power supply
ps1.vinok	Power supply
ps2.prsnt	Power supply
ps2.pwrok	Power supply
ps2.vinok	Power supply
io.front.t_amb	IO controller board
io.rear.t_amb	IO controller board
io.v_+1v5	IO controller board
io.v_+2v5	IO controller board
io.v_+5v_disk	IO controller board
io.v_-12v	IO controller board
proc.p0.t_core	CPU board
proc.p1.t_core	CPU board
proc.front.t_amb	CPU board
proc.rear.t_amb	CPU board
proc.p0.v_+1v25	CPU board
proc.p0.v_+1v5	CPU board
proc.p0.v_+2v5	CPU board
proc.p1.v_+1v25	CPU board
proc.p1.v_+1v5	CPU board
proc.p1.v_+2v5	CPU board
proc.v_+1v8	CPU board
sys.v_+12v	CPU board
sys.v_+1v2	CPU board
sys.v_+3v3	CPU board
sys.v_+3v3stby	CPU board
sys.v_+5v	CPU board
sys.v_bat	CPU board
bp.locate.btn	Not a sensor, but a locate button. On rear backplane.

TABLE A-1

Name of Sensor	Location of Sensor
fp.prsnt	Disk backplane
fp.locate.btn	Not a sensor, but a locate button. On rear backplane.
hdd[x].state	Software sensors. No corresponding hardware. Status of the sensors are set by app running on host.
sys.intsw	Power backplane
sys.acpi	IO controller board

APPENDIX **B**

Error Handling

This appendix contains information about how the servers process and log errors. It includes the following sections:

Handling of Uncorrectable Errors

This section explains how the server handles uncorrectable errors.

Note – The BIOS ChipKill feature must be disabled if you are testing for failures of multiple bits within a DRAM (ChipKill corrects for the failure of a four-bit wide DRAM).

- The BIOS logs the error to the SP system event log (SEL) through the board management controller (BMC).
- The SP's SEL is updated with the failing DIMM pair's specific bank address.
- The system reboots.
- The BIOS logs the error in DMI.

Note – If the error is on low 1MB, the BIOS freezes after rebooting. Therefore, no DMI log is recorded.

- An example of the error reported by the SEL through IPMI 2.0 is as follows:
  - When low memory is erroneous, the BIOS is frozen on pre-boot low memory test because the BIOS cannot decompress itself into faulty DRAM and execute the following items:

```
ipmitool> sel list
100 | 08/26/2005 | 11:36:09 | OEM #0xfb |
200 | 08/26/2005 | 11:36:12 | System Firmware Error | No
usable system memory
300 | 08/26/2005 | 11:36:12 | Memory | Memory Device
Disabled | CPU 0 DIMM 0
```

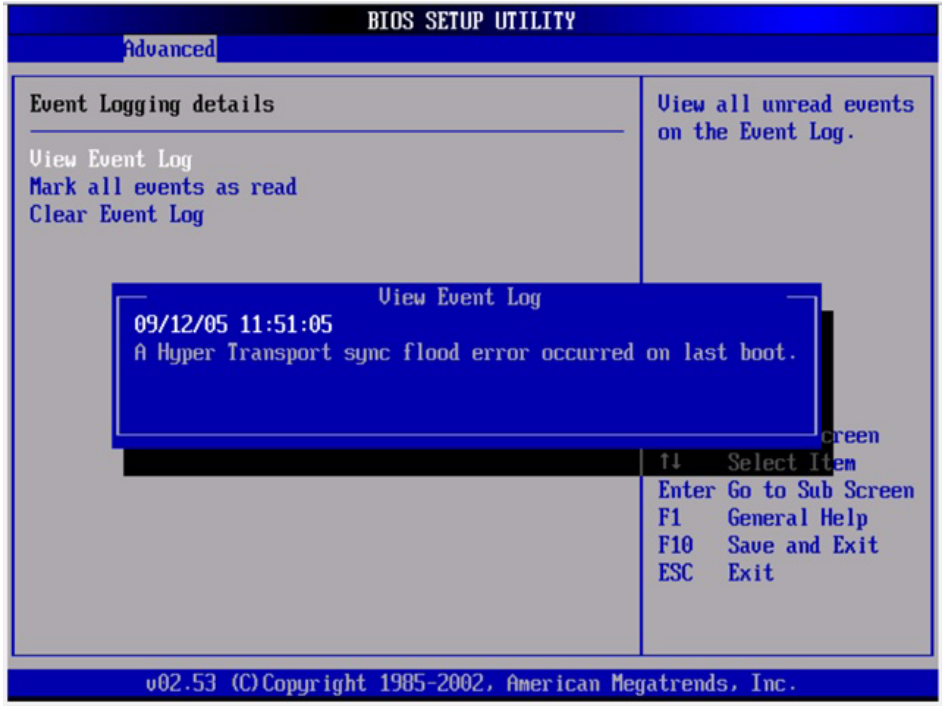
  - When the faulty DIMM is beyond the BIOS's low 1MB extraction space, proper boot happens:

```
ipmitool> sel list
100 | 08/26/2005 | 05:04:04 | OEM #0xfb |
200 | 08/26/2005 | 05:04:09 | Memory | Memory Device
Disabled | CPU 0 DIMM 0
```

- Note the following considerations for this revision:
  - Uncorrectable ECC Memory Error is not reported.
  - Multi-bit ECC errors are reported as `Memory Device Disabled`.
  - On first reboot, BIOS logs a HyperTransport Error in the DMI log.
  - The BIOS disables the DIMM.
  - The BIOS sends the SEL records to the BMC.
  - The BIOS reboots again.
  - The BIOS skips the faulty DIMM on the next POST memory test.
  - The BIOS reports available memory, excluding the faulty DIMM pair.

FIGURE B-1 shows an example of a DMI log screen from BIOS Setup Page.

FIGURE B-1 DMI Log Screen, Uncorrectable Error

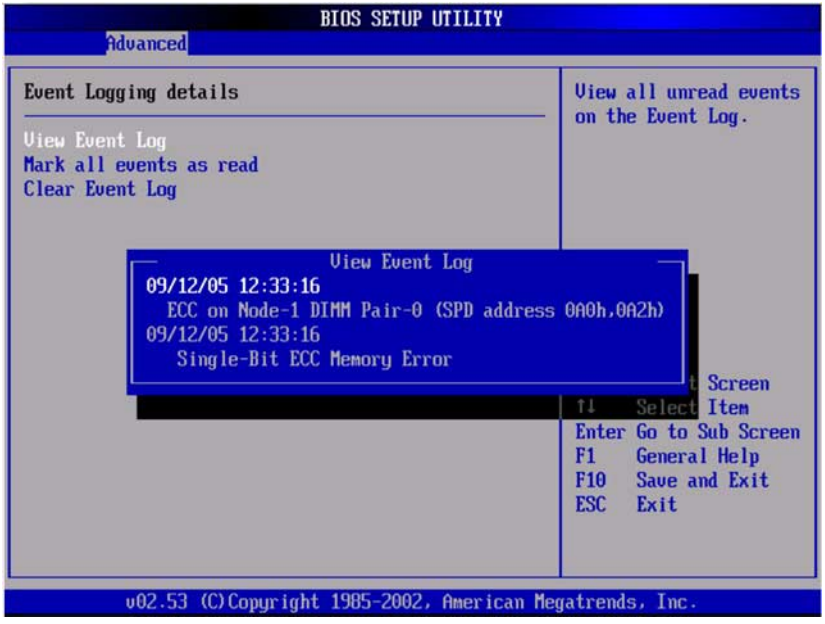


Handling of Correctable Errors

This section lists facts and considerations about how the server handles correctable errors.

- During BIOS POST:
  - The BIOS polls the MCK registers.
  - The BIOS logs to DMI.
  - The BIOS logs to the SP SEL through the BMC.
- The feature is turned off at OS boot time by default.
- Solaris support provides full self-healing and automated diagnosis for the CPU and Memory subsystems.
- FIGURE B-2 shows an example of a DMI log screen from BIOS Setup Page:

FIGURE B-2 DMI Log Screen, Correctable Error



- If during any stage of memory testing the BIOS finds itself incapable of reading or writing to the DIMM, it takes the following actions:
  - The BIOS disables the DIMM as indicated by the Memory Decreased message in the example in FIGURE B-3.
  - The BIOS logs an SEL record.

- The BIOS logs an event in DMI.

FIGURE B-3 DMI Log Screen, Correctable Error, Memory Decreased

Handling of Parity Errors (PERR)

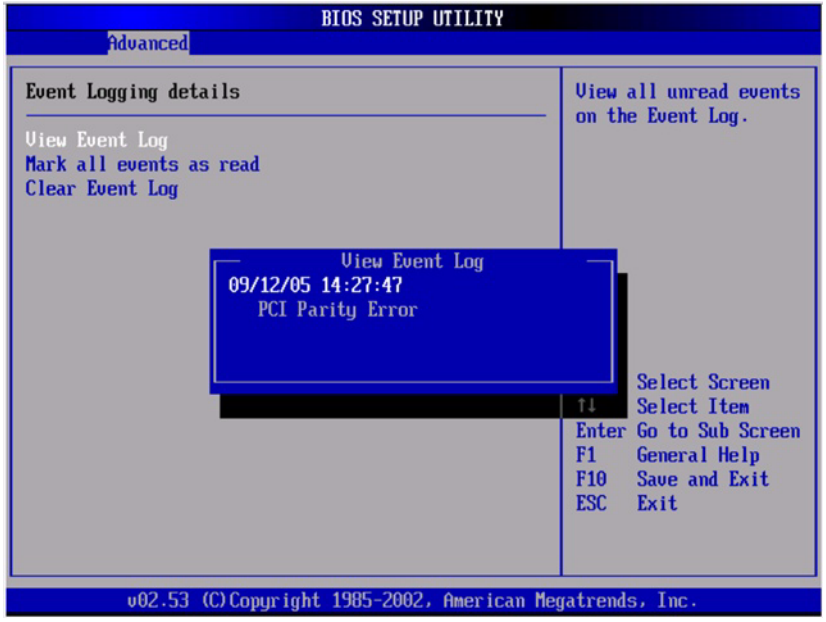
This section lists facts and considerations about how the server handles parity errors (PERR).

- The handling of parity errors works through NMIs.
- During BIOS POST, the NMI is logged in the DMI and the SP SEL. See the following example command and output:

```
[root@d-mpk12-53-238 root]# ipmitool -H 129.146.53.95 -U root
-P changeme -I lan sel list -v

SEL Record ID   : 0100
Record Type     : 00
Timestamp       : 01/10/2002 20:16:16
Generator ID    : 0001
EvM Revision    : 04
Sensor Type     : Critical Interrupt
Sensor Number   : 00
Event Type      : Sensor-specific Discrete
Event Direction : Assertion Event
Event Data      : 04ff00
Description     : PCI PERR
```

- FIGURE B-4 shows an example of a DMI log screen from BIOS Setup Page, with a parity error.

FIGURE B-4 DMI Log Screen, PCI Parity Error



- The BIOS displays the following messages and freezes (during POST or DOS):
  - `NMI EVENT!!`
  - `System Halted due to Fatal NMI!`
- The Linux NMI trap catches the interrupt and reports the following NMI "confusion report " sequence:

```
Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 2d on CPU 0.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 2d on CPU 1.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?

Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 3d on CPU 1.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?
```

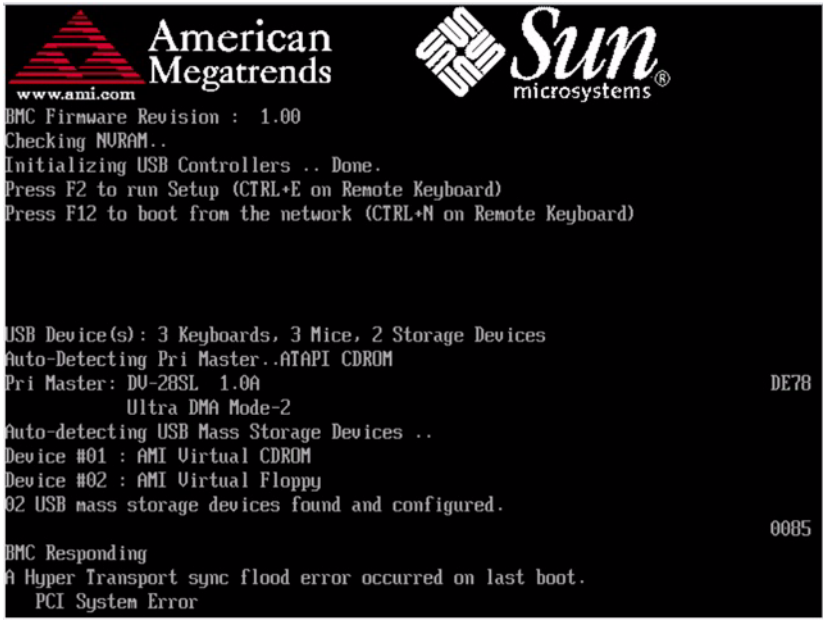
```
Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 3d on CPU 0.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?
```

Handling of System Errors (SERR)

This section lists facts and considerations about how the server handles system errors (SERR).

- System error handling works through the HyperTransport Synch Flood Error mechanism on 8111 and 8131.
- The following events happen during BIOS POST:
  - POST reports any previous system errors at the bottom of the screen. See FIGURE B-5 for an example.

FIGURE B-5 POST Screen, Previous System Error Listed



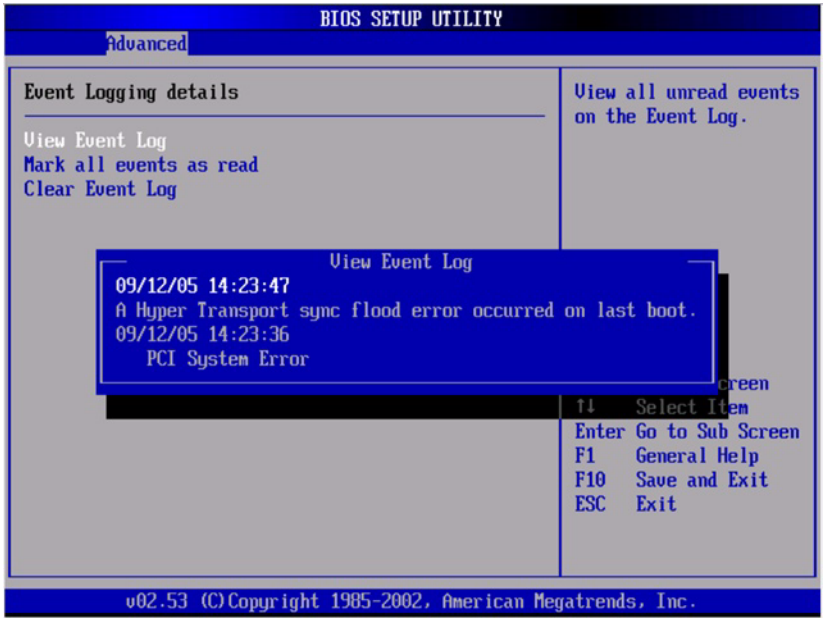
  - SERR and HyperTransport Synch Flood Error are logged in DMI and the SP SEL. See the following sample output:

```
SEL Record ID    : 0a00
Record Type      : 00
Timestamp        : 08/10/2005 06:05:32
Generator ID     : 0001
EvM Revision     : 04
Sensor Type      : Critical Interrupt
Sensor Number    : 00
```

```
Event Type      : Sensor-specific Discrete
Event Direction : Assertion Event
Event Data      : 05ffff
Description     : PCI SERR
```

- FIGURE B-6 shows an example DMI log screen from the BIOS Setup page with a system error.

FIGURE B-6 DMI Log Screen, System Error Listed



Handling Mismatching Processors

This section lists facts and considerations about how the server handles mismatching processors.

- The BIOS performs a complete POST.
- The BIOS displays a report of any mismatching CPUs, as shown in the following example:

```
AMIBIOS(C)2003 American Megatrends, Inc.
BIOS Date: 08/10/05 14:51:11 Ver: 08.00.10
CPU : AMD Opteron(tm) Processor 254,  Speed : 2.4 GHz
Count : 3, CPU Revision, CPU0 : E4, CPU1 : E6
Microcode Revision, CPU0 : 0, CPU1 : 0
DRAM Clocking CPU0 = 400 MHz, CPU1 Core0/1 = 400 MHz

Sun Fire X4500 Server, 1 AMD North Bridge, Rev E4
1 AMD North Bridge, Rev E6
1 AMD 8111 I/O Hub, Rev C2
2 AMD 8131 PCI-X Controllers, Rev B2
System Serial Number  : 0505AMF028
BMC Firmware Revision :  1.00
Checking NVRAM..
Initializing USB Controllers .. Done.
Press F2 to run Setup (CTRL+E on Remote Keyboard)
Press F12 to boot from the network (CTRL+N on Remote Keyboard)
Press F8 for BBS POPUP  (CTRL+P on Remote Keyboard)
```

- No SEL or DMI event is recorded.
- The system enters Halt mode and the following message is displayed:

```
******** Warning: Bad Mix of Processors *********
Multiple core processors cannot be installed with single core
processors.
Fatal Error... System Halted.
```

Hardware Error Handling Summary

TABLE B-1 summarizes the most common hardware errors that you might encounter with these servers.

TABLE B-1 Hardware Error Handling Summary

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
SP failure	The SP fails to boot upon application of system power.	The SP controls the system reset, so the system may power on, but will not come out of reset. • During power up, the SP's boot loader turns on the power LED. • During SP boot, Linux startup, and SP sanity check, the power LED blinks. • The LED is turned off when SP management code (the IPMI stack) is started. • At exit of BIOS POST, the LED goes to STEADY ON state.	Not logged	Fatal
SP failure	SP boots but fails POST.	The SP controls the system RESET, so the system will not come out of reset.	Not logged	Fatal
BIOS POST failure	Server BIOS does not pass POST.	There are fatal and non-fatal errors in POST. The BIOS does detect some errors that are announced during POST as POST codes on the bottom right corner of the display on the serial console and on the video display. Some POST codes are forwarded to the SP for logging. The POST codes do not come out in sequential order and some are repeated, because some POST codes are issued by code in add-in card BIOS expansion ROMs. In the case of early POST failures (for example, the BSP fails to operate correctly), BIOS just halts without logging. For some other POST failures subsequent to memory and SP initialization, the BIOS logs a message to the SP's SEL.		

TABLE B-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
Single-bit DRAM ECC error	With ECC enabled in the BIOS Setup, the CPU detects and corrects a single-bit error on the DIMM interface.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half-second by SMI timer interrupts and is done by the BIOS SMI handler. The BIOS SMI handler starts logging each detected error and stops logging when the limit for the same error is reached. The BIOS's polling can be disabled through a software interface.	SP SEL	Normal operation
Single four-bit DRAM error	With CHIP-KILL enabled in the BIOS Setup, the CPU detects and corrects for the failure of a four-bit-wide DRAM on the DIMM interface.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half-second by SMI timer interrupts and is done by the BIOS SMI handler. The BIOS SMI handler starts logging each detected error and stops logging when the limit for the same error is reached. The BIOS's polling can be disabled through a software interface.	SP SEL	Normal operation
Uncorrectable DRAM ECC error	The CPU detects an uncorrectable multiple-bit DIMM error.	The "sync flood" method of handling this is used to prevent the erroneous data from being propagated across the HyperTransport links. The system reboots, the BIOS recovers the machine check register information, maps this information to the failing DIMM (when CHIPKILL is disabled) or DIMM pair (when CHIPKILL is enabled), and logs that information to the SP. The BIOS will halt the CPU.	SP SEL	Fatal
Unsupported DIMM configuration	Unsupported DIMMs are used or supported DIMMs are loaded improperly.	The BIOS displays an error message, logs an error, and halts the system.	DMI Log SP SEL	Fatal
HyperTransport link failure	CRC or link error on one of the HyperTransport Links	Sync floods on HyperTransport links, the machine resets itself, and error information gets retained through reset. The BIOS reports, `A Hyper Transport sync flood error occurred on last boot, press F1 to continue.`	DMI Log SP SEL	Fatal

TABLE B-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
PCI SERR, PERR	System or parity error on a PCI bus	Sync floods on HyperTransport links, the machine resets itself, and error information gets retained through reset. The BIOS reports, `A Hyper Transport sync flood error occurred on last boot, press F1 to continue.`	DMI Log SP SEL	Fatal
BIOS POST Microcode Error	The BIOS could not find or load the CPU Microcode Update to the CPU. The message most likely appears when a new CPU is installed in a system controller with an outdated BIOS. In this case, the BIOS must be updated.	The BIOS displays an error message, logs the error to DMI, and boots.	DMI Log	Non-fatal
BIOS POST CMOS Checksum Bad	CMOS contents failed the Checksum check.	The BIOS displays an error message, logs the error to DMI, and boots.	DMI Log	Non-fatal
Unsupported CPU configuration	The BIOS supports mismatched frequency and steppings in CPU configuration, but some CPUs might not be supported.	The BIOS displays an error message, logs the error, and halts the system.	DMI Log	Fatal
Correctable error	The CPU detects a variety of correctable errors in the MCi_STATUS registers.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half second by SMI timer interrupts, and is done by the BIOS SMI handler. The SMI handler logs a message to the SP SEL if the SEL is available, otherwise SMI logs a message to DMI. The BIOS's polling can be disabled through software SMI.	DMI Log SP SEL	Normal operation
Single fan failure	Fan failure is detected by reading tach signals.	The Front Fan Fault, Service Action Required, and individual fan module LEDs are lit.	SP SEL	Non-fatal

TABLE B-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
Multiple fan failure	Fan failure is detected by reading tach signals.	The Front Fan Fault, Service Action Required, and individual fan module LEDs are lit.	SP SEL	Fatal
Single power supply failure	When any of the AC/DC PS_VIN_GOOD or PS_PWR_OK signals are deasserted.	Service Action Required, and Power Supply Fault LEDs are lit.	SP SEL	Non-fatal
DC/DC power converter failure	Any POWER_GOOD signal is deasserted from the DC/DC converters.	The Service Action Required LED is lit, the system is powered down to standby power mode, and the Power LED enters standby blink state.	SP SEL	Fatal
Voltage above/below Threshold	The SP monitors system voltages and detects voltage above or below a given threshold.	The Service Action Required LED and Power Supply Fault LED blink.	SP SEL	Fatal
High temperature	The SP monitors CPU and system temperatures, and detects temperatures above a given threshold.	The Service Action Required LED and System Overheat Fault LED blink. The system controller is shut down above the specified critical level.	SP SEL	Fatal
Processor thermal trip	The CPU drives the THERMTRIP_L signal when it detects an overtemp condition.	CPLD shuts down power to the CPU. The Service Action Required LED and System Overheat Fault LED blink.	SP SEL	Fatal
Boot device failure	The BIOS is not able to boot from a device in the boot device list.	The BIOS goes to the next boot device in the list. If all devices in the list fail, an error message is displayed: Retry from beginning of list. SP can control or change boot order	DMI Log	Non-fatal

PART II Sun Fire X4540 Server Diagnostics Guide

This part contains the *Sun Fire X4540 Server Diagnostics Guide* and has the following chapters:

CHAPTER 8

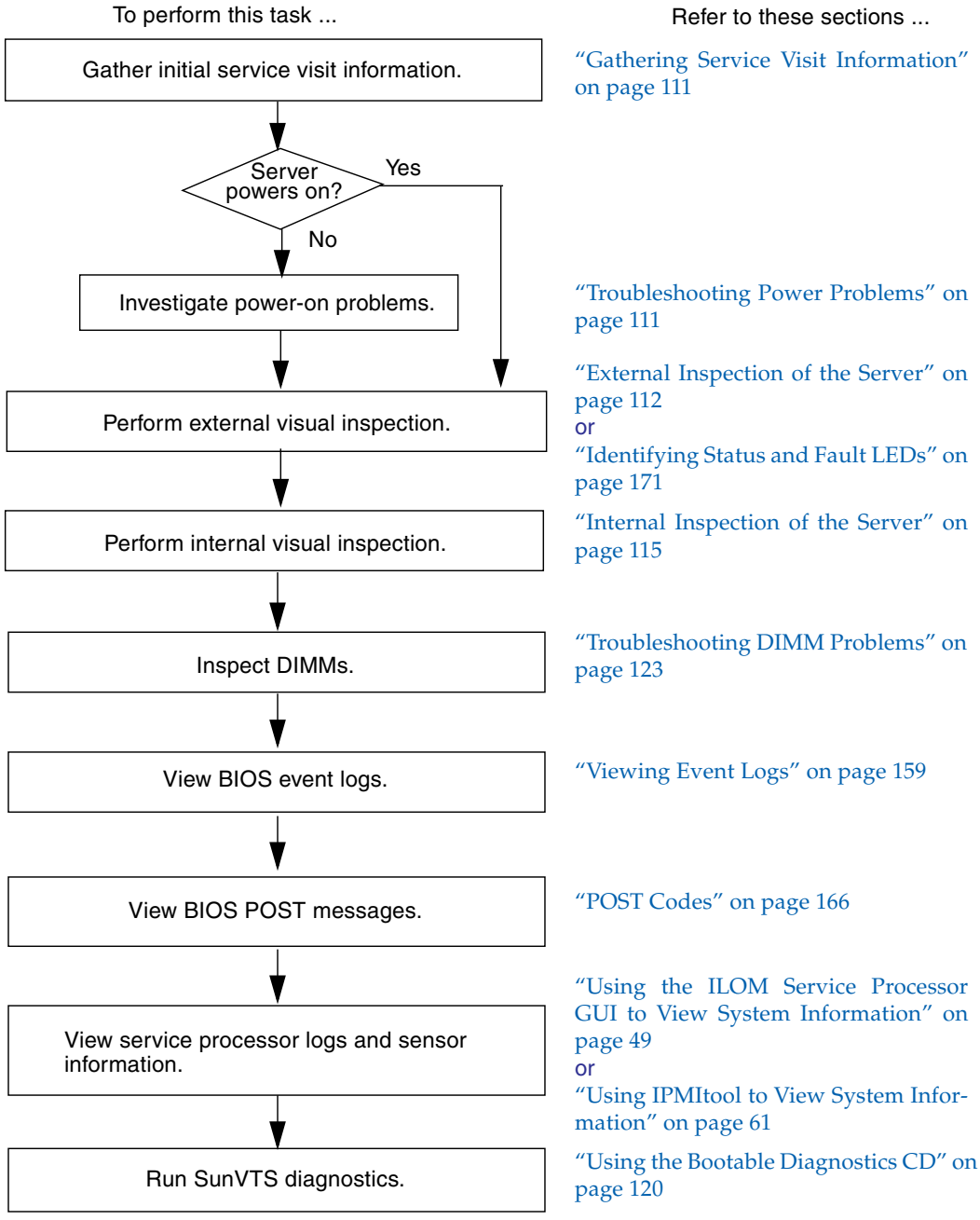
Initial Inspection of the Server

This chapter includes the following topics:

Service Visit Troubleshooting Flowchart

Use the following flowchart as a guideline for using this guide to troubleshoot the Sun Fire Sun Fire X4500/X4540 Servers server.

FIGURE 8-1 Troubleshooting Flowchart



Gathering Service Visit Information

Use the following general guidelines when you begin troubleshooting.

1. **Collect initial service visit information, from the service-call paperwork or onsite personnel, about the following items:**
   - Events that occurred prior to the failure
   - Whether any hardware or software was modified or installed
   - Whether the server was recently installed or moved
   - How long the server has exhibited symptoms
   - The duration or frequency of the problem
2. **Document the exisiting server settings before you make any changes.**

   Record the BIOS version, software version and server serial numbers. Check the product notes to view issues associated with the server hardware and software.
3. **Adjust the exisiting server settings to correct the problem.**

   If possible, make one change at a time in order to isolate potential problems. Use this method to maintain a controlled environment and reduce troubleshooting.
4. **Note the changes made and results of any change you make.**

   Include any errors or informational messages.
5. **Check for potential device conflicts before you add a new device.**
6. **Check for version dependencies, especially with third-party software.**
7. **If the problem is not evident, continue with the next section,** "Troubleshooting Power Problems" on page 111**.**

Troubleshooting Power Problems

Do one of the following.

- If the server can power on, skip this section and proceed to "External Inspection of the Server" on page 112.
- If the server can not power on, do the following procedure.

1. **Check that AC power cords are attached firmly to the server's power supplies and to the AC sources.**

   Use of the cable clamps will ensure that the AC power cords are attached to the server's power supplies. FIGURE 8-3 shows AC power cords on the rear panel.

2. **Check that the server covers, including hard disk drive access cover, system controller cover, and fan access cover are firmly in place.**

   Refer to the cover labels. An intrusion switch on the system controller shuts the server down when the hard disk drive access cover is removed.

3. **Investigate the conditions that can trigger an automatic shutdown sequence:**

   A power-off sequence is initiated by a request from either of the following items:

   - **Board management controller** (BMC). The conditions that trigger the BMC to issue a shutdown request are:
     - An over-temperature condition for more than 1 second.
     - Multiple fan failures.

   or

   - **Fault condition**. The fault conditions that trigger a shutdown are:
     - All power supplies have failed or have been removed.
     - A power supply has been out of spec for more than 100 mS.
     - The hot-swap circuit has faulted.
     - An over-temperature condition has occurred.

Note – Any power supply that is out of spec causes a reset, but only power supplies that remain out of spec for more than 100 mS cause a shutdown.

External Inspection of the Server

Improperly set controls and loose or improperly connected cables are common causes of problems with hardware components.

To perform a visual inspection of the external system:

1. **Inspect the front panel LEDs for indications of component malfunction.**

FIGURE 8-2 shows the front panel controls and indicators. TABLE 8-1 describes the controls and indicators.

FIGURE 8-2 Sun Fire X4540 Server Front Panel LEDs

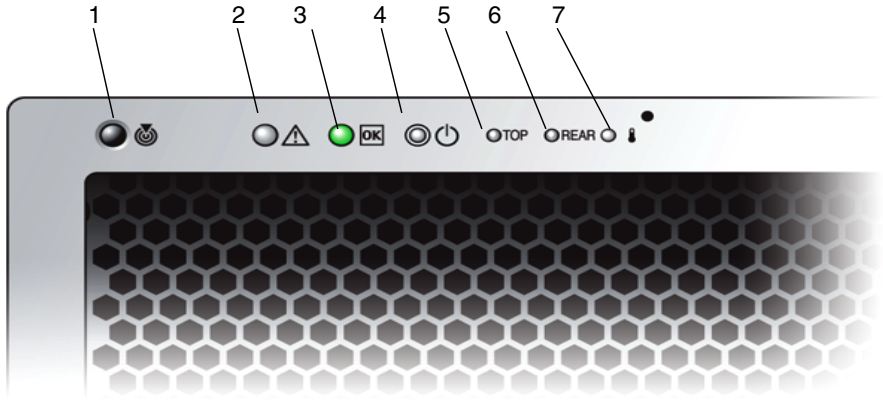


TABLE 8-1 Front Panel Controls and Indicators

#	Name	Color	Description
1	Locate button/LED	White	Operators can turn this LED On remotely to help then locate the server in a crowded server room. Press to turn off. Pressing the Locate LED/Switch for five seconds turns all indicators ON for 15 seconds.
2	System Fault	White	On – When service action is required.
3	Power/Operation	Green	Steady – Power is On. Blink – Standby power is On but main power is Off. Off – Power is Off.
4	System power button	Grey	To power on main power for all the server components.
5	Top failure LED	Amber	On – HDD or fan fault.
6	Rear failure LED	Amber	On – Power supply, or system controller fault (service is required).
7	Over Temperature LED	Amber	On – When system is over temperature.

2. Inspect the back panel LEDs for indications of component malfunction.

FIGURE 8-3 shows the rear panel features. TABLE 8-2 describes each feature.

FIGURE 8-3 Sun Fire X4540 Server Rear Panel LEDs

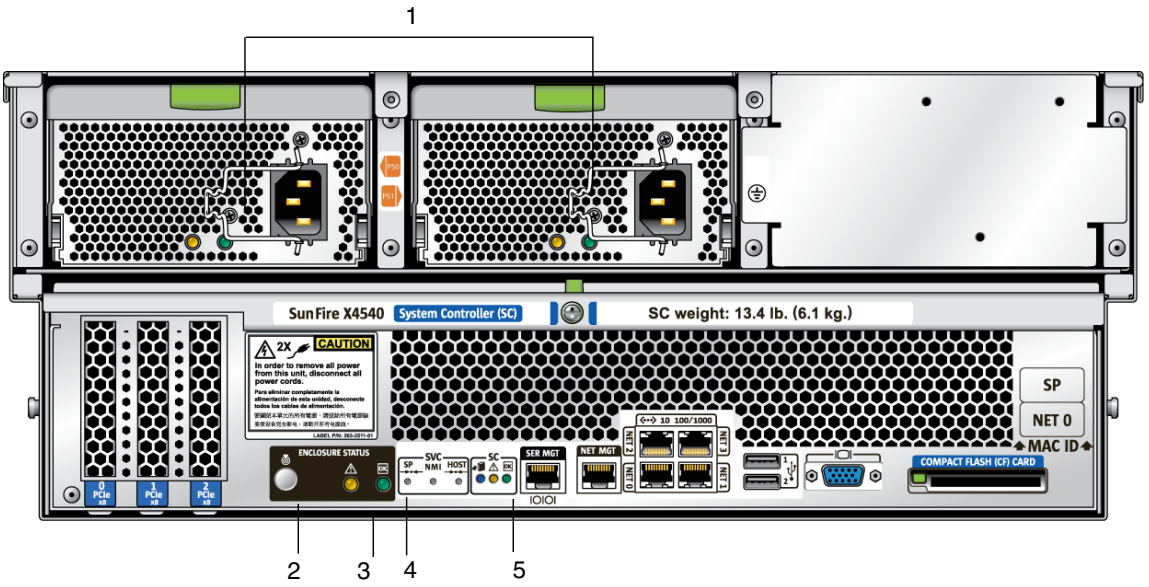


TABLE 8-2 Rear Panel Features

#	Name	Description
1	AC power connectors	Verify that the PS LEDs are green. Each power supply has its own AC connector with a clip to secure its power cable.
2	Locate button/LED	White Operators can turn this LED On remotely to help then locate the server in a crowded server room. Press to turn off.
3	Fault LED	Amber – When on, service action required. Steady – Power is On. Off – Power is Off.
4	OK LED	Green – Service action allowed. When On, service action is required. Blink – Standby power is On but main power is Off.
5	System controller status LEDs	Blue – Ready to remove. Amber – Fault, service action required. Green – Operational, no action required.

For additional LED locations and descriptions, see "Identifying Status and Fault LEDs" on page 171.

3. **Verify that nothing in the server environment is blocking air flow or making a contact that could short out power.**

4. **If the problem is not evident, continue with the next section,** "Internal Inspection of the Server" on page 115**.**

Internal Inspection of the Server

To perform a visual inspection inside the server:

1. **Shut down the server, from main power to standby power mode.**

   Choose one of the following methods, using a non-conducting ballpoint pen or stylus. See FIGURE 8-4.

- **Graceful shutdown –** Press and release the Power button on the front panel. Pressing the power button causes Advanced Configuration and Power Interface (ACPI) enabled operating systems to perform an orderly shutdown of the operating system. Servers not running ACPI-enabled operating systems will shut down to standby power mode immediately.
- **Emergency shutdown –** Press and hold the Power button for four seconds to force main power off and enter standby power mode.

  After main power is off, the Power/OK LED on the front panel blinks once every three seconds, indicating that the server is in standby power mode.

Caution – You must disconnect the AC power cords from the back panel of the server, to completely power off the server. When you use the Power button to enter standby power mode, power is still applied to the graphics-redirect and service processor (GRASP) board and power supply fans, indicated when the Power/OK LED is blinking.

FIGURE 8-4 Sun Fire X4540 Server Front Panel

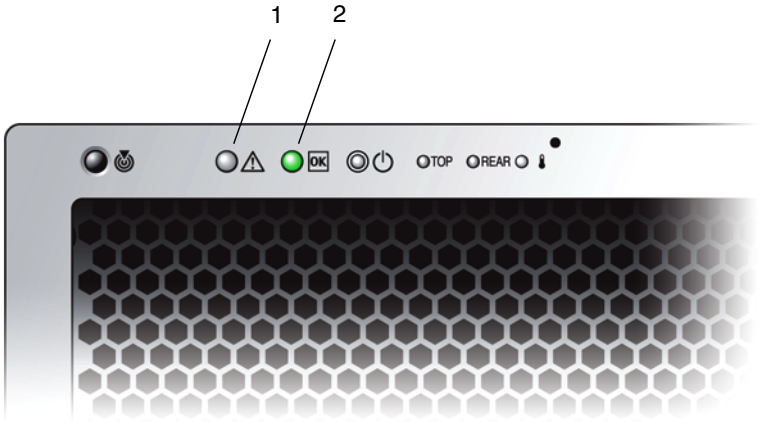


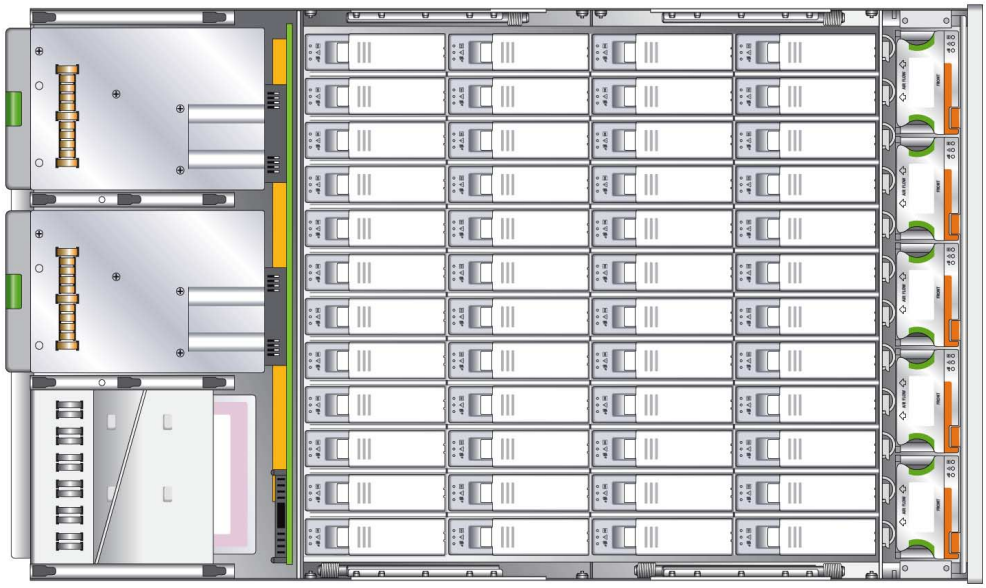
Figure Legend

1	Power Button
2	Power/OK LED

2. Remove the component covers, including hard disk drive cover, system controller cover, and fan cover, as required.

FIGURE 8-5 shows the server internal components. For instructions on removing the component covers, refer to the *Sun Fire™ X4540 Server Service Manual*, 819-4359.

FIGURE 8-5 Sun Fire X4540 Server Internal Components



3. **Inspect the internal status indicator LEDs, which can indicate component malfunction.**

   For LED locations and descriptions, see "Internal Status Indicator LEDs" on page 175 and "DIMM Fault LEDs" on page 128.

Note – You can hold down the Locate button on the server back panel or front panel for 5 seconds to initiate a "push-to-test" mode that illuminates all other LEDs both inside and outside of the chassis for 15 seconds.

---

4. **Verify that there are no loose or improperly seated components.**
5. **Verify that all cable connectors inside the system are firmly and correctly attached to their appropriate connectors.**
6. **Verify that any after-factory components are qualified and supported.**

   For a list of supported PCI cards and DIMMs, refer to the *Sun Fire X4540 Server Service Manual*, 819-4359.

7. **Check that the installed DIMMs comply with the supported DIMM population rules and configurations, as described in** Chapter 10, "Troubleshooting DIMM Problems" on page 123**.**
8. **Replace the component covers.**

9. **To restore main power mode to the server (all components powered on), use a non-conducting ballpoint pen or stylus to press and release the Power button on the server front panel. See** FIGURE 8-4**.**

   When main power is applied to the full server, the Power/OK LED next to the Power button lights and remains lit.

10. **If the problem with the server is not evident, you can try viewing the power-on self test (POST) messages and BIOS event logs during system startup. Continue with** "Viewing Event Logs" on page 159**.**

CHAPTER 9

Using SunVTS Diagnostic Software

This chapter contains information about the SunVTS™ diagnostic software tool.

This chapter includes the following topics:

About SunVTS Diagnostic Software

Sun Fire X4540 servers are shipped with a Bootable Diagnostics CD that contains SunVTS (Validation Test Suite) software.

SunVTS provides a comprehensive diagnostic tool that tests and validates Sun hardware by verifying the connectivity and functionality of most hardware controllers and devices on Sun platforms. SunVTS software can be tailored with modifiable test instances and processor affinity features.

The following tests are supported on x86 platforms. The current x86 support is for the 32-bit operating system only.

- CD DVD Test (cddvdtest)
- CPU Test (cputest)
- Disk and Diskette Drives Test (disktest)
- Data Translation Look-Aside Buffer (dtlbtest)
- Floating Point Unit Test (fputest)
- Network Hardware Test (nettest)
- Ethernet Loopback Test (netlbtest)
- Physical Memory Test (pmemtest)
- Serial Port Test (serialtest)

- System Test (systest)
- Universal Serial Bus Test (usbtest)
- Virtual Memory Test (vmemtest)

Accessing SunVTS

SunVTS software has a graphical user interface (GUI) that provides test configuration and status monitoring. The user interface can be run on one system to display the SunVTS testing of another system on the network. SunVTS software also provides a TTY-mode interface for situations in which running a GUI is not possible.

SunVTS Documentation

For the most up-to-date SunVTS documentation, go to:

http://www.sun.com/oem/products/vts/

Running SunVTS Diagnostic Tests

Using the Bootable Diagnostics CD

Use the Bootable Diagnostics CD to diagnose server problems. This CD is designed so that the server will boot from the CD. This CD boots the Solaris™ operating system and starts SunVTS software. Diagnostic tests run and write output to log files that the service technician can use to determine the problem with the server.

SunVTS 7.0 or later software is preinstalled on these Sun Fire X4540 servers. The server is also shipped with the Sun Fire X4540 Server Bootable Diagnostics CD (Part number 705-1439).

SunVTS Log Files

SunVTS provides access to four different log files:

- **SunVTS test error log** contains time-stamped SunVTS test error messages. The log file path name is `/var/sunvts/logs/sunvts.err`. This file is not created until a SunVTS test failure occurs.

- **SunVTS kernel error log** contains time-stamped SunVTS kernel and SunVTS probe errors. SunVTS kernel errors are errors that relate to running SunVTS, and not to testing of devices. The log file path name is `/var/sunvts/logs/vtsk_stderr.txt`. This file is not created until SunVTS reports a SunVTS kernel error.
- **SunVTS information log** contains informative messages that are generated when you start and stop the SunVTS test sessions. The log file path name is `/var/sunvts/logs/sunvts.info`. This file is not created until a SunVTS test session runs.
- **Solaris system message log** is a log of all the general Solaris events logged by `syslogd`. The path name of this log file is `/var/adm/messages`.

Requirements

To use the Sun Fire X4540 Server Bootable Diagnostics CD, you must have a USB CD-ROM drive, keyboard, mouse, and monitor attached to the server on which you are performing diagnostics.

Using the Bootable Diagnostics CD

To use the Sun Fire X4540 Server Bootable Diagnostics CD to perform diagnostics:

1. **Install the USB CD-ROM drive into the Sun Fire X4540 Server.**
2. **With the server powered on, insert the Sun Fire X4540 Server Bootable Diagnostics CD (705-1439) into the DVD-ROM drive.**
3. **Reboot the server, but press F2 during the start of reboot so that you can change the BIOS setting for boot-device priority.**
4. **When the BIOS Main menu appears, navigate to the BIOS Boot menu.**

   Instructions for navigating within the BIOS screens are printed on the BIOS screens.
5. **On the BIOS Boot menu screen, select Boot Device Priority.**

   The Boot Device Priority screen appears.
6. **Select the DVD-ROM drive to be the primary boot device.**
7. **Save and exit the BIOS screens.**

8. **Reboot the server.**

   When the server reboots from the CD in the DVD-ROM drive, the Solaris Operating System boots and SunVTS software starts and opens its first GUI window.

9. **In the SunVTS GUI, press Enter or click the Start button when you are prompted to start the tests.**

   The test suite will run until it encounters an error or the test is completed.

Note – The CD will take approximately nine minutes to boot.

---

10. **When SunVTS software completes the test, review the log files generated during the test.**

Reviewing SunVTS Log Files

1. **Click the Log button.**

   The Log file window is displayed.

2. **Specify the log file that you want to view by selecting it from the Log File window.**

   The content of the selected log file is displayed in the window.

3. **Choose the following actions from the three lower buttons:**
   - **Print the log file –** A dialog box appears for you to specify your printer options and printer name.
   - **Delete the log file –** The file remains displayed, but will be gone the next time you try to display it.
   - **Close the Log file window –** The window is closed.

Note – To save the log files: You must save the log files to another networked system or a removable media device. When you use the Bootable Diagnostics CD, the server boots from the CD. Therefore, the test log files are not on the server's hard disk drive and they will be deleted when you power cycle the server.

CHAPTER 10

Troubleshooting DIMM Problems

This chapter describes how to detect and correct problems with the Sun Fire Sun Fire X4500/X4540 Servers server's Dual Inline Memory Modules (DIMMs). It includes the following sections:

DIMM Population Rules

The DIMM population rules for the server are as follows:

- Each CPU can support a maximum of eight DIMMs.
- The DIMM slots are paired and the DIMMs must be installed in pairs (0-1, 2-3, 4-5, and 6-7). See FIGURE 10-1. The memory sockets are colored black or white to indicate which slots are paired by matching colors.
- DIMMs are populated starting from the outside (away from the CPU) and working toward the inside.
- CPUs with only a single pair of DIMMs must have those DIMMs installed in that CPU's outside white DIMM slots (6 and 7). See FIGURE 10-1.
- Only DDR2 800 Mhz, 667Mhz, and 533Mhz DIMMs are supported.
- Each pair of DIMMs must be identical (same manufacturer, size, and speed).

Supported DIMM Configurations

TABLE 10-1 lists the supported DIMM configurations for the Sun Fire Sun Fire X4500/X4540 Servers server.

TABLE 10-1 Supported DIMM Configurations

Slot 3	Slot 2	Slot 1	Slot 0	Total Memory Per CPU
0	2 GB	0	2 GB	4 GB
2 GB	2 GB	2 GB	2 GB	8 GB
4 GB	4 GB	4 GB	4 GB	16 GB

DIMM Replacement Policy

Replace a DIMM when one of the following events takes place:

- The DIMM fails memory testing under BIOS due to Uncorrectable Memory Errors (UCEs).
- UCEs occur and investigation shows that the errors originated from memory.

  In addition, a DIMM should be replaced whenever more than 24 Correctable Errors (CEs) originate in 24 hours from a single DIMM and no other DIMM is showing further CEs.
- If more than one DIMM has experienced multiple CEs, other possible causes of CEs have to be ruled out by a qualified Sun Support specialist before replacing any DIMMs.

Retain copies of the logs showing the memory errors per the above rules to send to Sun for verification prior to calling Sun.

How DIMM Errors Are Handled by the System

This section describes system behavior for the two types of DIMM errors: UCEs (Uncorrectable Errors) and CEs (Correctable Errors). This section also describes BIOS DIMM error messages.

Uncorrectable DIMM Errors

In all operating systems (OS's), the behavior is the same for UCEs:

1. When an UCE occurs, the memory controller causes an immediate reboot of the system.
2. During reboot, the BIOS checks the Machine Check registers and determines that the previous reboot was due to an UCE, then reports this message in POST after the memtest stage:

   ```
   A Hypertransport Sync Flood occurred on last boot
   ```

3. BIOS reports this event in the service processor's system event log (SEL) as shown in the sample IPMItool output below:

```
# ipmitool -H 10.6.77.249 -U root -P changeme -I lanplus sel list
8 | 09/25/2007 | 03:22:03 | System Boot Initiated #0x02 | Initiated by warm
     reset | Asserted
9 | 09/25/2007 | 03:22:03 | Processor #0x04 | Presence detected | Asserted
a | 09/25/2007 | 03:22:03 | OEM #0x12 |  | Asserted
b | 09/25/2007 | 03:22:03 | System Event #0x12 | Undetermined system hardware
     failure | Asserted
c | OEM record e0 | 0000000200000000029000002
d | OEM record e0 | 000000040000000000b00006
e | OEM record e0 | 00000048000000000011110322
f | OEM record e0 | 00000058000000000000030000
10 | OEM record e0 | 000100440000000000feffff000
11 | OEM record e0 | 00010048000000000000ff3efa
12 | OEM record e0 | 10ab0000000010000006040012
13 | OEM record e0 | 10ab000000111102011110020
14 | OEM record e0 | 0018304c00f200002000020c0f
15 | OEM record e0 | 0019304c00f200004000020c0f
16 | OEM record e0 | 001a304c00f45aa10015080a13
17 | OEM record e0 | 001a3054000000000320004880
18 | OEM record e0 | 001b304c00f200001000020c0f
```

```
19 | OEM record e0 | 8000000200000000029000002
1a | OEM record e0 | 80000004000000000000b00006
1b | OEM record e0 | 80000048000000000011110322
1c | OEM record e0 | 80000058000000000000030000
1d | OEM record e0 | 80010044000000000fefff000
1e | OEM record e0 | 80010048000000000000ff3efa
1f | 09/25/2007 | 03:22:06 | System Boot Initiated #0x03 | Initiated by warm
     reset | Asserted
20 | 09/25/2007 | 03:22:06 | Processor #0x04 | Presence detected | Asserted
21 | 09/25/2007 | 03:22:15 | System Firmware Progress #0x01 | Memory
     initialization | Asserted
22 | 09/25/2007 | 03:22:16 | Memory | Uncorrectable ECC | Asserted | CPU 0 DIMM 0
23 | 09/25/2007 | 03:22:16 | Memory | Uncorrectable ECC | Asserted | CPU 1 DIMM 1
24 | 09/25/2007 | 03:22:16 | Memory | Memory Device Disabled | Asserted | CPU
     2 DIMM 0
25 | 09/25/2007 | 03:22:16 | Memory | Memory Device Disabled | Asserted | CPU
     2 DIMM 1
```

The lines in the display start with event numbers (in hex), followed by a description of the event. TABLE 10-2 describes the contents of the display.

TABLE 10-2 Lines in IPMI Output

Event (hex)	Description
8	UCE caused a Hypertransport sync flood which lead to system's warm reset. #0x02 refers to a reboot count maintained since the last AC power reset.
9	BIOS detected and initiated 4 processors in system.
a	BIOS detected a Sync Flood caused this reboot.
b	BIOS detected a hardware error caused the Sync Flood.
c to 1e	BIOS retrieved and reported some hardware evidence, including all processors' Machine Check Error registers (events 14 to 18).
1f	After BIOS detected that a UCE had occurred, it located the DIMM and reset. 0x03 refers to reboot count.
21 to 25	BIOS off-lined faulty DIMMs from system memory space and reported them. Each DIMM of a pair is being reported, since hardware UCE evidence cannot lead BIOS any further than detection of a faulty pair.

Correctable DIMM Errors

If a DIMM has 24 or more correctable errors in 24 hours, it is considered defective and should be replaced.

At this time, CEs are not logged in the server's system event logs. They are reported or handled in the supported operating systems as follows:

- Windows Server:

  a. A Machine Check error-message bubble appears on the task bar.

  b. The user must manually open Event Viewer to view errors. Access Event Viewer through this menu path:

  ```
  Start-->Administration Tools-->Event Viewer
  ```

  c. The user can then view individual errors (by time) to see details of the error.

- Solaris:

  Solaris FMA reports and (sometimes) retires memory with correctable Error Correction Code (ECC) errors. See your Solaris Operating System documentation for details. Use the command:

  ```
  fmdump -eV
  ```

  to view ECC errors

- Linux:

  The HERD utility can be used to manage DIMM errors in Linux. See the *x64 Servers Utilities Reference Manual* for details.

  - If HERD is installed, it copies messages from `/dev/mcelog` to `/var/log/messages`.
  - If HERD is not installed, a program called mcelog copies messages from `/dev/mcelog to /var/log/mcelog`.

The Bootable Diagnostics CD described in Using SunVTS Diagnostic Software also captures and logs CEs.

BIOS DIMM Error Messages

The BIOS displays and logs the following DIMM error messages:

`NODE-`*`n`*` Memory Configuration Mismatch`

The following conditions will cause this error message:

- The DIMMs mode is not paired (running in 64-bit mode instead of 128-bit mode).
- The DIMMs' speed is not same.
- The DIMMs do not support ECC.
- The DIMMs are not registered.
- The MCT stopped due to errors in the DIMM.

- The DIMM module type (buffer) is mismatched.
- The DIMM generation (I or II) is mismatched.
- The DIMM CL/T is mismatched.
- The banks on a two-sided DIMM are mismatched.
- The DIMM organization is mismatched (128-bit).
- The SPD is missing Trc or Trfc information.

DIMM Fault LEDs

When you press the Press to See Fault button on the motherboard or the mezzanine board, LEDs next to the DIMMs flash to indicate that the system has detected 24 or more CEs in a 24-hour period on that DIMM.

Note – The DIMM Fault and Motherboard Fault LEDs operate on stored power for up to a minute when the system is powered down, even after the AC power is disconnected, and the motherboard (or mezzanine board) is out of the system. The stored power lasts for about half an hour.

Note – Disconnecting the AC power removes the fault indication. To recover fault information, view the SP SEL. Refer to the *Sun Integrated Lights Out Manager User's Guide*.

- DIMM fault LED is off – The DIMM is operating properly.
- DIMM fault LED is flashing (amber) – At least one of the DIMMs in this DIMM pair has reported 24 CEs within a 24-hour period.
- Motherboard Fault LED on mezzanine is on – There is a fault on the motherboard. This LED is there because you cannot see the motherboard LEDs when the mezzanine board is present.

Note – The Motherboard Fault LED operates independently of the Press to See Fault button, and does not operate on stored power.

See FIGURE 10-1 for the locations of DIMMs and LEDs on the motherboard.

FIGURE 10-1 DIMMs and LEDs on Motherboard

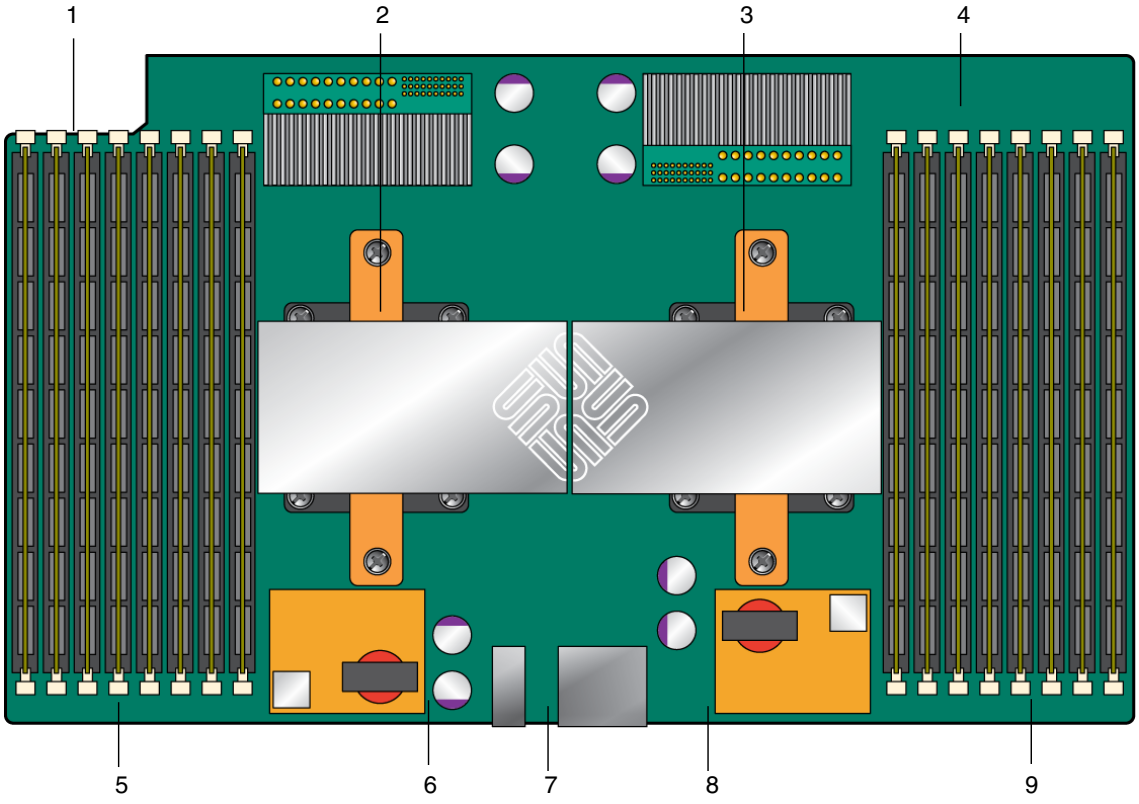


Figure Legend

1	DIMMs 0 2 1 3
2	CPU 1 (under heatsink)
3	CPU 0 (under heatsink)
4	DIMMs 3 1 2 0
5	DIMM fault LEDs
6	CPU 1 fault LED
7	Battery fault LED
8	CPU 0 fault LED
9	DIMM fault LED

Isolating and Correcting DIMM ECC Errors

If your log files report an ECC error or a problem with a DIMM, complete the steps below until you can isolate the fault.

In this example, the log file reports an error with the DIMM in CPU0, slot 7. The fault LEDs on CPU0, slots 6 and 7 are on.

To isolate and correct DIMM ECC errors:

1. **If you have not already done so, shut down your server to standby power mode and remove the cover.**
2. **Inspect the installed DIMMs to ensure that they comply with the** "DIMM Population Rules" on page 123**.**
3. **Press the PRESS TO SEE FAULT button, and inspect the DIMM fault LEDs. See** FIGURE 10-1**.**

   A flashing LED identifies a component with a fault.

   - For CEs, the LEDs correctly identify the DIMM where the errors were detected.
   - For UCEs, both LEDs in the pair flash if there is a problem with either DIMM in the pair.

Note – If your server is equipped with a mezzanine board, the motherboard DIMMs and LEDs will be hidden beneath it. However, the Motherboard Fault LED lights to indicate that there is a problem on the motherboard (only while AC power is still connected). If the Motherboard Fault LED on the mezzanine board lights, remove the mezzanine board as described in your server's service manual, and inspect the LEDs on the motherboard.

---

4. **Disconnect the AC power cords from the server.**

Caution – Before handling components, attach an ESD wrist strap to a chassis ground (any unpainted metal surface). The system's printed circuit boards and hard disk drives contain components that are extremely sensitive to static electricity.

Note – To recover fault information view the SP SEL. Refer to the *Sun Integrated Lights Out Manager User's Guide*.

---

5. **Remove the DIMMs from the DIMM slots in the CPU.**

   Refer to your server's service manual for details.

6. **Visually inspect the DIMMs for physical damage, dust, or any other contamination on the connector or circuits.**

7. **Visually inspect the DIMM slot for physical damage. Look for cracked or broken plastic on the slot.**

8. **Dust off the DIMMs, clean the contacts, and reseat them.**

Caution – Use only compressed air to dust DIMMs.

9. **If there is no obvious damage, replace any failed DIMMs.**

   For UCEs, if the LEDs indicate a fault with the pair, replace both DIMMs. Ensure that they are inserted correctly with ejector latches secured.

10. **Reconnect AC power cords to the server.**

11. **Power on the server and run the diagnostics test again.**

12. **Review the log file.**

    If the tests identify the same error, the problem is in the CPU, not the DIMMs.

CHAPTER 11

Using the ILOM Service Processor GUI to View System Information

This chapter contains information about using the Integrated Lights Out Manager (ILOM) service processor (SP) GUI to view monitoring and maintenance information for your server. This chapter includes the following sections:

For more information on using the ILOM SP GUI to maintain the server (for example, configuring alerts), refer to the *Sun Integrated Lights Out Manager User's Guide* and supplement.

Connecting the SP to a Serial Port

To make a serial connection to the service processor:

1. **Connect a serial cable from the RJ-45 Serial Management port, on the server back panel, to a terminal device.**
2. **Press ENTER on the terminal device to establish a connection between the terminal device and the server ILOM SP.**

Note – If you are connecting to the serial port on the SP before it has been powered up or during its power-up sequence, you will see bootup messages displayed.

The service processor displays a login prompt, after a short wait. For example:

```
SUNSP0003BA84D777 login:
```

The first string in the prompt is the default host name for the ILOM SP. The host name consists of the prefix *SUNSP* and the unique MAC address of the ILOM SP.

3. **Log in to the SP.**

   When you first try to access the ILOM SP, you are prompted to type the default user name and password. Type the default user name and password:

   Default user name: **root**
   Default password: **changeme**

   After you have successfully logged in to the SP, the screen displays the default command prompt: ->

4. **To start the serial console, type the following commands:**

```
cd /SP/console
start
```

5. **Determine whether you successfully connected to the SP:**

   - If you successfully connected to the SP, continue with the following procedures:
     - "Viewing ILOM SP Event Logs" on page 134
     - "Viewing Replaceable Component Information" on page 137
     - "Viewing Temperature, Voltage, and Fan Sensor Readings" on page 139
   - If you could *not* connect to the SP, there might be a problem with the graphics-redirect and service processor (GRASP) board. Replace this board and then repeat Step 1 through Step 4. Refer to the *Sun Fire X4540 Server Service Manual*, 819-4359, for instructions.

Viewing ILOM SP Event Logs

Events are notifications that occur in response to some actions. The IPMI system event log (SEL) provides status information about the Sun Fire X4540 server's hardware and software to the ILOM software, which displays the events in the ILOM web GUI.

- If any of the logs or information screens indicate a DIMM error, see "BIOS DIMM Error Messages" on page 127 and "Isolating and Correcting DIMM ECC Errors" on page 130.

- If the problem with the server is not evident after viewing ILOM SP logs and information, continue with "Running SunVTS Diagnostic Tests" on page 120.

To view event logs:

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

   a. **Type the IP address of the server's SP into your web browser.**

      The Sun Integrated Lights Out Manager Login screen is displayed.

   b. **Type your user name and password.**

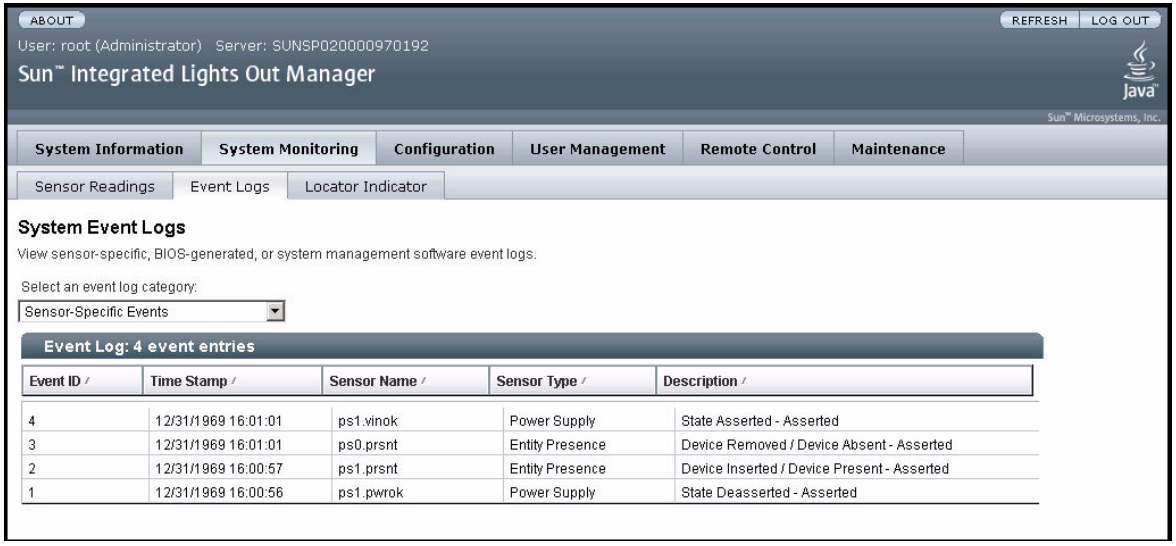
      When you first try to access the ILOM SP, you are prompted to type the default user name and password. The default user name and password are:

      Default user name: **`root`**
      Default password: **`changeme`**

2. **From the System Monitoring tab, select Event Logs.**

   The System Event Logs page is displayed. See FIGURE 11-1 for sample information.

FIGURE 11-1 System Event Logs Page



3. **Select a category of an event that you want to view in the log from the drop-down menu.**

   You can select from the following types of events:

   - **Sensor-specific events**. These events relate to a specific sensor for a component, for example, a fan sensor or a power supply sensor.
   - **BIOS-generated events**. These events relate to error messages generated in the BIOS.
   - **System management software events**. These events relate to events that occur within the ILOM software.

   After you have selected a category of event, the Event Log table is updated with the specified events. The fields in the Event Log are described in TABLE 11-1.

TABLE 11-1 Event Log Fields

Field	Description
Event ID	The number of the event, in sequence from number 1.
Time Stamp	The day and time the event occurred. If the Network Time Protocol (NTP) server is enabled to set the SP time, the SP clock will use Universal Coordinated Time (UTC). For more information about time stamps, see "Interpreting Event Log Time Stamps" on page 137.
Sensor Name	The name of a component for which an event was recorded. The sensor name abbreviations correspond to the following components: sys: System or chassis • p0: Processor 0 • p1: Processor 1 • io: I/O board • ps: Power supply • fp: Front panel • ft: Fan tray • mb: Motherboard
Sensor Type	The type of sensor for the specified event.
Description	A description of the event.

4. **To clear the event log, click the Clear Event Log button.**

   A confirmation dialog box is displayed.

5. **Click OK to clear all entries in the log.**

6. **If the problem with the server is not evident after viewing ILOM SP logs and information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

Interpreting Event Log Time Stamps

The system event log time stamps are related to the service processor clock settings. If the clock settings change, the change is reflected in the time stamps.

When the service processor reboots, the SP clock is set to Thu Jan 1 00:00:00 UTC 1970. The SP reboots as a result of the following:

- A complete system unplug/replug power cycle
- An IPMI command; for example, `mc reset cold`
- A command-line interface (CLI) command; for example, `reset /SP`
- ILOM web GUI operation; for example, from the Maintenance tab, selecting Reset SP
- An SP firmware upgrade

After an SP reboot, the SP clock is changed by the following:

- When the host is booted. The host's BIOS unconditionally sets the SP time to that indicated by the host's RTC. The host's RTC is set by the following operations:
  - When the host's CMOS is cleared as a result of changing the host's RTC battery or inserting the CMOS-clear jumper on the system controller. The host's RTC starts at Jan 1 00:01:00 2002.
  - When the host's operating system sets the host's RTC. The BIOS does not consider time zones. Solaris and Linux software respect time zones and will set the system clock to UTC. Therefore, after the OS adjusts the RTC, the time set by the BIOS will be UTC.
  - When the user sets the RTC using the host BIOS Setup screen.
- Continuously via NTP if NTP is enabled on the SP. NTP jumping is enabled to recover quickly from an erroneous update from the BIOS or user. NTP servers provide UTC time. Therefore, if NTP is enabled on the SP, the SP clock will be in UTC.
- Via the CLI, ILOM web GUI, and IPMI.

Viewing Replaceable Component Information

Depending on the component you select, information about the manufacturer, component name, serial number, and part number can be displayed.

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

a. **Type the IP address of the server's SP into your web browser.**

The Sun Integrated Lights Out Manager Login screen is displayed.

b. **Type your user name and password.**

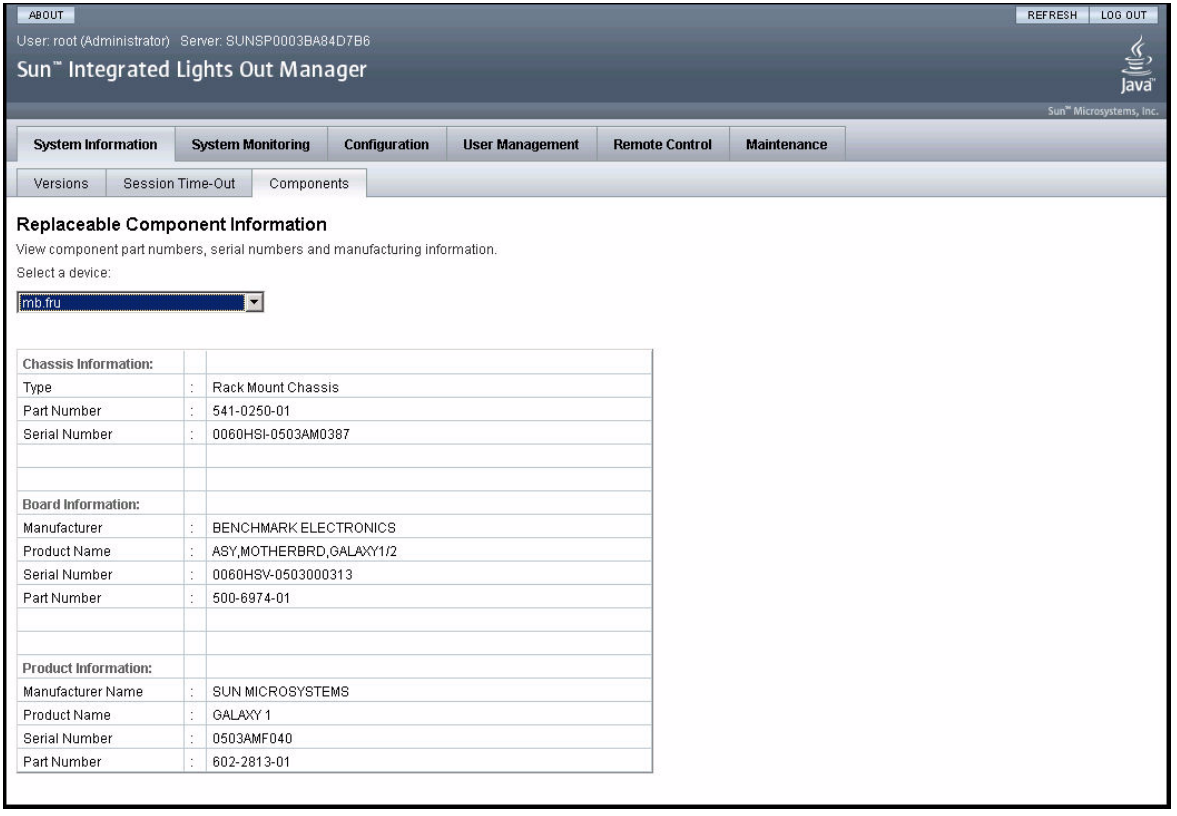
When you first try to access the ILOM Service Processor, you are prompted to type the default user name and password. Type the default user name and password:

Default user name: **`root`**
Default password: **`changeme`**

2. **From the System Information tab, select Components.**

The Replaceable Component Information page is displayed. See FIGURE 11-2.

FIGURE 11-2 Replaceable Component Information Page



3. **Select a component from the drop-down list.**

Information about the selected component is displayed.

4. **If the problem with the server is not evident after viewing replaceable component information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

Viewing Temperature, Voltage, and Fan Sensor Readings

This section describes how to view the Sun Fire X4540 server temperature, voltage, and fan sensor readings.

There are a total of six temperature sensors that are monitored. They all generate IPMI events that will be logged in to the system event log (SEL) when an upper threshold is exceeded. Three of these sensor readings are used to adjust the fan speeds and perform other actions, such as illuminating LEDs and powering off the chassis. These sensors and their respective thresholds are as follows:

- Front panel ambient temperature (fp.t_amb)
  - Upper non-critical: 30 degrees C
  - Upper critical: 35 degrees C
  - Upper non-recoverable: 40 degrees C
- CPU 0 (p0.t_core) and CPU 1 (p1.t_core) die temperatures
  - Upper non-critical: 55 degrees C
  - Upper critical: 65 degrees C
  - Upper non-recoverable: 75 degrees C

There are three other temperature sensors:

- I/O board ambient temperature (io.t_amb)
- system controller ambient temperature (mb.t_amb)
- Power distribution board ambient temperature (pdb.t_amb)

To View Sensor Readings:

1. **Log in to the SP as Administrator or Operator to reach the ILOM web GUI:**

   a. **Type the IP address of the server's SP into your web browser.**

   The Sun Integrated Lights Out Manager Login screen is displayed.

b. Type your user name and password.

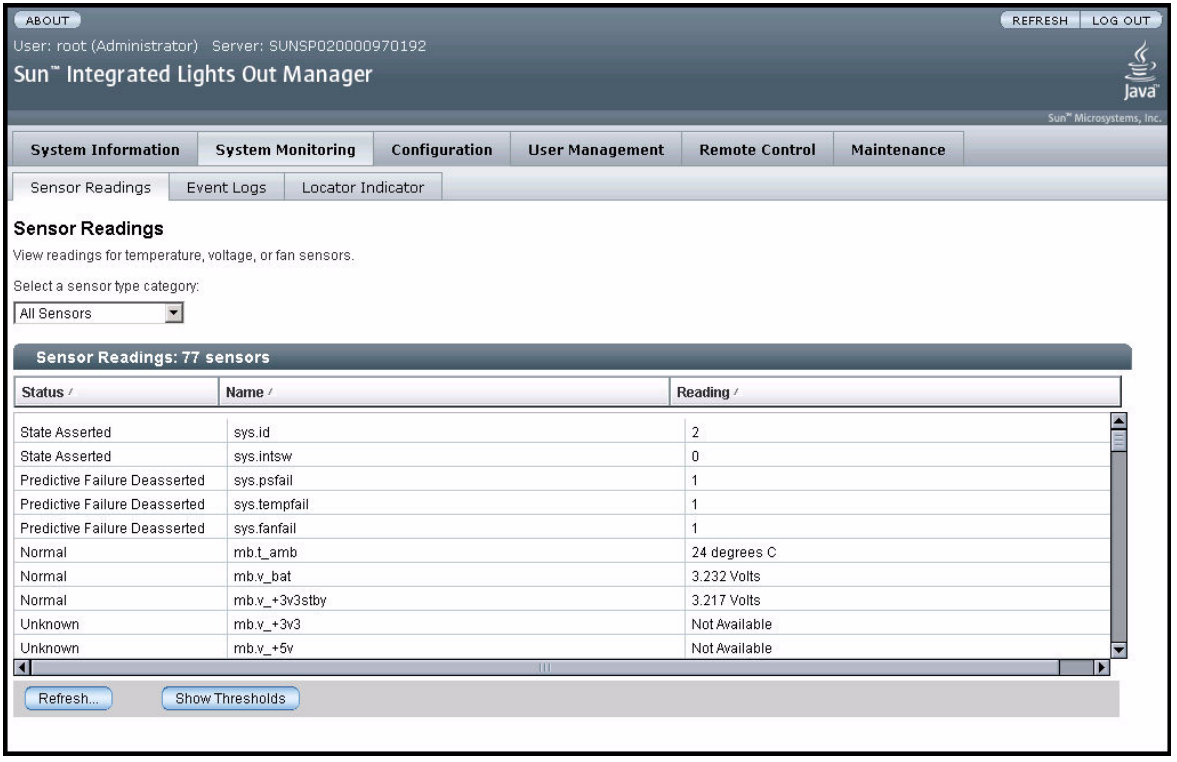
When you first try to access the ILOM Service Processor, you are prompted to type the default user name and password. Type the default user name and password:

Default user name: **root**
Default password: **changeme**

2. From the System Monitoring tab, select Sensor Readings.

The Sensor Readings page is displayed. See FIGURE 11-3.

FIGURE 11-3 Sensor Readings Page



3. Select the type of sensor readings that you want to view from the drop-down menu.

You can select All Sensors, Temperature Sensors, Voltage Sensors, or Fan Sensors.

The sensor readings are displayed. The Sensor Readings fields are described in TABLE 11-2.

TABLE 11-2 Sensor Readings Fields

Field	Description
Status	Reports the status of the sensor, including State Asserted, State Deasserted, Predictive Failure, Device Inserted/Device Present, Device Removed/Device Absent, Unknown, and Normal.
Name	Reports the name of the sensor. The names correspond to the following components: • sys: System or chassis • bp: Back panel • fp: Front panel • mb: Motherboard • io: I/O board • p0: Processor 0 • p1: Processor 1 • ft0: Fan tray 0 • ft1: Fan tray 1 • pdb: Power distribution board • ps0: Power supply 0 • ps1: Power supply 1
Reading	Reports the rpm, temperature, and voltage measurements.

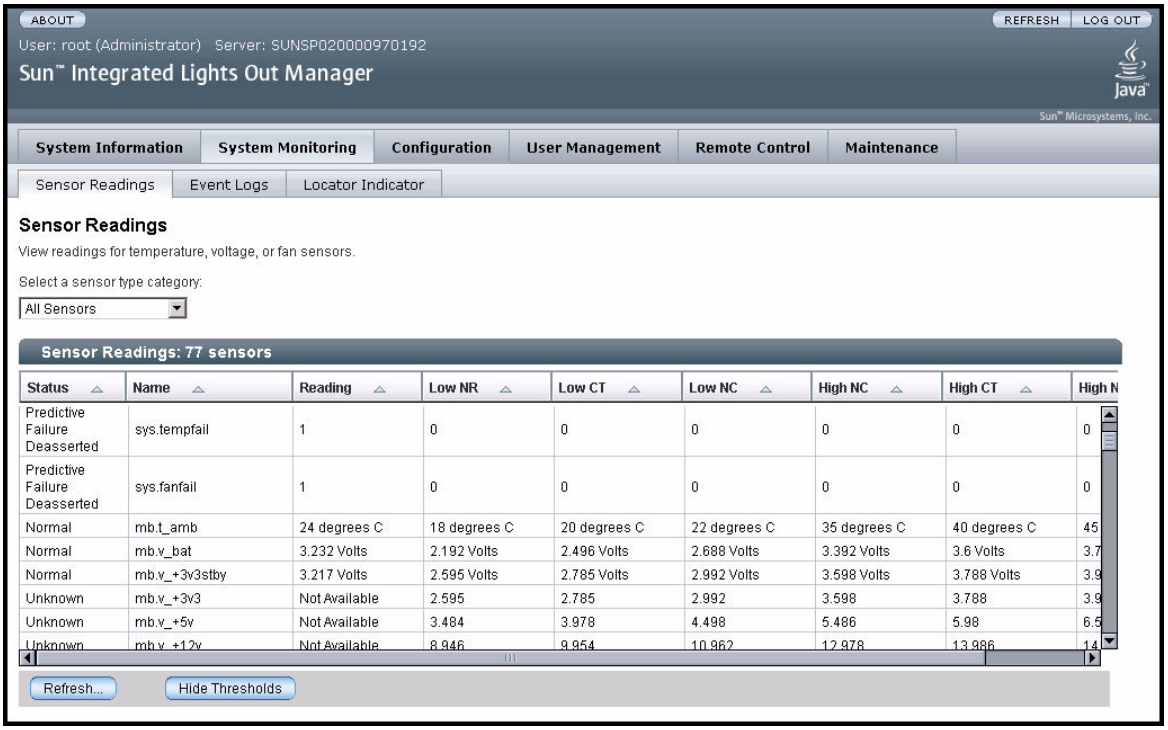
4. **Click the Refresh button to update the sensor readings to their current status.**
5. **Click the Show Thresholds button to display the settings that trigger alerts.**

   The Sensor Readings table is updated. See the example in FIGURE 11-4.

   For example, if system temperature reaches 30 C, the service processor will send an alert. Sensor thresholds include the following:

   - Low/High NR: Low or high non-recoverable
   - Low/High CR: Low or high critical
   - Low/High NC: Low or high non-critical

FIGURE 11-4 Sensor Readings Page With Thresholds Displayed



6. **Click the Hide Thresholds button to revert to the sensor readings.**

   The sensor readings are redisplayed, without the thresholds.

7. **If the problem with the server is not evident after viewing sensor readings information, continue with** "Running SunVTS Diagnostic Tests" on page 120**.**

CHAPTER 12

Using IPMItool to View System Information

This chapter contains information about using the Intelligent Platform Management Interface (IPMI) to view monitoring and maintenance information for your server. This chapter includes the following sections:

About IPMI

IPMI is an open-standard hardware management interface specification that defines a specific way for embedded management subsystems to communicate. IPMI information is exchanged though baseboard management controllers (BMCs), which are located on IPMI-compliant hardware components.

Using low-level hardware intelligence instead of the operating system has two main benefits: First, this configuration allows for out-of-band server management. Second, the operating system is not burdened with transporting system status data.

Your Sun Fire X4540 Service Processor (SP) is IPMI v2.0 compliant. You can access IPMI functionality through the command line with the IPMItool utility either in-band or out-of-band. Additionally, you can generate an IPMI-specific trap from the web interface or manage the server's IPMI functions from any external management solution that is IPMI v1.5 or v2.0 compliant. For more information about the IPMI v2.0 specification, go to
http://www.intel.com/design/servers/ipmi/spec.htm#spec2

About IPMItool

IPMItool is a simple, command-line interface used to manage IPMI-enabled devices. You can use this utility to perform IPMI functions with a kernel device driver or over a LAN interface. IPMItool allows you to manage system hardware components, monitor system health, and monitor and manage system environmentals, independent of the operating system.

IPMItool is included on the Sun Fire X4540 server Tools and Drivers CD (705-1438). Locate IMPItool and its related documentation on your Sun Fire X4540 Server Tools and Drivers CD, or download this tool at:

http://ipmitool.sourceforge.net/

IPMItool Man Page

After you install the IPMItool package, you can access detailed information about command usage and syntax from the `man` page that is installed. From a command line, type the following command:

```
man ipmitool
```

Connecting to the Server With IPMItool

To connect over a remote interface, you must supply a user name and password. The default user with administrator-level access is **`root`** with password **`changeme`**. This means you must use the `-U` and `-P` parameters to pass both user name and password on the command line, as shown in the following example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme chassis status
```

Note – If you encounter command-syntax problems with your particular operating system, you can use the **ipmitool -h** command and parameter to determine which parameters can be passed with the `ipmitool` command on your operating system. Also refer to the IPMItool man page by typing **man ipmitool**.

Note – In the example commands shown in this appendix, the default username, **root**, and default password, **changeme** are shown. You should type the user name and password that has been set for the server.

Enabling the Anonymous User

In order to enable the Anonymous/NULL user, you must alter the privilege level on that account. This will let you connect without supplying a `-U` user option on the command line. The default password for this user is **anonymous**.

To enable the anonymous user, type the following commands:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme channel setaccess
1 1 privilege=4
ipmitool -I lanplus -H <IPADDR> -P anonymous user list
```

Changing the Default Password

You can also change the default passwords for a particular user ID. First, get a list of users and find the ID for the user you wish to change. Then, supply it with a new password, as shown in the following command sequence:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user list
ID        NameCallin  Link Auth  IPMI Msg   Channel Priv Limit
1         false   false      true       NO ACCESS
2         root false   false      true       ADMINISTRATOR
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user set password
2 newpass
ipmitool -I lanplus -H <IPADDR> -U root -P newpass chassis status
```

Configuring an SSH Key

You can use IPMItool to configure an SSH key for a remote shell user. To do this, first determine the user ID for the desired remote SP user with the user list command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme user list
```

Then supply the user ID and the location of the RSA or DSA public key to use with the `ipmitool sunoem sshkey` command. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem sshkey set
2 id_rsa.pub
Setting SSH key for user id 2.......done
```

You can also clear the key for a particular user, for example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem sshkey del
2
Deleted SSH key for user id 2
```

Using IPMItool to Read Sensors

For more information about supported IPMI 2.0 commands and the sensor naming for this server, also refer to the *Integrated Lights Out Manager Administration Guide*, 819-1160.

Reading Sensor Status

There are a number of ways to read sensor status, from a broad overview that lists all sensors, to querying individual sensors and returning detailed information on them.

For information on the physical locations of the sensors in the system, see "Sun Fire X4540 Sensor Locations" on page 181.

Reading All Sensors

To get a list of all sensors in these servers and their status, use the `sdr list` command with no arguments. This returns a large table with every sensor in the system and its status.

The five fields of the output lines, as read from left to right are:

1. IPMI sensor ID (16-character maximum)

2. IPMI sensor number

3. Sensor status, indicating which thresholds have been exceeded

4. Entity ID and instance

5. Sensor reading

   For example:

```
fp.t_amb          | 0Ah | ok  | 12.0 | 22 degrees C
```

Reading Specific Sensors

Although the default output is a long list of sensors, it is possible to refine the output to see only specific sensors. The `sdr list` command can use an optional argument to limit the output to sensors of a specific type. TABLE 12-1 describes the available sensor arguments.

TABLE 12-1 IPMItool Sensor Arguments

Argument	Description	Sensors
`all`	All sensor records	All sensors
`full`	Full sensor records	Temperature, voltage, and fan sensors
`compact`	Compact sensor records	Digital Discrete: failure and presence sensors
`event`	Event-only records	Sensors used only for matching with SEL records
`mcloc`	MC locator records	Management Controller sensors
`generic`	Generic locator records	Generic devices: LEDs
`fru`	FRU locator records	FRU devices

For example, to see only the temperature, voltage, and fan sensors, you would use the following command, with the `full` argument.

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sdr elist full
fp.t_amb         | 0Ah | ok  | 12.0 | 22 degrees C
ps.t_amb         | 11h | ok  | 10.0 | 21 degrees C
ps0.f0.speed     | 15h | ok  | 10.0 | 11000 RPM
ps1.f0.speed     | 19h | ok  | 10.1 | 0 RPM
mb.t_amb         | 1Ah | ok  |  7.0 | 25 degrees C
mb.v_bat         | 1Bh | ok  |  7.0 | 3.18 Volts
mb.v_+3v3stby    | 1Ch | ok  |  7.0 | 3.17 Volts
mb.v_+3v3        | 1Dh | ok  |  7.0 | 3.34 Volts
mb.v_+5v         | 1Eh | ok  |  7.0 | 5.04 Volts
mb.v_+12v        | 1Fh | ok  |  7.0 | 12.22 Volts
mb.v_-12v        | 20h | ok  |  7.0 | -12.20 Volts
```

```
mb.v_+2v5core     | 21h | ok  |  7.0 | 2.54 Volts
mb.v_+1v8core     | 22h | ok  |  7.0 | 1.83 Volts
mb.v_+1v2core     | 23h | ok  |  7.0 | 1.21 Volts
io.t_amb          | 24h | ok  | 15.0 | 21 degrees C
p0.t_core         | 2Bh | ok  |  3.0 | 44 degrees C
p0.v_+1v5         | 2Ch | ok  |  3.0 | 1.56 Volts
p0.v_+2v5core     | 2Dh | ok  |  3.0 | 2.64 Volts
p0.v_+1v25core    | 2Eh | ok  |  3.0 | 1.32 Volts
p1.t_core         | 34h | ok  |  3.1 | 40 degrees C
p1.v_+1v5         | 35h | ok  |  3.1 | 1.55 Volts
p1.v_+2v5core     | 36h | ok  |  3.1 | 2.64 Volts
p1.v_+1v25core    | 37h | ok  |  3.1 | 1.32 Volts
ft0.fm0.f0.speed | 43h | ok  | 29.0 | 6000 RPM
ft0.fm1.f0.speed | 44h | ok  | 29.1 | 6000 RPM
ft0.fm2.f0.speed | 45h | ok  | 29.2 | 6000 RPM
ft1.fm0.f0.speed | 46h | ok  | 29.3 | 6000 RPM
ft1.fm1.f0.speed | 47h | ok  | 29.4 | 6000 RPM
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

You can also generate a list of all sensors for a specific Entity. Use the list output to determine which entity you are interested in seeing, then use the `sdr entity` command to get a list of all sensors for that entity. This command accepts an entity ID and an optional entity instance argument. If an entity instance is not specified, it will display all instances of that entity.

The entity ID is given in the fourth field of the output, as read from left to right. For example, in the output shown in the previous example, all the fans are entity 29. The last fan listed (29.5) is entity 29, with instance 5:

```
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

For example, to see all fan-related sensors, you would use the following command that uses the entity 29 argument.

ipmitool -I lanplus -H *<IPADDR>* **-U root -P changeme sdr entity 29**

```
ft0.fm0.fail      | 3Dh | ok  | 29.0 | Predictive Failure Deasserted
ft0.fm0.led       | 00h | ns  | 29.0 | Generic Device @20h:19h.0
ft0.fm1.fail      | 3Eh | ok  | 29.1 | Predictive Failure Deasserted
ft0.fm1.led       | 00h | ns  | 29.1 | Generic Device @20h:19h.1
ft0.fm2.fail      | 3Fh | ok  | 29.2 | Predictive Failure Deasserted
ft0.fm2.led       | 00h | ns  | 29.2 | Generic Device @20h:19h.2
ft1.fm0.fail      | 40h | ok  | 29.3 | Predictive Failure Deasserted
ft1.fm0.led       | 00h | ns  | 29.3 | Generic Device @20h:19h.3
ft1.fm1.fail      | 41h | ok  | 29.4 | Predictive Failure Deasserted
ft1.fm1.led       | 00h | ns  | 29.4 | Generic Device @20h:19h.4
ft1.fm2.fail      | 42h | ok  | 29.5 | Predictive Failure Deasserted
ft1.fm2.led       | 00h | ns  | 29.5 | Generic Device @20h:19h.5
ft0.fm0.f0.speed | 43h | ok  | 29.0 | 6000 RPM
ft0.fm1.f0.speed | 44h | ok  | 29.1 | 6000 RPM
ft0.fm2.f0.speed | 45h | ok  | 29.2 | 6000 RPM
```

```
ft1.fm0.f0.speed | 46h | ok  | 29.3 | 6000 RPM
ft1.fm1.f0.speed | 47h | ok  | 29.4 | 6000 RPM
ft1.fm2.f0.speed | 48h | ok  | 29.5 | 6000 RPM
```

Other queries can include a particular type of sensor. The command in the following example would return a list of all Temperature type sensors in the SDR.

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sdr type
temperature
sys.tempfail     | 03h | ok  | 23.0 | Predictive Failure Deasserted
mb.t_amb         | 05h | ok  |  7.0 | 25 degrees C
fp.t_amb         | 14h | ok  | 12.0 | 25 degrees C
ps.t_amb         | 1Bh | ok  | 10.0 | 24 degrees C
io.t_amb         | 22h | ok  | 15.0 | 23 degrees C
p0.t_core        | 2Ch | ok  |  3.0 | 35 degrees C
p1.t_core        | 35h | ok  |  3.1 | 36 degrees C
```

Using IPMItool to View the ILOM SP System Event Log

The ILOM SP System Event Log (SEL) provides storage of all system events. You can view the SEL with IPMItool. This topic includes the following sections:

Viewing the SEL With IPMItool

There are two different IPMI commands that you can use to see different levels of detail.

- View the ILOM SP SEL with a minimal level of detail by using the `sel list` command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel list
100 | Pre-Init Time-stamp | Entity Presence #0x16 | Device Absent
200 | Pre-Init Time-stamp | Entity Presence #0x26 | Device Present
300 | Pre-Init Time-stamp | Entity Presence #0x25 | Device Absent
400 | Pre-Init Time-stamp | Phys Security  #0x01   | Gen Chassis
```

```
intrusion
500  | Pre-Init Time-stamp  | Entity Presence  #0x12    | Device
Present
```

Note – When you use this command, an event record gives a sensor number, but does not display the name of the sensor for the event. For example, in line 100 in the sample output above, the sensor number `0x16` is displayed. For information about how to map sensor names to the different sensor number formats that might be displayed, see "Sensor Numbers and Sensor Names in SEL Events" on page 152.

- View the ILOM SP SEL with a detailed event output by using the `sel elist` command instead of `sel list`. The `sel elist` command cross-references event records with sensor data records to produce descriptive event output. It takes longer to execute because it has to read from both the SEL and the Static Data Repository (SDR). For increased speed, generate an SDR cache before using the `sel elist command`. See "Using the Sensor Data Repository (SDR) Cache" on page 151. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel elist first 3
100 | Pre-Init Time-stamp   | Temperature fp.t_amb | Upper Non-
critical going high | Reading 31 > Threshold 30 degrees C
200 | Pre-Init Time-stamp   | Power Supply ps1.pwrok | State
Deasserted
300 | Pre-Init Time-stamp   | Entity Presence ps1.prsnt | Device
Present
```

Certain qualifiers are available to refine and limit the SEL output. If you want to see only the first NUM records, add that as a qualifier to the command. If you want to see the last NUM records, use that qualifier. For example, to see the last three records in the SEL, type the following command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel elist last 3
800 | Pre-Init Time-stamp   | Entity Presence ps1.prsnt | Device
Absent
900 | Pre-Init Time-stamp | Phys Security sys.intsw | Gen Chassis
intrusion
a00 | Pre-Init Time-stamp   | Entity Presence ps0.prsnt | Device
Present
```

If you want to get more detailed information on a particular event, you can use the `sel get` *ID* command, in which you specify an SEL record ID. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel get 0x0a00
SEL Record ID : 0a00
Record Type : 02
Timestamp : 07/06/1970 01:53:58
Generator ID : 0020
EvM Revision : 04
```

```
Sensor Type : Entity Presence
Sensor Number : 12
Event Type : Generic Discrete
Event Direction : Assertion Event
Event Data (RAW) : 01ffff
Description : Device Present
Sensor ID : ps0.prsnt (0x12)
Entity ID : 10.0
Sensor Type (Discrete): Entity Presence
States Asserted : Availability State
          [Device Present]
```

In the example above, this particular event describes that Power Supply #0 is detected and present.

Clearing the SEL With IPMItool

To clear the SEL, type the `sel clear` command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sel clear
Clearing SEL. Please allow a few seconds to erase.
```

Using the Sensor Data Repository (SDR) Cache

When working with the ILOM SP, certain operations can be expensive in terms of execution time and the amount of data transferred. Typically, issuing the `sdr elist` command requires the entire SDR to be read from the SP. Similarly, the `sel elist` command needs to read both the SDR and the SEL from the SP in order to cross-reference events and display useful information.

To speed up these operations, it is possible to pre-cache the static data in the SDR and feed it back into IPMItool. This can have a dramatic effect in the processing time for some commands. In order to generate an SDR cache for later use, type the `sdr dump` command. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sdr dump
galaxy.sdr
Dumping Sensor Data Repository to 'galaxy.sdr'
```

After you have generated a cache file, it can be supplied to future invocations of IPMItool with the `-S` option. For example:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme -S galaxy.sdr sel
elist
```

```
100 | Pre-Init Time-stamp | Entity Presence ps1.prsnt | Device Absent
200 | Pre-Init Time-stamp | Entity Presence io.f0.prsnt | Device
Absent
300 | Pre-Init Time-stamp | Power Supply ps0.vinok | State Asserted
...
```

Sensor Numbers and Sensor Names in SEL Events

Depending on which IPMI command you use, the sensor number that is displayed for an event might appear in slightly different formats. See the following examples:

- The sensor number for the sensor ps1.prsnt (power supply 1 present) can be displayed as either `1Fh` or `0x1F`.
- `38h` is equivalent to `0x38`.
- `4Bh` is equivalent to `0x4B`.

The output from certain commands might not display the sensor name along with the corresponding sensor number. To see all sensor names in your server mapped to the corresponding sensor numbers, you can use the following command:

```
ipmitool -H 129.144.82.21 -U root -P changeme sdr elist
sys.id           | 00h | ok  | 23.0 | State Asserted
sys.intsw        | 01h | ok  | 23.0 |
sys.psfail     | 02h | ok  | 23.0 | Predictive Failure Asserted
...
```

In the sample output above, the sensor name is in the first column and the corresponding sensor number is in the second column.

For a detailed explanation of each sensor, listed by name, refer to the *Integrated Lights Out Manager Supplement*.

Viewing Component Information With IPMItool

You can view information about system hardware components. The software refers to these components as field-replaceable unit (FRU) devices.

To read the FRU inventory information on these servers, you must first have the FRU ROMs programmed. After that is done, you can see a full list of the available FRU data by using the `fru print` command, as shown in the following example (only two FRU devices are shown in the example, but all devices would be shown).

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme fru print
FRU Device Description : Builtin FRU Device (ID 0)
          Board Mfg             : BENCHMARK ELECTRONICS
          Board Product         : ASSY,SERV PROCESSOR,X4X00
          Board Serial          : 0060HSV-0523000195
          Board Part Number     : 501-6979-02
          Board Extra           : 000-000-00
          Board Extra           : HUNTSVILLE,AL,USA
          Board Extra           : b302
          Board Extra           : 06
          Board Extra           : GRASP
          Product Manufacturer  : SUN MICROSYSTEMS
          Product Name          : ILOM
FRU Device Description : sp.net0.fru (ID 2)
          Product Manufacturer  : MOTOROLA
          Product Name          : FAST ETHERNET CONTROLLER
          Product Part Number   : MPC8248 FCC
          Product Serial        : 00:03:BA:D8:73:AC
          Product Extra         : 01
          Product Extra         : 00:03:BA:D8:73:AC

...
```

Viewing and Setting Status LEDs

In these servers, all LEDS are activity-oriented; that is, the SP is responsible for the I2C commands that assert and deassert each GPIO pin for each flash cycle.

The IPMItool command for reading LED status is:

ipmitool -I lanplus -H *<IPADDR>* **sunoem led get** *<sensor ID>*

The IPMItool command for setting LED status is:

ipmitool -I lanplus -H *<IPADDR>* **sunoem led set** *<sensor ID> <LED mode>*

It is possible for both of these commands to operate on all sensors at once by substituting **all** for the sensor ID. That way, you can easily get a list of all LEDs and their status with one command.

See "LED Sensor IDs" on page 154 and "LED Modes" on page 155 for information about the variables in these commands.

LED Sensor IDs

All LEDs in this server are represented by two sensors:

- A Generic Device Locator record describes the location of the sensor in the system. It has an `.led` suffix and is the name that is fed into the `led set` and `led get` commands. You can get a list of all of these sensors by issuing the `sdr list generic` command.
- A Digital Discrete fault sensor monitors the status of the LED pin and is asserted when the LED is active. These sensors have a `.fail` suffix and are used to report events to the SEL.

Each LED has both a descriptor and a status reading sensor, and the two are linked; that is, if you use the *`.led`* sensor to turn on a particular LED, then the status change is represented in the associated *`.fail`* sensor. Also, for some of these, an event is generated in the SEL. For LEDs that blink on failure instead of steady-on, the events are not generated (this is because it would display an event every time the LED flashed in the blink cycle).

TABLE 12-2 lists the LED sensor IDs in these servers. See "Identifying Status and Fault LEDs" on page 171 for diagrams of the LED locations.

TABLE 12-2 LED Sensor IDs

LED Sensor ID	Description
sys.power.led	System Power (front+back)
sys.locate.led	System Locate (front+back)
sys.alert.led	System Alert (front+back)
sys.psfail.led	System Power Supply Failed
sys.tempfail.led	System Over Temperature
sys.fanfail.led	System Fan Failed
bp.power.led	Back Panel Power
bp.locate.led	Back Panel Locate
bp.alert.led	Back Panel Alert
fp.power.led	Front Panel Power
fp.locate.led	Front Panel Locate
fp.alert.led	Front Panel Alert
io.hdd0.led	Hard Disk 0 Failed
io.hdd1.led	Hard Disk 1 Failed
io.hdd2.led	Hard Disk 2 Failed

TABLE 12-2 LED Sensor IDs *(Continued)*

LED Sensor ID	Description
io.hdd3.led	Hard Disk 3 Failed
io.f0.led	I/O Fan Failed
p0.led	CPU 0 Failed
p0.d0.led	CPU 0 DIMM 0 Failed
p0.d1.led	CPU 0 DIMM 1 Failed
p0.d2.led	CPU 0 DIMM 2 Failed
p0.d3.led	CPU 0 DIMM 3 Failed
p1.led	CPU 1 Failed
p1.d0.led	CPU 1 DIMM 0 Failed
p1.d1.led	CPU 1 DIMM 1 Failed
p1.d2.led	CPU 1 DIMM 2 Failed
p1.d3.led	CPU 1 DIMM 3 Failed
ft0.fm0.led	Fan Tray 0 Module 0 Failed
ft0.fm1.led	Fan Tray 0 Module 1 Failed
ft0.fm2.led	Fan Tray 0 Module 2 Failed
ft1.fm0.led	Fan Tray 1 Module 0 Failed
ft1.fm1.led	Fan Tray 1 Module 1 Failed
ft1.fm2.led	Fan Tray 1 Module 2 Failed

LED Modes

You supply the modes in TABLE 12-3 to the `led set` commands to specify the mode in which you want the LED to be placed.

TABLE 12-3 LED Modes

Mode	Description
OFF	LED off
ON	LED steady-on
STANDBY	100 ms on, 2900 ms off
SLOW	1 Hz blink rate
FAST	4 Hz blink rate

LED Sensor Groups

Because each LED has its own sensor and can be controlled independently, there is some overlap in sensors. In particular, there are separate LEDs defined for the power, locate, and alert LEDs on the front and back panels.

It is desirable to have these sensors "linked" so that both the front and back panel LEDs can be controlled at the same time. This is handled through the use of Entity Association Records. These are records in the SDR that contain a list of entities that are considered part of a group.

For each Entity Association Record we also define another Generic Device Locator as a logical entity to indicate to system software that it refers to a group of LEDS rather than a single physical LED. TABLE 12-4 describes the LED sensor groups.

TABLE 12-4 LED Sensor Groups

Group Name	Sensors in Group
sys.power.led	bp.power.led fp.power.led
sys.locate.led	bp.locate.led fp.locate.led
sys.alert.led	bp.alert.led fp.alert.led

For example, to set both the front and back panel Power/OK LEDs to a standby blink rate, you could type the following command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem led set
sys.power.led standby
Set LED fp.power.led to STANDBY
Set LED bp.power.led to STANDBY
```

You could turn off the back panel Power/OK LED but leave the front panel Power/OK LED blinking by typing the following command:

```
ipmitool -I lanplus -H <IPADDR> -U root -P changeme sunoem led set
bp.power.led off
Set LED bp.power.led to OFF
```

Using IPMItool Scripts for Testing

For testing purposes, it is often useful to change the status of all (or at least several) LEDs at once. You can do this by constructing an IPMItool script and executing it with the `exec` command.

The following example shows a script to turn on all fan module LEDS:

```
sunoem led set ft0.fm0.led on
sunoem led set ft0.fm1.led on
sunoem led set ft0.fm2.led on
sunoem led set ft1.fm0.led on
sunoem led set ft1.fm1.led on
sunoem led set ft1.fm2.led on
```

If this script file were then named `leds_fan_on.isc`, you would use it in a command as follows:

ipmitool -I lanplus -H *<IPADDR>* **-U root -P changeme exec leds_fan_on.isc**

CHAPTER 13

Event Logs and POST Codes

This chapter contains information about the BIOS event log, the BMC system event log, the power-on self test (POST), and console redirection. For more information on the BIOS event log and post codes, refer to the *Sun Fire X4540 Server Service Manual* (819-4359).

This chapter includes the following topics:

Viewing Event Logs

To view the BIOS event log and the BMC system event log.

1. **Turn on main power so that all components are powered on . Use a non-conducting ball-point pen or stylus to press and release the Power button on the server front panel. See** FIGURE 8-4**.**

   When main power is applied to the full server, the Power/OK LED next to the Power button lights and remains lit.

2. **Enter the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

   The BIOS Main menu screen is displayed.

3. **View the BIOS event log:**

   a. **From the BIOS Main Menu screen, select Advanced.**

      The Advanced Settings screen is displayed:

```
Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit
*******************************************************************************
* Advanced Settings                                * Options for CPU        *
* ************************************************ *                        *
* WARNING: Setting wrong values in below sections   *                        *
*          may cause system to malfunction.         *                        *
*                                                   *                        *
* * CPU Configuration                               *                        *
* * IDE Configuration                               *                        *
* * SuperIO Configuration                           *                        *
* * ACPI Configuration                              *                        *
* * Event Log Configuration                         *                        *
* * Hyper Transport Configuration                   *                        *
* * IPMI 2.0 Configuration                          *                        *
* * MPS Configuration                               * **    Select Screen    *
* * PCI express Configuration                       *                        *
* * AMD PowerNow Configuration                      * **    Select Item      *
* * Remote Access Configuration                     * Enter Go to Sub Screen *
* * USB Configuration                               * F1    General Help     *
*                                                   * F10   Save and Exit    *
*                                                   * ESC   Exit             *
* ************************************************************************** *
```

   b. **From the Advanced Settings screen, select Event Log Configuration.**

      The Advanced Menu Event Logging Details screen is displayed.

```
Advanced
*******************************************************************************
* Event Logging details                            * View all unread events *
* ************************************************ * on the Event Log.      *
* View Event Log                                   *                        *
* Mark all events as read                          *                        *
* Clear Event Log                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  *                        *
*                                                  * **    Select Screen    *
*                                                  * **    Select Item      *
*                                                  * Enter Go to Sub Screen *
*                                                  * F1    General Help     *
*                                                  * F10   Save and Exit    *
*                                                  * ESC   Exit             *
*                                                  *                        *
*                                                  *                        *
*******************************************************************************
```

   c. **From the Event Logging Details screen, select View Event Log.**

      All unread events are displayed.

4. **View the BMC system event log:**

a. **From the BIOS Main Menu screen, select Advanced.**

The Advanced Settings screen is displayed. See below.

b. **From the Advanced Settings screen, select IPMI 2.0 Configuration.**

The Advanced Menu IPMI 2.0 Configuration screen is displayed:

```
Advanced
*******************************************************************************
* IPMI 2.0 Configuration                          * View all events in the *
* *********************************************** * BMC Event Log.         *
* Status Of BMC                  Working          *                         *
* * View BMC System Event Log                     * It will take up to     *
* Reload BMC System Event Log                     * 60 Seconds approx.      *
* Clear BMC System Event Log                      * to read all            *
* * LAN Configuration                             * BMC SEL records.        *
* * PEF Configuration                             *                         *
* BMC Watch Dog Timer Action     [Disabled]       *                         *
*                                                 *                         *
*                                                 *                         *
*                                                 *                         *
*                                                 * **    Select Screen    *
*                                                 * **    Select Item      *
*                                                 * Enter Go to Sub Screen *
*                                                 * F1    General Help     *
*                                                 * F10   Save and Exit    *
*                                                 * ESC   Exit             *
*                                                 *                         *
*                                                 *                         *
*******************************************************************************
```

c. **From the IPMI 2.0 Configuration screen, select View BMC System Event Log.**

The log takes about 60 seconds to generate, then it is displayed on the screen.

5. **If the problem with the server is not evident, continue with** "Using the ILOM Service Processor GUI to View System Information" on page 49**, or** "Using IPMItool to View System Information" on page 61**.**

About Power-On Self-Test (POST)

The system BIOS provides a rudimentary power-on self-test. After power on, POST does the following tasks:

- Checks the basic devices required for the server to operate
- Tests memory, tests the LSI SAS1068E disk controllers
- Probes and enumerates the attached disks
- Initializes the two Intel dual-gigabit Ethernet controllers

The progress of the self-test is indicated by a series of POST codes. These codes are displayed at the bottom right corner of the system's VGA screen (after the self-test has progressed far enough to initialize the system video). However, the codes are displayed as the self-test runs and scroll off of the screen too quickly to be read (see "POST Codes" on page 166).

An alternate method of displaying the POST codes is to redirect the output of the console to a serial port (see "Redirecting Console Output" on page 163).

This section includes the following topics:

BIOS POST Memory Test Overview

The BIOS POST memory test is performed as follows:

1. The first megabyte of DRAM is tested by the BIOS before the BIOS code is shadowed (that is, copied from ROM to DRAM).

2. Once executing out of DRAM, the BIOS performs a simple memory test (a write/read of every location with the pattern `55aa55aa`).

Note – This memory test is performed only if Quick Boot is *not* enabled from the Boot Settings Configuration screen. Enabling Quick Boot causes the BIOS to skip the memory test. See "Changing POST Options" on page 164 for more information.

Note – Because the Sun Fire X4540 server can contain up to 64GB of memory, the memory test can take several minutes. You can escape from POST testing by pressing any key during POST.

3. The BIOS polls the memory controllers for both correctable and uncorrectable memory errors and logs those errors into the service processor.

Redirecting Console Output

Use the following instructions to access the service processor and redirect the console output so that the BIOS POST codes can be read.

1. **Initialize the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

   The BIOS Main menu screen is displayed.

2. **Select the Advanced menu tab.**

   The Advanced Settings screen is displayed.

3. **Select IPMI 2.0 Configuration.**

   The IPMI 2.0 Configuration screen is displayed.

4. **Select the LAN Configuration menu item.**

   The LAN Configuration screen is displayed.

5. **Determine the server's IP address:**

   a. **Select the IP Assignment option that you want to use (**`DHCP` **or** `Static`**).**

      If you choose `DHCP`, the server's IP address is retrieved from your network's DHCP server and displayed using the following format:
      `Current IP address in BMC : xxx.xxx.xxx.xxx`

      If you choose `Static` to assign the IP address manually, perform the following steps:

   b. **Type the IP address in the IP Address field.**

      You can also enter the subnet mask and default gateway settings in their respective fields.

   c. **Select Commit and press Return to commit the changes.**

   d. **Select Refresh and press Return to see your new settings displayed in the** `Current IP address in BMC` **field.**

6. **Start a web browser and type the service processor's IP address in the browser's URL field.**
7. **When you are prompted for a user name and password, type the following:**

   User Name: **`root`**

   Password: **`changeme`**

   The Sun Integrated Lights Out Manager main GUI screen is displayed.
8. **Click the Remote Control tab.**
9. **Click the Redirection tab.**
10. **Set the color depth for the redirection console at either 6 or 8 bits.**
11. **Click the Start Redirection button.**
12. **When you are prompted for a user name and password, type the following:**

    User Name: **`root`**

    Password: **`changeme`**

    The current POST screen is displayed.

Changing POST Options

These instructions are optional, but you can use them to change the operations that the server performs during POST testing.

▼ To Change POST Options

1. **Initialize the BIOS Setup utility by pressing the F2 key while the system is performing the power-on self-test (POST).**

The BIOS Main menu screen is displayed.

2. **Select Boot.**

The Boot Settings screen is displayed.

```
Main    Advanced    PCIPnP    Boot    Security    Chipset    Exit
*******************************************************************************
* Boot Settings                                  * Configure Settings     *
* ********************************************** * during System Boot.    *
* * Boot Settings Configuration                  *                         *
*                                                *                         *
* * Boot Device Priority                         *                         *
* * Hard Disk Drives                             *                         *
*                                                *                         *
*                                                *                         *
*                                                *                         *
*                                                *                         *
*                                                *                         *
*                                                *                         *
*                                                * **    Select Screen    *
*                                                * **    Select Item      *
*                                                * Enter Go to Sub Screen *
*                                                * F1    General Help     *
*                                                * F10   Save and Exit    *
*                                                * ESC   Exit             *
*                                                *                         *
*                                                *                         *
*******************************************************************************
```

3. Select Boot Settings Configuration.

The Boot Settings Configuration screen is displayed.

```
Boot
*******************************************************************************
* Boot Settings Configuration                    * Allows BIOS to skip    *
* ********************************************** * certain tests while    *
* Quick Boot                    [Disabled]       * booting. This will     *
* System Configuration Display  [Disabled]       * decrease the time      *
* Quiet Boot                    [Disabled]       * needed to boot the     *
* Language                      [English]        * system.                *
* AddOn ROM Display Mode        [Force BIOS]     *                         *
* Bootup Num-Lock               [On]             *                         *
* Wait For 'F1' If Error        [Disabled]       *                         *
* Interrupt 19 Capture          [Disabled]       *                         *
*                                                *                         *
*                                                * **    Select Screen    *
*                                                * **    Select Item      *
*                                                * +-    Change Option    *
*                                                * F1    General Help     *
*                                                * F10   Save and Exit    *
*                                                * ESC   Exit             *
*                                                *                         *
*******************************************************************************
```

4. On the Boot Settings Configuration screen, there are several options that you can enable or disable:

- **Quick Boot –** This option is disabled by default. If you enable this, the BIOS skips certain tests while booting, such as the extensive memory test. This decreases the time it takes for the system to boot.
- **System Configuration Display –** This option is disabled by default. If you enable this, the System Configuration screen is displayed before booting begins.
- **Quiet Boot –** This option is disabled by default. If you enable this, the Sun Microsystems logo is displayed instead of POST codes.

POST Codes

TABLE 13-1 contains descriptions of each of the POST codes, listed in the same order in which they are generated. These POST codes appear as a four-digit string that is a combination of two-digit output from primary I/O port 80 and two-digit output from secondary I/O port 81. In the POST codes listed in TABLE 13-1, the first two digits are from port 81 and the last two digits are from port 80.

TABLE 13-1 POST Codes

Post Code	Description
00d0	Coming out of POR, PCI configuration space initialization, Enabling 8111's SMBus.
00d1	Keyboard controller BAT, Waking up from PM, Saving power-on CPUID in scratch CMOS.
00d2	Disable cache, full memory sizing, and verify that flat mode is enabled.
00d3	Memory detections and sizing in boot block, cache disabled, IO APIC enabled.
01d4	Test base 512KB memory. Adjust policies and cache first 8MB.
01d5	Bootblock code is copied from ROM to lower RAM. BIOS is now executing out of RAM.
01d6	Key sequence and OEM specific method is checked to determine if BIOS recovery is forced. If next code is E0, BIOS recovery is being executed. Main BIOS checksum is tested.
01d7	Restoring CPUID; moving bootblock-runtime interface module to RAM; determine whether to execute serial flash.
01d8	Uncompressing runtime module into RAM. Storing CPUID information in memory.
01d9	Copying main BIOS into memory.
01da	Giving control to BIOS POST.
0004	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. If the CMOS checksum is bad, update CMOS with power-on default values.
00c2	Set up boot strap processor for POST. This includes frequency calculation, loading BSP microcode, and applying user requested value for GART Error Reporting setup question.
00c3	Errata workarounds applied to the BSP (#78 & #110).
00c6	Re-enable cache for boot strap processor, and apply workarounds in the BSP for errata #106, #107, #69, and #63 if appropriate.
00c7	HT sets link frequencies and widths to their final values.
000a	Initializing the 8042 compatible Keyboard Controller.
000c	Detecting the presence of Keyboard in KBC port.
000e	Testing and initialization of different Input Devices. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1.

TABLE 13-1 POST Codes *(Continued)*

Post Code	Description
8600	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.
de00	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.
8613	Initialize PM regs and PM PCI regs at Early-POST. Initialize multi host bridge, if system supports it. Setup ECC options before memory clearing. Enable PCI-X clock lines in the 8131.
0024	Uncompress and initialize any platform specific BIOS modules.
862a	BBS ROM initialization.
002a	Generic Device Initialization Manager (DIM) - Disable all devices.
042a	ISA PnP devices - Disable all devices.
052a	PCI devices - Disable all devices.
122a	ISA devices - Static device initialization.
152a	PCI devices - Static device initialization.
252a	PCI devices - Output device initialization.
202c	Initializing different devices. Detecting and initializing the video adapter installed in the system that has optional ROMs.
002e	Initializing all the output devices.
0033	Initializing the silent boot module. Set the window for displaying text information.
0037	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.
4538	PCI devices - IPL device initialization.
5538	PCI devices - General device initialization.
8600	Preparing CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLI HLT state.

POST Code Checkpoints

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. TABLE 13-2 describes the type of checkpoints that might occur during the POST portion of the BIOS. These two-digit checkpoints are the output from primary I/O port 80.

TABLE 13-2 POST Code Checkpoints

Post Code	Description
03	Disable NMI, Parity, video for EGA, and DMA controllers. At this point, only ROM accesses are to the GPNV. If BB size is 64K, require to turn on ROM Decode below FFFF0000h. It should allow USB to run in E000 segment. The HT must program the NB specific initialization and OEM specific initialization can program if it need at beginning of BIOS POST, like overriding the default values of Kernel Variables.
04	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. Verify CMOS checksum manually by reading storage area. If the CMOS checksum is bad, update CMOS with power-on default values and clear passwords. Initialize status register A. Initializes data variables that are based on CMOS setup questions. Initializes both the 8259-compatible PICs in the system.
05	Initializes the interrupt controlling hardware (generally PIC) and interrupt vector table.
06	Do R/W test to CH-2 count reg. Initialize CH-0 as system timer. Install the POSTINT1Ch handler. Enable IRQ-0 in PIC for system timer interrupt. Traps INT1Ch vector to "POSTINT1ChHandlerBlock."
C0	Early CPU Init Start--Disable Cache--Init Local APIC.
C1	Set up boot strap processor information.
C2	Set up boot strap processor for POST. This includes frequency calculation, loading BSP microcode, and applying user requested value for GART Error Reporting setup question.
C3	Errata workarounds applied to the BSP (#78 & #110).
C5	Enumerate and set up application processors. This includes microcode loading and workarounds for errata (#78, #110, #106, #107, #69, #63).
C6	Re-enable cache for boot strap processor, and apply workarounds in the BSP for errata #106, #107, #69, and #63 if appropriate. In case of mixed CPU steppings, errors are sought and logged, and an appropriate frequency for all CPUs is found and applied. NOTE: APs are left in the CLI HLT state.
C7	The HT sets link frequencies and widths to their final values. This routine gets called after CPU frequency has been calculated to prevent bad programming.
0A	Initializes the 8042 compatible Keyboard Controller.
0B	Detects the presence of PS/2 mouse.
0C	Detects the presence of Keyboard in KBC port.
0E	Testing and initialization of different Input Devices. Also, update the Kernel Variables. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1. Uncompress all available language, BIOS logo, and Silent logo modules.
13	Initializes PM regs and PM PCI regs at Early-POST, Initializes multi host bridge, if system support it. Setup ECC options before memory clearing. REDIRECTION causes corrected data to written to RAM immediately. CHIPKILL provides 4 bit error det/corr of x4 type memory. Enable PCI-X clock lines in the 8131.

TABLE 13-2 POST Code Checkpoints *(Continued)*

Post Code	Description
20	Relocate all the CPUs to a unique SMBASE address. The BSP will be set to have its entry point at A000:0. If less than 5 CPU sockets are present on a board, subsequent CPUs entry points will be separated by 8000h bytes. If more than 4 CPU sockets are present, entry points are separated by 200h bytes. CPU module will be responsible for the relocation of the CPU to correct address. NOTE: APs are left in the INIT state.
24	Uncompress and initialize any platform-specific BIOS modules.
30	Initializes System Management Interrupt.
2A	Initializes different devices through DIM.
2C	Initializes different devices. Detects and initializes the video adapter installed in the system that have optional ROMs.
2E	Initializes all the output devices.
31	Allocate memory for ADM module and uncompress it. Give control to ADM module for initialization. Initializes language and font modules for ADM. Activate ADM module.
33	Initializes the silent boot module. Sets the window for displaying text information.
37	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.
38	Initializes different devices through DIM.
39	Initializes DMAC-1 and DMAC-2.
3A	Initialize RTC date/time.
3B	Test for total memory installed in the system. Also, Check for DEL or ESC keys to limit memory test. Display total memory in the system.
3C	By this point, RAM read/write test is completed, program memory holes or handle any adjustments needed in RAM size with respect to NB. Test if HT Module found an error in BootBlock and CPU compatibility for MP environment.
40	Detect different devices (Parallel ports, serial ports, and coprocessor in CPU, ... etc.) successfully installed in the system and update the BDA, EBDA, ... etc.
50	Programming the memory hole or any kind of implementation that needs an adjustment in system RAM size if needed.
52	Updates CMOS memory size from memory found in memory test. Allocates memory for Extended BIOS Data Area from base memory.
60	Initializes NUM-LOCK status and programs the KBD typematic rate.
75	Initializes Int-13 and prepare for IPL detection.
78	Initializes IPL devices controlled by BIOS and option ROMs.
7A	Initializes remaining option ROMs.
7C	Generate and write contents of ESCD in NVRam.

TABLE 13-2 POST Code Checkpoints *(Continued)*

Post Code	Description
84	Log errors encountered during POST.
85	Display errors to the user and gets the user response for error.
87	Execute BIOS setup if needed/requested.
8C	After all device initialization is done, programmed any user selectable parameters relating to NB/SB, such as timing parameters, non-cacheable regions and the shadow RAM cacheability, and do any other NB/SB/PCIX/OEM specific programming needed during Late-POST. Background scrubbing for DRAM, and L1 and L2 caches are set up based on setup questions. Get the DRAM scrub limits from each node.
8D	Build ACPI tables (if ACPI is supported).
8E	Program the peripheral parameters. Enable/Disable NMI as selected.
90	Late POST initialization of system management interrupt.
A0	Check boot password if installed.
A1	Clean-up work needed before booting to OS.
A2	Takes care of runtime image preparation for different BIOS modules. Fill the free area in F000h segment with 0FFh. Initializes the Microsoft IRQ Routing Table. Prepares the runtime language module. Disables the system configuration display if needed.
A4	Initialize runtime language module.
A7	Displays the system configuration screen if enabled. Initialize the CPUs before boot, which includes the programming of the MTRRs.
A8	Prepare CPU for OS boot including final MTRR values.
A9	Wait for user input at config display if needed.
AA	Uninstall POST INT1Ch vector and INT09h vector. Deinitializes the ADM module.
AB	Prepare BBS for Int 19 boot.
AC	Any kind of Chipsets (NB/SB) specific programming needed during End- POST, just before giving control to runtime code booting to OS. Programmed the system BIOS (0F0000h shadow RAM) cacheability. Ported to handle any OEM specific programming needed during End-POST. Copy OEM specific data from POST_DSEG to RUN_CSEG.
B1	Save system context for ACPI.
00	Prepares CPU for booting to OS by copying all of the context of the BSP to all application processors present. NOTE: APs are left in the CLIHLT state.
61-70	OEM POST Error. This range is reserved for chipset vendors and system manufacturers. The error associated with this value may be different from one platform to the next.

CHAPTER 14

Identifying Status and Fault LEDs

This appendix contains information about the external and internal LEDs on the Sun Fire Sun Fire X4500/X4540 Servers server.

This chapter includes the following topics:

Sections describe the controls and indicators on the front and rear panels of the Sun Fire X4540 server. These sections describe external status LEDs that you can see from the outside of the server.

Additional sections describe internal status and fault LEDs that can only be viewed with the hard disk drive cover, system controller cover, and fan cover removed.

The following figures and tables describe the features and status indicator LEDs that are visible outside of the server.

Front Panel Features

FIGURE 14-1 shows the front panel. FIGURE 14-2 shows the controls and indicator details. FIGURE 14-1 describes the controls and indicators.

FIGURE 14-1 Sun Fire X4540 Server Front Panel Features

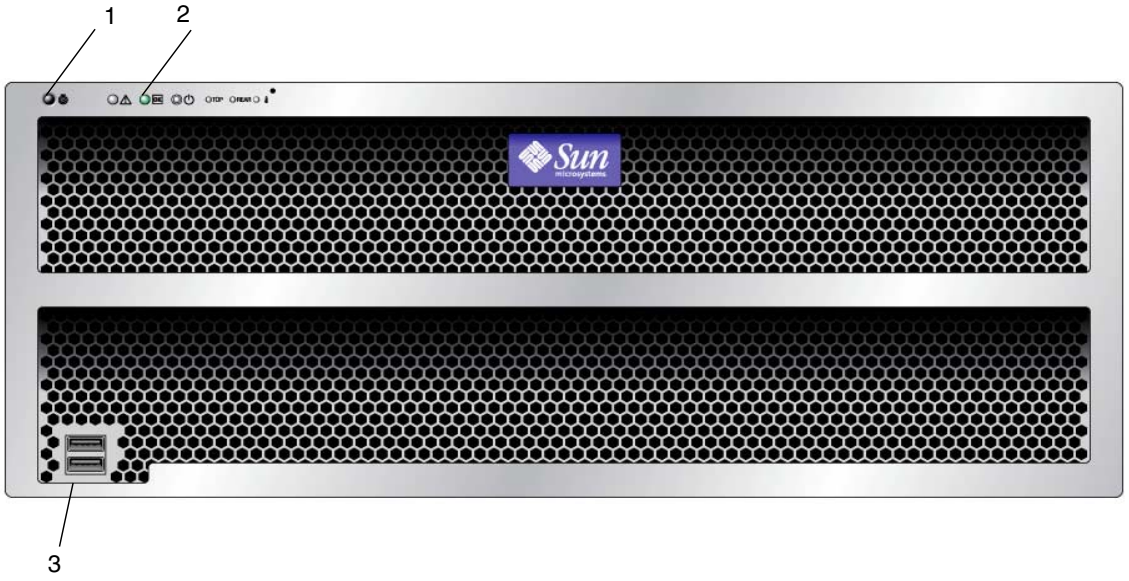


Figure Legend

1	Locate button
2	Power/OK LED
3	USB ports (2)

FIGURE 14-2 Sun Fire X4540 Server Front Panel Controls and Indicators

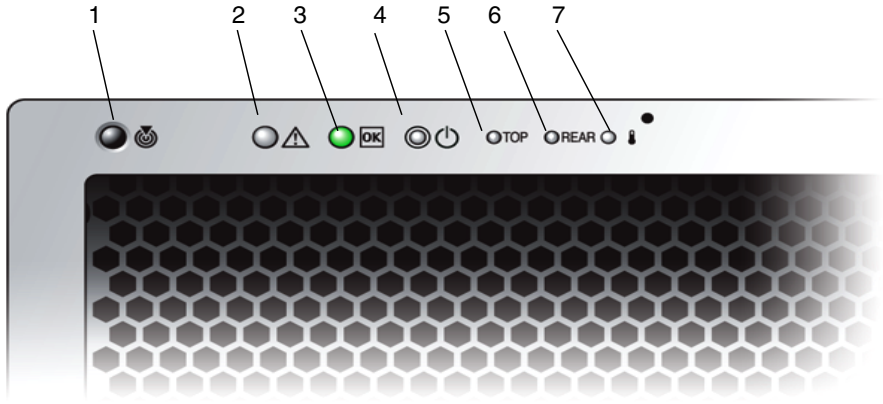


TABLE 14-1 Front Panel Controls and Indicators

#	Name	Color	Description
1	Locate button/LED	White	Operators can turn this LED On remotely to help then locate the server in a crowded server room. Press to turn off. Pressing the Locate LED/Switch for five seconds turns all indicators ON for 15 seconds.
2	System Fault	White	On – When service action is required.
3	Power/Operation	Green	Steady – Power is On. Blink – Standby power is On but main power is Off. Off – Power is Off.
4	System power button	Grey	To power on main power for all the server components.
5	Top failure LED	Amber	On – HDD or fan fault.
6	Rear failure LED	Amber	On – Power supply, or system controller fault (service is required).
7	Over Temperature LED	Amber	On – When system is over temperature.

Rear Panel Features

FIGURE 14-3 shows all the features of the rear panel. TABLE 14-2 describes each rear panel feature.

FIGURE 14-3 Sun Fire X4540 Server Rear Panel

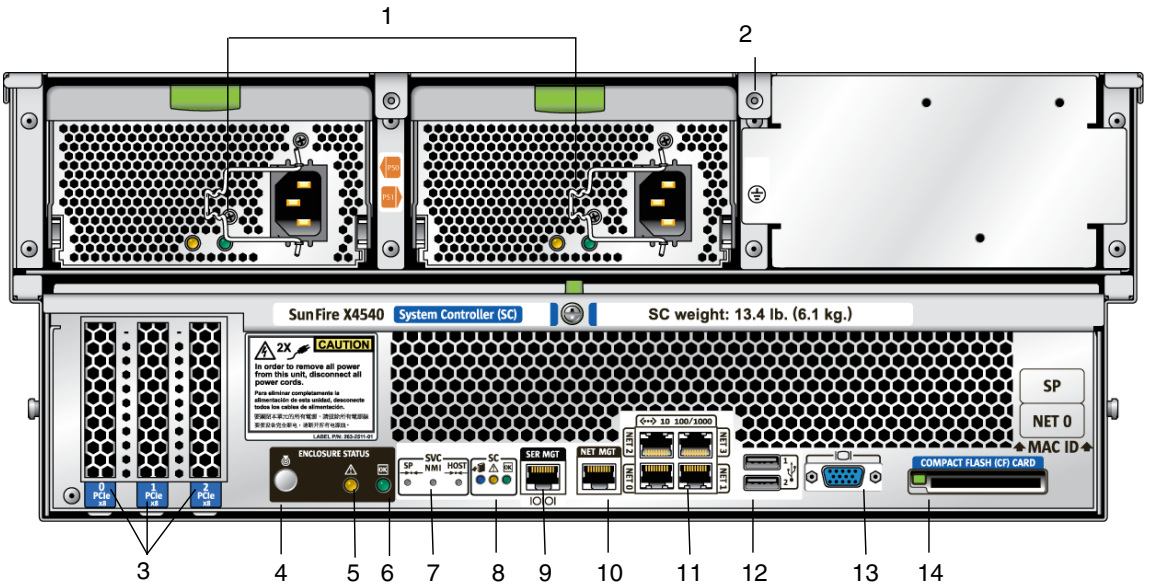


TABLE 14-2 Rear Panel Features

#	Name	Description
1	AC power connectors	Verify that the PS LEDs are green. Each power supply has its own AC connector with a clip to secure its power cable.
2	Chassis ground	Connect grounding straps here.
3	0 PCI-e, 1 PCI-e, 2 PCI-e	Slots for three PCI-e cards.
4	Locate button/LED	White Operators can turn this LED On remotely to help then locate the server in a crowded server room. Press to turn off.
5	Fault LED	Amber – When on, service action required. Steady – Power is On. Off – Power is Off.

TABLE 14-2 Rear Panel Features

#	Name	Description
6	OK LED 	Green – Service action allowed. When On, service action is required. Blink – Standby power is On but main power is Off.
7	SVC Service buttons	SP – Reset Service Processor. NMI – Non-Maskable Interrupt dump. Sends an NMI to the CPU. Used for debugging only. Host – Reset Host Bus Adapter. Do not use these buttons unless instructed by Sun service personnel. To operate these buttons, insert a stylus or a straightened paper clip into the recess.
8	SC - System controller status LEDs	Blue – Ready to remove.  Amber – Fault, service action required.  Green – Operational, no action required. 
9	SER MGT	Serial management port (serial connection to service processor).
10	NET MGT (S)	Net management and service processor port.
11	10/100/1000	GigabitEthernet ports connect server to Ethernet.
12	USB connectors	Connect USB devices.
13	Video connector	Connect video monitor.
14	Compact flash (CF) card	Insert compact flash card devices.

Internal Status Indicator LEDs

The Sun Fire X4540 server has internal status board LEDs for the CPU board, the CPU and DIMM slots on the CPU board. The system includes internal LEDs on the disk drives, the fan trays, and the PCI slots.

See the following figures and tables for information about the LEDs that you can view inside of the server.

- FIGURE 14-4 and FIGURE 14-5 show the disk drive and fan tray LEDs.
- FIGURE 14-6 and TABLE 14-3 describe the internal LED and button locations.

Disk Drive and Fan Tray LEDs

FIGURE 14-4 shows the location of the disk drive and fan trays. FIGURE 14-5 shows a close-up view of the disk drive and fan trays and also shows the symbols that identify the LEDs.

FIGURE 14-4 Disk Drives and Fan Trays

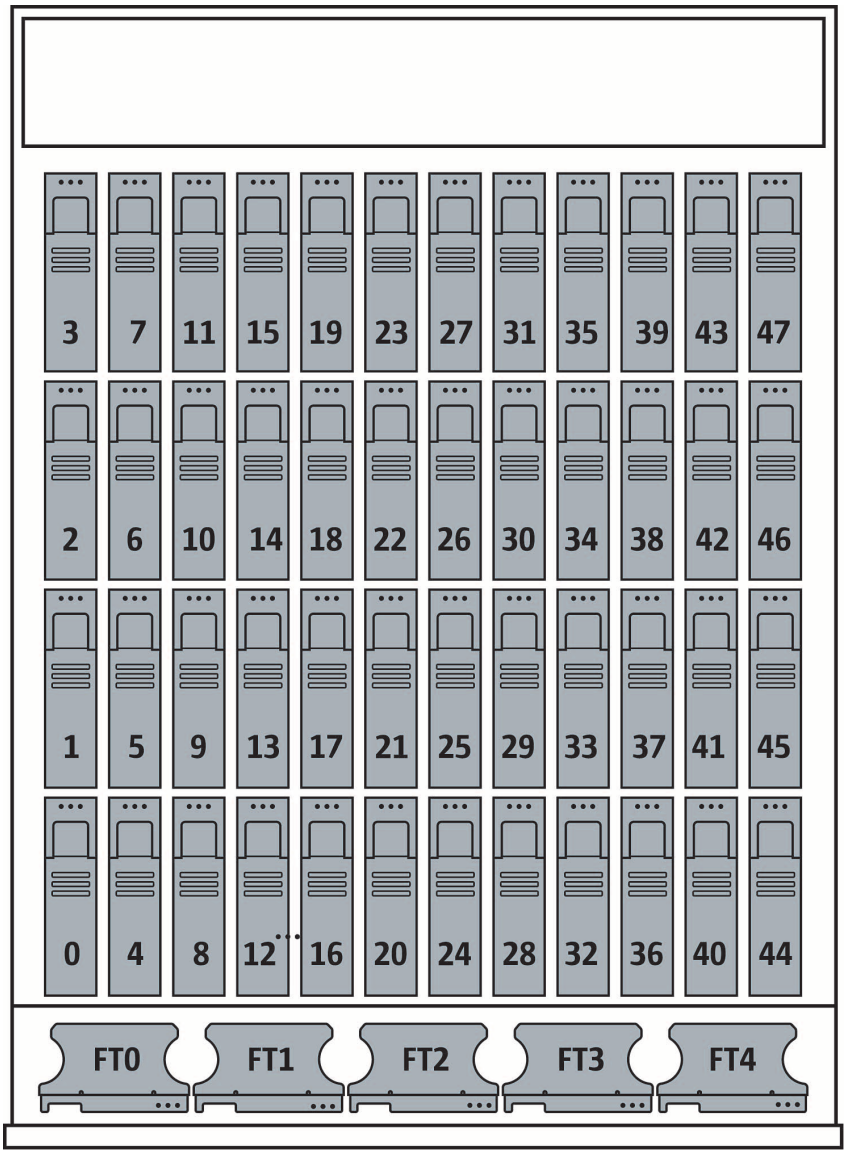
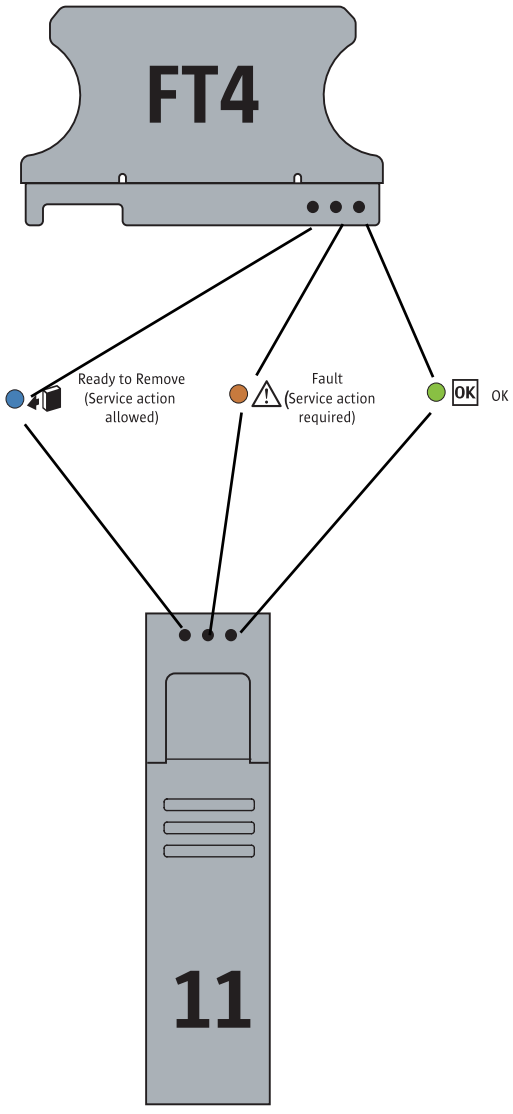


FIGURE 14-5 Disk Drive and Fan Tray LEDs



CPU Board LEDs

The CPU board has three types of LEDs, DIMM fault, CPU fault, and battery fault.

The CPU LEDs are active only when the Remind button is depressed. CPU LEDs blink to indicate a failure, otherwise they stay Off.

Note – The CPU and DIMM LEDs continue to indicate a failure until the system is powered on. The Battery LED continues to indicate a failure until the service processor is started.

Internal LEDs appear in FIGURE 14-6 and are listed in TABLE 14-3.

FIGURE 14-6 CPU Module LED and Button Locations

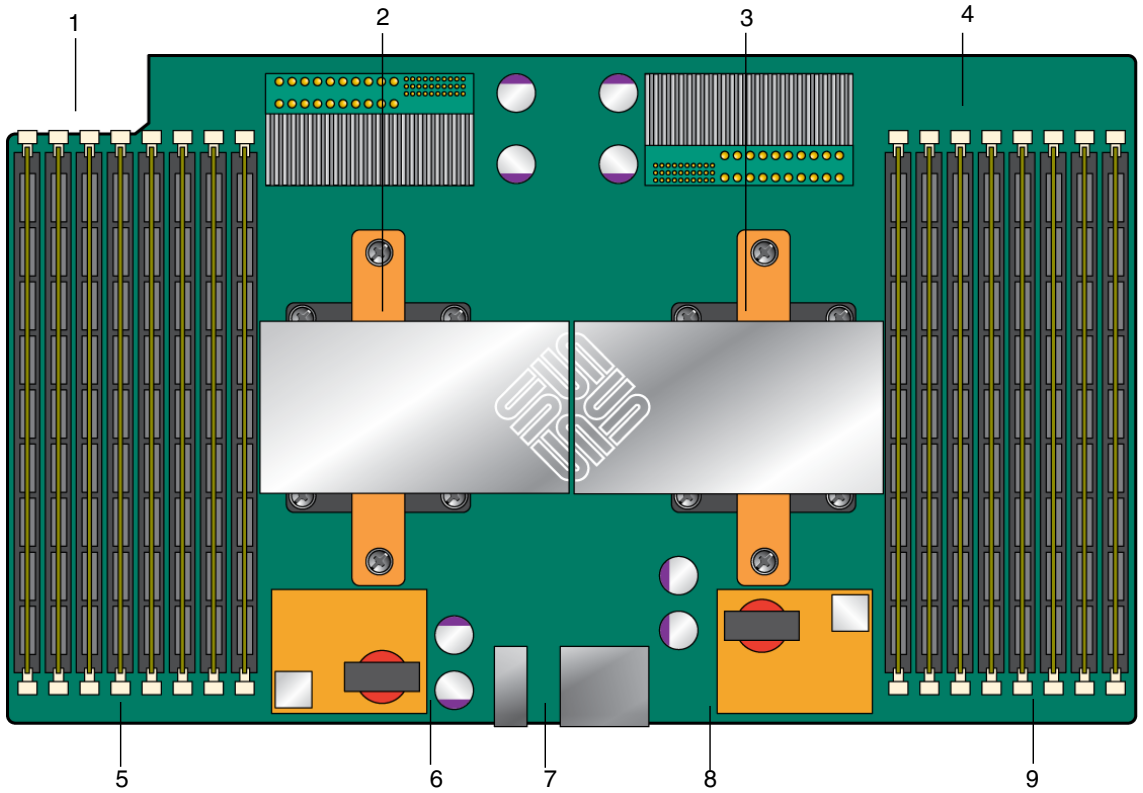


Figure Legend

1	DIMMs 0 2 1 3
2	CPU 1 (under heatsink)
3	CPU 0 (under heatsink)
4	DIMMs 3 1 2 0
5	DIMM fault LEDs
6	CPU 1 fault LED

Figure Legend

7	Battery fault LED
8	CPU 1 fault LED
9	DIMM fault LED

TABLE 14-3 Internal LEDs

Name	Color	Function
1. Disk Drives See FIGURE 14-5		
Status	Green	Blinking, data is transfering, unit is OK.
Fault	Amber	Fault, service action is required.
Ready to Remove	Blue	Unit is ready to remove. Service action allowed.
2. Fan Trays See FIGURE 14-5		
Status	Green	Unit is OK.
Fault	Amber	Fault, service action is required.
3. *CPU* See FIGURE 14-6. LEDs are active only when the Remind button is pressed.		
DIMM Failure	Amber	Blinks to indicate that the system has found a fault with the DIMM. Restart system to clear fault.
CPU Failure	Amber	Blinks to indicate that the system has found a fault with a CPU. Restart system to clear fault.
Battery Failure	Amber	Blinks to indicate that the system has found a fault with the battery. Start service processor to clear fault.

APPENDIX **C**

Sun Fire X4540 Sensor Locations

This appendix lists the locations of the sensors of the Sun Fire X4540 server:

TABLE C-1

Name of Sensor	Location of Sensor
sys.intsw	Power backplane
sys.acpi	IO controller board
sys.nmi	Not a sensor, but an NMI button on rear backplane
sys.reset.btn	Not a sensor, but an NMI button on rear backplane
sys.locate.btn	Not a sensor, but an NMI button on front backplane
sys.v_+3v3stby	CPU board
sys.v_+3v3	CPU board
bat.v_bat	CPU board
sys.v_+12v	CPU board
sys.v_+1v2ht	CPU board
proc.prsnt	CPU board
proc.front.t_amb	CPU board
proc.rear.t_amb	CPU board
p0.prsnt	CPU board
p0.hot	CPU board
p0.t_core	CPU board
p0.v_vddcore	CPU board
p0.v_+1v8	CPU board
p0.v_+0v9	CPU board

TABLE C-1

Name of Sensor	Location of Sensor
p1.prsnt	CPU board
p1.hot	CPU board
p1.v_vddcore	CPU board
p1.t_core	CPU board
p1.v_+1v8	CPU board
p1.v_+0v9	CPU board
io.rear.t_amb	IO controller board
io.front.t_amb	IO controller board
io.v_bat	IO controller board
io.v_+3v3stby	IO controller board
io.v_+3v3	IO controller board
io.v_+5v	IO controller board
io.v_+12v	IO controller board
io.v_+5v_disk	IO controller board
io.v_+1v5	IO controller board
io.v_+1v4	IO controller board
io.v_+1v8	IO controller board
io.v_+1v2	IO controller board
dbp.t_amb	Disk backplane
ft0.f0.speed	Fan board
ft0.f1.speed	Fan board
ft1.f0.speed	Fan board
ft1.f1.speed	Fan board
ft2.f0.speed	Fan board
ft2.f1.speed	Fan board
ft3.f0.speed	Fan board
ft3.f1.speed	Fan board
ft4.f0.speed	Fan board
ft4.f1.speed	Fan board
ft0.prsnt	Fan board

TABLE C-1

Name of Sensor	Location of Sensor
ft1.prsnt	Fan board
ft2.prsnt	Fan board
ft3.prsnt	Fan board
ft4.prsnt	Fan board
ps0.vinok	Power supply
ps0.pwrok	Power supply
ps1.vinok	Power supply
ps1.pwrok	Power supply
ps2.vinok	Power supply
ps2.pwrok	Power supply
ps0.prsnt	Power supply
ps1.prsnt	Power supply
ps2.prsnt	Power supply
hdd[x].state	Software sensors. No corresponding hardware. Status of the sensors are set by app running on host.
hdd[x].hba.state	IO controller board

APPENDIX **D**

Error Handling

This appendix contains information about how the servers process and log errors. It includes the following sections:

Uncorrectable Errors

This section lists facts and considerations about how the server handles uncorrectable errors.

Note – The BIOS ChipKill feature must be disabled if you are testing for failures of multiple bits within a DRAM (ChipKill corrects for the failure of a four-bit wide DRAM).

- The BIOS logs the error to the SP system event log (SEL) through the board management controller (BMC).
- The SP's SEL is updated with the failing DIMM pair's specific bank address.
- The system reboots.
- The BIOS logs the error in DMI and SP event logs.

Note – If the error is on low 1MB, the BIOS freezes after rebooting. Therefore, no DMI log is recorded.

- An example of the error reported by the SEL through IPMI 2.0 is as follows:
  - When low memory is erroneous, the BIOS is frozen on pre-boot low memory test because the BIOS cannot decompress itself into faulty DRAM and execute the following items:

```
ipmitool> sel list
100 | 08/26/2005 | 11:36:09 | OEM #0xfb |
200 | 08/26/2005 | 11:36:12 | System Firmware Error | No
usable system memory
300 | 08/26/2005 | 11:36:12 | Memory | Memory Device
Disabled | CPU 0 DIMM 0
```

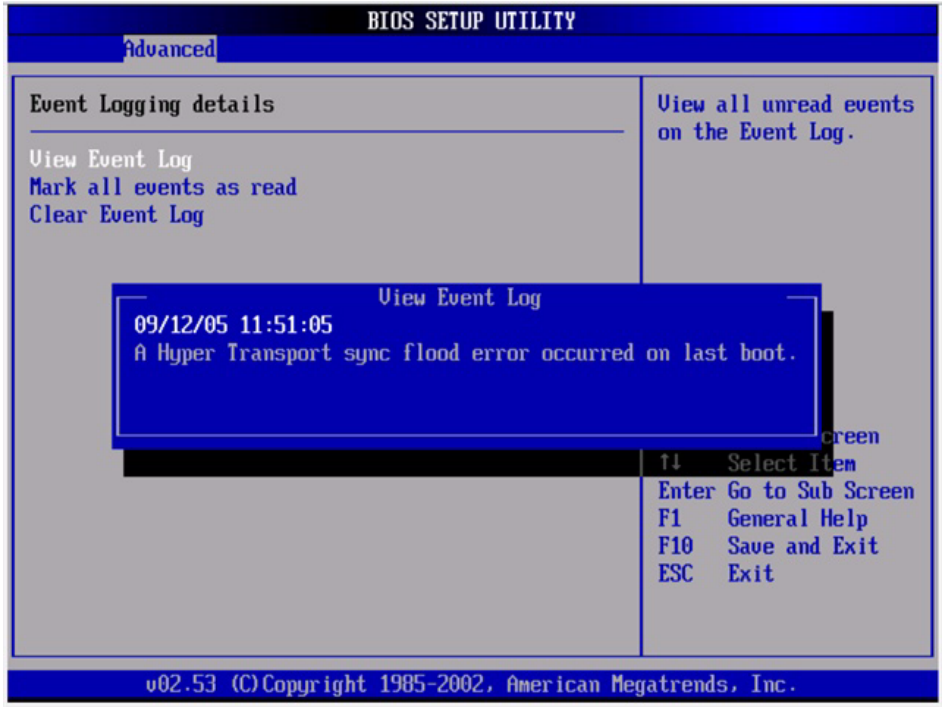
  - When the faulty DIMM is beyond the BIOS's low 1MB extraction space, proper boot happens:

```
ipmitool> sel list
100 | 08/26/2005 | 05:04:04 | OEM #0xfb |
200 | 08/26/2005 | 05:04:09 | Memory | Memory Device
Disabled | CPU 0 DIMM 0
```

- Note the following considerations for this revision:
  - Uncorrectable ECC Memory Error is not reported.
  - Multi-bit ECC errors are reported as `Memory Device Disabled`.
  - On first reboot, BIOS logs a HyperTransport Error in the DMI log.
  - The BIOS disables the DIMM.
  - The BIOS sends the SEL records to the BMC.
  - The BIOS reboots again.
  - The BIOS skips the faulty DIMM on the next POST memory test.
  - The BIOS reports available memory, excluding the faulty DIMM pair.

FIGURE D-1 shows an example of a DMI log screen from the BIOS Setup Page.

FIGURE D-1 DMI Log Screen, Uncorrectable Error

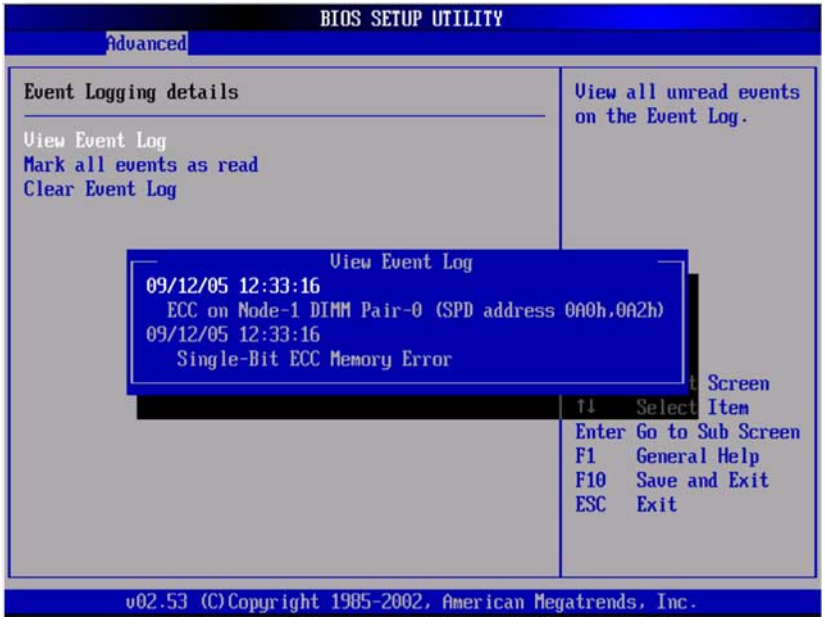


Correctable Errors

This section lists facts and considerations about how the server handles correctable errors.

- During BIOS POST:
  - The BIOS polls the MCK registers.
  - The BIOS logs to DMI.
  - The BIOS logs to the SP SEL through the BMC.
- The feature is turned off at OS boot time by default.
- Solaris support provides full self-healing and automated diagnosis for the CPU and Memory subsystems.
- FIGURE D-2 shows an example of a DMI log screen from BIOS Setup Page:

FIGURE D-2 DMI Log Screen, Correctable Error



- If during any stage of memory testing the BIOS finds itself incapable of reading or writing to the DIMM, it takes the following actions:
  - The BIOS disables the DIMM as indicated by the Memory Decreased message in the example in FIGURE D-3.
  - The BIOS logs an SEL record.

- The BIOS logs an event in DMI.

FIGURE D-3 DMI Log Screen, Correctable Error, Memory Decreased

Parity Errors (PERR)

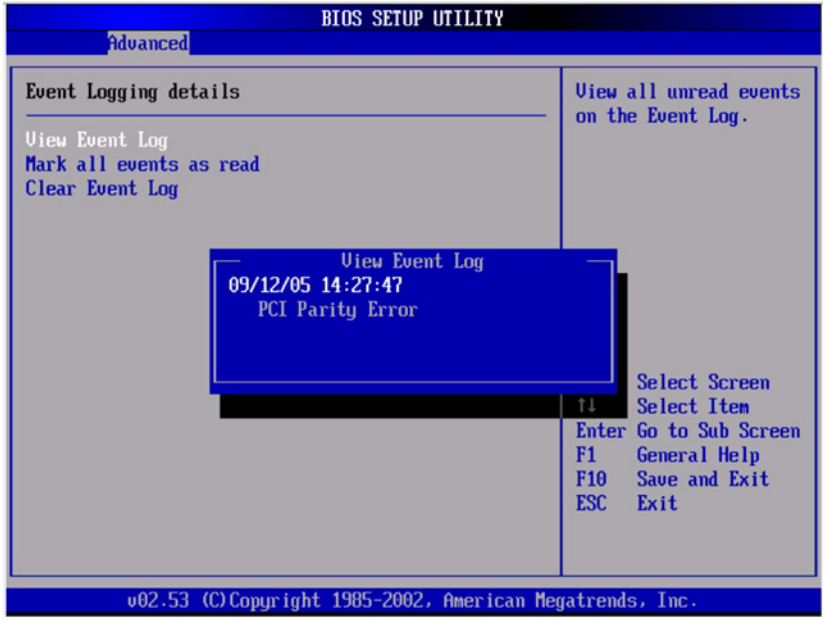
This section lists facts and considerations about how the server handles parity errors (PERR).

- The handling of parity errors works through NMIs.
- During BIOS POST, the NMI is logged in the DMI and the SP SEL. See the following example command and output:

```
[root@d-mpk12-53-238 root]# ipmitool -H 129.146.53.95 -U root
-P changeme -I lan sel list -v

SEL Record ID   : 0100
Record Type     : 00
Timestamp       : 01/10/2002 20:16:16
Generator ID    : 0001
EvM Revision    : 04
Sensor Type     : Critical Interrupt
Sensor Number   : 00
Event Type      : Sensor-specific Discrete
Event Direction : Assertion Event
Event Data      : 04ff00
Description     : PCI PERR
```

- FIGURE D-4 shows an example of a DMI log screen from BIOS Setup Page, with a parity error.

FIGURE D-4 DMI Log Screen, PCI Parity Error



- The BIOS displays the following messages and freezes (during POST or DOS):
  - `NMI EVENT!!`
  - `System Halted due to Fatal NMI!`
- The Linux NMI trap catches the interrupt and reports the following NMI "confusion report " sequence:

```
Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 2d on CPU 0.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 2d on CPU 1.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?

Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 3d on CPU 1.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?
```

```
Aug 5 05:15:00 d-mpk12-53-159 kernel: Uhhuh. NMI received
for unknown reason 3d on CPU 0.

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?

Aug 5 05:15:00 d-mpk12-53-159 kernel: Dazed and confused,
but trying to continue

Aug 5 05:15:00 d-mpk12-53-159 kernel: Do you have a strange
power saving mode enabled?
```

System Errors (SERR)

This section lists facts and considerations about how the server handles system errors (SERR).

- System error handling works through the HyperTransport Synch Flood Error mechanism on 8111 and 8131.
- The following events happen during BIOS POST:
  - POST reports any previous system errors at the bottom of the screen. See FIGURE D-5 for an example.

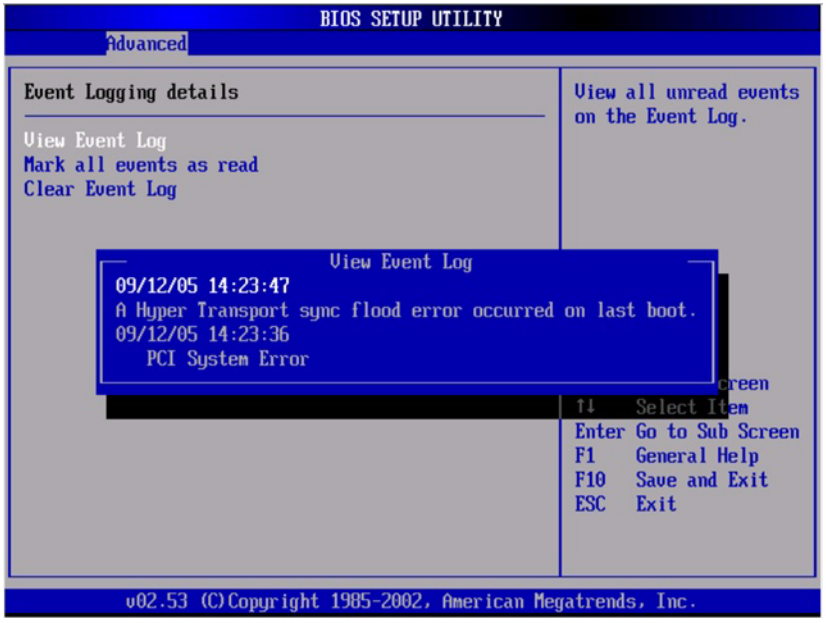
FIGURE D-5 POST Screen, Previous System Error Listed

- SERR and HyperTransport Synch Flood Error are logged in DMI and the SP SEL. See the following sample output:

```
SEL Record ID    : 0a00
Record Type      : 00
Timestamp        : 08/10/2005 06:05:32
Generator ID     : 0001
EvM Revision     : 04
Sensor Type      : Critical Interrupt
Sensor Number    : 00
Event Type       : Sensor-specific Discrete
Event Direction  : Assertion Event
Event Data       : 05ffff
Description      : PCI SERR
```

- FIGURE D-6 shows an example DMI log screen from the BIOS Setup page with a system error.

FIGURE D-6 DMI Log Screen, System Error Listed



Handling Mismatched Processors

This section lists facts and considerations about how the server handles mismatching processors.

- The BIOS performs a complete POST.
- The BIOS displays a report of any mismatching CPUs, as shown in the following example:

```
AMIBIOS(C)2006 American Megatrends, Inc.
BIOS Build Version : 0ABNF010 Date: 04/04/08 18:56:20 Core:
08.00.14
CPU : Quad-Core AMD Opteron(tm) Processor 2356
Speed : 2.30 GHz     Count : 8
Node0 DCT0 = 667 MHz, DCT1 = 667 MHz,
Node1 DCT0 = 667 MHz, DCT1 = 667 MHz,

Sun Fire X4540, 2 AMD North Bridges, Rev B3
NVMM ROM Version : 4.081.40
BMC Firmware Revision :  2.0.2.3, CPLD Revision : 2.0
SP IP Address : 010.006.143.054

Initializing USB Controllers .. Done.
Press F2 to run Setup  (CTRL+E on Remote Keyboard)
Press F8 for BBS POPUP (CTRL+P on Remote Keyboard)
Press F12 to boot from the network (CTRL+N on Remote Keyboard)
System Memory : 64.0 GB
USB Device(s): 2 Keyboards, 2 Mice, 1 Hub
Auto-detecting USB Mass Storage Devices ..

00 USB mass storage devices found and configured.
0085
BMC Responding
Press <ESC> to continue....6
```

- No SEL or DMI event is recorded.
- The system enters Halt mode and the following message is displayed:

```
******** Warning: Bad Mix of Processors *********
Multiple core processors cannot be installed with single core
processors.
Fatal Error... System Halted.
```

Hardware Error Handling Summary

TABLE D-1 summarizes the most common hardware errors that you might encounter with these servers.

TABLE D-1 Hardware Error Handling Summary

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
SP failure	The SP fails to boot upon application of system power.	The SP controls the system reset, so the system may power on, but will not come out of reset. • During power up, the SP's boot loader turns on the power LED. • During SP boot, Linux startup, and SP sanity check, the power LED blinks. • The LED is turned off when SP management code (the IPMI stack) is started. • At exit of BIOS POST, the LED goes to STEADY ON state.	Not logged	Fatal
SP failure	SP boots but fails POST.	The SP controls the system RESET, so the system will not come out of reset.	Not logged	Fatal
BIOS POST failure	Server BIOS does not pass POST.	There are fatal and non-fatal errors in POST. The BIOS does detect some errors that are announced during POST as POST codes on the bottom right corner of the display on the serial console and on the video display. Some POST codes are forwarded to the SP for logging. The POST codes do not come out in sequential order and some are repeated, because some POST codes are issued by code in add-in card BIOS expansion ROMs. In the case of early POST failures (for example, the BSP fails to operate correctly), BIOS just halts without logging. For some other POST failures subsequent to memory and SP initialization, the BIOS logs a message to the SP's SEL.		

TABLE D-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
Single-bit DRAM ECC error	With ECC enabled in the BIOS Setup, the CPU detects and corrects a single-bit error on the DIMM interface.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half-second by SMI timer interrupts and is done by the BIOS SMI handler. The BIOS SMI handler starts logging each detected error and stops logging when the limit for the same error is reached. The BIOS's polling can be disabled through a software interface.	SP SEL	Normal operation
Single four-bit DRAM error	With CHIP-KILL enabled in the BIOS Setup, the CPU detects and corrects for the failure of a four-bit-wide DRAM on the DIMM interface.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half-second by SMI timer interrupts and is done by the BIOS SMI handler. The BIOS SMI handler starts logging each detected error and stops logging when the limit for the same error is reached. The BIOS's polling can be disabled through a software interface.	SP SEL	Normal operation
Uncorrectable DRAM ECC error	The CPU detects an uncorrectable multiple-bit DIMM error.	The "sync flood" method of handling this is used to prevent the erroneous data from being propagated across the HyperTransport links. The system reboots, the BIOS recovers the machine check register information, maps this information to the failing DIMM (when CHIPKILL is disabled) or DIMM pair (when CHIPKILL is enabled), and logs that information to the SP. The BIOS will halt the CPU.	SP SEL	Fatal
Unsupported DIMM configuration	Unsupported DIMMs are used or supported DIMMs are loaded improperly.	The BIOS displays an error message, logs an error, and halts the system.	DMI Log SP SEL	Fatal
HyperTransport link failure	CRC or link error on one of the HyperTransport Links	Sync floods on HyperTransport links, the machine resets itself, and error information gets retained through reset. The BIOS reports, `A Hyper Transport sync flood error occurred on last boot, press F1 to continue.`	DMI Log SP SEL	Fatal

TABLE D-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
PCI SERR, PERR	System or parity error on a PCI bus	Sync floods on HyperTransport links, the machine resets itself, and error information gets retained through reset. The BIOS reports, `A Hyper Transport sync flood error occurred on last boot, press F1 to continue.`	DMI Log SP SEL	Fatal
BIOS POST Microcode Error	The BIOS could not find or load the CPU Microcode Update to the CPU. The message most likely appears when a new CPU is installed in a system controller with an outdated BIOS. In this case, the BIOS must be updated.	The BIOS displays an error message, logs the error to DMI, and boots.	DMI Log	Non-fatal
BIOS POST CMOS Checksum Bad	CMOS contents failed the Checksum check.	The BIOS displays an error message, logs the error to DMI, and boots.	DMI Log	Non-fatal
Unsupported CPU configuration	The BIOS supports mismatched frequency and steppings in CPU configuration, but some CPUs might not be supported.	The BIOS displays an error message, logs the error, and halts the system.	DMI Log	Fatal
Correctable error	The CPU detects a variety of correctable errors in the MCi_STATUS registers.	The CPU corrects the error in hardware. No interrupt or machine check is generated by the hardware. The polling is triggered every half second by SMI timer interrupts, and is done by the BIOS SMI handler. The SMI handler logs a message to the SP SEL if the SEL is available, otherwise SMI logs a message to DMI. The BIOS's polling can be disabled through software SMI.	DMI Log SP SEL	Normal operation
Single fan failure	Fan failure is detected by reading tach signals.	The Front Fan Fault, Service Action Required, and individual fan module LEDs are lit.	SP SEL	Non-fatal

TABLE D-1 Hardware Error Handling Summary *(Continued)*

Error	Description	Handling	Logged (DMI Log or SP SEL)	Fatal?
Multiple fan failure	Fan failure is detected by reading tach signals.	The Front Fan Fault, Service Action Required, and individual fan module LEDs are lit.	SP SEL	Fatal
Single power supply failure	When any of the AC/DC PS_VIN_GOOD or PS_PWR_OK signals are deasserted.	Service Action Required, and Power Supply Fault LEDs are lit.	SP SEL	Non-fatal
DC/DC power converter failure	Any POWER_GOOD signal is deasserted from the DC/DC converters.	The Service Action Required LED is lit, the system is powered down to standby power mode, and the Power LED enters standby blink state.	SP SEL	Fatal
Voltage above/below Threshold	The SP monitors system voltages and detects voltage above or below a given threshold.	The Service Action Required LED and Power Supply Fault LED blink.	SP SEL	Fatal
High temperature	The SP monitors CPU and system temperatures, and detects temperatures above a given threshold.	The Service Action Required LED and System Overheat Fault LED blink. The system controller is shut down above the specified critical level.	SP SEL	Fatal
Processor thermal trip	The CPU drives the THERMTRIP_L signal when it detects an overtemp condition.	CPLD shuts down power to the CPU. The Service Action Required LED and System Overheat Fault LED blink.	SP SEL	Fatal
Boot device failure	The BIOS is not able to boot from a device in the boot device list.	The BIOS goes to the next boot device in the list. If all devices in the list fail, an error message is displayed: Retry from beginning of list. SP can control or change boot order	DMI Log	Non-fatal

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