Oracle® Server X5-2L Service Manual

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Oracle Server X5-2L Service Manual

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Using This Documentation

- **Overview** – This service manual explains how to remove and replace parts in Oracle Server X5-2L, and how to maintain and troubleshoot the system.
- **Audience** – This guide is intended for trained technicians and authorized service personnel who have been instructed on the hazards within the equipment and qualified to remove and replace hardware.
- **Required knowledge** – Advanced experience troubleshooting and replacing hardware.

Product Documentation Library

Documentation and resources for this product and related products are available at https://www.oracle.com/goto/x5-2l/docs.

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About the Oracle Server X5-2L

These sections describe the controls, connectors, LEDs, system components, and replaceable components of the server.

Note - Always update the server with the latest firmware, drivers, and other hardware-related software by downloading the latest software release package when you first receive the server, and for every new software release. For information about the software release packages and how to download the software, refer to "Getting Firmware and Software Updates" in *Oracle Server X5-2L Installation Guide*.

Description	Links
Review the product description.	"Product Description" on page 15
Review the controls and connectors on the server.	"About Controls and Connectors" on page 16
Review system components.	"About System Components" on page 22

Product Description

The Oracle Server X5-2L is an enterprise-class, two rack unit (2U) server. It supports the following components:

- Up to two Intel processors. Processors with the following capabilities are supported:
  - 18-core, 2.3 GHz, 145W processors
  - 12-core, 2.6 GHz, 135W processors
  - 10-core, 2.6 GHz, 105W processors
  - 8-core, 2.4 GHz, 85W processors
- Up to 12 DIMMs per processor for a maximum of 24 DDR4 DIMMs and a maximum of 768 GB of memory are supported in dual-processor systems. A maximum of 12 DDR4 DIMMs and a maximum of 384 GB of memory are supported in single-processor systems. RDIMMs (8 GB and 16 GB) and LRDIMMs (32 GB) are supported.
- Six PCIe Gen3 slots in the dual-processor systems. PCIe slots 1, 2, and 3 are nonfunctional in single-processor systems.

- Storage drive configurations can comprise both hard disk drives (HDDs) or solid state disk drives (SSDs). Configurations include:
  - Up to twelve 3.5-inch hot-pluggable SAS HDDs
  - Up to twenty-four 2.5-inch hot-pluggable SAS HDDs or SSDs, with optional support for up to four PCIe-based NVMe SSDs
  - Up to eight 2.5-inch hot-pluggable SAS HDDs or SSDs, with optional support for a SATA DVD and up to four PCIe-based NVMe SSDs
  - (Optional) Up to two rear-mounted 2.5-inch SAS storage drives in the twelve 3.5-inch storage drive and twenty-four 2.5-inch storage drive configurations
- Two hot-pluggable, redundant 1000W power supplies.
- An on-board Oracle Integrated Lights Out Manager (Oracle ILOM) service processor (SP) based on the Emulex Pilot 3 chip.
- The optional Oracle System Assistant server setup tool, which is embedded on a preinstalled USB flash drive.

About Controls and Connectors

The following sections describe the controls, indicators, connectors, and drives located on the front and rear panels.

- "Front Panel Components on Twelve Drive Systems" on page 18
- "Front Panel Components on Twenty-Four Drive Systems" on page 20
- "Rear Panel Components and Cable Connections" on page 21

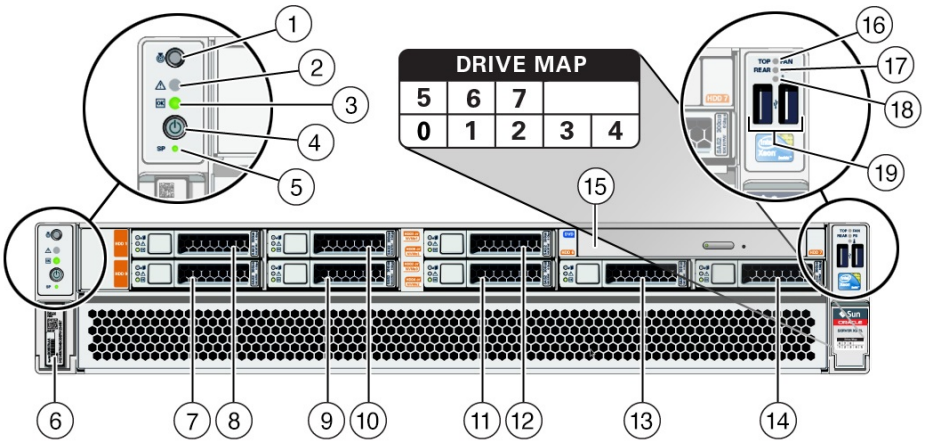
Related Information

- "About System Components" on page 22
- "Illustrated Parts Breakdown" on page 23
- "Troubleshooting Using the Server Front and Rear Panel Status Indicators" on page 32

Front Panel Components on Eight Drive Systems

Note - Systems with eight drives can contain an optional DVD drive. Systems with twelve drives and twenty-four drives do not contain a DVD drive.

FIGURE 1 Front Panel With Eight 2.5-Inch Drives and DVD Configuration



Call Out	Description
1	Locator LED/Locator button: white
2	Service Required LED: amber
3	Power/OK LED: green
4	Power button
5	SP OK LED: green
6	Product Serial Number (PSN) and Radio Frequency Identification (RFID) label
7	Storage drive 0 (HDD/SSD)
8	Storage drive 1 (HDD/SSD)
9	Storage drive 2 (HDD/SSD/NVMe 0)
10	Storage drive 3 (HDD/SSD/NVMe 1)
11	Storage drive 4 (HDD/SSD/NVMe 2)
12	Storage drive 5 (HDD/SSD/NVMe 3)
13	Storage drive 6 (HDD/SSD)
14	Storage drive 7 (HDD/SSD)
15	Optional SATA DVD drive
16	Top Fan Fault LED: amber
17	Power Supply (PS) Fault LED: amber
18	System Over Temperature Warning LED: amber

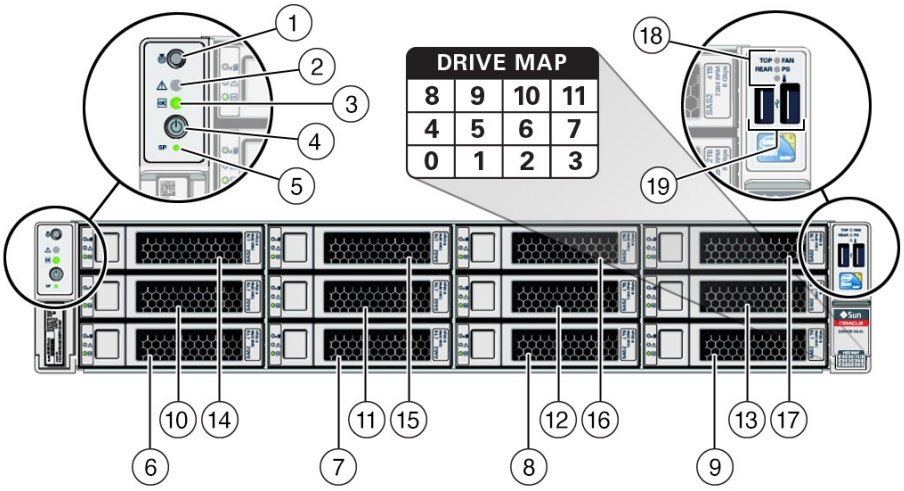
Call Out	Description
19	USB 2.0 connectors (2)

Related Information

- “Front Panel Components on Twelve Drive Systems” on page 18
- “Front Panel Components on Twenty-Four Drive Systems” on page 20
- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32

Front Panel Components on Twelve Drive Systems

FIGURE 2 Front Panel With Twelve 3.5-Inch Drives Configuration



Call Out	Description
1	Locator LED/Locator button: white
2	Service Required LED: amber
3	Power/OK LED: green
4	Power button

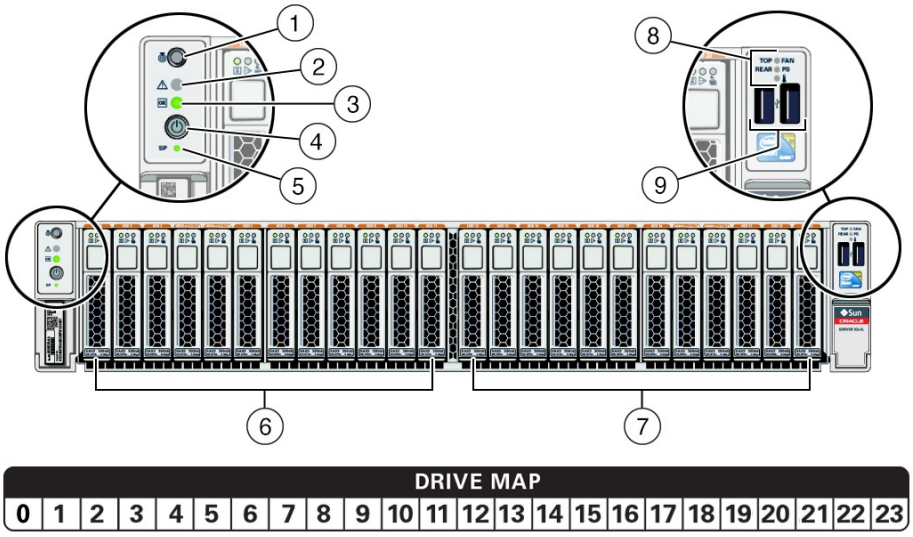
Call Out	Description
5	SP OK LED: green
6	Storage drive 0 (HDD/SSD)
7	Storage drive 1 (HDD/SSD)
8	Storage drive 2 (HDD/SSD)
9	Storage drive 3 (HDD/SSD)
10	Storage drive 4 (HDD/SSD)
11	Storage drive 5 (HDD/SSD)
12	Storage drive 6 (HDD/SSD)
13	Storage drive 7 (HDD/SSD)
14	Storage drive 8 (HDD/SSD)
15	Storage drive 9 (HDD/SSD)
16	Storage drive 10 (HDD/SSD)
17	Storage drive 11 (HDD/SSD)
18	Top Fan Fault LED: amber; Power Supply (PS) Fault LED: amber; System Over Temperature Warning LED: amber
19	USB 2.0 connectors (2)

Related Information

- “Front Panel Components on Eight Drive Systems” on page 16
- “Front Panel Components on Twenty-Four Drive Systems” on page 20
- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32

Front Panel Components on Twenty-Four Drive Systems

FIGURE 3 Front Panel With Twenty-Four 2.5-Inch Drives Configuration



Call Out	Description
1	Locator LED/Locator button: white
2	Service Required LED: amber
3	Power/OK LED: green
4	Power button
5	SP OK LED: green
6	Storage drives 0 through 11 (HDD/SSD; Storage drives 3 and 4: HDD/SSD/NVMe)
7	Storage drives 12 through 23 (HDD/SSD; Storage drives 19 and 20: HDD/SSD/NVMe)
8	Top Fan Fault LED: amber; Power Supply (PS) Fault LED: amber; System Over Temperature Warning LED: amber
9	USB 2.0 connectors (2)

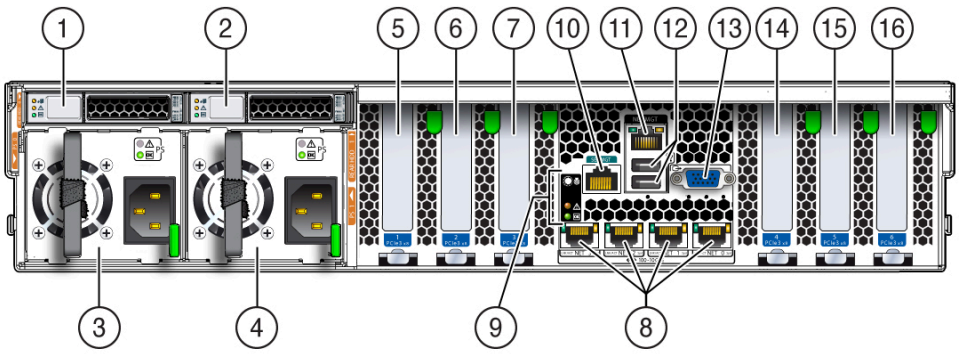
Related Information

- “Front Panel Components on Eight Drive Systems” on page 16
- “Front Panel Components on Twelve Drive Systems” on page 18
- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32

Rear Panel Components and Cable Connections

Note - Systems that are configured with twelve and twenty-four front panel storage drives also contain two rear-mounted storage drives. Systems that are configured with eight front panel storage drives do not contain rear-mounted storage drives.

FIGURE 4 Rear Panel Components With Storage Drives Configuration



Call Out	Description
1	Rear storage drive 0 (HDD/SSD)
2	Rear storage drive 1 (HDD/SSD)
3	Power supply unit 0 (PS0)
4	Power supply unit 1 (PS1)
5	PCIe slot 1 (Nonfunctional in single-processor systems.)
6	PCIe slot 2 (Nonfunctional in single-processor systems.)
7	PCIe slot 3 (Nonfunctional in single-processor systems. This slot is the default slot for the optional Oracle PCIe Switch Controller Card.)

Call Out	Description
8	Network (NET) 100/1000/10000 ports (NET3–NET0) (NET2 and NET3 are nonfunctional in single-processor systems.)
9	System status LEDs: Locator/Button: white; Service Required: amber; Power/OK: green
10	Serial management (SER MGT)/RJ-45 serial port
11	Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management 10/100/1000BASE-T port (NET MGT)
12	USB 2.0 ports (2)
13	DB-15 video connector
14	PCIe slot 4
15	PCIe slot 5
16	PCIe slot 6 (This slot is the default slot for the Oracle Storage 12 Gb/s SAS PCIe RAID HBA.)

Note - For more information on rear panel components and connections, refer to “Rear Panel Connector Locations” on page 45. See also “Rear Panel Pinhole Switches” on page 50.

Related Information

- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243
- “Identifying the Server Ports” on page 245

About System Components

These sections describe the components of the server:

- “Illustrated Parts Breakdown” on page 23
- “Customer-Replaceable Units” on page 24
- “Field-Replaceable Units” on page 25

Related Information

- “Servicing CRUs That Do Not Require Server Power-Off” on page 75
- “Servicing CRUs That Require Server Power-Off” on page 105

- “Servicing FRUs” on page 137

Illustrated Parts Breakdown

The following figure identifies the major components of the server.

FIGURE 5 System Components

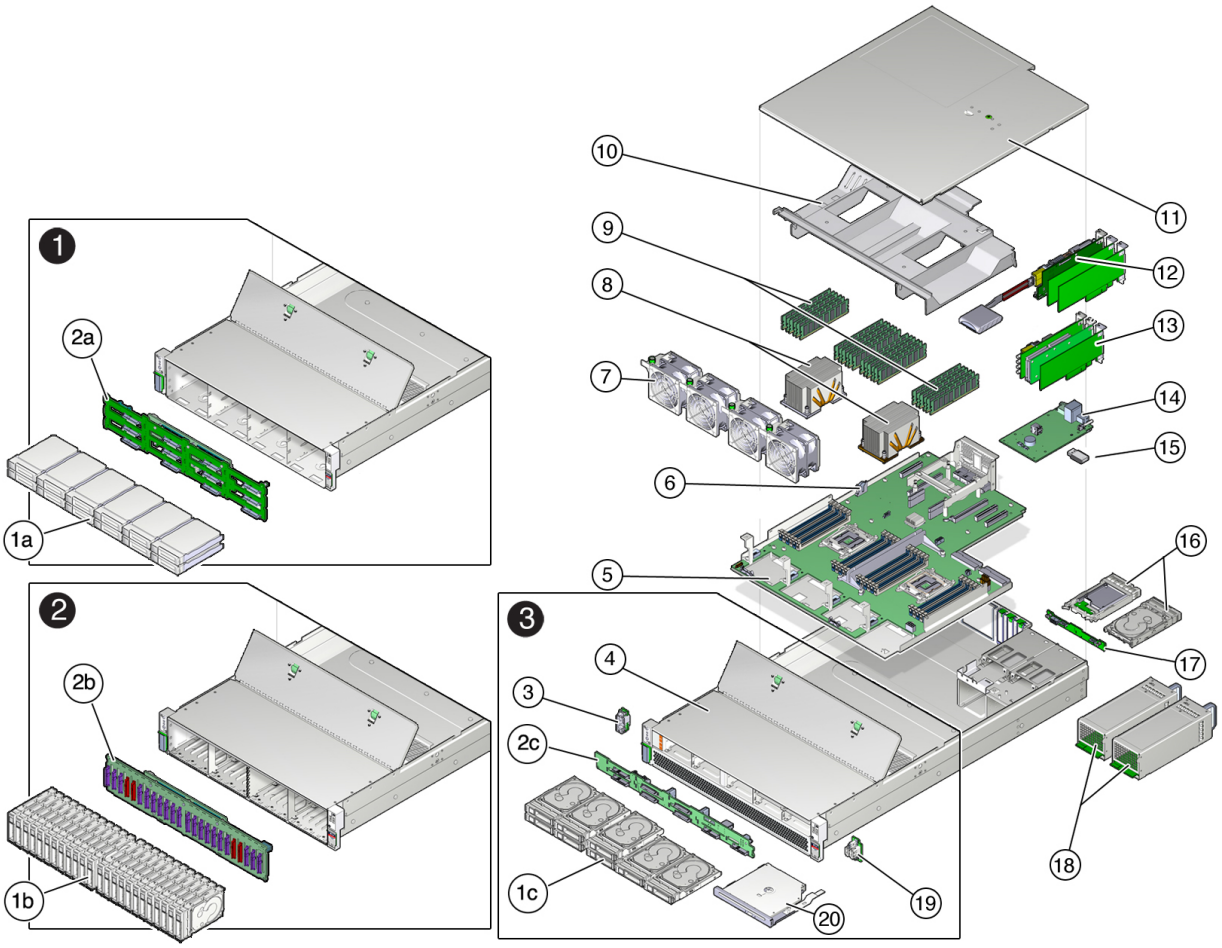


Figure Legend	Description
1a	Twelve 3.5-inch storage drives
1b	Twenty-four 2.5-inch storage drives
1c	Eight 2.5-inch storage drives
2a	Front disk backplane for twelve 3.5-inch drives
2b	Front disk backplane for twenty-four 2.5-inch drives
2c	Front disk backplane for eight 2.5-inch drives
3	Left LED indicator module
4	System chassis
5	Motherboard assembly
6	System battery
7	Fan modules
8	Processors and heatsinks (Single-processor systems contain only a single processor in socket P0; socket P1 contains a cover to protect processor socket pins.)
9	DIMMs (Only twelve DIMMs are supported in single-processor systems and the DIMMs must be installed in P0 DIMM sockets.)
10	Air baffle
11	Top cover
12	Oracle Storage 12 Gb/s SAS PCIe RAID HBA and super capacitor
13	PCIe cards (PCIe slots 1, 2, and 3 are nonfunctional in single-processor systems.)
14	I/O and internal USB card
15	Internal USB drive
16	Rear-mounted storage drives
17	Rear storage drive backplane
18	Power supplies
19	Right LED indicator module
20	DVD drive (optional)

Customer-Replaceable Units

The following table lists the customer-replaceable units (CRUs) in the server and directs you to the replacement instructions.

CRU	Description	Replacement Instructions
Battery	Lithium coin-cell battery that powers the CMOS BIOS and real-time clock.	“Servicing the Battery (CRU)” on page 132

CRU	Description	Replacement Instructions
DIMMs	Add or replace memory modules in the system.	“Servicing the DIMMs (CRU)” on page 105
Storage drives	Storage drive configurations can comprise both hard disk drives (HDDs) or solid state disk drives (SSDs). Configurations include: ■ Up to twelve 3.5-inch hot-pluggable SAS HDDs ■ Up to twenty-four 2.5-inch hot-pluggable SAS HDDs or SSDs, with optional support for up to four PCIe-based NVMe SSDs ■ Up to eight 2.5-inch hot-pluggable SAS HDDs or SSDs, with optional support for up to four PCIe-based NVMe SSDs	“Servicing Storage Drives and Rear Drives (CRU)” on page 75
Fan modules	Four fan modules for cooling the server components.	“Servicing Fan Modules (CRU)” on page 93
PCIe cards	Optional add-on cards that can expand the functionality of the server.	“Servicing PCIe Cards (CRU)” on page 120
Power supply unit (PSU)	Two fully redundant AC-powered power supplies.	“Servicing Power Supplies (CRU)” on page 99

Related Information

- “Field-Replaceable Units” on page 25
- “Illustrated Parts Breakdown” on page 23
- “Servicing CRUs That Do Not Require Server Power-Off” on page 75
- “Servicing CRUs That Require Server Power-Off” on page 105

Field-Replaceable Units

The following table lists the field-replaceable units (FRUs) in the server and directs you to the replacement instructions.

FRU	Description	Replacement Instructions
Processor and heatsink	The processor that carries out the instructions of the system.	“Servicing Processors (FRU)” on page 138
Disk backplanes	Provide power and communications connectors for storage drives.	“Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156
SAS cables	Provide signals between the front disk backplane and the Oracle Storage 12 Gb/s SAS PCIe RAID HBA, and from the front disk backplane to the rear disk backplane.	“Servicing SAS Cables (FRU)” on page 177

FRU	Description	Replacement Instructions
NVMe cables	Provide signals between the Oracle PCIe NVMe switch card and the disk backplane.	“Servicing NVMe Cables (FRU)” on page 183
Oracle Storage 12 Gb/s SAS PCIe RAID HBA	Located in PCIe slot 6, the Oracle Storage 12 Gb/s SAS PCIe RAID HBA manages SAS storage drives.	“Servicing the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card (FRU)” on page 189
DVD drive	Optional DVD drive on configurations with eight 2.5-inch drives.	“Servicing the DVD Drive (FRU)” on page 196
Front LED/USB indicator modules	Contain the push-button circuitry and LEDs that are displayed on the bezel of the chassis.	“Servicing the Front LED/USB Indicator Modules (FRU)” on page 202
Motherboard assembly	Provides connectors for the DIMMs, processors, PCIe risers, and other components.	“Servicing the Motherboard Assembly (FRU)” on page 218

Related Information

- “Customer-Replaceable Units” on page 24
- “Illustrated Parts Breakdown” on page 23
- “Servicing FRUs” on page 137

Troubleshooting and Diagnostics

This section includes information about troubleshooting hardware component faults for the Oracle Server X5-2L. It contains the following topics.

Description	Link
Maintenance-related information and procedures that you can use to troubleshoot and repair server hardware issues.	“Troubleshooting Server Component Hardware Faults” on page 27
Information about software and firmware diagnostic tools that you can use to isolate problems, monitor the server, and exercise the server subsystems.	“Troubleshooting With Diagnostic Tools” on page 42
Information about attaching devices to the server to perform troubleshooting.	“Attaching Devices to the Server” on page 44
Information about contacting Oracle support.	“Getting Help” on page 52

Troubleshooting Server Component Hardware Faults

This section contains maintenance-related information and procedures that you can use to troubleshoot and repair server hardware issues. The following topics are covered.

Description	Section Links
Troubleshooting overview information and procedure.	“Troubleshooting Server Hardware Faults” on page 28
Resources for troubleshooting and diagnostic information.	“Troubleshooting and Diagnostic Information” on page 31
Discerning the server state using the front and rear panel indicators.	“Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32
Causes, actions, and preventative measures for problems related to the cooling subsystem.	“Troubleshooting System Cooling Issues” on page 37
Causes, actions, and preventative measures for problems related to the power subsystem.	“Troubleshooting Power Issues” on page 39

Troubleshooting Server Hardware Faults

When a server hardware fault event occurs the system lights the Service Required LED and captures the event in the system event log (SEL). If you have set up notifications through Oracle ILOM, you also receive an alert through the notification method you chose. When you become aware of a hardware fault, you should address it immediately.

To investigate a hardware fault, see the following:

- "Basic Troubleshooting Process" on page 28
- "Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface" on page 29

Basic Troubleshooting Process

Use the following process to address a hardware fault (for the step-by-step procedure, see "Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface" on page 29).

1. **Identify the server subsystem containing the fault**.

   You can use Oracle ILOM to identify the failed component.
2. **Review the** *Oracle Server X5-2L Product Notes***.**

   The product notes contain up-to-date information about the server, including hardware-related issues.
3. **Prepare the server for service using Oracle ILOM**.

   If you have determined that the hardware fault requires service (physical access to the server), use Oracle ILOM to take the server offline, activate the Locate LED, and power off the server.
4. **Prepare the service work space**.

   Before servicing the server, prepare the work space, ensuring ESD protection for the server and components.

   See "Preparing for Service" on page 55.
5. **Service components**.

   To service the components, see the removal, installation, and replacement procedures in this document.

   Note - A component designated as a field-replaceable unit (FRU) must be replaced by Oracle Service personnel. Contact Oracle Service.

   ---
6. **Clear the fault in Oracle ILOM**.

Depending on the component, you might need to clear the fault in Oracle ILOM. Generally, components that have a FRU ID clear the fault automatically.

Related Information

- See “Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface” on page 29

▼ Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface

Note - The screens shown in this procedure might differ from those for your server.

This procedure uses the basic troubleshooting steps described in “Basic Troubleshooting Process” on page 28.

Use this procedure to troubleshoot hardware faults with the Oracle ILOM web interface and, if necessary, prepare the server for service.

Note - This procedure provides one basic approach to troubleshooting hardware faults. It uses a combination of the Oracle ILOM web interface and command-line interface (CLI). However, the procedure can be performed using only the Oracle ILOM CLI interface. For more information about the Oracle ILOM web interface and CLI, refer to the Oracle ILOM documentation.

Before beginning this procedure, obtain the latest version of the *Oracle Server X5-2L Product Notes*.

1. Log in to the server SP Oracle ILOM web interface.

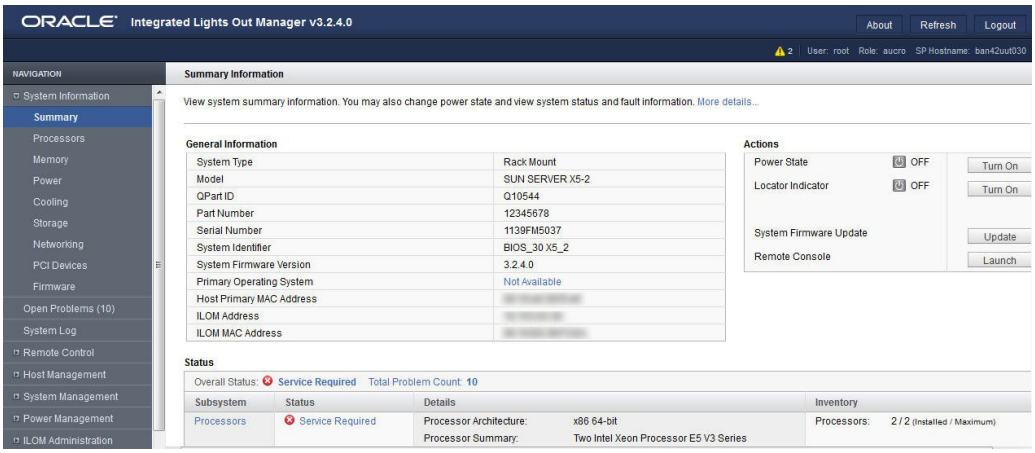
Open a browser and direct it using the IP address of the server SP. Enter a user name (with administrator privileges) and password at the log-in screen. The Summary Information screen appears.

The Status section of the Summary Information screen provides information about the server subsystems, including:

- Processors
- Memory
- Power
- Cooling

- Storage
- Networking

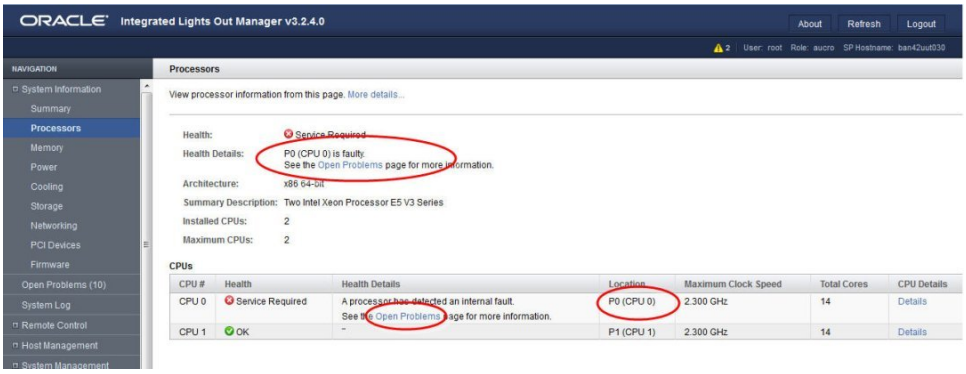
2. **In the Status section of the Summary Information screen, identify the server subsystem that requires service.**



In the above example, the Status screen shows that the Processor subsystem requires service. This indicates that a hardware component within the subsystem is in a fault state.

3. **To identify the component, click on Processors in the Status section.**

The Processor screen appears.



The above example shows the Processors subsystem screen and indicates that CPU 0 has a fault.

4. **To get more information, click one of the Open Problems links.**

   The Open Problems screen provides detailed information, such as the time the event occurred, the component and subsystem name, and a description of the issue. It also includes a link to an Oracle Knowledge Base article.

   Tip - The System Log provides a chronological list of all the system events and faults that have occurred since the log was last reset and includes additional information, such as severity levels and error counts. The System Log also includes information on device not reported in the Subsystem Summary screen. To access the System Log, in the left panel, click System Log.

   In this example, the hardware fault with CPU 0 requires local/physical access to the server.

5. **Before going to the server, review the *Oracle Server X5-2L Product Notes* for information related to the issue or the component.**

   The product notes contain up-to-date information about the server, including hardware-related issues.

6. **To prepare the server for service, see "Preparing for Service" on page 55.**

   After servicing the component, you might need to clear the fault in Oracle ILOM. For more information, refer the service procedure for the component.

7. **Service the component.**

Troubleshooting and Diagnostic Information

The following table lists diagnostic and troubleshooting-related procedures and references that can assist you with resolving server issues.

Description	Link
Diagnostic information for the x86 servers, including procedures for performing runtime and firmware-based tests, using Oracle ILOM, and running U-Boot and UEFI Diagnostics tests to exercise the system and isolate subtle and intermittent hardware-related problems.	*Oracle x86 Servers Diagnostics, Applications, and Utilities Guide for Servers with Oracle ILOM 3.1 and Oracle ILOM 5.0.x*
Administrative information for the Oracle Sun Server X-5 series servers, including information about how to	*Oracle X5 Series Servers Administration Guide*

Description	Link
use Oracle System Assistant and using the Oracle ILOM system event log (SEL) to identify a problem's possible source.	
Information about troubleshooting front and rear panel status indicators.	“Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32
Information about how to manage server hardware faults using the Oracle ILOM Fault Management Shell.	“Managing Server Hardware Faults Through the Oracle ILOM Fault Management Shell” on page 42

Troubleshooting Using the Server Front and Rear Panel Status Indicators

These sections describe the status indicators (LEDs) located on the front and rear of the server, including those found on components and ports. This section includes the following topics:

- “Server Boot Process and Normal Operating State Indicators” on page 32
- “Server System-Level Status Indicators” on page 33
- “Server Fan Status Indicators” on page 34
- “Storage and Boot Drive Indicators” on page 35
- “Power Supply Status Indicators” on page 35
- “Network Management Port Status Indicators” on page 36
- “Ethernet Ports Status Indicators” on page 36
- “Motherboard Status Indicators” on page 36

Related Information

- “Front Panel Components on Eight Drive Systems” on page 16
- “Front Panel Components on Twelve Drive Systems” on page 18
- “Front Panel Components on Twenty-Four Drive Systems” on page 20
- “Rear Panel Components and Cable Connections” on page 21

Server Boot Process and Normal Operating State Indicators

A normal server boot process involves two indicators, the service processor SP OK LED indicator and the Power/OK LED indicator.

When AC power is connected to the server, the server boots into standby power mode:

1. The SP OK LED blinks slowly (0.5 seconds on, 0.5 seconds off) while the SP is starting, and the main Power/OK LED remains off until the SP is ready.
2. After a few minutes, the main Power/OK LED slowly flashes the standby blink pattern (0.1 seconds on, 2.9 seconds off), indicating that the SP (and Oracle ILOM) is ready for use. In standby power mode, the server is not initialized or fully powered on at this point.

When powering on the server (either by the Power button or Oracle ILOM), the server boots to full power mode:

1. The Power/OK LED blinks slowly (0.5 seconds on, 0.5 seconds off), and the SP OK LED remains lit (no blinking).
2. When the server has successfully booted, the Power/OK LED remains lit. When the Power/OK LED and the SP OK LED indicators remain lit, the server is in full power mode.

Note - The green Power/OK LED indicator and the green SP OK indicator remain lit (no blinking) when the server is in a normal operating state.

Server System-Level Status Indicators

There are seven system-level status indicators (LEDs), some of which are located on both the server front panel and the server back panel. The following table describes these indicators.

TABLE 1 Server System-Level Status Indicators

Status Indicator Name	Icon	Color	State and Meaning
Locator LED and button		White	Indicates the location of the server. ■ OFF – Server is operating normally. ■ FAST BLINK – Use Oracle ILOM to activate this LED indicator to enable you to locate a particular system quickly and easily. ■ Pressing the Locate button will toggle the LED indicator fast blink on or off.
Service Required		Amber	Indicates the fault state of the server. ■ OFF – The server is operating normally. ■ STEADY ON – A fault is present on the server. This LED indicator lights whenever a fault indicator lights for a replaceable component on the server. **Note -** When this LED indicator is lit, a system console message might appear that includes a recommended service action.
Power/OK		Green	Indicates the operational state of the chassis. ■ OFF – AC power is not present or the Oracle ILOM boot is not complete.

Status Indicator Name	Icon	Color	State and Meaning
			■ STANDBY BLINK – Standby power is on, but the chassis power is off and the Oracle ILOM SP is running. ■ SLOW BLINK – Startup sequence has been initiated on the host. This pattern should begin soon after you power on the server. This status indicates either: power-on self-test (POST) code checkpoint tests are running on the server host system, or the host is transitioning from the powered-on state to the standby state on shutdown. ■ STEADY ON – The server is powered on, and all host POST code checkpoint tests are complete. The server is in one of the following states: the server host is booting the operating system (OS), or the server host is running the OS.
SP OK		Green	Indicates the state of the service processor. ■ OFF – Service processor (SP) is not running. ■ SLOW BLINK – SP is booting. ■ STEADY ON – SP is fully operational.
Top Fan	Top	Amber	Indicates that one or more of the internal fan modules have failed. ■ OFF – Indicates steady state; no service is required. ■ STEADY ON – Indicates service required.
Rear Power Supply Fault	Rear	Amber	Indicates that one of the server power supplies has failed. ■ OFF – Indicates steady state; no service is required. ■ STEADY ON – Indicates service required; service the power supply.
System Over Temperature Warning		Amber	Indicates a warning for an overtemperature condition. ■ OFF – Normal operation; no service is required. ■ STEADY ON – The system is experiencing an overtemperature warning condition. **Note -** This is a warning indication, not a fatal overtemperature. Failure to correct this might result in the system overheating and shutting down unexpectedly.

Server Fan Status Indicators

Each fan module has one status indicator (LED). The LEDs are located on the chassis mid-wall adjacent to and aligned with the fan modules and are visible when the top cover fan door is open.

TABLE 2 Server Fan Status Indicators

Status Indicator Name	Icon	Color	State and Meaning
Fan Status	None	Amber	■ Off – The fan module is correctly installed and operating within specification. ■ Amber – The fan module is faulty. The front TOP FAN LED and the front and rear panel Service Required LEDs are also lit if the system detects a fan module fault.

Storage and Boot Drive Indicators

There are three status indicators (LEDs) on each drive.

TABLE 3 Server Front Storage and Boot Disk Drive Indicators

Status Indicator Name	Icon	Color	State and Meaning
OK/Activity	OK	Green	■ OFF – Power is off or installed drive is not recognized by the system.[†] ■ STEADY ON – The drive is engaged and is receiving power. ■ RANDOM BLINKING – There is disk activity. Status indicator LED blinks on and off to indicate activity.
Service Required	⚠	Amber	■ OFF – The storage drive is operating normally. ■ STEADY ON – The system has detected a fault with the storage drive.
OK to Remove		Blue	■ STEADY ON – The storage drive can be removed safely during a hot-plug operation. ■ OFF – The storage drive has not been prepared for removal.

[†]If a rear backplane hard disk's OK/Activity LED shuts off, it may also indicate that a rear hard disk has spun down into a temporary "suspend" mode, in which case the disk would again spin up when coming out of suspend mode.

Power Supply Status Indicators

There are two status indicators (LEDs) on each power supply. These indicators are visible from the rear of the server.

TABLE 4 Server Power Supply Indicators

Status Indicator Name	Icon	Color	State and Meaning
AC OK/ DC OK	OK	Green	■ OFF – No AC power is present. ■ SLOW BLINK – Normal operation. Input power is within specification. DC output voltage is not enabled. ■ STEADY ON – Normal operation. Input AC power and DC output voltage are within specification.
Service Required	⚠	Amber	■ OFF – Normal operation. No service action is required. ■ STEADY ON – The power supply (PS) has detected a PS fan failure, PS overtemperature, PS over current, or PS over or under voltage.

Network Management Port Status Indicators

The server has one 10/100/1000BASE-T Ethernet management domain interface, labeled NET MGT. There are two status indicators (LEDs) on this port. These indicators are visible from the rear of the server.

TABLE 5 Network Management Port Status Indicators

Status Indicator Name	Location	Color	State and Meaning
Activity	Top right	Green	■ ON – Link up. ■ OFF – No link or down link. ■ FLASHING – Packet activity.
Link speed	Top left	Green	■ Green ON – 1000BASE-T link. ■ OFF – 10/100BASE-T link.

Ethernet Ports Status Indicators

The server has four Gigabit Ethernet ports (NET 3, NET 2, NET 1, and NET 0). There are two status indicators on each port. These indicators (LEDs) are visible from the rear of the server.

Note - Ethernet ports NET 2 and NET 3 are nonfunctional in single-processor systems.

TABLE 6 Gigabit Ethernet Port Status Indicators

Status Indicator Name	Location	Color	State and Meaning
Activity	Top left	Green	■ ON – No function. ■ OFF– No activity. ■ FLASHING – Packet activity.
Link speed	Top right	Bicolored: Amber/ Green	■ OFF – 100BASE-T link. ■ Amber ON – 1000BASE-T link. ■ Green ON – 10GBBASE-T link. ■ FLASHING – No function.

Motherboard Status Indicators

The motherboard contains the following status indicators (LEDs).

- **DIMM Fault Status Indicators:** Each of the 24 DIMM sockets on the motherboard has an amber fault status indicator (LED) associated with it. If Oracle ILOM determines that a DIMM is faulty, pressing the Fault Remind button on the motherboard I/O card signals the service processor to light the fault LED associated with the failed DIMM. For more information on DIMM fault status indicators and the location of the Fault Remind Button, see "Servicing the DIMMs (CRU)" on page 105.
- **Processor Fault Status Indicators:** The motherboard includes a fault status indicator (LED) adjacent to each of the two processor sockets. These LEDs indicate when a processor fails. Pressing the Fault Remind button on the motherboard I/O card signals the service processor to light the fault status indicators associated with the failed processors. For more information on processor fault status indicators and the location of the Fault Remind Button, see "Servicing Processors (FRU)" on page 138.
- **Fault Remind Status Indicator:** This status indicator (LED) is located next to the Fault Remind button and is powered from the super capacitor that powers the fault LEDs on the motherboard. This LED lights to indicate that the fault remind circuitry is working properly in cases where no components have failed and, as a result, none of the component fault LEDs illuminate. For more information on the fault remind status indicator and the location of the Fault Remind Button, see "Using the Server Fault Remind Button" on page 113.
- **STBY PWRGD Status Indicator:** This green status indicator (LED) is labeled STBY PWRGD and is located on the motherboard near the rear of the server. This LED lights to inform a service technician that the motherboard is receiving standby power from at least one of the power supplies. This LED is provided to help prevent service actions on the server internal components while the AC power cords are installed and power is being supplied to the server.

Note - The service instructions for all internal components require that all AC power be removed from the power supplies prior to the server top cover being removed.

Troubleshooting System Cooling Issues

Maintaining the proper internal operating temperature of the server is crucial to the health of the server. To prevent server shutdown and damage to components, address over temperature and hardware-related issues as soon as they occur. If your server has a temperature-related fault, the cause of the problem might be:

- "External Ambient Temperature Too High" on page 38
- "Airflow Blockage" on page 38
- "Cooling Areas Compromised" on page 38
- "Hardware Component Failure" on page 39

External Ambient Temperature Too High

Server component cooling relies on the movement of cool air through the server. The cool air is pulled into the server from its external environment. If the ambient temperature of the server's external environment is too high, cooling does not occur, and the internal temperature of the server and its components increases. This can cause poor server performance or a failure of one or more components.

Action: Check the ambient temperature of the server space against the environmental specifications for the server. If the temperature is not within the required operating range, remedy the situation immediately.

Prevention: Periodically check the ambient temperature of the server space to ensure that it is within the required range, especially if you have made any changes to the server space (for example, added additional servers). The temperature must be consistent and stable.

Airflow Blockage

The server cooling system uses fans to pull cool air in from the server front intake vents and exhaust warm air out the server back panel vents. If the front or back vents are blocked, the airflow through the server is disrupted and the cooling system fails to function properly causing the server internal temperature to rise.

Action: Inspect the server front and back panel vents for blockage from dust or debris. Additionally, inspect the server interior for improperly installed components or cables that can block the flow of air through the server.

Prevention: Periodically inspect and clean the server vents using an ESD certified vacuum cleaner. Ensure that all components, such as cards, cable, fans, air baffles and dividers are properly installed. Never operate the server without the top cover installed.

Cooling Areas Compromised

To function properly, the server has cooling areas that are maintained by an air baffle, component filler panels, and the server top cover. These server components need to be in place for the server to function as a sealed system. If internal cooling areas are compromised, the server cooling system, which relies on the movement of cool air through the server, cannot function properly, and the airflow inside the server becomes chaotic and non-directional.

Action: Inspect the server interior to ensure that the air baffle is properly installed. Ensure that all external-facing slots (storage drive, DVD, PCIe) are occupied with either a component or a component filler panel. Ensure that the server top cover is in place and sits flat and snug on top of the server.

Prevention: When servicing the server, ensure that the air baffle is installed correctly and that the server has no unoccupied external-facing slots. Never operate the server without the top cover installed.

Hardware Component Failure

Components, such as power supplies and fan modules, are an integral part of the server cooling system. When one of these components fails, the server internal temperature can rise. This rise in temperature can cause other components to enter into an over-temperature state. Additionally, some components, such as processors, might overheat when they are failing, which can also generate an over-temperature event.

To reduce the risk related to component failure, power supplies and fan modules are installed in pairs to provide redundancy. Redundancy ensures that if one component in the pair fails, the other functioning component can continue to maintain the subsystem. For example, power supplies serve a dual function; they provide both power and airflow. If one power supply fails, the other functioning power supply can maintain both the power and the cooling subsystems.

Action: Investigate the cause of the over-temperature event, and replace failed components *immediately*. For hardware troubleshooting information, see “Troubleshooting Server Hardware Faults” on page 28.

Prevention: Component redundancy is provided to allow for component failure in critical subsystems, such as the cooling subsystem. However, once a component in a redundant system fails, the redundancy no longer exists, and the risk for server shutdown and component failures increases. Therefore, it is important to maintain redundant systems and replace failed components *immediately*.

Troubleshooting Power Issues

If your server does not power on, the cause of the problem might be:

- “AC Power Connection” on page 39
- “Power Supplies (PSUs)” on page 40
- “Top Cover” on page 41

AC Power Connection

The AC power cords are the direct connection between the server power supplies and the power sources. The server power supplies need separate stable AC circuits. Insufficient voltage levels

or fluctuations in power can cause server power problems. The power supplies are designed to operate at a particular voltage and within an acceptable range of voltage fluctuations (refer to "Electrical Power Requirements" in *Oracle Server X5-2L Installation Guide*).

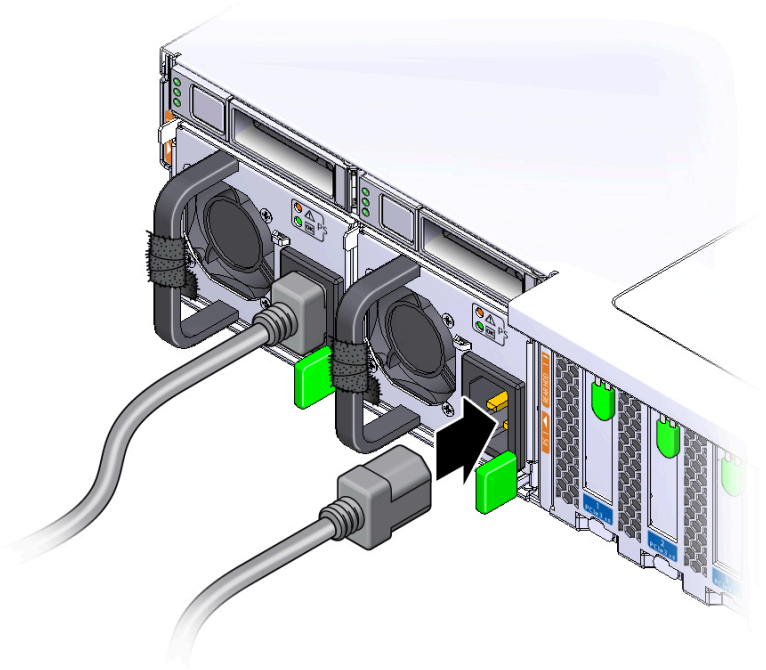
Action: Check that both AC power cords are connected to the server. Check that the correct power is present at the outlets and monitor the power to verify that it is within the acceptable range. You can verify proper connection and operation by checking the power supply (PS) indicator panels, which are located at the back of the server on the power supplies. Lit green AC OK indicators show a properly functioning power supply. An amber AC OK indicator indicates that the AC power to the power supply is insufficient.

Prevention: Use the AC power cord Velcro retaining clips and position the cords to minimize the risk of accidental disconnection. Ensure that the AC circuits that supply power to the server are stable and not overburdened.

Power Supplies (PSUs)

The server power supplies (PSUs) provide the necessary server voltages from the AC power outlets. If the power supplies are inoperable, unplugged, or disengaged from the internal connectors, the server cannot power on.

Note - The Velcro straps shown in the following figure should be used to secure the power cord connectors to the rear of the power supplies. The Velcro retaining straps minimize the risk of accidental disconnection.



Action: Check that the AC cables are connected to both power supplies. Check that the power supplies are operational (the PSU indicator panel should have a lit green AC OK indicator). Ensure that the power supply is properly installed. A power supply that is not fully engaged with its internal connector does not have power applied and does not have a lit green AC OK indicator.

Prevention: When a power supply fails, replace it immediately. To ensure redundancy, the server has two power supplies. This redundant configuration prevents server downtime, or an unexpected shutdown, due to a failed power supply. The redundancy allows the server to continue to operate if one of the power supplies fails. However, when a server is being powered by a single power supply, the redundancy no longer exists, and the risk for downtime or an unexpected shutdown increases. When installing a power supply, ensure that it is fully seated and engaged with its connector inside the drive bay. A properly installed power supply has a lit green AC OK indicator.

Top Cover

The server top cover is an important component for a properly functioning server. The top cover is vital to the server cooling subsystem because it helps to maintain the pressure areas within the server, and the top cover also protects against accidental exposure to hazardous voltages

and damage to internal components. For these reasons, the server top cover is interlocked to the server power. The interlock is created by a switch that is mounted inside the server on the housing for the power supply. The switch engages when the cover is installed, allowing power to be applied to the server. When the cover is not installed, the server cannot power on. If the server is powered on when the cover is removed, power is *immediately* switched off.

Action: If the server does not power on, check that the switch is intact and properly aligned. Ensure that the server top cover is in place and sits flat and snug on top of the server. Ensure that the interlock switch components have not been damaged, removed, or misaligned. For instructions for properly installing the top cover, see "Install the Server Top Cover" on page 236.

Prevention: After removing the top cover, take care that it does not get bent. When servicing the server, take care that the internally mounted interlock switch component does not get damaged or misaligned. Never operate the server without the top cover installed.

Managing Server Hardware Faults Through the Oracle ILOM Fault Management Shell

The Oracle ILOM Fault Management Shell enables you to view and manage fault activity on a managed servers and other types of devices.

For more information about how to use the Oracle ILOM Fault Management Shell, refer to the *Oracle ILOM User's Guide for System Monitoring and Diagnostics Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Troubleshooting With Diagnostic Tools

The server and its accompanying software and firmware contain diagnostic tools and features that can help you isolate component problems, monitor the status of a functioning system, and exercise one or more subsystem to disclose more subtle or intermittent hardware-related problems.

Each diagnostic tool has its own specific strength and application. Review the tools listed in this section and determine which tool might be best to use for your situation. Once you have determined the tool to use, you can access it locally, while at the server, or remotely.

- "Diagnostic Tools" on page 43

■ “Diagnostic Tool Documentation” on page 44

Diagnostic Tools

The selection of diagnostic tools available for your server range in complexity from a comprehensive validation test suite (Oracle VTS) to a chronological event log (Oracle ILOM System Log). The selection of diagnostic tools also includes standalone software packages, firmware-based tests, and hardware-based LED indicators.

The following table summarizes the diagnostic tools that you can use when troubleshooting or monitoring your server.

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
Oracle ILOM	SP firmware	Monitors environmental condition and component functionality sensors, generates alerts, performs fault isolation, and provides remote access.	Can function on either standby power mode or full power mode and is not OS dependent.	Designed for remote and local access.
Preboot Menu	SP firmware	Enables you to restore some Oracle ILOM default settings when Oracle ILOM is not accessible.	Can function on standby power and when operating system is not running.	Local, but remote serial access is possible if the SP serial port is connected to a network-accessible terminal server.
Hardware-based LED indicators	Hardware and SP firmware	Indicates status of overall system and particular components.	Available when system power is available.	Local, but sensor and indicators are accessible from Oracle ILOM web interface or command-line interface (CLI).
Power-On Self-Test (POST)	Host firmware	Tests core components of system: CPUs, memory, and motherboard I/O bridge integrated circuits.	Runs on startup. Available when the operating system is not running.	Local, but can be accessed through Oracle ILOM Remote System Console Plus.
U-Boot	SP firmware	Initializes and test aspects of the service processor (SP) prior to booting the Oracle ILOM SP and operating system. Tests SP memory, SP, network devices and I/O devices.	Can function on standby power and when operating system is not running.	Local, but remote serial access is possible if the SP serial port is connected to a network-accessible terminal server.
UEFI Diagnostics	SP firmware	The UEFI diagnostics can test and detect problems on	You can use either the Oracle ILOM	Remote access through Oracle

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
		all processors, memory, disk drives, and network ports. It is used on newer Oracle systems, such as the Oracle Server X5-2L.	web interface or the command-line interface (CLI) to run UEFI diagnostics.	ILOM Remote System Console Plus.
Oracle Solaris commands	Operating system software	Displays various kinds of system information.	Requires operating system.	Local, and over network.
Oracle Linux commands	Operating system software	Displays various kinds of system information.	Requires operating system.	Local, and over network.
Oracle VTS	Diagnostic tool standalone software	Exercises and stresses the system, running tests in parallel.	Requires the Solaris operating system. Install Oracle VTS software separately.	View and control over network.

Diagnostic Tool Documentation

The following table identifies where you can find more information about diagnostic tools.

Diagnostic Tool	Documentation	Location
Oracle ILOM	Oracle Integrated Lights Out Manager 5.0 Documentation Library	`https://www.oracle.com/goto/ilom/docs`
Preboot Menu	*Oracle x86 Servers Diagnostics Guide*	`https://www.oracle.com/goto/x86admindiag/docs`
System indicators and sensors	This document	“Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32
U-Boot or UEFI Diags	*Oracle x86 Servers Diagnostics Guide*	`https://www.oracle.com/goto/x86admindiag/docs`
Oracle VTS	Oracle VTS software and documentation	`https://docs.oracle.com/cd/E19719-01/index.html`

Attaching Devices to the Server

The following sections contain procedural information for attaching devices to the server so you can access diagnostic tools when troubleshooting and servicing the server:

- “Attach Devices to the Server” on page 45

- “Rear Panel Connector Locations” on page 45
- “Configuring Serial Port Sharing” on page 47
- “Server Operating System Names for the NVMe Storage Drives” on page 48
- “Ethernet Port Boot Order and Device Naming” on page 49
- “Rear Panel Pinhole Switches” on page 50

▼ Attach Devices to the Server

This procedure explains how to connect devices to the server (remotely and locally), so that you can interact with the service processor (SP) and the server console.

1. **Connect an Ethernet cable to the Gigabit Ethernet (NET) connectors as needed for OS support.**

   See “Rear Panel Connector Locations” on page 45.

2. **To connect to the service processor's Oracle ILOM over the network, connect an Ethernet cable to the Ethernet port labeled NET MGT.**

   See “Rear Panel Connector Locations” on page 45.

3. **To access the Oracle ILOM command-line interface (CLI) locally using the management port, connect a serial null modem cable to the RJ-45 serial port labeled SER MGT.**

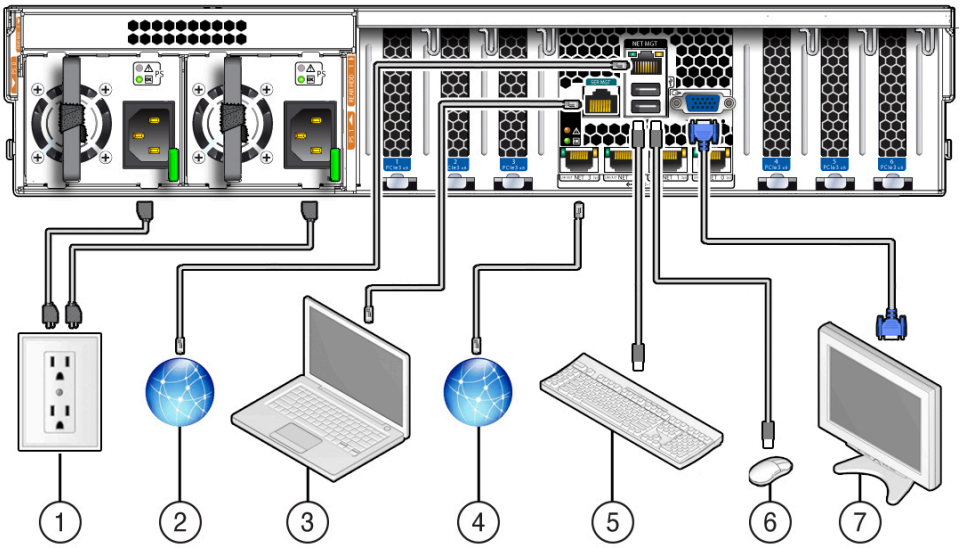
   See “Rear Panel Connector Locations” on page 45.

4. **To interact with the system console locally, connect a mouse and keyboard to the USB connectors and a monitor to the DB-15 video connector.**

   See “Rear Panel Connector Locations” on page 45.

Rear Panel Connector Locations

The following illustration shows and describes the locations of the back panel connectors. Use this information to set up the server, so that you can access diagnostic tools and manage the server during service.



No.	Cable Port or Expansion Slot	Description
1	Power supply 0 input power	The server has two power supply connectors, one for each power supply.
	Power supply 1 input power	Do not attach power cables to the power supplies until you have finished connecting the data cables to the server. The server goes into standby power mode, and the Oracle ILOM service processor initializes when the AC power cables are connected to the power source. System messages might be lost after 60 seconds if the server is not connected to a terminal, PC, or workstation. **Note -** Oracle ILOM will signal a fault on any installed power supply that is not connected to an AC power source, since it might indicate a loss of redundancy.
2	Network management port (NET MGT)	The service processor NET MGT port is the optional connection to the Oracle ILOM service processor. The NET MGT port is configured by default to use Dynamic Host Configuration Protocol (DHCP). The service processor NET MGT port uses an RJ-45 cable for a 10/100/1000BASE-T connection.
3	Serial management port (SER MGT)	The service processor SER MGT port uses an RJ-45 cable and is the default connection to the Oracle ILOM service processor. This port supports local connections to the server and only recognizes Oracle ILOM command-line interface (CLI) commands. Typically you connect a terminal or terminal emulator to this port. **Note -** This port does not support network connections.
4	Ethernet ports (NET 3, NET 2, NET 1, NET 0)	The four 10-Gigabit Ethernet ports enable you to connect the system to the network.

No.	Cable Port or Expansion Slot	Description
		Note - Ethernet ports NET2 and NET3 are nonfunctional in single-processor systems.
5, 6	USB ports (USB 0, USB 1)	The two USB ports support hot-plugging. You can connect and disconnect USB cables and peripheral devices while the server is running without affecting system operations.
7	Video port (VGA)	Use a 15-pin video cable to connect a VGA video device to the server. Optionally, you can connect to the VGA port when installing the operating system.

Configuring Serial Port Sharing

By default, the SP console (SER MGT) port sends serial port output from the server. Using Oracle ILOM, you can specify that the host console (COM1) be assigned as owner of the server serial port output. This feature is useful for Windows kernel debugging, as it enables you to view non-ASCII character traffic from the host console.

You should set up the network on the SP before attempting to change the serial port owner to the host server. If the network is not set up, and you switch the serial port owner to the host server, you will be unable to connect using the CLI or web interface to change the serial port owner back to the SP. To return the serial port owner setting to the SP, you need to restore access to the serial port on the server. For more details about restoring access to the server port on your server, see the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

You can assign serial port output using either the Oracle ILOM web interface or the command-line interface (CLI). For instructions, see the following sections:

- “Assign Serial Port Output Using the CLI” on page 47
- “Assign Serial Port Output Using the Web Interface” on page 48

▼ Assign Serial Port Output Using the CLI

1. Open an SSH session and at the command line log in to the SP Oracle ILOM CLI.

Log in as a user with root or administrator privileges. For example:

`ssh root@`*`ipaddress`*

Where *ipaddress* is the IP address of the server SP.

For more information, see “Accessing Oracle ILOM” in the *Oracle X5 Series Servers Administration Guide*.

The Oracle ILOM CLI prompt (->) appears.

2. **To set the serial port owner, type:**

```
-> set /SP/serial/portsharing owner=host
```

Note - The serial port sharing value by default is `owner=SP`.

3. **Connect a serial host to the server.**

▼ Assign Serial Port Output Using the Web Interface

1. **Log in to the SP Oracle ILOM web interface.**

   To log in, open a web browser and direct it using the IP address of the server SP. Log in as root or a user with administrator privileges. See "Accessing Oracle ILOM" in the *Oracle X5 Series Servers Administration Guide*.

   The Summary Information screen appears.

2. **In the Oracle ILOM web interface, select ILOM Administration → Connectivity from the navigation menu on the left side of the screen.**

3. **Select the Serial Port tab.**

   The Serial Port Settings page appears.

Note - The serial port sharing setting by default is `Service Processor`.

4. **In the Serial Port Settings page, select `Host Server` as the serial port owner.**

5. **Click `Save` for the changes to take effect.**

6. **Connect a serial host to the server.**

Server Operating System Names for the NVMe Storage Drives

If the optional NVMe storage drives are installed in the server's front panel, they are labeled NVMe0, NVMe1, NVMe2, and NVMe3. However, the server operating systems assign these

storage drives different names. For the corresponding names assigned by the operating systems, see the following table.

TABLE 7 Operating System NVMe Storage Drive Nomenclature

Storage Drive Labels	Names Assigned by the Server Operating Systems
NVMe0	PCI-Express Slot 10
NVMe1	PCI-Express Slot 11
NVMe2	PCI-Express Slot 12
NVMe3	PCI-Express Slot 13

Ethernet Port Boot Order and Device Naming

This section contains information about the boot order and device naming for the four 10-Gigabit Ethernet ports on the rear panel of the server. For location information, see “Rear Panel Connector Locations” on page 45. From right to left, the ports are numbered NET 0 to NET 3.

Ethernet Port Boot Order

The order in which the BIOS detects the Ethernet ports during server boot is listed below.

Note - You can change the boot priority using the Boot Device Priority screen available in the Boot menu of the BIOS Setup Utility.

1. NET 0
2. NET 1
3. NET 2
4. NET 3

Ethernet Port Device Naming

Note - Naming used by the interfaces might vary from that listed below depending on which devices are installed in the system.

The device naming for the Ethernet interfaces is reported differently by different interfaces and operating systems. The following table shows BIOS (physical) and operating system (logical) naming conventions used for each interface. These naming conventions might vary depending on conventions of your operating system and which devices are installed in the server.

Port	BIOS	Solaris	Linux	Windows (example default names, see note below)
NET 0	3A00	ixgbe 0	eth 0	Ethernet
NET 1	3A01	ixgbe 1	eth 1	Ethernet 2
NET 2	8200	ixgbe 2	eth 2	Ethernet 3
NET 3	8201	ixgbe 3	eth 3	Ethernet 4

Note - For Windows, port names like Ethernet, Ethernet 2, Ethernet 3, and Ethernet 4 are used by default. However, actual port naming is based on the order of enumeration, typically during operating system installation. Additionally, Windows allows you to rename the ports to meet application-specific needs.

Rear Panel Pinhole Switches

This section shows the location of the rear panel pinhole switches.

FIGURE 6 Rear Panel Pinhole Switches

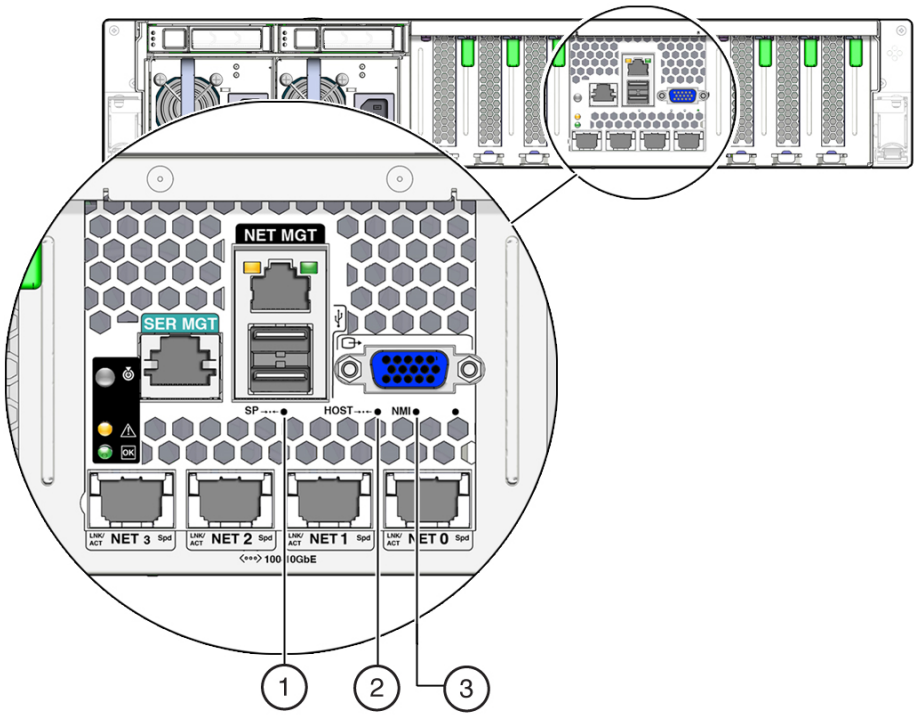


Figure Legend	Description
1	SP Reset
2	Host Warm Reset
3	Non-maskable interrupt (NMI)†

†Oracle Service use only.

Caution - Using a conductive tool, such as a metal paper clip or graphite pencil, can cause a short that can cause an immediate host power off, and/or circuit damage.

Getting Help

The following sections describe how to get additional help to resolve server-related problems.

- "Contacting Support" on page 52
- "Locating the Chassis Serial Number" on page 53

Contacting Support

If the troubleshooting procedures in this chapter fail to solve your problem, use the following table to collect information that you might need to communicate to support personnel.

System Configuration Information Needed	Your Information
Service contract number	
System model	
Operating environment	
System serial number	
Peripherals attached to the system	
Email address and phone number for you and a secondary contact	
Street address where the system is located	
Superuser password	
Summary of the problem and the work being done when the problem occurred	
Other Useful Information	
IP address	
Server name (system host name)	
Network or internet domain name	
Proxy server configuration	

Related Information

- "Locating the Chassis Serial Number" on page 53

Locating the Chassis Serial Number

You might need to have your server serial number when you ask for service on your system. Record this number for future use. Use one of the following resources or methods to locate your server serial number.

- The serial number is located on the Radio-frequency Identification (RFID) label on the bottom left side of the front panel bezel, below the general status LEDs.

  For illustrations of the storage cell front panel, see "About Controls and Connectors" on page 16.
- The serial number is recorded on the service label that is attached to the top cover of the system.
- The serial number is recorded on the yellow Customer Information Sheet (CIS) that is attached to your storage cell packaging.
- Locate the yellow Customer Information Sheet (CIS) attached to your server packaging. This sheet includes the serial number.
- Using Oracle ILOM:
  - From the command-line interface (CLI), type the command: `show/SYS`.
  - From the web interface, view the serial number on the System Information screen.
- Using Oracle System Assistant, view the serial number on the System Overview screen.

Preparing for Service

These sections describe safety considerations and provide prerequisite procedures and information about replacing components within the server.

Description	Links
Understand the safety precautions, understand the safety symbols, and take ESD precautions prior to removing or installing parts in the server.	"Safety Precautions" on page 55 "Safety Symbols" on page 56 "Electrostatic Discharge Safety" on page 56
Understand the key identity properties auto-update feature.	"FRU Key Identity Properties (KIP) Automated Update" on page 57
Assemble the required tools.	"Required Tools" on page 58
Before working with components within the server, power down the server and prepare for servicing.	"Preparing the Server for Component Replacement" on page 59

Related Information

- "Returning the Server to Operation" on page 235

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all standard cautions, warnings, and instructions marked on the equipment and described in the *Oracle Server X5-2L Safety and Compliance Guide* and *Important Safety Information for Oracle's Hardware Systems*.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment electrical rating label.
- Follow the electrostatic discharge safety practices as described in "Electrostatic Discharge Safety" on page 56.

- Disconnect both power supply cords before servicing components.

Related Information

- “Safety Symbols” on page 56
- “Electrostatic Discharge Safety” on page 56

Safety Symbols

The following symbols might appear in this document. Note their meanings.



Caution - Risk of personal injury or equipment damage. To avoid personal injury or equipment damage, follow the instructions.



Caution - Hot surface. Avoid contact. Surfaces are hot and might cause personal injury if touched.



Caution - Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

Related Information

- “Safety Precautions” on page 55
- “Electrostatic Discharge Safety” on page 56

Electrostatic Discharge Safety

Devices that are sensitive to electrostatic discharge (ESD), such as the motherboard, PCIe cards, drives, processors, and memory DIMMs require special handling.



Caution - The boards and drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy components. Do not touch the components along their connector edges.

Do the following when handling ESD-sensitive components:

- Use an antistatic wrist strap.

  Wear an antistatic wrist strap and use an antistatic mat when handling components such as drive assemblies, boards, or cards. When servicing or removing server components, attach an antistatic strap to your wrist and then to a metal area on the chassis. Then disconnect the power cords from the server. Following this practice equalizes the electrical potentials between you and the server.

  Note - An antistatic wrist strap is not included in the Accessory Kit for the server. However, antistatic wrist straps are included with options and components.

- Use an antistatic mat.

  Place ESD-sensitive components such as the motherboard, memory DIMMS, and other printed circuit board (PCB) cards on an antistatic mat. The following items can be used as an antistatic mat:

  - An antistatic bag used to wrap an Oracle replacement part
  - An Oracle ESD mat (orderable item)
  - A disposable ESD mat (shipped with some replacement parts or optional system components)

Related Information

- “Safety Precautions” on page 55
- “Safety Symbols” on page 56
- “Preparing the Server for Component Replacement” on page 59
- “Returning the Server to Operation” on page 235

FRU Key Identity Properties (KIP) Automated Update

Oracle ILOM includes a key identity properties (KIP) auto-update feature that ensures product information that is used for service entitlement and warranty coverage is accurately maintained by the server at all times, including during hardware replacement activities.

The KIP includes the server product name, product part number (PPN), and product serial number (PSN). The KIP are stored in the FRUID (field-replaceable unit identifiers) container of the three server FRUs that are designated quorum members.

The quorum members include:

- Disk backplane (DBP), designated as a primary quorum member.
- Motherboard (MB), designated as a backup quorum member.
- Power supply (PS), designated as a backup quorum member.

When a server FRU that contains the KIP is removed and a replacement component is installed, the KIP of the replacement component is programmed by Oracle ILOM to contain the same KIP as the other two components.

Note - Only one of the quorum members can be replaced at a time. Automated updates can only be completed when two of the three quorum members contain matching key identity properties.

Related Information

- “Servicing Power Supplies (CRU)” on page 99
- “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156
- “Servicing the Motherboard Assembly (FRU)” on page 218

Required Tools

The server can be serviced with the following tools:

- Antistatic wrist strap
- Antistatic mat
- Hex/flat head screwdriver
- No. 2 Phillips screwdriver

Related Information

- “Preparing for Service” on page 55
- “Servicing CRUs That Do Not Require Server Power-Off” on page 75
- “Servicing CRUs That Require Server Power-Off” on page 105
- “Servicing FRUs” on page 137

Preparing the Server for Component Replacement

Note - When you are replacing the storage drives or power supplies, not all of these procedures are necessary. See the replacement procedures for those components for more information.

Before you can remove and install components that are inside the server, you must perform the procedures in the following sections:

- “Powering Down the Server” on page 59
- “Disconnect Cables From the Server” on page 65
- “Extend the Server to the Maintenance Position” on page 66
- “Remove the Server From the Rack” on page 67
- “Take Antistatic Measures” on page 68
- “Remove the Server Top Cover” on page 69
- “Remove the Fan Assembly Door From the Server” on page 70
- “Remove the Disk Cage Cover From the Server” on page 72

Related Information

- “Returning the Server to Operation” on page 235

Powering Down the Server

Determine how you want to power down the server by reviewing the options in the following table.

Description	Link
Power down the server gracefully to prevent data from being corrupted. Performing a graceful shutdown ensures that the system is ready for restart.	■ “Power Down the Server Gracefully Using the Oracle ILOM CLI” on page 60 ■ “Power Down the Server Gracefully Using the Oracle ILOM Web Interface” on page 61 ■ “Power Down the Server Gracefully Using the Power Button” on page 62
If the server is not responding, or you must shut down the server quickly, perform an immediate shutdown.	■ “Power Down the Server for Immediate Shutdown Using the Power Button” on page 63 ■ “Power Down the Server for Immediate Shutdown Using the Oracle CLI” on page 63

Description	Link
	■ “Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface” on page 64

Related Information

- “Power On the Server” on page 243

▼ Power Down the Server Gracefully Using the Oracle ILOM CLI

Performing a graceful shutdown ensures that all of your data is saved and the system is ready for restart.

1. **Log in to the server as superuser or equivalent.**

   Depending on the nature of the problem, you might want to view the system status or the log files or run diagnostics before you shut down the system. For log file information, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Collection at `https://www.oracle.com/goto/ilom/docs`.

2. **Notify affected users that the server will be powered down.**

3. **Save any open files, and quit all running applications.**

   Refer to your application documentation for specific information about these processes.

4. **Log in to the Oracle ILOM command-line interface (CLI) using an Administrator account.**

   For instructions, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Collection.

5. **At the Oracle ILOM prompt, shut down the operating system:**

   ```
   -> stop /System
   ```

   If the system is running the Oracle Solaris OS, refer to the Oracle Solaris system administration documentation for additional information.

6. **Disconnect the power and cables from the server.**

   See “Disconnect Cables From the Server” on page 65.



Caution - When you power down the server using Oracle ILOM, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- "Power Down the Server Gracefully Using the Oracle ILOM Web Interface" on page 61
- "Power Down the Server Gracefully Using the Power Button" on page 62
- "Power Down the Server for Immediate Shutdown Using the Power Button" on page 63
- "Power On the Server" on page 243

▼ Power Down the Server Gracefully Using the Oracle ILOM Web Interface

Performing a graceful shutdown ensures that all of your data is saved and the system is ready for restart.

1. **Log in to the server as superuser or equivalent.**

   Depending on the nature of the problem, you might want to view the system status or the log files or run diagnostics before you shut down the system. For log file information, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Collection at `https://www.oracle.com/goto/ilom/docs`.

2. **Notify affected users that the server will be powered down.**

3. **Save any open files, and quit all running applications.**

   Refer to your application documentation for specific information about these processes.

4. **Log in to the Oracle ILOM web interface using an Administrator account.**

   The Oracle ILOM web interface System Information → Summary Information page appears.

5. **In the left pane, click Host Management → Power Control, and click Graceful Shutdown and Power Off from the Select Action list.**

6. **Click Save, and then click OK.**

   The host server performs an orderly power-down.

7. **Disconnect the power cords and data cables from the server.**

   See “Disconnect Cables From the Server” on page 65.



Caution - When you power down the server using Oracle ILOM, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- “Power Down the Server Gracefully Using the Oracle ILOM CLI” on page 60
- “Power Down the Server Gracefully Using the Power Button” on page 62
- “Power Down the Server for Immediate Shutdown Using the Power Button” on page 63
- “Power On the Server” on page 243

▼ Power Down the Server Gracefully Using the Power Button

1. **Press and quickly release the Power button on the front panel.**

   This action causes ACPI-enabled operating systems to perform an orderly shutdown of the operating system. Servers not running ACPI-enabled operating systems shut down to standby power mode immediately.

   When main power is off, the Power/OK LED on the front panel begins flashing, indicating that the server is in standby power mode. See “Server System-Level Status Indicators” on page 33.

2. **Disconnect the power cords and data cables from the server.**

   See “Disconnect Cables From the Server” on page 65.



Caution - When you power down the server using the Power button, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- “Server System-Level Status Indicators” on page 33
- “Power Down the Server Gracefully Using the Oracle ILOM CLI” on page 60
- “Power Down the Server Gracefully Using the Oracle ILOM Web Interface” on page 61
- “Power On the Server” on page 243

▼ Power Down the Server for Immediate Shutdown Using the Power Button



Caution - This procedure quickly forces the server main power off. You might corrupt your system data during an immediate power-down, so use this procedure to power down the server only after attempting the graceful power-down procedure.

1. **Press and hold the Power button for four seconds to force the main power off and to enter standby power mode.**

   When main power is off, the Power/OK LED on the front panel begins flashing, indicating that the server is in standby power mode. See "Server System-Level Status Indicators" on page 33.

2. **Disconnect the power cords and data cables from the server.**

   See "Disconnect Cables From the Server" on page 65.



Caution - When you power down the server using the Power button, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- "Server System-Level Status Indicators" on page 33
- "Power Down the Server for Immediate Shutdown Using the Oracle CLI" on page 63
- "Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface" on page 64
- "Power On the Server" on page 243

▼ Power Down the Server for Immediate Shutdown Using the Oracle CLI



Caution - This procedure quickly forces the server main power off. You might corrupt your system data during an immediate power-down, so use this procedure to power down the server only after attempting the graceful power-down procedure.

1. **Log in to the Oracle ILOM command-line interface (CLI) using an Administrator account.**

Oracle ILOM displays the default command prompt (->), indicating that you have successfully logged in to Oracle ILOM.

2. **From the CLI prompt, type the following command:**

```
-> stop -f /System
```

The server powers down immediately.

3. **Disconnect the power and data cables from the server.**

See "Disconnect Cables From the Server" on page 65.



Caution - When you power down the server using Oracle ILOM, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- "Power Down the Server for Immediate Shutdown Using the Power Button" on page 63
- "Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface" on page 64
- "Power On the Server" on page 243

▼ Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface



Caution - This procedure quickly forces the server main power off. You might corrupt your system data during an immediate power-down, so use this procedure to power down the server only after attempting the graceful power-down procedure.

1. **Log in to the Oracle ILOM web interface using an Administrator account.**

The Oracle ILOM web interface System Information → Summary Information page appears.

2. **In the left pane, click Host Management → Power Control, and click Immediate Power Off in the Select Action list.**

3. **Click Save, and then click OK.**

The server powers down immediately.

4. **Disconnect the power and data cables from the server.**

See “Disconnect Cables From the Server” on page 65.

Caution - When you power down the server using Oracle ILOM, the server enters standby power mode. Power is still directed to the service processor remote management subsystem and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- “Power Down the Server for Immediate Shutdown Using the Power Button” on page 63
- “Power Down the Server for Immediate Shutdown Using the Oracle CLI” on page 63
- “Power On the Server” on page 243

▼ Disconnect Cables From the Server

Caution - The system supplies standby power to the circuit boards even when the system is powered off.

1. **Label all cables connected to the server.**
2. **Power down the server.**
   See “Powering Down the Server” on page 59.
3. **Disconnect the power cords from the rear of the server.**
4. **Disconnect all data cables from the rear of the server.**
5. **If your rackmount kit includes a cable management device, remove the cables from it.**
6. **Depending on the components that you are servicing, either extend the server to the maintenance position, or remove the server from the rack.**

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Powering Down the Server” on page 59
- “Extend the Server to the Maintenance Position” on page 66
- “Remove the Server From the Rack” on page 67

- “Reconnect Power and Data Cables” on page 243

▼ Extend the Server to the Maintenance Position

The following components can be serviced with the server in the maintenance position:

- Storage drives
- Fan modules
- Power supplies
- DVD drive
- DDR4 DIMMs
- PCIe cards and cables
- SAS cables
- NVMe cables
- Internal USB drives
- System battery
- Processors
- Disk backplanes
- Front indicator modules
- Motherboard

If the server is installed in a rack with extendable slide-rails, use this procedure to extend the server to the maintenance position.

1. **To prevent the rack from tipping forward when the server is extended, extend all rack anti-tilt devices.**

   For instructions for stabilizing the rack, refer to “Stabilize the Rack for Installation” in *Oracle Server X5-2L Installation Guide*.

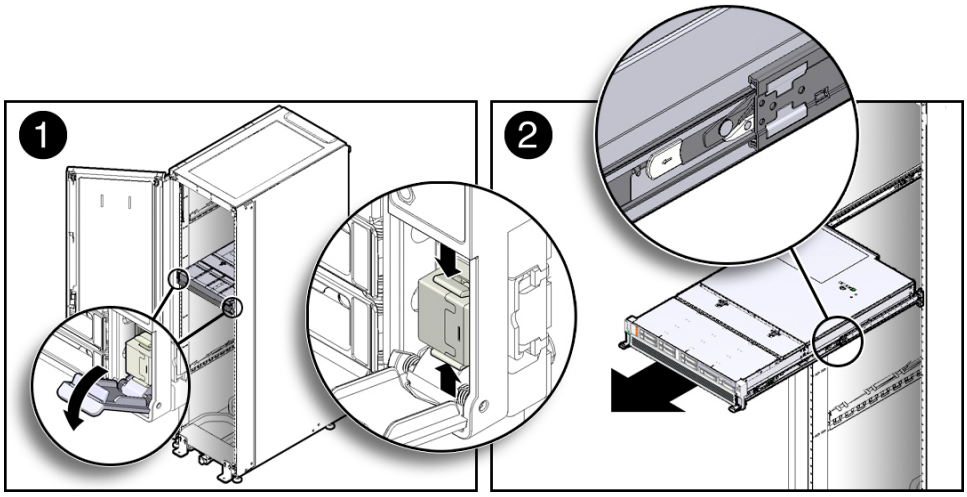
2. **Verify that no cables will be damaged or will interfere when the server is extended.**

   Although the cable management arm (CMA) that is supplied with the server is hinged to accommodate extending the server, you should ensure that all cables and cords are capable of extending.

3. **From the front of the server, open and hold the left and right release latch covers in the open position.**

   When in an open position, the release latch covers engage the slide-rail release latches [1].

Caution - Deploy any rack anti-tilt mechanism before releasing the slide-rail release latches.



4. **While the release latch covers are in the open position, slowly pull the server forward until the slide-rails latch into a locked position [2].**

   The server is now in the extended maintenance position.

Related Information

- “Disconnect Cables From the Server” on page 65
- “Remove the Server From the Rack” on page 67
- “Reinstall the Server in the Rack” on page 240

▼ Remove the Server From the Rack

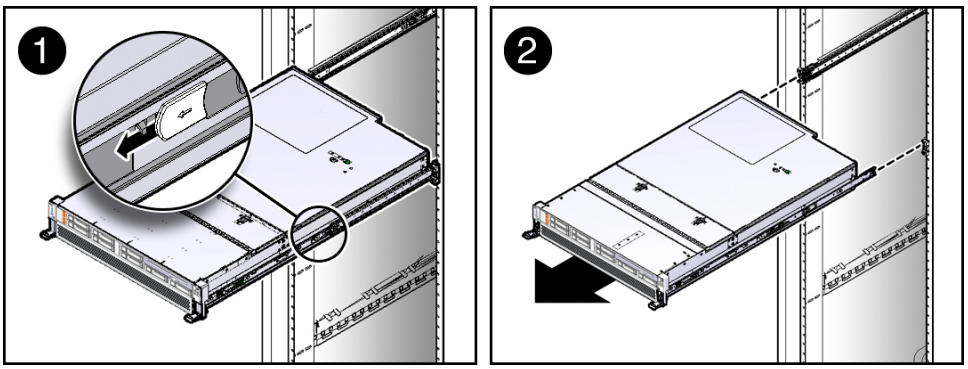
Caution - The server weighs approximately 63 pounds (28.5 kg). Two people are required to unmount and carry the chassis.

1. **Disconnect all the cables and power cords from the server.**

2. **Remove the cable management arm (CMA).**
   For instructions for removing the CMA, see the "Remove the Cable Management Arm" in *Oracle Server X5-2L Installation Guide*.

3. **Extend the server to the maintenance position.**
   See "Extend the Server to the Maintenance Position" on page 66.

4. **From the front of the server, pull the green slide-rail release tabs toward the front of the server, and pull the server out of the rack until it is free of the rack rails [1 and 2].**
   A slide-rail release tab is located on each slide-rail.



5. **Set the server on a sturdy work surface.**

Related Information

- "Disconnect Cables From the Server" on page 65
- "Extend the Server to the Maintenance Position" on page 66
- "Reinstall the Server in the Rack" on page 240

▼ Take Antistatic Measures

1. **Prepare an antistatic surface on which to set parts during removal and installation.**
   Place electrostatic discharge (ESD-sensitive components on an antistatic mat. The following items can be used as an antistatic mat:

- An antistatic bag used to wrap a replacement part
- An Oracle ESD mat (orderable item)
- A disposable ESD mat (shipped with some replacement parts or optional system components)

2. **Attach an antistatic wrist strap.**

When servicing or removing server components, attach an antistatic strap to your wrist and then to a metal area on the chassis. Then perform procedures for servicing the server.

Note - An antistatic wrist strap is not included in the Accessory Kit for the server. However, antistatic wrist straps are included with options and components.

Related Information

- "Extend the Server to the Maintenance Position" on page 66
- "Remove the Server From the Rack" on page 67
- "Remove the Server Top Cover" on page 69
- "Remove the Fan Assembly Door From the Server" on page 70
- "Remove Antistatic Measures" on page 240

▼ Remove the Server Top Cover



Caution - If you remove the top cover without first removing the AC power cords, then not only will the server host shut down, but also this condition will be flagged as a system fault (that is, the fault LEDs will light).

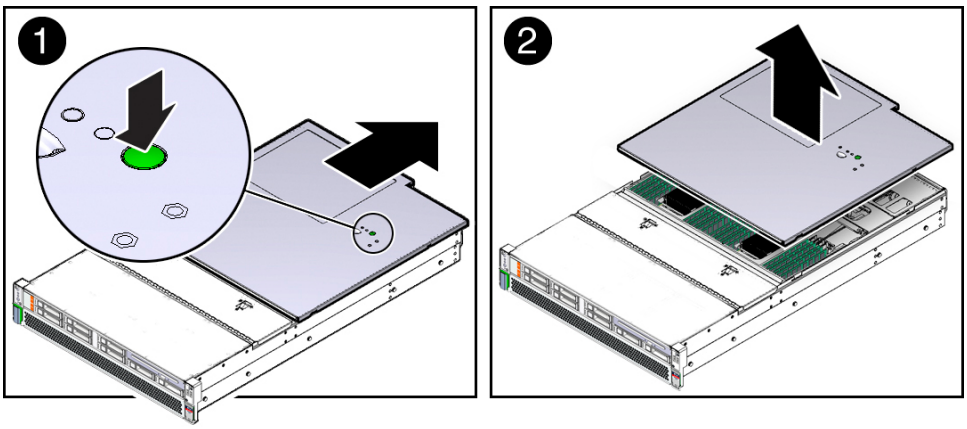
Note - Servicing some components requires that the top cover be removed.

---

1. **Ensure that AC power cords are disconnected from the server power supplies.**

2. **Unlatch the top cover [1].**

Press the green release button on the top of the server cover.



3. **While pressing the top cover release button, slide the cover toward the rear of the server [2].**
4. **If necessary, open the fan assembly door.**
5. **Lift up and remove the top cover [2].**

Related Information

- “Take Antistatic Measures” on page 68
- “Remove the Fan Assembly Door From the Server” on page 70
- “Install the Server Top Cover” on page 236

▼ Remove the Fan Assembly Door From the Server

Before you service the server's storage drive backplane, you should first remove the server's front fan assembly door.

Note - This procedure is only required for systems configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives. If your system is configured with eight 2.5-inch storage drives, see “Remove the Disk Cage Cover From the Server” on page 72.

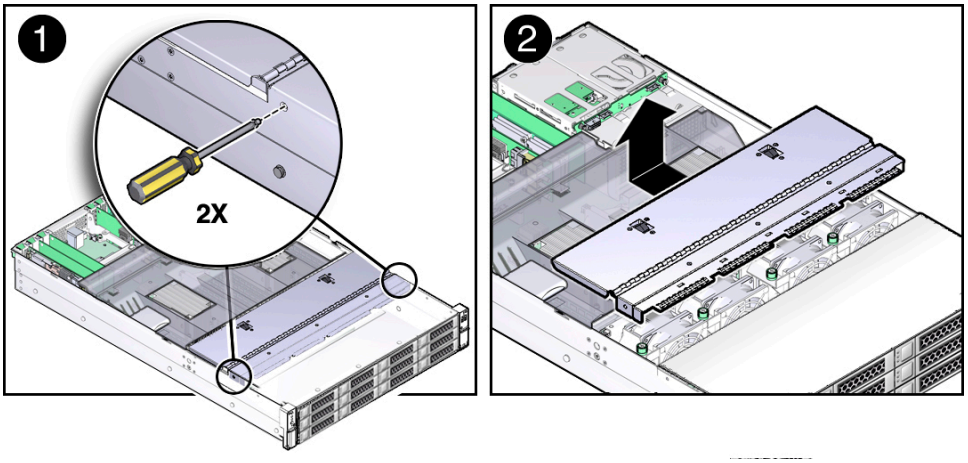
---

1. **Ensure that the AC power cords are disconnected from the server power supplies.**

2. **Use a No. 2 Phillips screwdriver to remove the screws that secure the fan assembly door [1].**

   - **If your system is configured with twelve 3.5-inch storage drives, remove the two screws on each side of the chassis and the three screws on top of the chassis.**

   - **If your system is configured with twenty-four 2.5-inch storage drives, remove the two screws on each side of the chassis.**



3. **Slide the fan assembly door toward the rear of the server, and lift and remove the door from the chassis [2].**

Related Information

- “Take Antistatic Measures” on page 68
- “Remove the Server Top Cover” on page 69
- “Install the Server Top Cover” on page 236
- “Install the Fan Assembly Door” on page 238

▼ Remove the Disk Cage Cover From the Server

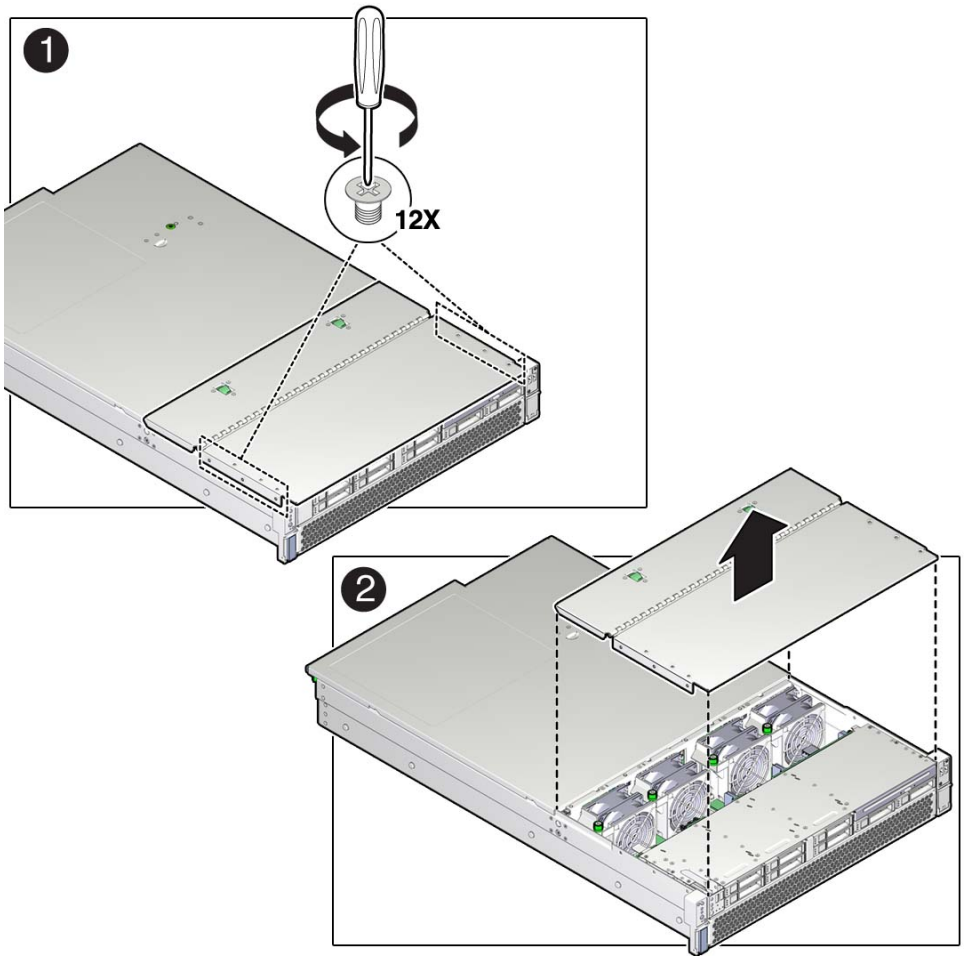
Before you service the server's storage drive backplane, you should first remove the server's disk cage cover.

Note - This procedure is only required for systems configured with eight 2.5-inch storage drives. If your system is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, see “Remove the Fan Assembly Door From the Server” on page 70.

---

1. **Ensure that the AC power cords are disconnected from the server power supplies.**

2. **Using a No. 2 Phillips screwdriver, remove the twelve screws (three on each top side of the chassis, and three on each side of the chassis) that secure the disk cage cover [1].**



3. **Slide the cover forward and lift to remove the disk cage cover from the chassis [2].**

Related Information

- “Take Antistatic Measures” on page 68

- “Remove the Server Top Cover” on page 69
- “Install the Server Top Cover” on page 236
- “Install the Disk Cage Cover” on page 239

Servicing CRUs That Do Not Require Server Power-Off

These sections describe how to service customer-replaceable units (CRUs) that do not require you to power off the server. For more information about CRUs, see “Illustrated Parts Breakdown” on page 23 and “Customer-Replaceable Units” on page 24.

Description	Links
Service storage and boot drives.	“Servicing Storage Drives and Rear Drives (CRU)” on page 75
Service fan modules.	“Servicing Fan Modules (CRU)” on page 93
Service power supplies.	“Servicing Power Supplies (CRU)” on page 99

Related Information

- “Servicing CRUs That Require Server Power-Off” on page 105
- “Servicing FRUs” on page 137

Servicing Storage Drives and Rear Drives (CRU)

These sections describe how to remove and install storage drives.

- “Storage Drives Hot-Plug Conditions” on page 76
- “Storage Drive Failure and RAID” on page 76
- “Removing and Replacing an HDD or SSD Storage Drive” on page 77
- “Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 83
- “Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 86
- “Removing and Replacing a Rear Storage Drive” on page 90

Related Information

- “Servicing SAS Cables (FRU)” on page 177
- “Servicing NVMe Cables (FRU)” on page 183

Storage Drives Hot-Plug Conditions

The hard-disk drives (HDDs), solid-state drives (SSDs), and NVMe SSD drives installed in the server are hot-pluggable, but this capability depends on how the drives are configured. To hot-plug a drive you must be able to take the drive offline before you can remove it. When you take the drive offline, you prevent any application from accessing the drive and remove the logical software links to the drive.

The following conditions inhibit the ability to perform hot-plugging of a drive:

- The drive provides the operating system, and the operating system is not mirrored on another drive.
- The drive cannot be logically isolated from the online operations of the server.

If either of the disk drive conditions is true, then you must shut down the system before you replace the drive. See “Powering Down the Server” on page 59.

Note - Replacing a drive does not require removing the server from a rack.

Related Information

- “Storage and Boot Drive Indicators” on page 35
- “Removing and Replacing an HDD or SSD Storage Drive” on page 77
- “Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 83
- “Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 86
- “Removing and Replacing a Rear Storage Drive” on page 90

Storage Drive Failure and RAID

A single storage drive failure does not cause a data failure if the storage drives are configured as a mirrored RAID 1 volume (optional). The storage drive can be removed, and when a new storage drive is inserted, the contents are automatically rebuilt from the rest of the array with no need to reconfigure the RAID parameters. If the replaced storage drive was configured as a hot-spare, the new HDD is automatically configured as a new hot-spare.

For information about the implementation of RAID on this server, refer to "Configuring Storage Drives for Operating System Installation" in *Oracle Server X5-2L Installation Guide*.

Removing and Replacing an HDD or SSD Storage Drive

The following sections describe how to remove and replace an HDD or SSD storage drive.

- "Remove an HDD or SSD Storage Drive" on page 77
- "Install an HDD or SSD Storage Drive" on page 82

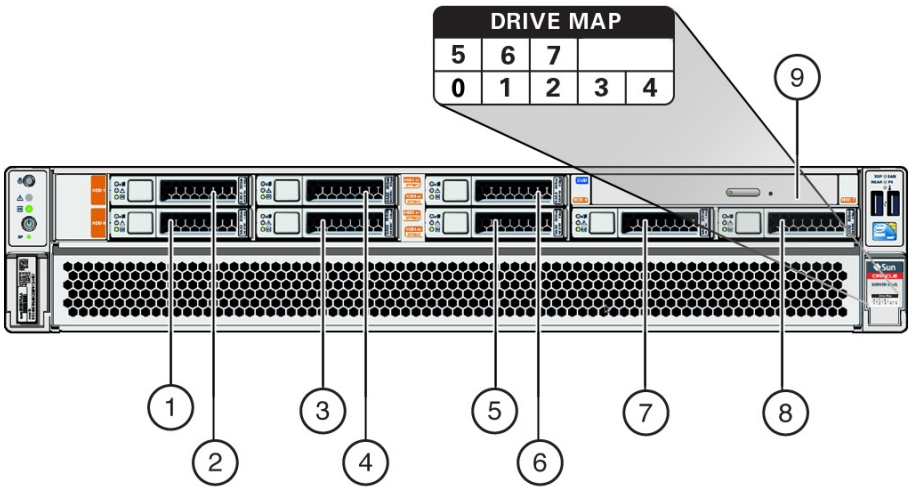
▼ Remove an HDD or SSD Storage Drive

1. **Prepare the system for the drive removal.**

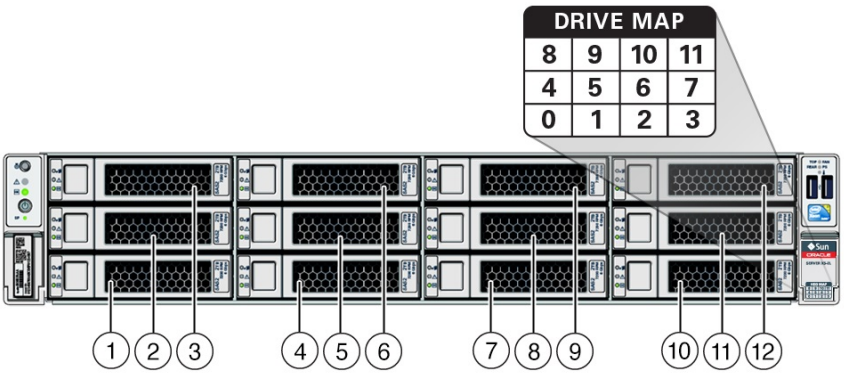
   Refer to "Take Antistatic Measures" on page 68.

2. **Identify the location of the drive that you want to remove.**

   The following illustrations show the location of the drives and the internal system software designations for the drives. For information on storage drive status indicators (LEDs), refer to "Storage and Boot Drive Indicators" on page 35.

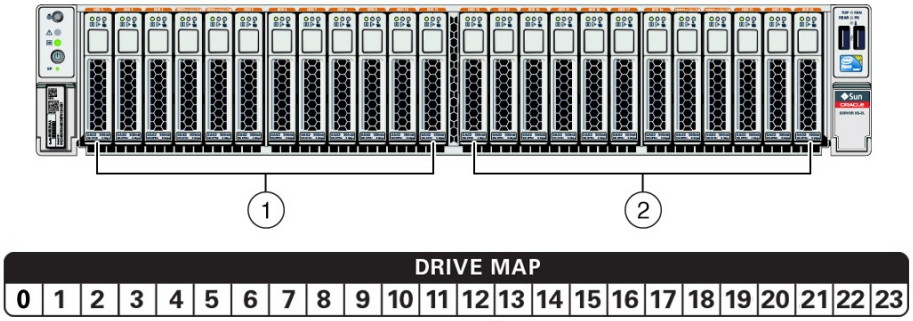


Number	Description
1	Storage drive 0 (HDD/SSD)
2	Storage drive 1 (HDD/SSD)
3	Storage drive 2 (HDD/SSD/NVMe 0)
4	Storage drive 3 (HDD/SSD/NVMe 1)
5	Storage drive 4 (HDD/SSD/NVMe 2)
6	Storage drive 5 (HDD/SSD/NVMe 3)
7	Storage drive 6 (HDD/SSD)
8	Storage drive 7 (HDD/SSD)
9	Optional SATA DVD drive



Number	Description
1	Storage drive 0 (HDD/SSD)
2	Storage drive 4 (HDD/SSD)
3	Storage drive 8 (HDD/SSD)
4	Storage drive 1 (HDD/SSD)
5	Storage drive 5 (HDD/SSD)
6	Storage drive 9 (HDD/SSD)
7	Storage drive 2 (HDD/SSD)
8	Storage drive 6 (HDD/SSD)
9	Storage drive 10 (HDD/SSD)

Number	Description
9	Storage drive 3 (HDD/SSD)
10	Storage drive 7 (HDD/SSD)
11	Storage drive 11 (HDD/SSD)



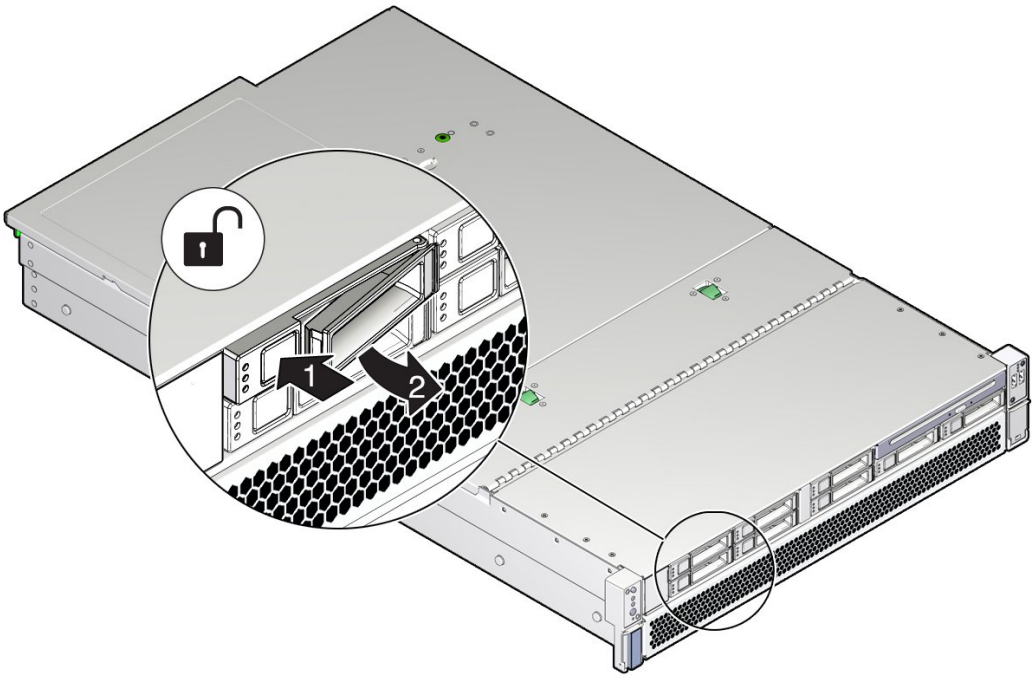
Number	Description
1	Storage drives 0 through 11 (HDD/SSD; Storage drives 3 and 4: HDD/SSD/NVMe)
2	Storage drives 12 through 23 (HDD/SSD; Storage drives 19 and 20: HDD/SSD/NVMe)

3. **If you are removing an HDD or SSD storage drive, type the required operating system commands to stop the server from using the drive; otherwise, proceed to the next step.**

   The exact commands required depend on the configuration of your drives. Unmount file systems, or issue RAID commands as needed.

   Note - The blue OK to Remove status indicator LED on the drive may or may not light, as support for this varies depending on the operating system in use.

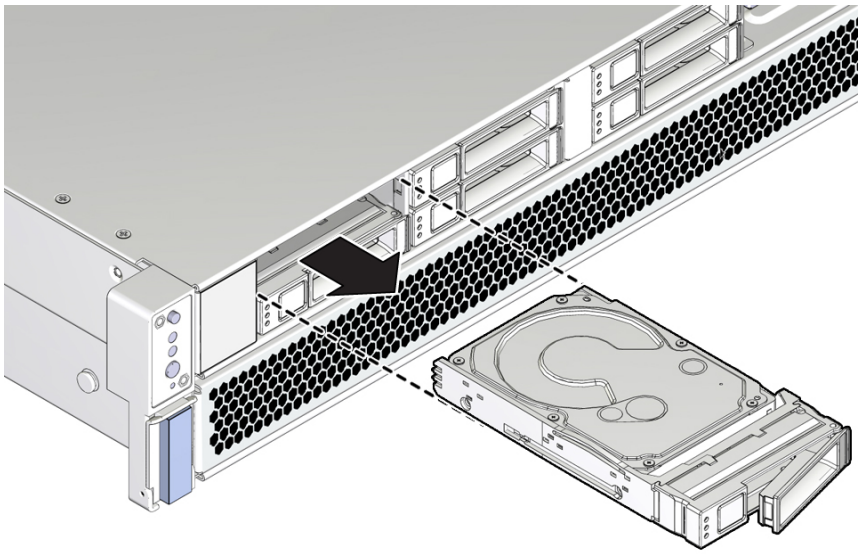
4. **On the drive you plan to remove, push the latch release button to open the drive latch [1, 2].**



Number	Description
1	Pressing the latch release button.
2	Opening the latch.

Caution - The latch is not an ejector. Do not open the latch too far to the right. Doing so can damage the latch.

5. **Grasp the latch and pull the drive out of the drive slot.**



6. **Consider your next steps:**

   - If you are replacing the drive, continue to "Install an HDD or SSD Storage Drive" on page 82.
   - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

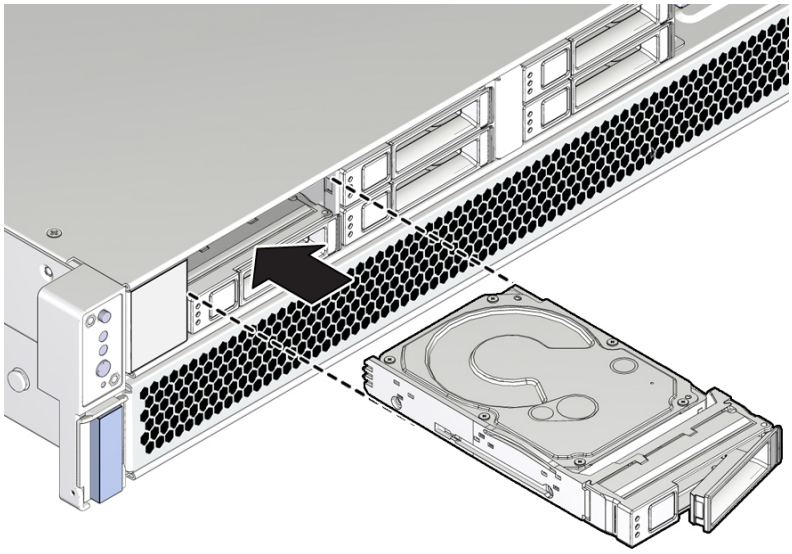
     For information on how to install a storage drive filler panel, see "Remove and Install Filler Panels" on page 236.

Related Information

- "Storage and Boot Drive Indicators" on page 35
- "Storage Drives Hot-Plug Conditions" on page 76
- "Storage Drive Failure and RAID" on page 76
- "Install an HDD or SSD Storage Drive" on page 82
- "Install a Rear Storage Drive" on page 92

▼ Install an HDD or SSD Storage Drive

1. **Remove the replacement drive from its packaging, and place the drive on an antistatic mat.**
2. **If necessary, remove the drive filler panel.**
3. **Align the replacement drive with the drive slot.**
   The drive is physically addressed according to the slot in which it is installed. It is important to install a replacement drive in the same slot as the drive that was removed.
4. **Slide the drive into the slot until the drive is fully seated.**



5. **Close the drive latch to lock the drive in place.**
6. **Perform administrative procedures to reconfigure the drive.**
   The procedures that you perform at this point depend on how your data is configured. You might need to partition the drive, create file systems, load data from backups, or have the drive updated from a RAID configuration.

Related Information

- “Storage and Boot Drive Indicators” on page 35

- “Storage Drives Hot-Plug Conditions” on page 76
- “Storage Drive Failure and RAID” on page 76
- “Remove an HDD or SSD Storage Drive” on page 77
- “Remove a Rear Storage Drive” on page 90

Removing and Replacing an NVMe Storage Drive Using Oracle Solaris

Note - NVMe storage drives are supported only on servers that are running Oracle Solaris or Oracle Linux operating systems. Servers that are running Oracle VM, Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, or VMware ESXi do not support NVMe drives.

The following sections describe how to remove and replace an NVMe storage drive on a server that is running the Oracle Solaris operating system.

- “Unmount an NVMe Storage Drive” on page 83
- “Remove an NVMe Storage Drive From the Server” on page 84
- “Verify Removal of an NVMe Storage Drive” on page 84
- “Install an NVMe Storage Drive in the Server” on page 85
- “Power On an NVMe Storage Drive and Attach a Device Driver” on page 85

▼ Unmount an NVMe Storage Drive

1. **Log in to Oracle Solaris that is running on the server.**

2. **To find the NVMe drive slot number, type:**

   # **`hotplug list –lc`**

   This command produces output similar to the following for each of the NVMe drives installed in the server:

```
# hotplug list –lc
Connection  State    Description
Path
--------------------------------------------------------------------
pcie13      ENABLED  PCIe-Native /pci@7a,0/pci8086,2f08@3/pci111d,80b5@4
```

3. **To prepare the NVMe drive for removal, that is, detach the device driver and power off the drive slot, type the following commands:**

```
# hotplug poweroff pcie13
# hotplug list –lc
```

The following output appears for the NVMe drive that has been unmounted:

```
# hotplug list –lc
Connection  State    Description
Path
--------------------------------------------------------------
pcie13      PRESENT  PCIe-Native /pci@7a,0/pci8086,2f08@3/pci111d,80b5@4
```

4. **Verify that the OK to Remove indicator (LED) on the NVMe storage drive is lit.**

▼ Remove an NVMe Storage Drive From the Server

Perform this procedure to physically remove an NVMe storage drive from the server.

1. **Identify the physical location of the NVMe drive that you want to remove.**
   For storage drive locations, see “Remove an HDD or SSD Storage Drive” on page 77.
2. **Verify that the OK to Remove indicator (LED) on the NVMe storage drive is lit.**
3. **On the drive you plan to remove, push the latch release button to open the drive latch.**
   See “Remove an HDD or SSD Storage Drive” on page 77.
4. **Grasp the latch and pull the drive out of the drive slot.**
5. **Consider your next steps:**
   - If you are replacing the drive, continue to “Verify Removal of an NVMe Storage Drive” on page 84, and then “Install an NVMe Storage Drive in the Server” on page 85.
   - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

     For information on how to install a storage drive filler panel, see “Remove and Install Filler Panels” on page 236.

▼ Verify Removal of an NVMe Storage Drive

- **To verify that the NVMe drive has been removed, type:**

hotplug list –lc

The following output appears for the NVMe drive that you removed:

```
# hotplug list –lc
Connection  State    Description
Path
--------------------------------------------------------------------
pcie13      EMPTY    PCIe-Native /pci@7a,0/pci8086,2f08@3/pci111d,80b5@4
```

▼ Install an NVMe Storage Drive in the Server

Perform this procedure to physically install an NVMe storage drive into the server.

Note - After you physically remove an NVMe storage drive from the server, wait at least 10 seconds before installing a replacement drive.

---

1. **Remove the replacement drive from its packaging and place the drive on an antistatic mat.**
2. **If necessary, remove the drive filler panel.**
3. **Align the replacement drive with the drive slot.**
   The drive is physically addressed according to the slot in which it is installed. It is important to install a replacement drive in the same slot as the drive that was removed.
4. **Slide the drive into the slot until the drive is fully seated.**
   See “Install an HDD or SSD Storage Drive” on page 82.
5. **Close the drive latch to lock the drive in place.**

▼ Power On an NVMe Storage Drive and Attach a Device Driver

1. **Type: # hotplug enable pcie13**
2. **Type: # hotplug list –lc**
   The following status is displayed for the NVMe storage drive.

```
# hotplug list –lc
Connection  State    Description
Path
--------------------------------------------------------------------
pcie13      Enabled  PCIe-Native /pci@7a,0/pci8086,2f08@3/pci111d,80b5@4
```

3. **To check the NVMe drive health, firmware level, temperature, get error log, SMART data, security erase, low level format, etc., type:**

   # **nvmeadm list**

Related Information

- “Storage and Boot Drive Indicators” on page 35
- “Storage Drives Hot-Plug Conditions” on page 76
- “Storage Drive Failure and RAID” on page 76
- “Remove an HDD or SSD Storage Drive” on page 77
- “Install an HDD or SSD Storage Drive” on page 82

Removing and Replacing an NVMe Storage Drive Using Oracle Linux

Note - NVMe storage drives are supported only on servers that are running Oracle Solaris or Oracle Linux operating systems. Servers that are running Oracle VM, Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise Server, or VMware ESXi do not support NVMe drives.

The following sections describe how to remove and replace an NVMe storage drive on a server that is running the Oracle Linux operating system.

- “Unmount an NVMe Storage Drive” on page 86
- “Remove an NVMe Storage Drive” on page 88
- “Verify Removal of an NVMe Storage Drive” on page 89
- “Install an NVMe Storage Drive in the Server” on page 89
- “Power On an NVMe Storage Drive and Attach a Device Driver” on page 90
- “Verify Operation of an NVMe Storage Drive” on page 90

▼ Unmount an NVMe Storage Drive

1. **Log in to Oracle Linux that is running on the server.**
2. **Remove the NVMe storage device path.**
   a. **To find the PCIe addresses (Bus Device Function), type:**

find /sys/devices |egrep 'nvme[0-9][0-9]?$'

This commands returns output similar to the following:

```
/sys/devices/pci0000:80/0000:80:03.0/0000:b0:00.0/0000:b1:04.0/0000:b2:00.0/misc/
nvme0
/sys/devices/pci0000:80/0000:80:03.0/0000:b0:00.0/0000:b1:05.0/0000:b4:00.0/misc/
nvme1
```

In the above listing, the PCIe addresses are highlighted in bold text.

b. To obtain the slot number (APIC ID) for the bus address, type the following command to list all of the PCIe slot numbers and the corresponding bus addresses:

egrep –H '.*' /sys/bus/pci/slots/*/address

This commands returns output similar to the following:

```
   /sys/bus/pci/slots/10/address:0000:b8:00
   /sys/bus/pci/slots/11/address:0000:b6:00
   /sys/bus/pci/slots/12/address:0000:b2:00 (instance nvme0, pcie slot 12, drive
 label nvme2)
   /sys/bus/pci/slots/13/address:0000:b4:00 (instance nvme1, pcie slot 13, drive
 label nvme3)
```

In the above output, the bus addresses for the corresponding NVMe instances are highlighted in bold text.

Note - In the above output, notice that the instance names for the NVMe drives does not correspond to the NVMe drive labels on the front of the server, that is, pci/slots/12/address: 0000:b2:00 corresponds to instance nvme0; however, on the front of the server, this drive is labeled NVMe2. For a table that shows the relationship between the pci/slot# and the NVMe storage drive label on the front of the server, see "Server Operating System Names for the NVMe Storage Drives" on page 48.

---

c. Disconnect all users of the NVMe drive and back up the NVMe drive data as needed.

i. Use the `umount` command to unmount any file systems that are mounted on the device.

ii. Remove the device from any multiple device (md) and Logical Volume Manager (LVM) volume using it.

If the device is a member of an LVM Volume group, then it may be necessary to move data off the device using the `pvmove` command, then use the `vgreduce` command to remove the physical volume, and (optionally) `pvremove` to remove the LVM meta data from the disk.

iii. **If the device uses multipathing, run `multipath -l` and note all the paths to the device. Then, remove the multipathed device using the `multipath -f device` command.**

iv. **Run the `blockdev --flushbufs device` command to flush any outstanding I/O to all paths to the device.**

3. **To prepare the NVMe drive for removal, that is, detach the NVMe device driver and power off the NVMe drive slot, type:**

   # **`echo 0 > /sys/bus/pci/slots/`***`$slot`*`/power`**

   Where *$slot* is the slot number obtained in Step 2b above.

4. **Verify that the OK to Remove indicator (LED) on the NVMe drive is lit.**

▼ Remove an NVMe Storage Drive

Perform this procedure to physically remove an NVMe storage drive from the server.

1. **Identify the location of the NVMe drive that you want to remove.**

   For storage drive locations, see "Remove an HDD or SSD Storage Drive" on page 77.

2. **Verify that the OK to Remove indicator (LED) on the NVMe drive is lit.**

3. **On the NVMe drive you plan to remove, push the latch release button to open the drive latch.**

   See "Remove an HDD or SSD Storage Drive" on page 77.

4. **Grasp the latch and pull the drive out of the drive slot.**

5. **Consider your next steps:**

   - If you are replacing the drive, continue to "Verify Removal of an NVMe Storage Drive" on page 89, and then "Install an NVMe Storage Drive in the Server" on page 89.

- If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

  For information on how to install a storage drive filler panel, see "Remove and Install Filler Panels" on page 236.

▼ Verify Removal of an NVMe Storage Drive

1. **To check the NVMe drive enumeration so as to verify that NVMe drive has been removed, type:**

   # **lspci -nnd :0953**

2. **View the command output and verify that the entry for the slot number that was disabled no longer appears.**

   This commands returns output similar to the following:

```
b2:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device  [8086:0953]
 (rev 01)
b6:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device  [8086:0953]
 (rev 01)
b8:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device  [8086:0953]
 (rev 01)
```

▼ Install an NVMe Storage Drive in the Server

Perform this procedure to physically install an NVMe storage drive into the server.

Note - After you physically remove an NVMe drive from the server, wait at least 10 seconds before installing a replacement drive.

---

1. **Remove the replacement drive from its packaging and place the drive on an antistatic mat.**

2. **If necessary, remove the drive filler panel.**

3. **Align the replacement drive with the drive slot.**

   The drive is physically addressed according to the slot in which it is installed. It is important to install a replacement drive in the same slot as the drive that was removed.

4. **Slide the drive into the slot until the drive is fully seated.**

   See "Install an HDD or SSD Storage Drive" on page 82.

5. **Close the drive latch to lock the drive in place.**

▼ Power On an NVMe Storage Drive and Attach a Device Driver

- **To power on the slot and attach the device driver, type:**

  # **`echo 1 /sys/bus/pci/slots/`***`$slot`***`/power`**

  Where *$slot* is the slot number for the NVMe storage drive.

▼ Verify Operation of an NVMe Storage Drive

- **To verify that an NVMe drive is operating properly, do one of the following:**
  - Check the `/var/log/messages` log file.
  - Type: **`ls -l /dev/nvme*`**.

Related Information

- “Storage and Boot Drive Indicators” on page 35
- “Storage Drives Hot-Plug Conditions” on page 76
- “Storage Drive Failure and RAID” on page 76
- “Remove an HDD or SSD Storage Drive” on page 77
- “Install an HDD or SSD Storage Drive” on page 82

Removing and Replacing a Rear Storage Drive

The following sections describe how to remove and replace a rear storage drive.

- “Remove a Rear Storage Drive” on page 90
- “Install a Rear Storage Drive” on page 92

▼ Remove a Rear Storage Drive

Note - Rear storage drives are supported in the twelve 3.5-inch storage drive and twenty-four 2.5-inch storage drive configurations only. Rear storage drives are not supported in the eight 2.5-inch storage drive configuration.

1. **Prepare the system for the drive removal.**
   Refer to "Take Antistatic Measures" on page 68.

2. **Identify the rear storage drive you want to remove.**
   For specific storage drive locations, see "Rear Panel Components and Cable Connections" on page 21. For information on storage drive status indicators (LEDs), refer to "Storage and Boot Drive Indicators" on page 35.

3. **Type the operating system commands required to stop the server from using the drive.**
   The exact commands required depend on the configuration of your drives. Unmount file systems, or issue RAID commands as needed.

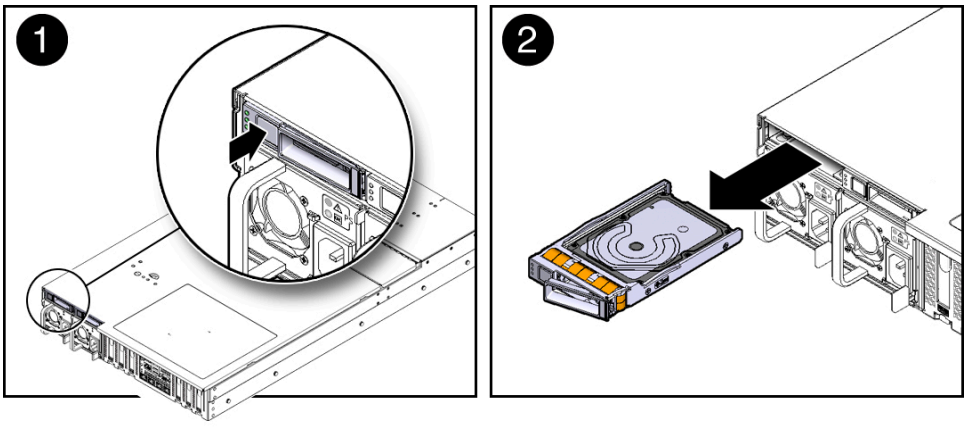
   Note - The blue OK to Remove status indicator LED on the drive may or may not light, as support for this varies depending on the operating system in use.

4. **Remove the rear storage drive.**

   a. **On the storage drive that you want to remove, push the drive release button to open the latch [1].**

   b. **Grasp the drive latch, and pull the drive out of the drive slot [2].**

Caution - The drive latch is not an ejector. Do not open the latch too far to the right. Doing so can damage the latch.



5. **Consider your next steps:**

   - If you are replacing the drive, continue to "Install a Rear Storage Drive" on page 92.
   - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

     For information on how to install a storage drive filler panel, see "Remove and Install Filler Panels" on page 236.

Related Information

- "Rear Panel Components and Cable Connections" on page 21
- "Storage and Boot Drive Indicators" on page 35
- "Remove an HDD or SSD Storage Drive" on page 77

▼ Install a Rear Storage Drive

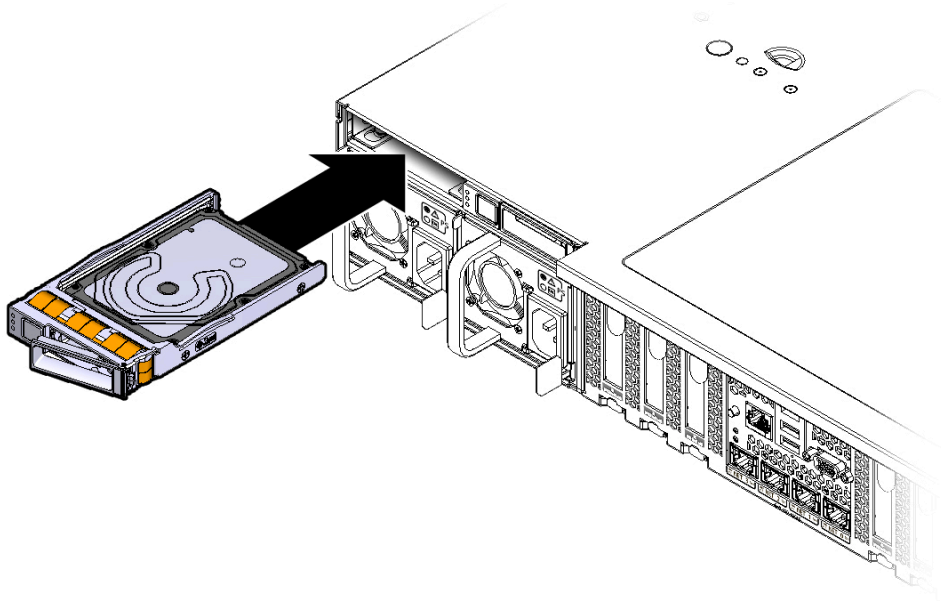
Note - Rear storage drives are supported in the twelve 3.5-inch storage drive and twenty-four 2.5-inch storage drive configurations only. Rear storage drives are not supported in the eight 2.5-inch storage drive configuration.

1. **If necessary, remove the drive filler panel.**

2. **Determine the drive slot location for the replacement drive.**

   If you removed an existing drive from a slot in the system, you must install the replacement drive in the same slot as the drive that was removed. Drives are physically addressed according to the slot in which they are installed. See "Rear Panel Components and Cable Connections" on page 21 for boot drive locations.

3. **Slide the drive into the drive slot until it is fully seated.**



4. **Close the drive latch to lock the drive in place.**

5. **Perform administrative procedures to reconfigure the drive.**
   The procedures that you perform at this point depend on how your data is configured. You might need to partition the drive, create file systems, load data from backups, or have the drive updated from a RAID configuration.

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Storage and Boot Drive Indicators” on page 35
- “Install an HDD or SSD Storage Drive” on page 82

Servicing Fan Modules (CRU)

The fan modules are located in the front of the server. See the following procedures:

- “Remove a Fan Module” on page 94
- “Install a Fan Module” on page 97

Related Information

- “Remove the Server Top Cover” on page 69

▼ Remove a Fan Module

You do not have to power off the server to service fan modules.

You should not begin this procedure unless you have a replacement fan module and you are ready to install it right away.

1. **Extend the server to the maintenance position.**

   See “Extend the Server to the Maintenance Position” on page 66.

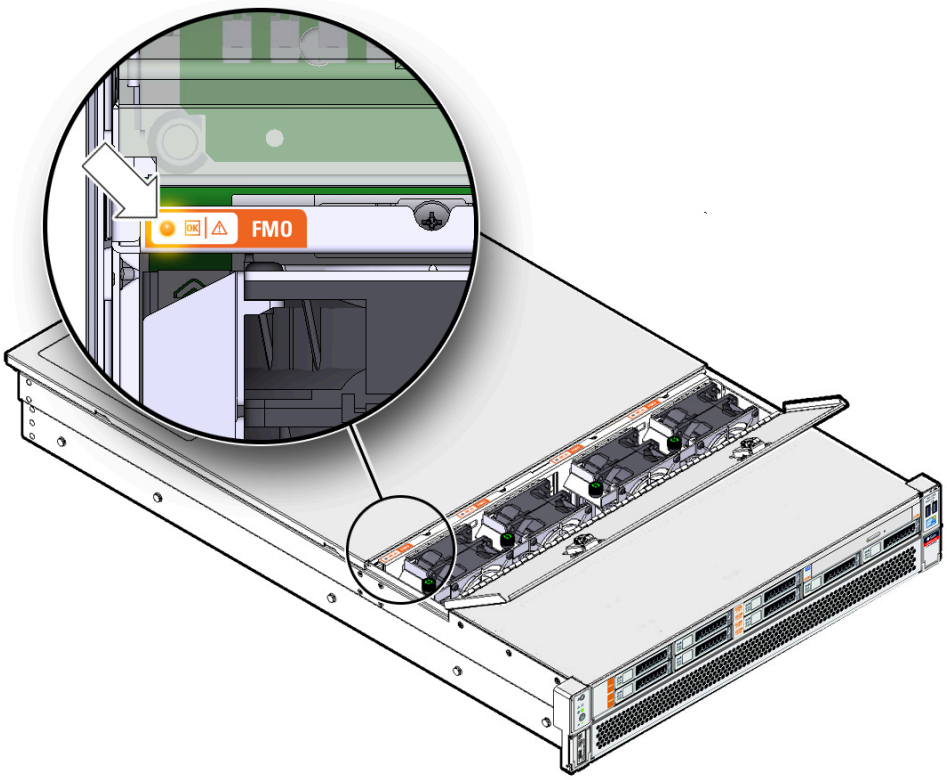
2. **To access the fan modules, open the top cover fan assembly door.**



Caution - Close the top cover fan assembly door within 60 seconds to maintain adequate airflow to properly cool the server. Leaving the door open for more than 60 seconds, while the server is running, might cause the server to automatically shut down.

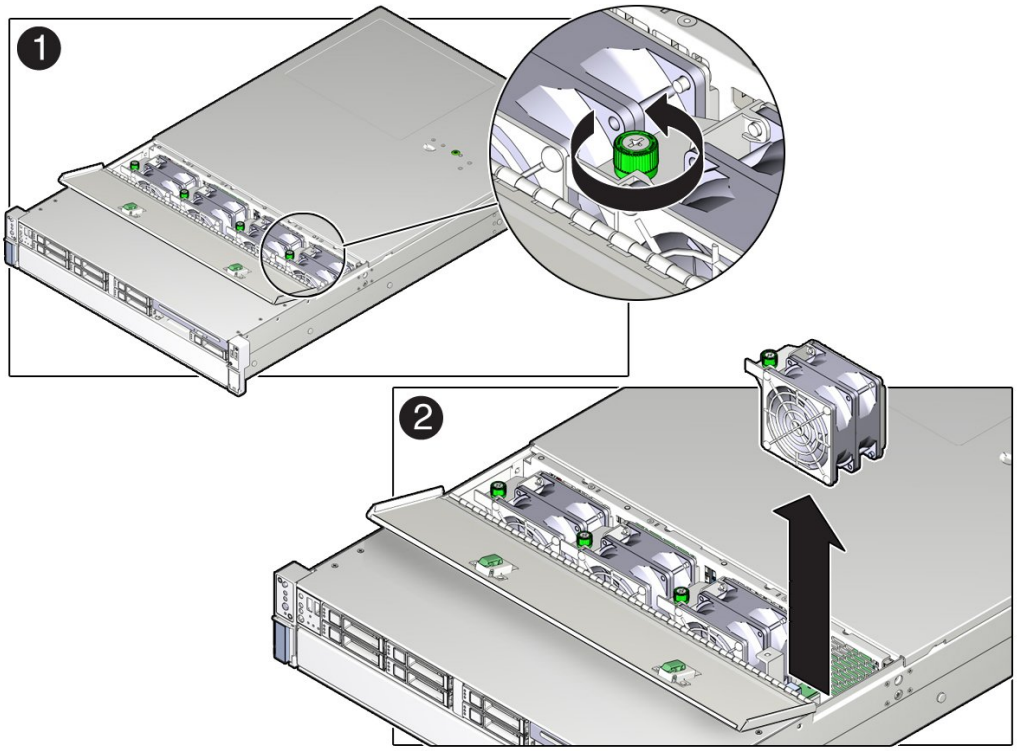
3. **Identify the faulty fan module.**

Each fan module has a fan status indicator (LED) that is located next to the module. If the LED is amber, the fan has failed. The location of the fan status LED is shown in the following figure.



LED Color and State Meaning
Amber – The fan module is faulty. The front Top Fan LED and the front and rear panel Service Required LEDs are also lit if the system detects a fan module fault.

4. **Use a No. 2 Phillips screwdriver to loosen the captive screw that secures the faulty fan module in the chassis [1].**



5. **Grasp both the captive screw and the opposite end of the module and lift the fan module straight up and out of the chassis, and set it aside on an antistatic mat [2].**

Caution - When removing a fan module, do not rock it back and forth. Rocking the fan module can cause damage to the motherboard connectors.

Caution - Do not service any other components in the fan compartment unless the system is shut down and the power cords are removed.

6. **Consider your next step:**

- If you removed the fan assembly as part of another procedure, return to that procedure.

- Otherwise, continue to “Install a Fan Module” on page 97.

Related Information

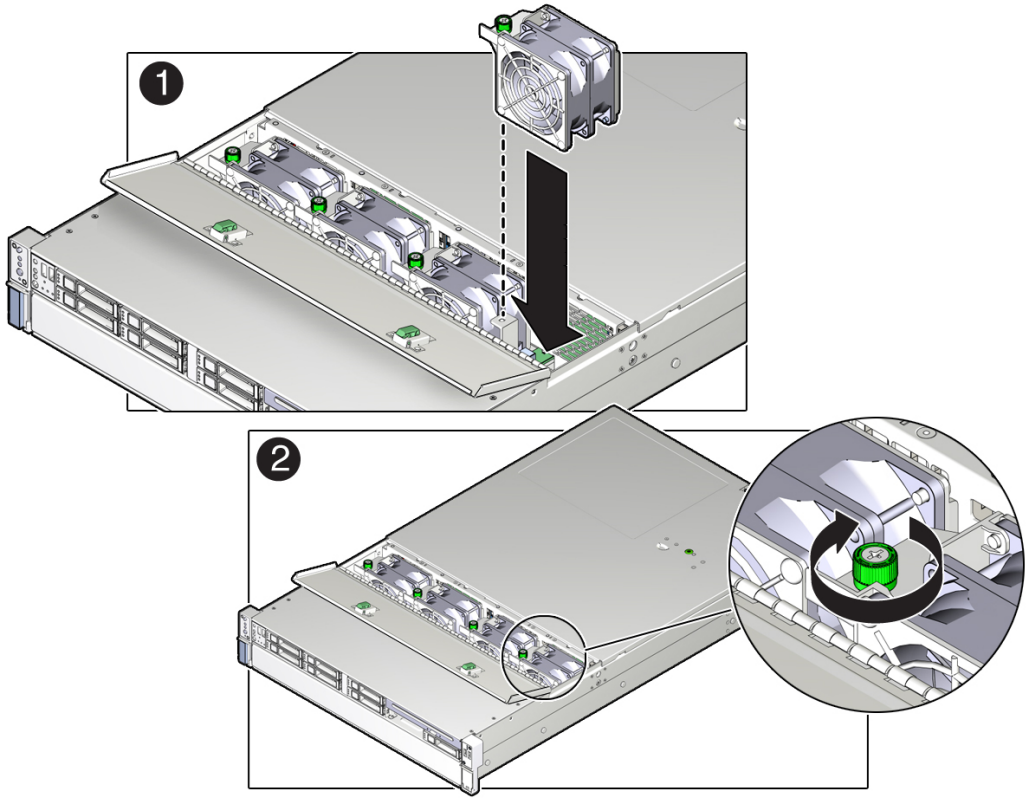
- “Install a Fan Module” on page 97

▼ Install a Fan Module

1. **Remove the replacement fan module from its packaging, and place it on an antistatic mat.**

2. **With the top cover fan assembly door open, install the replacement fan module into the server [1].**

The fan modules are keyed to ensure that they are installed in the correct orientation.



3. **Press down on the fan module and apply firm pressure to fully seat the fan module.**

4. **Verify that the fan module status indicator (LED) on the replacement fan module is not illuminated.**

5. **Using your thumb and forefinger, tighten the captive screw to secure the fan module to the chassis. Then use a No. 2 Phillips screwdriver to tighten the screw an additional 1/4 turn to secure the fan module to the chassis [2].**

6. **Close the top cover fan assembly door.**

7. **Verify that the Top Fan Fault LED on the front of the server and the Service Required LEDs on the front and rear of the server are extinguished.**

   See “Server System-Level Status Indicators” on page 33 for more information about identifying and interpreting system status indicators.

8. **Consider your next step:**

   - If you installed the fan module as part of another procedure, return to that procedure.
   - Otherwise, return the server to operation. See “Returning the Server to Operation” on page 235.

Related Information

- “Remove a Fan Module” on page 94

Servicing Power Supplies (CRU)

The server's redundant power supplies support concurrent maintenance, which enables you to remove and replace a power supply without shutting down the server, provided that the other power supply is online and working.

The server supports model A258 (1000 watt) power supplies. The A258 power supply unit (PSU) provides conversion from the AC lines to the system, accepting ranges from 100-240 volts AC (VAC). These PSUs are designed to be hot-swappable, and in most cases will provide fully redundant “1+1” power, allowing the system to suffer the loss of a PSU or an AC feed with no loss to system availability.

In maximally configured systems, it is possible that the worst-case power consumption of the system could exceed the capacity of a single PSU. The PSUs provide an over-subscription mode, which allows the system to operate with fault-tolerance even with modest excursions beyond the rated capacity of a single PSU. This over-subscription support is accomplished using hardware signaling between the PSU and motherboard circuitry, which can force the system to throttle CPU and memory power in the event that a PSU is lost. The resulting power savings will be enough to allow the system to continue to run (in a lower-performance state) until the power problem is resolved.

The following status indicators (LEDs) are lit when a power supply fault is detected:

- Front and rear Service Required LEDs
- Amber Service Required LED on the faulty power supply
- Rear Power Supply Fault LED located on the server front panel

If a power supply fails and you do not have a replacement available, leave the failed power supply installed to ensure proper airflow in the server. For more information, refer to the following topic and procedures:

- “Power Supply Status Indicators” on page 35
- “Remove a Power Supply” on page 100
- “Install a Power Supply” on page 102

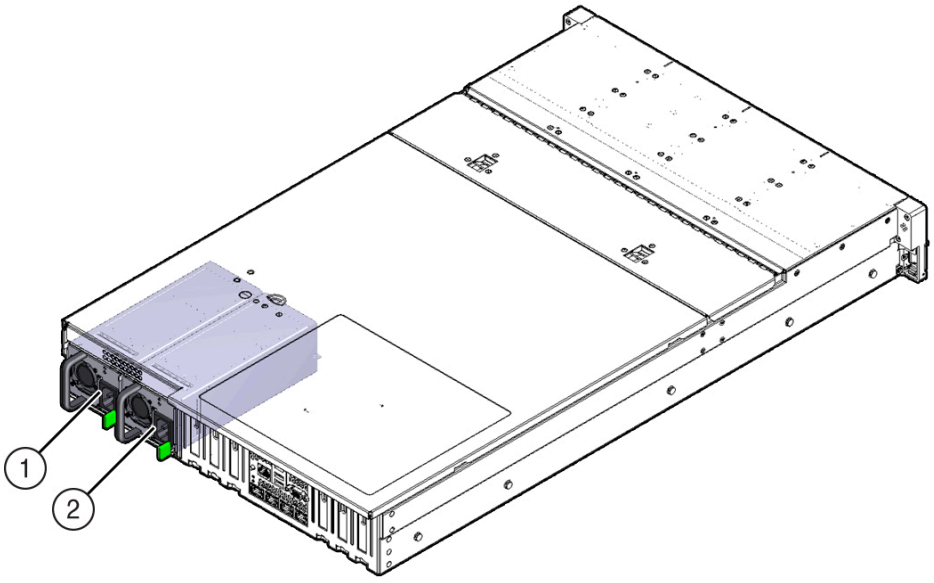
Related Information

- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32
- “Powering Down the Server” on page 59

▼ Remove a Power Supply

1. **Prepare the system for power supply removal.**
   Refer to “Take Antistatic Measures” on page 68.

2. **Identify which power supply requires replacement.**



Number	Description
1	Power supply 0
2	Power supply 1

A lit amber Service Required LED on a power supply indicates that a failure was detected. You can also use the Oracle ILOM `show faulty` command at the Oracle ILOM command-line prompt (`->`) to identify a power supply failure.

Alternatively, to list all known faults in the server, log into the Oracle Solaris OS and issue the `fmadm faulty` command, or log into the Oracle ILOM service processor from the Oracle ILOM Fault Management Shell and issue the `fmadm faulty` command. For more information about how to use the Oracle ILOM Fault Management Shell and supported commands, see the *Oracle ILOM User's Guide for System Monitoring and Diagnostics Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Note - The fans of a failed power supply might still be spinning when the system is powered on. The fans will stop spinning when you disconnect the power cords.

---

3. **Gain access to the rear of the server where the faulty power supply is located.**

4. **If the cable management arm (CMA) is installed, disconnect both CMA left-side connectors and move the CMA out of the way.**

   For instructions for disconnecting the CMA left-side connectors, refer to "Remove the Cable Management Arm" in *Oracle Server X5-2L Installation Guide*.

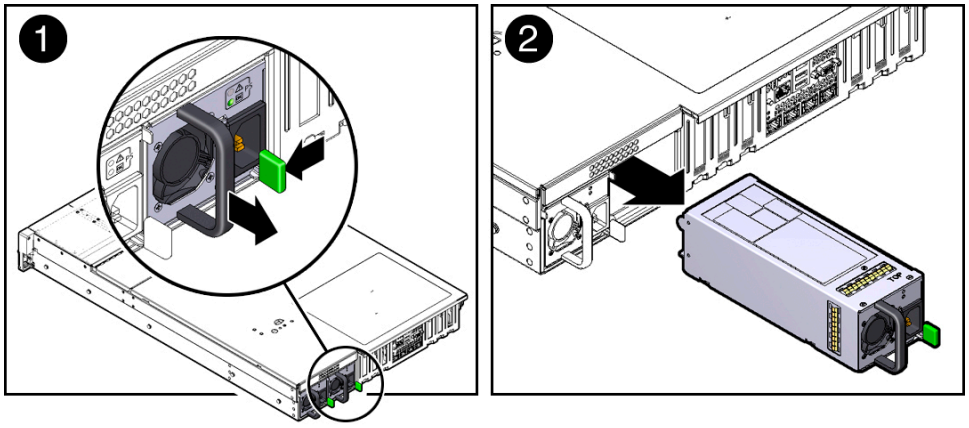


Caution - When disconnecting the CMA left-side connectors, be sure to use your arm to support the CMA so that it does not hang down under its own weight and stress the right-side connectors; otherwise, the CMA might be damaged. You must continue to support the CMA until you have reconnected both of the left-side connectors.

---

5. **Disconnect the power cord from the faulty power supply.**

6. **Grasp the power supply handle and push the power supply latch to the left [1].**



7. **Pull the power supply out of the chassis [2].**

Caution - Whenever you remove a power supply, you should replace it with another power supply; otherwise, the server might overheat due to improper airflow.

8. **Continue to "Install a Power Supply" on page 102.**

Related Information

- "Rear Panel Components and Cable Connections" on page 21
- "Power Supply Status Indicators" on page 35
- "Install a Power Supply" on page 102

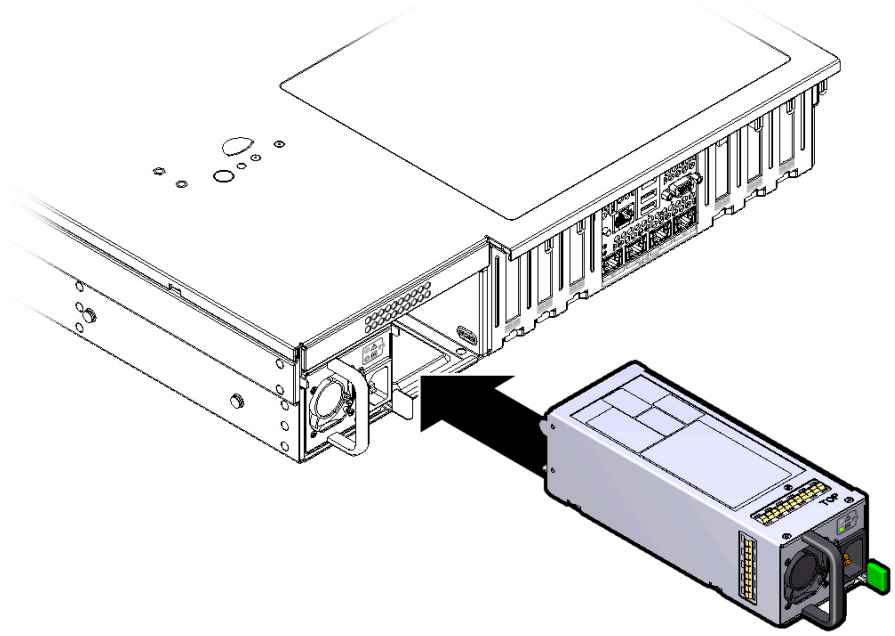
Install a Power Supply

Caution - Always replace the failed power supply with the same type model of power supply.

1. **Remove the replacement power supply from its packaging, and place it on an antistatic mat.**

2. **Align the replacement power supply with the empty power supply slot.**

3. **Slide the power supply into the slot until it is fully seated.**
   You will hear an audible click when the power supply fully seats.



4. **Reconnect the power cord to the power supply.**

5. **Verify that the amber Service Required LED on the replaced power supply and the Service Required LEDs are not lit on the front and rear panels.**

Note - After you have replaced Power Supply 0, you might need to reset the Oracle ILOM service processor (SP) to propagate the key identity properties (KIP) data to the new power supply. For instructions on resetting the SP, see the *Oracle Integrated Lights Out Manager (ILOM) 5.0 Configuration and Maintenance Guide* at `https://www.oracle.com/goto/ilom/docs`. Power Supply 1 does not contain KIP data, and therefore does not require an SP reset after replacement.

---

6. **If you disconnected the two CMA left-side connectors, reconnect the connectors.**

For instructions for reconnecting the CMA left-side connectors, refer to "Install the Cable Management Arm" in *Oracle Server X5-2L Installation Guide*.

Related Information

- "Rear Panel Components and Cable Connections" on page 21
- "Power Supply Status Indicators" on page 35
- "Remove a Power Supply" on page 100

Servicing CRUs That Require Server Power-Off

These sections describe how to service customer-replaceable units (CRUs) that require you to power off the server. For more information about CRUs, see “Illustrated Parts Breakdown” on page 23 and “Customer-Replaceable Units” on page 24.

Description	Links
Service the DIMMs.	“Servicing the DIMMs (CRU)” on page 105
Service the PCIe cards.	“Servicing PCIe Cards (CRU)” on page 120
Service the internal USB flash drives.	“Servicing the Internal USB Flash Drives (CRU)” on page 128
Service the battery.	“Servicing the Battery (CRU)” on page 132

Related Information

- “Servicing CRUs That Do Not Require Server Power-Off” on page 75
- “Servicing FRUs” on page 137

Servicing the DIMMs (CRU)

The Oracle Server X5-2L supports a variety of DDR4 DIMM configurations that can include quad-rank (QR), dual-rank (DR), and single-rank (SR) DDR4 DIMMs.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in “Electrostatic Discharge Safety” on page 56.



Caution - Ensure that all power is removed from the server before removing or installing DIMMs, or damage to the DIMMs might occur. You must disconnect all power cables from the system before performing these procedures.

The following topics and procedures provide information to assist you when replacing a DIMM or upgrading DIMMs:

- "DIMM and Processor Physical Layout" on page 106
- "DIMM Population Scenarios" on page 107
- "DIMM Population Rules" on page 108
- "Populating DIMMs for Optimal System Performance" on page 109
- "DIMM Operating Speeds" on page 112
- "DIMM Rank Classification Labels" on page 112
- "Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Faulty DIMMs" on page 113
- "Using the Server Fault Remind Button" on page 113
- "Identify and Remove a Faulty DIMM" on page 114
- "Install a DIMM" on page 118

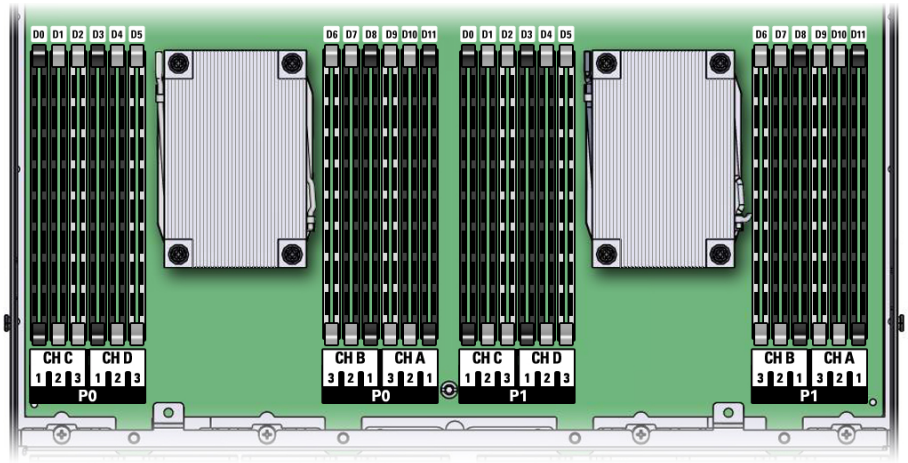
Related Information

- "Servicing Processors (FRU)" on page 138

DIMM and Processor Physical Layout

The physical layout of the DIMMs and processor(s) is shown in the following figure. When viewing the server from the front, processor 0 (P0) is on the left. Notice that each processor, P0 and P1, have four memory channels that are labeled, from left to right, Ch C, Ch D, Ch B, and Ch A.

FIGURE 7 DIMM and Processor Physical Layout



Note - In single-processor systems, the DIMM sockets associated with processor 1 (P1) are nonfunctional and should not be populated with DIMMs.

Related Information

- "DIMM Population Scenarios" on page 107
- "DIMM Population Rules" on page 108
- "Populating DIMMs for Optimal System Performance" on page 109
- "DIMM Operating Speeds" on page 112
- "DIMM Rank Classification Labels" on page 112
- "Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Faulty DIMMs" on page 113

DIMM Population Scenarios

There are two scenarios in which you are required to populate DIMMs:

- A DIMM fails and needs to be replaced.

In this scenario, you can use the Fault Remind button to determine the failed DIMM, then remove the failed DIMM and replace it. To ensure that system performance is maintained, you must replace the failed DIMM with a DIMM of the same size (in gigabytes) and type (quad-rank, dual-rank, or single-rank). In this scenario, you should not change the DIMM configuration.

- You have purchased new DIMMs and you want to use them to upgrade the server's memory.

  In this scenario, you should adhere to DIMM population rules and follow the recommended DIMM population order for optimal system performance.

Related information

- “DIMM Population Rules” on page 108
- “Populating DIMMs for Optimal System Performance” on page 109
- “Using the Server Fault Remind Button” on page 113
- “Identify and Remove a Faulty DIMM” on page 114
- “Install a DIMM” on page 118

DIMM Population Rules

The population rules for adding DIMMs to the server are as follows:

- The server supports 32-GB quad-rank (QR) Load-Reduced DIMMs (LRDIMMs) and 8-GB single-rank (SR) and 16-GB dual-rank (DR) Registered DIMMs (RDIMMs).
- Do not mix 32-GB LRDIMMs and 8-GB or 16-GB RDIMMs in the same server. If the server has 32-GB LRDIMMs installed, you cannot install 8-GB or 16-GB RDIMMs and vice versa.
- Within a memory channel, DIMMs must be populated in the black sockets first, then in the black sockets with white tabs, and then in the white sockets.
- If you are installing a mix of RDIMM sizes (for example, 8-GB and 16-GB), install the larger size RDIMMs first, then the smaller RDIMMs, until all of the RDIMMs are installed.
- There are no restrictions on the minimum number of DIMM sockets that must be populated. The server will operate properly with one DIMM installed.

Populating DIMMs for Optimal System Performance

Optimal performance is achieved by populating the DIMMs so that the memory is symmetrical, or balanced. Symmetry is achieved by adhering to the following guidelines:

- In single-processor systems, populate DIMMs of the same size in multiples of four.
- In dual-processor systems, populate DIMMs of the same size in multiples of eight.
- Populate the DIMM sockets in the order described in the following sections.

The following sections provide an example of how to populate the DIMM sockets to achieve optimal system performance.

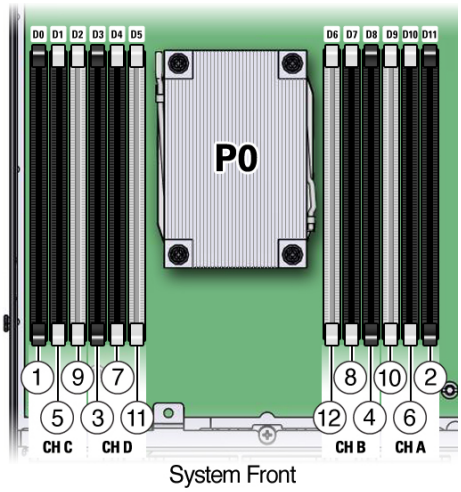
Note - Not all possible configurations are shown here.

- "Populating DIMMs in Single-Processor Systems for Optimal System Performance" on page 109
- "Populating DIMMs in Dual-Processor Systems for Optimal System Performance" on page 111

Populating DIMMs in Single-Processor Systems for Optimal System Performance

In single-processor systems, install DIMMs only into DIMM sockets associated with processor 0 (P0). Starting with socket P0 D0, first filling the black sockets, then the black sockets with white tabs, and then the white sockets, as shown in the following figure. Notice that the order of populating the black sockets is Ch C first, Ch A second, Ch D third, and Ch B last. Repeat the same population sequence for the black sockets with white tabs, and finally for the white sockets.

FIGURE 8 DIMM Population Order for Single-Processor Systems



The following table describes the proper order in which to populate DIMMs in a single-processor system using the numbered callouts in the above figure, the memory channel labels (Ch A through Ch D), and the DIMM socket labels (D0 through D11).

TABLE 8 DIMM Population Order for Single-Processor Systems

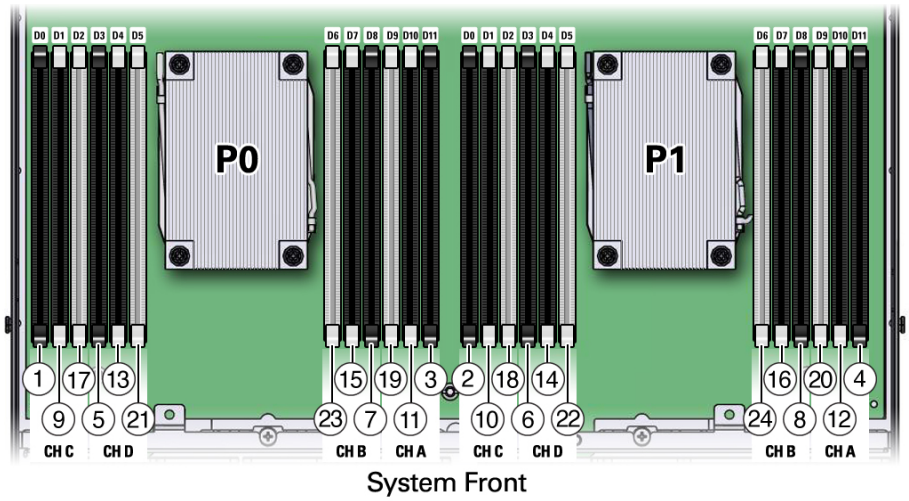
Population Order	DIMMs Sockets for Processor 0 (P0)	Memory Channels
Fill the black sockets first		
First	D0	Ch C
Second	D11	Ch A
Third	D3	Ch D
Fourth	D8	Ch B
Then fill the black sockets with white tabs		
Fifth	D1	Ch C
Sixth	D10	Ch A
Seventh	D4	Ch D
Eighth	D7	Ch B
Then fill the white sockets		
Ninth	D2	Ch C

Population Order	DIMMs Sockets for Processor 0 (P0)	Memory Channels
Tenth	D9	Ch A
Eleventh	D5	Ch D
Twelfth	D6	Ch B

Populating DIMMs in Dual-Processor Systems for Optimal System Performance

In dual-processor systems, populate DIMMs into DIMM sockets starting with processor 0 (P0) D0, then, alternating between sockets associated with processor 0 (P0) and matching sockets for processor 1 (P1). Fill the black sockets, then the black sockets with white tabs, and finally, the white sockets, as shown in the following figure. Notice that the order of populating the black DIMM sockets is Ch C first, Ch A second, Ch D third, and Ch B last. Repeat the same population sequence for the black sockets with white tabs, and finally, for the white sockets.

FIGURE 9 DIMM Population Order for Dual-Processor Systems



The following table describes the proper order in which to install DIMMs in a dual-processor system using the numbered callouts in the above figure, the memory channel labels (Ch A through Ch D), and the DIMM socket labels (D0 through D11).

TABLE 9 DIMM Population Order for Dual-Processor Systems

Population Order	DIMM Sockets for Processor 0 (P0)	DIMM Sockets for Processor 1 (P1)	Memory Channels
Fill the black sockets first	**Alternate between processor 0...**	**...and processor 1**	
First	Fill D0 first	Then fill D0	Ch C
Second	Fill D11 first	Then fill D11	Ch A
Third	Fill D3 first	Then fill D3	Ch D
Fourth	Fill D8 first	Then fill D8	Ch B
Fill the black sockets with white tabs	**Alternate between processor 0...**	**...and processor 1**	
Fifth	Fill D1 first	Then fill D1	Ch C
Sixth	Fill D10 first	Then fill D10	Ch A
Seventh	Fill D4 first	Then fill D4	Ch D
Eighth	Fill D7 first	Then fill D7	Ch B
Fill the white sockets last	**Alternate between processor 0...**	**...and processor 1**	
Ninth	Fill D2 first	Then fill D2	Ch C
Tenth	Fill D9 first	Then fill D9	Ch A
Eleventh	Fill D5 first	Then fill D5	Ch D
Twelfth	Fill D6 first	Then fill D6	Ch B

DIMM Operating Speeds

The maximum supported memory speed is 2133 MT/s. However, not all system configurations will support operation at this speed. The maximum attainable memory speed will be limited by the maximum speed supported by the specific type of processor and the specific memory population. All memory installed in the system will operate at the same speed, or frequency.

DIMM Rank Classification Labels

DIMMs come in a variety of ranks: single, dual, or quad. Each DIMM is shipped with a label identifying its rank classification. The following table identifies the label corresponding to each DIMM rank classification:

TABLE 10 DIMM Rank Classification Labels

Rank Classification	Label
Quad-rank LRDIMM	4Rx4

Rank Classification	Label
Dual-rank RDIMM	2Rx4
Single-rank RDIMM	1Rx4

Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Faulty DIMMs

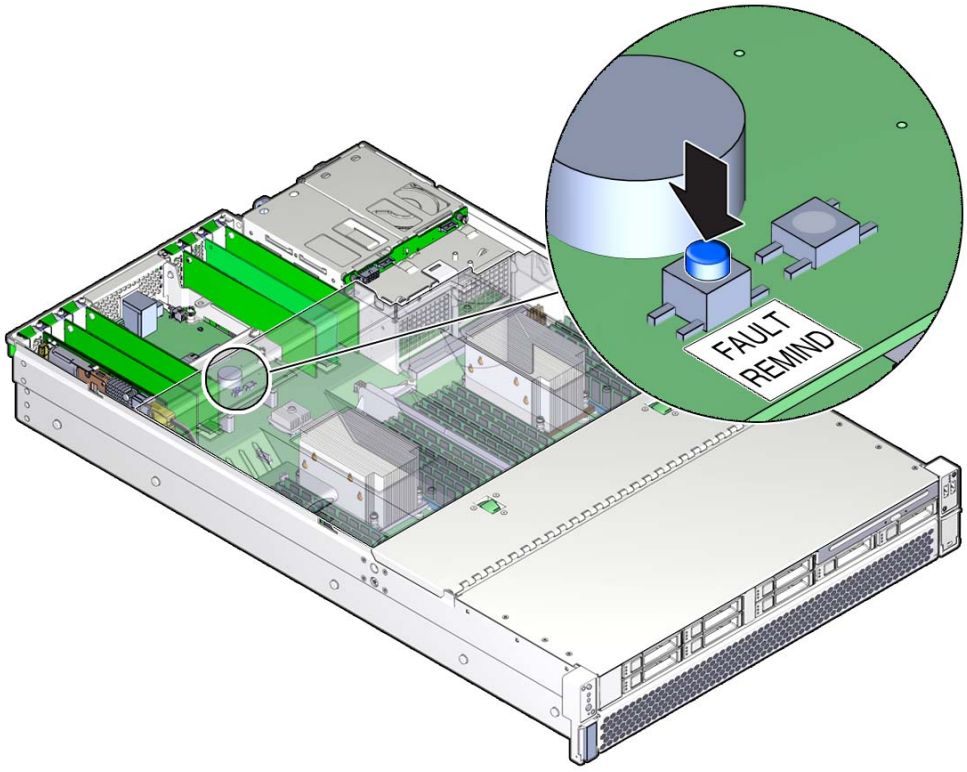
When a single DIMM is marked as failed by Oracle ILOM (for example, `fault.memory.intel.dimm.training-failed` is listed in the service processor Event Log), BIOS might disable the entire memory channel that contains the failed DIMM, up to three DIMMs. As a result, none of the memory installed in the disabled channel will be available to the operating system. However, when the Fault Remind button is pressed, only the fault status indicator (LED) associated with the failed DIMM lights. The fault LEDs for the other DIMMs in the memory channel remain off. Therefore, you can correctly identify the failed DIMM using the lit LED.

Using the Server Fault Remind Button

When the server Fault Remind button is pressed, an LED located next to the Fault Remind button lights green to indicate that there is sufficient voltage present in the fault remind circuit to light any fault LEDs that were lit due to a component failure. If this LED does not light when you press the Fault Remind button, it is likely that the capacitor powering the fault remind circuit has lost its charge. This can happen if the Fault Remind button is pressed for several minutes with fault LEDs lit or if power has been removed from the server for more than 15 minutes.

The following figure shows the location of the Fault Remind button.

FIGURE 10 Fault Remind Button Location



▼ Identify and Remove a Faulty DIMM

1. **Prepare the server for service.**

   a. **Power off the server, and disconnect the power cords from the server power supplies.**

      See "Powering Down the Server" on page 59.

   b. **Extend the server into the maintenance position.**

See “Extend the Server to the Maintenance Position” on page 66.

c. **Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis.**

See “Electrostatic Discharge Safety” on page 56.

d. **Remove the server top cover.**

See “Remove the Server Top Cover” on page 69.

e. **Swivel the air baffle into the upright position to allow access to DIMMs.**

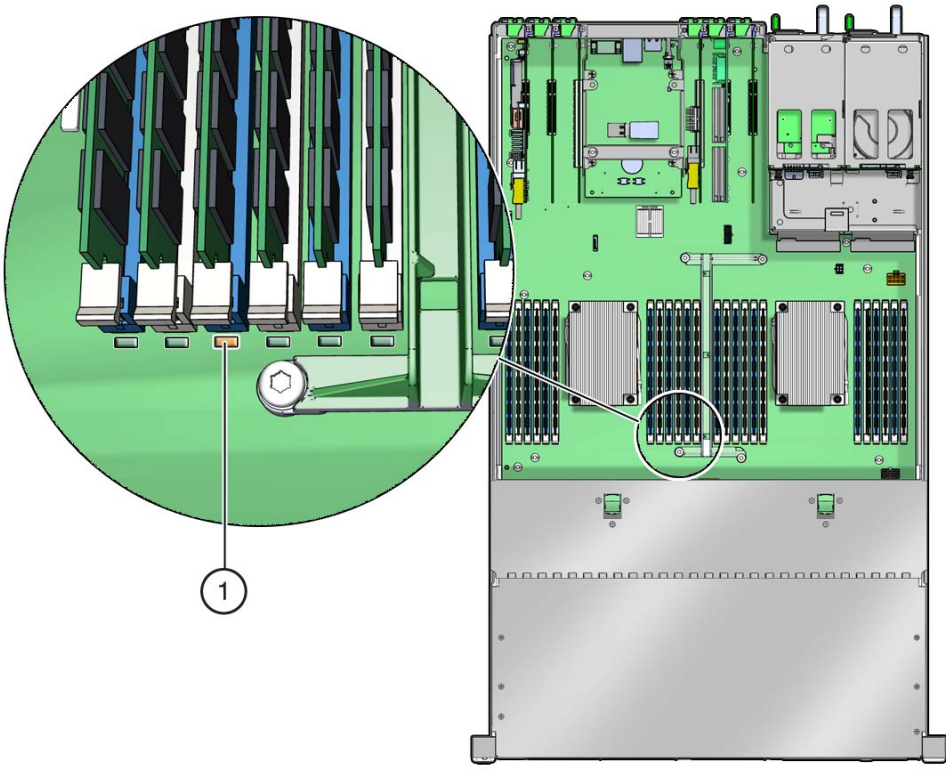
2. **Identify and note the location of the faulty DDR4 DIMM by pressing the Fault Remind button on the motherboard I/O card.**

See “Using the Server Fault Remind Button” on page 113.

Faulty DIMMs are identified with a corresponding amber LED on the motherboard.

- If the DIMM fault LED is off, then the DIMM is operating properly.

- If the DIMM fault LED is on (amber), then the DIMM is faulty and should be replaced [1].

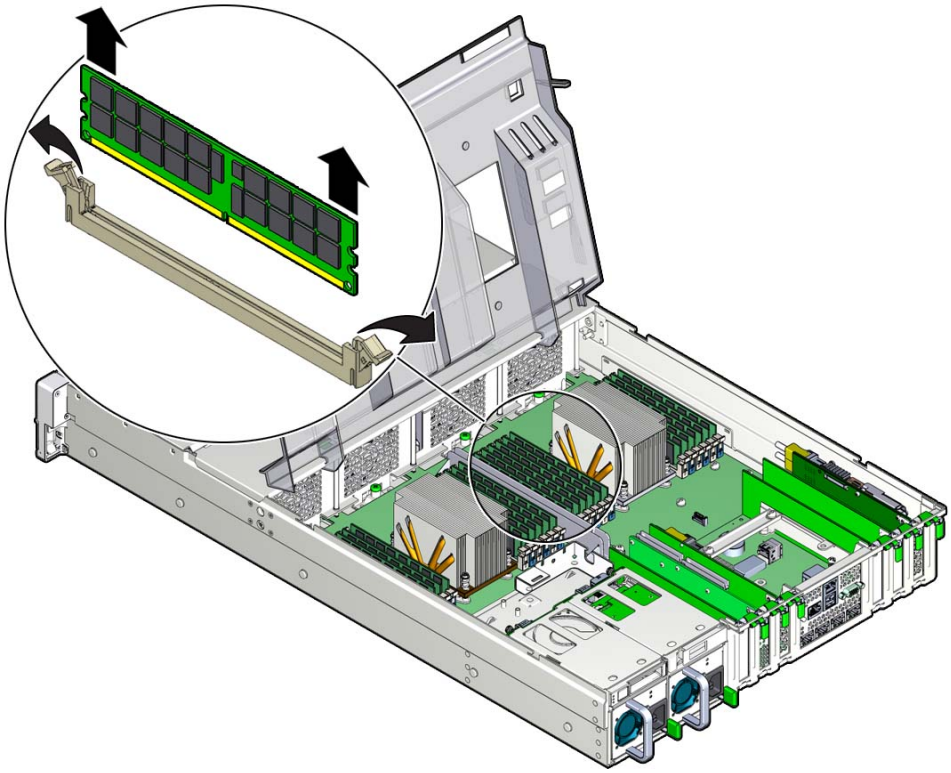


3. **To remove the faulty DIMM, do the following:**

   a. **Rotate both DIMM socket ejectors outward as far as they will go.**

      The DIMM is partially ejected from the socket. See the following figure.

b. Carefully lift the DIMM straight up to remove it from the socket.



4. Replace each faulty DIMM with either another DIMM of the same rank size (quad-rank, dual-rank, or single-rank) or leave the socket empty.

For DIMM replacement instructions, see “Install a DIMM” on page 118.

Related Information

- “DIMM and Processor Physical Layout” on page 106
- “DIMM Population Rules” on page 108
- “Populating DIMMs for Optimal System Performance” on page 109
- “DIMM Rank Classification Labels” on page 112
- “Install a DIMM” on page 118

Install a DIMM

1. **Unpack the replacement DDR4 DIMM and place it on an antistatic mat.**

2. **Ensure that the replacement DDR4 DIMM matches the size of the DIMM it is replacing.**

   You must not replace a single-rank or dual-rank DIMM with a quad-rank DIMM and vice versa. If you violate this rule, the performance of the server might be adversely affected. For DIMM socket population rules, see "DIMM Population Rules" on page 108.

3. **Install a DIMM.**

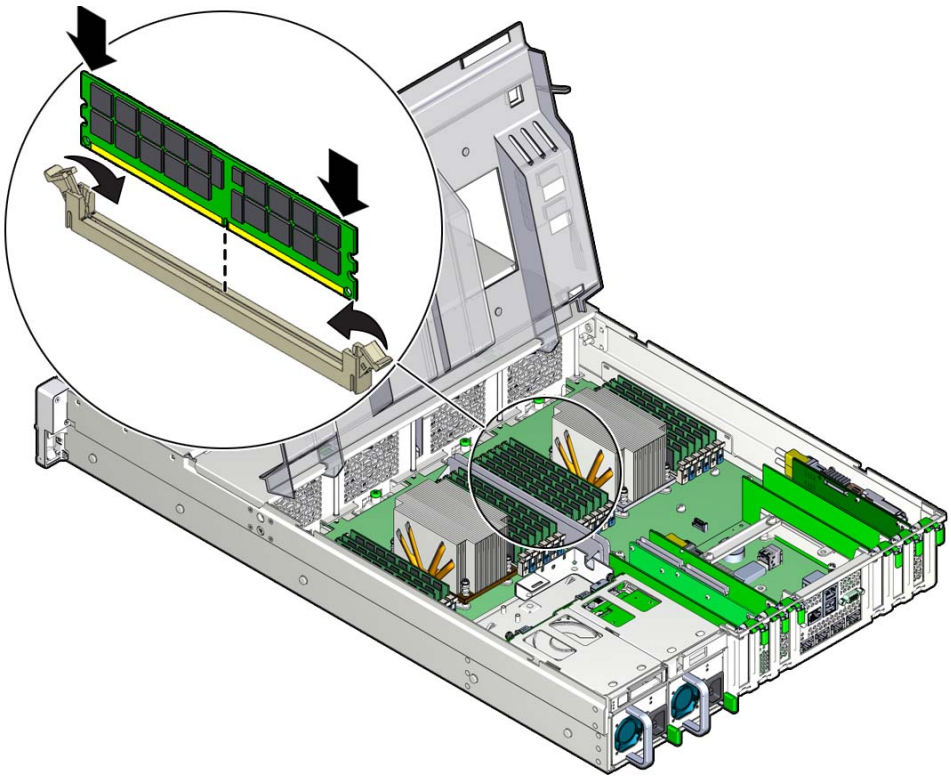
   a. **Ensure that the ejector tabs are in the open position.**

   b. **Align the notch in the replacement DIMM with the connector key in the connector socket.**

      The notch ensures that the DIMM is oriented correctly.

   c. **Push the DDR4 DIMM into the connector socket until the ejector tabs lock the DIMM in place.**

If the DIMM does not easily seat into the connector socket, verify that the notch in the DIMM is aligned with the connector key in the connector socket. If the notch is not aligned, damage to the DIMM might occur.



4. **Repeat Step 3 until all replacement DIMMs are installed.**

5. **Return the server to operation:**

   a. **Lower the air baffle to the installed position.**

   b. **Install the server top cover.**
   See “Install the Server Top Cover” on page 236.

   c. **Return the server to the normal rack position.**
   See “Return the Server to the Normal Rack Position” on page 241.

d. **Reconnect the power cords and data cables to the server.**

   See “Reconnect Power and Data Cables” on page 243.

e. **Power on the server.**

   See “Power On the Server” on page 243.

   Verify that the power supply AC OK LED is lit.

6. **(Optional) Use Oracle ILOM to clear server DDR4 DIMM faults.**

DDR4 DIMM faults are automatically cleared after a new DIMM has been installed. If you need to manually clear DDR4 DIMM faults, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Note - If you want to move a faulty DDR4 DIMM to a new DIMM socket or re-seat a DIMM for troubleshooting, you must first manually clear the associated DIMM fault. Otherwise, the DIMM fault might follow the DIMM to the new socket location or reoccur on the current socket location, causing a false DIMM fault condition.

Related Information

- “DIMM and Processor Physical Layout” on page 106
- “DIMM Population Rules” on page 108
- “Populating DIMMs for Optimal System Performance” on page 109
- “DIMM Rank Classification Labels” on page 112
- “Identify and Remove a Faulty DIMM” on page 114

Servicing PCIe Cards (CRU)

These sections describe how to service and install PCIe cards. Refer to your PCIe card documentation for complete software and cabling information about your card.



Caution - The procedures in this section should *not* be used to service the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card that is located in PCIe slot 6 or the optional Oracle PCIe NVMe switch card that is located in PCIe slot 3. The Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and Oracle PCIe NVMe switch card are field replaceable units (FRUs) and should be serviced only by qualified Oracle Service personnel.

Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in "Take Antistatic Measures" on page 68.

Caution - Ensure that all power is removed from the server before removing or installing PCIe cards. You must disconnect all power cables from the system before performing these procedures.

Note - For a complete list of supported PCIe cards, refer to the *Oracle Server X5-2L Product Notes* at `https://www.oracle.com/goto/x5-2l/docs`.

This section covers the following procedures:

- "PCIe Slot Locations" on page 121
- "Remove a PCIe Card" on page 122
- "Install a PCIe Card" on page 125

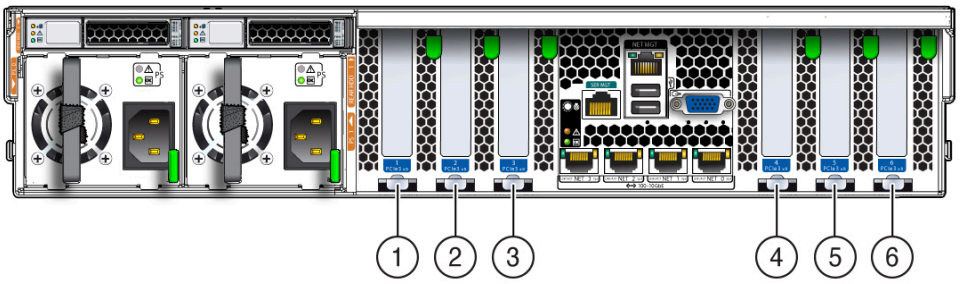
Related Information

- "Servicing the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card (FRU)" on page 189

PCIe Slot Locations

There are six PCIe slots available for optional PCIe cards. The following figure shows the PCIe slot numbering.

FIGURE 11 PCIe Slot Locations



Call Out	Description
1	PCIe slot 1 (PCIe slot 1 is nonfunctional in single-processor systems.)
2	PCIe slot 2 (PCIe slot 2 is nonfunctional in single-processor systems.)
3	PCIe slot 3 (PCIe slot 3 is nonfunctional in single-processor systems. Primary slot for the optional Oracle PCIe NVMe switch card)
4	PCIe slot 4
5	PCIe slot 5
6	PCIe slot 6 (Primary slot for the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card)

Note - All of the PCIe slots comply with the PCI Express 3.0 specification and can accommodate 25 Watt PCIe3 cards.

Related Information

- “Remove a PCIe Card” on page 122
- “Install a PCIe Card” on page 125

▼ Remove a PCIe Card

Note - PCIe slots 1, 2, and 3 are nonfunctional in single-processor systems.

Note - Prior to replacing or installing a PCIe card, refer to the card documentation for specific installation and cabling instructions.

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Extend the server to the maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   c. **Attach an antistatic wrist strap.**

      See “Electrostatic Discharge Safety” on page 56.

   d. **Remove the server top cover.**

      See “Remove the Server Top Cover” on page 69.

   e. **Swivel the air baffle into the upright position to allow access to PCIe cards.**

2. **Locate the PCIe card that you want to remove.**

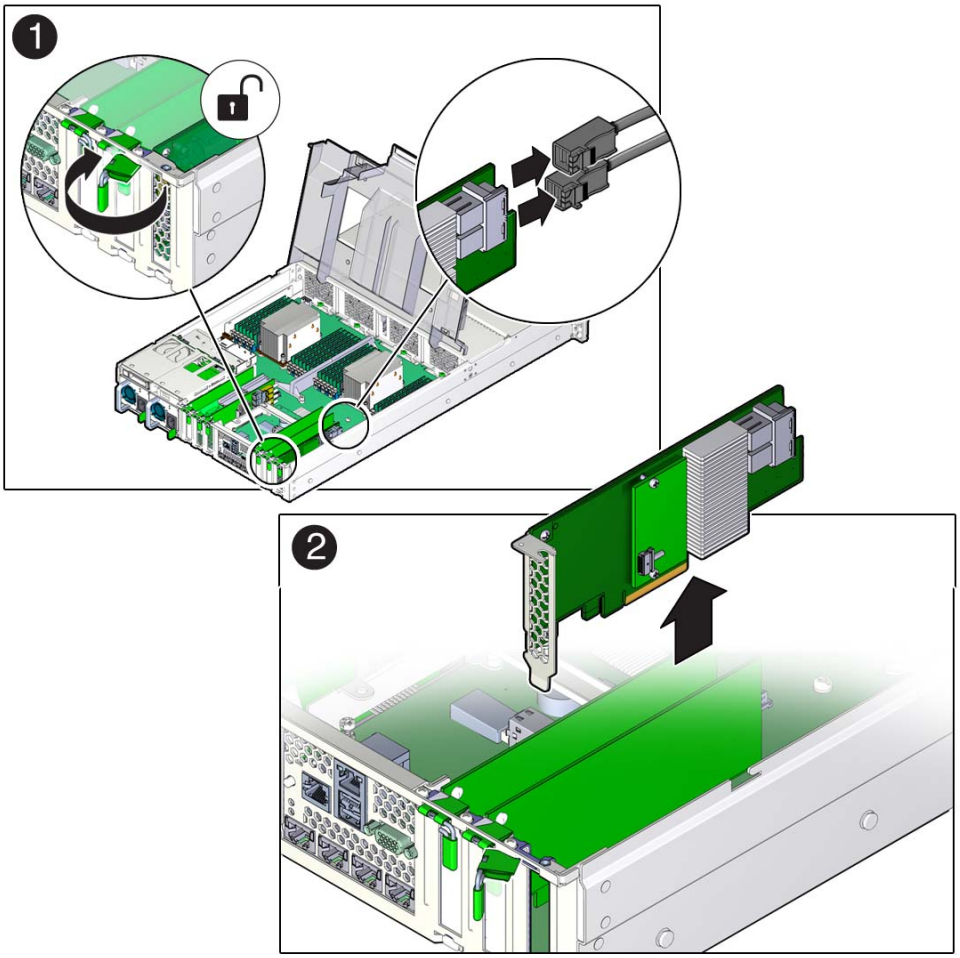
   See “PCIe Slot Locations” on page 121.

3. **If necessary, record where the PCIe cards are installed.**

4. **Unplug all data cables from the PCIe card [1].**

   Note the cable connections in order to ease proper reconnection of the cables.

5. **Rotate the PCIe card locking mechanism [1], and then lift up on the PCIe card to disengage it from the motherboard connectors [2].**



6. **Place the PCIe card on an antistatic mat.**

Caution - If you are not immediately inserting a replacement PCIe card into the empty slot, insert a PCIe filler panel in the slot to reduce the possibility of radiated electromagnetic interference (EMI). For instructions for installing a PCIe filler panel, see "Remove and Install Filler Panels" on page 236.

Related Information

- “PCIe Slot Locations” on page 121
- “Install a PCIe Card” on page 125

▼ Install a PCIe Card

Note - PCIe slots 1, 2, and 3 are nonfunctional in single-processor systems.

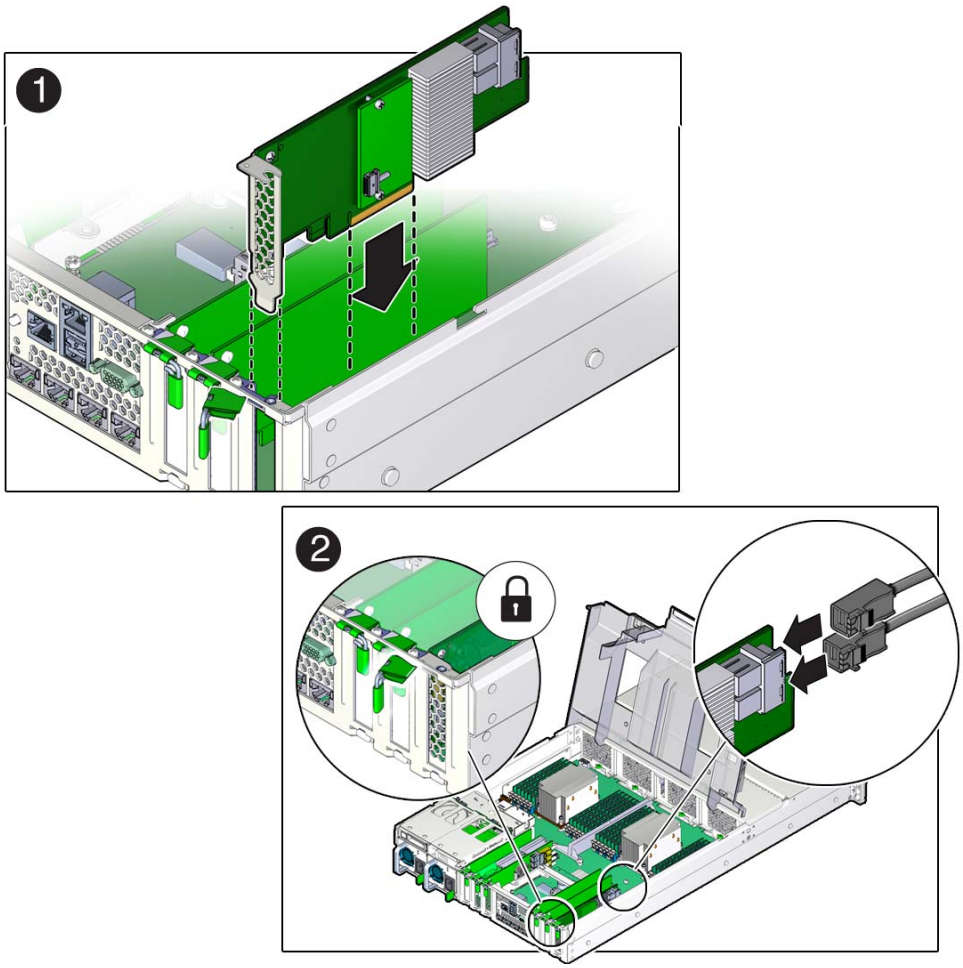
1. **Unpack the replacement PCIe card, and place it on an antistatic mat.**
2. **Locate the proper PCIe slot for the card you are replacing.**

Note - PCIe slot 3 is the primary slot for the Oracle PCIe NVMe switch card. This card is required for controlling and managing the optional NVMe storage drives.

3. **If necessary, remove the PCIe filler panel from the slot.**

Note - Save this filler panel in case you need to remove the PCIe card from the system.

4. **Insert the PCIe card into the correct slot [1], and rotate the PCIe locking mechanism to secure the PCIe card in place [2].**



5. **Reconnect the cables to the PCIe card that you unplugged during the removal procedure [2].**

6. **Return the server to operation.**

   a. **Lower the air baffle to the installed position.**

b. **Install the top cover.**

   See “Install the Server Top Cover” on page 236.

c. **Return the server to the normal rack position.**

   See “Return the Server to the Normal Rack Position” on page 241.

d. **Connect any required data cables to the PCIe card.**

   Route data cables through the cable management arm.

e. **Reconnect the power cords to the power supplies and power on the server.**

   See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the AC OK LED is lit.

7. **Use Oracle ILOM to clear any server PCIe card faults.**

   If a PCIe card fault message in Oracle ILOM is not cleared under Open Problems, you must manually clear the fault in Oracle ILOM. For instructions for manually clearing a PCIe card fault, see the procedure "Clear Faults for Undetected Replaced or Repaired Hardware Components" in the *Oracle ILOM User's Guide for System Monitoring and Diagnostics Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

8. **To determine wheather additional steps are required to complete the installation of the PCIe card, refer to the server product notes for the type of PCIe card you installed.**

   For a complete listing of the PCIe host bus adapter (HBA) cards supported by the server, refer to the *Oracle Server X5-2L Product Notes* at `https://www.oracle.com/goto/x5-2l/docs`.

Related Information

- “PCIe Slot Locations” on page 121
- “Remove a PCIe Card” on page 122

Servicing the Internal USB Flash Drives (CRU)



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow antistatic practices as described in "Take Antistatic Measures" on page 68.



Caution - Ensure that all power is removed from the server before removing or installing a flash drive or damage to the drive might occur. You must disconnect all power cables from the system before performing these procedures.

This section covers the following procedures:

- "Servicing the Oracle System Assistant USB Flash Drive" on page 128
- "Remove an Internal USB Flash Drive" on page 129
- "Install an Internal USB Flash Drive" on page 130

Related Information

- "USB Ports" on page 250

Servicing the Oracle System Assistant USB Flash Drive

If the Oracle System Assistant software is corrupted on the USB flash drive, you should try to repair it before replacing the USB flash drive.

Oracle System Assistant uses a specially formated USB flash drive. Do not replace the Oracle System Assistant flash drive with a standard flash drive. If the Oracle System Assistant USB flash drive fails and it cannot be repaired by reloading the Oracle System Assistant software, contact Oracle Services and request a service call to have Oracle System Assistant USB flash drive replaced.

Note - If your server is configured with Oracle System Assistant software, it is located on the USB flash drive in the bottom USB slot.

For instructions for troubleshooting and repairing Oracle System Assistant, refer to the Oracle System Assistant troubleshooting information in the *Oracle X5 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`.

▼ Remove an Internal USB Flash Drive

The server can be equipped with up to two internal USB Flash drives.

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the server power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Extend the server into maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

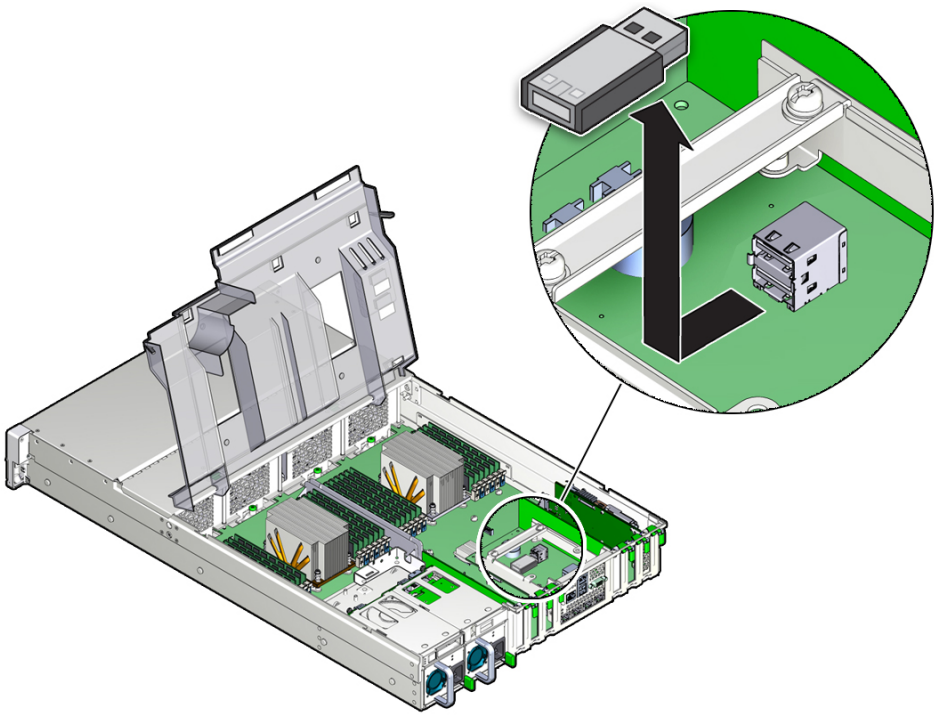
      See “Electrostatic Discharge Safety” on page 56.

   d. **Remove the server top cover.**

      See “Remove the Server Top Cover” on page 69.

2. **To remove a USB flash drive, grasp the flash drive and pull it from the slot.**

Note - If your server is configued with Oracle System Assistant software, it is located on the USB flash drive in the bottom USB slot. Before removing the Oracle System Assistant USB flash drive, see “Servicing the Oracle System Assistant USB Flash Drive” on page 128.



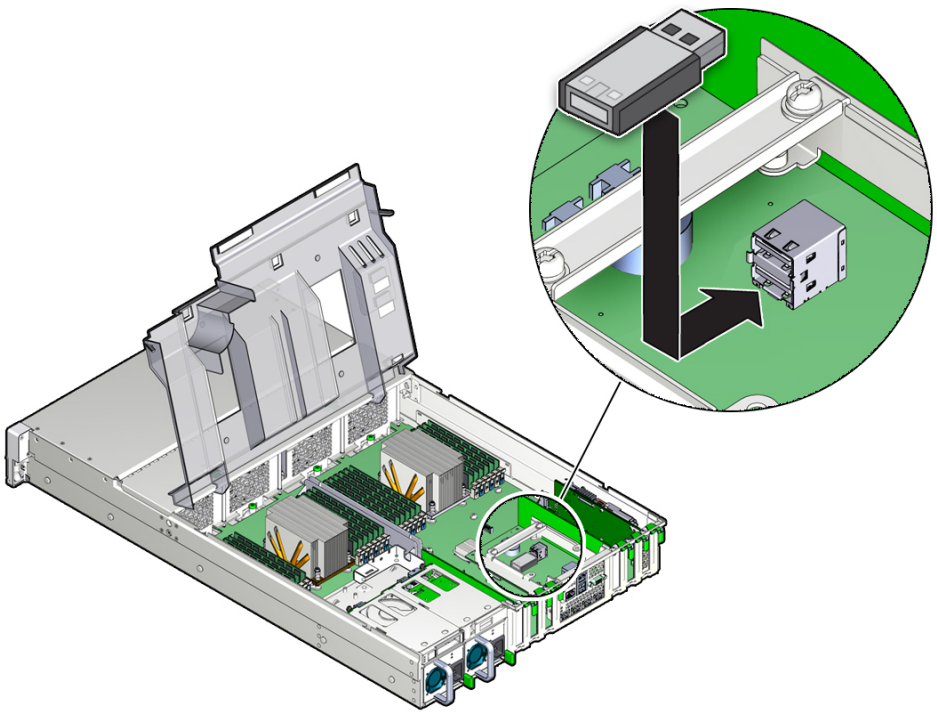
Related Information

- “Install an Internal USB Flash Drive” on page 130

▼ Install an Internal USB Flash Drive

1. **Unpack the replacement USB flash drive.**
2. **Insert the flash drive into the USB slot.**

Note - If you are replacing the Oracle System Assistant USB flash drive, insert the USB flash drive into the bottom USB slot.



3. **Return the server to operation.**

   a. **Install the server top cover.**

      See “Install the Server Top Cover” on page 236.

   b. **Return the server to the normal rack position.**

      See “Return the Server to the Normal Rack Position” on page 241.

   c. **Reconnect the power cords to the server power supplies and power on the server.**

      See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

4. **If the USB flash drive that you replaced was the Oracle System Assistant USB flash drive, you need to reinstall Oracle System Assistant on the new USB flash drive.**

   For instructions, see the procedures for restoring Oracle System Assistant in the *Oracle X5 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`.

Related Information

- "Remove an Internal USB Flash Drive" on page 129

Servicing the Battery (CRU)

The real-time clock (RTC) battery maintains system time when the server is powered off and a time server is unavailable. If the server fails to maintain the proper time when the system is powered off and not connected to a network, replace the battery.



Caution - Ensure that all power is removed from the server before removing or installing the battery. You must disconnect the power cables from the system before performing this procedure.

This section covers the following procedures:

- "Remove the Battery" on page 132
- "Install the Battery" on page 134

▼ Remove the Battery

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the server power supplies.**

      See "Powering Down the Server" on page 59.

   b. **Extend the server into the maintenance position.**

      See "Extend the Server to the Maintenance Position" on page 66.

c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

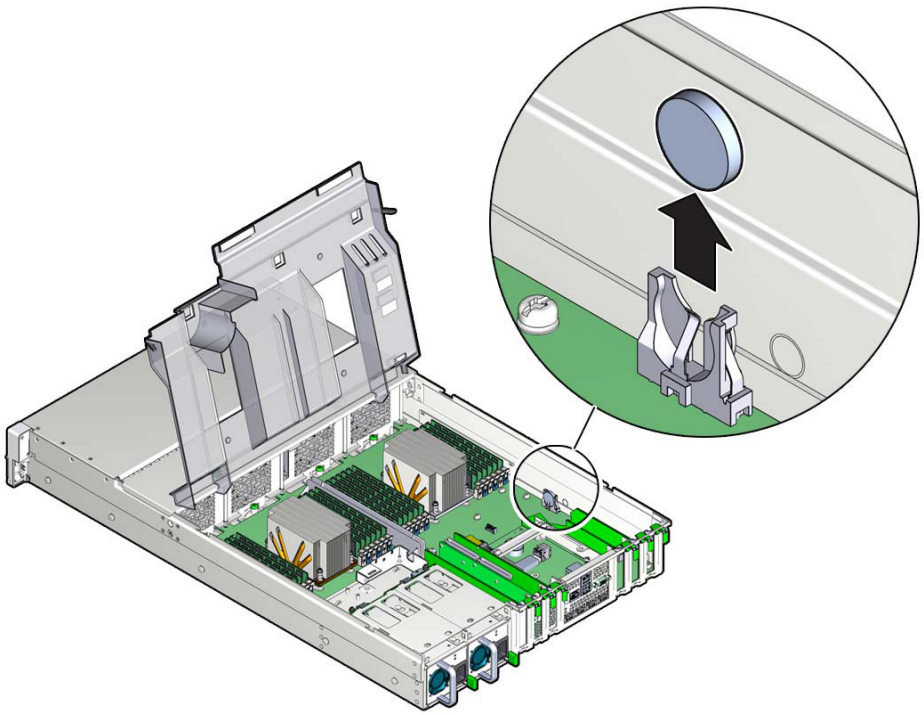
   See “Electrostatic Discharge Safety” on page 56.

d. **Remove the server top cover.**

   See “Remove the Server Top Cover” on page 69.

e. **Swivel the air baffle into the upright position to allow access to the battery.**

2. **To dislodge the battery from its retainer, gently push the top edge of the battery away from the retainer.**



3. **Lift the battery up and out of its retainer.**

Related Information

- “Install the Battery” on page 134

▼ Install the Battery

1. **Unpack the replacement battery.**
2. **Press the new battery into the battery retainer with the positive side (+) facing the server chassis side wall.**
3. **Return the server to operation.**
   a. **Lower the air baffle to the installed position.**
   b. **Install the server top cover.**
      See “Install the Server Top Cover” on page 236.
   c. **Return the server to the normal rack position.**
      See “Return the Server to the Normal Rack Position” on page 241.
   d. **Reconnect the power cords to the server power supplies, and power on the server.**
      See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Note - If the service processor is configured to synchronize with a network time server using the Network Time Protocol (NTP), the Oracle ILOM SP clock will be reset as soon as the server is powered on and connected to the network; otherwise, proceed to the next step.

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4. **If the service processor is not configured to use NTP, you must do one of the following:**
   - Reset the Oracle ILOM SP clock using the Oracle ILOM CLI or the web interface.
     For instructions, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.
   - Use the BIOS Setup Utility to reprogram the host clock.
     For the BIOS Main menu that supports this procedure, refer to the *Oracle X5 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`.

Related Information

- “Remove the Battery” on page 132

Servicing FRUs

The following sections describe how to service field-replaceable units (FRUs). You must power down the system and remove the AC power cords before servicing all FRU components. For more information about FRUs, see “Illustrated Parts Breakdown” on page 23 and “Field-Replaceable Units” on page 25.

Note - Only authorized Oracle service personnel should service FRUs.

Description	Links
Service the processors.	“Servicing Processors (FRU)” on page 138
Service the front and rear storage drive backplanes.	“Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156
Service SAS cables.	“Servicing SAS Cables (FRU)” on page 177
Service NVMe cables.	“Servicing NVMe Cables (FRU)” on page 183
Service the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and super capacitor.	“Servicing the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card (FRU)” on page 189
Service the DVD drive.	“Servicing the DVD Drive (FRU)” on page 196
Service the front indicator LED/USB modules.	“Servicing the Front LED/USB Indicator Modules (FRU)” on page 202
Service the motherboard assembly.	“Servicing the Motherboard Assembly (FRU)” on page 218

Related Information

- “Servicing CRUs That Do Not Require Server Power-Off” on page 75
- “Servicing CRUs That Require Server Power-Off” on page 105

Servicing Processors (FRU)

Caution - Processors should be removed and replaced only by authorized Oracle Service personnel.

Caution - Ensure that all power is removed from the server before removing or installing a processor. You must disconnect the power cables from the system before performing these procedures.

Caution - This procedure requires that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See “Electrostatic Discharge Safety” on page 56.

Note - On single-processor systems, neither a heatsink nor a processor filler cover are installed in the processor socket 1 (P1). To protect the delicate processor socket pins, the cover that comes on the motherboard from manufacturing is left in place.

This section covers the following topics:

- “Selecting the Correct Processor Removal and Replacement Tool” on page 138
- “Remove a Processor” on page 143
- “Install a Processor” on page 150

Related Information

- “Servicing the DIMMs (CRU)” on page 105

Selecting the Correct Processor Removal and Replacement Tool

Caution - The correct color-coded processor removal and replacement tool must be used to remove and replace a processor; otherwise, the processor or the processor socket might be damaged. Additionally, do not use a tool that is designed for earlier generations of Intel processors (CPUs). If you use an earlier generation tool, the processor will only be partially held by the tool and it could fall from the tool, which could damage the processor socket.

Selecting the correct processor removal and replacement tool is a two-step process. First you determine the size of the processor that is being replaced, then you select the removal and replacement tool that fits that size.

The processors supported by the Oracle Server X5-2L are available in two sizes. The processors with 10 or fewer cores are smaller than the processors with 12 or more cores. You can determine the size of the processor that you are going to remove and replace in either of these two ways:

- Use Oracle Integrated Lights Out Manager (ILOM) 5.0 to display processor information.

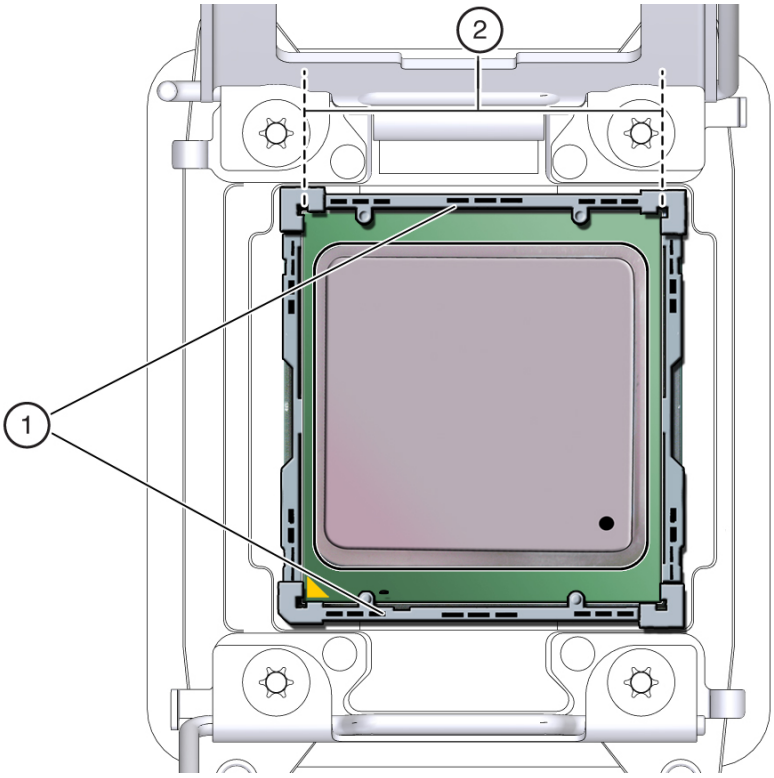
  For instructions, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.
- Visually check the size of the processor installed in the server.

  This requires that you remove the processor heatsink and open the processor independent loading mechanism (ILM) assembly that holds the processor in the socket. For instructions, see "Remove a Processor" on page 143. This is the same procedure that you will use when you remove the processor.

If you choose to visually check the size of the processor, refer to the next two figures to see how to distinguish the smaller processors from the larger processors. Figure 12, "Smaller Processor Installed in a Motherboard Processor Socket," on page 140 shows the smaller processor installed. Notice that the right and left edges of the processor are within the boundaries of the processor alignment brackets.

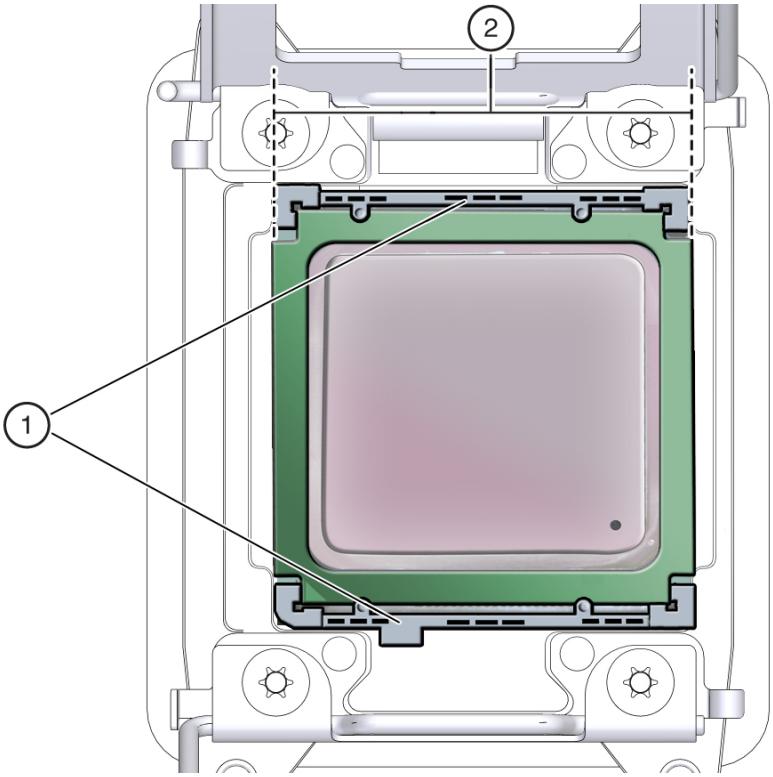
Figure 13, "Larger Processor Installed in a Motherboard Processor Socket," on page 141 shows the larger processor installed. Notice that the right and left edges of the processor extend beyond the boundaries of the processor alignment brackets.

FIGURE 12 Smaller Processor Installed in a Motherboard Processor Socket



Call Out	Description
1	Processor alignment brackets
2	Processor left and right edges are within alignment bracket boundaries

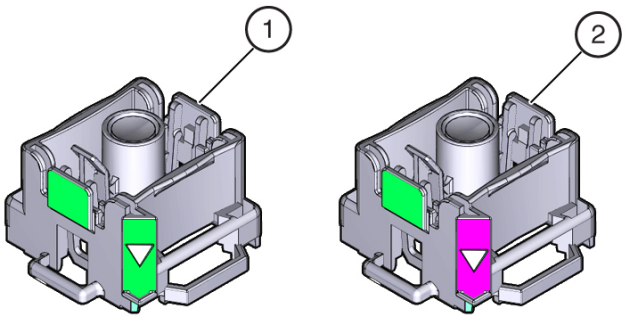
FIGURE 13 Larger Processor Installed in a Motherboard Processor Socket



Call Out	Description
1	Processor alignment brackets
2	Processor left and right edges extend beyond alignment bracket boundaries

After you have determined the size of the processor installed in your server, select the correct processor removal and replacement tool. Like the processors, the processor removal and replacement tool is also available in two sizes. The tool for the smaller processors (processors with 10 or fewer cores) is color-coded green. The tool for the larger processors (processors with 12 or more cores) is color-coded pink. See Figure 14, “Color-Coded Processor Removal and Replacement Tools,” on page 142.

FIGURE 14 Color-Coded Processor Removal and Replacement Tools



Call Out	Description
1	Green, color-coded removal and replacement tool for the smaller processors-models (10 cores or less)
2	Pink, color-coded removal and replacement tool for the larger processor-models (12 cores or more)

Caution - The pink color-coded processor removal and replacement tool must be used only with the larger processors (the 12-, and 18-core processors). Likewise, the green color-coded removal and replacement tool must be used only with smaller processors (the 8-, and 10-core processors); otherwise, the processor or the processor socket might be damaged.

The following table provides an easy reference for matching a processor (by number of cores or model number) to the correct processor removal and replacement tool. The processor removal and replacement tool part number is also recorded on the tool.

TABLE 11 Processor Model Numbers by Number of Cores

Processor Cores	Processor Model Number	Processor Removal and Replacement Tool Color Code and Part Number
8-core	E5-2630 V3	Green, part number G29477-002 or later
10-core	E5-2660 V3	Green, part number G29477-002 or later
12-core	E5-2690 V3	Pink, part number G54233-001 or later

Processor Cores	Processor Model Number	Processor Removal and Replacement Tool Color Code and Part Number
18-core	E5-2699 V3	Pink, part number G54233-001 or later

Note - The correct processor removal and replacement tool is included in the box with the replacement processor. Additionally, both removal and replacement tools ship with replacement motherboards.

▼ Remove a Processor



Caution - The correct color-coded processor removal and replacement tool must be used to remove a processor; otherwise, the processor or the processor socket might be damaged. For information on how to select the correct processor removal/replacement tool, see “Selecting the Correct Processor Removal and Replacement Tool” on page 138.



Caution - Be careful not to touch the processor socket pins. The processor socket pins are very fragile. A light touch can bend the processor socket pins beyond repair. Always use the processor removal and replacement tool to remove and replace the processor.

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See “Take Antistatic Measures” on page 68.

   c. **Extend the server to the maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   d. **Remove the server top cover.**

      See “Remove the Server Top Cover” on page 69.

e. Swivel the air baffle into the upright position to allow access to the processors.

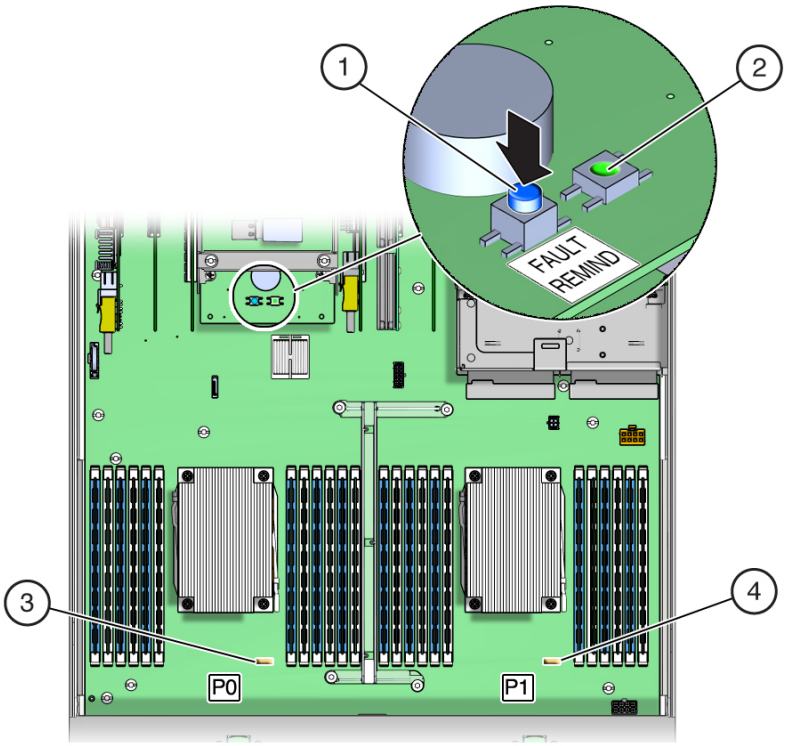
2. Identify the location of the faulty processor by pressing the Fault Remind button on the motherboard I/O card.

Note - When the Fault Remind button is pressed, an LED located next to the Fault Remind button lights green to indicate that there is sufficient voltage present in the fault remind circuit to light any fault LEDs that were lit due to a failure. If this LED fails to light when you press the Fault Remind button, it is likely that the capacitor powering the fault remind circuit has lost its charge. This can happen if the Fault Remind button is pressed for a long time with fault LEDs lit or if power has been removed from the server for more than 15 minutes.

The processor fault LED for the faulty processor lights. The processor fault LEDs are located next to the processors:

- If the processor fault LED is off, then the processor is operating properly.

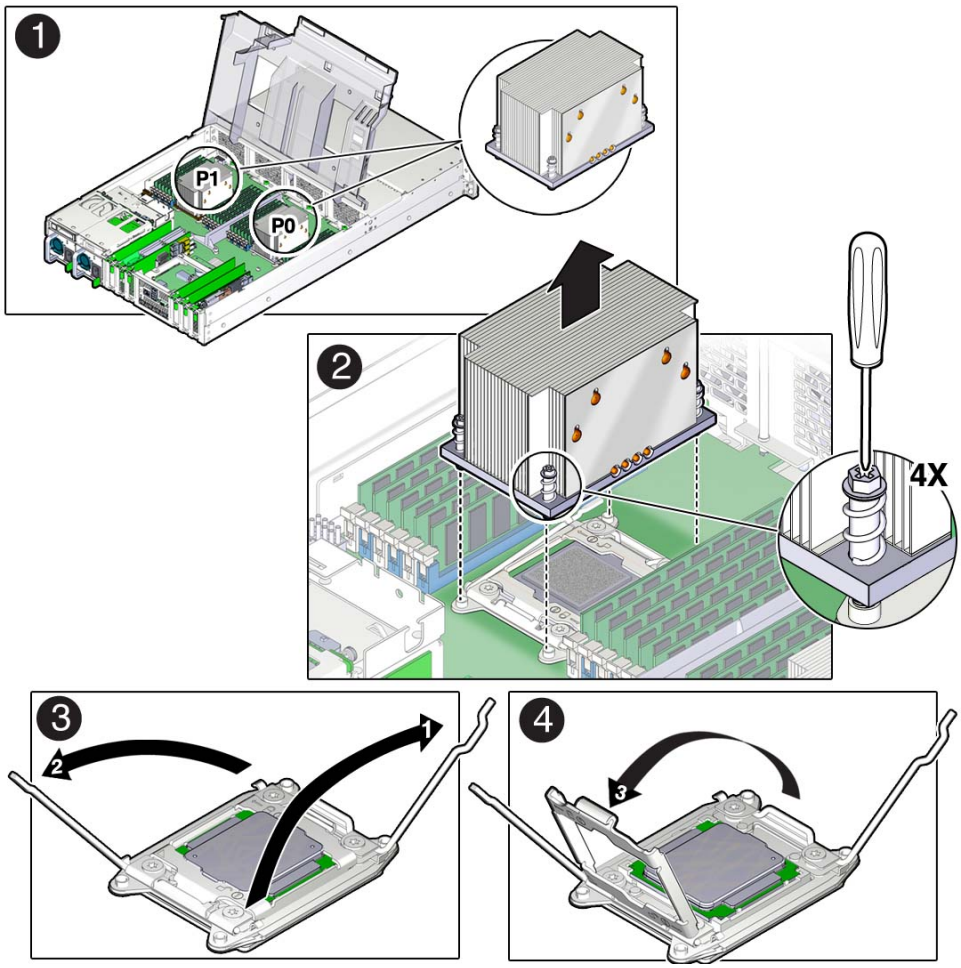
- If the processor fault LED is on (amber), then the processor is faulty and should be replaced.



Number	Description
1	Fault Remind button
2	Fault Remind LED
3	Processor 0 fault LED
4	Processor 1 fault LED

3. **Gently press down on the top of the heatsink to counteract the pressure of the captive spring-loaded screws that secure the heatsink to the motherboard and loosen the four Phillips captive screws in the heatsink using a No. 2 Phillips screwdriver [2].**

Turn the screws counterclockwise alternately one and one-half turns until they are fully released.



4. **To separate the heatsink from the top of the processor, gently twist the heatsink left and right, while pulling upward, and then lift off the heatsink and place it upside down on a flat surface.**

   A thin layer of thermal grease separates the heatsink and the processor. This grease acts as an adhesive.

Note - Do not allow the thermal grease to contaminate the work space or other components.

5. **Use an alcohol pad to clean the thermal grease from the underside of the heatsink.**

   Be careful not to get the thermal grease on your fingers.

Caution - Failure to clean the heatsink prior to removing the processor could result in the accidental contamination of the processor socket or other components. Also, be careful not to get the grease on your fingers, as this could result in contamination of components.

6. **Disengage the processor release lever on the right side of the processor socket (viewing the server from the front) by pushing down on the lever and moving it to the side away from the processor, and then rotating the lever upward [3].**

7. **Disengage the processor release lever on the left side of the processor socket (viewing the server from the front) by pushing down on the lever and moving it to the side away from the processor, and then rotating the lever upward [3].**

8. **To lift the ILM assembly load plate off of the processor socket, rotate the processor release lever on the right side of the processor toward the closed position (the ILM assembly load plate is lifted up as the release lever is lowered toward the closed position) and carefully swing the ILM load plate to the fully open position [4].**

Caution - Whenever you remove a processor, you should replace it with another processor and reinstall the processor heatsink; otherwise, the server might overheat due to improper airflow. For instructions for installing a processor, see “Install a Processor” on page 150.

9. **To remove the processor from the processor socket, acquire the processor removal and replacement tool and perform the following steps.**

Caution - Before removing the processor, ensure that you are using the correct color-coded processor removal and replacement tool. For information on how to select the correct processor removal and replacement tool, see “Selecting the Correct Processor Removal and Replacement Tool” on page 138.

   a. **Locate the button in the center of the top of the processor removal tool and press it to the down position [1].**

b. Properly position the tool over the processor socket and lower it into place over the processor socket [2].

To properly position the tool over the processor socket, rotate the tool until the green triangle on the side of the tool is facing the front of the server and it is over the left side of the processor socket when viewing the server from the front.

c. Press the release lever on the processor tool to release the center button and engage the processor [3].

An audible click indicates that the processor is engaged.

d. Grasp the tool by the sides and remove it from the server [4].

e. Turn the tool upside down and verify that it contains the processor [5].

f. While holding the processor tool upside down, press the center button on the tool to release the processor [5].

g. Carefully grasp the processor by the front and back edges, lift it out of the tool and place it with the circuit side down (the installed orientation) into an antistatic container [6].

h. Carefully clean the thermal grease off the top of the processor.

Caution - The following figure shows the green color-coded processor removal and replacement tool. If you are removing a processor with 12 or more cores, you must use the pink color-coded processor removal and replacement tool. For information on how to select the correct processor removal and replacement tool, see “Selecting the Correct Processor Removal and Replacement Tool” on page 138.

Related Information

- “Install a Processor” on page 150

Install a Processor

Caution - The correct color-coded processor removal and replacement tool must be used to install a processor; otherwise, the processor or the processor socket might be damaged. For information on how to select the correct processor removal and replacement tool, see “Selecting the Correct Processor Removal and Replacement Tool” on page 138.

Caution - Be careful not to touch the processor socket pins. The processor socket pins are very fragile. A light touch can bend the processor socket pins beyond repair. Always use the processor removal and replacement tool to remove and replace the processor.

1. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

   See “Take Antistatic Measures” on page 68.

2. **Unpack the replacement processor, and place it on an antistatic mat.**

3. **Ensure that the replacement processor is identical to the failed processor that was removed.**

   For a description of the processors that are supported by the server, refer to “Server Components” in *Oracle Server X5-2L Installation Guide*.

4. **Ensure that the two processor ILM assembly levers and the ILM assembly load plate are in the fully open position.**

   For instructions for opening the processor ILM assembly levers and the load plate, see Step 6 through Step 8 of “Remove a Processor” on page 143.

5. **To install the replacement processor into the processor removal and replacement tool, acquire the tool and perform the following steps.**

Caution - Before installing the processor, ensure that you are using the correct color-coded processor removal and replacement tool. For information on how to select the correct processor removal and replacement tool, see “Selecting the Correct Processor Removal and Replacement Tool” on page 138.

a. **Press the button in the center of the tool to the down position [1].**

b. **Turn the tool upside down, grasp the processor by its front and back edges and position the processor (circuit side up) in the tool so that the triangle on the corner of the processor aligns with the triangle on the side of the processor removal and replacement tool [2].**

c. **Lower the processor into the tool and press the tool release lever to release the center button and engage the processor [3].**

   An audible click indicates that the processor is locked into place.

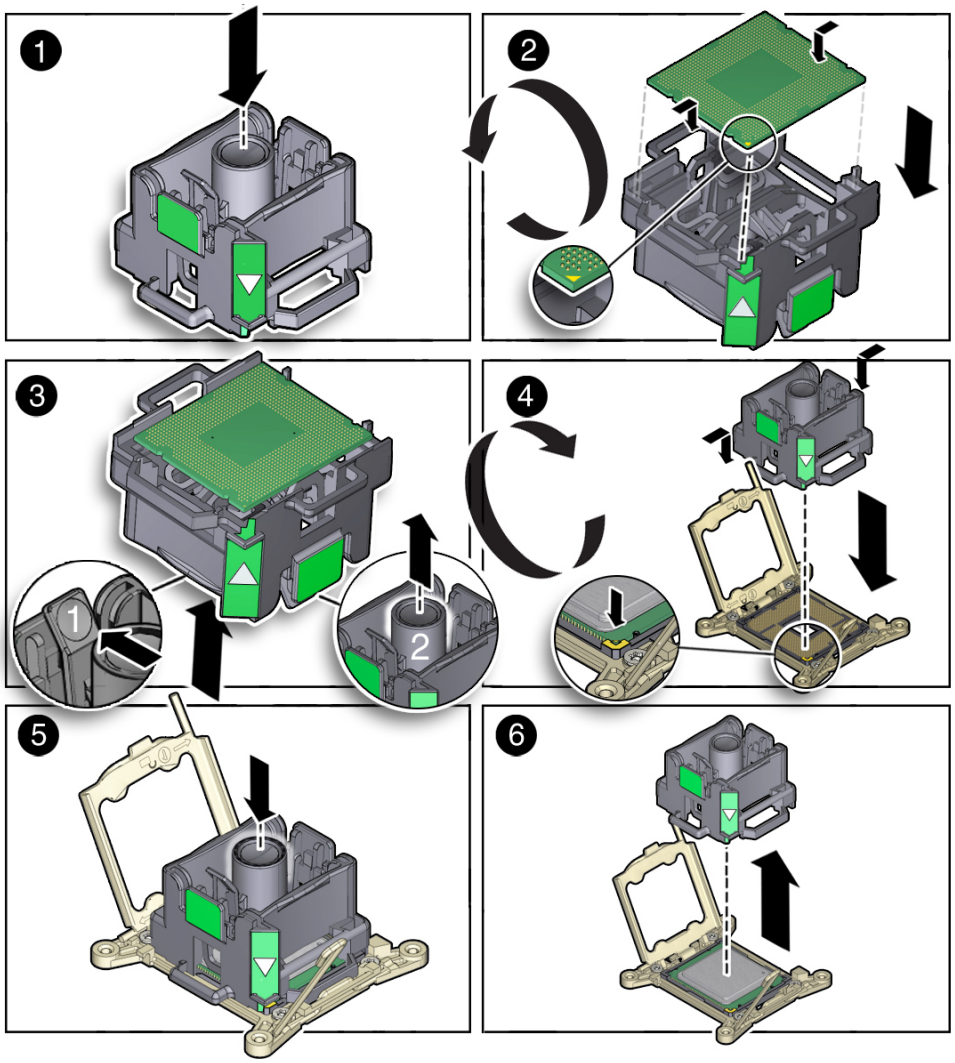
d. **Properly position the tool over the processor socket and lower it into place [4].**

   To properly position the tool in the processor socket, rotate the tool until the green triangle on the side of the tool is facing the front of the server and it is over the left side of the processor socket (when viewing the server from the front) and lower the tool into the processor socket.

e. **Press the center button on the tool down to release the processor so that it is installed in the socket [5].**

f. **Remove the processor removal and replacement tool [6].**

Caution - The following figure shows the green color-coded processor removal and replacement tool. If you are installing a processor with 12 or more cores, you must use the pink color-coded processor removal and replacement tool. For information on how to select the correct processor removal and replacement tool, see "Selecting the Correct Processor Removal and Replacement Tool" on page 138.



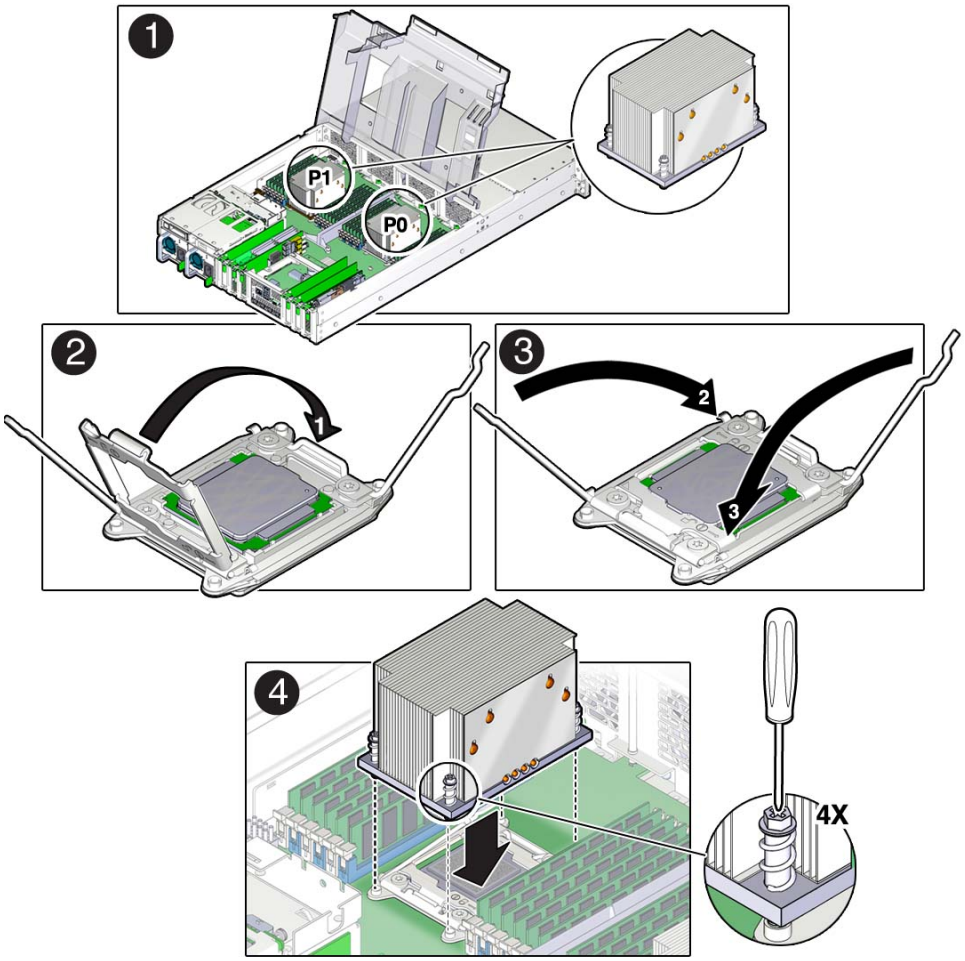
6. **Visually check the alignment of the processor in the socket [1].**

   When properly aligned, the processor sits flat in the processor socket.

Caution - Do not press down on the processor. Irreparable damage to the processor or motherboard might occur from excessive downward pressure. Do not forcibly seat the processor into the socket. Excessive downward pressure might damage the socket pins.

7. **Swing the processor ILM assembly load plate into the closed position [2].**

   Ensure that the load plate sits flat around the periphery of the processor.



8. **Engage the socket release lever on the left side of the socket (viewing the server from the front) by rotating it downward and slipping it under the catch [3].**

9. **Engage the socket release lever on the right side of the socket (viewing the server from the front) by rotating it downward and slipping it under the catch [3].**

10. **Use the syringe (supplied with the new or replacement processor) to apply approximately 0.1 mL of thermal grease to the center of the top of the processor.**

    To measure 0.1 ml of thermal grease, use the graduated scale on the thermal grease syringe.

    Note - Do not distribute the grease; the pressure of the heatsink will do it for you when you install the heatsink.

11. **Inspect the heatsink for dust and lint.**

    Clean the heatsink if necessary.

12. **Orient the heatsink so that the screws line up with the mounting posts [4].**

    Note - The processor heatsink is not symmetrical.

13. **Carefully position the heatsink on the processor, aligning it with the mounting posts to reduce movement after it makes initial contact with the layer of thermal grease [4].**

    Caution - Avoid moving the heatsink after it has contacted the top of the processor. Too much movement could disturb the layer of thermal grease, causing voids, and leading to ineffective heat dissipation and component damage.

14. **Use a No. 2 Phillips screwdriver to tighten the screws alternately one-half turns until fully seated [4].**

15. **Return the server to operation.**

    a. **Lower the air baffle to the installed position.**

    b. **Install the server top cover.**

       See “Install the Server Top Cover” on page 236.

    c. **Return the server to the normal rack position.**

       See “Return the Server to the Normal Rack Position” on page 241.

d. Reconnect the power cords to the power supplies, and power on the server.

See "Reconnect Power and Data Cables" on page 243 and "Power On the Server" on page 243. Verify that the power supply AC OK LED is lit.

16. Use Oracle ILOM to clear server processor faults.

Refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs` for more information about the following steps.

a. To show server faults, log in to the server as `root` using the Oracle ILOM CLI, and type the following command to list all known faults on the server:

-> **`show /SP/faultmgmt`**

The server lists all known faults, for example:

```
-> show /SP/faultmgmt
  Targets:
      shell
      0 (/SYS/MB/P0)
  Properties:
  Commands:
      cd
      show
```

Alternatively, to list all known faults in the server, log into the Oracle Solaris OS and issue the `fmadm faulty` command, or log into the Oracle ILOM service processor from the Oracle ILOM Fault Management Shell and issue the `fmadm faulty` command. For more information about how to use the Oracle ILOM Fault Management Shell and supported commands, see the *Oracle ILOM User's Guide for System Monitoring and Diagnostics Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

b. To clear the fault identified in Step 16a, type the following command:

-> **`set /SYS/MB/P0 clear_fault_action=true`**

For example:

```
-> set /SYS/MB/P0 clear_fault_action=true
Are you sure you want to clear /SYS/MB/P0 (y/n)? y
Set 'clear_fault_action' to 'true'
```

Alternatively, to clear all known faults in the server, log into the Oracle Solaris OS and issue the `fmadm repair` command, or log into the Oracle ILOM service processor from

the Oracle ILOM Fault Management Shell and issue the `fmadm repair` command. For more information about how to use the Oracle ILOM Fault Management Shell and supported commands, see the *Oracle ILOM User's Guide for System Monitoring and Diagnostics Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Related Information

- “Remove a Processor” on page 143

Servicing the Front and Rear Storage Drive Backplanes (FRU)



Caution - Front and rear storage drive backplanes should be removed and replaced only by authorized Oracle Service personnel.



Caution - Ensure that all power is removed from the server before removing or installing the storage drive backplane. You must disconnect the power cables before performing this procedure.

To remove and install the front and rear storage drive backplanes, follow these procedures:

- “Remove the Storage Drive Backplane for Eight-Drive Systems” on page 157
- “Install the Storage Drive Backplane for Eight-Drive Systems” on page 160
- “Remove the Storage Drive Backplane for Twelve-Drive Systems” on page 162
- “Install the Storage Drive Backplane for Twelve-Drive Systems” on page 166
- “Remove the Storage Drive Backplane for Twenty-Four Drive Systems” on page 168
- “Install the Storage Drive Backplane for Twenty-Four Drive Systems” on page 171
- “Remove the Storage Drive Backplane for Rear-Mounted Storage Drives” on page 173
- “Install the Storage Drive Backplane for Rear-Mounted Storage Drives” on page 175

Related Information

- “Servicing Storage Drives and Rear Drives (CRU)” on page 75
- “Servicing SAS Cables (FRU)” on page 177
- “Servicing NVMe Cables (FRU)” on page 183

▼ Remove the Storage Drive Backplane for Eight-Drive Systems

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See “Take Antistatic Measures” on page 68.

   c. **Extend the server into the maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   d. **Remove the disk cage cover.**

      See “Remove the Disk Cage Cover From the Server” on page 72.

   e. **If necessary, remove the fan modules from the server.**

      See “Remove a Fan Module” on page 94.

2. **Pull each storage drive out far enough to disengage if from the disk backplane.**

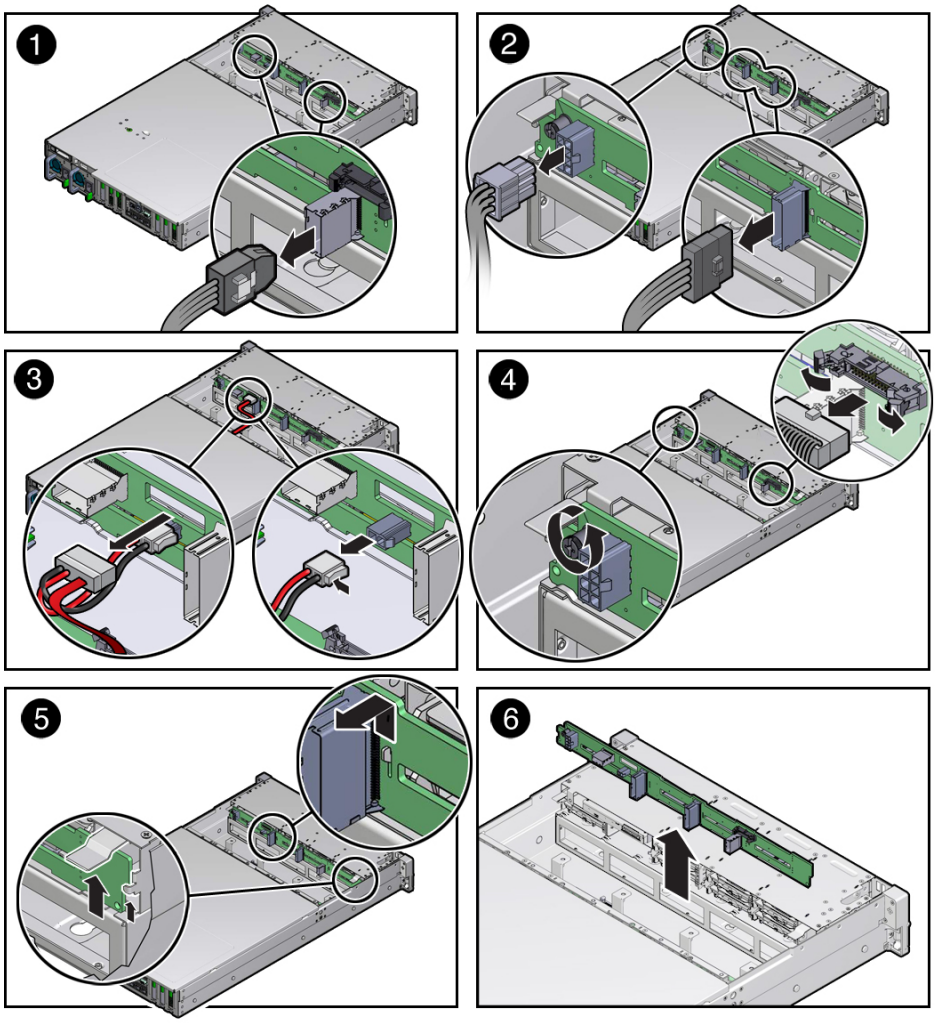
   See “Remove an HDD or SSD Storage Drive” on page 77.

   Note - It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the disk backplane. If you do remove the storage drives from the server, record their locations so that you can reinstall them in the same locations.

3. **Disconnect the cables from the storage drive backplane.**

   a. **Disconnect the two SAS cables from the storage drive backplane to the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [1].**

Note the cable connections in order to ease proper reconnection of the cables.



b. Disconnect the power cable from the storage drive backplane [2].

c. If present, disconnect the two optional NVMe cables from the storage drive backplane [2].

d. **If the server has a DVD drive, disconnect the power and DVD data connections from the storage drive backplane [3].**

   See "Remove the DVD Drive" on page 197.

e. **Disconnect the auxiliary signal cable from the storage drive backplane [4]**

4. **Using a No. 2 Phillips screwdriver, loosen the right-side spring-mounted screw that secures the storage drive backplane to the chassis [4].**

5. **Lift up on the left-side spring tab, and then gently release the storage drive backplane from the standoff hooks and out from under the spring tab [5].**

6. **Pull the storage drive backplane away from the standoff hooks and spring tab and out of the chassis [6].**

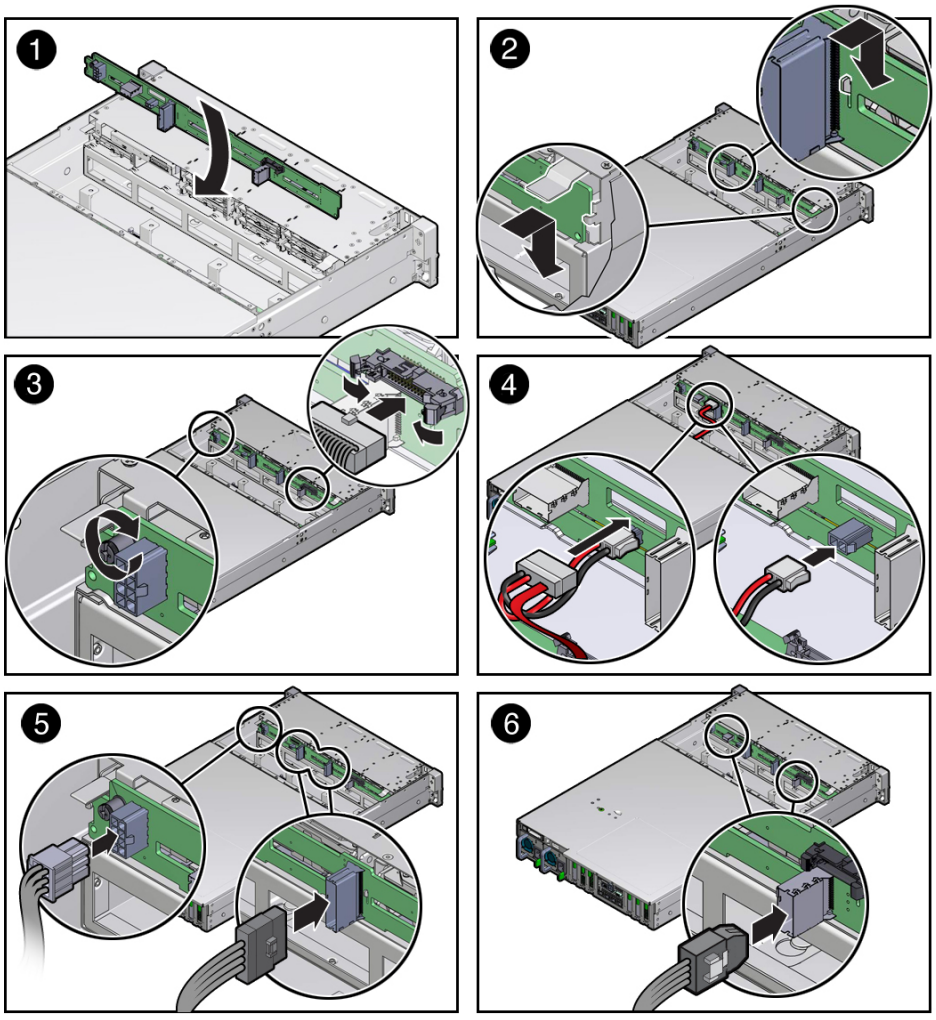
7. **Place the storage drive backplane on an antistatic mat.**

Related Information

- "Install the Storage Drive Backplane for Eight-Drive Systems" on page 160

▼ Install the Storage Drive Backplane for Eight-Drive Systems

1. **Lower the storage drive backplane into the server, and then position it under the left-side spring tab to engage the standoff hooks. [1 and 2].**



2. **Using a No. 2 Phillips screwdriver, install and tighten the right-side spring-mounted screw to secure the storage drive backplane to the chassis [3].**

3. **Reconnect the cables to the storage drive backplane.**

   a. **Reconnect the auxiliary signal cable to the storage drive backplane [3].**

   Note - Cable part number 7064127 is required to connect the auxiliary signal to the storage drive backplane.

   b. **If the server has a DVD drive, reconnect the power and DVD data connections to the storage drive backplane [4].**

      See “Install the DVD Drive” on page 199.

   Note - Cable part number 7064128 is required to connect DVD power and data to the storage drive backplane.

   c. **Reconnect the power cable to the storage drive backplane [5].**

   Note - Cable part number 7064125 is required to connect power to the storage drive backplane.

   d. **If present, reconnect the two optional NVMe cables to the storage drive backplane [5].**

      To ensure proper NVMe cable connections, see “Install NVMe Cables” on page 187.

   e. **Reconnect the two SAS cables to the storage drive backplane from the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [6].**

      To ensure proper SAS cable connections, see “Install SAS Storage Drive Cables” on page 180.

4. **Return the server to operation.**

   a. **If removed, install the fan modules.**

      See “Install a Fan Module” on page 97.

   b. **Install the disk cage cover, and close the fan assembly door.**

      See “Install the Disk Cage Cover” on page 239.

   c. **Install all storage drives into the storage cage.**

See “Install an HDD or SSD Storage Drive” on page 82.

d. Return the server to the normal rack position.

See “Return the Server to the Normal Rack Position” on page 241.

e. Reconnect the power cords to the power supplies, and power on the server.

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Note - IMPORTANT: When the disk backplane is replaced, the key identity properties (KIP) of the disk backplane is programmed by Oracle ILOM to contain the same KIP as the other quorum member components. If you have removed other quorum member components, you might need to manually program the product serial number (PSN) into the new disk backplane. For more information, refer to “FRU Key Identity Properties (KIP) Automated Update” on page 57.

Related Information

- “Remove the Storage Drive Backplane for Eight-Drive Systems” on page 157

▼ Remove the Storage Drive Backplane for Twelve-Drive Systems

1. Prepare the server for service.

a. Power off the server and disconnect the power cords from the power supplies.

See “Powering Down the Server” on page 59.

b. Extend the server into the maintenance position.

See “Extend the Server to the Maintenance Position” on page 66.

c. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.

See “Take Antistatic Measures” on page 68.

d. **Open the server fan assembly door, and remove the fan modules from the server.**

   See “Remove a Fan Module” on page 94.

e. **Remove the fan assembly door from the server.**

   See “Remove the Fan Assembly Door From the Server” on page 70.

2. **Pull each storage drive out far enough to disengage if from the disk backplane.**

   See “Remove an HDD or SSD Storage Drive” on page 77.

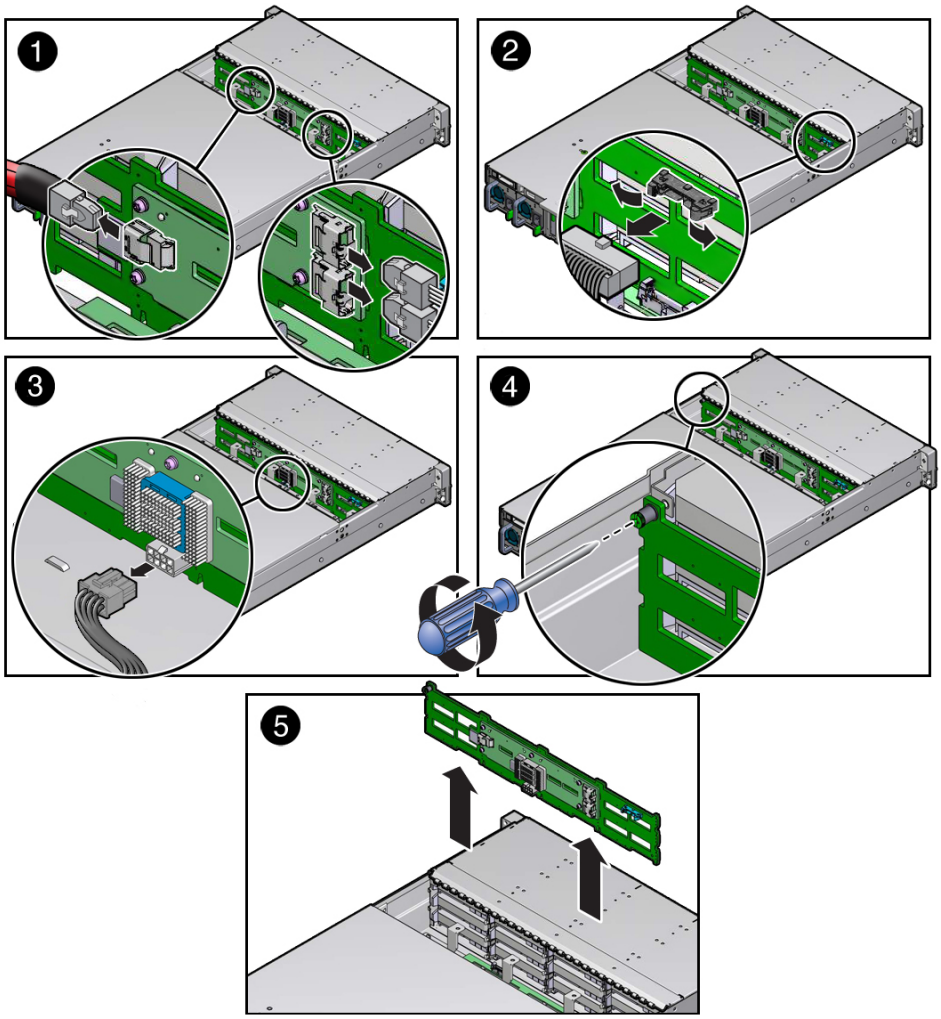
Note - It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the disk backplane. If you do remove the storage drives from the server, make a note of their locations so that you can reinstall them in the same locations.

---

3. **Disconnect the cables from the storage drive backplane.**

   a. **Disconnect the SAS cable from the storage drive backplane to the rear-mounted storage drives, and the two SAS cables from the storage drive backplane to the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [1].**

Note the cable connections in order to ease proper reconnection of the cables.



b. **Disconnect the auxiliary signal cable from the storage drive backplane [2].**

c. **Disconnect the power cable from the storage drive backplane [3].**

4. **Using a No. 2 Phillips screwdriver, loosen the right-side spring-mounted screw that secures the storage drive backplane to the chassis [4].**

5. **Lift the storage drive backplane up to release it from the standoff hooks and out of the chassis [5].**

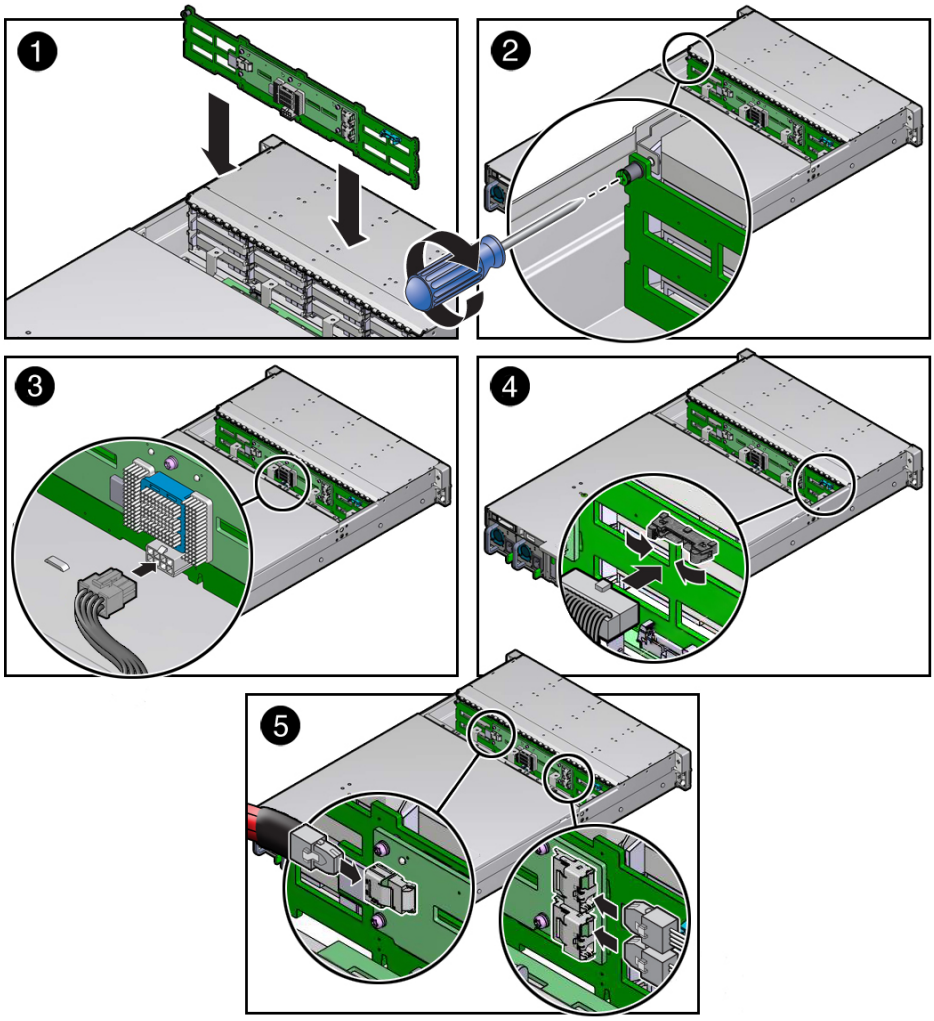
6. **Place the storage drive backplane on an antistatic mat.**

Related Information

- “Install the Storage Drive Backplane for Twelve-Drive Systems” on page 166

▼ Install the Storage Drive Backplane for Twelve-Drive Systems

1. **Lower the storage drive backplane into the server, and position it to engage the standoff hooks [1].**



2. **Using a No. 2 Phillips screwdriver, install and tighten the right-side spring-mounted screw to secure the storage drive backplane to the chassis [2].**

3. **Reconnect the cables to the storage drive backplane.**

   a. **Reconnect the power cable to the storage drive backplane [3].**

   Note - Cable part number 7086654 is required to connect power to the storage drive backplane.

   b. **Reconnect the auxiliary signal cable to the storage drive backplane [4].**

   Note - Cable part number 7079291 is required to connect the auxiliary signal to the storage drive backplane.

   c. **Reconnect the SAS cable to the storage drive backplane from the rear-mounted storage drives, and the two SAS cables to the storage drive backplane from the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [5].**

      To ensure proper SAS cable connections, see “Install SAS Storage Drive Cables” on page 180.

4. **Return the server to operation.**

   a. **Install the fan assembly door top cover.**

      See “Install the Fan Assembly Door” on page 238.

   b. **Install the fan modules and close the fan assembly door.**

      See “Install a Fan Module” on page 97.

   c. **Install all storage drives into the storage drive cage.**

      See “Install an HDD or SSD Storage Drive” on page 82.

   d. **Return the server to the normal rack position.**

      See “Return the Server to the Normal Rack Position” on page 241.

   e. **Reconnect the power cords to the power supplies, and power on the server.**

      See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Note - IMPORTANT: When the disk backplane is replaced, the key identity properties (KIP) of the disk backplane is programmed by Oracle ILOM to contain the same KIP as the other quorum member components. If you have removed other quorum member components, you might need to manually program the product serial number (PSN) into the new disk backplane. For more information, refer to "FRU Key Identity Properties (KIP) Automated Update" on page 57.

Related Information

- "Remove the Storage Drive Backplane for Twelve-Drive Systems" on page 162

▼ Remove the Storage Drive Backplane for Twenty-Four Drive Systems

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See "Powering Down the Server" on page 59.

   b. **Extend the server into the maintenance position.**

      See "Extend the Server to the Maintenance Position" on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See "Take Antistatic Measures" on page 68.

   d. **Open the server fan assembly door, and remove the fan modules from the server.**

      See "Remove a Fan Module" on page 94.

   e. **Remove the fan assembly door from the server.**

      See "Remove the Fan Assembly Door From the Server" on page 70.

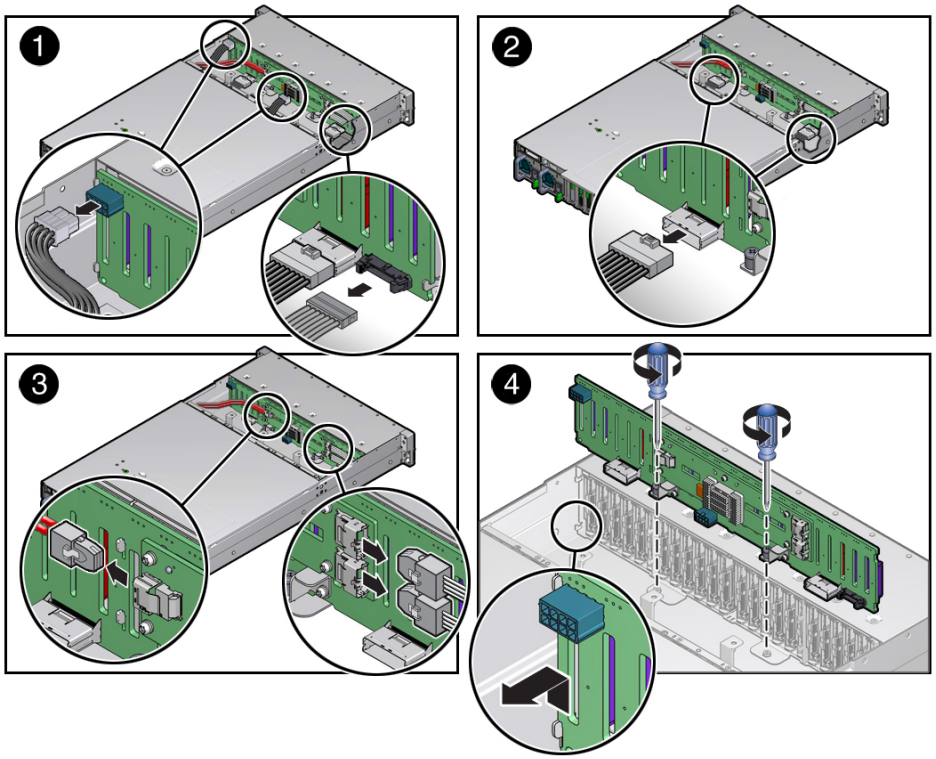
2. **Pull each storage drive out far enough to disengage it from the disk backplane.**

   See "Remove an HDD or SSD Storage Drive" on page 77.

Note - It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the disk backplane. If you do remove the storage drives from the server, make a note of their locations so that you can reinstall them in the same locations.

3. **Disconnect the cables from the storage drive backplane.**

   a. **Disconnect the two power cables and the auxiliary signal cable from the storage drive backplane [1].**



   b. **If present, disconnect the two optional NVMe cables from the storage drive backplane [2].**

c. **Disconnect the SAS cable from the storage drive backplane to the rear-mounted storage drives, and the two SAS cables from the storage drive backplane to the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [3].**

   Note the cable connections in order to ease proper reconnection of the cables.

4. **Using a No. 2 Phillips screwdriver, loosen the two spring-mounted screws that secure the storage drive backplane to the chassis [4].**

5. **Lift the storage drive backplane up to release it from the standoff hooks [4].**

6. **Pull the storage drive backplane away from the standoff hooks and out of the chassis.**

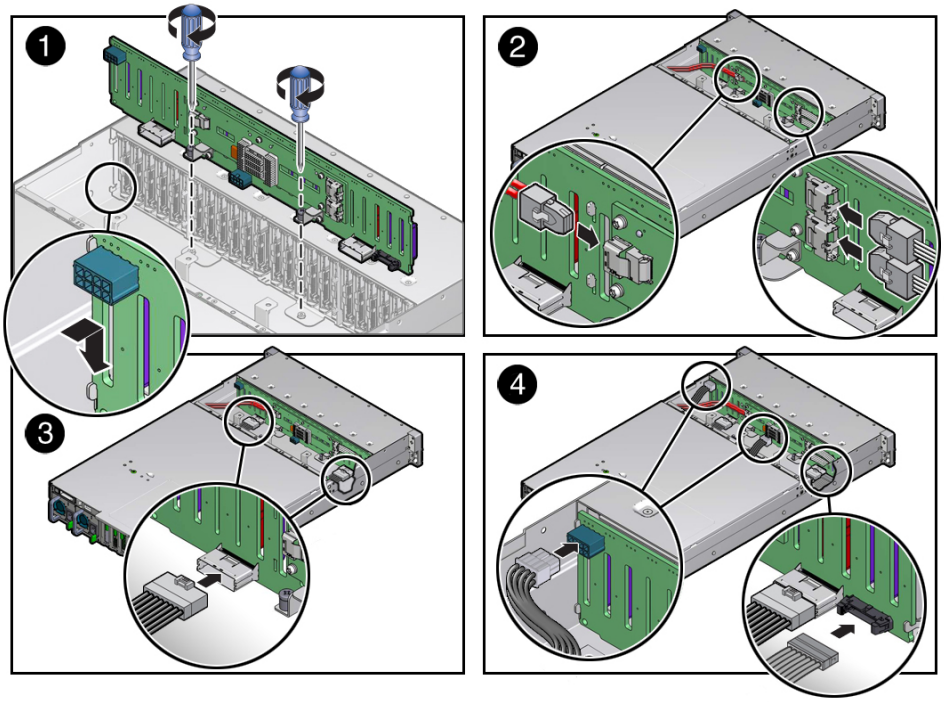
7. **Place the storage drive backplane on an antistatic mat.**

Related Information

- “Install the Storage Drive Backplane for Twenty-Four Drive Systems” on page 171

▼ Install the Storage Drive Backplane for Twenty-Four Drive Systems

1. **Lower the storage drive backplane into the server, and position it to engage the standoff hooks [1].**



2. **Using a No. 2 Phillips screwdriver, install and tighten the two spring-mounted screws to secure the storage drive backplane to the chassis [1].**

3. **Reconnect the cables to the storage drive backplane.**

   a. **Reconnect the SAS cable to the storage drive backplane from the rear-mounted storage drives, and the two SAS cables to the storage drive backplane from the Oracle Storage 12 Gb/s SAS PCIe RAID HBA [2].**

      To ensure proper SAS cable connections, see “Install SAS Storage Drive Cables” on page 180.

b. **If present, reconnect the two optional NVMe cables to the storage drive backplane [3].**

To ensure proper NVMe cable connections, see “Install NVMe Cables” on page 187.

c. **Reconnect the two power cables and the auxiliary signal cable to the storage drive backplane [4].**

Use the following cable part number table to ensure proper cable connections.

Cable Part Number	Description
7079291	Auxiliary signal cable
7064125	Power cable, right
7086654	Power cable, center

4. **Return the server to operation.**

a. **Install the fan assembly door top cover.**

See “Install the Fan Assembly Door” on page 238.

b. **Install the fan modules and close the fan assembly door.**

See “Install a Fan Module” on page 97.

c. **Install all storage drives into the storage drive cage.**

See “Install an HDD or SSD Storage Drive” on page 82.

d. **Return the server to the normal rack position.**

See “Return the Server to the Normal Rack Position” on page 241.

e. **Reconnect the power cords to the power supplies, and power on the server.**

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Note - IMPORTANT: When the disk backplane is replaced, the key identity properties (KIP) of the disk backplane is programmed by Oracle ILOM to contain the same KIP as the other quorum member components. If you have removed other quorum member components, you might need to manually program the product serial number (PSN) into the new disk backplane. For more information, refer to “FRU Key Identity Properties (KIP) Automated Update” on page 57.

Related Information

- “Remove the Storage Drive Backplane for Twenty-Four Drive Systems” on page 168

▼ Remove the Storage Drive Backplane for Rear-Mounted Storage Drives

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**
   See “Powering Down the Server” on page 59.

   b. **Extend the server into the maintenance position.**
   See “Extend the Server to the Maintenance Position” on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
   See “Take Antistatic Measures” on page 68.

   d. **Remove the server top cover.**
   See “Remove the Server Top Cover” on page 69.

   e. **Swivel the air baffle into the upright position to allow access to the storage drive backplane.**

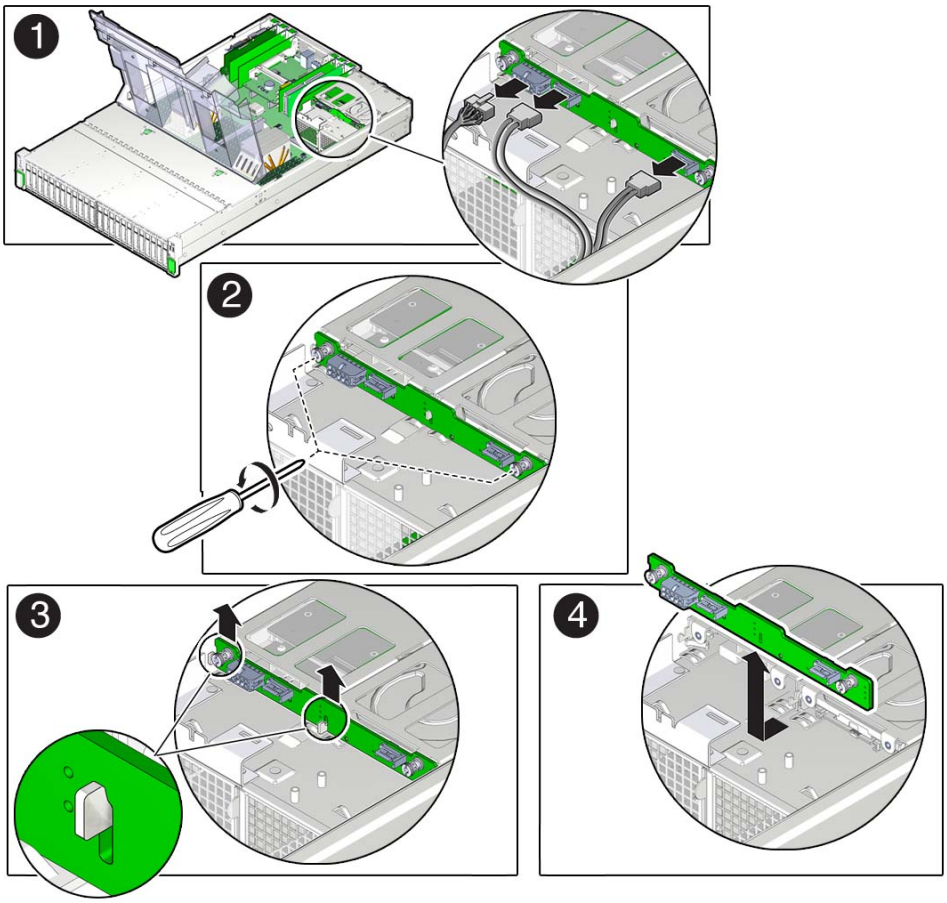
2. **Pull each rear-mounted storage drive out far enough to disengage if from the disk backplane.**
   See “Remove a Rear Storage Drive” on page 90.

   Note - It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the disk backplane. If you do remove the storage drives from the server, make a note of their locations so that you can reinstall them in the same locations.

3. **Disconnect the cables from the storage drive backplane [1].**

   a. **Disconnect the two SAS cables from the storage drive backplane.**

b. **Disconnect the power cable from the storage drive backplane.**



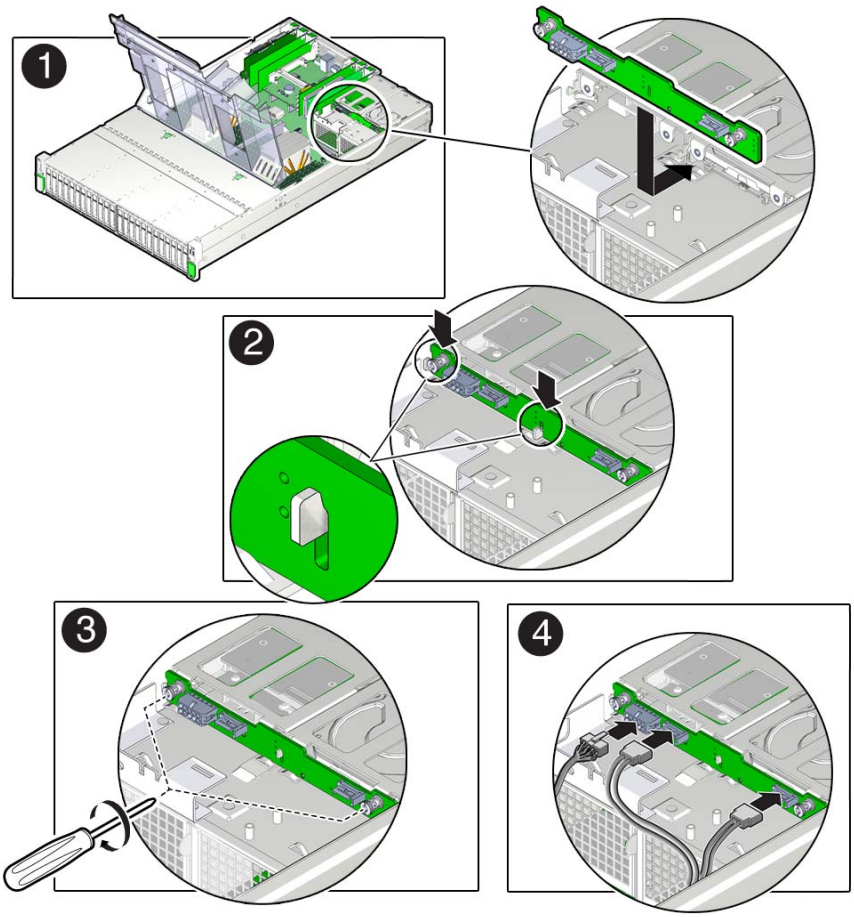
4. **Using a No. 2 Phillips screwdriver, loosen the two screws that secure the storage drive backplane to the storage drive cage [2].**
5. **Lift the storage drive backplane up to release it from the two standoff hooks [3].**
6. **Pull the storage drive backplane away from the standoff hooks and out of the chassis [4].**
7. **Place the storage drive backplane on an antistatic mat.**

Related Information

- “Install the Storage Drive Backplane for Rear-Mounted Storage Drives” on page 175

▼ Install the Storage Drive Backplane for Rear-Mounted Storage Drives

1. **Lower the storage drive backplane into the server, and position it to engage the two standoff hooks [1 and 2].**



2. **Using a No. 2 Phillips screwdriver, install and tighten the two screws to secure the storage drive backplane to the storage drive cage [3].**

3. **Reconnect the cables to the storage drive backplane [4].**

   a. **Reconnect the power cable to the storage drive backplane.**

   Note - Cable part number 530-4037-01 is required to connect power to the rear storage drive backplane.

   b. **Reconnect the two SAS cables to the storage drive backplane.**

      To ensure proper SAS cable connections, see “Install SAS Storage Drive Cables” on page 180.

4. **Return the server to operation.**

   a. **Lower the air baffle to the installed position.**

   b. **Install the server top cover.**

      See “Install the Server Top Cover” on page 236.

   c. **Install all storage drives into the storage drive cage.**

      See “Install a Rear Storage Drive” on page 92.

   d. **Return the server to the normal rack position.**

      See “Return the Server to the Normal Rack Position” on page 241.

   e. **Reconnect the power cords to the power supplies, and power on the server.**

      See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Remove the Storage Drive Backplane for Rear-Mounted Storage Drives” on page 173

Servicing SAS Cables (FRU)

Caution - SAS cables should be removed and replaced only by authorized Oracle Service personnel.

Caution - The system supplies power to the cables even when the server is powered off. To avoid personal injury or damage to the server, you must disconnect power cords before servicing the cables.

This section covers the following procedures:

- "Remove SAS Storage Drive Cables" on page 177
- "Install SAS Storage Drive Cables" on page 180

Related Information

- "Servicing Storage Drives and Rear Drives (CRU)" on page 75
- "Servicing the Front and Rear Storage Drive Backplanes (FRU)" on page 156
- "Servicing NVMe Cables (FRU)" on page 183

▼ Remove SAS Storage Drive Cables

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See "Powering Down the Server" on page 59.

   b. **Extend the server to the maintenance position.**

      See "Extend the Server to the Maintenance Position" on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See "Electrostatic Discharge Safety" on page 56.

   d. **Remove the server top cover.**

See “Remove the Server Top Cover” on page 69.

e. **Open the server fan assembly door and remove fan modules.**

See “Remove a Fan Module” on page 94.

f. **Swivel the air baffle into the upright position to allow access to the SAS storage drive cables.**

g. **Depending on your server's storage drive configuration, do one of the following:**

- **If your server is configured with twenty-four 2.5-inch storage drives or twelve 3.5-inch storage drives, remove the server's front fan assembly door cover.**

  See “Remove the Fan Assembly Door From the Server” on page 70.

- **If your server is configured with eight 2.5-inch storage drives, remove the server's disk cage cover.**

  See “Remove the Disk Cage Cover From the Server” on page 72.

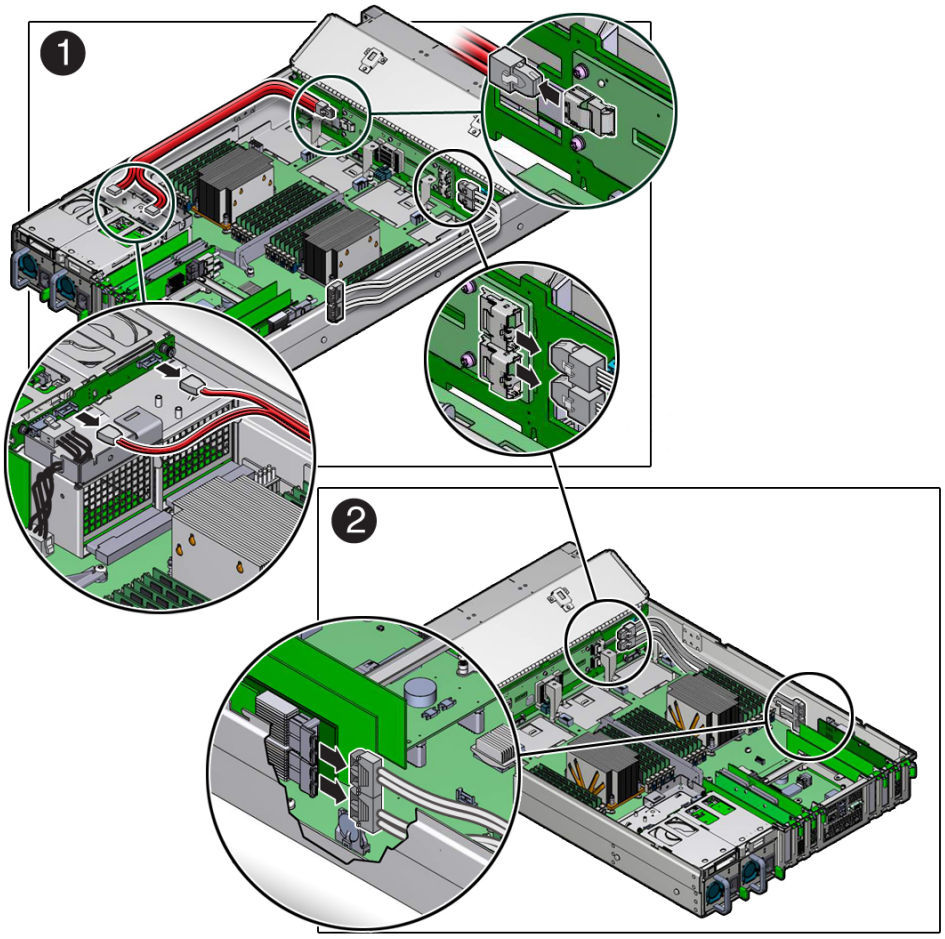
2. **Disconnect the SAS cables.**

a. **(Optional) To disconnect the SAS cables between the rear storage drive backplane and front storage drive backplane, press each latch, and then pull out to disengage the cable from each SAS connector [1].**

b. **To disconnect the SAS cables between the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card in PCIe slot 6 and the front storage drive backplane, press each latch, and then pull out to disengage the cable from each SAS connector [1 and 2].**

See also “Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 190.

Note - The following figure shows SAS cables being removed from the twenty-four drive system configuration. If you are removing SAS cables from an eight-drive system configuration, your front disk backplane SAS connector locations will be different. In addition, the chassis mid-wall is removed in the illustration to clearly show the SAS cable connections.



3. **Remove the SAS cables from the server.**

Note - (Optional) SAS cable connectors do not fit through the right-side chassis mid-wall. If you are removing SAS cables between the rear storage drive backplane and front storage drive backplane, you first must remove the chassis mid-wall. For instructions, see Step 11 in "Remove the Motherboard Assembly" on page 218.

Carefully remove the SAS cable bundles from the chassis mid-wall. Be careful not to snag the cables on the server components.

Related Information

- "Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card" on page 190
- "Install SAS Storage Drive Cables" on page 180

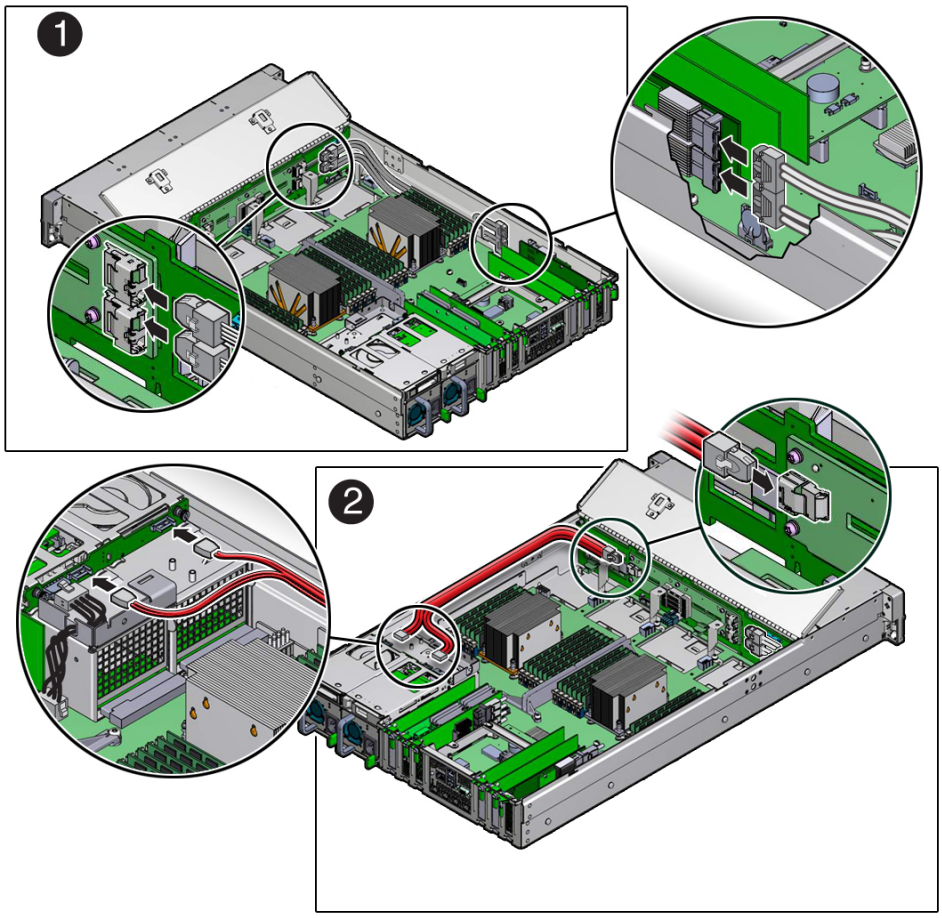
▼ Install SAS Storage Drive Cables

1. **Install SAS storage drive cables.**

   a. **Install the SAS cables between the front storage drive backplane and the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card in PCIe slot 6 [1].**

      Route the SAS cable bundle through the chassis mid-wall and along the left side of the chassis. To ensure that the SAS cable bundle does not interfere with the air baffle, install the SAS cable bundle under the super capacitor cable for the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card along the left side of the chassis.

Note - The following figure shows SAS cables being installed in the twenty-four drive system configuration. If you are installing SAS cables in an eight-drive system configuration, your front disk backplane SAS connector locations will be different. In addition, the chassis mid-wall is removed in the illustration to clearly show the SAS cable connections.



b. (Optional) Install the cables between the front storage drive backplane and the rear storage drive backplane [2].

Note - SAS cable connectors do not fit through the right-side chassis mid-wall. If you are installing SAS cables between the rear storage drive backplane and front storage drive backplane, you first must remove the chassis mid-wall. For instructions, see Step 3 in "Install the Motherboard Assembly" on page 228.

Route the SAS cable bundle through the chassis mid-wall and along the right side of the chassis.

2. **Reconnect the SAS cables.**

   a. **To reconnect the SAS cables between the front storage drive backplane and the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card, plug each cable into its SAS connector until you hear an audible click [1].**

   See also "Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card" on page 193.

   Use the following table to ensure proper SAS cable connections:

System Disk Configuration	Disk Backplane Ports	HBA Port	Cable Part Number
Eight storage drives	Shorter length cable for drives 0-3	J5A1	7076125
Eight storage drives	Longer length cable for drives 4-7	J5A1	7076125
Twelve storage drives	J302 (Upper)	J5A1	7091185
Twelve storage drives	J301 (Lower)	J5A1	7091185
Twenty-four storage drives	J3202 (Upper)	J5A1	7091185
Twenty-four storage drives	J3201 (Lower)	J5A1	7091185

   b. **(Optional) To reconnect the SAS cables between the front storage drive backplane and the rear storage drive backplane, plug each cable into its SAS connector until you hear an audible click [2].**

   In twelve and twenty-four drive systems, attach the SAS cable to connector (J300) on the front storage drive backplane and to SAS connectors (RHDD0 and RHDD1) on the rear storage drive backplane.

Note - Cable part number 7064129 is required for SAS connections between the front storage drive backplane and rear storage drive backplane.

3. **Return the server to operation.**

a. **Depending on your server's storage drive configuration, do one of the following:**

   - **If your server is configured with twenty-four 2.5-inch storage drives or twelve 3.5-inch storage drives, install the server's front fan assembly door cover.**
     See “Install the Fan Assembly Door” on page 238.

   - **If your server is configured with eight 2.5-inch storage drives, install the server's disk cage cover.**
     See “Install the Disk Cage Cover” on page 239.

b. **Lower the air baffle to the installed position.**

c. **Install the fan modules and close the fan assembly door.**
   See “Install a Fan Module” on page 97.

d. **Install the server top cover.**
   See “Install the Server Top Cover” on page 236.

e. **Return the server to the normal rack position.**
   See “Return the Server to the Normal Rack Position” on page 241.

f. **Reconnect the power cords to the power supplies, and power on the server.**
   See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 193
- “Remove SAS Storage Drive Cables” on page 177

Servicing NVMe Cables (FRU)



Caution - NVMe cables should be removed and replaced only by authorized Oracle Service personnel.



Caution - The system supplies power to the cables even when the server is powered off. To avoid personal injury or damage to the server, you must disconnect power cords before servicing the cables.

This section covers the following procedures:

- "Remove NVMe Cables" on page 184
- "Install NVMe Cables" on page 187

Related Information

- "Servicing Storage Drives and Rear Drives (CRU)" on page 75
- "Servicing the Front and Rear Storage Drive Backplanes (FRU)" on page 156
- "Servicing SAS Cables (FRU)" on page 177

▼ Remove NVMe Cables

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See "Powering Down the Server" on page 59.

   b. **Extend the server to the maintenance position.**

      See "Extend the Server to the Maintenance Position" on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See "Electrostatic Discharge Safety" on page 56.

   d. **Remove the server top cover.**

      See "Remove the Server Top Cover" on page 69.

   e. **Open the server fan assembly door and remove the fan modules.**

      See "Remove a Fan Module" on page 94.

f. **Swivel the air baffle into the upright position to allow access to the NVMe cables.**

g. **Depending on your server's storage drive configuration, do one of the following:**

- **If your server is configured with twenty-four 2.5-inch storage drives, remove the server's front fan assembly door cover.**

  See “Remove the Fan Assembly Door From the Server” on page 70.

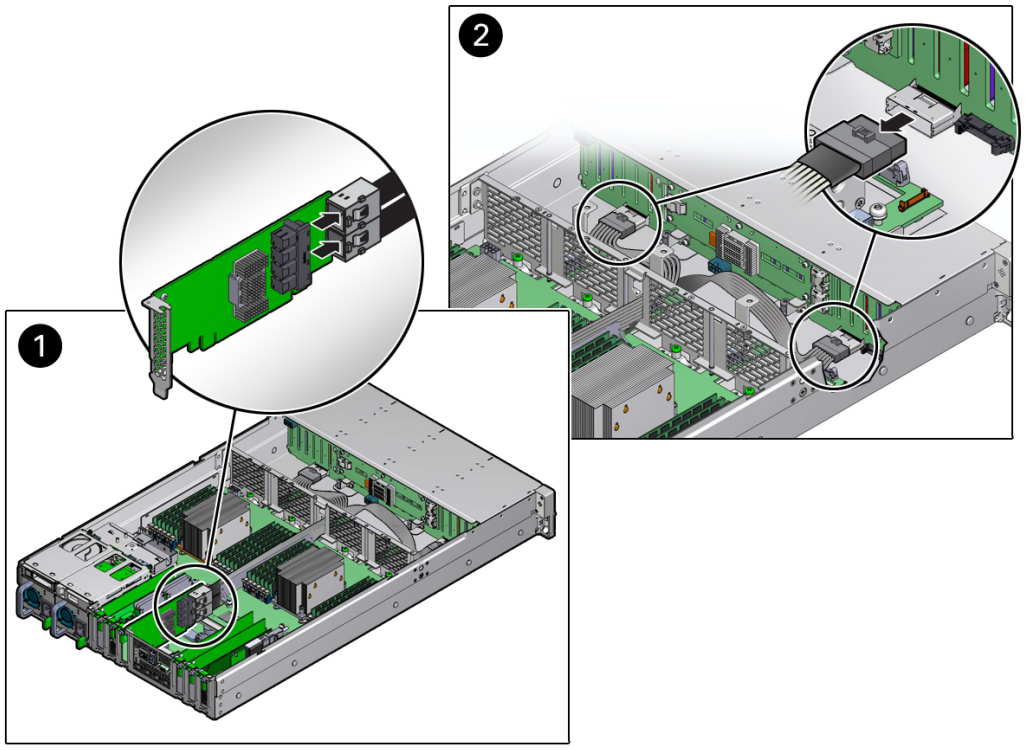
- **If your server is configured with eight 2.5-inch storage drives, remove the server's disk cage cover.**

  See “Remove the Disk Cage Cover From the Server” on page 72.

2. **Disconnect the NVMe cables from the Oracle PCIe NVMe switch card in slot 3 [1].**

   Press each latch, and then pull out to disengage the cable from each connector. See also “Remove a PCIe Card” on page 122.

Note - The following figure shows NVMe cables being removed from the twenty-four drive system configuration. If you are removing NVMe cables from an eight-drive system configuration, your front disk backplane NVMe connector locations will be different.



3. **Disconnect the NVMe cables from the front storage drive backplane [2].**

   Press each latch, and then pull out to disengage the cable from each connector.

4. **Remove the NVMe cables from the server.**

   Carefully remove the NVMe cable bundle from the chassis mid-wall. Be careful not to snag the cables on the server components.

Related Information

- “Install NVMe Cables” on page 187

Install NVMe Cables

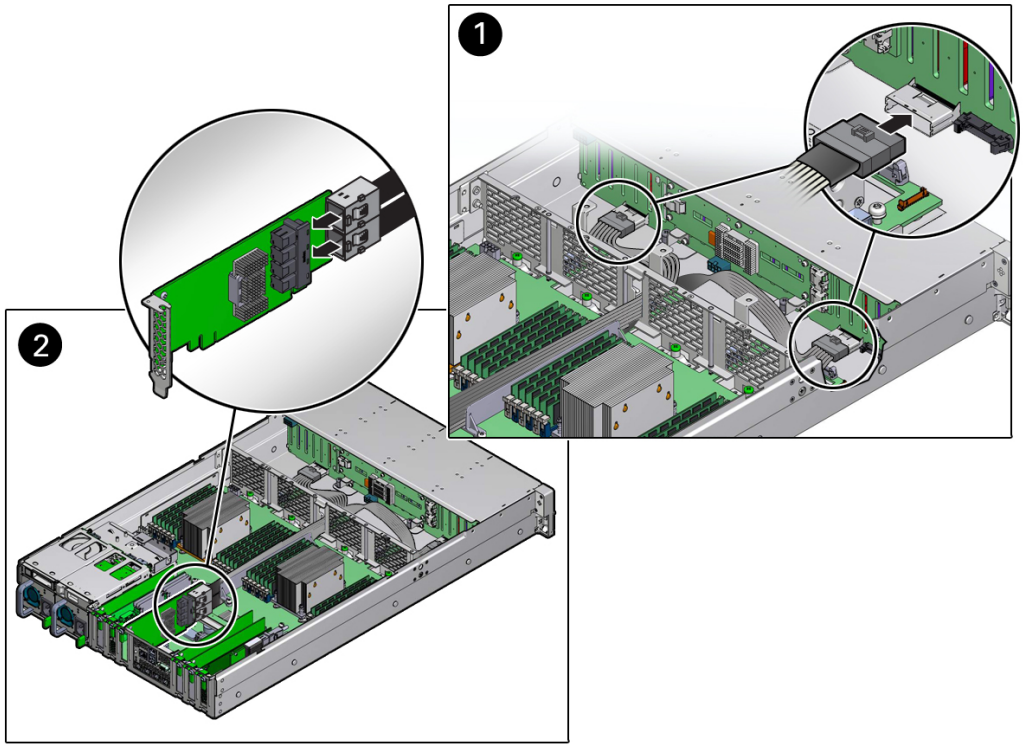
1. **Install the NVMe cables between the front storage drive backplane and the Oracle PCIe NVMe switch card in PCIe slot 3.**

   Route the NVMe cable bundle through the chassis mid-wall and via the cable trough between the fan modules and processors.

2. **Reconnect the NVMe cables to the front storage drive backplane [1].**

   Plug each cable into its connector until you hear an audible click.

   Note - The following figure shows NVMe cables being installed in the twenty-four drive system configuration. If you are installing NVMe cables in an eight-drive system configuration, your front disk backplane NVMe connector locations will be different.



3. **Reconnect the NVMe cables to the Oracle PCIe NVMe switch card in slot 3 [2].**

Plug each cable into its connector until you hear an audible click. See also “Install a PCIe Card” on page 125.

Use the following table to ensure proper NVMe cable connections.

Note - Each NVMe cable contains a matching label that corresponds to the port on the Oracle PCIe NVMe switch card. For example, the NVMe cable labeled 0,1 plugs into Oracle PCIe NVMe switch card port 0,1, and the cable labeled 2,3 plugs into Oracle PCIe NVMe switch card port 2,3.

System Disk Configuration	Disk Backplane Cable Connector	Oracle PCIe NVMe Switch Card Port Cable Connector	Cable Part Number
Eight storage drive	A	2,3	7089783
Eight storage drive	B	0,1	7089783
Twenty-four storage drives	A	2,3	7089784
Twenty-four storage drives	B	0,1	7089784

4. **Return the server to operation.**

   a. **Depending on your server's storage drive configuration, do one of the following:**

   - **If your server is configured with twenty-four 2.5-inch storage drives, install the server's front fan assembly door cover.**

     See “Install the Fan Assembly Door” on page 238.

   - **If your server is configured with eight 2.5-inch storage drives, install the server's disk cage cover.**

     See “Install the Disk Cage Cover” on page 239.

   b. **Lower the air baffle to the installed position.**

   c. **Install the fan modules and close the fan assembly door.**

      See “Install a Fan Module” on page 97.

   d. **Install the server top cover.**

      See “Install the Server Top Cover” on page 236.

e. **Return the server to the normal rack position.**
See “Return the Server to the Normal Rack Position” on page 241.

f. **Reconnect the power cords to the power supplies, and power on the server.**
See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Remove NVMe Cables” on page 184

Servicing the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card (FRU)

These sections describe how to service and install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card.



Caution - The Oracle Storage 12 Gb/s SAS PCIe RAID HBA card should be removed and replaced only by authorized Oracle Service personnel.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in “Take Antistatic Measures” on page 68.



Caution - Ensure that all power is removed from the server before removing or installing PCIe cards. You must disconnect all power cables from the system before performing these procedures.

This section covers the following procedures:

- “Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 190
- “Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 193

Related Information

- “Servicing SAS Cables (FRU)” on page 177

▼ Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Extend the server to the maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   c. **Attach an antistatic wrist strap.**

      See “Electrostatic Discharge Safety” on page 56.

   d. **Remove the server top cover.**

      See “Remove the Server Top Cover” on page 69.

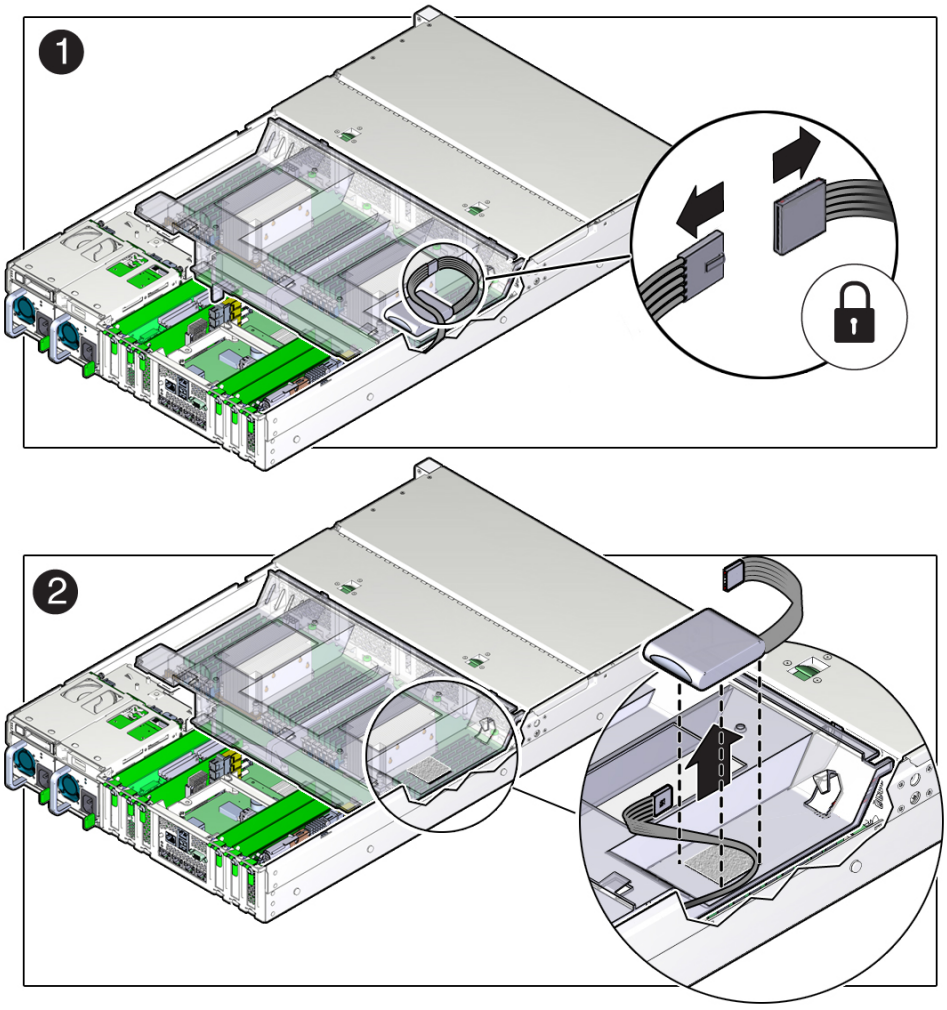
2. **Remove the super capacitor from the chassis.**

   a. **Grasp both ends of the cable connector, press in on the release latch, and then unplug the connector [1].**

      The HBA super capacitor is secured to the air baffle by a recloseable fastener, which allows it to be easily removed and replaced.

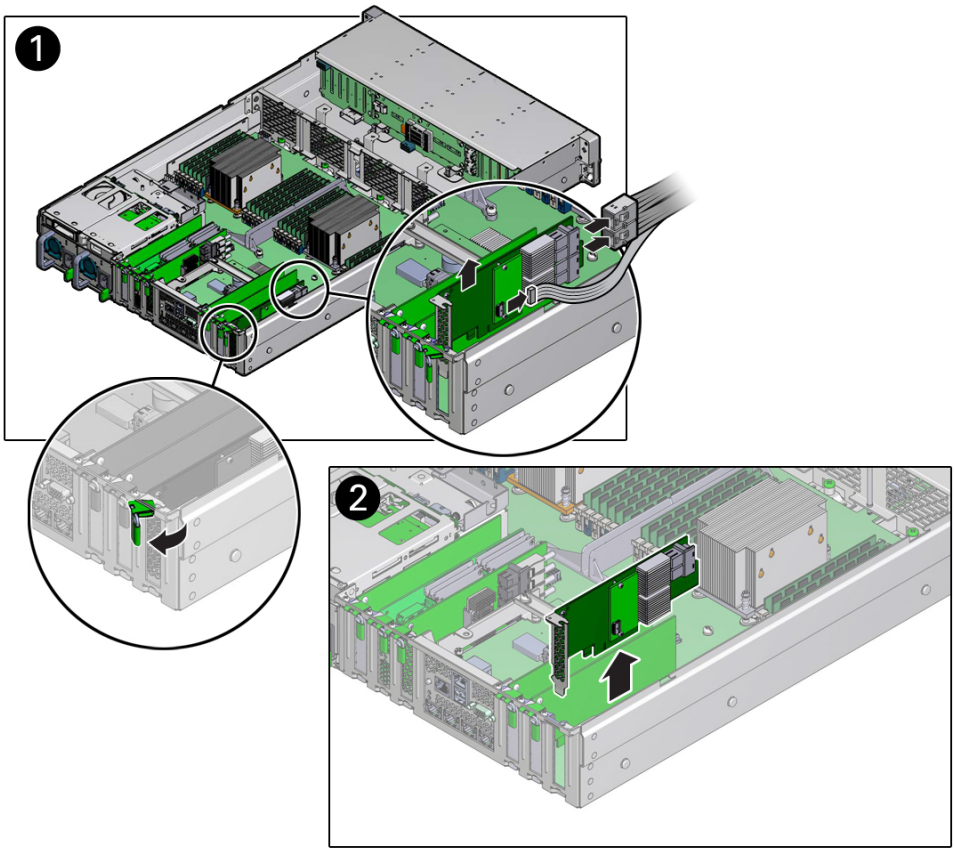
   b. **To separate the HBA super capacitor from the air baffle, place your finger under the rear of the super capacitor and lift up [2].**

Place the super capacitor on an antistatic mat.



3. **Swivel the air baffle into the upright position to allow access to the super capacitor cable and the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card.**

4. **Rotate the PCIe card locking mechanism, and then lift up on the PCIe HBA card to disengage it from the motherboard connectors [1].**



5. **Disconnect the super capacitor cable and the SAS cables from the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card [1].**

   See also "Remove SAS Storage Drive Cables" on page 177.

6. **Lift and remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and super capacitor cable from the chassis [2].**

7. **Place the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and super capacitor cable on an antistatic mat.**

Related Information

- “Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 193

▼ Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card

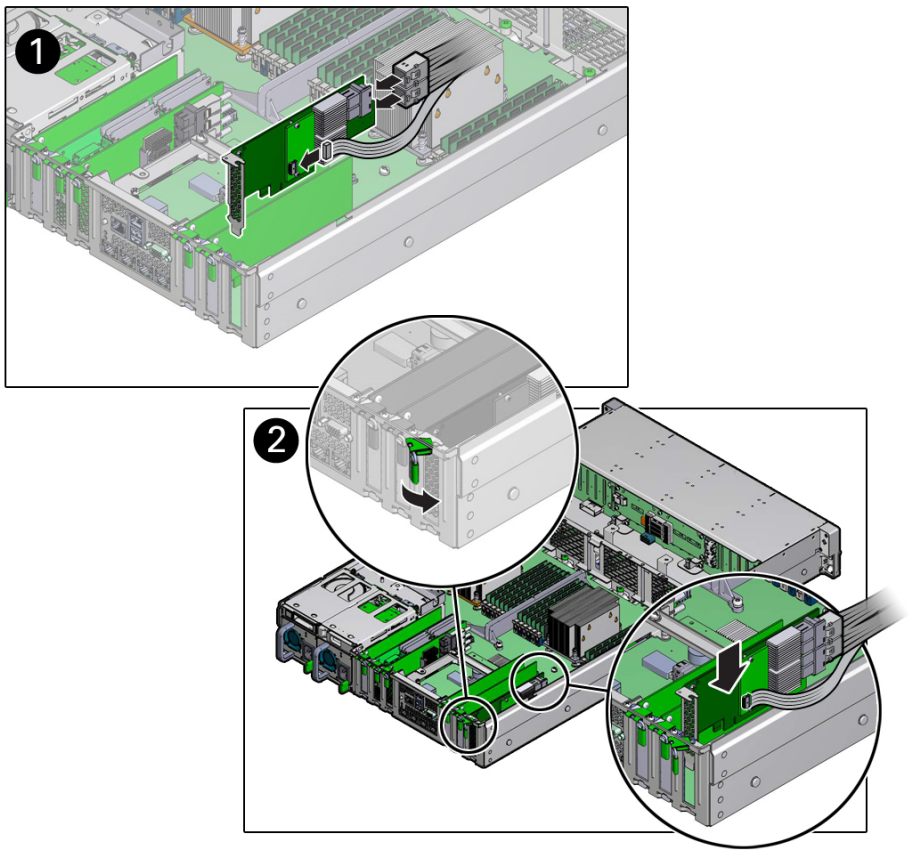
1. **Unpack the replacement Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and super capacitor, and place them on an antistatic mat.**

2. **Swivel the air baffle into the upright position and install the super capacitor cable along the left sidewall of the chassis.**

   Install the super capacitor cable on top of the SAS cable bundle along the left sidewall of the chassis. Otherwise, the SAS cable bundle will interfere with the air baffle.

3. **Connect the super capacitor cable to the Oracle Storage 12 Gb/s SAS PCIe RAID HBA, and then reconnect the SAS cables that you unplugged during the removal procedure [1].**

To ensure proper SAS cable connections, see "Install SAS Storage Drive Cables" on page 180.



4. **Insert the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card into PCIe slot 6, and rotate the PCIe locking mechanism to secure the PCIe HBA card in place [2].**

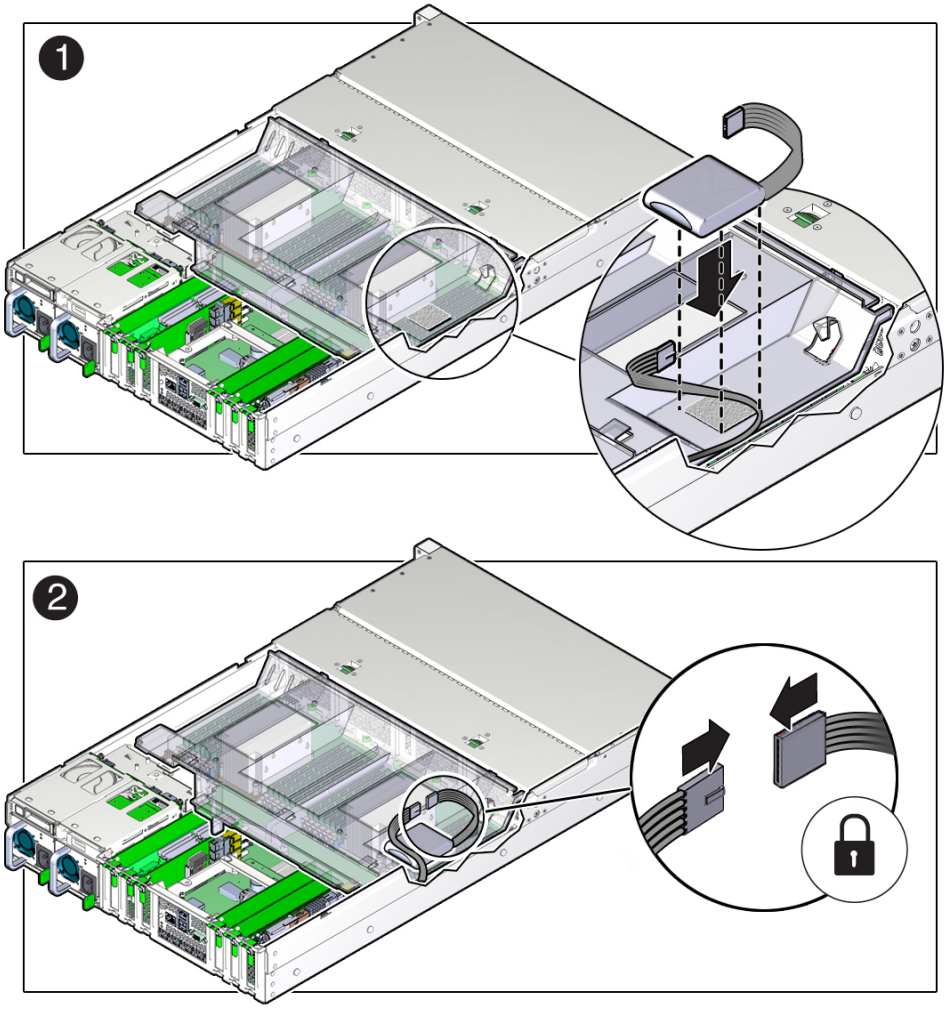
Note - PCIe slot 6 is the primary slot for the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card. The card is required for controlling and managing the SAS storage drives.

5. **Install the super capacitor in the chassis.**

   a. **Lower the air baffle to the installed position.**

b. **Apply a recloseable fastener to the underside of the super capacitor.**

c. **Align the recloseable fastener on the super capacitor with the recloseable fastener on the air baffle and press down [1].**



d. **Connect the super capacitor's cable [2].**

6. **Return the server to operation.**

   a. **Install the top cover.**

      See “Install the Server Top Cover” on page 236.

   b. **Return the server to the normal rack position.**

      See “Return the Server to the Normal Rack Position” on page 241.

   c. **Connect any required data cables to the PCIe card.**

      Route data cables through the cable management arm.

   d. **Reconnect the power cords to the power supplies and power on the server.**

      See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

7. **Use Oracle ILOM to clear any server PCIe card faults.**

   You can use the Oracle ILOM web interface or the command-line interface (CLI) to manually clear faults. For information on how to use the Oracle ILOM web interface or the CLI to clear server faults, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Related Information

- “Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 190

Servicing the DVD Drive (FRU)

The DVD drive is available only on eight-drive systems. The DVD drive is accessible from the chassis front panel and by removing the disk cage cover.



Caution - The DVD drive should be removed and replaced only by authorized Oracle Service personnel.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in “Take Antistatic Measures” on page 68.



Caution - Ensure that all power is removed from the server before removing or installing the DVD drive or damage to the drive might occur. You must disconnect all power cables from the system before performing these procedures.

This section covers the following procedures:

- "Remove the DVD Drive" on page 197
- "Install the DVD Drive" on page 199

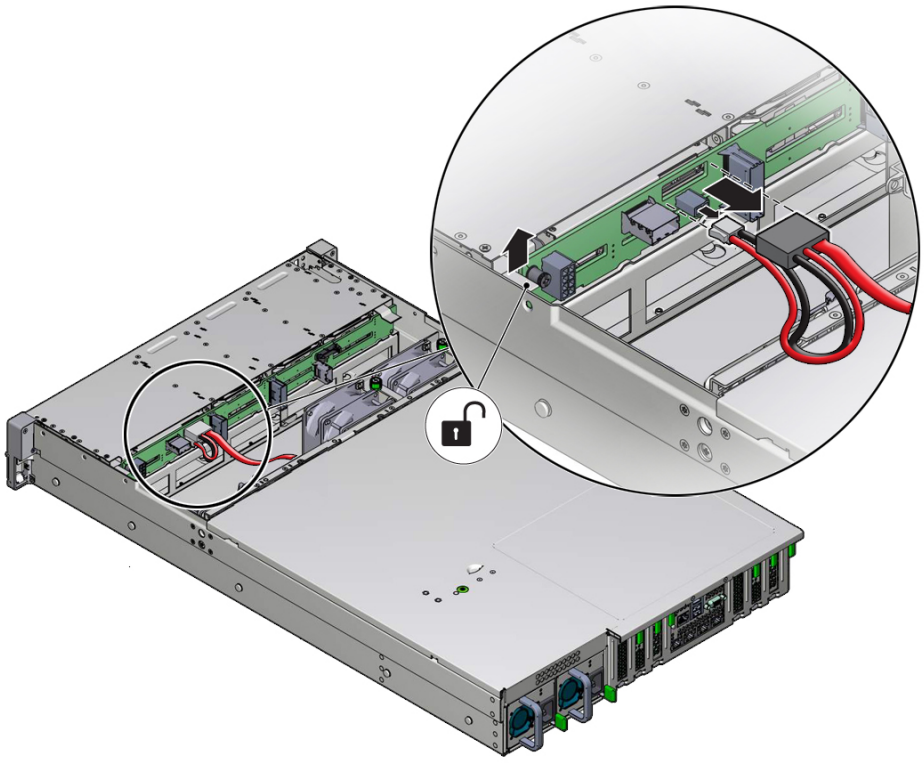
Related Information

- "Servicing Fan Modules (CRU)" on page 93

▼ Remove the DVD Drive

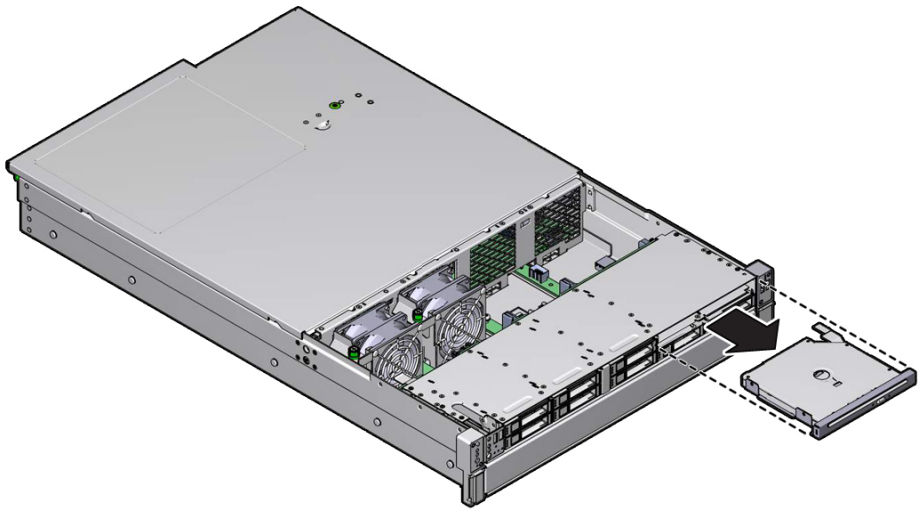
1. **Remove media from the drive.**
2. **Prepare the server for service.**
   a. **Power off the server and disconnect the power cords from the server power supplies.**
      See "Powering Down the Server" on page 59.
   b. **Extend the server into the maintenance position.**
      See "Extend the Server to the Maintenance Position" on page 66.
   c. **Attach an antistatic wrist strap.**
      See "Electrostatic Discharge Safety" on page 56.
   d. **Remove the disk cage cover.**
      See "Remove the Disk Cage Cover From the Server" on page 72.
3. **If necessary, remove fan modules 2 and 3 from the chassis.**
   See "Remove a Fan Module" on page 94.

4. **Reach into the server directly behind the DVD drive, and disconnect the power and DVD data connectors from rear of the DVD drive.**



5. **Lift up on the release tab on the rear of the DVD drive to disengage the drive from chassis.**

6. **Gently push the DVD forward and out of the front of the chassis.**



7. **Standing in front of the chassis, grasp the DVD drive with both hands, and continue to pull the DVD drive from the chassis until it clears the front of the server.**

8. **Place the DVD drive on an antistatic mat.**

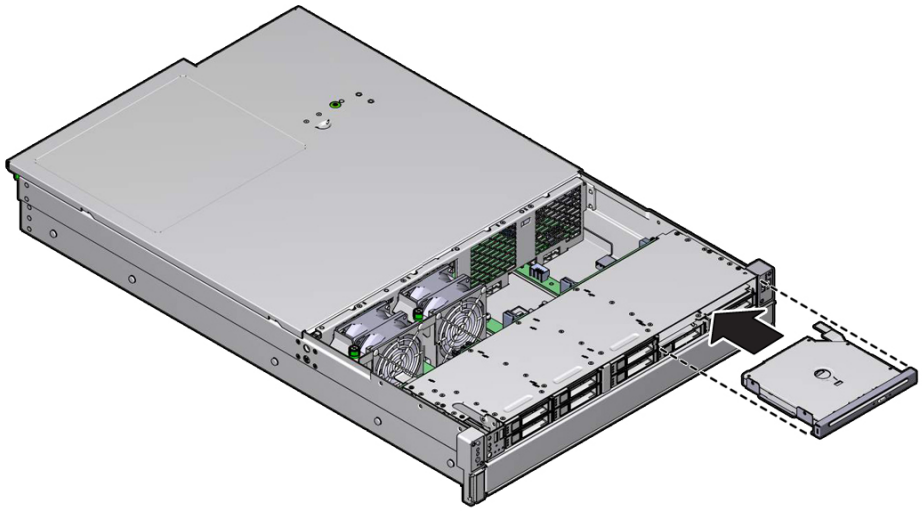
Related Information

- “Install the DVD Drive” on page 199

▼ Install the DVD Drive

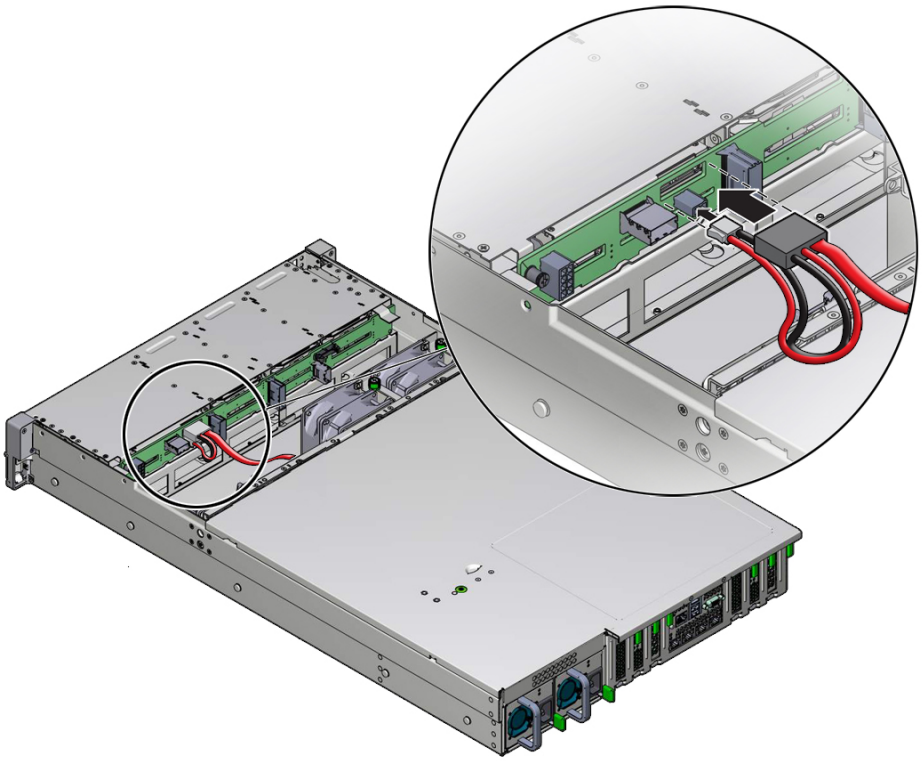
1. **Gently push the replacement DVD drive into the chassis [1].**

2. **Continue to push the DVD drive into the chassis until the release tab on the rear of the drive engages the chassis with an audible click.**



3. **Reach into the server directly behind the DVD drive, and reconnect the power and DVD data connectors to the rear of the DVD drive.**

Note - Cable part number 7064128 is required to connect power and DVD data to the front storage drive backplane.



4. **If removed, reinstall fan modules 2 and 3 in the chassis.**

   See “Install a Fan Module” on page 97.

5. **Install the disk cage cover, and close the fan assembly door.**

   See “Install the Disk Cage Cover” on page 239.

6. **Return the server to operation.**

   a. **Return the server to the normal rack position.**

      See “Return the Server to the Normal Rack Position” on page 241.

b. Reconnect the power cords to the server power supplies, and power on the server.

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Remove the DVD Drive” on page 197

Servicing the Front LED/USB Indicator Modules (FRU)



Caution - The front LED/USB indicator modules should be removed and replaced only by authorized Oracle Service personnel.



Caution - Ensure that all power is removed from the server before removing or installing a front LED/USB indicator module. You must disconnect the power cables before performing this procedure.

This section covers the following procedures:

- “Remove the Left LED Indicator Module” on page 202
- “Install the Left LED Indicator Module” on page 206
- “Remove the Right LED/USB Indicator Module” on page 210
- “Install the Right LED/USB Indicator Module” on page 214

Related Information

- “Troubleshooting Using the Server Front and Rear Panel Status Indicators” on page 32

▼ Remove the Left LED Indicator Module

1. Prepare the server for service.

a. Power off the server and disconnect the power cords from the power supplies.

See “Powering Down the Server” on page 59.

b. **Extend the server into the maintenance position.**

See “Extend the Server to the Maintenance Position” on page 66.

c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

See “Take Antistatic Measures” on page 68.

d. **Remove the server top cover.**

See “Remove the Server Top Cover” on page 69.

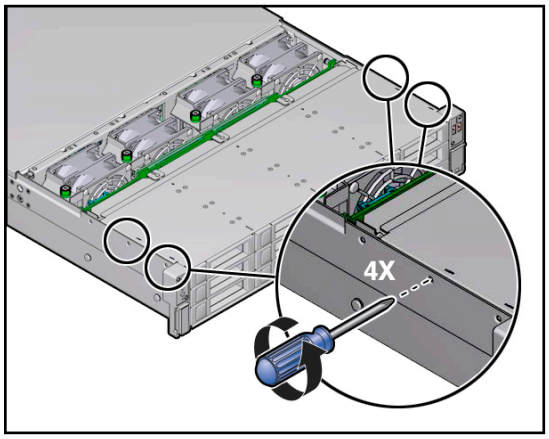
2. **Depending on your server's storage drive configuration, do one of the following:**

- **If your server is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, perform the following procedures.**

a. **Remove the server fan assembly door.**

See “Remove the Fan Assembly Door From the Server” on page 70.

b. **Remove the four remaining No. 2 Phillips screws (two on each side of the chassis) that secure the disk cage assembly to the server chassis.**



- **If your server is configured with eight 2.5-inch storage drives, remove the server disk cage cover.**

  See “Remove the Disk Cage Cover From the Server” on page 72.

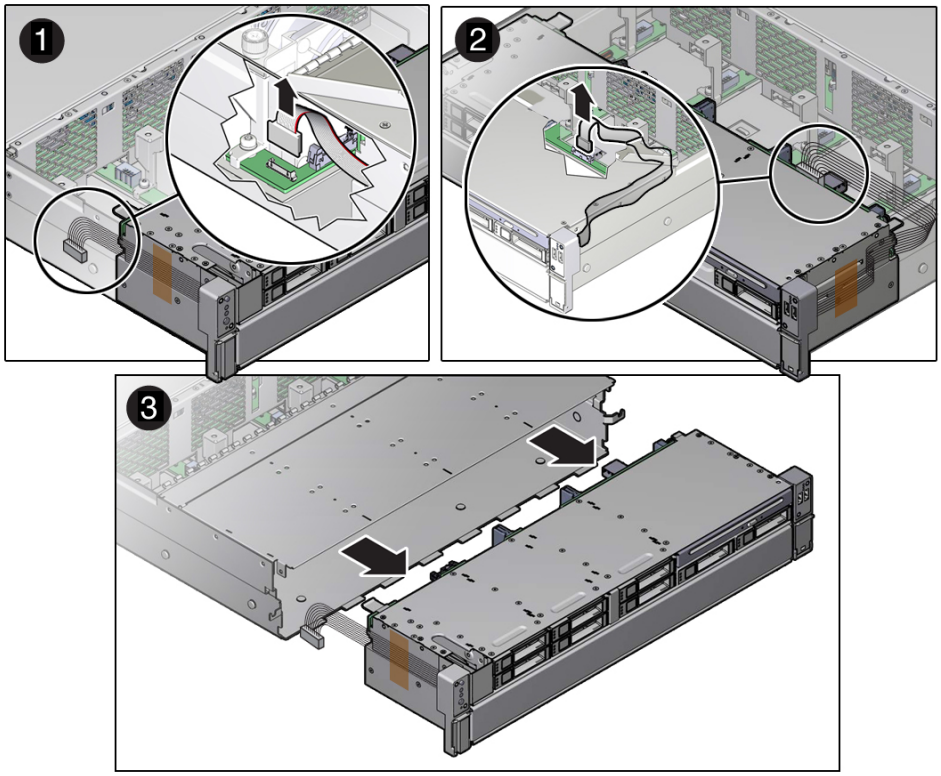
3. **Remove the fan modules from the server.**

   See “Remove a Fan Module” on page 94.

4. **Disconnect all cables from the front storage drive backplane.**

   See the procedures for your storage drive configuration in “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

5. **Disconnect the left LED indicator module cable and the right LED/USB indicator module cable from the motherboard [1 and 2].**



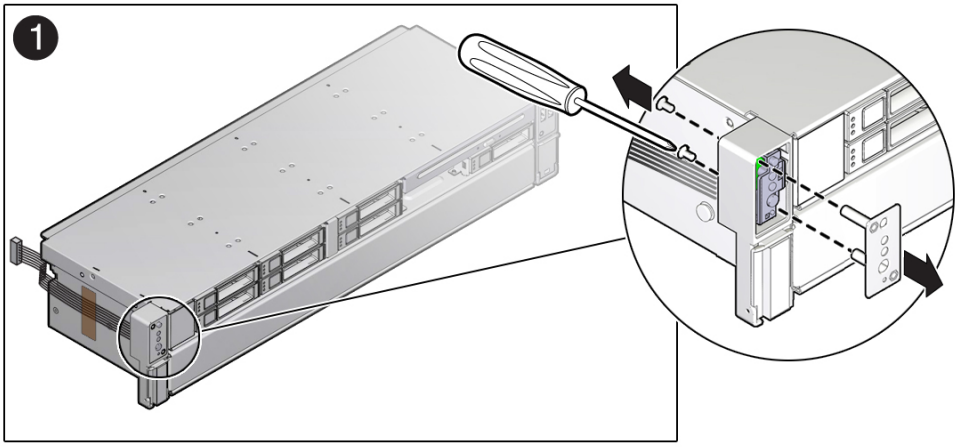
6. **Slide the disk cage assembly forward, and then gently lift the disk cage assembly from the chassis [3].**

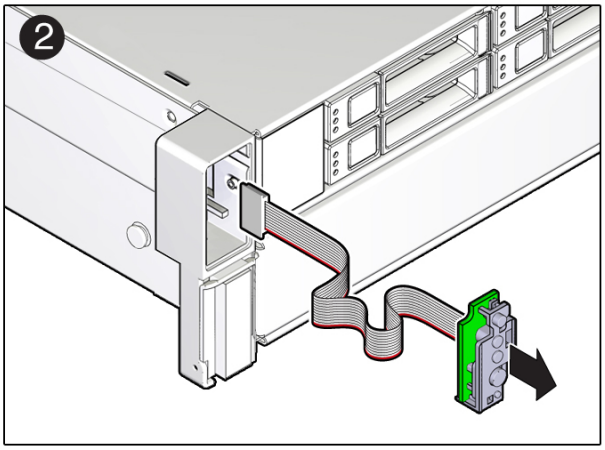
   Set the disk cage assembly on an anti-static mat.

7. **Remove the left LED indicator module.**

   a. **Remove the two No. 2 Phillips screws that secure the LED indicator module to the server front panel [1].**

      If present, remove the capping tape that secures the cable to the side of the disk cage assembly.





b. **Remove the LED indicator module from the server front panel [2].**

Related Information

- “Server System-Level Status Indicators” on page 33
- “Install the Left LED Indicator Module” on page 206

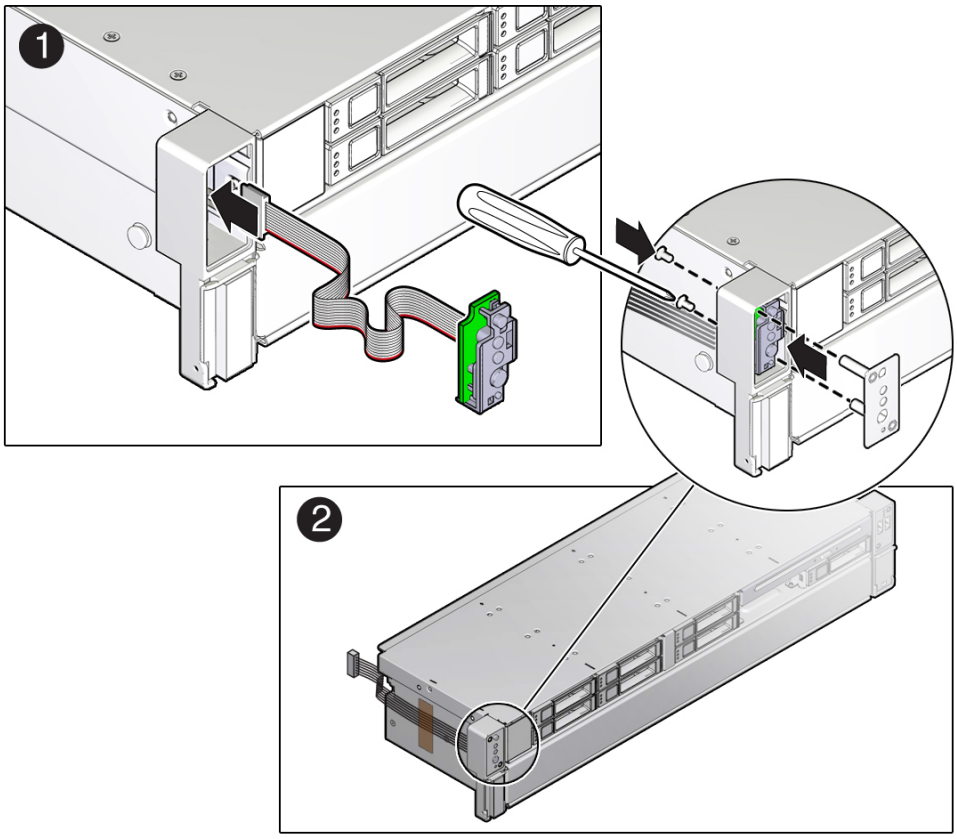
▼ Install the Left LED Indicator Module

1. **Install the left LED indicator module.**

   a. **Push the LED indicator module and cable through the left LED housing on the server front panel [1].**

      If necessary, use a piece of capping tape to secure the cable to the side of the disk cage assembly.

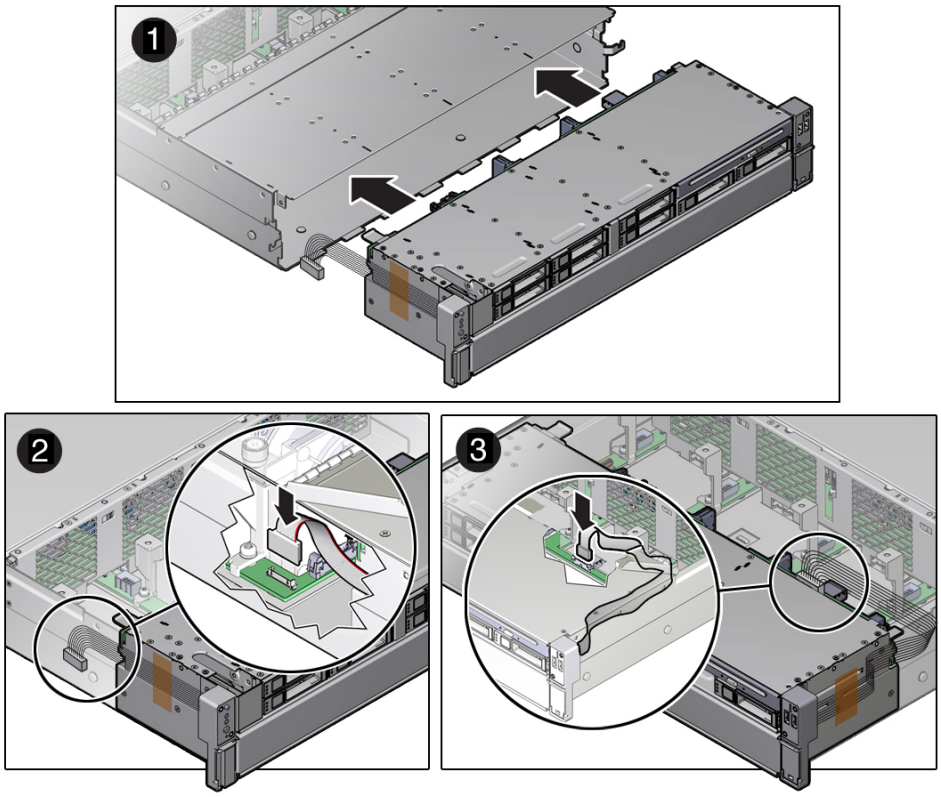
Note - Cable part number 7064122 is required for the left LED indicator module.



b. **Insert and tighten the two No. 2 Phillips screws to secure the LED indicator module to the server front panel [2].**

2. **Gently lift the disk cage assembly and set it into the server chassis [1].**

Slightly push the disk cage assembly into the server chassis to ensure that the disk cage screw holes are correctly aligned with the server chassis.



3. **Reconnect the left LED indicator module cable and the right LED/USB indicator module cable to the motherboard [2 and 3].**

4. **Reconnect all cables to the front storage drive backplane.**

   See the procedures for your storage drive configuration in “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

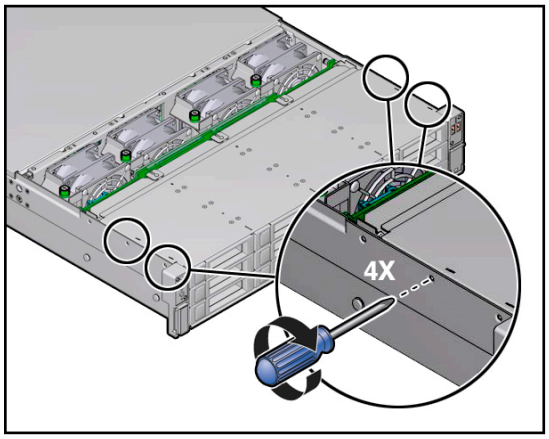
5. **Install the fan modules in the server.**

   See “Install a Fan Module” on page 97.

6. **Depending on your server's storage drive configuration, do one of the following:**

- **If your server is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, perform the following procedures.**

  a. **Install the four No. 2 Phillips screws (two on each side of the chassis) that secure the disk cage assembly to the server chassis.**



  b. **Install the server fan assembly door.**

  See “Install the Fan Assembly Door” on page 238.

- **If your server is configured with eight 2.5-inch storage drives, install the server disk cage cover.**

  See “Install the Disk Cage Cover” on page 239.

7. **Return the server to operation.**

  a. **Install the server top cover.**

  See “Install the Server Top Cover” on page 236.

  b. **Return the server to the normal rack position.**

  See “Return the Server to the Normal Rack Position” on page 241.

  c. **Reconnect the power cords to the power supplies, and power on the server.**

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Server System-Level Status Indicators” on page 33
- “Remove the Left LED Indicator Module” on page 202

▼ Remove the Right LED/USB Indicator Module

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

      See “Powering Down the Server” on page 59.

   b. **Extend the server into the maintenance position.**

      See “Extend the Server to the Maintenance Position” on page 66.

   c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

      See “Take Antistatic Measures” on page 68.

   d. **Remove the server top cover.**

      See “Remove the Server Top Cover” on page 69.

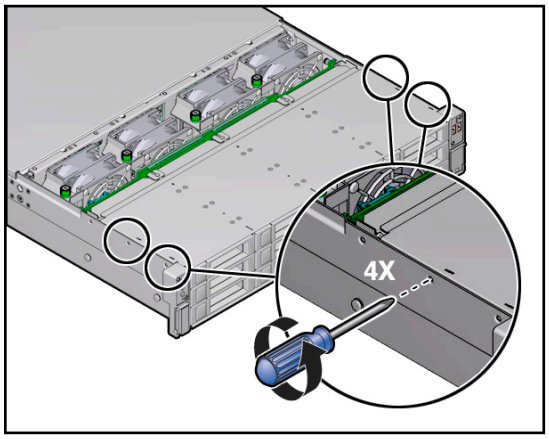
2. **Depending on your server's storage drive configuration, do one of the following:**

   - **If your server is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, perform the following procedures.**

     a. **Remove the server fan assembly door.**

        See “Remove the Fan Assembly Door From the Server” on page 70.

b. **Remove the four remaining No. 2 Phillips screws (two on each side of the chassis) that secure the disk cage assembly to the server chassis.**



- **If your server is configured with eight 2.5-inch storage drives, remove the server disk cage cover.**

  See “Remove the Disk Cage Cover From the Server” on page 72.

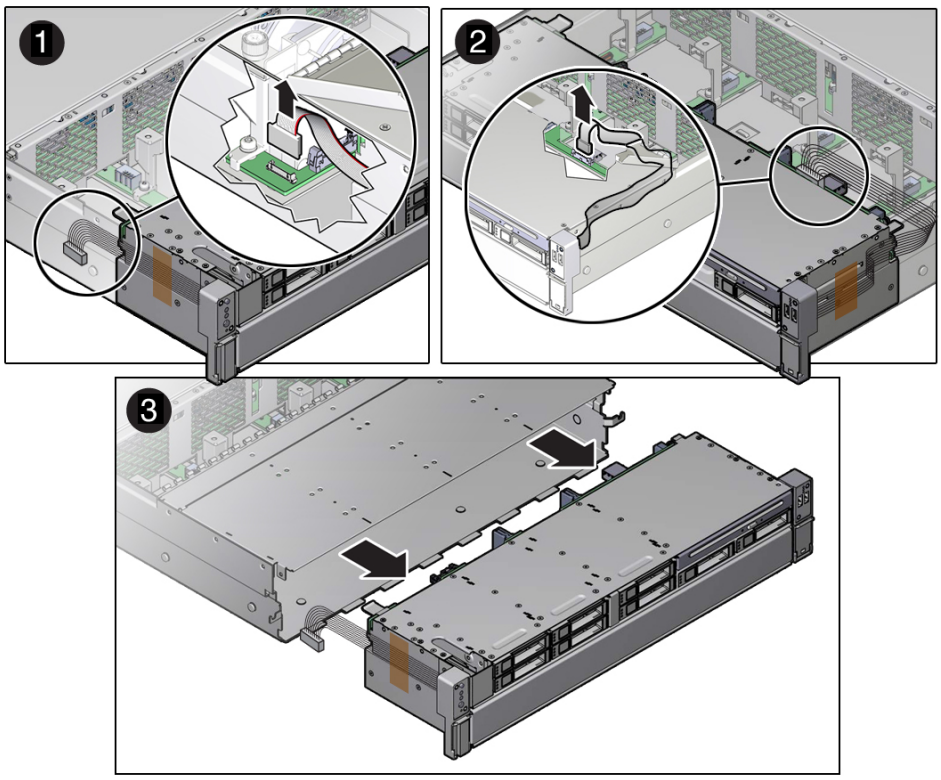
3. **Remove the fan modules from the server.**

   See “Remove a Fan Module” on page 94.

4. **Disconnect all cables from the front storage drive backplane.**

   See the procedures for your storage drive configuration in “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

5. **Disconnect the left LED indicator module cable and the right LED/USB indicator module cable from the motherboard [1 and 2].**



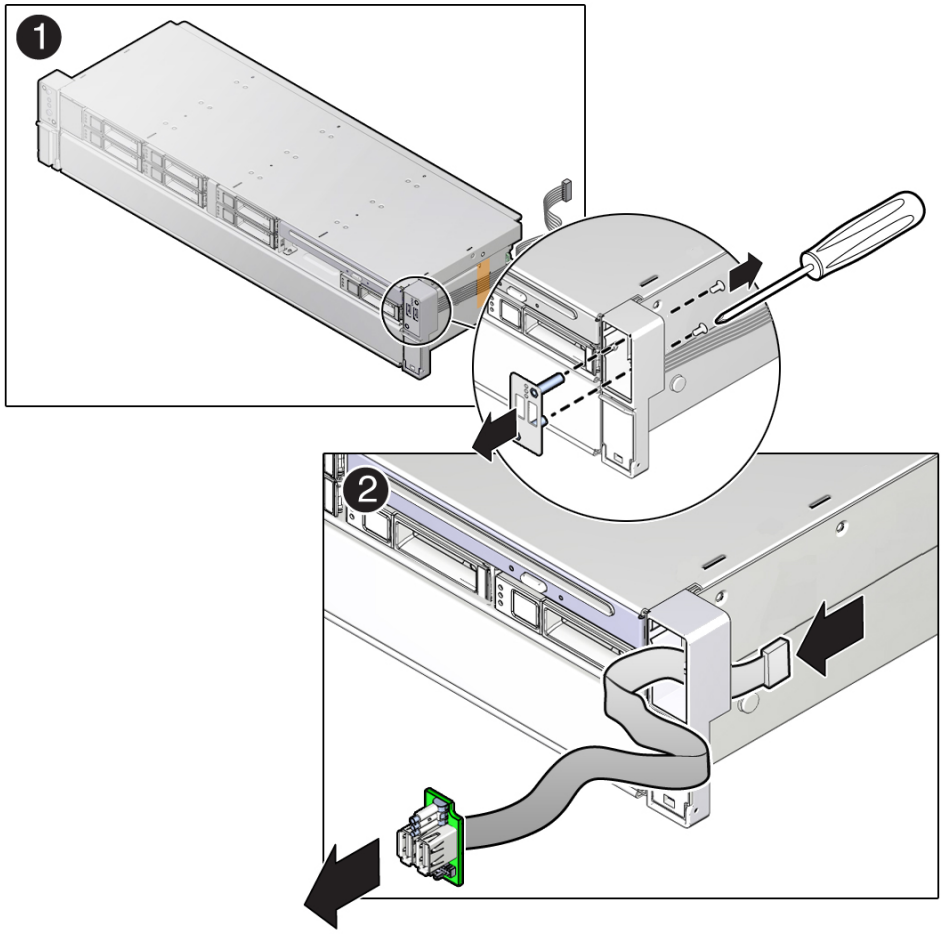
6. **Slide the disk cage assembly forward, and then gently lift the disk cage assembly from the chassis [3].**

   Set the disk cage assembly on an anti-static mat.

7. **Remove the right LED/USB indicator module.**

   a. **Remove the two No. 2 Phillips screws that secure the LED/USB indicator module to the server front panel [1].**

If present, remove the capping tape that secures the cable to the side of the disk cage assembly.



b. Remove the LED/USB indicator module from the server front panel [2].

Related Information

- “Server System-Level Status Indicators” on page 33
- “Install the Right LED/USB Indicator Module” on page 214

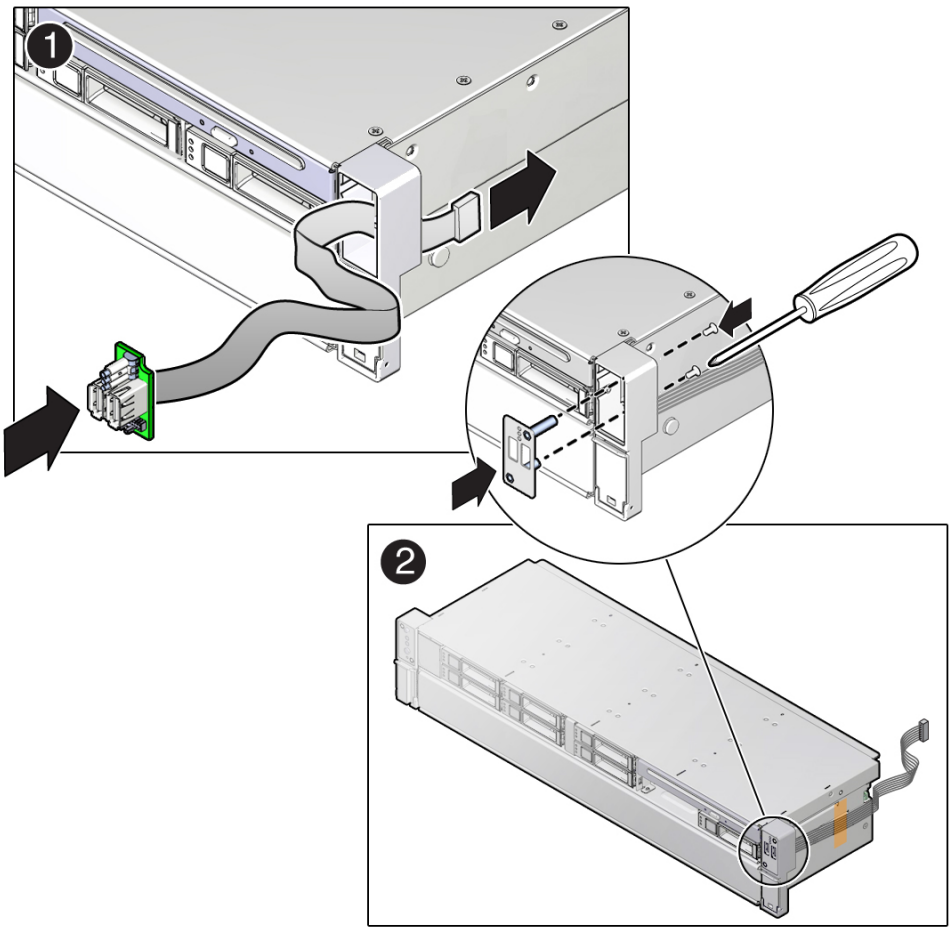
▼ Install the Right LED/USB Indicator Module

1. **Install the right LED/USB indicator module.**

   a. **Push the LED/USB indicator module and cable through the right LED housing on the server front panel [1].**

      If necessary, use a piece of capping tape to secure the cable to the side of the disk cage assembly.

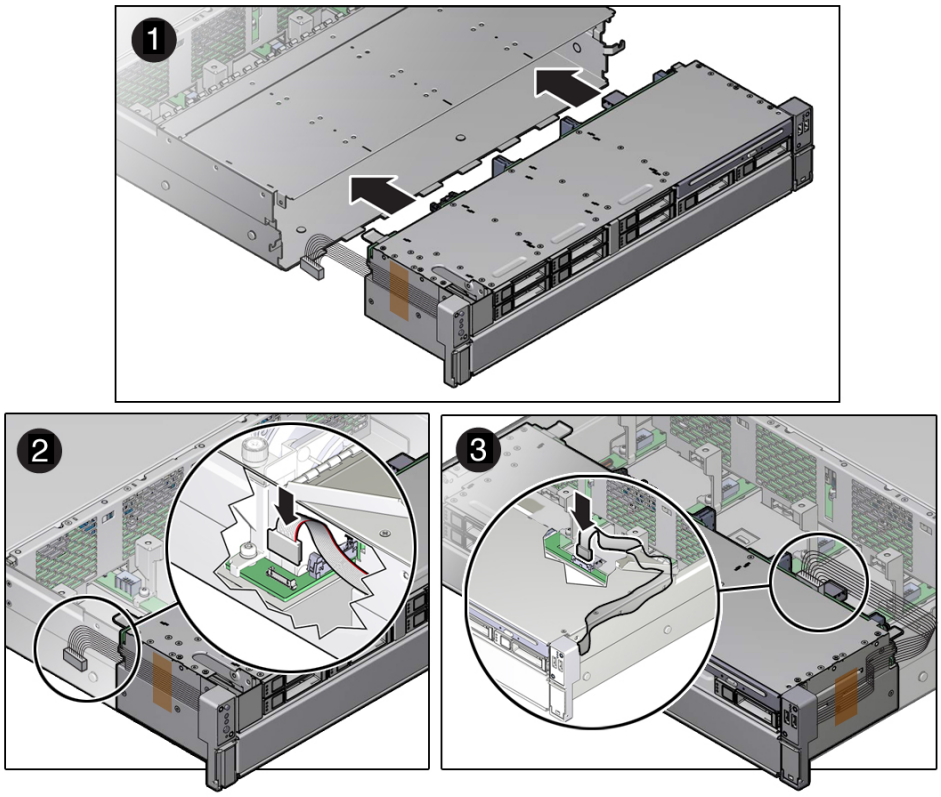
Note - Cable part number 7064124 is required for the right LED/USB indicator module.



b. **Insert and tighten the two No. 2 Phillips screws to secure the LED/USB indicator module to the server front panel [2].**

2. **Gently lift the disk cage assembly and set it into the server chassis [1].**

Slightly push the disk cage assembly into the server chassis to ensure that the disk cage screw holes are correctly aligned with the server chassis.



3. **Reconnect the left LED indicator module cable and the right LED/USB indicator module cable to the motherboard [2 and 3].**

4. **Reconnect all cables to the front storage drive backplane.**

   See the procedures for your storage drive configuration in “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

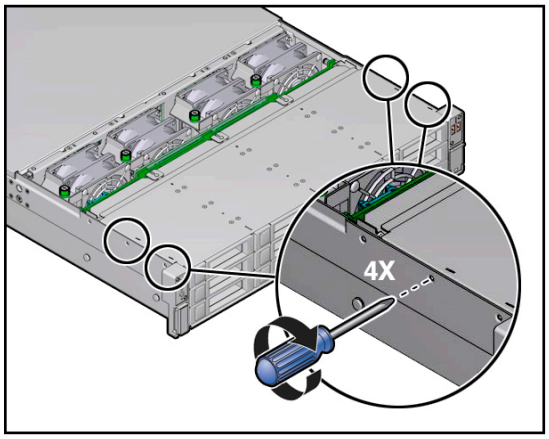
5. **Install the fan modules in the server.**

   See “Install a Fan Module” on page 97.

6. **Depending on your server's storage drive configuration, do one of the following:**

- **If your server is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, perform the following procedures.**

  a. **Install the four No. 2 Phillips screws (two on each side of the chassis) that secure the disk cage assembly to the server chassis.**



  b. **Install the server front fan assembly door.**

  See “Install the Fan Assembly Door” on page 238.

- **If your server is configured with eight 2.5-inch storage drives, install the server disk cage cover.**

  See “Install the Disk Cage Cover” on page 239.

7. **Return the server to operation.**

  a. **Install the server top cover.**

  See “Install the Server Top Cover” on page 236.

  b. **Return the server to the normal rack position.**

  See “Return the Server to the Normal Rack Position” on page 241.

  c. **Reconnect the power cords to the power supplies, and power on the server.**

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Related Information

- “Server System-Level Status Indicators” on page 33
- “Remove the Right LED/USB Indicator Module” on page 210

Servicing the Motherboard Assembly (FRU)

Caution - The motherboard assembly should be removed and replaced only by authorized Oracle Service personnel.

Caution - Ensure that all power is removed from the server before removing or installing the motherboard. You must disconnect the power cables before performing these procedures.

Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This discharge can cause server components to fail. To avoid damage, ensure that you follow the antistatic practices as described in “Electrostatic Discharge Safety” on page 56.

This section covers the following procedures:

- “Remove the Motherboard Assembly” on page 218
- “Install the Motherboard Assembly” on page 228

Related Information

- “About System Components” on page 22

▼ Remove the Motherboard Assembly

1. **Prepare the server for service.**

   a. **Power off the server and disconnect the power cords from the power supplies.**

See “Powering Down the Server” on page 59.

b. Extend the server into the maintenance position.

See “Extend the Server to the Maintenance Position” on page 66.

c. Attach an antistatic wrist strap to your wrist, and then to a metal area of the chassis.

See “Take Antistatic Measures” on page 68.

d. Remove the server top cover.

See “Remove the Server Top Cover” on page 69.

2. Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and its associated super capacitor.

See “Remove the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 190.

3. Remove the air baffle.

Remove the air baffle by lifting the baffle up and out of the server.

4. Remove the following reusable components:



Caution - During the motherboard removal procedure, it is important to label power supplies with the slot numbers from which they were removed (PS0, PS1). This is required because the power supplies must be reinstalled into the slots from which they were removed; otherwise, the server key identity properties (KIP) data might be lost. When a server requires service, the KIP is used by Oracle to verify that the warranty on the server has not expired. For more information on KIP, see “FRU Key Identity Properties (KIP) Automated Update” on page 57.

- Fan modules

  See “Remove a Fan Module” on page 94.
- SAS storage drive cables

  See “Remove SAS Storage Drive Cables” on page 177.
- NVMe cables (if present)

  See “Remove NVMe Cables” on page 184.
- PCIe cards

  See “Remove a PCIe Card” on page 122.
- Power supplies

  See “Remove a Power Supply” on page 100.

5. **If the server has a DVD drive, disconnect the DVD drive cable from the motherboard SATA connector.**

   To remove the DVD drive cable, carefully guide it through the chassis mid-wall and place it on top of the disk cage so that it is away from the motherboard. You do not need to disconnect the DVD drive cable from the DVD drive.

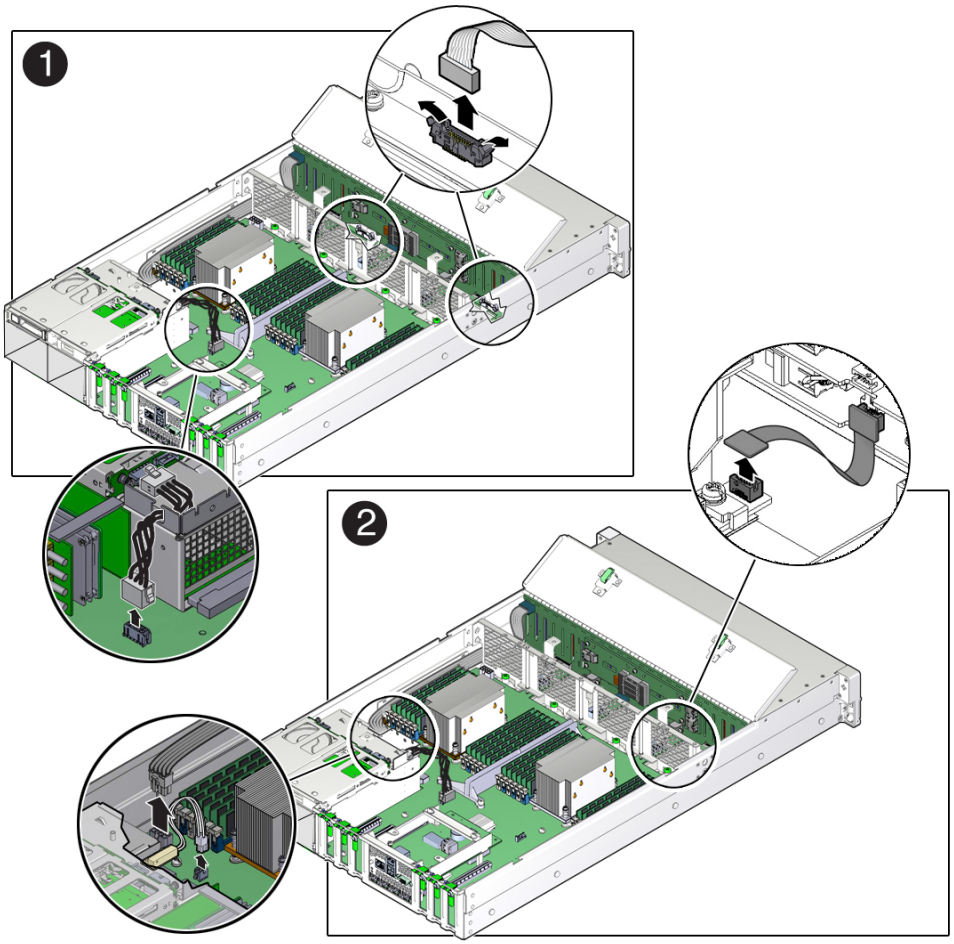
   See "Remove the DVD Drive" on page 197.

6. **Disconnect the power cable from the motherboard to the rear storage drive backplane [1].**

   See "Servicing the Front and Rear Storage Drive Backplanes (FRU)" on page 156.

7. **Disconnect the ribbon cables from the left front LED indicator module and right front LED/USB indicator module [1].**

See “Servicing the Front LED/USB Indicator Modules (FRU)” on page 202.



8. **Disconnect the auxiliary signal cable from the motherboard to the front storage drive backplane [2].**

   See “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

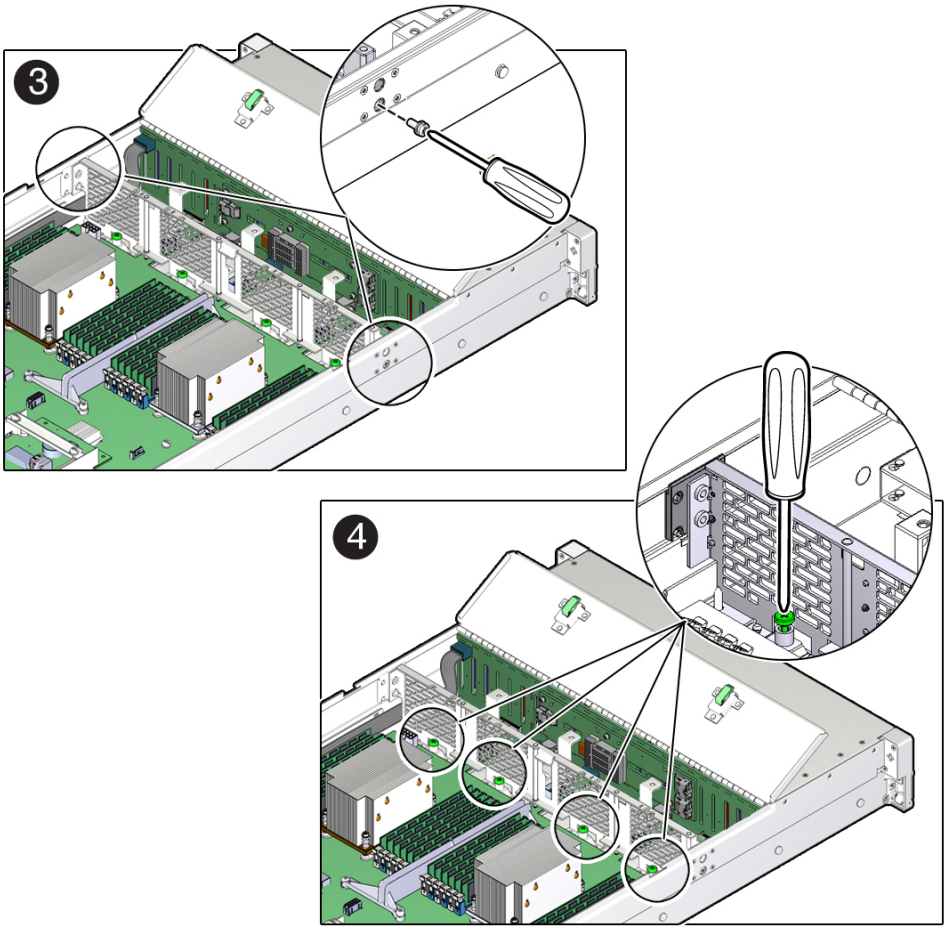
9. **Disconnect the power cable from the motherboard to the front storage drive backplane [2].**

   See “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

10. **Disconnect the signal cable from the server intrusion switch [2].**

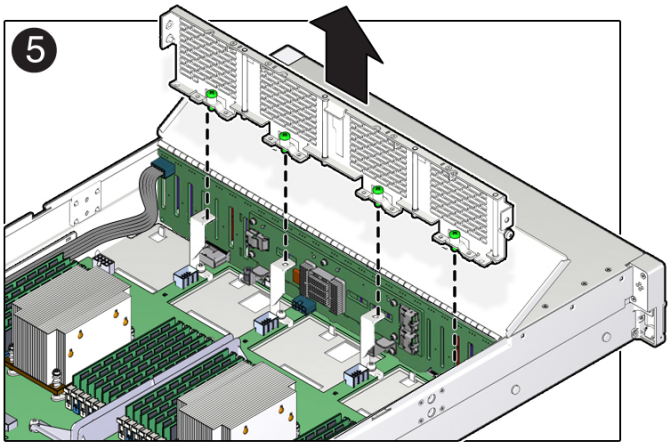
11. **Remove the mid-wall from the chassis.**

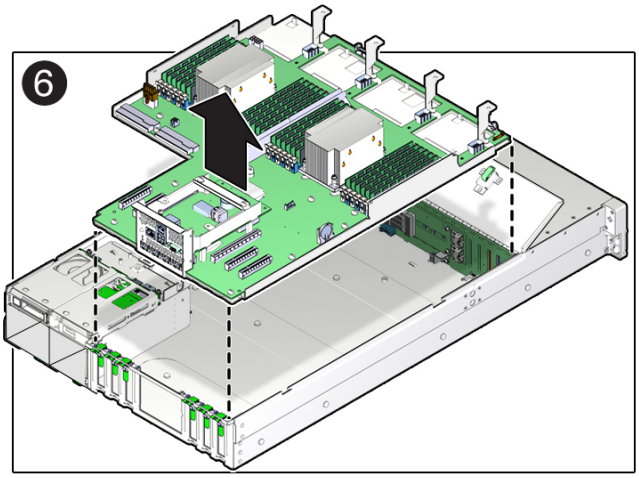
    a. **Using a hex/flat head screwdriver, remove the screw on each side of the chassis that secures the mid-wall to the chassis [3].**



    b. **Using a No. 2 Phillips screwdriver, loosen the four green captive screws that secure the chassis mid-wall to the bottom of the chassis [4].**

c. **Lift the mid-wall out of the chassis [5].**





12. **With the server in the extended maintenance position, remove the motherboard from the server with all reusable components that populate the motherboard in place.**

    a. **Carefully slide the motherboard forward, and lift it out of the chassis [6].**

    b. **Place the motherboard assembly on an antistatic mat, and next to the replacement motherboard.**

13. **Remove the following reusable components from the motherboard and install them onto the replacement motherboard.**

    - DDR4 DIMMs

      See “Identify and Remove a Faulty DIMM” on page 114 and “Install a DIMM” on page 118.

      Note - Install the DDR4 DIMMs only in the slots (connectors) from which they were removed. Performing a one-to-one replacement of DIMMs significantly reduces the possibility that DIMMs will be installed in the wrong slots. If you do not reinstall the DIMMs in the same slots, server performance might be reduced and some DIMMs might not be used.

    - USB flash drives

      See “Remove an Internal USB Flash Drive” on page 129 and “Install an Internal USB Flash Drive” on page 130.

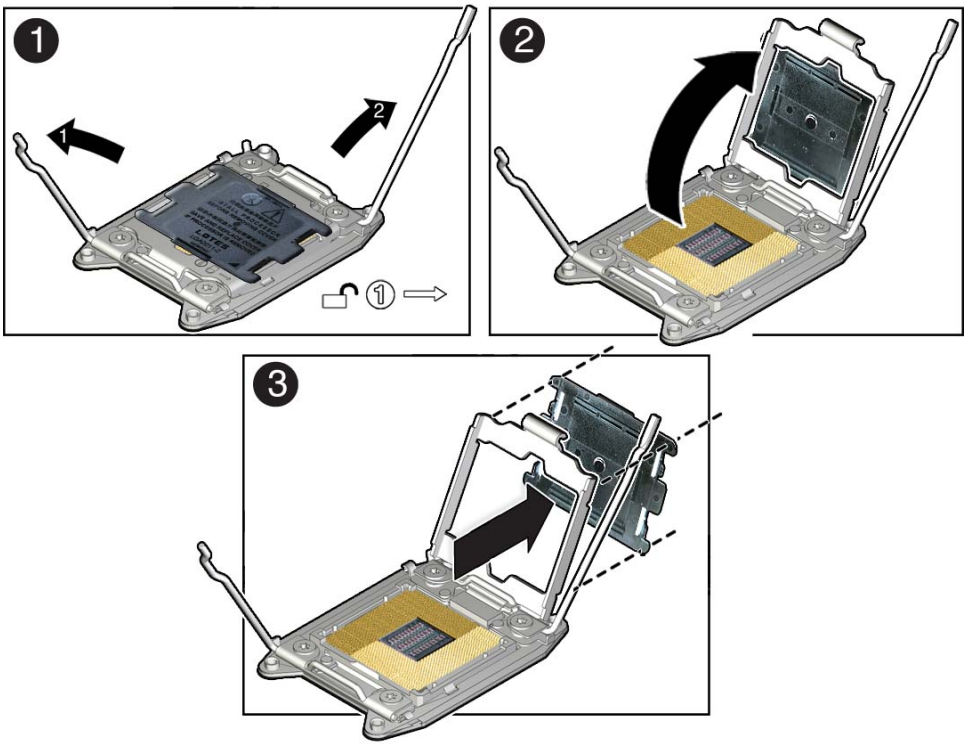
14. **Remove the processors from the failed motherboard.**

    See “Remove a Processor” on page 143.

15. **Remove the processor socket covers from the replacement motherboard and install the processors.**

    a. **Disengage the processor Independent Loading Mechanism (ILM) assembly hinge lever on the right side of the processor socket (viewing the server**

from the front) by pushing down on the lever and moving it to the side away from the processor, and then rotating the lever upward [1].



b. Disengage the processor ILM assembly load lever on the left side of the processor socket (viewing the server from the front) by pushing down on the lever and moving it to the side away from the processor, and then rotating the lever upward [1].

c. To lift the processor ILM assembly load plate off of the processor socket, rotate the ILM assembly hinge lever on the right side of the processor toward the closed position (the load plate is lifted up as the hinge lever is lowered) and carefully swing the load plate to the fully open position [2].

d. Grasp the top and underside of the processor socket cover with one hand (place your thumb against the underside of the cover), place your other

thumb against the underside of the cover, and carefully push the cover out of the processor ILM assembly load plate [3].

Caution - Be careful not to allow the processor socket cover to fall into the processor socket as this could result in damage to the socket.

e. Install a processor into the socket from which you removed the processor socket cover.

See "Install a Processor" on page 150.

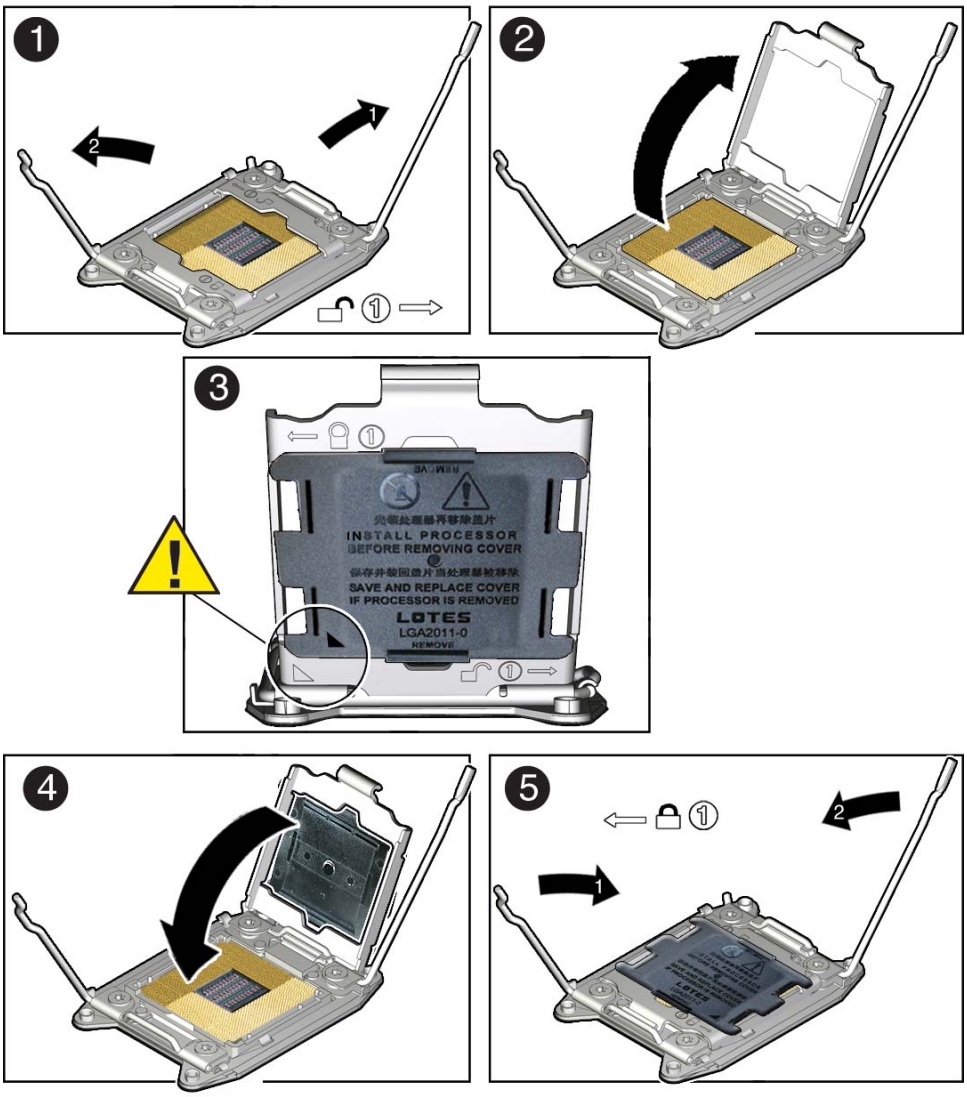
f. Repeat Step 15a through Step 15e to remove the second processor socket cover from the replacement motherboard and install the second processor.

16. Install the processor socket covers on the faulty motherboard.

Caution - The processor socket covers must be installed on the faulty motherboard; otherwise, damage might result to the processor sockets during handling and shipping.

Caution - Be careful not to allow the processor socket cover to fall into the processor socket as this could result in damage to the socket.

a. Open one of the processor ILM assemblies on the faulty motherboard [1 and 2].



b. **Hold the processor ILM assembly load plate open with one hand and position the processor socket cover over the top of the pressure frame so that 1) the arrow on the processor socket cover is aligned with the arrow on the load plate and 2) the fasteners on one side of the cover (the fasteners are located on the underside of the cover) are inside the load plate (it does not matter which side), and use your thumb to press the other side of the processor socket cover into the load plate. [3].**

c. **Close the processor ILM assembly load plate [4 and 5].**

d. **Repeat Step 16a through Step 16c to install the second processor socket cover on the faulty motherboard.**

Related Information

- “About System Components” on page 22
- “Customer-Replaceable Units” on page 24
- “Field-Replaceable Units” on page 25
- “Install the Motherboard Assembly” on page 228

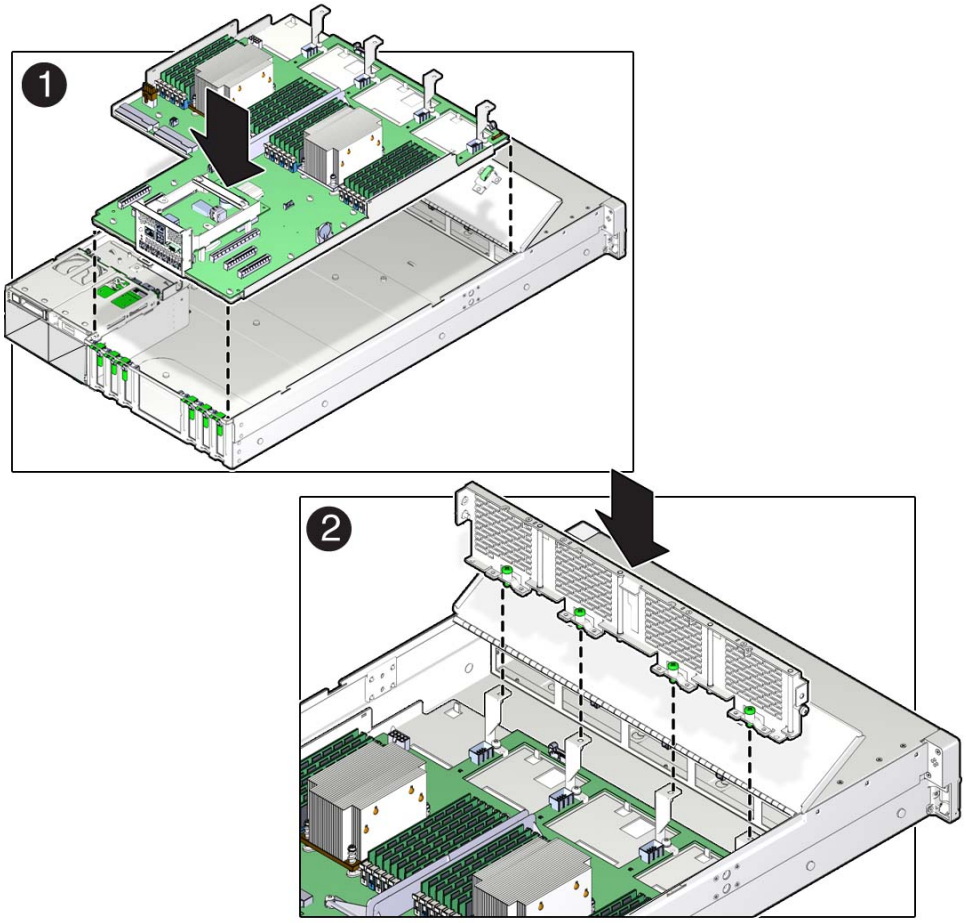
▼ Install the Motherboard Assembly

1. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**

   See “Take Antistatic Measures” on page 68.

2. **Carefully lift and place the motherboard assembly into the chassis [1].**

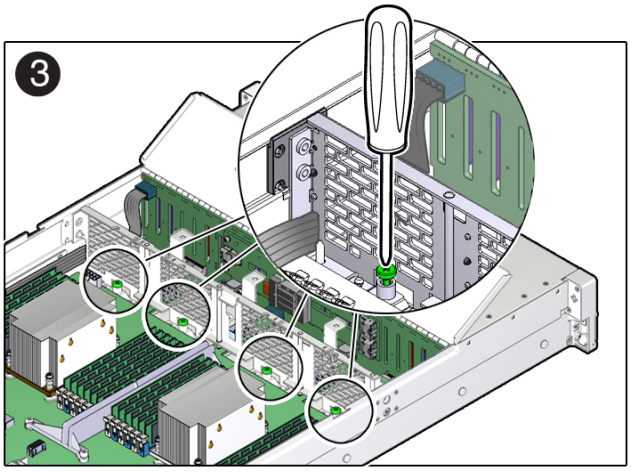
Tilt the motherboard to the right side to fit under the power supply assembly, level the motherboard and place it into the server chassis, then slide it to the rear of the server to engage the raised standoffs.

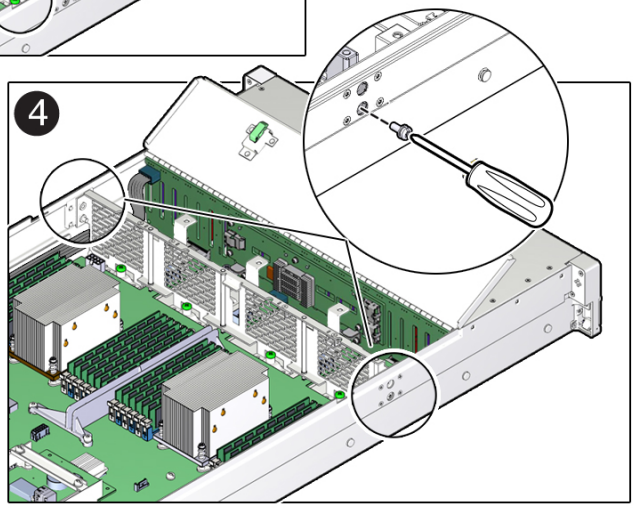


3. **Install the mid-wall into the chassis.**

   a. **Lift and place the mid-wall into the chassis [2].**

b. **Using a No. 2 Phillips screwdriver, tighten the four green captive screws that secure the mid-wall to the bottom of the chassis [3].**





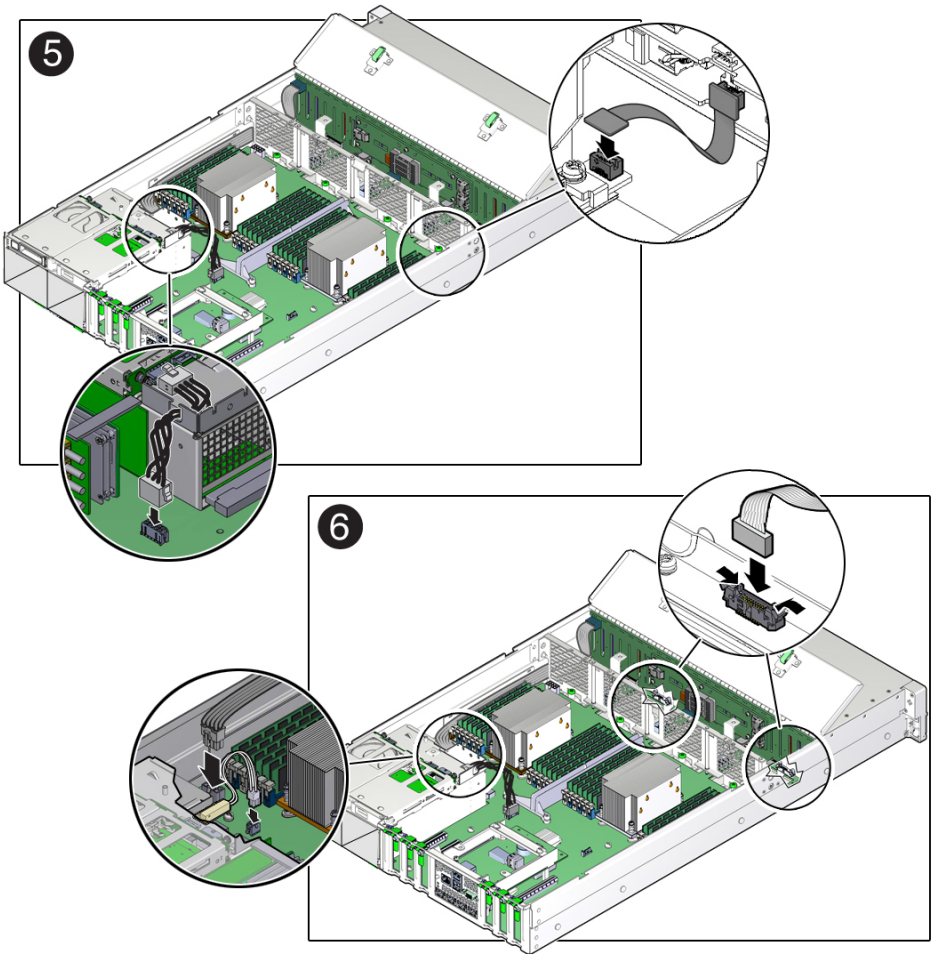
c. **Using a hex/flat head screwdriver, insert and tighten the screw on each side of the chassis to secure the mid-wall in the chassis [4].**

4. **Reconnect the power cable to the motherboard from the rear storage drive backplane [5].**

See “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

5. **Reconnect the auxiliary signal cable to the motherboard from the front storage drive backplane [5].**

   See “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.



6. **Reconnect the ribbon cables from left and right LED/USB indicator modules to the motherboard [6].**

   See “Servicing the Front LED/USB Indicator Modules (FRU)” on page 202.

7. **Reconnect the power cable to the motherboard from the front storage drive backplane [6].**

See “Servicing the Front and Rear Storage Drive Backplanes (FRU)” on page 156.

8. **Reconnect the server intrusion switch cable to the motherboard [6].**

9. **If the server has a DVD drive, reconnect the DVD drive cable.**

   To reconnect the DVD drive cable, carefully guide it through the chassis mid-wall and reconnect it to the motherboard SATA connector.

   See “Install the DVD Drive” on page 199.

10. **Reinstall the following components:**



Caution - When reinstalling power supplies, it is important to reinstall them into the slots from which they were removed during the motherboard removal procedure; otherwise, the server key identity properties (KIP) data might be lost. When a server requires service, the KIP is used by Oracle to verify that the warranty on the server has not expired. For more information on KIP, see “FRU Key Identity Properties (KIP) Automated Update” on page 57.

- Power supplies

  See “Install a Power Supply” on page 102.
- PCIe cards

  See “Install a PCIe Card” on page 125.
- NVMe cables (if present)

  See “Install NVMe Cables” on page 187.
- SAS storage drive cables

  See “Install SAS Storage Drive Cables” on page 180.
- Fan modules

  See “Install a Fan Module” on page 97.

11. **Install the air baffle.**

    Install the air baffle by placing it into the server. Leave the air baffle in an upright position in preparation for installing the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card.

12. **Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA card and its associated super capacitor.**

    See “Install the Oracle Storage 12 Gb/s SAS PCIe RAID HBA Card” on page 193.

13. **Return the server to operation.**

    a. **Install the server top cover.**

See “Install the Server Top Cover” on page 236.

b. Return the server to the normal rack position.

See “Return the Server to the Normal Rack Position” on page 241.

c. Reconnect the power cords to the power supplies, and power on the server.

See “Reconnect Power and Data Cables” on page 243 and “Power On the Server” on page 243. Verify that the power supply AC OK LED is lit.

Note - IMPORTANT: After replacing the motherboard, you might need to manually program the product serial number (PSN) into the new motherboard. This is necessary because the motherboard is a secondary member of a select group (or quorum) of components for maintaining the PSN for service entitlement, and if you replace more than one of the quorum members during any given service procedure, a secondary quorum member might need to be programmed with the PSN.

Related Information

- “About System Components” on page 22
- “Customer-Replaceable Units” on page 24
- “Field-Replaceable Units” on page 25
- “Remove the Motherboard Assembly” on page 218

Returning the Server to Operation

After replacing components inside of the server, perform the procedures in the following sections.

Description	Links
Note server filler panel requirements.	“Server Filler Panel Requirements” on page 235
Install the server top cover.	“Install the Server Top Cover” on page 236
Install the fan door assembly top cover.	“Install the Fan Assembly Door” on page 238
Install the disk cage cover.	“Install the Disk Cage Cover” on page 239
Remove any antistatic measures.	“Remove Antistatic Measures” on page 240
Reinstall the server chassis in the rack.	“Reinstall the Server in the Rack” on page 240
Return the server to the normal rack position.	“Return the Server to the Normal Rack Position” on page 241
Reconnect power and data cables.	“Reconnect Power and Data Cables” on page 243
Power on the server.	“Power On the Server” on page 243

Related Information

- “Preparing for Service” on page 55

Server Filler Panel Requirements

The server might be shipped with module-replacement filler panels for storage drives and PCIe cards. These filler panels are installed at the factory and must remain in the server until you replace them with a purchased option.

Before you can install an optional server component into the server, you must remove the filler panel from the location into which you intend to install the component. When you remove a storage drive or a PCIe card from the server, you must install either a replacement for the component removed or a filler panel.

Related Information

- “Preparing for Service” on page 55

Remove and Install Filler Panels

- **See the procedures in the following table to remove and install filler panels for storage drives and PCIe cards.**

Filler Panel Type	Removal Procedure	Installation Procedure
Storage drive	1. Locate the storage drive filler panel to be removed from the server. 2. To unlatch the storage drive filler panel, pull the release lever, and then tilt the lever out into a fully opened position. 3. To remove the filler panel from the slot, hold the opened release lever, and gently slide the filler panel toward you.	1. Locate the vacant storage drive module slot in the server, and then ensure that the release lever on the filler panel is fully opened. 2. Slide the filler panel into the vacant slot by pressing the middle of the filler panel faceplate with your thumb or finger. The release lever will go in as it makes contact with the chassis. Do not slide the filler panel in all the way. Leave the filler panel out approximately 0.25 to 0.50 inch (6 to 12 mm) from the opening. 3. Using your thumb or finger, press on the middle of the filler panel faceplate until the release lever engages with the chassis. 4. Close the release lever until it clicks into place and is flush with the front of the server.
PCIe slot	1. Remove the server top cover. 2. To remove the PCIe slot filler panel, rotate the PCIe locking mechanism, and then lift and remove the PCIe slot filler panel from the location into which you intend to install the PCIe card. **Note -** PCIe slots 1, 2, and 3 are nonfunctional in single-processor systems.	1. Remove the server top cover. 2. To install the PCIe slot filler panel, press the PCIe filler panel into the vacant PCIe slot, and then rotate the PCIe locking mechanism to secure the PCIe slot filler panel.

Install the Server Top Cover

1. **Place the top cover on the chassis.**

   Set the cover down so that it hangs over the rear of the server by about 1 inch (25 mm) and the side latches align with the cutouts in the chassis.

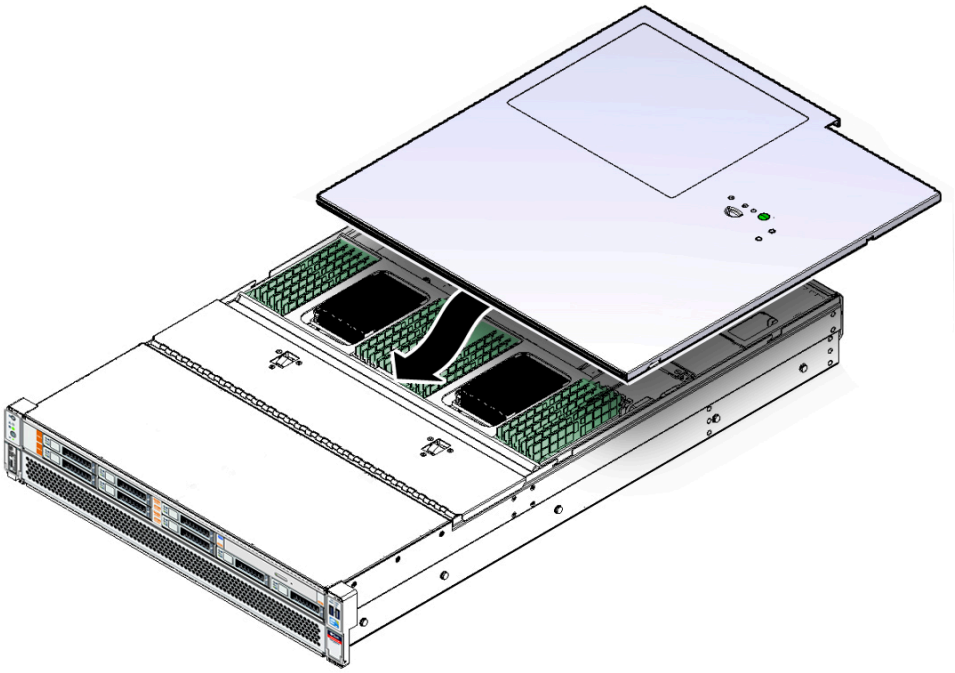
2. **Check both sides of the chassis to ensure that the top cover is fully down and flush with the chassis.**

   If the cover is not fully down and flush with the chassis, slide the cover towards the rear of the chassis to position the cover in the correct position.

Caution - If the top cover is not correctly positioned before you attempt to latch the cover, the internal latch that is located on the underside of the cover might be damaged.

3. **Gently slide the cover toward the front of the chassis until it latches into place (with an audible click).**

   As you slide the cover toward the front of the server, watch the green release button. You will hear an audible click when the green release button pops up, indicating that the cover is locked.



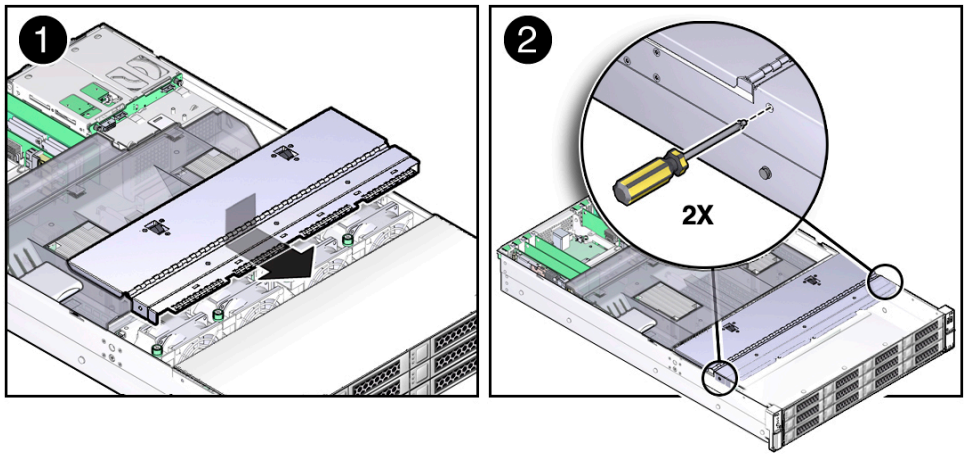
Related Information

- "Remove the Server Top Cover" on page 69

Install the Fan Assembly Door

Note - The procedures in this section should be used for systems configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives. If your system is configured with eight 2.5-inch drives, see “Install the Disk Cage Cover” on page 239.

1. **Place the fan assembly door on the chassis and slightly over the fan assembly.**
2. **Slide the fan assembly door forward and under the lip of the forward top cover until it latches into place [1].**



3. **Use a No. 2 Phillips screwdriver to install and secure the fan assembly door [2].**
   - **If your system is configured with twelve 3.5-inch storage drives, install and tighten the two screws on each side of the chassis and the three screws on top of the chassis.**
   - **If your system is configured with twenty-four 2.5-inch storage drives, install and tighten the two screws on each side of the chassis.**

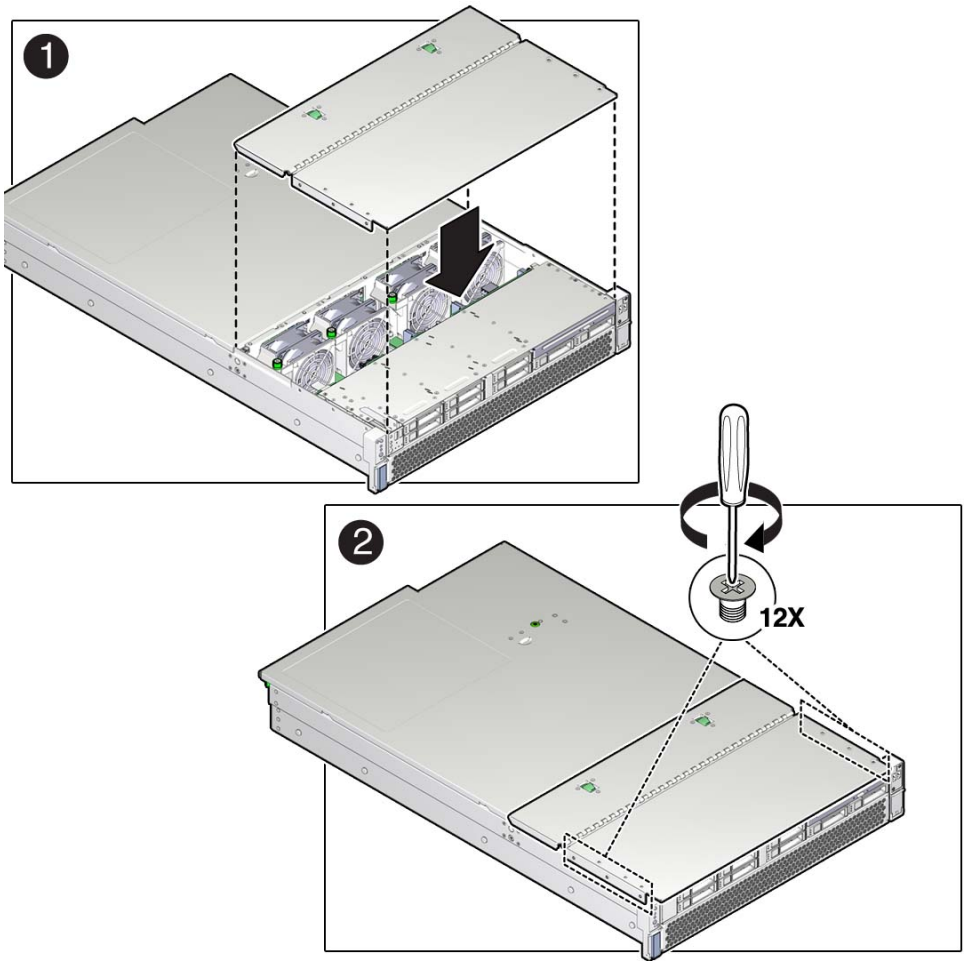
Related Information

- “Remove the Fan Assembly Door From the Server” on page 70
- “Remove the Server Top Cover” on page 69

Install the Disk Cage Cover

Note - The procedures in this section should be used for systems configured with eight 2.5-inch storage drives. If your system is configured with twelve 3.5-inch storage drives or twenty-four 2.5-inch storage drives, see “Install the Fan Assembly Door” on page 238.

1. **Place the disk cage cover on the chassis [1].**



2. **Using a No. 2 Phillips screwdriver, install and tighten the twelve screws (three on each top side of the chassis, and three on each side of the chassis) to secure the disk cage cover [2].**

Related Information

- “Remove the Server Top Cover” on page 69
- “Install the Server Top Cover” on page 236
- “Remove the Disk Cage Cover From the Server” on page 72

▼ Remove Antistatic Measures

1. **Remove any antistatic straps or conductors from the server chassis.**
2. **Remove the antistatic wrist strap from yourself.**

Related Information

- “Take Antistatic Measures” on page 68

▼ Reinstall the Server in the Rack

After servicing the system, reinstall it into the rack.



Caution - Deploy any rack anti-tilt mechanism before installing the server into the rack.



Caution - The server weighs approximately 63 pounds (28.5 kg). Two people are required to carry the chassis and install it in the rack.

1. **Lift the server from the antistatic mat, and reinstall the server into the rack.**

   Refer to “Installing the Server Into a Rack” in *Oracle Server X5-2L Installation Guide* for the installation instructions specific to your rackmount kit.

2. **If the cable management arm (CMA) is not installed, that is, you removed it because you removed the server completely out of the rack, install the CMA.**

   For installation instructions for the CMA, refer to “Install the Cable Management Arm” in *Oracle Server X5-2L Installation Guide*.

3. **If the cables are disconnected from the rear of the server, that is, you disconnected the cables because you removed the server completely out of the rack, reconnect the cables.**

   - **For instructions on reconnecting cables to the rear of the server, see "Reconnect Power and Data Cables" on page 243.**
   - **For detailed information on connecting cables to the rear of the server, refer to "Rear Cable Connections and Ports" in *Oracle Server X5-2L Installation Guide*.**

Related Information

- "Remove the Server From the Rack" on page 67
- "Reconnect Power and Data Cables" on page 243

▼ Return the Server to the Normal Rack Position

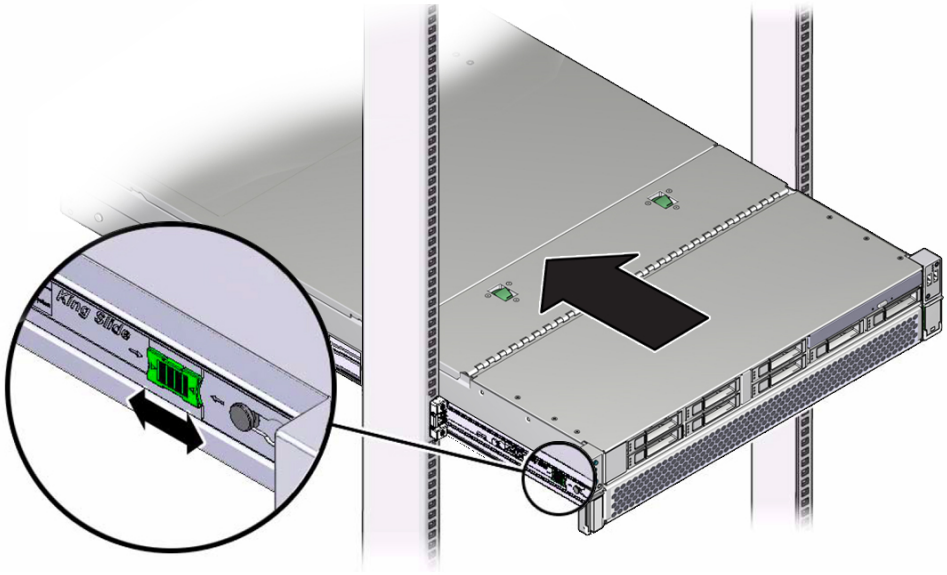
If the server is in the extended maintenance position, use this procedure to return the server to the normal rack position.

1. **Push the server back into the rack, as described in the following steps.**

   a. **Simultaneously pull and hold the two green release tabs (one on each side of the slide rails on the server) toward the front of the server while you push the server into the rack.**

      As you push the server into the rack, verify that the cable management arm (CMA) retracts without binding.

Note - To pull the green release tab, place your finger in the center of the tab, not on the end, and apply pressure as you pull the tab toward the front of the server.



b. **Continue pushing the server into the rack until the slide-rail locks (on the front of the server) engage the slide-rail assemblies.**

   You will hear an audible click when the server is in the normal rack position.

2. **If the CMA is not installed, that is, you removed it because you removed the server completely out of the rack, install the CMA.**

   For installation instructions for the CMA, refer to "Install the Cable Management Arm" in *Oracle Server X5-2L Installation Guide*.

3. **If the cables are disconnected from the rear of the server, that is, you disconnected the cables because you extended the server out of the rack, reconnect the cables.**

   - For instructions on reconnecting cables to the rear of the server, see "Reconnect Power and Data Cables" on page 243.

- For detailed information on connecting cables to the rear of the server, refer to "Rear Cable Connections and Ports" in *Oracle Server X5-2L Installation Guide*.

Related Information

- "Reconnect Power and Data Cables" on page 243

Reconnect Power and Data Cables

1. **Reconnect the data cables to the rear of the server, as appropriate.**

   If the cable management arm (CMA) is in the way, extend the server approximately 13 cm (5 inches) out of the front of the rack.

2. **Reconnect the power cables to the power supplies.**

3. **If necessary, reinstall the cables into the cable management arm and secure them with Velcro straps.**

4. **Power on the server.**

   See "Power On the Server" on page 243.

Related Information

- "Disconnect Cables From the Server" on page 65
- "Reinstall the Server in the Rack" on page 240
- "Return the Server to the Normal Rack Position" on page 241
- "Power On the Server" on page 243

Power On the Server

As soon as the power cords are connected, standby power is applied. In standby power mode, the Power/OK LED on the server front panel blinks steadily. Depending on the configuration of the firmware, the system might boot. If it does not boot, follow this procedure.

- **Power on the server by performing one of the following actions:**

  - Press the Power button on the front bezel.
  - Log in to the Oracle ILOM web interface, click Host Management → Power Control and select Power On from the Select Action list.

- Log in to the Oracle ILOM command-line interface (CLI), and type the following command at the Oracle ILOM prompt:

```
-> start /System
```

  When the server is powered on and the power-on self-test (POST) code checkpoint tests have completed, the green Power/OK status indicator (LED) on the front panel of the server lights and remains lit.

Related Information

- “Powering Down the Server” on page 59
- “Reconnect Power and Data Cables” on page 243

Identifying the Server Ports

These sections describe the pinouts of the server connectors.

Description	Links
Review the Gigabit Ethernet ports.	“Gigabit Ethernet Ports” on page 245
Review the network management ports.	“Network Management Port” on page 246
Review the serial management ports.	“Serial Management Port” on page 247
Review the video connectors.	“Video Connector” on page 249
Review the USB ports.	“USB Ports” on page 250

Related Information

- “About the Oracle Server X5-2L” on page 15

Gigabit Ethernet Ports

The server has four auto-negotiating 100/1000/10GBASE-T Gigabit Ethernet (GbE) system domain ports. All four Ethernet ports use a standard RJ-45 connector. The transfer rates are shown in the following table.

Note - Ethernet ports NET2 and NET3 are nonfunctional in single-processor systems.

TABLE 12 Ethernet Port Transfer Rates

Connection Type	IEEE Terminology	Transfer Rate
Fast Ethernet	100BASE-T	100 Mbps
Gigabit Ethernet	1000BASE-T	1,000 Mbps
10 Gigabit Ethernet	10GBASE-T	10,000 Mbps

The following figure and table describe the 10-GbE port pin signals.

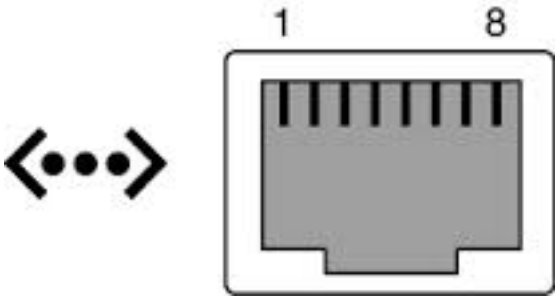


TABLE 13 10-GbE Port Signals

Pin	Signal Description	Pin	Signal Description
1	Transmit/Receive Data 0 +	5	Transmit/Receive Data 2 –
2	Transmit/Receive Data 0 –	6	Transmit/Receive Data 1 –
3	Transmit/Receive Data 1 +	7	Transmit/Receive Data 3 +
4	Transmit/Receive Data 2 +	8	Transmit/Receive Data 3 –

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Server System-Level Status Indicators” on page 33
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243

Network Management Port

The server has one auto-negotiating 10/100/1000BASE-T Ethernet management domain interface, labeled NET MGT. For information about configuring this port for managing the server with Oracle ILOM, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.



TABLE 14 Network Management Port Signals

Pin	Signal Description	Pin	Signal Description
1	Transmit Data +	5	Common Mode Termination
2	Transmit Data –	6	Receive Data –
3	Receive Data +	7	Common Mode Termination
4	Common Mode Termination	8	Common Mode Termination

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Server System-Level Status Indicators” on page 33
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243

Serial Management Port

The serial management connector (labeled SER MGT) is an RJ-45 connector that can be accessed from the rear panel. This port is the default connection to the server. Use this port *only* for server management.

TABLE 15 Default Serial Connections for Serial Port

Parameter	Setting
Connector	SER MGT
Rate	9600 baud
Parity	None
Stop bits	1

Parameter	Setting
Data bits	8

The following figure and table describe the SER MGT port pin signals.



TABLE 16 Serial Management Port Signals

Pin	Signal Description	Pin	Signal Description
1	Request to Send	5	Ground
2	Data Terminal Ready	6	Receive Data
3	Transmit Data	7	Data Set Ready
4	Ground	8	Clear to Send

If you need to connect to the SER MGT port using a cable with either a DB-9 or a DB-25 connector, follow the pin descriptions in the tables to create a crossover adapter appropriate for your serial connection.

TABLE 17 RJ-45 to DB-9 Adapter Crossovers Wiring Reference

Serial Port (RJ-45 Connector)		DB-9 Adapter	
Pin	Signal Description	Pin	Signal Description
1	RTS	8	CTS
2	DTR	6	DSR
3	TXD	2	RXD
4	Signal ground	5	Signal ground
5	Signal ground	5	Signal ground
6	RXD	3	TXD
7	DSR	4	DTR
8	CTS	7	RTS

TABLE 18 RJ-45 to DB-25 Adapter Crossovers Wiring Reference

Serial Port (RJ-45 Connector)		DB-25 Adapter	
Pin	**Signal Description**	**Pin**	**Signal Description**
1	RTS	5	CTS
2	DTR	6	DSR
3	TXD	3	RXD
4	Signal ground	7	Signal ground
5	Signal ground	7	Signal ground
6	RXD	2	TXD
7	DSR	20	DTR
8	CTS	4	RTS

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243

Video Connector

The video connector is a DB-15 connector that can be accessed from the back panel.

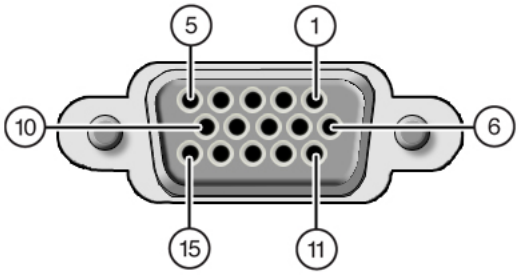


TABLE 19 Video Connector Signals

Pin	Signal Description	Pin	Signal Description
1	Red Video	9	[KEY]

Pin	Signal Description	Pin	Signal Description
2	Green Video	10	Sync Ground
3	Blue Video	11	Monitor ID - Bit 1
4	Monitor ID - Bit 2	12	Monitor ID - Bit 0
5	Ground	13	Horizontal Sync
6	Red Ground	14	Vertical Sync
7	Green Ground	15	N/C (Reserved)
8	Blue Ground		

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243

USB Ports

The server has six USB ports for attaching supported USB 2.0–compliant devices. Two USB ports are on the rear panel, two USB ports are on the front panel, and two USB ports are located on the motherboard.

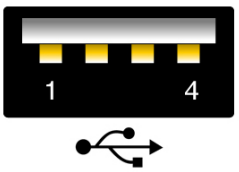


TABLE 20 USB Port Signals

Pin	Signal Description
1	+5 V
2	DAT-
3	DAT+
4	Ground

Related Information

- “Rear Panel Components and Cable Connections” on page 21
- “Disconnect Cables From the Server” on page 65
- “Reconnect Power and Data Cables” on page 243

Setting Up BIOS Configuration Parameters

This section provides an overview of BIOS configuration management, Legacy BIOS, UEFI BIOS, and the BIOS Setup Utility.

Description	Links
Learn about the tools available to manage the BIOS configuration.	"Managing the BIOS Configuration" on page 253
Learn how to access the BIOS Setup Utility.	"Accessing the BIOS Setup Utility" on page 254
Learn about UEFI BIOS.	"Using UEFI" on page 259
Learn how BIOS allocates Option ROM and I/O resources.	"Using BIOS for Resource Allocation" on page 262
Learn how to perform common BIOS setup procedures.	"Common BIOS Setup Utility Tasks" on page 263

Related Information

- "BIOS Setup Utility Menu Options" on page 281

Managing the BIOS Configuration

The BIOS configuration parameters on an Oracle x86 server are manageable from the BIOS Setup Utility and Oracle ILOM. You can also download the BIOS firmware using Oracle System Assistant. For information about using these tools to manage the BIOS configuration, refer to:

- **Oracle System Assistant** – *Oracle X5 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`
- **Oracle ILOM** – "Maintaining x86 BIOS Configuration Parameters" in the *Oracle ILOM Administrator's Guide for Configuration and Maintenance Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

- **BIOS Setup Utility** – “Common BIOS Setup Utility Tasks” on page 263

Related Information

- Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: `https://www.oracle.com/goto/ilom/docs`

Accessing the BIOS Setup Utility

The BIOS Setup Utility provides five main menus that you can use to view product information, and to configure, enable, and disable, or manage system components.

This section provides the following information:

- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255
- “Access BIOS Setup Utility Menus” on page 256
- “Navigate BIOS Setup Utility Menus” on page 257

BIOS Setup Utility Menus

The following table provides descriptions for the top-level BIOS Setup Utility menus.

TABLE 21 BIOS Setup Utility Menus Summary

Menu	Description
Main	General product information, including memory, time/date, security settings, system serial number, and CPU and DIMM information.
Advanced	Configuration information for the CPU, trusted computing, USB, and other information. Set the IP address for the server SP. **Note -** When operating in UEFI Boot Mode, Runtime UEFI driver configuration settings let you manage PCIe drivers for all configurable devices.
Boot	Enable or disable Oracle System Assistant support, set the boot mode to Legacy BIOS or UEFI BIOS, and configure the boot device priority.
IO	Manage configuration settings for I/O devices, such as I/O virtualization settings, and enable and disable Option ROMs.
Save & Exit	Save changes and exit, discard changes and exit, discard changes, or restore the default BIOS settings.

See “BIOS Setup Utility Menu Options” on page 281 for examples of each of these screens.

Related Information

- “BIOS Setup Utility Menu Options” on page 281
- “Navigate BIOS Setup Utility Menus” on page 257

BIOS Key Mappings

When viewing the BIOS output from a terminal using the serial console redirection feature, some terminals do not support function keys. BIOS supports the mapping of function keys to Control key sequences when serial redirection is enabled. The following table provides a description of the function key to Control key sequence mappings.

TABLE 22 Function Key to Control Key Sequence Mapping

Function Key	Control Key Sequence	BIOS POST Function	BIOS Setup Function
F1	Ctrl+Q	Not applicable	Activate the Setup Utility Help menu.
F2	Ctrl+E	Enter BIOS Setup Utility while the system is performing the power-on self-test (POST).	Not applicable
F7	Ctrl+D	Not applicable	Discard changes. (Not applicable to UEFI Driver Control menu)
F8	Ctrl+P	Activate the BIOS Boot Menu.	Not applicable
F9	Ctrl+O	Launch Oracle System Assistant. BIOS boots to Oracle System Assistant, bypassing the current Boot Options Priority list for this one-time boot method.	Activate Load Optimal Values pop-up menu. (Not applicable to UEFI Driver Control menu)
F10	Ctrl+S	Not applicable	Activate Save and Exit pop-up menu. (Not applicable to UEFI Driver Control menu)
F12	Ctrl+N	Activate Network boot.	Not applicable

Related Information

- “Access BIOS Setup Utility Menus” on page 256
- “Navigate BIOS Setup Utility Menus” on page 257

Access BIOS Setup Utility Menus

You can access the BIOS Setup Utility screens from the following interfaces:

- Use a USB keyboard and VGA monitor connected directly to the server. (A mouse is not required to access the BIOS Setup Utility.)
- Use a terminal (or terminal emulator connected to a computer) through the serial port on the back panel of the server.
- Connect to the server using the Oracle ILOM Remote System Console Plus application.

1. **Reset or power on the server.**

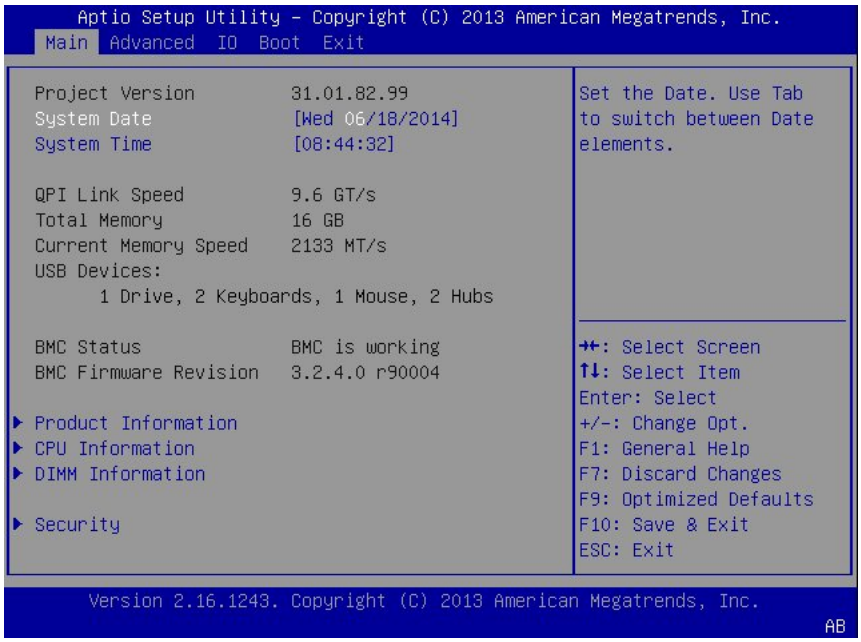
   For example, to reset the server:

   - **From the local server,** press the Power button on the front panel of the server to power off the server, and then press the Power button again to power on the server.
   - **From the Oracle ILOM web interface,** click Host Management → Power Control and select Reset from the Select Action list.
   - **From the Oracle ILOM CLI,** type `reset /System`

   The power-on self-test (POST) sequence begins.

2. **To enter the BIOS Setup Utility, press the F2 key (Ctrl+E from a serial connection) when prompted and while the BIOS is running the power-on self-tests (POST).**

The BIOS Setup Utility Main Menu screen appears.



Related Information

- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255
- “BIOS Setup Utility Menu Options” on page 281

▼ Navigate BIOS Setup Utility Menus

To navigate the menus or options listed on a menu, use the arrow keys. The currently selected option or sub-menu is highlighted. For further instructions on how to navigate and change settings in the BIOS Setup Utility, refer to the online information provided on the menu.

1. **Access the BIOS Setup Utility.**

   See “Access BIOS Setup Utility Menus” on page 256.

2. **Use the left and right arrow keys to select the different primary menu options.**

   As you select each menu option, the top-level screen for that menu option appears.

3. **To navigate options presented on a top-level screen, use the up and down arrow keys.**

   Only options that can be modified are highlighted when you press the up and down arrow keys.

   - **If an option can be modified, as you select the option, user instructions for modifying the option appear in the right column of the screen.**
   - **If an option is a link to a sub-screen, a description of the sub-menu content appears in the right column.**

4. **Modify an option by pressing the + or - keys (plus or minus keys) or by pressing Enter and selecting the desired option from the pop-up menus.**

5. **Press the Esc key to return from a sub-menu screen to the previous menu screen.**

   Pressing Esc from a top-level menu is equivalent to selecting the Discard Changes and Exit option from the Save & Exit Menu.

6. **Modify parameters as needed.**

7. **Press the F10 key to save your changes and exit the BIOS Setup Utility.**

   Alternatively, you can select the Save & Exit Menu, and then select the `Save Changes and Reset` to save your changes and exit the BIOS Setup Utility.

Note - After modifying any BIOS settings and selecting `Save Changes and Reset` from the Save & Exit Menu, the subsequent reboot might take longer than a typical reboot where no settings were modified. The additional delay is required to ensure that changes to the BIOS settings are synchronized with Oracle ILOM.

Related Information

- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255
- “BIOS Setup Utility Menu Options” on page 281

Using UEFI

The BIOS firmware controls the system from power-on until an operating system is booted.

The Oracle Server X5-2L contains a Unified Extensible Firmware Interface (UEFI)-compatible BIOS that can be configured to support either UEFI or Legacy BIOS modes. The BIOS can be configured to support either UEFI or Legacy BIOS modes. Legacy BIOS is the default mode, and should be used with software and adapters that do not have UEFI drivers.

This section includes the following information:

- "Selecting Legacy BIOS or UEFI Boot Mode" on page 259
- "Switching Between Legacy BIOS and UEFI Boot Modes" on page 260
- "UEFI Boot Mode Advantages" on page 260
- "Configuration Utilities for Add-In Cards" on page 261

Selecting Legacy BIOS or UEFI Boot Mode

You can select either Legacy BIOS Boot Mode or UEFI Boot Mode. Legacy BIOS Boot Mode is the default.

If you change BIOS boot modes, the boot candidates from the previously selected mode are no longer available from the Boot Options Priority List in the BIOS Setup Utility. The boot candidates from the new mode appear in the Boot Options Priority List only after you select Save Changes and Reset from the BIOS Setup Utility menu. Use the Oracle ILOM BIOS Backup and Restore function to preserve the BIOS configuration in case you want to switch back to the previously selected mode. For information, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

All supported operating systems can use either UEFI Boot Mode or Legacy BIOS Boot Mode. However, once you choose a boot mode and install an operating system, if you reboot the server and select a different boot mode, the installed image can only be used in the mode in which it was installed. For instructions for selecting either UEFI Boot Mode or Legacy BIOS Boot Mode, see "Select Legacy BIOS or UEFI BIOS Boot Mode" on page 264.

Choose Legacy BIOS Boot Mode to allow host bus adapters (HBAs) to use option ROMs, and when software or adapters do not have UEFI drivers. In Legacy BIOS Boot Mode, only boot candidates that support Legacy BIOS Boot Mode appear in the Boot Options Priority List in the BIOS Setup Utility.

Choose UEFI Boot Mode when software and adapters use UEFI drivers. You can manually select UEFI Boot Mode during system setup. In UEFI Boot Mode, only boot candidates that support UEFI Boot Mode appear in the Boot Options Priority List in the BIOS Setup Utility.

Related Information

- “Switching Between Legacy BIOS and UEFI Boot Modes” on page 260
- “UEFI Boot Mode Advantages” on page 260
- “Configuration Utilities for Add-In Cards” on page 261

Switching Between Legacy BIOS and UEFI Boot Modes

When switching between Legacy BIOS Boot Mode and UEFI BIOS Boot Mode (either direction), BIOS settings that affect the Boot Options Priority list settings will be changed. If the boot mode is changed, the boot candidates from the previous boot mode disappear. The boot candidates for the newly changed boot mode appear after you save your changes and reset the host and in the next boot to the BIOS Setup Utility.

Because the settings for a given mode do not persist after a transition between modes, you should use the BIOS Backup and Restore feature to capture and preserve the BIOS configuration if you intend to switch back to the previous boot mode and want to retain your previous BIOS settings. For information about the BIOS Backup and Restore feature, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

Related Information

- “Selecting Legacy BIOS or UEFI Boot Mode” on page 259
- “UEFI Boot Mode Advantages” on page 260
- “Configuration Utilities for Add-In Cards” on page 261

UEFI Boot Mode Advantages

When the option is available to choose between a Legacy BIOS Boot Mode or UEFI BIOS Boot Mode operating system installation, the advantages to choosing a UEFI BIOS Boot Mode installation include the following:

- Avoids Legacy Option ROM address constraints. For more information, see "Legacy Option ROM Allocation" on page 262.
- Supports operating system boot partitions greater than 2 terabytes (2 TB) in size. For more information about limitations for supported operating systems, refer to the *Oracle Server X5-2L Product Notes* at `https://www.oracle.com/goto/x5-2l/docs`.
- Integrates PCIe device configuration utilities within the BIOS Setup Utility menus. For more information, see "BIOS Setup Utility Menu Options" on page 281.
- Displays bootable operating system images in the boot list as labeled entities, for example, you will see a Windows boot manager label as opposed to raw device labels.

Related Information

- "Selecting Legacy BIOS or UEFI Boot Mode" on page 259
- "Select the Boot Device" on page 266

Configuration Utilities for Add-In Cards

The method for interacting with configuration utilities for add-in cards and (system resident) I/O adapters differs depending on whether Legacy BIOS Boot Mode or UEFI BIOS Boot Mode is used.

In Legacy BIOS Boot Mode, I/O adapter utilities are invoked during BIOS POST progression using hot keys identified by the adapter Option ROM during POST. When the hot key is pressed, the adapter specific configuration utility interface is presented. Often the interface will have a vendor-specific design.

In UEFI BIOS Boot Mode, the configuration screens for the add-in cards will appear as menu items in the BIOS Advanced Menu as part of the standard BIOS Setup Utility screens. For example, if the Oracle Storage 12 Gb/s SAS PCIe RAID host bus adapter is installed in the server, the configuration utility for the HBA appears as a menu selection under the iSCSI menu option on the BIOS Advanced Menu.

Related Information

- "Selecting Legacy BIOS or UEFI Boot Mode" on page 259

Using BIOS for Resource Allocation

This section explains how the BIOS allocates Option ROM and I/O resources.

- "Legacy Option ROM Allocation" on page 262

Legacy Option ROM Allocation

In Legacy BIOS Boot Mode, there are PC architecture constraints on Legacy Option ROM allocation. These constraints do not apply to UEFI Option ROMs, which are often referred to as UEFI drivers.

Choose Legacy BIOS Boot Mode to allow host bus adapters (HBAs) to use Option ROMs. Choose UEFI BIOS Boot Mode to use UEFI drivers.

The system BIOS allocates 128 KB of address space for Legacy Option ROMs. This address space is shared between on-board devices and PCIe add-in cards. This fixed address space limitation is imposed by the PC architecture and not by the BIOS itself. It is possible to exhaust the available address space when installing PCIe add-in cards. When the address space is exhausted, Oracle ILOM displays an `Option ROM Space Exhausted` message, which means that one or more devices cannot load Option ROMs.

For example, if you install a SAS PCIe card, you might encounter a message similar to the following message in the Oracle ILOM event log:

```
Option ROM Space Exhausted - Device XXX Disabled
```

By default, all on-board Legacy Options ROMs are enabled in the BIOS. However, you can disable most of these Option ROMs, unless they are required to support booting from the associated device or to provide some other boot-time function. For example, it is not necessary to load the Option ROM for the on-board network ports unless you want to boot from one or more network ports (even then, you can disable the Options ROMs for the remaining ports).

To minimize server boot time and reduce the likelihood of exhausting the available Option ROM address space, disable the Option ROMs for all devices that you do not intend to boot from. Enable Option ROMs only for those devices from which you intend to boot. If Option ROMs are enabled for more than one boot device, you might encounter an Option ROM space exhausted condition. If you encounter the Option ROM space exhausted condition even after disabling all devices from which you do not intend to boot, then disable additional Option ROMs. Under some circumstances it might be necessary to disable Option ROMs for all devices except for the primary boot device.

Related Information

- “Access BIOS Setup Utility Menus” on page 256
- “Configure Option ROM Settings” on page 275

Common BIOS Setup Utility Tasks

This section presents the procedures for some of the BIOS setup tasks that you will typically perform when setting up and managing the server.

- “Verify BIOS Factory Default Settings” on page 263
- “Select Legacy BIOS or UEFI BIOS Boot Mode” on page 264
- “Select the Boot Device” on page 266
- “Enable or Disable Oracle System Assistant” on page 268
- “Configure TPM Support” on page 269
- “Configure SP Network Settings” on page 272
- “Configure Option ROM Settings” on page 275
- “Configure I/O Resource Allocation” on page 279
- “Exit BIOS Setup Utility” on page 279

▼ Verify BIOS Factory Default Settings

In the BIOS Setup Utility, you return the BIOS settings to the optimal factory default values, as well as view and edit settings as needed. Any changes that you make in the BIOS Setup Utility (using the F2 key) persist until the next time you change the settings.

Before you begin, ensure that the following requirements are met:

- A hard disk drive or solid state drive is properly installed in the server.
- A console connection is established to the server.

1. **Reset or power on the server.**

   - **From the local server,** press the Power button on the front panel of the server to power off the server, and then press the Power button again to power on the server.
   - **From the Oracle ILOM web interface,** click Host Management → Power Control and select Reset from the Select Action list.
   - **From the Oracle ILOM CLI,** type `reset /System`

The server resets.

2. **When prompted, press the F2 key to access the BIOS Setup Utility.**

3. **To ensure that the factory defaults are set, do the following:**

   a. **Press the F9 key to automatically load the optimal factory default settings.**

      A message appears prompting you to continue this operation by selecting OK or to cancel the operation by selecting Cancel.

   b. **In the message, highlight OK, and then press Enter.**

      The BIOS Setup Utility screen appears with the cursor highlighting the first value on the screen.

4. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

   Alternatively, you can save the changes and exit the BIOS Setup Utility by navigating to the Save & Exit Menu and selecting `Save Changes and Reset`.

Related Information

- “Access BIOS Setup Utility Menus” on page 256
- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255

▼ Select Legacy BIOS or UEFI BIOS Boot Mode

The BIOS firmware supports both Legacy BIOS BOOT Mode and UEFI BIOS Boot Mode. The default setting is Legacy BIOS Boot Mode. For more information about selecting the BIOS boot mode, refer to “Using UEFI” on page 259.

1. **Access the BIOS Setup Utility menus.**

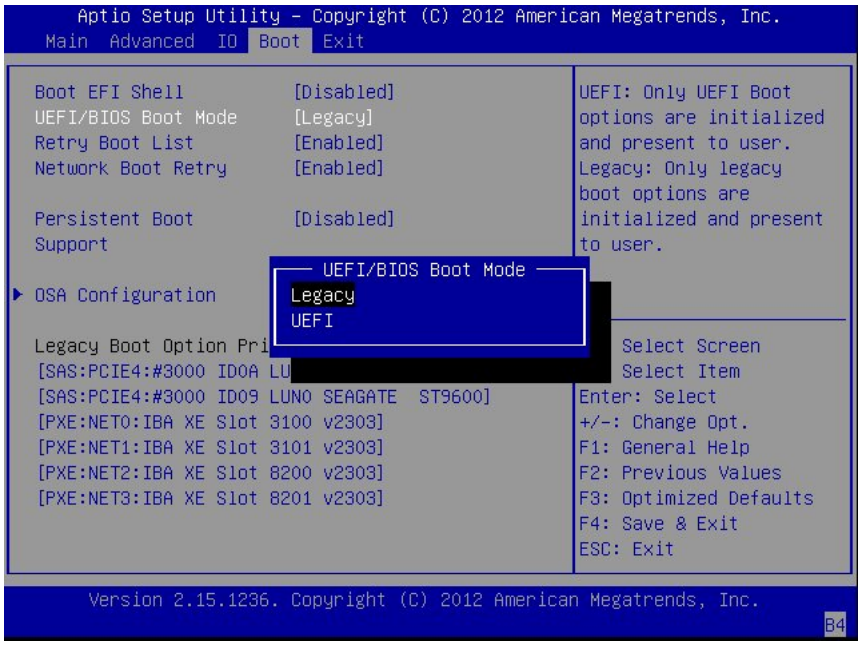
   See “Access BIOS Setup Utility Menus” on page 256.

2. **From the BIOS Main Menu screen, select `Boot`.**

   The Boot Menu screen appears.

3. **From the Boot Menu screen, use the up and down arrow keys to select `UEFI/Legacy BIOS Boot Mode`, and then press Enter.**

The UEFI/BIOS dialog box appears.



Note - You cannot configure the boot device priority after switching the boot mode. A system reboot is required to properly populate the Boot Options Priority list with devices that support the chosen boot mode.

4. **Use the up and down arrow keys to select the appropriate Legacy or UEFI mode, and then press Enter.**

5. **Press F10 to save the changes and exit the BIOS Setup Utility.**

Related Information

- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255

Select the Boot Device

The Boot Options Priority list contents depend on which BIOS mode is selected. When UEFI Boot Mode is selected, only UEFI boot candidates will be initialized and displayed in the Boot Options Priority list. When Legacy BIOS is selected, only Legacy BIOS boot candidates are initialized and displayed.

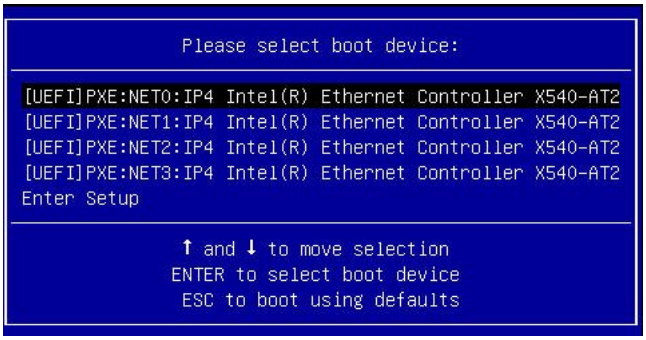
In addition to using the F2 key to view or edit the system BIOS settings, you can use the F8 key during the BIOS startup to specify a temporary boot device. This selected boot device is in effect only for the current system boot. The permanent boot device specified using the F2 key will be in effect after booting from the temporary boot device.

1. **Reset or power on the server.**

   - **From the local server,** press the Power button on the front panel of the server to power off the server, and then press the Power button again to power on the server.
   - **From the Oracle ILOM web interface,** click Host Management → Power Control and select Reset from the Select Action list.
   - **From the Oracle ILOM CLI,** type `reset /System`

2. **Press the F8 key (or Ctrl+P from a serial connection) when prompted while the UEFI is running the power-on self-test (POST).**

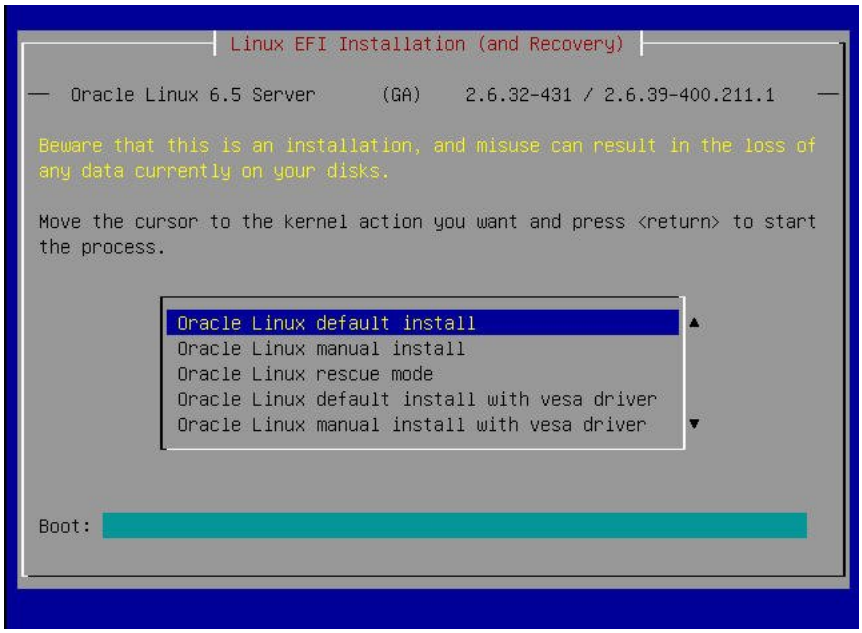
   The Please Select Boot Device dialog box appears.



3. **In the Please Select Boot Device dialog box, select the boot device according to the operating system and UEFI Boot Mode you elected to use, and then press Enter.**

Note - Based on the boot mode you selected (UEFI BIOS Boot Mode or Legacy BIOS Boot Mode), the Please Select Boot Device dialog box displays only the applicable devices. For example, when the UEFI BIOS Boot Mode is elected, only UEFI BIOS boot devices are displayed in the dialog box.

A dialog box similar to the following appears.



4. **Follow the on-screen instructions to install the operating system from the selected boot device.**

Related Information

- “BIOS Setup Utility Menus” on page 254
- “BIOS Key Mappings” on page 255

Enable or Disable Oracle System Assistant

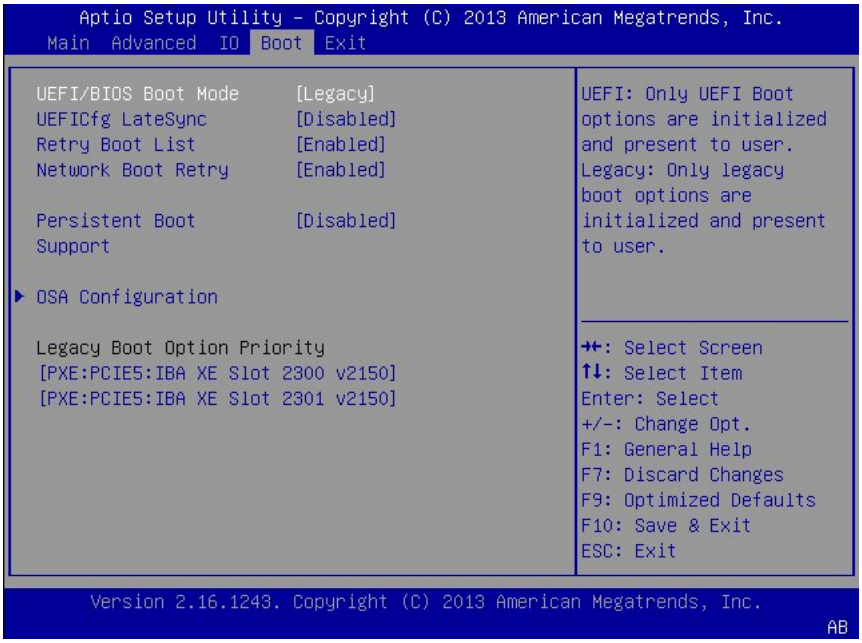
If you have disabled Oracle System Assistant, you can use the BIOS Setup Utility Boot Menu to put the USB device in an online state, so that Oracle System Assistant becomes available to the operating system.

1. **Access the BIOS Setup Utility.**

   See “Access BIOS Setup Utility Menus” on page 256.

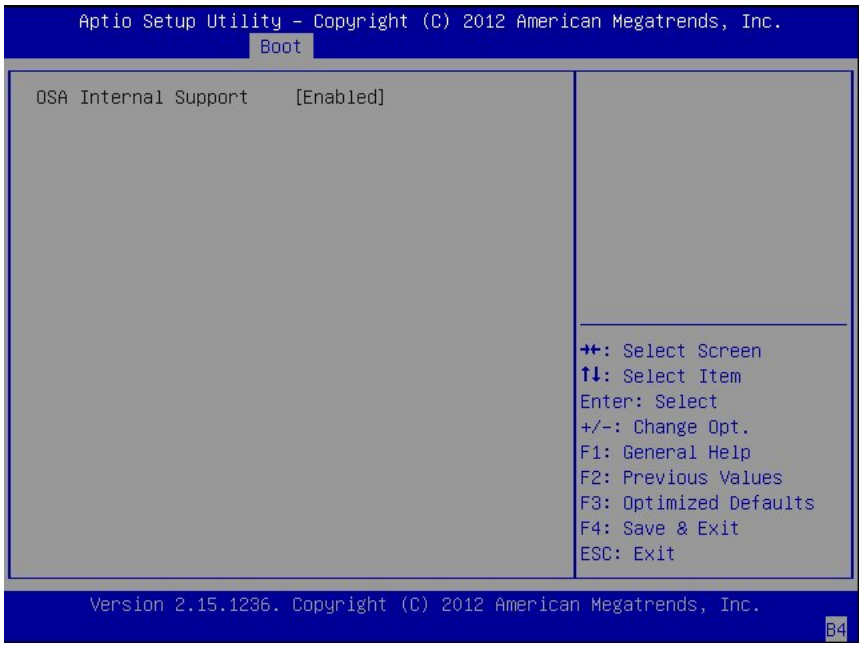
2. **In the BIOS Setup Utility menus, navigate to the Boot Menu.**

   The Boot Menu screen appears.



3. **Select `OSA Configuration`.**

The OSA Configuration screen appears. The setting for OSA Internal Support is either `Enabled` or `Disabled`.



4. **To change the setting, use the + or - key (plus or minus key), and then press Enter to select either `Enabled` or `Disabled`.**
5. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

- “BIOS Boot Menu Selections” on page 301

▼ Configure TPM Support

If you intend to use the Trusted Platform Module (TPM) feature set, you must configure the server to support this feature.

Note - TPM enables you to administer the TPM security hardware in your server. For additional information about implementing this feature, refer to the Windows Trusted Platform Module Management documentation provided by your operating system or third-party software vendor.

1. **Access the BIOS Setup Utility menus.**

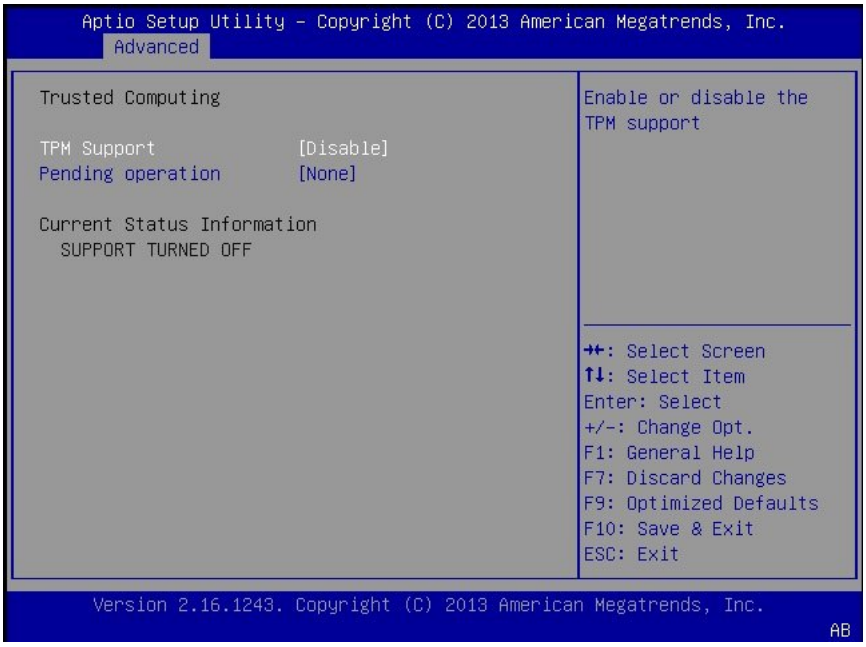
   See "Access BIOS Setup Utility Menus" on page 256.

2. **In the BIOS Setup Utility menus, navigate to the Advanced Menu.**

   The Advanced Menu screen appears.

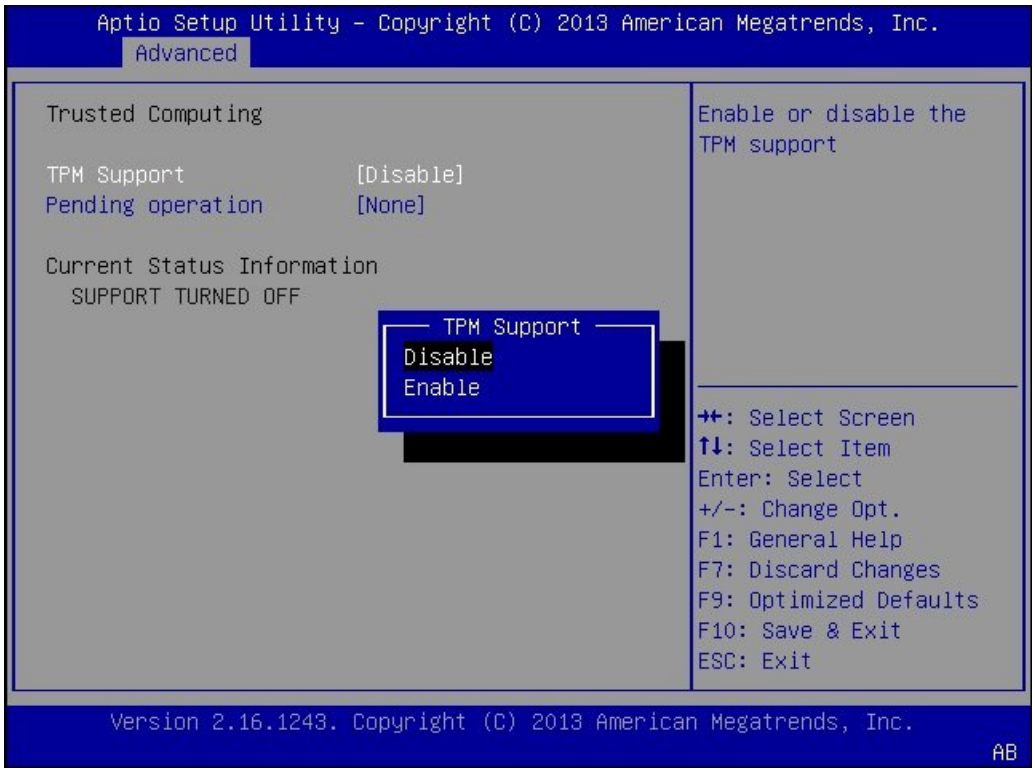
3. **In the Advanced Menu screen, select `Trusted Computing`.**

   The TPM Configuration screen appears.



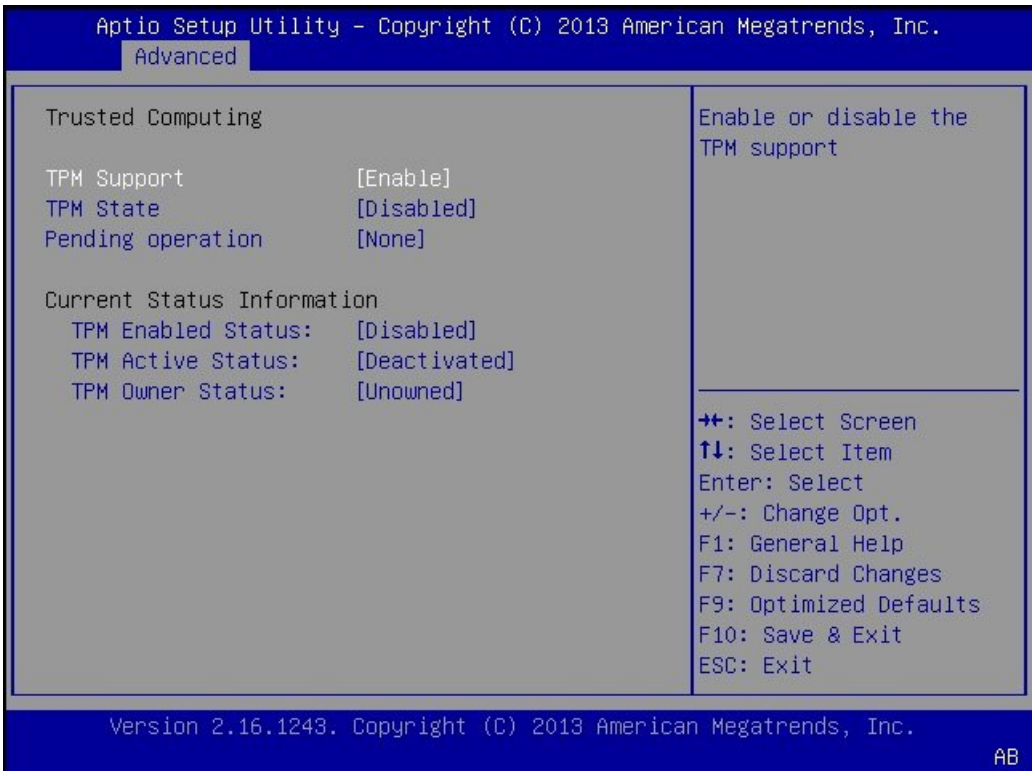
4. **TPM Support is listed as `Disabled` (it is disabled by default). Select `TPM Support` and press Enter.**

A TPM Support dialog box appears.



5. **In the dialog box, set `TPM Support` to `Enable`, and then press Enter.**

The updated TPM Configuration screen appears.



6. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

- "BIOS Setup Utility Menus" on page 254
- Microsoft's Windows Trusted Platform Module Management documentation

▼ Configure SP Network Settings

Choose one of the following methods to specify service processor (SP) network settings:

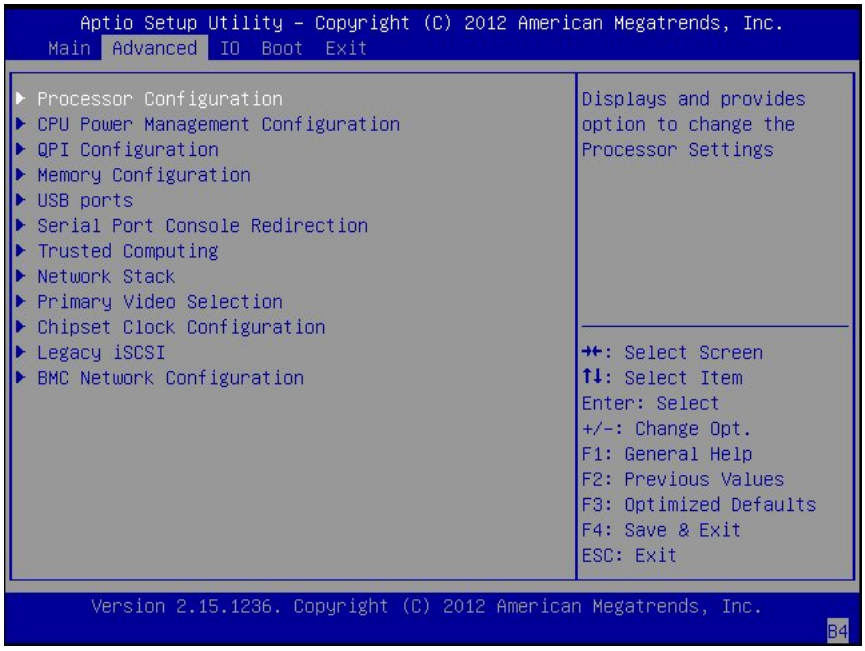
- **BIOS** – Assign the IP address for the server SP from the BIOS Setup Utility on the Advanced Menu.
- **Oracle ILOM** – For instructions on setting the IP address for the server SP using Oracle ILOM, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.
- **Oracle System Assistant** – For instructions on using Oracle System Assistant to configure SP network settings, refer to *Oracle X5 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`.

1. **Access the BIOS Setup Utility menus.**

   See "Access BIOS Setup Utility Menus" on page 256.

2. **In the BIOS Setup Utility menus, navigate to the Advanced Menu.**

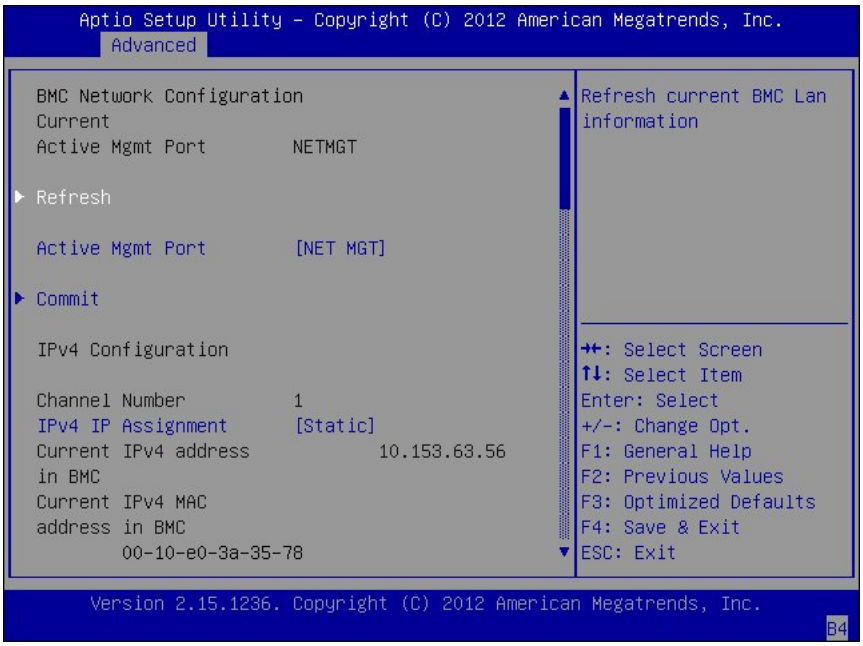
   The Advanced Menu screen appears.



3. **In the Advanced Menu, select `BMC Network Configuration`, and then press Enter.**

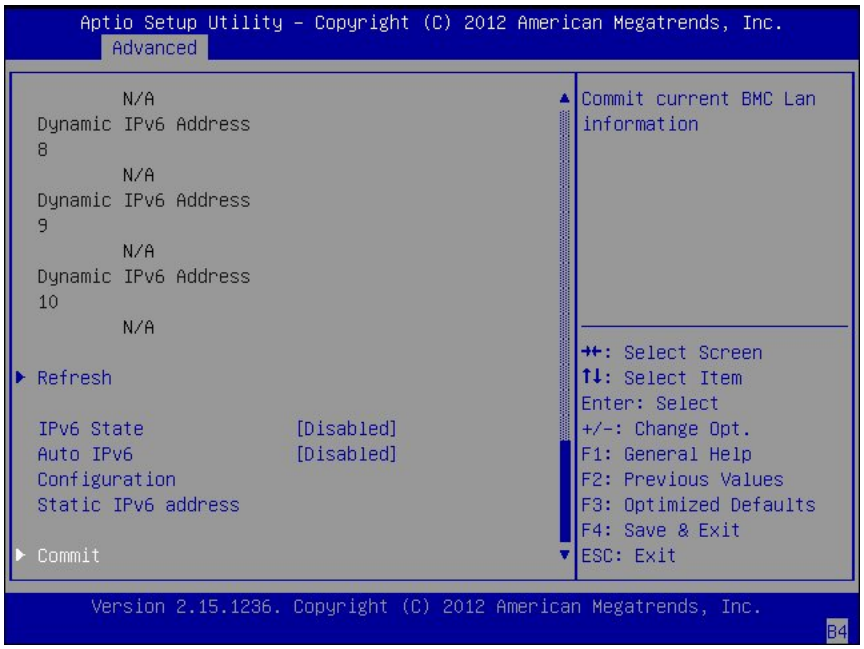
   The BMC Network Configuration screen appears.

The BMC is the Baseboard Management Controller.



4. **Select `Refresh`, and then press Enter to display the current BMC network settings.**

The BMC Network Configuration screen refreshes. Scroll down to review BMC network settings.



5. **Select `Commit` to update the BMC network settings with the latest values.**
6. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

- “BIOS Setup Utility Menus” on page 254

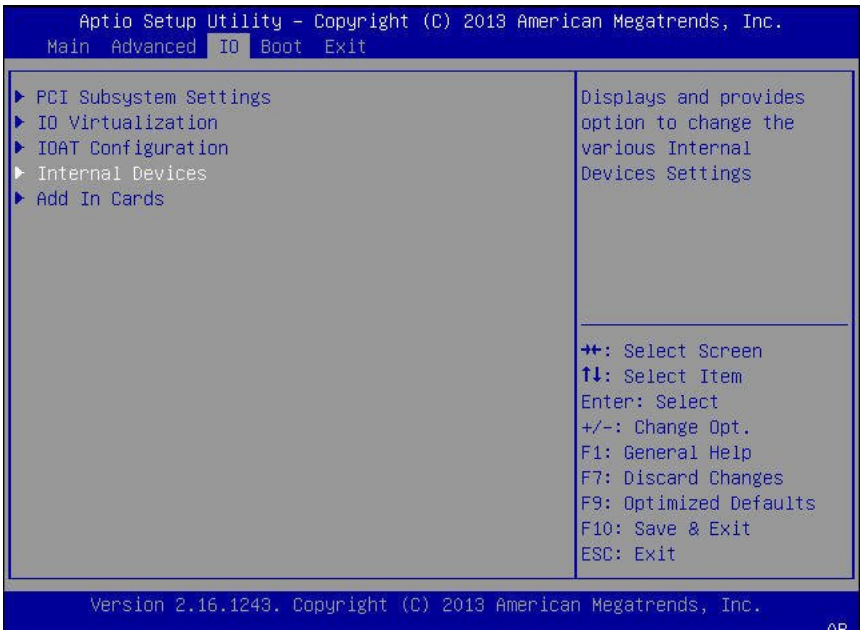
▼ Configure Option ROM Settings

1. **Access the BIOS Setup Utility menus.**

   See “Access BIOS Setup Utility Menus” on page 256.

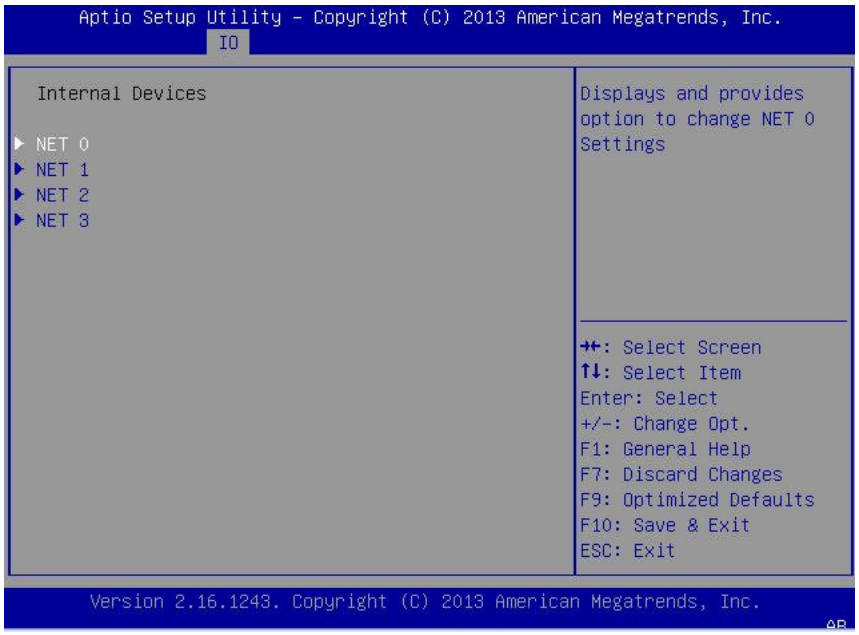
2. **In the BIOS Setup Utility menus, navigate to the IO Menu.**

The IO Menu screen appears.



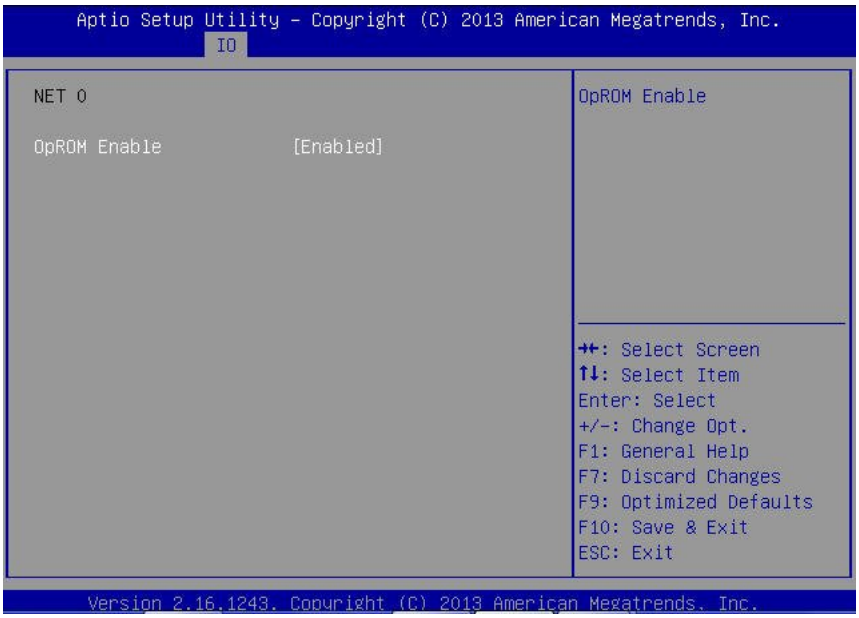
3. **In the IO Menu, select either Internal Devices or Add In Cards and press Enter to display the internal device or add-in card slot for which you want to enable or disable Option ROM.**

The Internal Devices or Add In Cards screen appears.



4. **Select the internal device or add In card slot that you want to configure.**

The Option ROM screen for that internal device or add-in card slot appears.



5. **Select OpROM Enable and press Enter. Do one of the following:**

   - **Select `Enabled` to enable the Option ROM setting.**
   - **Select `Disabled` to disable the Option ROM setting.**

6. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

- “Legacy Option ROM Allocation” on page 262
- “Access BIOS Setup Utility Menus” on page 256
- “BIOS Setup Utility Menus” on page 254

Configure I/O Resource Allocation

1. **Access the BIOS Setup Utility menus.**
   See “Access BIOS Setup Utility Menus” on page 256.
2. **In the BIOS Setup Utility menus, navigate to the IO Menu.**
   The IO Menu screen appears.
3. **Select Add In Cards and press Enter to display the add-in card slots.**
4. **Select the slot for which you want to configure the card, and press Enter.**
5. **Do one of the following:**
   - **Select `Enabled` to enable I/O resource allocation for the I/O card.**
   - **Select `Disabled` to disable I/O resource allocation for the I/O card.**
6. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

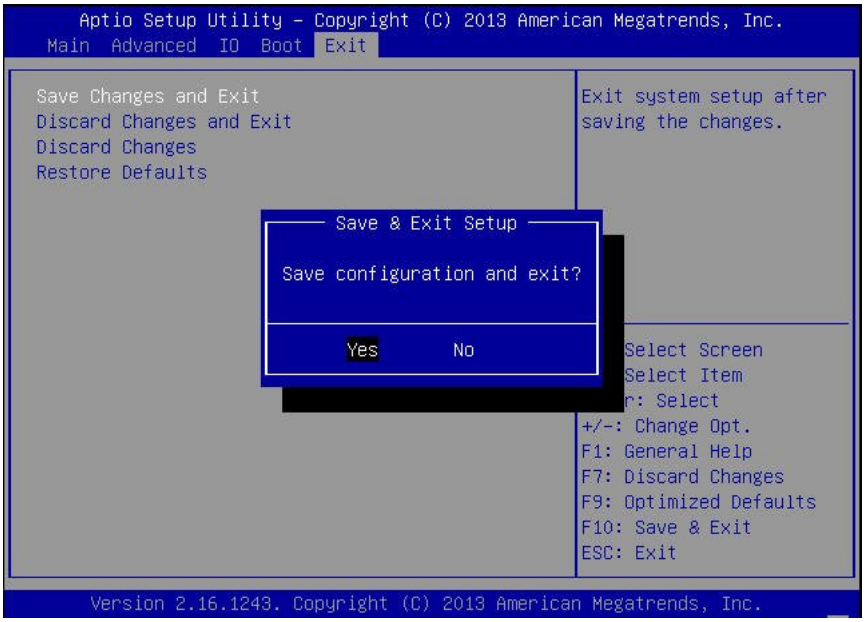
Related Information

- “Access BIOS Setup Utility Menus” on page 256
- “BIOS Setup Utility Menus” on page 254

Exit BIOS Setup Utility

1. **Use the left and right arrow keys to navigate to the top-level Save & Exit Menu.**
2. **Use the up and down arrow keys to select the desired action.**
3. **Press Enter to select the option.**

A confirmation dialog box appears.



4. **In the confirmation dialog box, select `Yes` to proceed and exit the BIOS Setup Utility, or select `No` to stop the exit process.**

Note - After modifying any BIOS settings and selecting `Save Changes and Exit` from the Save & Exit Menu, the subsequent reboot might take longer than a typical reboot where no settings were modified. The additional delay is required to ensure that changes to the BIOS settings are synchronized with Oracle ILOM.

Related Information

- “Access BIOS Setup Utility Menus” on page 256
- “BIOS Setup Utility Menus” on page 254

BIOS Setup Utility Menu Options

This section includes screenshots of the main menus in the BIOS Setup Utility for the Oracle Server X5-2L. Following the screenshot for each menu is a table of the options available from that menu.

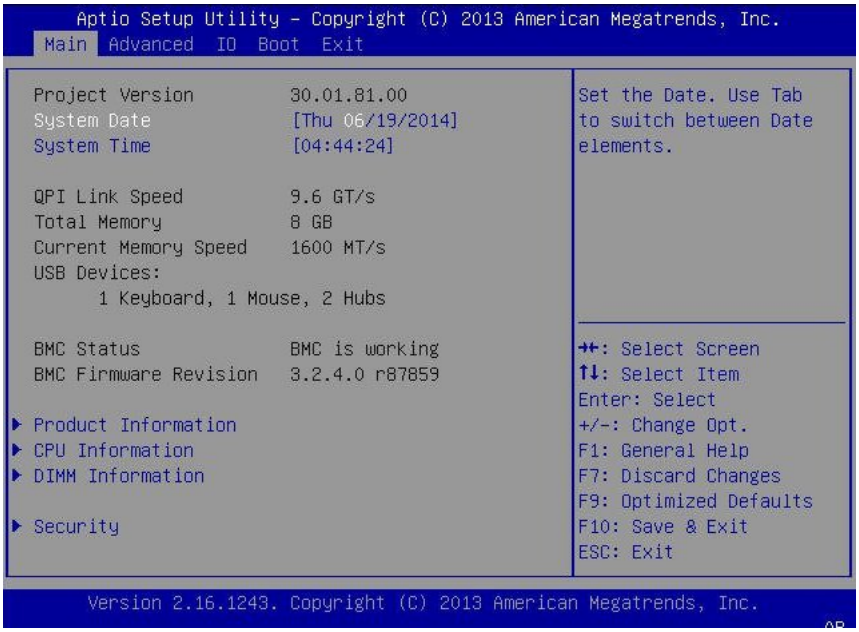
Description	Links
Review the BIOS Main Menu selections.	“BIOS Main Menu Selections” on page 281
Review the BIOS Advanced Menu selections.	“BIOS Advanced Menu Selections” on page 285
Review the BIOS IO Menu selections.	“BIOS IO Menu Selections” on page 298
Review the Boot Menu selections.	“BIOS Boot Menu Selections” on page 301
Review the BIOS Exit Menu selections.	“BIOS Exit Menu Selections” on page 303

Related Information

- *Oracle X5 Series Servers Administration Guide* at: `http://www.oracle.com/goto/x86admindiag/docs`
- “Setting Up BIOS Configuration Parameters” on page 253

BIOS Main Menu Selections

This section includes a screenshot of the BIOS Main Menu. The options that are available from the Main Menu are described in the table that follows. Options in the table that are marked as “(R/O)” are read-only information and cannot be changed.



The following table describes the options provided by the BIOS Main menu and sub-menus.

TABLE 23 BIOS Main Menu Options

Setup Options	Options	Defaults	Description
Project Version (R/O)			BIOS version is displayed. This string is a unique identifier used to reference a specific BIOS release. Format is XXYYZZPP, which indicates: ■ XX - Unique project/platform code. ■ YY - BIOS major release. ■ ZZ - BIOS minor release. ■ PP - Build number. Example: 18.01.04.01
System Date			Current date is displayed. You can change the date setting. Example: [Thu 06/20/2014]
System Time			Current time is displayed. You can change the time setting. Example: [13:38:27]

Setup Options	Options	Defaults	Description
QPI Link Speed (R/O)	SLOW/ 6.4 GT/s 7.2 GT/s 8.0 GT/s 9.6 GT/s		Intel Quick Path Interconnect (QPI) operational speed is displayed.
Total Memory (R/O)			Memory in gigabytes is displayed. Example: 224 GB
Current Memory Speed (R/O)			Memory speed is displayed. Example: 1333 MHz
USB Devices (R/O)			Detected USB devices are displayed. Example: 1 Drive, 2 keyboards, 1 mouse, 3 hubs
BMC Status (R/O)			Detected condition of the service processor. Example: BMC is working
BMC Firmware Revision (R/O)			The service processor firmware version is displayed. Example: 3.2.0.0 r84011
PRODUCT INFORMATION (R/O)			Product information is displayed.
Product Name			Product name is displayed. Example: Oracle Server X5-2L
Product Serial Number			Product serial number is displayed. Example: 1134FML00V
Board Serial Number			Board serial number is displayed. Example: 0328MSL-1132U900
CPU INFORMATION (R/O)			Attributes of a single processor (CPU) are defined. A separate information structure is provided for each processor supported in the system. Most of the values are dependent on the processor.
Socket 0 CPU Information (R/O)			If CPU socket 0 is populated, the following options are listed. Otherwise, displays “Not Present.”
Genuine Intel CPU @ 2.6 GHz			Processor ID brand is displayed.
CPU Signature			Processor information is displayed.

Setup Options	Options	Defaults	Description
			Example: 306F1
Microcode Patch			Software update (microcode patch) information is displayed. Example: 80000011
Max CPU Speed			Maximum non-turbo speed of the processor is displayed. Example: 2100 MHz
Min CPU Speed			Minimum speed of the processor is displayed. Example: 1200 MHz
Processor Cores			Number of available processor cores is displayed. Example: 18
Active processor cores			Number of active processor cores is displayed.
Intel HT Technology			Indicates whether Intel Hyper Threading is supported.
Intel VT-x Technology			Indicates whether Intel Virtualization Technology is supported.
L1 Data Cache			Example: 448
L1 Code Cache			Example: 448
L2 Cache			Example: 3584 KB
L3 Cache			Example: 35840 KB
Socket 1 CPU Information (R/O)			If CPU socket 1 is populated, the same options as Socket 0 CPU Information are displayed. Otherwise, displays “Not Present.”
DIMM INFORMATION (R/O)			Memory module (DIMM) presence and size information are displayed.
Socket 0 DIMMs (R/O)			For D0...D11, if a DIMM is present, memory size (in gigabytes) is displayed. Otherwise, displays “Not Present.”
Socket 1 DIMMs (R/O)			Same as CPU socket 0.
SECURITY SETTING			Configure the security setting.
Administrator Password			Set the Administrator password.

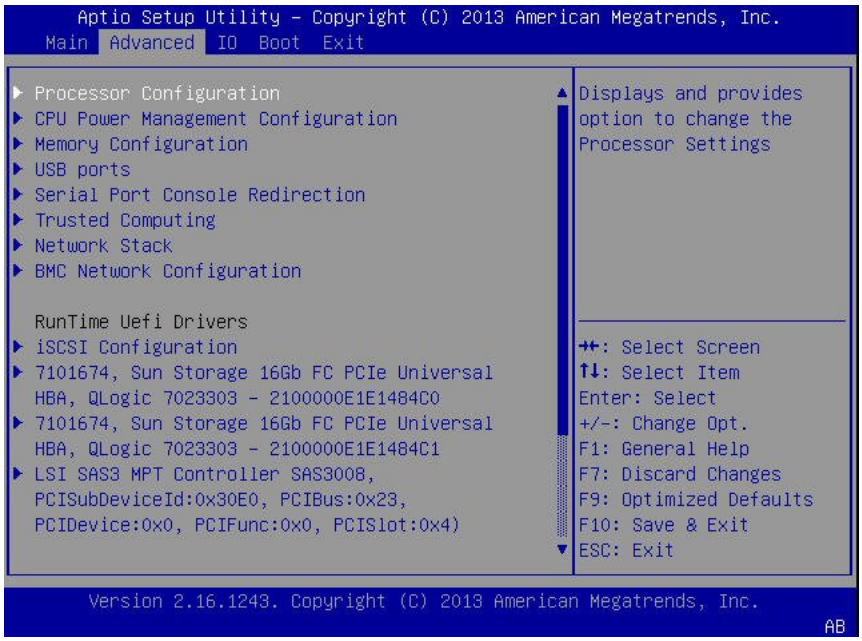
Related Information

- “BIOS Advanced Menu Selections” on page 285

- “BIOS IO Menu Selections” on page 298
- “BIOS Boot Menu Selections” on page 301
- “BIOS Exit Menu Selections” on page 303

BIOS Advanced Menu Selections

This section includes a screenshot of the BIOS Advanced Menu. The options that are available from the Advanced Menu are described in the sections that follow. Options in the tables that are marked as “(R/O)” are read-only information and cannot be changed.



The following sections describe the BIOS Advanced Menu options:

- “BIOS Advanced Menu Processor Configuration Options” on page 286
- “BIOS Advanced Menu CPU Power Management Configuration Options” on page 287
- “BIOS Advanced Menu Memory Configuration Option” on page 287
- “BIOS Advanced Menu USB Ports Options” on page 288
- “BIOS Advanced Menu Serial Port Console Redirection Options” on page 289

- "BIOS Advanced Menu Trusted Computing Options" on page 290
- "BIOS Advanced Menu Network Stack Options" on page 291
- "BIOS Advanced Menu BMC Network Configuration Options" on page 292
- "BIOS Advanced Menu iSCSI Configuration Options" on page 295
- "BIOS Advanced Menu Ethernet Controller Options" on page 296

BIOS Advanced Menu Processor Configuration Options

The following table describes the BIOS Advanced Menu processor configuration options.

TABLE 24 BIOS Advanced Menu Processor Configuration

Setup Options	Options	Defaults	Description
Hyper-threading	Disabled/Enabled	Enabled	Use to enable Hyper Threading. When enabled, two threads are available per enabled core. When disabled, only one thread per enabled core is available.
Active Processor Cores	A minimum of one up to the maximum number of cores available in the processor package.	All	The number of cores to enable in each processor package.
Execute Disable Bit	Disabled/Enabled	Enabled	When disabled, forces XD features flag to always return 0.
Hardware Prefetcher	Disabled/Enabled	Enabled	Enable the mid-level cache (MLC) streamer prefetcher (MSR 1A4h bit [0]).
Adjacent Cache Prefetch	Disabled/Enabled	Enabled	Enable the mid-level cache (MLC) streamer prefetcher (MSR 1A4h bit [1]).
DCU Streamer Prefetcher	Disabled/Enabled	Enabled	Enable DCU streamer prefetcher, which is a L1 data cache prefetcher (MSR 1A4h [2]).
DCP IP Prefetcher	Disabled/Enabled	Enabled	Enable DCU IP prefetcher, which is a L1 data cache prefetcher (MSR 1A4h [3]).
Intel Virtualization Technology	Disabled/Enabled	Enabled	When enabled, a Virtual Machine Manager (VMM) can utilize the additional hardware capabilities provided by Intel Virtualization Technology.

BIOS Advanced Menu CPU Power Management Configuration Options

The following table describes the BIOS Advanced Menu CPU power management configuration options.

TABLE 25 BIOS Advanced Menu CPU Power Management Configuration

Setup Options	Options	Defaults	Description
Power Technology	Disabled/Energy Efficient/ Custom	Custom	Enables the power management features.
EIST (GV3)	Endabled/Disabled	Enabled	Enable or disable Enhanced Intel SpeedStep Technology (EIST).
Turbo Mode	Enabled/Disabled	Enabled	Enabled mode is supported only if Turbo Mode is supported in the CPU. Enabled mode also requires that Enhanced Multi Threaded Thermal Monitoring (EMTTM) be enabled on the CPU.
CPU C3 report	Enabled/Disabled	Disabled	Enable/disable the CPU C3 (ACPI C3) report to the operating system.
CPU C6 report	Enabled/Disabled	Enabled	Enable/disable the CPU C6 (ACPI C3) report to the operating system.
CPU C7 report	Enabled/Disabled	Disabled	Enable/disable the CPU C7 (ACPI C3) report to the operating system.
Package C State limit	Endabled/Disabled	Enabled	Enable/disable Package C State limit.
Energy_PERF_BIAS_CFG mode	PERF/Balanced Perf/Balanced Power/Power	Balanced Perf	Use this option to select the Energy_PERF_BIAS_CFG mode.
Uncore Frequency Scaling	Endabled/Disabled	Disabled	Enable/disable Uncore Frequency Scaling (USF).

BIOS Advanced Menu Memory Configuration Option

The following table describes the BIOS Advanced Menu memory configuration option.

TABLE 26 BIOS Advanced Menu Memory Configuration Option

Setup Option	Options	Defaults	Description
Numa	Enabled/Disabled	Enabled	Enable or disable Non Uniform Memory Access (NUMA).
COD Enable	Enabled/Disabled	Disabled	Enable or disable Cluster on Die.

BIOS Advanced Menu USB Ports Options

The following table describes the BIOS Advanced Menu USB ports options.

TABLE 27 BIOS Advanced Menu USB Ports

Setup Options	Options	Defaults	Description
EHCI Hand-off	Disabled/Enabled	Disabled	Enable or disable Enhanced Host Controller Interface (EHCI) hand-off support. This is a workaround for operating systems without EHCI hand-off support. The EHCI change of ownership should be claimed by the EHCI driver.
Port 60/64 Emulation	Disabled/Enabled	Enabled	Enable I/O port 60h/64h emulation support. Enable this setting for the complete USB keyboard legacy support for non-USB aware operating systems.
EHCI Controller 1	Disabled/Enabled	Enabled	Enable or disable EHCI Controller 1.
EHCI Controller 2	Disabled/Enabled	Enabled	Enable or disable EHCI Controller 2.
Rear Port #0	Disabled/Enabled	Enabled	Enable or disable USB Rear Port 0.
Rear Port #1	Disabled/Enabled	Enabled	Enable or disable USB Rear Port 1.
Front Port #0	Disabled/Enabled	Enabled	Enable or disable USB Front Port 0.
Front Port #1	Disabled/Enabled	Enabled	Enable or disable USB Front Port 1.
Internal Port #0	Disabled/Enabled	Enabled	Enable or disable USB Internal Port 0.
Internal Port #1	Disabled/Enabled	Enabled	Enable or disable USB Internal Port 1.

BIOS Advanced Menu Serial Port Console Redirection Options

The following table describes the BIOS Advanced Menu serial port console redirection options.

TABLE 28 BIOS Advanced Menu Serial Port Console Redirection Options

Setup Options	Options	Defaults	Description
EMS Console Redirection	Disabled/Enabled	Disabled	Enable or disable console redirection for Windows Emergency Management Service (EMS) administration.
Console Redirection	Disabled/Enabled	Enabled	Enable or disable console redirection.
Terminal Type	VT100/VT100+/VT-UTF8/ ANSI	VT100+	Select the emulation for the terminal: ■ VT100: ASCII character set. ■ VT100+: Extends VT100 to support color, function keys, etc. ■ VT-UTF8: Uses UTF8 encoding to map Unicode characters onto one or more bytes. ■ ANSI: Extended ASCII character set.
Bits per Second	9600 19200 38400 57600 115200	9600	Select the serial port transmission speed. The speed must be matched on the connecting serial device. Long or noisy lines require lower speeds.
Data Bits	7/8	8	Select the data bits.
Parity	None/Even/Odd/Mark/Space	None	A parity bit can be sent with the data bits to detect some transmission errors. ■ None: No parity bits are sent. ■ Even: Parity bit is 0 if the number of 1s in the data bits is even. ■ Odd: Parity bit is 0 if the number of 1s in the data bits is odd.

Setup Options	Options	Defaults	Description
			■ Mark: Parity bit is always 1. ■ Space: Parity bit is always 0. Mark and Space parity do not allow for error detection. They can be used as an additional data bit.
Stop Bits	1/2	1	Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning of a serial data packet.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.
Flow Control	None, Hardware RTS/CTS, Software Xon/Xoff	None	Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to restart the flow. Hardware flow control uses two wires to send start/stop signals.

BIOS Advanced Menu Trusted Computing Options

The following table describes the BIOS Advanced Menu trusted computing options.

TABLE 29 BIOS Advanced Menu Trusted Computing Options

Setup Options	Options	Defaults	Description
TPM Support	Disabled/Enabled	Disabled	Enable or disable Trusted Platform Module (TPM) support. Only UEFI BIOS implements this setup option. If disabled, the OS will not show TPM. Reset of the platform is required.
TPM State	Disabled/Enabled	Disabled	Displays whether TPM Support is enabled.

Setup Options	Options	Defaults	Description
			Note - This option is available only if TPM Support is set to enabled.
Pending Operation	None/Enable Take Ownership/ Disable Take Ownership/TPM Clear	None	Used to schedule an operation for the security device. **Note -** Your computer will reboot during restart in order to change the state of a security device.
Current Status Information			If TPM Support is disabled, Current Status Information displays SUPPORT Turned OFF.”
TPM Enabled Status	Disabled/Enabled	Disabled	Use this option to provide the current capability state of the security device. **Note -** This option is available only if TPM Support is set to enabled.
TPM Active Status	Deactivated/Activated	Deactivated	Use this option to provide the current capability state of the security device. **Note -** This option is available only if TPM Support is set to enabled.
TPM Owner Status	Owned/Unowned	Unowned	Use this option to provide the current ownership state. **Note -** This option is available only if TPM Support is set to enabled.

BIOS Advanced Menu Network Stack Options

The following table describes the BIOS Advanced Menu network stack options.

TABLE 30 BIOS Advanced Menu Network Stack Options

Setup Options	Options	Defaults	Description
Network Stack	Disabled/Enabled	Enabled	Enable or disable the UEFI network stack.
Ipv4 PXE Support	Disabled/Enabled	Enabled	Enable or disable IPv4 PXE Boot support. If disable, the IPv4 Boot Option will not be created.
Ipv6 PXE Support	Disabled/Enabled	Disabled	Enable or disable IPv6 PXE Boot support. If disable, the

Setup Options	Options	Defaults	Description
			IPv6 Boot Option will not be created.

BIOS Advanced Menu BMC Network Configuration Options

The following table describes the BIOS Advanced Menu BMC network configuration options.

TABLE 31 BIOS Advanced Menu BMC Network Configuration Options

Setup Options	Options	Defaults	Description
Current Active Management Port (R/O)	NA	NETMGT	The currently active management port.
Refresh	NA	NA	Refresh current BMC LAN information with the latest information from the service processor.
Active Mgmt Port	NET MGT/NET0/NET1/NET2/ NET3	NET MGT	Use to change the currently active network management port.
Commit	NA	NA	Commit the current BMC network LAN information.
IPv4 Configuration	NA	NA	Current configuration of the IPv4 settings is displayed.
Channel Number (R/O)		1	Current channel number is displayed.
Current IPv4 IP Assignment in BMC (R/O)	Static/Dynamic	Static	Set the IPV4 IP assignment to Static or Dynamic. This setting determines whether the service processor is assigned a static IPv4 address or assigned a dynamic IPv4 address using Dynamic Host Control Protocol (DHCP).
Current IPv4 address in BMC (R/O)	NA	NA	Displays the current IPv4 address in the BMC.
Current IPv4 MAC Address in BMC (R/O)	NA	NA	If IPv4 Assignment is set to Static, set the IPv4 address for the service processor. Example: 172.31.255.255
Current IPv4 Subnet Mask in BMC (R/O)	NA	NA	If the IPv4 Assignment is set to Static, set the IPv4 subnet mask.

Setup Options	Options	Defaults	Description
			Example: 255.255.255.0
Current IPv4 Default Gateway in BMC	NA	NA	If the IPv4 Assignment is set to Static, set the IPv4 default gateway Example: 172.31.255.255
Refresh			Refresh the current BMC LAN information.
IPv4 IP Assignment	Static/Dynamic	Static	Current IPv4 assignment.
IPv4 Address	NA	NA	If set, current IPv4 address is displayed.
IPv4 Subnet Mask	NA	NA	If set, current IPv4 Subnet Mask is displayed.
IPv4 Default Gateway	NA	NA	If set, current IPv4 Default Gateway is displayed.
Commit			Commit the current BMC LAN information.
IPv6 Configuration			Current configuration of the IPv6 settings is displayed. IPv6 addresses are written with hexadecimal digits and colon separators. For example: 2001: 0db0:000:82a1:0000:0000:1234: abcd. IPv6 addresses are composed of two parts: a 64-bit subnet prefix and a 64-bit host interface ID. To shorten the IPv6 address, you can (1) omit all leading zeros, and (2) replace one consecutive group of zeros with a double colon (::). For example: 2001: db0:0:82a1::1234:abcd.
Channel Number (R/O)		1	Current channel number is displayed.
Current IPv6 State (R/O)	Enabled/Disabled	Enabled	Current IPv6 state is displayed.
Current IPv6 Auto Configuration (R/O)	Stateful/Stateless	Stateless	Current IPv6 autoconfiguration parameters are displayed.
Link Local IPv6 Address (R/O)			Current link local IPv6 address is displayed. Example: fe80::214:4fff:feca: 5f7e/64
Static IPv6 Address (R/O)			Current static IPv6 address is displayed.

Setup Options	Options	Defaults	Description
			Example: 2001:0db0:000:82a1:0000:0000:1234:abcd
IPv6 Gateway (R/O)			Current IPv6 gateway address is displayed. Example: fe80::211:5dff:febe:5000/128
Dynamic IPv6 Address 1-*n* (R/O)			Current dynamic IPv6 addresses are displayed. Example: fec0:a:8:b7:214:4fff:feca:5f7e/64
Refresh			Select Refresh to update to the current settings.
IPv6 State	Disabled/Enabled	Disabled	Set the IPv6 state to enabled or disabled.
Auto IPv6 Configuration	Disabled/ Stateless/ Dhcpv6_stateless/ Dhcpv6_stateful	Disabled	Autoconfiguration options are: ■ Disabled: When autoconfiguration is disabled, only the Link Local address is set. None of the autoconfiguration options to configure an IPv6 address are run. ■ Stateless: When enabled, the IPv6 Stateless autoconfiguration is run to learn the IPv6 addresses for the device. ■ Dhcpv6_stateless: When enabled, the Dhcpv6_stateless autoconfiguration is run to learn the DNS and domain information for the device. ■ Dhcpv6_stateful: When enabled, the Dhcpv6_stateful autoconfiguration is run to learn the IP addresses and DNS information for the device.
Static IPv6 Address (R/O)			Set the static IPv6 address. Example: 2001:0db0:000.82a1:0000:0000:1234:abcd
Commit			Commit the current BMC LAN information.

BIOS Advanced Menu iSCSI Configuration Options

The following table describes the BIOS Advanced Menu iSCSI configuration options.

TABLE 32 BIOS Advanced Menu iSCSI Configuration Options

Setup Options	Options	Defaults	Description
iSCSI Initiator Name	NA (must be specified)	None	The worldwide unique name of the iSCSI Initiator. Only IQN format is accepted.
Add an Attempt			
iSCSI Attempt Name	NA (must be specified)	None	The readable name that you assigned to this attempt.
iSCSI Mode	Disabled/Enabled/Enabled for MPIO	Disabled	Set to Enabled for multipath I/O (MPIO). MPIO can boost the performance of an application by load balancing traffic across multiple ports.
Internet Protocol	IP4/IP6/Autoconfigure	IP4	Can be set to IP4, IP6, or Autoconfigure. The initiator IP address is assigned by the system to IP6. In Autoconfigure mode, the iSCSI driver attempts to connect to the iSCSI target using the IPv4 stack. If this fails, then the iSCSI driver attempt to connect using the IPv6 stack.
Connection Retry Count	0 to 16	0	The count range is 0 to 16. If set to 0, there are no retries.
Connection Establishing Timeout	NA	1,000	The timeout value in milliseconds. The minimum value is 100 milliseconds and the maximum is 20 seconds.
Configure ISID	Derived from the MAC address	The default value is derived from the Mac Address	The OUI-format ISID is 6 bytes. The default value is derived from the MAC address. Only the last 3 bytes are configurable. Example: Update 0ABBCCDDEEFF to 0ABBCCF07901 by inputting F07901
Enable DHCP	Disabled/Enabled	Disabled	Enable or disable DHCP
Initiator IP Address	NA	0.0.0.0	Use to set initiator IP address in dotted-decimal notation.

Setup Options	Options	Defaults	Description
Initiator Subnet Mask	NA	0.0.0.0	Use to set initiator subnet mask IP address in dotted-decimal notation.
Gateway	NA	0.0.0.0	Use to set initiator gateway IP address in dotted-decimal notation.
Target Name	NA	NA	The worldwide unique name of the target. Only IQN format is accepted.
Target IP address	0.0.0.0	None	Use to set target IP address in dotted-decimal notation.
Target Port		3260	Use to change target port number.
Boot LUN		0	Use to set the hexadecimal representation of the boot logical unit number (LUN). Example: 4752-3A4F-6b7e-2F99
Authentication Type	CHAP/None	CHAP	Define the Challenge-Handshake Authentication Protocol (CHAP). Available settings are CHAP, Kerberos, and None.
CHAP Type	One Way/Mutual	One Way	Use to set CHAP type to either One Way or Mutual.
CHAP Name	NA	None	Use to set CHAP name.
CHAP Secret	NA	None	Use to set the CHAP secret password. The secret length range is 12 to 16 bytes.
Delete Attempts	NA	NA	Use to delete one or more attempts.
Change Attempt Order	NA	NA	Use to change the order of attempts. Use arrow keys to select the attempt, then press +/- keys to move the attempt up/ down in the attempt order list.

BIOS Advanced Menu Ethernet Controller Options

The following table describes the BIOS Advanced Menu Ethernet controller options.

TABLE 33 BIOS Advanced Menu Ethernet Controller Options

Setup Options	Options	Defaults	Description
Port Configuration Menu			
NIC configuration			Use to configure the network device port.
Link Speed (R/O)	Supported port speeds/Auto Negotiate	NA	Specifies the port speed used for the selected boot protocol. **Note -** This option is not supported.
Wake on LAN	Disable/Enabled	NA	Enable or disable wake on LAN. **Note -** This option is not supported.
Blink LEDs	0/1/2/3	0	Use to identify the physical network port by blinking the associated LED.
Port Configuration Information			Displays and specifies the port settings for the network device.
UEFI Driver (R/O)	NA	NA	Identifies the UEFI driver.
Adapter PBA (R/O)	NA	NA	Product board adapter (PBA) number. You can use the Intel Network Adapter PBA number to search for the adapter's model number. The PBA number is a nine digit number that is the last part of the adapter board serial number. The PBA number is presented in this format: *xxxxxxx-xxx*, for example, C80222-001.
Chip Type (R/O)	NA	NA	Manufacturer and model number
PCI Device ID (R/O)		1528	Device identifier
PCI Address (R/O)	NA	NA	Bus device function identifier Example format: Bus:Device: Function
Link Status	Connected/Disconnected	Disconnected	Specifies the link status of the network port.
MAC Address (R/O)	NA	None	Lists the MAC address of the network interface card (NIC).

Related Information

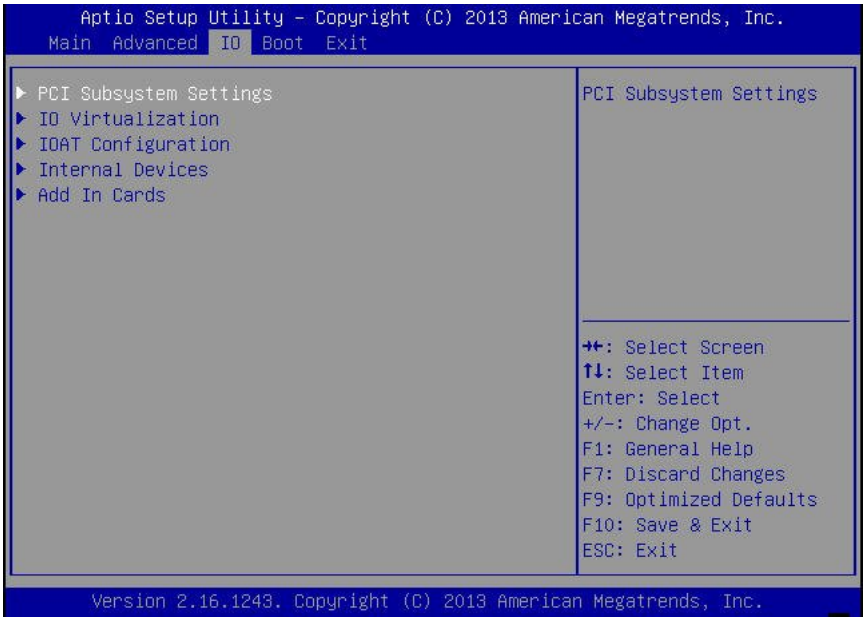
- “BIOS Main Menu Selections” on page 281
- “BIOS IO Menu Selections” on page 298
- “BIOS Boot Menu Selections” on page 301

- “BIOS Exit Menu Selections” on page 303

BIOS IO Menu Selections

This section includes a screenshot of the BIOS IO Menu. The options that are available from the IO Menu are described in the sections that follow.

Note - PCIe slots 1, 2, 3, and Ethernet ports NET2 and NET3 are nonfunctional in single-processor systems.



The following sections describe the BIOS IO Menu options.

- “BIOS IO Menu PCI Subsystem Settings Options” on page 299
- “BIOS IO Menu IO Virtualization Options” on page 299
- “BIOS IO Menu I/OAT Configuration Options” on page 300
- “BIOS IO Menu Internal Devices Options” on page 300
- “BIOS IO Menu Add In Cards Options” on page 300

BIOS IO Menu PCI Subsystem Settings Options

The following table describes the BIOS IO Menu PCI subsystem settings options.

TABLE 34 BIOS IO Menu PCI Subsystem Settings Options

Setup Options	Options	Defaults	Description
PCI 64 Bit Resources Allocation	Disabled/Enabled	Enabled	Enable or disable 64-bit capable devices to be decoded in above 4G address space. This setting is available only if the system supports 64-bit decoding.

BIOS IO Menu IO Virtualization Options

The following table describes the BIOS IO Menu IO virtualization options.

TABLE 35 BIOS IO Menu IO Virtualization Options

Setup Options	Options	Defaults	Description
VT-d	Disabled/Enabled	Enabled	Enable or disable Intel Virtualization Technology for directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMA remapping reporting (DMAR) Advance Configuration Power Interface (ACPI) tables.
SR-IOV	Disabled/Enabled	Enabled	Single Root I/O Virtualization (SR-IOV) is used to configure devices into multiple virtual devices that can be used on virtual OS installations. If supported by the hardware and set to enabled, all devices within the system that are SR-IOV capable are configured to support SR-IOV and I/O resources are allocated to the device as normal. If set to disabled, I/O resources are not allocated to the device.
ARI	Disabled/Enabled	Enabled	If Alternate Routing ID (ARI) is supported by the hardware and set to enabled, devices are permitted to locate virtual functions (VFs) in function

Setup Options	Options	Defaults	Description
			numbers 8 to 255 of the captured bus number, instead of normal function numbers 0 to 7.

BIOS IO Menu I/OAT Configuration Options

The following table describes the BIOS IO Menu I/OAT configuration options.

TABLE 36 BIOS IO Menu I/OAT Configuration Options

Setup Options	Options	Defaults	Description
Intel I/OAT	Disabled/Enabled	Enabled	Enable or disable Intel I/OAT.
DCA Support	Disabled/Enabled	Enabled	Enable or disable direct cache access (DCA) support.

BIOS IO Menu Internal Devices Options

The following table describes the BIOS IO Menu internal devices options.

TABLE 37 BIOS IO Menu Internal Devices Options

Setup Options	Options	Defaults	Description
NET0			Displays and provides options to change the internal device settings.
OpROM Enable	Disabled/Enabled	Enabled	Enable or disable Option ROM. If set to enabled, Option ROM for the card executes as normal. If set to disabled, Option ROM for the card is not copied into memory and the execution of the Option ROM is inhibited.
NET1, NET2, and NET3 **Note -** Ethernet ports NET2 and NET3 are nonfunctional in single-processor systems.			See NET0 description.

BIOS IO Menu Add In Cards Options

The following table describes the BIOS IO Menu add in cards options.

TABLE 38 BIOS IO Menu Add In Cards Options

Setup Options	Options	Defaults	Description
Slot 1 **Note -** PCIe slot 1, slot 2, and slot 3 are nonfunctional in single-processor systems.			Displays and provides options to change the settings of the devices in PCIe slots.
OpROM Enable	Disable/Enabled	Enabled	Enable or disable Option ROM for add-in card.
Slot 2, Slot 3, Slot 4, Slot 5, and Slot 6			See Slot 1 description

Related Information

- “BIOS Main Menu Selections” on page 281
- “BIOS Advanced Menu Selections” on page 285
- “BIOS Boot Menu Selections” on page 301
- “BIOS Exit Menu Selections” on page 303

BIOS Boot Menu Selections

This section includes a screenshot of the BIOS Boot Menu. The options that are available from the Boot Menu are described in the table that follows.

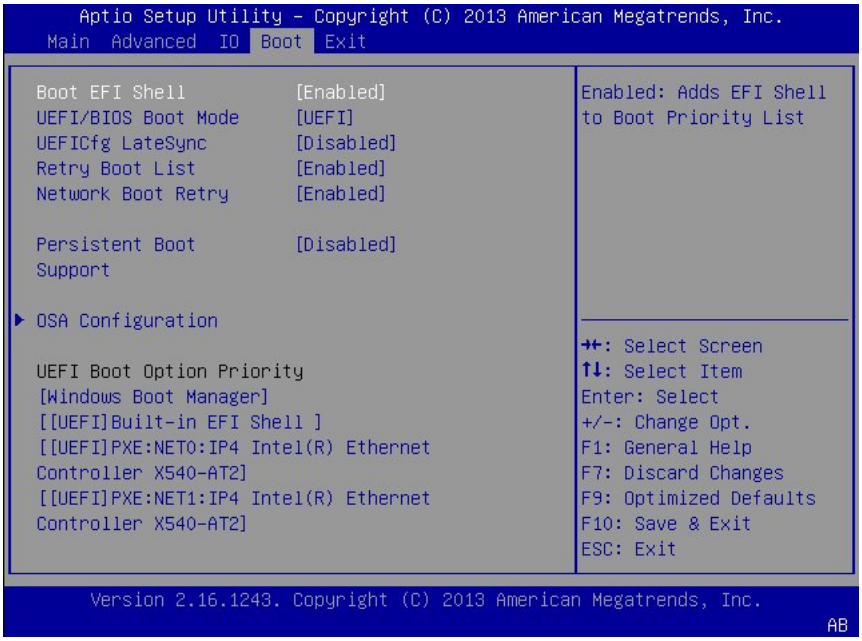


TABLE 39 BIOS Boot Menu Options

Setup Options	Options	Defaults	Description
UEFI/BIOS Boot Mode	Legacy/UEFI	Legacy	Select either Legacy BIOS or UEFI as the boot mode. ■ Enable UEFI: Only UEFI BIOS boot options are initialized and presented to the user. ■ Enable Legacy BIOS: Only Legacy BIOS boot options are initialized and presented to the user.
Retry Boot List	Disabled/Enabled	Enabled	If enabled, BIOS automatically retries to boot from the top of the Boot Options Priority list when all devices have been attempted and failed.
Network Boot Retry	Disabled/Enabled/Boot List	Enabled	If enabled, BIOS automatically retries the PXE list present in the system when all PXE attempts have failed. If set to disabled, the system halts and displays the error message “Network Boot Failed” when all PXE boots failed. If set to Boot List, fail over to the main Boot Options Priority list.

Setup Options	Options	Defaults	Description
Persistent Boot Support	Disabled/Enabled	Disabled	If enabled, the Persistent Boot feature is enabled. If disabled, system reverts back to the default boot handling from the next boot.
OSA Configuration			Configure whether the operating system recognizes Oracle System Assistant at boot.
OSA Internal Support **Note -** This option is nonfunctional if the server does not have an OSA USB flash drive installed.	Disabled/Enabled	Enabled	Enable or disable the OSA flash drive's USB port.
Legacy Boot Option Priority	UEFI/Legacy	Legacy	Displays the system boot order.

Related Information

- “BIOS Main Menu Selections” on page 281
- “BIOS Advanced Menu Selections” on page 285
- “BIOS IO Menu Selections” on page 298
- “BIOS Exit Menu Selections” on page 303

BIOS Exit Menu Selections

This section includes a screenshot of the BIOS Exit Menu. The options that are available from the Exit Menu are described in the table that follows.

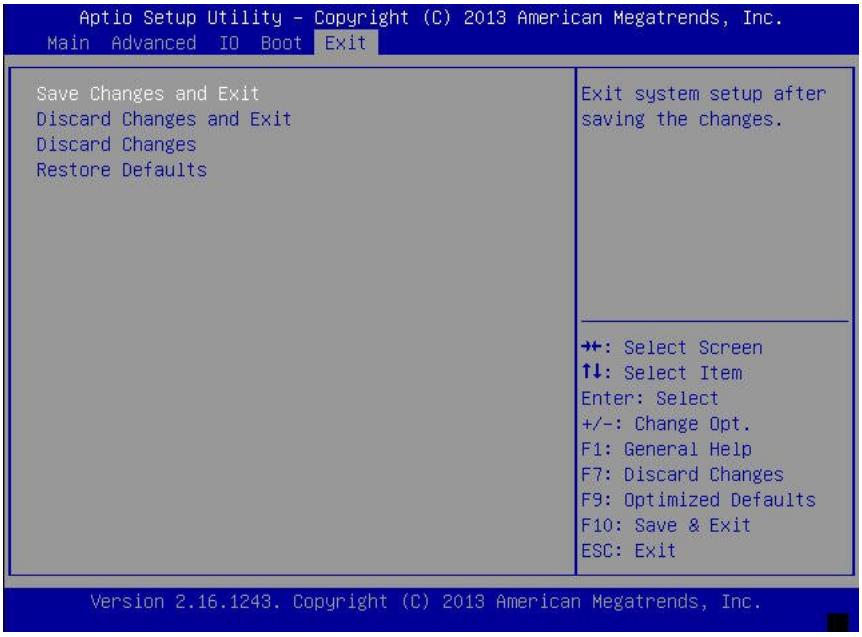


TABLE 40 BIOS Exit Menu Options

Setup Options	Description
Save Changes and Exit	Save changes and exit the BIOS Setup Utility.
Discard Changes and Exit	Exit the BIOS Setup Utility without saving changes.
Discard Changes	Discard any changes made to the setup options.
Restore Defaults	Restore/load the optimal default values for all of the setup options.

Related Information

- “BIOS Main Menu Selections” on page 281
- “BIOS Advanced Menu Selections” on page 285
- “BIOS IO Menu Selections” on page 298
- “BIOS Boot Menu Selections” on page 301

Monitoring Components and Identifying SNMP Messages

This section includes information about monitoring components and identifying SNMP messages for the Oracle Server X5-2L.

Description	Links
Review how Oracle ILOM monitors component health and faults.	"Monitoring Component Health and Faults Using Oracle ILOM" on page 305
Review information about system components and nomenclature.	"Monitoring System Components" on page 306
Review SNMP traps generated by the server.	"Identifying SNMP Trap Messages" on page 317

Related Information

- Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: `https://www.oracle.com/goto/ilom/docs`

Monitoring Component Health and Faults Using Oracle ILOM

The Oracle ILOM 5.0 interfaces provide easy-to-view information about the health status of system components. From the Oracle ILOM web interface or in the Oracle ILOM command-line interface (CLI), you can collect system-specific information about the server, determine the health state of discrete components, and view any open problems on the server. Oracle ILOM automatically detects system hardware faults and environmental conditions on the server. If a problem occurs on the server, Oracle ILOM will automatically do the following:

- Illuminate the Service Required status indicator (LED) on the server front and back panels.
- Identify the faulted component in the Open Problems table.
- Record system information about the faulted component or condition in the event log.

For further information about administering open problems that are detected and reported by Oracle ILOM, refer to “Administering Open Problems” in the *Oracle ILOM Administrator's Guide for Configuration and Maintenance Firmware Release 5.0.x* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at https://www.oracle.com/goto/ilom/docs.

Related Information

- Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: https://www.oracle.com/goto/ilom/docs

Monitoring System Components

The tables in this section identify the system components and describe the naming conventions applied to the components of the Oracle Server X5-2L.

Each section corresponds to an IPMI entity ID and lists sensors, indicators, and field-replaceable units (FRUs) related to that entity. The tables contain the following fields:

- **Component Name** – Shows the user-visible component name used in management interfaces to refer to a specific sensor, indicator, or FRU. The IPMI name is a shortened form of the component name, and is indicated by the **boldface** portion of the component name.
- **IPMI Type** – Indicates the type of sensor, indicator, or FRU represented.
- **Description** – Describes the particular component name reference.
- **Values** – Defines the states of the sensor, indicator, or FRU entity, and any specific units or values that are expected, if applicable.

Note - Some component names are hidden in the Oracle ILOM user interfaces. These names are marked as hidden in the tables. Further, as of Oracle ILOM 3.1, the Oracle ILOM 3.0 legacy targets `/SYS` and `/STORAGE` have been replaced by `/System`. Even though these legacy targets might be hidden, you can still use them to issue commands. For information on legacy targets, see the ILOM 3.1 Documentation Library at https://www.oracle.com/goto/ilom/docs.

This section includes information for the following server components:

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311

- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

System Chassis Components

The following table lists the system chassis components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/**SYS**	FRU	Product information only	
/SYS/**UUID**	FRU	Unique system ID	Derived from host MAC address. Used for PXE boot and licensing.
/SYS/**ACPI**	State sensor	Advanced Configuration and Power Interface	(*hidden*) 01h-ACPI_ON_WORKING 20h-ACPI_SOFT_OFF
/SYS/**VPS**	Threshold sensor	Virtual power sensor	Watts
/SYS/**VPS_CPUS**	Threshold sensor	Virtual power sensor (CPUs)	Watts
/SYS/**VPS_MEMORY**	Threshold sensor	Virtual power sensor (Memory)	Watts
/SYS/**VPS_FANS**	Threshold sensor	Virtual power sensor (Fans)	Watts
/SYS/**INTSW**	Discrete sensor	Chassis intrusion switch	01h-Deasserted 02h-Asserted
/SYS/**T_AMB**	Threshold sensor	Ambient temperature on system motherboard, located behind the left side front SIS indicator.	Degrees Celsius
/SYS/**TEMP_FAULT**	Indicator	Temperature Fault LED	Color: Amber Location: Front panel Off: Normal On: Chassis overtemp fault
/SYS/**OK**	Indicator	Power OK LED	Color: Green

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
			Location: Front panel Off: Power is off. Standby blink: Standby power is on; Oracle ILOM SP is running. Slow blink: Startup sequence initiated on host. On: Host is booting OS or running the OS.
/SYS/**SERVICE**	Indicator	Service Required LED	Color: Amber Location: Front panel Off: Normal On: Server requires service.
/SYS/**LOCATE**	Indicator	Locator LED	Color: White Location: Front and rear panels Off: Normal Fast blink: Locate function is activated; self-extinguishes after 30 minutes.
/SYS/**HOST_ERR**	Discrete sensor	Host asserted error sensor	01h-Deasserted 02h-Asserted
/SYS/**PS_FAULT**	Indicator	Rear Power Supply Fault LED	Color: Amber Location: Mainboard Off: Normal On: General power supply fault
/SYS/**FAN_FAULT**	Indicator	Top Fan Fault LED	Color: Amber Location: Mainboard Off: Normal On: General fan fault

Related Information

- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310

- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

Cooling Unit Components

The system has 3.5-inch fan modules with two fans in each module. The following table lists the system cooling unit components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**MB/FM[0-3]**	FRU	Fan module FRU	
/SYS/**MB/FM[0-3]/F[0-x]**	FRU	Individual fan	
/SYS/**MB/FM[0-3]/PRSNT**	Discrete sensor	Fan module is present.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**MB/FM[0-3]/F[0-x]/TACH**	Threshold sensor	Fan module fan speed	RPM
/SYS/**MB/FM[0-3]/SERVICE**	Indicator	Fan Service Required LED	Color: Amber Location: Mainboard Off: Normal On: Fan module was diagnosed as faulty.

Related Information

- “System Chassis Components” on page 307
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315

■ “Hard Disk Drive Components” on page 316

Disk Backplane Components

The following table lists the disk backplane (DBP) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**DBP**	FRU	Disk backplane FRU	
/SYS/**DBP/SASEXP**	FRU	SAS Expander FRU	
/SYS/**DBP/SASEXP/PRSNT**	Discrete sensor	SAS Expander board presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**DBP/SASEXP/T_CORE**	Threshold sensor	SAS Expander board temperature, reported by Expander CPLD	Degrees Celsius
/SYS/**DBP/HDD[0-*x*]**	Pseudo	Hard disk drives	
/SYS/**DBP/HDD[0-*x*]/PRSNT**	Discrete sensor	Hard disk drive presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**DBP/HDD[0-*x*]/STATE**	State sensor	Hard disk drive state	02h-DRIVE_FAULT 04h-PREDICTIVE_FAILURE 08h-HOT_SPARE
/SYS/**DBP/HDD[0-*x*]/SERVICE**	Indicator	Service Required LED	Color: Amber Location: Hard disk drive (HDD) Off: Normal On: HDD was diagnosed as faulty
/SYS/**DBP/HDD[0-*x*]/OK2RM**	Indicator	OK to remove	Color: Blue Location: HDD drive Off: Normal On: OK to remove HDD
/SYS/**DBP/NVME[0-*x*]**		NVMe drives	
/SYS/**DBP/NVME[0-*x*]/PRSNT**	Discrete sensor	NVMe device presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

Memory Device Components

The following table lists the memory device components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/**P[0-*x*]/D[0-11]**	FRU	Host CPU DIMM FRU	
/SYS/MB/**P[0-*x*]/D[0-11]/PRSNT**	Discrete sensor	Host CPU DIMM is present.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/**P[0-*x*]/D[0-11]/SERVICE**	Indicator	Host CPU DIMM Service Required LED	Color: Amber Location: Mainboard Off: Normal On: DIMM was diagnosed as faulty.

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Power Unit Components” on page 312
- “Processor Components” on page 313

- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

Power Unit Components

The following table lists the power unit components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**PS[0-1]**	FRU	Power supply FRU	
/SYS/**PS[0-1]/PRSNT**	Discrete sensor	Power supply is present	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**PS[0-1]/STATE**	Discrete sensor	Multistate, power supply sensor type, per IPMI	Presence detected Failure detected Predictive failure Power supply input lost Power supply input lost or out-of-range Power supply input out-of-range Configuration error
/SYS/**PS[0-1]/P_IN**	Power sensor	Input power draw	Watts
/SYS/**PS[0-1]/P_OUT**	Power sensor	Output power	Watts
/SYS/**PS[0-1]/V_IN**	Voltage sensor	Input voltage	Volts
/SYS/**PS[0-1]/V_12V**	Voltage sensor	12V output voltage	Volts
/SYS/**PS[0-1]/V_12V_STBY**	Voltage sensor	12V standby output voltage	Volts
/SYS/**PS[0-1]/T_OUT**	Temperature sensor	Ambient temperature	Degrees Celsius

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309

- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

Processor Components

The following table lists the processor (CPU) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**MB/P[0-*x*]**	FRU	Host CPU FRU	
/SYS/**MB/P[0-*x*]/PRSNT**	Discrete sensor	Host CPU is present.	01h-ENTITY_PRESENT 02h-ENTITY_ABSENT
/SYS/**MB/P[0-*x*]/SERVICE**	Indicator	Host CPU Service Required LED	Color: Amber Location: Mainboard Off: Normal On: Processor was diagnosed as faulty.
/SYS/**MB/P[0-*x*]/V_DIMM**	Static sensor	CPU DIMM bank operating voltage	1.2V

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “System Board Components” on page 314
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

System Board Components

The following table lists the system board components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**MB**	FRU	General host system board FRU	
/SYS/**MB/CPLD**	FRU	Mainboard CPLD/FPGA firmware version	
/SYS/**MB/NET[0-3]**	FRU	Host Ethernet FRU	
/SYS/**MB/PCIE[1-6]**	FRU	PCIe slot	
/SYS/**MB/PCIE[1-6]/PRSNT**	Discrete sensor	Option card inserted into PCIe slot	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**MB/PCIE3/PCIESW**	FRU	PCIe switch for NVMe support, optional, dedicated slot	
/SYS/**MB/T_OUT_ZONE[0-2]**	Threshold sensor	Cooling zone chassis exhaust temperature, located behind the specified PCIe slots. ■ Zone 0 – PCIe slot 5 ■ Zone 1 – PCIe slot 4 ■ Zone 2 – PCIe slot 1	Degrees Celsius
/SYS/**MB/T_IN_ZONE[0-2]**	Threshold sensor	Cooling zone chassis inlet temperature, located in front of the specified PCIe slots. ■ Zone 0 – PCIe slot 5 ■ Zone 1 – PCIe slot 4 ■ Zone 2 – PCIe slot 1	Degrees Celsius
/SYS/**MB/T_CORE_NET01**	Threshold sensor	Gigabit Ethernet controller die temperature	CPU 0, NET 0+1 Degrees Celsius
/SYS/**MB/T_CORE_NET23**	Threshold sensor	Gigabit Ethernet controller die temperature	CPU 1, NET 2+3 Degrees Celsius
/SYS/**MB/T_IN_PS**	Threshold sensor	Power supply unit (PSU) inlet temperature, located directly in front of the PSU 0 air inlet.	Degrees Celsius
/SYS/**SP**	FRU	Service processor FRU	
/SYS/**SP/OK**	Indicator	SP OK LED	Color: Green Location: Front panel On: SP is operating.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
			Off: SP requires service.
/SYS/**SP/NET[0-1]**	FRU	SP Ethernet FRU	

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Firmware Components” on page 315
- “Hard Disk Drive Components” on page 316

System Firmware Components

The following table lists the system firmware components.

Component Name (Oracle ILOM CLI Target)	IPMI Type	Description
/SYS/**MB/BIOS**	FRU	BIOS FRU
/SYS/**MB/CPLD**	FRU	Mainboard CPLD/FPGA firmware

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
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Hard Disk Drive Components

The following table lists the hard disk drive (HDD) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**MB/RHDD[0-1]**	FRU	Rear hard disk drive FRU	From host
/SYS/**MB/RHDD[0-1]/PRSNT**	Discrete sensor	Rear hard disk drive presence	01h-ENTITY_PRESENT, 02h-ENTITY_ABSENT
/SYS/**MB/RHDD[0-1]/SERVICE**	Indicator	Rear hard disk drive Service Required LED	Color: Amber Location: Rear HDD Off: Normal On: Hard disk drive (HDD) was diagnosed as faulty.
/SYS/**MB/RHDD[0-1]/OK2RM**	Indicator	Rear hard disk drive OK to Remove LED	Color: Blue Location: Rear HDD Off: Normal On: OK to remove
/SYS/**MB/RHDD[0-1]/STATE**	Discrete sensor	Rear hard disk drive state	02h-DRIVE_FAULT 04h-PREDICTIVE_FAILURE 08h-HOT_SPARE
/SYS/**DBP/HDD[0-*x*]**	FRU	Hard disk drive FRU	From host
/SYS/**DBP/HDD[0-*x*]/PRSNT**	Discrete sensor	Hard disk drive presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/**DBP/HDD[0-*x*]/STATE**	Discrete sensor	Writable multistate, slot/connector sensor type, per IPMI	02h-DRIVE_FAULT 04h-PREDICTIVE_FAILURE 08h-HOT_SPARE
/SYS/**DBP/HDD[0-*x*]/SERVICE**	Indicator	Hard disk drive Service Required LED	Color: Amber Location: HDD Off: Normal On: Hard disk drive was diagnosed as faulty.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/**DBP/HDD[0-*x*]/OK2RM**	Indicator	Hard disk drive OK to Remove LED	Color: Blue Location: HDD Off: Normal On: OK to remove
/SYS/**DBP/NVME[0-*x*]**	FRU	NVMe drive FRU	
/SYS/**DBP/NVME[0-*x*]/PRSNT**	Discrete sensor	PCIe NVMe drive	01h-ENTITY_PRESENT 02h-ENTITY_ABSENT

Related Information

- “System Chassis Components” on page 307
- “Cooling Unit Components” on page 309
- “Disk Backplane Components” on page 310
- “Memory Device Components” on page 311
- “Power Unit Components” on page 312
- “Processor Components” on page 313
- “System Board Components” on page 314
- “System Firmware Components” on page 315

Identifying SNMP Trap Messages

It is possible to configure Oracle ILOM to generate Simple Network Management Protocol (SNMP) traps when hardware problems occur. For information about how to configure SNMP alert rule destinations to start receiving these traps, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at `https://www.oracle.com/goto/ilom/docs`.

The tables in these sections list the set of SNMP traps that are generated from Oracle ILOM.

- “Environmental Events” on page 318
- “Hard Disk Drive Events” on page 320
- “Power Events” on page 320
- “Fan Events” on page 325
- “Memory Events” on page 326
- “Entity Presence Events” on page 331

■ “Physical Security Events” on page 332

Environmental Events

The following table lists environmental events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapTempFatalThresholdExceeded **Oracle ILOM Event Message:** Lower fatal threshold exceeded **Severity and Description:** Critical; A temperature sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/T_OUT /SYS/MB/T_IN_ZONE0 /SYS/MB/T_OUT_ZONE0 /SYS/MB/T_IN_ZONE1 /SYS/MB/T_OUT_ZONE1 /SYS/MB/T_IN_ZONE2 /SYS/MB/T_OUT_ZONE2
SNMP Trap: sunHwTrapTempFatalThresholdDeasserted **Oracle ILOM Event Message:** Lower fatal threshold no longer exceeded **Severity and Description:** Informational; A temperature sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/T_OUT /SYS/MB/T_IN_ZONE0 /SYS/MB/T_OUT_ZONE0 /SYS/MB/T_IN_ZONE1 /SYS/MB/T_OUT_ZONE1 /SYS/MB/T_IN_ZONE2 /SYS/MB/T_OUT_ZONE2
SNMP Trap: sunHwTrapTempCritThresholdExceeded **Oracle ILOM Event Message:** Upper critical threshold exceeded **Severity and Description:** Critical; A temperature sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/T_OUT /SYS/MB/T_IN_ZONE0 /SYS/MB/T_OUT_ZONE0 /SYS/MB/T_IN_ZONE1 /SYS/MB/T_OUT_ZONE1 /SYS/MB/T_IN_ZONE2 /SYS/MB/T_OUT_ZONE2
SNMP Trap: sunHwTrapTempCritThresholdDeasserted **Oracle ILOM Event Message:** Upper critical threshold no longer exceeded	/SYS/PS[0-1]/T_OUT /SYS/MB/T_IN_ZONE0

Messages and Descriptions	Component Name
Severity and Description: Informational; A temperature sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/T_OUT_ZONE0 /SYS/MB/T_IN_ZONE1 /SYS/MB/T_OUT_ZONE1 /SYS/MB/T_IN_ZONE2 /SYS/MB/T_OUT_ZONE2
SNMP Trap: sunHwTrapTempFatalThresholdExceeded **Oracle ILOM Event Message:** Lower fatal threshold exceeded **Severity and Description:** Critical; A temperature sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/T_AMB /SYS/MB/T_CORE_NET01 /SYS/MB/T_CORE_NET23 /SYS/MB/T_IN_PS
SNMP Trap: sunHwTrapTempFatalThresholdDeasserted **Oracle ILOM Event Message:** Lower fatal threshold no longer exceeded **Severity and Description:** Informational; A temperature sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/T_AMB /SYS/MB/T_CORE_NET01 /SYS/MB/T_CORE_NET23 /SYS/MB/T_IN_PS
SNMP Trap: sunHwTrapTempCritThresholdExceeded **Oracle ILOM Event Message:** Upper critical threshold exceeded **Severity and Description:** Critical; A temperature sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/T_CORE_NET01 /SYS/MB/T_CORE_NET23 /SYS/MB/T_IN_PS
SNMP Trap: sunHwTrapTempCritThresholdDeasserted **Oracle ILOM Event Message:** Upper critical threshold no longer exceeded **Severity and Description:** Informational; A temperature sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/T_CORE_NET01 /SYS/MB/T_CORE_NET23 /SYS/MB/T_IN_PS

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Hard Disk Drive Events

The following table lists hard disk drive events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapSlotOrConnectorError **Oracle ILOM Event Message:** Assert **Severity and Description:** Major: A sensor associated with a slot or connector has detected an error.	/SYS/DBP/HDD[0-*x*]/STATE
SNMP Trap: sunHwTrapSlotOrConnectorOk **Oracle ILOM Event Message:** Deassert **Severity and Description:** Informational; A sensor associated with a slot or connector has returned to its normal state.	/SYS/DBP/HDD[0-*x*]/STATE

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Power Events

The following table lists power events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_PRESENCE ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_PRESENCE DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_FAILURE ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_FAILURE DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_PREDICTIVE_FAILURE ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_PREDICTIVE_FAILURE DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_INPUT_LOST ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_INPUT_LOST DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_INPUT_ERROR ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_INPUT_ERROR DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE

Messages and Descriptions	Component Name
Oracle ILOM Event Message: PS_INPUT_RANGE_ERROR ASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_INPUT_RANGE_ERROR DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_CONFIG_ERROR ASSERT **Severity and Description**Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyError **Oracle ILOM Event Message:** PS_CONFIG_ERROR DEASSERT **Severity and Description:** Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded **Oracle ILOM Event Message:** Upper noncritical threshold exceeded **Severity and Description:** Minor; A sensor has reported that its value has gone above an upper non critical threshold setting or below a lower non critical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/VPS
SNMP Trap: sunHwTrapSensorThresholdOk **Oracle ILOM Event Message:**Upper noncritical threshold no longer exceeded **Severity and Description:** Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	/SYS/VPS
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded **Oracle ILOM Event Message:** Upper noncritical threshold exceeded **Severity and Description:** Minor; A sensor has reported that its value has gone above an upper non critical threshold setting or below a lower non critical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower.	/SYS/VPS_FANS /SYS/PS[0-1]/P_IN /SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorThresholdOk **Oracle ILOM Event Message:** Upper noncritical threshold no longer exceeded **Severity and Description:** Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	/SYS/VPS_FANS /SYS/PS[0-1]/P_IN /SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorFatalThresholdExceeded	/SYS/PS[0-1]/P_IN

Messages and Descriptions	Component Name
Oracle ILOM Event Message: Lower fatal threshold exceeded **Severity and Description:** Critical; A power supply sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorFatalThresholdDeasserted **Oracle ILOM Event Message:** Lower fatal threshold no longer exceeded **Severity and Description:** Informational; A power supply sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/P_IN /SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorCritThresholdExceeded **Oracle ILOM Event Message:** Lower critical threshold exceeded **Severity and Description:** Major; A power supply sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/P_IN /SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorCritThresholdDeasserted **Oracle ILOM Event Message:** Lower critical threshold no longer exceeded **Severity and Description:** Informational; A power supply sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/P_IN /SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapVoltageFatalThresholdExceeded **Oracle ILOM Event Message:** Lower fatal threshold exceeded **Severity and Description:** Critical; A voltage sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/V_12V /SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM
SNMP Trap: sunHwTrapVoltageFatalThresholdDeasserted **Oracle ILOM Event Message:** Lower fatal threshold no longer exceeded **Severity and Description:** Informational; A voltage sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/V_12V /SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM
SNMP Trap: sunHwTrapVoltageCritThresholdExceeded	/SYS/PS[0-1]/V_12V

Messages and Descriptions	Component Name
Oracle ILOM Event Message: Upper critical threshold exceeded **Severity and Description:** Critical; A voltage sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM
SNMP Trap: sunHwTrapVoltageCritThresholdDeasserted **Oracle ILOM Event Message:** Upper critical threshold no longer exceeded **Severity and Description:** Informational; A voltage sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/V_12V /SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM
SNMP Trap: sunHwTrapVoltageNonCritThresholdExceeded **Oracle ILOM Event Message:** Upper noncritical threshold exceeded **Severity and Description:** Minor; A voltage sensor has reported that its value has gone above an upper non critical threshold setting or below a lower non critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/PS[0-1]/V_12V /SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM
SNMP Trap: sunHwTrapVoltageOk **Oracle ILOM Event Message:** Upper noncritical threshold no longer exceeded **Severity and Description:** Informational; A voltage sensor has reported that its value is in the normal operating range.	/SYS/PS[0-1]/V_12V /SYS/PS[0-1]/V_12V_STBY /SYS/PS[0-1]/V_IN /SYS/MB/P[0-*x*]/V_DIMM

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Fan Events

The following table lists fan events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapFanSpeedCritThresholdExceeded **Oracle ILOM Event Message:** Lower critical threshold exceeded **Severity and Description:** Major; A fan speed sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/FM[0-3]/F[0-1]/TACH
SNMP Trap: sunHwTrapFanSpeedCritThresholdDeasserted **Oracle ILOM Event Message:** Lower critical threshold no longer exceeded **Severity and Description:** Informational; A fan speed sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/FM[0-3]/F[0-1]/TACH
SNMP Trap: sunHwTrapFanSpeedFatalThresholdExceeded **Oracle ILOM Event Message:** Lower fatal threshold exceeded **Severity and Description:** Critical; A fan speed sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/FM[0-3]/F[0-1]/TACH
SNMP Trap: sunHwTrapFanSpeedFatalThresholdDeasserted **Oracle ILOM Event Message:** Lower fatal threshold no longer exceeded **Severity and Description:** Informational; A fan speed sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	/SYS/MB/FM[0-3]/F[0-1]/TACH

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Memory Events

The following table lists memory events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded **Oracle ILOM Event Message:** Upper noncritical threshold exceeded **Severity and Description:** Minor; A sensor has reported that its value has gone above an upper non critical threshold setting or below a lower non critical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type. The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower.	/SYS/VPS_CPUS /SYS/VPS_MEMORY
SNMP Trap: sunHwTrapSensorThresholdOk **Oracle ILOM Event Message:** Upper noncritical threshold no longer exceeded **Severity and Description:** Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	/SYS/VPS_CPUS /SYS/VPS_MEMORY
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.cpu.intel.quickpath.link_slow "The Quickpath Interconnect (QPI) link is operating below normal speed." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.cpu.intel.quickpath.link_slow "The Quickpath Interconnect (QPI) link is operating below normal speed." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.cpu.intel.quickpath.unknown-errcode "An unknown error code from the Quickpath Interconnect (QPI) reference code has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared	/SYS/MB

Messages and Descriptions	Component Name
Oracle ILOM Event Message: event fault.cpu.intel.quickpath.unknown-errcode "An unknown error code from the Quickpath Interconnect (QPI) reference code has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.none "An invalid memory DIMM configuration has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.none "An invalid memory DIMM configuration has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.memtest-failed "All memory channels have been disabled due to memory test failures." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.memtest-failed "All memory channels have been disabled due to memory test failures." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.quadrank-3rd-slot "A quad-rank memory DIMM has been installed in the third slot of a memory channel." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.quadrank-3rd-slot "A quad-rank memory DIMM has been installed in the third slot of a memory channel." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.ddr3u-unsupported "An unsupported DDR3 ultra low voltage memory DIMM has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.ddr3u-unsupported "An unsupported DDR3 ultra low voltage memory DIMM has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.mrc.unknown-errcode "An unknown error code from the Memory Reference Code (MRC) has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.mrc.unknown-errcode "An unknown error code from the Memory Reference Code (MRC) has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.udimm-unsupported "An unbuffered memory DIMM (UDIMM) has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.udimm-unsupported "An unbuffered memory DIMM (UDIMM) has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.sodimm-unsupported "An unsupported SODIMM has been detected in system." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.sodimm-unsupported "An unsupported SODIMM has been detected in system." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.4gb-fused "An unsupported 4-gb memory DIMM has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.4gb-fused "An unsupported 4-gb memory DIMM has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.8gb-fused "An unsupported 8-gb memory DIMM has been detected."	/SYS/MB/P[0-*x*]/D[0-11]

Messages and Descriptions	Component Name
Severity and Description: Major; A memory component is suspected of causing a fault.	
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.8gb-fused "An unsupported 8-gb memory DIMM has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible "A memory DIMM is incompatible with the memory controller." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible "A memory DIMM is incompatible with the memory controller." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible-maxranks "The number of ranks allowed on a memory channel has been exceeded." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible-maxranks "The number of ranks allowed on a memory channel has been exceeded." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible-quadrank "An invalid quad-rank memory DIMM configuration has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.incompatible-quadrank "An invalid quad-rank memory DIMM configuration has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.numranks-unsupported "A memory DIMM with an unsupported number of ranks has been detected." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared	/SYS/MB/P[0-*x*]/D[0-11]

Messages and Descriptions	Component Name
Oracle ILOM Event Message: event fault.memory.intel.dimm.numranks-unsupported "A memory DIMM with an unsupported number of ranks has been detected." **Severity and Description:** Informational; A memory component fault has been cleared.	
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.speed-slow "A memory DIMM has been detected that is unable to run at speeds required by the platform." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.speed-slow "A memory DIMM has been detected that is unable to run at speeds required by the platform." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.disable-quadrank "Memory channel is populated with too many quad-rank memory DIMMs." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.disable-quadrank "Memory channel is populated with too many quad-rank memory DIMMs." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.population-invalid "Memory DIMM is improperly populated or is a type that is not compatible with other DIMMs installed." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.population-invalid "Memory DIMM is improperly populated or is a type that is not compatible with other DIMMs installed." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.out-of-order "The memory DIMMs in a channel are not populated in sequential order." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.out-of-order "The memory DIMMs in a channel are not populated in sequential order." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapMemoryFault **Oracle ILOM Event Message:** event fault.memory.intel.dimm.category-unknown "Memory DIMM is of an unknown type or category." **Severity and Description:** Major; A memory component is suspected of causing a fault.	/SYS/MB/P[0-*x*]/D[0-11]
SNMP Trap: sunHwTrapMemoryFaultCleared **Oracle ILOM Event Message:** event fault.memory.intel.dimm.category-unknown "Memory DIMM is of an unknown type or category." **Severity and Description:** Informational; A memory component fault has been cleared.	/SYS/MB/P[0-*x*]/D[0-11]

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- “System Board Components” on page 314
- “Hard Disk Drive Components” on page 316

Entity Presence Events

The following table lists entity presence events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapProcessorError **Oracle ILOM Event Message:** ENTITY_PRESENT ASSERT **Severity and Description:** Major; A processor sensor has detected an error. Device absent.	/SYS/MB/P[0-*x*]/PRSNT
SNMP Trap: sunHwTrapProcessorOk **Oracle ILOM Event Message:** ENTITY_PRESENT DEASSERT **Severity and Description:** Major; A processor sensor has returned to its normal state. Device present.	/SYS/MB/P[0-*x*]/PRSNT

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapProcessorError **Oracle ILOM Event Message:** ENTITY_DISABLED ASSERT **Severity and Description:** Major; A processor sensor has detected an error. Device disabled.	/SYS/MB/P[0-*x*]/PRSNT
SNMP Trap: sunHwTrapProcessorOk **Oracle ILOM Event Message:** ENTITY_DISABLED DEASSERT **Severity and Description:** Major; A processor sensor has returned to its normal state. Device enabled.	/SYS/MB/P[0-*x*]/PRSNT

Physical Security Events

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapSecurityIntrusion **Oracle ILOM Event Message:** Assert **Severity and Description:** Major; General Chassis intrusion asserted.	/SYS/INTSW

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