# Oracle® Server X5-4 Service Manual

**Part No: E56396-03**
December 2015

Oracle Server X5-4 Service Manual

**Part No: E56396-03**



**Access to Oracle Support**

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info` or visit `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs` if you are hearing impaired.

**Référence: E56396-03**



**Accès aux services de support Oracle**

Les clients Oracle qui ont souscrit un contrat de support ont accès au support électronique via My Oracle Support. Pour plus d'informations, visitez le site `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info` ou le site `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs` si vous êtes malentendant.

# Contents

# Using This Documentation

This section describes how to get the latest firmware and software for the system, documentation and feedback, and a document change history.



## Oracle Server X5-4 Model Naming Convention

The Oracle Server X5-4 name identifies the following:

- X identifies an x86 product.
- The first number, 5, identifies the generation of the server.
- The second number, 4, identifies the number of processor sockets in the server.

## Getting the Latest Firmware and Software

Firmware, drivers, and other hardware-related software for each Oracle x86 server are updated periodically.

You can obtain the latest version in the following ways:

- Oracle System Assistant: A factory-installed option for Oracle x86 servers. It has all the tools and drivers you need and resides on an internal USB flash stick.
- My Oracle Support: The Oracle support web site located at `https://support.oracle.com`.

# Documentation and Feedback

| Documentation | Link |
|---|---|
| All Oracle products | https://docs.oracle.com/ |
| Oracle Server X5-4 | http://www.oracle.com/goto/X5-4/docs-videos |
| Oracle Integrated Lights Out Manager (ILOM). Refer to the documentation for your supported version of Oracle ILOM as listed in the *Product Notes*. | http://www.oracle.com/goto/ILOM/docs |
| Oracle Hardware Management Pack. Refer to the documentation for your supported version as listed in the *Product Notes*. | http://www.oracle.com/goto/ohmp/docs |

Provide feedback on this documentation at: http://www.oracle.com/goto/docfeedback.

# About This Documentation

This documentation set is available in both PDF and HTML. The information is presented in topic-based format (similar to online help) and therefore does not include chapters, appendixes, or section numbering.

# Contributors

Primary Authors: Ray Angelo, Mark McGothigan, Ralph Woodley, Michael Bechler

Contributors: Kenny Tung, Johnny Hui, Prafull Singhal, Barry Wright, Cynthia Chin-Lee, David Savard, Tamra Smith-Wasel, Todd Creamer, William Schweickert

# Change History

The following lists the release history of this documentation set:

- December 2015. Technical updates.
- August 2015: Minor revisions and updates to docs and library.
- June 2015: Initial publication.

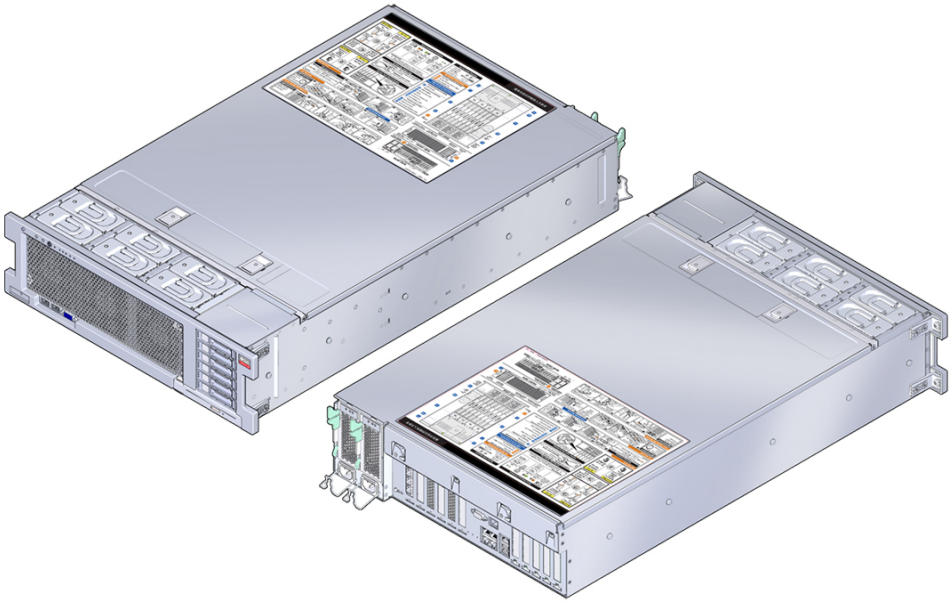
# Oracle Server X5-4 Service Manual Overview

This document contains service information and maintenance procedures for the Oracle® Server X5-4. The following table describes the major sections of this manual.

| Description | Link |
|---|---|
| Server system overview. | “Oracle Server X5-4 Overview” on page 15 |
| Troubleshooting and diagnostic procedures and information. | “Troubleshooting and Diagnostics” on page 37 |
| Server service-related information and procedures. | “Servicing the Server” on page 69 |
| Procedures for preparing to service the server. | “Preparing to Service the Server” on page 93 |
| Procedures for servicing customer-replaceable units (CRUs). | “Servicing CRU Components” on page 113 |
| Procedures for servicing field-replaceable units (FRUs). | “Servicing FRU Components” on page 179 |
| Procedures for preparing the server for operation. | “Returning the Server to Operation” on page 259 |
| Accessing the BIOS setup program. | “BIOS Setup Utility Menu Options” on page 273 |
| Listing of Power On Self-Test (POST) error codes and their meaning. | “POST and Checkpoint Codes” on page 341 |

# Oracle Server X5-4 Overview

This section describes the major features, components, and capabilities of the server.



| Description | Link |
|---|---|
| Server overview statement | “Server Overview” on page 16 |
| Components and features of the server front and back panels | “External Components and Features” on page 17 |
| Server subsystem components | “Server Subsystems Overview” on page 19 |

# Server Overview

The Oracle Server X5-4 is a 3RU rack-mount server system. The following table lists the server-supported components.

| Component | Description |
|---|---|
| Processor (CPU) | Intel Xeon® E7-8895 v3 18-core 2.6 GHz processor.<br><br>Supported configurations:<br><br>■ Two processors installed in sockets 0 and 1<br>■ Four processors installed in sockets 0 through 3 |
| Memory | Up to eight memory riser cards are supported (two risers per CPU) in the server chassis. Each memory riser supports up to twelve DDR3-1600 ECC low-voltage registered or load-reduced DIMMs, allowing up to twenty-four DIMMs per processor. Installed DIMMs must be the same type and size.<br><br>■ **In a two CPU system**, you can install up to a maximum of 1.5 TB of system memory.<br>■ **In a four CPU system**, you can install up to a maximum of 3 TB of system memory.<br><br>For information on supported DIMM configurations, see "Supported DIMMs and DIMM Population Rules" on page 157. |
| Storage devices | For internal storage, the server chassis provides:<br><br>■ Six 2.5-inch drive bays, accessible through the front panel.<br>All bays can be populated with SAS-3 HDDs or SSDs.<br>Four of the six drive bays (2 through 5) can also support NVMe SSD drives.<br>**Note -** NVMe drive support requires the purchase an optional PCIe NVMe Switch card during the initial factory order of the server. It cannot be added later.<br>■ An optional tray-load DVD+/-RW drive on the front of the server, below the drive bays.<br>■ Oracle Storage 12 Gb/s SAS RAID PCIe HBA, Internal.<br>This card supports RAID levels 0, 1, 5, 6, 10, 50, and 60, with a minimum of 1 Gb data cache, and Battery Backed Write Cache (BBWC) using an ESM (Energy Storage Module). |
| USB 2.0 ports | ■ Four external high-speed USB ports: two in front and two in back.<br>■ Two internal high-speed USB ports on the motherboard.<br>One internal port holds the optional factory-installed Oracle System Assistant (OSA) flash drive. A second internal port can hold a USB flash drive for system booting. |
| VGA ports | Two high-density DB-15 video ports: one in front and one in back.<br><br>The server includes an embedded VGA 2D graphics controller with 8 MB supporting resolutions up to 1600 x 1200 x 16bits @ 60 Hz (1024 x 768 when viewed remotely using Oracle ILOM RKVMS).<br>**Note -** The back VGA port supports VESA Device Data Channel for monitor identification. |
| PCIe 3.0 I/O slots | Eleven PCIe 3.0 slots that accommodate low-profile PCIe cards. |

| Component | Description |
|---|---|
| | ■ All slots support x8 PCIe connections<br>■ Slots 1 through 7, 9, and 10: x8-only connectors<br>■ Slots 8 and 11: x8 or x16 connectors<br><br>**Note -** PCIe slots 7 through 11 are only functional in four CPU systems. |
| Ethernet ports | Four 10 GbE RJ-45 Ethernet ports (back panel) |
| Service processor | Emulex Pilot 3 base management controller (BMC):<br><br>■ Supports the industry-standard IPMI feature set<br>■ Supports remote KVMS, DVD, and ISO image over IP<br>■ Includes serial port<br>■ Supports Ethernet access to SP through a dedicated 10/100/1000 RJ-45 Gigabit Ethernet (GbE) management port and optionally through one of the host GbE ports (sideband management) |
| Power supplies | Two hot-swappable power supplies, each with 1030/2060 watts (low line/high line) capacity, auto-ranging, light load efficiency mode and redundant over-subscription |
| Cooling fans | ■ Six hot-swappable, redundant fans at chassis front (top-loading)<br>■ Two redundant fans, one in each power supply |
| Management software | The following options are available:<br><br>■ Oracle Integrated Lights Out Manager (ILOM) on the Service Processor<br>■ Oracle System Assistant (OSA) on an optional internal USB flash drive<br>■ Oracle Hardware Management Pack.<br>■ Oracle Enterprise Management Ops Center, which can be downloaded from the Oracle site |
| Service labels | The system comes with two handy service labels for quick reference information. One on the exterior of the server (describing exterior components), and one on the underside of the top cover (describing interior components). |

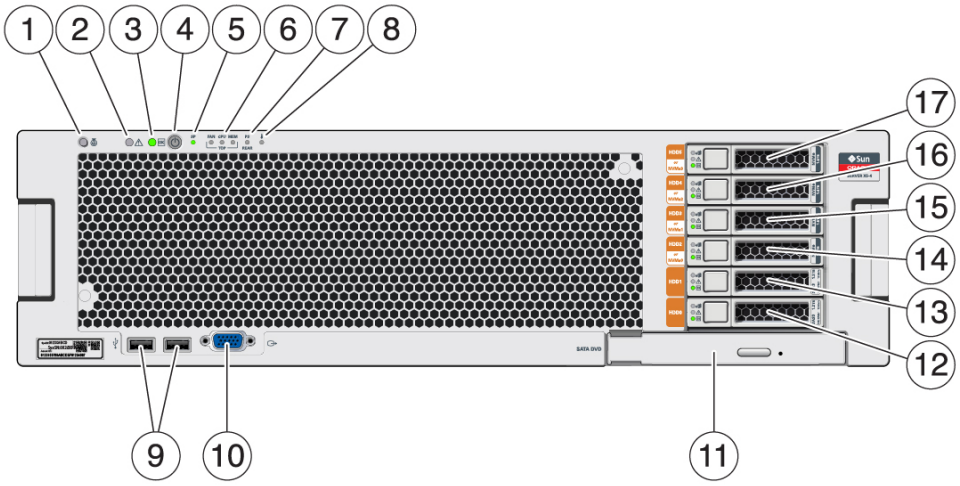
# External Components and Features

The following sections call out the features of the server front and back panels.


- “Server Front Panel Features” on page 17
- “Server Back Panel Features” on page 18


# Server Front Panel Features

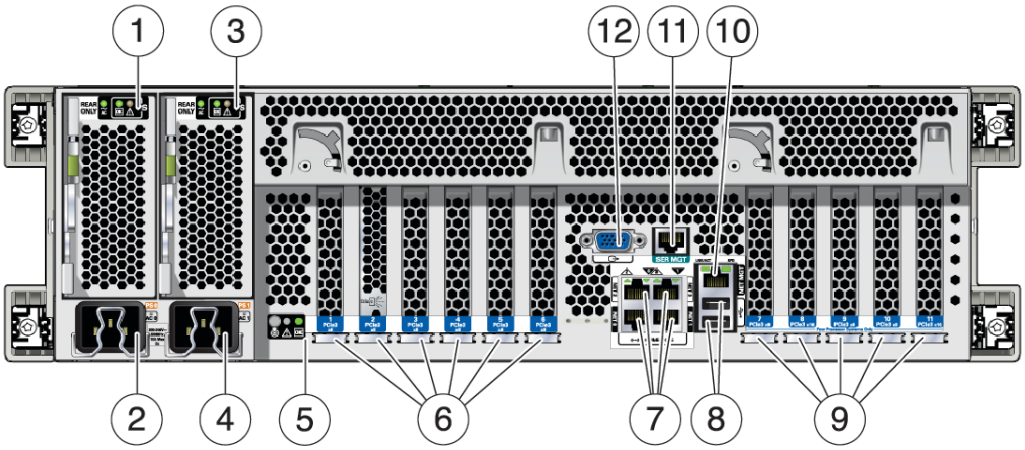
The following illustration shows the server front panel and describes its features.




| Callout | Description |
|---|---|
| 1 | Locator LED/button: white |
| 2 | Service Action Required indicator: amber |
| 3 | System OK indicator: green |
| 4 | Power button |
| 5 | SP OK indicator: green |
| 6 | Service Action Required indicators (3) for fan module (FAN), Processor (CPU) and Memory: amber |
| 7 | Power Supply (PS) Fault (Service Action Required) indicator: amber |
| 8 | Over Temperature Warning indicator: amber |
| 9 | USB 2.0 connectors (2) |
| 10 | DB-15 video connector |
| 11 | SATA DVD drive (optional) |
| 12–17 | Storage drive slots 0–5 (from bottom to top).<br>Slots 0 and 1 support only SAS drives (mechanical or SSD).<br>Slots 2–5 support both SAS and NVMe drives. |

# Server Back Panel Features

The following illustration shows the server back panel and describes its features.




| Callout | Description |
|---|---|
| 1 | Power supply unit (PSU) 0 indicator panel |
| 2 | PSU 0 AC inlet |
| 3 | PSU 1 indicator panel |
| 4 | PSU 1 AC inlet |
| 5 | System status indicator panel |
| 6 | PCIe card slots 1–6 |
| 7 | Onboard RJ-45 network (NET) 10 GbE ports: NET0–NET3 |
| 8 | USB 2.0 connectors (2) |
| 9 | PCIe card slots 7–11 |
| 10 | Service processor (SP) RJ-45 network management (NET MGT) port |
| 11 | Service processor (SP) RJ-45 serial management (SER MGT) port |
| 12 | DB-15 video connector |

# Server Subsystems Overview

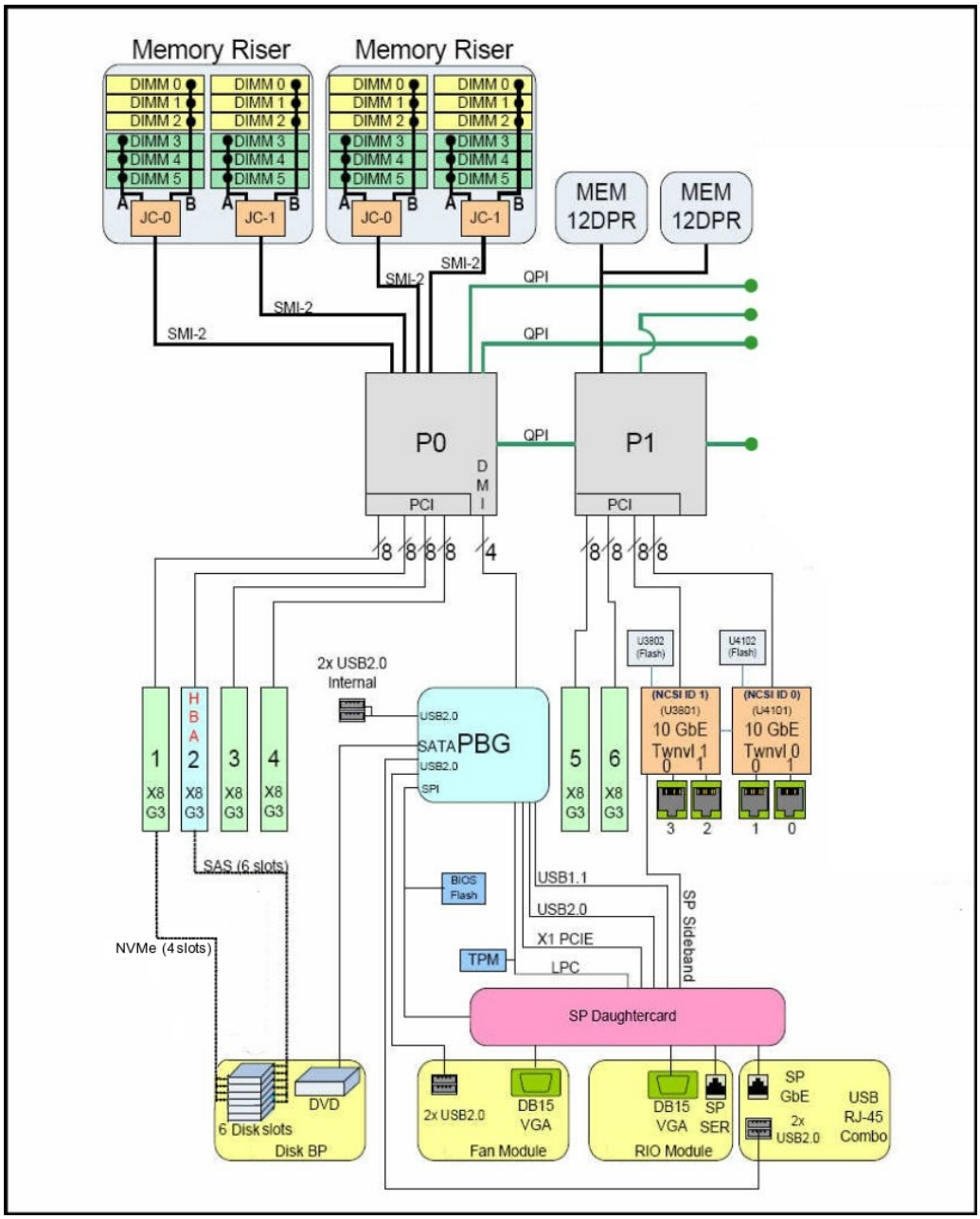
This section provides information about the server subsystems:


- "System Block Diagrams" on page 20
- "Processor Subsystem" on page 22
- "Memory Subsystem" on page 25
- "Cooling Subsystem" on page 25

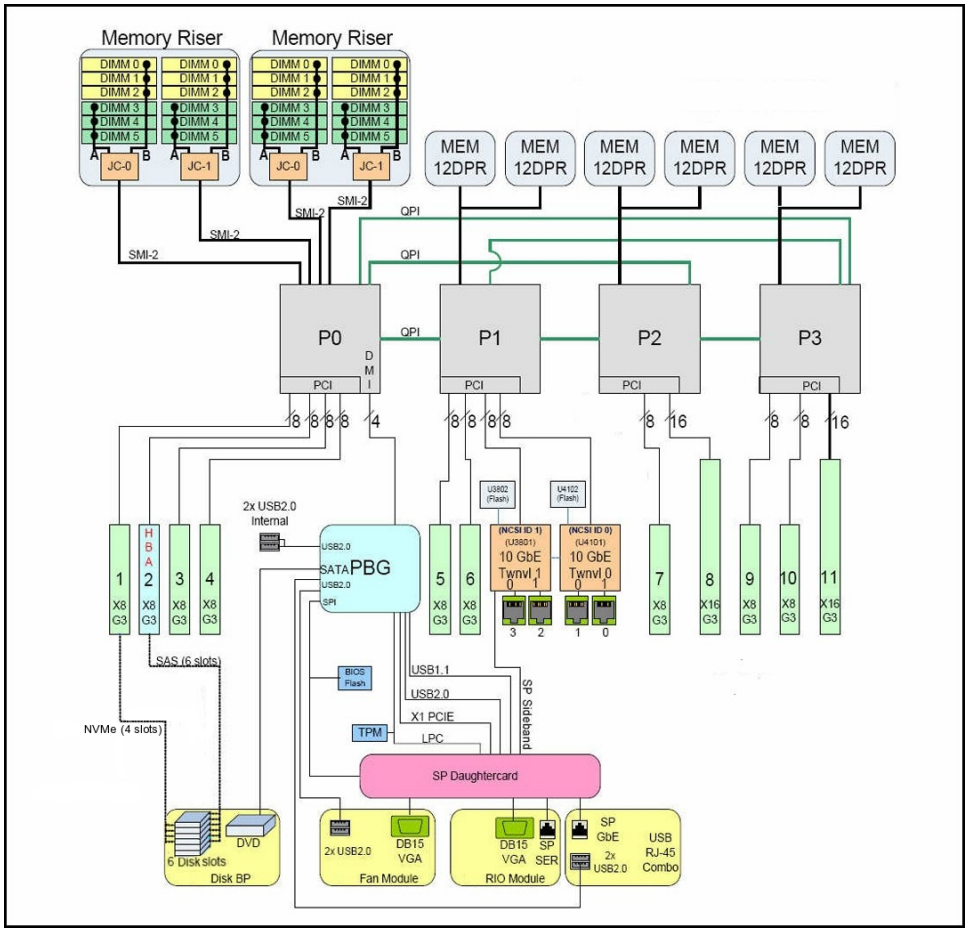
## System Block Diagrams

The server can be configured with two or four CPUs. This section shows the system block diagrams for these two server configurations:

## Two-CPU Block Diagram



## Four-CPU Block Diagram

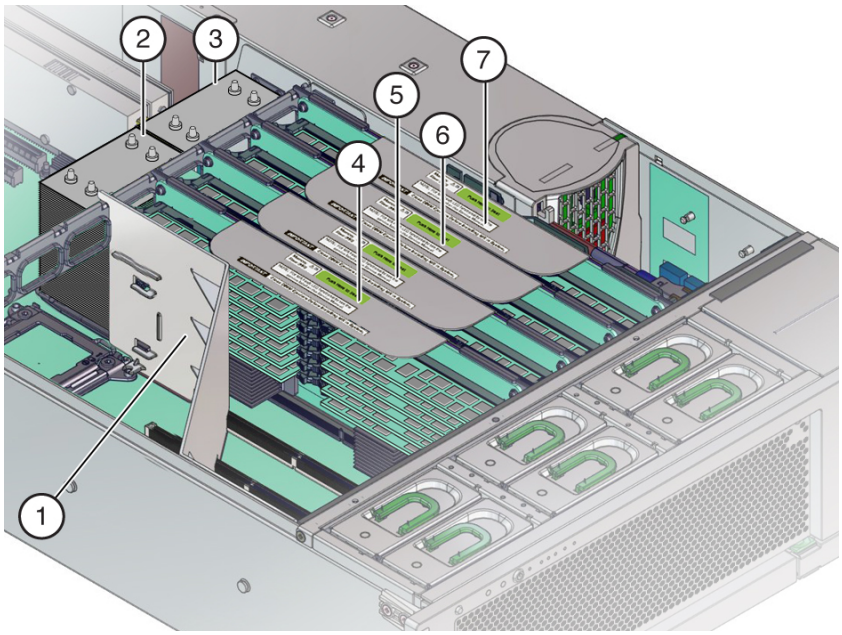



# Processor Subsystem

The Oracle Server X5-4 uses the Intel Xeon E7-8895 v3 18-core 2.6 GHz processor and supports two CPU-based configurations: a two-CPU configuration and a four-CPU configuration.

## Two-CPU Configuration

Servers with two CPUs have CPUs and heatsinks in sockets 0 and 1 and CPU cover plates installed in sockets 2 and 3. This configuration requires four memory riser cards and an air baffle to control airflow for maximum cooling. The following illustration shows the components in a two-CPU server configuration.

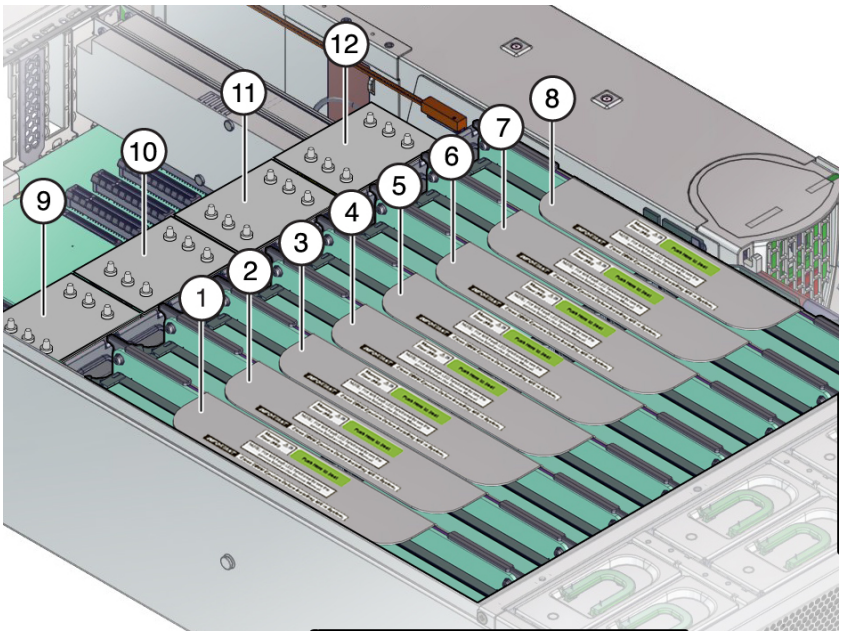



| Callout | Description |
|---|---|
| 1 | Air baffle |
| 2 | CPU P1 |
| 3 | CPU P0 |
| 4 | Memory riser card P1/MR1 |
| 5 | Memory riser card P1/MR0 |
| 6 | Memory riser card P0/MR1 |
| 7 | Memory riser card P0/MR0 |

For more information, see “Two-CPU Block Diagram” on page 21.

## Four-CPU Configuration

In addition to four CPUs, this configuration requires eight memory riser cards. The following illustration shows the components in a four-CPU server configuration.




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Memory riser card P3/MR1 | 7 | Memory riser card P0/MR1 |
| 2 | Memory riser card P3/MR0 | 8 | Memory riser card P0/MR0 |
| 3 | Memory riser card P2/MR1 | 9 | CPU P3 |
| 4 | Memory riser card P2/MR0 | 10 | CPU P2 |
| 5 | Memory riser card P1/MR1 | 11 | CPU P1 |
| 6 | Memory riser card P1/MR0 | 12 | CPU P0 |

The four-CPU configuration offers a greater level of resiliency with redundant QPI interconnects that allow working CPUs to route around a disabled CPU as the system starts.

For more information, see “Four-CPU Block Diagram” on page 22.

# Memory Subsystem

This section describes the server memory subsystem.

For more information about system memory (including DIMM population rules) and MR cards, see: “Memory Riser Card and DIMM Reference” on page 154

## Memory Slot Capacity

System memory resides on memory riser (MR) cards. Each card has 12 DIMM slots. The slot capacity of the server depends on the number of MR cards in the server, which in turn depends on the number of CPUs in the server. The server is available in a two CPU configuration and a four CPU configuration. Each CPU requires two MR cards. Therefore, a two-CPU configuration has 48 slots (four MR cards) and a four-CPU configuration has 96 slots (eight MR cards).

## Memory Channels and Buffers

MR cards contain twelve DIMM slots, four DDR3 channels, and two memory buffer ASICs. Each memory buffer has two channels (A and B) and links to three DIMM slots per channel. Each memory buffer is connected to the processor's built-in memory controller by an SMI-2 link.

## Memory Performance

For balanced performance, each channel for each memory buffer on the MR card must be populated. The only exception supported is a minimum factory configuration of two 16 GB DIMMs per MR card in DIMM slots D0 and D3.

# Cooling Subsystem

The internal components in the system are cooled by air that is pulled in through the front of the server and exhausted out the back of the server. Cooling occurs in two areas of the chassis, the power supply area and the motherboard area.

## Power Supply Cooling Area

The power supply area uses fans at the back of the power supplies to draw cool air in past the drives, through power supplies, and out the back.

## Motherboard Cooling Area

The motherboard area is divided into three zones where six 92-mm high-performance fans pull cool air in from the front of the server, move it across the motherboard, memory risers, processors, and I/O cards, and exhausts warm air out the back of the server.

The six fan modules are arranged in two rows allowing for a pair of redundant stacked fans for each of the three motherboard zones. If one of the fan modules fails, the other fan module in the pair has sufficient power to cool the zone until the failed fan can be replaced. However, if both fan modules in a pair fail, Oracle ILOM will power off the system to prevent thermal damage.

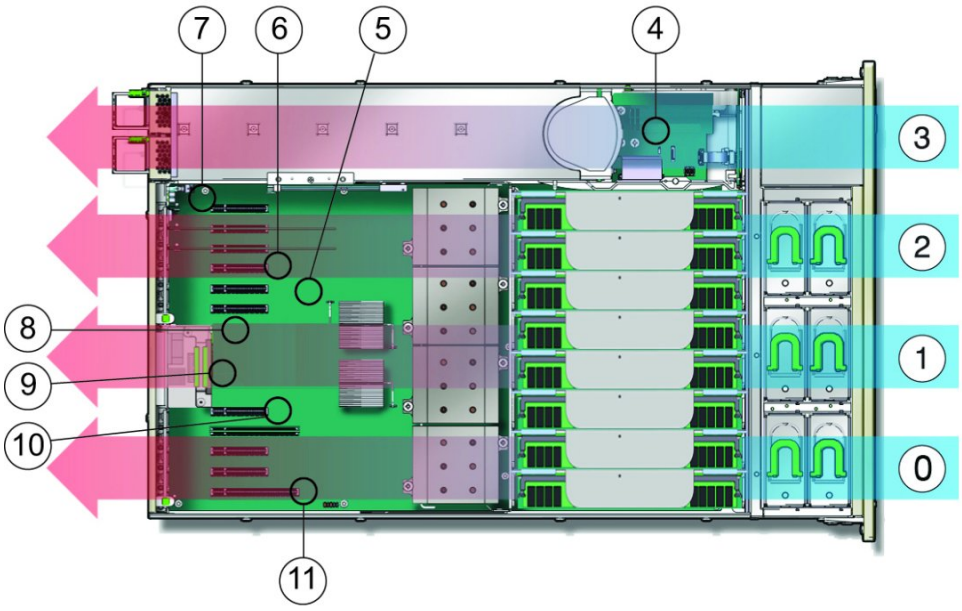
## Pressure Areas

The power supply and motherboard cooling areas have separate air pressures. The pressures are maintained by a plastic divider that, combined with the top cover, creates a seal between the two areas. It is important to maintain this seal because separate pressurizations for each area is the key to maintaining the integrity of the cooling system and the health of the server.

## Cooling Zones and Temperature Sensors

The two cooling areas are divided into four zones, one zone for the power supply area and three zones for the motherboard area. Dividing the cooling into zones allows for greater use of system resources, since each zone can operate independently at its highest efficiency. The zones are designated from left to right (from the front of the server) as: zone 0, zone 1, zone 2, and zone 3 (power supply area). Temperature monitoring of each zone is accomplished using motherboard-mounted temperature sensors.

The following illustration shows the cooling zones and the approximate location of the temperature sensors. The accompanying legend table provides sensor NAC names and sensor motherboard designations:




| Callout | Description | Callout | Description |
|---|---|---|---|
| 0 | Cooling zone 0 | 6 | Temperature sensor TS_ZONE2 (U4505) |
| 1 | Cooling zone 1 | 7 | Temperature sensor TS_OUT (U4506) |
| 2 | Cooling zone 2 | 8 | Temperature sensor TS_TVL_1 (U4002) |
| 3 | Cooling zone 3 (power supply backplane area) | 9 | Temperature sensor TS_TVL_0 (U4302) |
| 4 | Temperature sensor TS_PS (U4603) | 10 | Temperature sensor TS_ZONE0_B (U4509) |
| 5 | Temperature sensor TS_ZONE1 (U4507) | 11 | Temperature sensor TS_ZONE0_A (U4508) |

## Cooling the Two-CPU Configuration

A two-CPU server configuration has fewer components than a fully loaded, four-CPU configuration. To maximize cooling in a two-CPU configuration, an air baffle is installed in the memory riser area. The air baffle directs the fan output across the four memory riser cards and the two CPUs. For more information about the processor subsystem, see "Processor Subsystem" on page 22.

## Over-Temperature Issues

When the server cooling system is compromised by a hardware component failure or an airflow blockage, the internal temperature of the server can increase and cause component failure. To protect against over-temperature conditions, the server temperature and components are monitored using sensors. If the reading from a sensor indicates a temperature outside of the normal operating range of the component, or if a cooling subsystem-related component (such as a fan module) fails, the server management software lights the server fault indicator for the component and logs an event in the system event log (SEL). When a fault event occurs, address the issue *immediately*.

For information about troubleshooting the server cooling subsystem, see "Troubleshooting System Cooling Issues" on page 52.

# Power Subsystem

The server is equipped with two 1030/2060 watt auto-ranging hot-swappable power supplies that support a two CPU configuration at 110–127 VAC, or two or four CPU configuration at 200–240 VAC. The dual power supply configuration provides N+N redundancy.

The server supports the following power modes, server shutdowns, and resets.

**Full Power Mode**

When full power mode is applied, power is supplied to all the server components, the server boots, and the operating system (OS) functions. Apply full power mode by pressing the Power button on the server front panel when the server is in standby power mode. You can also apply full power to the server from Oracle ILOM. Once the server is operating in full power mode, the System OK and service processor (SP) indicators are on steady (see "Server Boot Process and Normal Operating State Indicators" on page 41).

**Note -** During an initial Power up sequence, the front fans will briefly run at full speed as part of a power-on test.

### Standby Power Mode

Standby power is a non-operating mode (OS does not boot), in which low-level power is supplied only to the components that are required to run the SP. To enter standby power mode, connect the AC power cables to the back of the server, but do not press the front panel Power button. You can also enter standby power mode by powering off the server from full power mode using one of the power-off methods (see below).

In standby power mode, the green SP indicator blinks while the SP is booting. Once the SP has booted, this SP indicator is steady on, and the green System OK indicator goes to standby blink (once every 3 seconds). See "Server Boot Process and Normal Operating State Indicators" on page 41.

### Graceful Shutdown

A graceful shutdown (also referred to as an orderly shutdown) is the safest method of shutting down the server to standby power mode because it warns users, closes files, and prepares the file system. To perform a graceful shutdown, use the server OS, Oracle ILOM, or the server front panel Power button.

A Graceful shutdown via the Power button is done with a single (momentary) press. However, an Immediate (Emergency) shutdown via the power button is done by pressing and holding the power button for > 5 seconds.

### Immediate Shutdown

An immediate shutdown of the server (also referred to as an emergency shutdown) should be used only in situations when you know that the loss of data is nonexistent or acceptable. An immediate shutdown does not warn users, does not properly close files, and does not gracefully shut down the operating system. Full power is immediately removed and the server goes to standby power mode.

### Complete Power Removal

Shutting down the server from full power mode to standby power mode does *not* completely remove power from the server. When it is in standby power mode, the server is in a low-power state. This low-power state is enough to maintain the service processor (SP), which runs Oracle ILOM. To completely remove power from the server, you need to remove the AC power cords.

### Warm Reset or Reboot

A warm reset is a reboot or restart of the server that occurs when you cycle server power from full power mode to standby power mode and back to full power mode. For example, a warm

reset might be required after a software or firmware update or when you want to launch Oracle System Assistant or the BIOS Setup Utility.

**Cold Reset**

A cold reset occurs when you restart the server from a completely powered-off state. A cold reset might be required to resolve a system issue. To perform a cold reset, place the server in standby power mode, disconnect the server from its AC power source, wait 30-60 seconds, then reconnect the server to its AC power source, allow the SP to boot, and then reapply full power.

**See Also:**

- “Power On the Server” on page 271
- “Powering Off the server” on page 101.
- “Resetting the Host or Service Processor” on page 63.

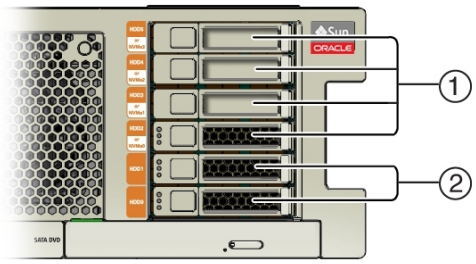
# Storage Subsystem

The server storage subsystem consists of the following:

- “Six 2.5-inch Drive Bays” on page 30
- “SATA DVD +/-RW Drive” on page 31

## Six 2.5-inch Drive Bays

The six 2.5-inch storage drive bays are located at the front of the server. The supported drive interfaces for each bay depend on the type of storage controller installed at the factory. SAS drives require a SAS Host Bus Adapter (HBA) and NVMe drives require a PCIe NVMe Switch card.



| Callout | Description |
|---|---|
| 1 | Slots for SAS or NVMe drives |
| 2 | Slots for SAS drives only |

- When configured with SAS drives (mechanical or SSD), the system must have one Oracle Storage 12 Gb/s SAS RAID PCIe HBA, Internal (7110117) installed in PCIe slot 2. The PCIe Gen-3 internal HBA has eight internal SAS3 ports that connect from the card to the system backplane through two bundled cables.
- When configured with NVMe SSD drives (up to four), the system must have one Oracle PCIe NVMe Switch card (7111393) installed in PCIe slot 1. The NVMe switch card has four NVMe internal ports that connect from the card to the system disk backplane through four bundled cables.

For slot designations, see “DVD, Storage Drive, and USB Designations” on page 78.

### SATA DVD +/-RW Drive

An optional DVD-RW SATA-Gen3 drive is located at the front of the server below the drive bays. A SATA3 port on the motherboard connects to the disk backplane through a SATA cable bundled with the HBA SAS1 cable.

For DVD designation, see “DVD, Storage Drive, and USB Designations” on page 78.

## Input/Output (I/O) Subsystem

The server I/O storage subsystem consists of the following:



### Eleven PCIe Gen 3 Slots

The server contains 11 PCIe Gen 3 slots, of which nine are x8 slots and two are x16 slots. All 11 slots are available in a four-CPU configured server. Only the first six slots (1-6) are available in a two-CPU configured server.

Slot 2 is reserved for the HBA that can support up to six SAS/SATA (mechanical or SSD) drives in all six drive slots.

Slot 1 can be used for a factory option PCIe NVMe Switch Card that can support up to four NVMe SSDs in drive slots 2 through 5.

**Note -** The NVMe Switch card is only supported in PCIe slot 1 and will not work in other PCIe slots.

For slot designation information, see “PCIe Slot Designations” on page 77.

## Two Internal and Four External High-Speed USB Ports

The two internal USB ports are located on the motherboard between the disk drive backplane and the PSU backplane boards. These ports can take a standard USB flash device, which can be used for system booting. Your system might be equipped with a preinstalled Oracle System Assistant USB device.

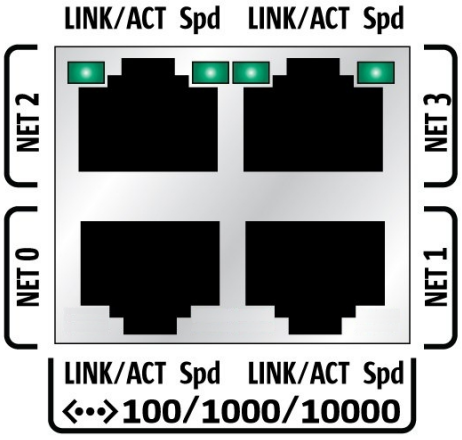
The Oracle System Assistant provides a separately bootable device that aids in the installation of the primary host OS, server hardware configuration, and the firmware upgrade process. Do not use the Oracle System Assistant USB drive as the primary host boot device or as server storage. If installed in your server, the Oracle System Assistant USB drive must be installed in the port labeled "OSA USB."

For port designations, see “DVD, Storage Drive, and USB Designations” on page 78.

Additionally, the server has four external USB ports, two on the front panel and two on the back panel. See “External Components and Features” on page 17.

## Four Onboard 10GbE Ports

Four 10 GigabitEthernet ports are located on the back panel of the server (see “Back Panel Connector Locations” on page 60). From left to right, the two bottom ports are NET 0 and NET 1; the two top ports are NET2 and NET 3, as shown in the following illustration.




BIOS detects the Ethernet ports in the following order during server boot:

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

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

The device naming for the Ethernet interfaces is reported differently by different interfaces and operating systems. The following illustration explains the logical (operating system) and physical (BIOS) naming conventions used for each interface.

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

| Port | BIOS | Solaris | Linux | Windows |
|---|---|---|---|---|
| Net 3 | 8101 | igb 3 | eth 3 | net 4 |
| Net 2 | 8100 | igb 2 | eth 2 | net3 |
| Net 1 | 0701 | igb 1 | eth 1 | net2 |
| Net 0 | 0700 | igb 0 | eth 0 | net |

# System Management Subsystem

The server has two embedded system management tools (Oracle ILOM and Oracle System Assistant) and a suite of command line tools that can be run from the host.

## Service Processor (SP) Oracle ILOM

The server comes with a removable service processor (SP) daughter card that is mounted on the server motherboard. The SP supports the industry-standard IPMI feature set and includes Oracle Integrated Lights Out Manager (ILOM) 3.2.5 and remote redirection of keyboard, video, mouse, and storage (KVMS).

The SP runs Oracle ILOM, a single-server management tool that allows you to monitor and maintain your server by providing real-time status and detailed information about the subsystems and components in your server. Oracle ILOM runs independently of the server OS and is accessible in both full power and standby power modes. The SP Oracle ILOM is accessible through the SP 100/1000/10000 Ethernet NET MGT port located on the server back panel or through one of the host's four built-in 10 GigabitEthernet ports (using sideband management).

## Oracle System Assistant

Your server might also come equipped with Oracle System Assistant. Oracle System Assistant is a server provisioning and update tool that assists in initial server set up and OS installation and allows you to easily manage server updates. As an option, Oracle System Assistant is delivered on a USB flash drive that is factory-installed in the internal USB slot labeled "OSA USB." The drive is configured with a server-specific version of Oracle System Assistant. You can start Oracle System Assistant from the server boot screen or from Oracle ILOM.

With Oracle System Assistant, you can:

- Get a single server-specific bundle of the latest available BIOS, Oracle ILOM, and hardware firmware and the latest tools and OS drivers from the Oracle support site.
- Update OS drivers and component firmware and configure RAID.
- Install supported operating systems with the latest drivers and supported tools.
- Configure a subset of Oracle ILOM settings.
- Save and restore customized BIOS settings or revert the BIOS to the factory defaults.
- Access embedded product documentation.
- Display system overview and detailed hardware inventory information.

## Oracle Hardware Management Pack

Oracle Hardware Management Pack provides scriptable command-line tools that help you manage and configure your Oracle servers from the host operating system.

Hardware Management Pack enables you to do the following using command-line tools:

- Configure BIOS (Legacy and UEFI), RAID volumes, and Oracle Integrated Lights Out Manager (ILOM).
- Upgrade server component firmware.
- Access the service processor and perform management tasks using IPMItool.
- View hardware configuration information and the status of your Oracle servers.
- Enable in-band monitoring of your Oracle hardware over Simple Network Management Protocol (SNMP). You can use this information to integrate your Oracle servers into your data center management infrastructure.
- Set up an Oracle ILOM trap proxy that forwards SNMP traps from your Oracle ILOM service processor to the host OS.

# Troubleshooting and Diagnostics

This section describes troubleshooting information and provides procedures to help you troubleshoot server hardware component faults.

| Description | Link |
|---|---|
| Maintenance-related information and procedures that you can use to troubleshoot and repair server hardware issues. | “Troubleshooting Server Hardware Component Faults” on page 37 |
| 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 57 |
| Information about attaching devices to the server to perform troubleshooting. | “Attaching Devices to the Server” on page 59 |
| Information on resetting the host or service processor (including the Oracle ILOM root password and account). | “Resetting the Host or Service Processor” on page 63 |
| Information about contacting Oracle support. | “Getting Help” on page 66 |

## Troubleshooting Server Hardware Component Faults

This section describes maintenance-related information and provides procedures that you can use to troubleshoot and repair server hardware issues.

| Description | Section Links |
|---|---|
| Troubleshooting overview information and procedure. | “Troubleshooting Hardware Faults Using Oracle ILOM” on page 38 |
| Discerning the server state using the front panel indicators. | “Troubleshooting Using the Front Panel Indicators” on page 40 |
| Explanation of the system Fault Remind Test Circuit. | “Troubleshooting Using the Fault Remind Test Circuits” on page 51 |

| Description | Section Links |
|---|---|
| Causes, actions, and preventative measures for problems related to the cooling subsystem. | “Troubleshooting System Cooling Issues” on page 52 |
| Causes, actions, and preventative measures for problems related to the power subsystem. | “Troubleshooting Power Issues” on page 54 |

# ▼ Troubleshooting Hardware Faults Using Oracle ILOM

This section provides a troubleshooting procedure that you can use to investigate server hardware faults and, if necessary, prepare the server for service

When a server hardware fault event occurs the system lights the Service Action Required indicator and captures the event in the system event log (SEL). If you have set up notification 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.

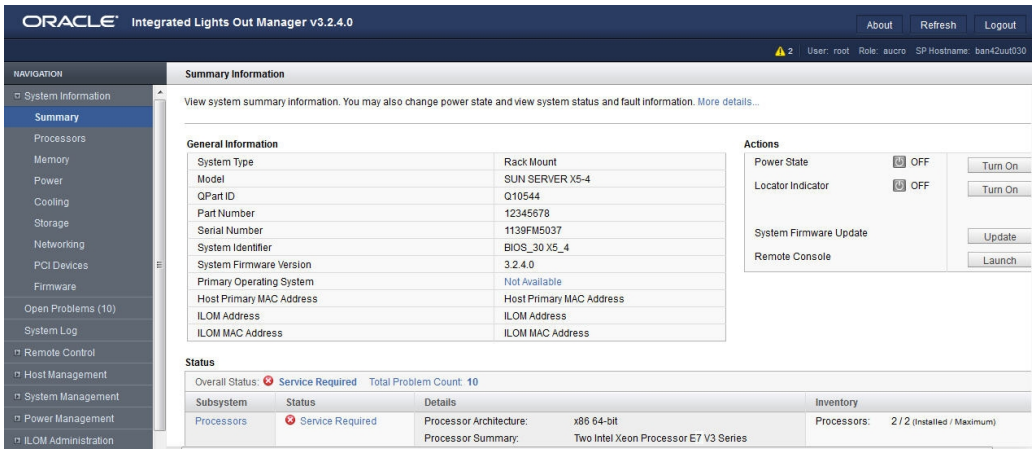
### 1. Log in to the server SP Oracle ILOM web interface.

Open a browser and enter the IP address of the server SP. At the login screen, type a user name (with administrator privileges) and password. The Summary screen appears.

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

- **Processors**
- **Memory**
- **Power**
- **Cooling**
- **Storage**
- **Networking**
- **I/O Modules**

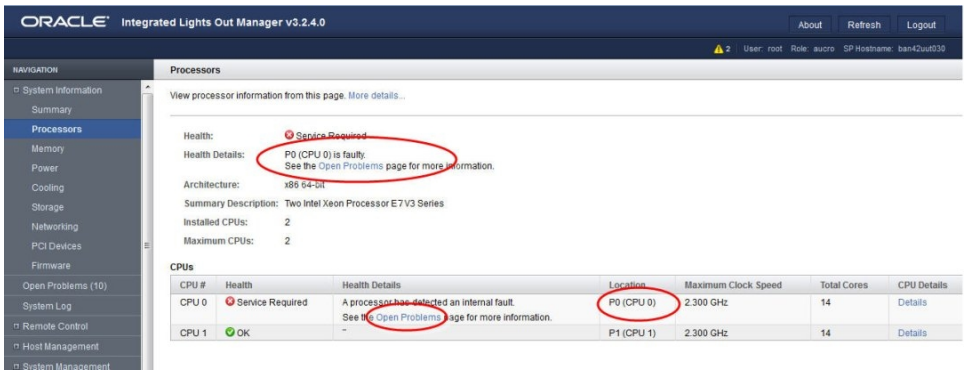
2. **In the Status section of the summary screen, identify the server subsystem that requires service.**




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

3. **To identify the component, click on the subsystem name.**

The subsystem screen appears.




The above example shows the processor information screen and indicates that CPU 0 has a problem.

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 a KnowledgeBase 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 devices not reported in the Subsystem Summary screen. To access it, click the System Log link.

   In this example, the hardware fault with DIMM 8 of CPU 0 requires local/physical access to the server.

5. **Before going to the server, review the server *Product Notes* document for information related to the issue or the component.**

   The *Product Notes* document contains up-to-date information about the server, including hardware-related issues.

6. **To prepare the server for service.**

   See "Preparing to Service the Server" on page 93.

7. **Service the component.**

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

# Troubleshooting Using the Front Panel Indicators

This section describes the state of the server front panel indicators when the system components are in a fault state.

The eight indicators on the server front panel show the state of the server. The following sections describe the conditions of the front panel indicators for various server states:

**Note -** For more information about the server front panel, see "Server Front Panel Features" on page 17.

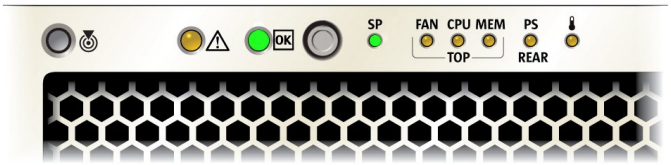
- "Server Boot Process and Normal Operating State Indicators" on page 41

## Server Boot Process and Normal Operating State Indicators

A normal server boot process involves two indicators, the service processor (SP) indicator and the System OK indicator. The process is described below:

1. When the AC power is applied to the server, the service processor (SP) boots. As the SP boots, its indicator blinks at the slow blink rate and the System OK indicator is off. For indicator blink rate information, see “Indicator Blink Rates” on page 46.
2. When the SP has successfully booted, the SP indicator is on steady and the System OK indicator blinks at the single blink rate. This indicates that the server is in standby power mode (see “Power Subsystem” on page 28).
3. When the server host is booting (full power applied), the System OK indicator blinks at the fast blink rate and the SP indicator is on steady. Once the server has successfully booted, the System OK indicator turns on steady.

   In its normal operating state, the system OK indicator and SP indicator are on steady and green.

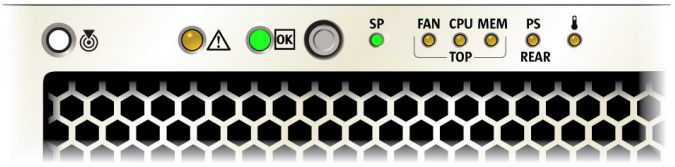


## Locator Indicator On

The Locator indicator helps identify a server in a rack of servers. It can be activated remotely from Oracle ILOM or from the front panel (by pressing the Locator button). Once activated, the indicator blinks at the fast blink rate.

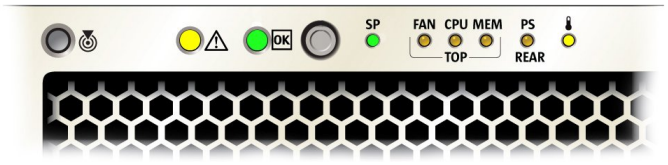
For indicator blink rate information, see “Indicator Blink Rates” on page 46.

For information on remotely turning on the Locator indicator, see “Managing the Locator Indicator” on page 107.



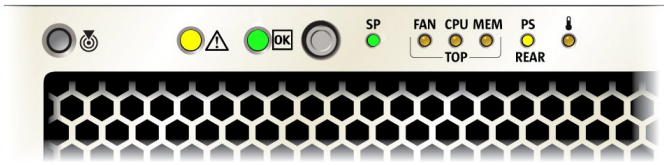

## Over Temperature Condition

For a server in an over-temperature state, the amber Service Action Required and Temperature indicators are on steady. The green OK indicator and the green SP indicator are on steady.



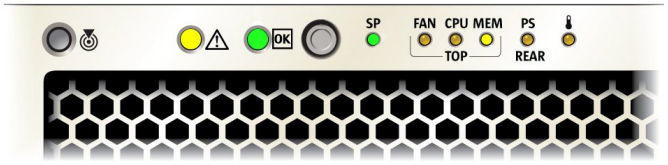
## PSU Failure

For a server with one of its PSU's in a failed state, the amber Service Action Required and PS REAR indicators are on steady. The green System OK indicator and the green SP indicator are on steady. In addition, the Service Action Required indicator on the failed PSU, as seen from the back of the system, will also light.




## Memory Failure

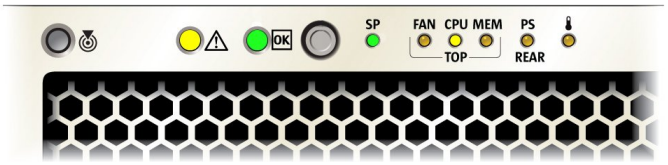
For a server with a failure in the memory subsystem, the amber Service Action Required and MEM TOP indicators are on steady. The green OK indicator and the green SP indicator are on steady.



## CPU Failure

For a server with a fault in the processor subsystem, the amber Service Action Required and CPU TOP indicators are on steady. The activity of green OK indicator and the green SP indicator vary depending on whether the server can boot successfully. The server might not be able to boot out of standby power mode.

For indicator blink rate information, see “Indicator Blink Rates” on page 46.



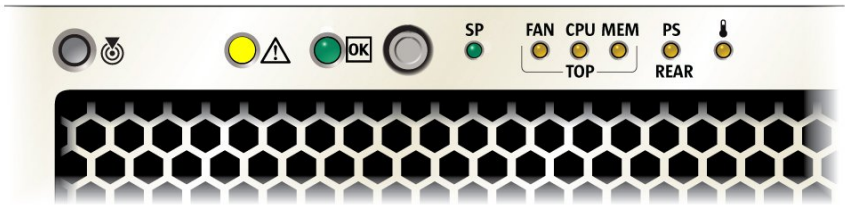

## Fan Module Failure

For a server with a fan module fault, the amber Service Action Required and the FAN TOP indicators are on steady. The green OK indicator and the green SP indicator are on steady.

For more information on fan indicators, see “Fan Module Reference” on page 135.

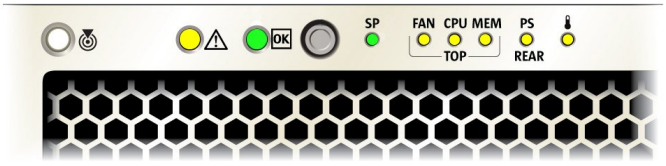
## SP Failure

For a server with an SP fault, the amber Service Action Required indicator is on steady. The green OK indicator and the green SP indicator are off.




## Front Panel Lamp Test

To perform a lamp test of all front panel indicators, press and hold down the Locate button for at least five seconds. All the indicators light up and remain on steady for 15 seconds (see "Unison Steady On" on page 49).



## Indicator Blink Rates

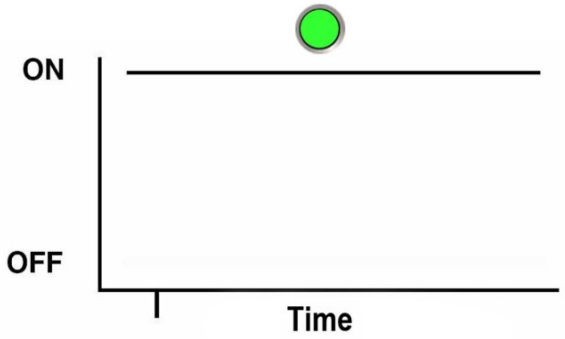
**Note -** The blink rate information described here might not apply to all server types (for example, blade or rack mount).

This section describes the following indicator blink rates:



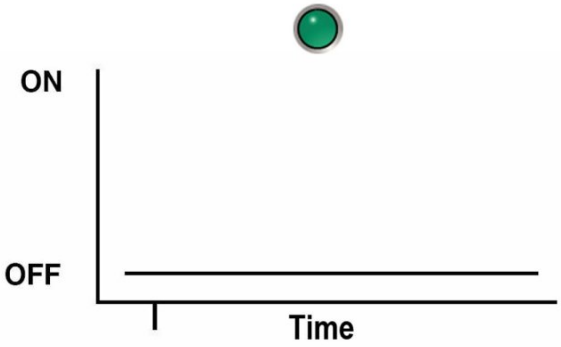
### Steady On

For the steady on state, an indicator is continually on (lit) and does not blink. This indicates a continuing condition, for example, an operational state (green) or a Service Action Required fault state (amber).



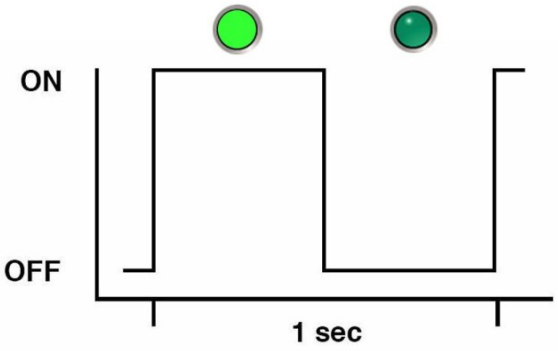
### Steady Off

For the steady off state, an indicator is continually off (not lit) and does not blink. This indicates that a system is not operational, for example, no AC power (unlit green System OK indicator) or a subsystem not in a fault state (unlit amber Service Action Required indicator).



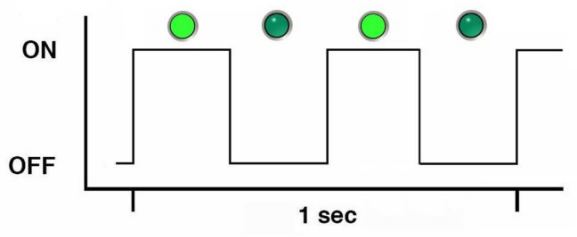

### Slow Blink Rate

For the slow blink rate, the indicator (typically green) repeatedly lights for half a second during a one second interval (1 Hz) and turns off for half a second. The slow blink rate indicates an on-going activity. For example, the slow blink rate occurs when a device is rebuilding, booting, or in transition from one mode to another.



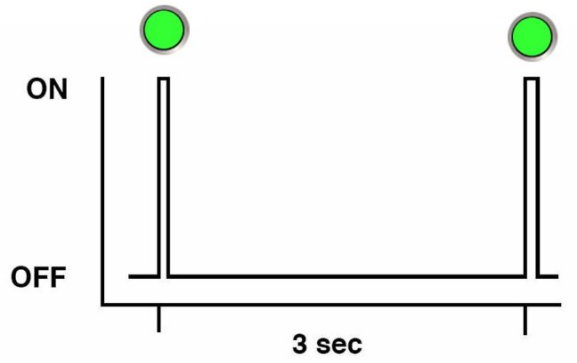
### Fast Blink Rate

For the fast blink rate, the indicator repeatedly blinks twice (on, off, on) during a one second interval (2 Hz). The fast blink rate indicates activity or data transfer.



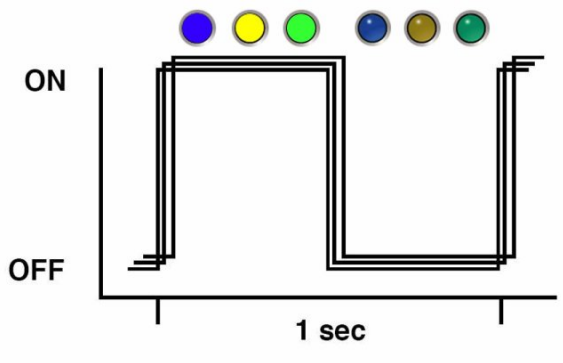

### Single (Standby) Blink Rate

For the single blink rate, the indicator repeatedly flashes once at the beginning of a three second interval. This indicates a component or system in standby mode. For example, the single blink rate occurs when a server is in standby power mode or a when hot spare device is waiting to be used (also used with amber indicators to indicate a predicted fault).



### Slow Unison Blink Rate

For the slow unison blink rate, the indicators on the component blink in unison for half a second during a one second interval (1 Hz). Typically, this is limited to three successive blinks. This confirms the successful insertion of a removable device (for example, a storage drive or blade) into a powered system (confirming the power connection).

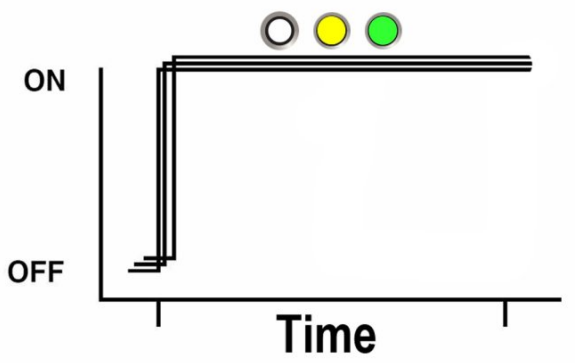



### Insertion Blink

The insertion blink is three successive blinks of a hot-swap component's primary status indicator (for example, the green OK indicator). The insertion blink occurs immediately after three successive unison blinks (see “Slow Unison Blink Rate” on page 49) of all the component indicators.

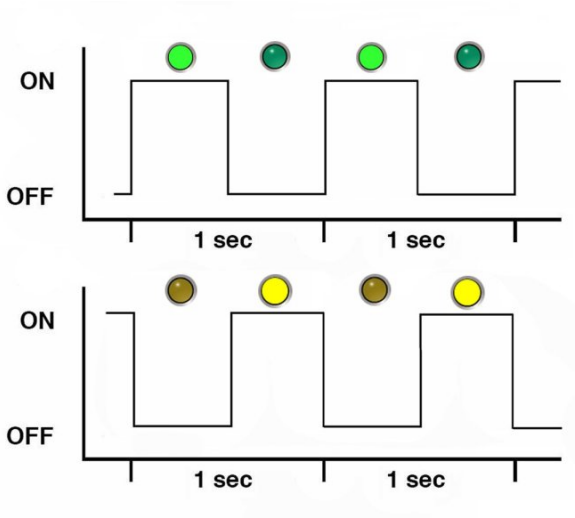
### Unison Steady On

For the unison steady on, all indicators are simultaneously on steady (see “Steady On” on page 46). This occurs during the front panel lamp test (see “Front Panel Lamp Test” on page 45).




### Alternating (Invalid FRU) Blink Rate

A repeating sequence of lit green and amber indicators at 1 Hz. Indicates that a component has an incorrect version or mismatch (for example, a power supply with a lower rating than the one specified). Also used for an unsupported component, a component in an unsupported slot, or a blade (server module) that causes a power supply to be oversubscribed for that system.



### Feedback Flash

An indicator flashes on and off during periods of activity, commensurate with the activity, but flashing does not exceed the 2 Hz fast blink rate (see, “Fast Blink Rate” on page 48). For example, disk drive read and write activity and communication port transmit and receive activity.

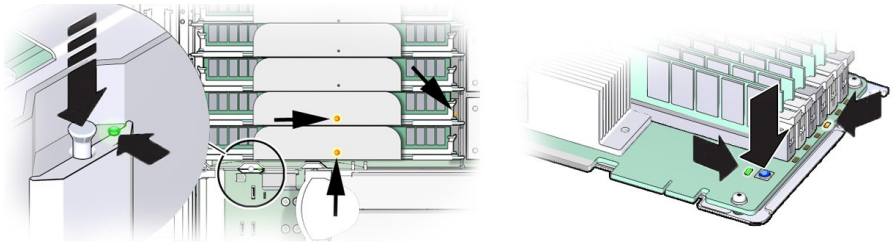
### Data Blink Rate

An indicator that is normally on repeatedly turns off twice during a one-second interval (2 Hz—see also, “Fast Blink Rate” on page 48) while data activity is taking place.

### Sequential (Diagnostic) Blink Rate

A repeating sequence in which each indicator successively lights for 0.5 sec each to indicate that diagnostics are running. This blink rate is used only on systems or components capable of running diagnostics (for example, blade servers).

## Troubleshooting Using the Fault Remind Test Circuits



The sever has two internal test circuits, the System Fault Remind Circuit and the DIMM Fault Remind Circuit. The circuits help you locate failed components. Use the System Fault Remind Circuit to locate a failed CPU or memory riser card, and use the DIMM Fault Remind Circuit to locate a failed DIMM. Both circuits hold an electrical charge and have limited operational capabilities once power is removed from the server. The DIMM Fault Remind Circuit is active for 10 minutes, and the System Fault Remind Circuit is active for 30 to 60 minutes.

Once AC power is connected to the system (providing standby power), the System Fault Remind circuit energy storage capacitor takes about 10 minutes to charge to 63% (which should be sufficient to turn on the indicator) and about 20 minutes to be fully charged. When you push down on the Fault Remind button, its power indicator should show green when the circuit has enough power to identify faulted components.

For information about how to use the circuits to identify failed components, see "Locate a Failed Memory Riser Card, DIMM, or CPU" on page 86.

# Troubleshooting System Cooling Issues

Maintaining the proper internal operating temperature of the server is crucial to a 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 one of following:

- "External Ambient Temperature Too High" on page 52
- "Airflow Blockage" on page 53
- "Internal Pressures Compromised" on page 53
- "Hardware Component Failure" on page 53

## External Ambient Temperature Too High

Server component cooling relies on the movement of cool ambient air 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 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 (see the *Installation Guide*). 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 a 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.

## Internal Pressures Compromised

The server has two main cooling area (see “Cooling Subsystem” on page 25). To function properly, these areas have separate pressures that are maintained using dividers, baffles, component filler panels, and the server top cover. These things need to be in place for the server to function as a sealed system. If the internal pressures 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 divider and air baffle (“Two-CPU Configuration” on page 23) are 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 divider and baffle are 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.

**Action**: Investigate the cause of the over-temperature event, and replace failed components *immediately*. For hardware troubleshooting information, see “Troubleshooting Server Hardware Component Faults” on page 37.

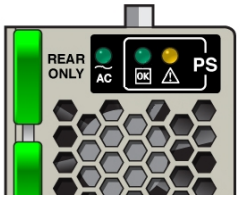
**Prevention**: Component redundancy is provided to a allow for component failure in critical subsystems, such as the cooling subsystem. However, once a component in a redundant system fails, the redundancy no longer exists, and the risk for server shutdown and component failures increases. Therefore, 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 one of the following:



## 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 (see the *Installation Guide*). A four-CPU configured server needs to operate at 200-240 VAC, while a two-CPU configured server can operate at either 100-127 VAC or 200-240 VAC. For more information about the processor subsystem, see “Processor Subsystem” on page 22.

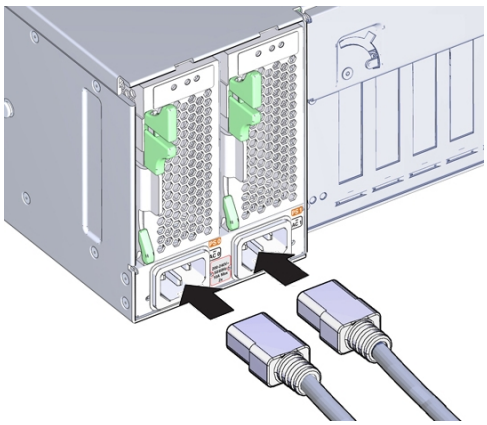
**Action**: Check that both AC power cords are connected to the server and check that the correct power is present at the outlets. If necessary, monitor the power to verify that it is within the

acceptable range. You can verify proper connection and operation of a power supply by checking its indicator panel.

A properly installed PSU has its green AC OK indicator lit. A properly functioning PSU has its green power (DC) OK indicator lit and its amber Service Action Required indicator off.

**Prevention**: Use the AC power cord 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 PSUs are inoperable, unplugged, or disengaged from the internal connectors, the server cannot power on.

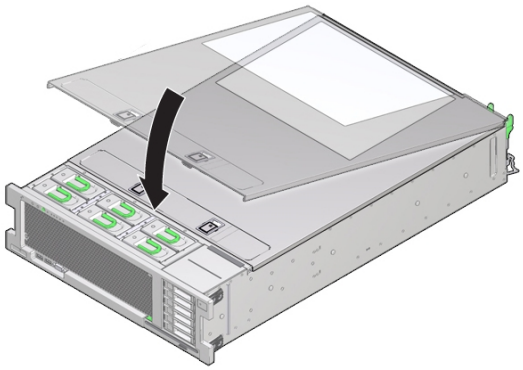
**Action**: Check that the AC cables are connected to both PSUs and that the PSUs are operational (the PSU indicator panel should have a lit green AC OK indicator). If not, ensure that the PSU is properly installed. A PSU that is not fully engaged with its internal connector does not have power applied 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 PSUs. This redundant configuration prevents server downtime, or an unexpected shutdown, due to a failed PSU. The redundancy allows the server to continue to operate if one of the PSUs fails. However, when a server is being powered by a single PSU, 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 PSU has its green AC OK indicator lit. A properly functioning PSU has its green power (DC) OK indicator lit and its amber Service Action Required indicator off

## Top Cover



The server top cover helps the cooling subsystem maintain pressure areas within the server. The top cover also protects against damage to internal components and accidental exposure to hazardous voltages. For these reasons, the server top cover is includes an interlock switch to server power.

The interlock switch has two components. One component is mounted inside the server on the housing for power supply, PS1, and includes a wire that plugs into the motherboard. The other component is mounted on the underside of the top cover. When the cover is installed these two components align, closing the switch and allowing power to the server. When the cover is removed, the switch opens removing power from the server. If the cover is removed while the server is powered on to full power mode, power to the server is *immediately* switched off.

**Action**: If the server does not power on, check that 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.

**Prevention**: After removing the top cover, take care that the cover does not get bent, or that the component on the underside is not damaged. 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.

# Troubleshooting With Diagnostic Tools

This section describes the available diagnostic tools and documentation that you can use to troubleshoot server issues.



## 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 subsystems 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.

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 include 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 conditions 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. |

| Diagnostic Tool | Type | What It Does | Accessibility | Remote Capability |
|---|---|---|---|---|
| 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 Console. |
| U-Boot | SP firmware | Initializes and tests aspects of the service processor (SP) prior to booting Oracle ILOM and the 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 | System BIOS | The UEFI diagnostics can test and detect problems on all CPU, memory, disk drives, and network ports. It is used on systems that support UEFI. | You can use either the Oracle ILOM web interface or the command-line interface (CLI) to run UEFI diagnostics. | Remote access through Oracle ILOM Remote Console. |
| 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 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 | Information | Location |
|---|---|---|
| Oracle ILOM | Oracle Integrated Lights Out Manager 3.2 Documentation Library | http://www.oracle.com/goto/ILOM/docs |
| Preboot Menu | *Oracle x86 Servers Diagnostics Guide* | http://www.oracle.com/goto/x86AdminDiag/docs |

| Diagnostic Tool | Information | Location |
|---|---|---|
| U-Boot diagnostics | *Oracle x86 Servers Diagnostics Guide* | http://www.oracle.com/goto/x86AdminDiag/docs |
| System indicators and sensors | *Oracle Server X5-4 Service Manual* | "Troubleshooting Using the Front Panel Indicators" on page 40 |
| POST | BIOS Setup Utility information | "BIOS Setup Utility Menu Options" on page 273 |
| POST | Power On Self-Test (POST) codes | "POST and Checkpoint Codes" on page 341 |
| UEFI diagnostics | *Oracle x86 Servers Diagnostics Guide* | http://www.oracle.com/goto/x86AdminDiag/docs |
| Oracle VTS | Oracle VTS software and documentation | http://docs.oracle.com/cd/E19719-01/index.html |

# Attaching Devices to the Server

This section describes server port information and provides procedures for attaching devices to the server.

- "Attach Devices to the Server" on page 59
- "Back Panel Connector Locations" on page 60
- "Configuring Serial Management Port Ownership" on page 61
- "Four Onboard 10GbE Ports" on page 32

## ▼ Attach Devices to the Server

This section provides information about connecting devices to server (remotely and locally), so you can interact with the service processor (SP) and the server console.

1. **Connect an Ethernet cable to the Gigabit Ethernet (NET) connectors.**

   See "Back Panel Connector Locations" on page 60.

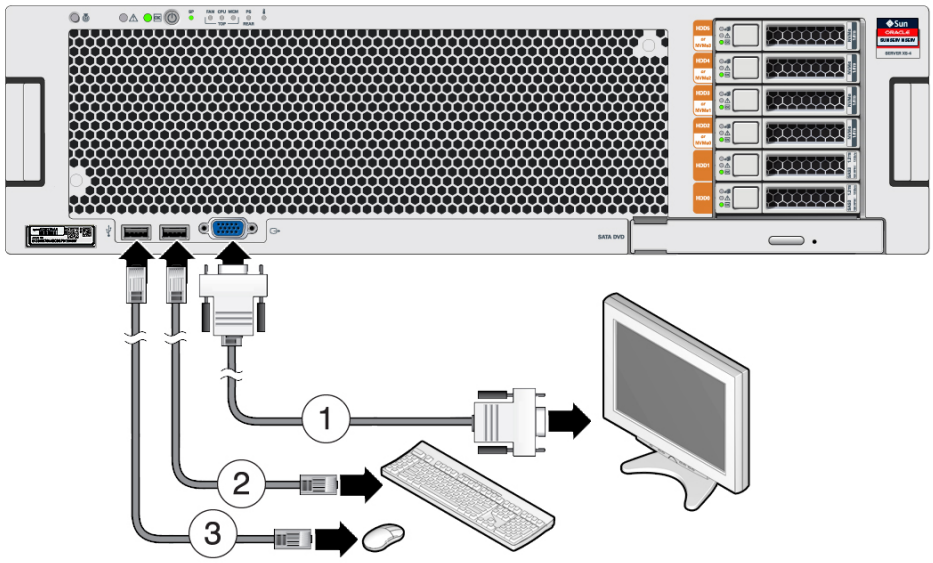
2. **To connect to Oracle ILOM over the network, connect an Ethernet cable to the Ethernet port labeled NET MGT.**

   See "Back Panel Connector Locations" on page 60.

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.**

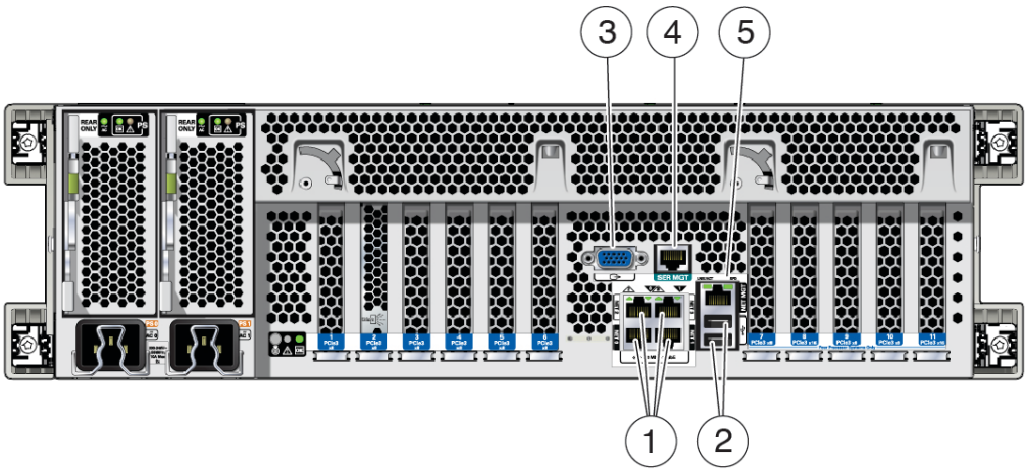
   See “Back Panel Connector Locations” on page 60.

4. **To interact with the system console locally, connect a monitor [1], keyboard [2] and mouse [3] to the server front panel connectors as shown in the illustration below.**




# Back 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 you can access diagnostic tools and manage the server during service.




| Callout | Description |
|---|---|
| 1 | 10 Gigabit Ethernet ports NET 0, 1, 2, 3[†] |
| 2 | USB 2.0 ports |
| 3 | DB-15 video connector |
| 4 | Service processor RJ-45 serial management port (SER MGT) |
| 5 | Service processor RJ-45 10/100/1000Base-T network management port (NET MGT) |

[†]For OS port naming information, see "Four Onboard 10GbE Ports" on page 32.

# Configuring Serial Management Port Ownership

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

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

- "Assign Serial Port Ownership Using the CLI" on page 62
- "Assign Serial Port Ownership Using the Web Interface" on page 63

## ▼ Assign Serial Port Ownership Using the CLI

**Before You Begin**

Set up a network connection to 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 back to the SP, use the network connection to Oracle ILOM.

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@`***ipadress*

   where *ipadress* is the IP address of the server SP.

   For more information, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

   The Oracle ILOM CLI prompt appears:

   ```
   ->
   ```

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

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

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

3. **To set the serial port owner back to the SP, type:**

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

   **Note -** If you inadvertently changed ownership of the serial management port (SER MGT) before setting up a network connection to Oracle ILOM, refer to the Oracle Integrated Lights Out Manager (ILOM) 3.2 Documentation Library at: `http://www.oracle.com/goto/ilom/docs` for details about restoring access to the serial management port on your server.

4. **To log out of Oracle ILOM, type:**

   ```
   -> exit
   ```

### ▼ Assign Serial Port Ownership Using the Web Interface

**Before You Begin**

Set up a network connection to 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 back to the SP, use the network connection to Oracle ILOM.

1. **Log in to the service processor 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. Refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

   The Summary screen appears.

2. **In the 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. **To set the host as the serial port owner, select `Host Server` at the Serial Port page.**

5. **To set the SP as the serial port owner, select `Service Processor` at the Serial Port page.**

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

7. **Log out of Oracle ILOM.**

# Resetting the Host or Service Processor

This section provides procedures for resetting the host and the SP

# Reset the Host or SP Using Oracle ILOM

**Before You Begin** The Host Control and Reset (r) role is required to reset a service processor.

1. **Log in to the Oracle ILOM (web or CLI) for the server.**
2. **Reset Oracle ILOM using one of the following methods:**

   - **From the Oracle ILOM CLI, enter the command:**

     ```
     reset /SP
     ```

   - **From the Oracle ILOM web interface, click ILOM Administration > Maintenance > Reset SP.**

   **Note -** Resetting the Oracle ILOM SP disconnects your current Oracle ILOM session. You must log in again to continue working in Oracle ILOM.

3. **Reset the host using one of the following methods:**

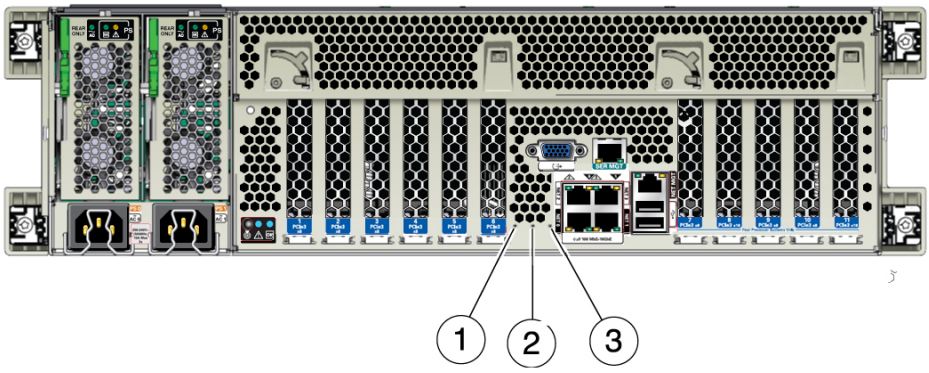
   - **From the Oracle ILOM CLI, enter the command:**

     ```
     reset /System
     ```

   - **From the Oracle ILOM web interface, click Host Management > Power Control, then select your reset method from the drop-down list.**

# Reset the Host or SP Using Back Panel Pinhole Switches

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




| Callout | Description |
|---|---|
| 1 | SP Reset |
| 2 | Host Warm Reset |
| 3 | NMI (Oracle Service use only) |

# Reset the SP Root Account Password or Recover the Root Account

If necessary, system administrators can recover the Oracle ILOM root account (if accidentally deleted) or reset the password for the Oracle ILOM root account to the factory default password.

To perform either action, you need a local serial management port (SER MGT) connection to Oracle ILOM. In addition, if the Physical Presence State is enabled (the default) in Oracle ILOM, you must prove that you are physically present at the server as described in the following procedure.

To recover the root account or root account password, perform these steps:

1. **Establish a local serial management connection to Oracle ILOM and log in to Oracle ILOM using the default user account.**

   For example:

```
ORACLESP-000000000 login: default

Press and release the physical presence button
```

```
Press return when this is completed...
```

For additional information logging in through the serial management port, see “Log In to Oracle ILOM CLI Using a Local Serial Connection” in *Oracle Server X5-4 Installation Guide*.

2. **To prove physical presence at the server, press the Locator button on the front of the server.**
   For the location of the Locator button, see “Server Front Panel Features” on page 17.
3. **Return to your serial console and press Enter.**
   You will be prompted for a password.
4. **Enter the password for the default user account: `defaultpassword`**
5. **Reset the root account password or re-create the root account.**
   Refer to the Oracle ILOM documentation for details on creating user accounts at: `http://www.oracle.com/goto/ILOM/docs`

# Getting Help

This sections describes how to get additional help to resolve server-related problems.



## 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 | |

| System Configuration Information Needed | Your Information |
|---|---|
| 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 | |

**See Also:**

- “Locating the System Serial Number” on page 67

# Locating the System Serial Number

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

- On the front panel of the server, look at the bottom left of the bezel to locate the server serial number.
- Locate the yellow Customer Information Sheet (CIS) attached to your server packaging. This sheet includes the serial number.
- From Oracle ILOM:
  - From the Oracle ILOM command-line interface (CLI), type the command: `show/SYS`.
  - From the Oracle ILOM web interface, view the serial number in the System Information tab.
- From Oracle System Assistant, view the serial number in the System Overview (home screen).

# Servicing the Server

This section describes component serviceability requirements and provides common service procedures.

| Description | Link |
|---|---|
| Component information, including component location, serviceability, and system designations | “Component Serviceability, Locations, and Designations” on page 69 |
| Procedures for setting up an ESD-safe work space. | “Performing Electrostatic Discharge and Static Prevention Measures” on page 79 |
| Recommended and required tools for servicing the server. | “Tools and Equipment” on page 81 |
| Information about component filler panels. | “Component Filler Panels” on page 81 |
| Procedures for using the fault remind test circuits. | “Locating a Failed Memory Riser Card, DIMM, or CPU” on page 82 |
| Procedures about clearing hardware faults in Oracle ILOM. | “Clear Hardware Fault Messages” on page 91 |

## Component Serviceability, Locations, and Designations

This section describes component service designations, serviceability, and locations.

# Component Serviceability

The replaceable components in your server are designated as either a customer-replaceable unit (CRU) or a field-replaceable unit (FRU).

- A part designated as a FRU must be replaced by an Oracle-qualified service technician.
- A part designated as a CRU can be replaced by a person who is not an Oracle-qualified service technician.

If the component can be serviced while the server is powered on, it is called a hot-service component. If the server has to be powered off before the component can be serviced, it is called a cold-service component.

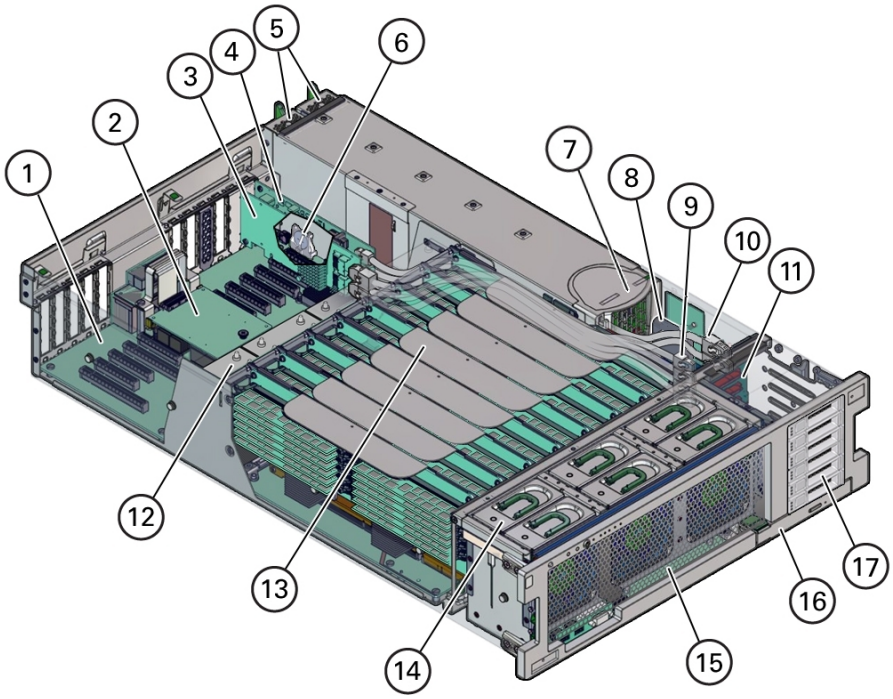
The following table lists the components, their service designations, and their serviceability.

| Component | Service Designation | Serviceability |
|---|---|---|
| Storage drives | CRU | Hot |
| Fan modules | CRU | Hot |
| Power supplies | CRU | Hot |
| Memory risers and DIMMs | CRU | Cold |
| PCIe cards | CRU | Cold |
| DVD drive | CRU | Cold |
| System (or RTC) battery | CRU | Cold |
| CPUs and heatsinks | FRU | Cold |
| SAS 12 Gb/s HBA and cables (HBA-to-disk backplane) | FRU | Cold |
| PCIe NVMe Switch card and cables (card-to-disk backplane) | FRU | Cold |
| Energy Storage Module (ESM) and cable (HBA-to-ESM) | FRU | Cold |
| Fan board | FRU | Cold |
| Power supply backplane | FRU | Cold |
| Storage drive backplane | FRU | Cold |
| SP card | FRU | Cold |
| Motherboard | FRU | Cold |

# Location of Replaceable Components

The following illustrations show the Oracle Server X5-4 components:

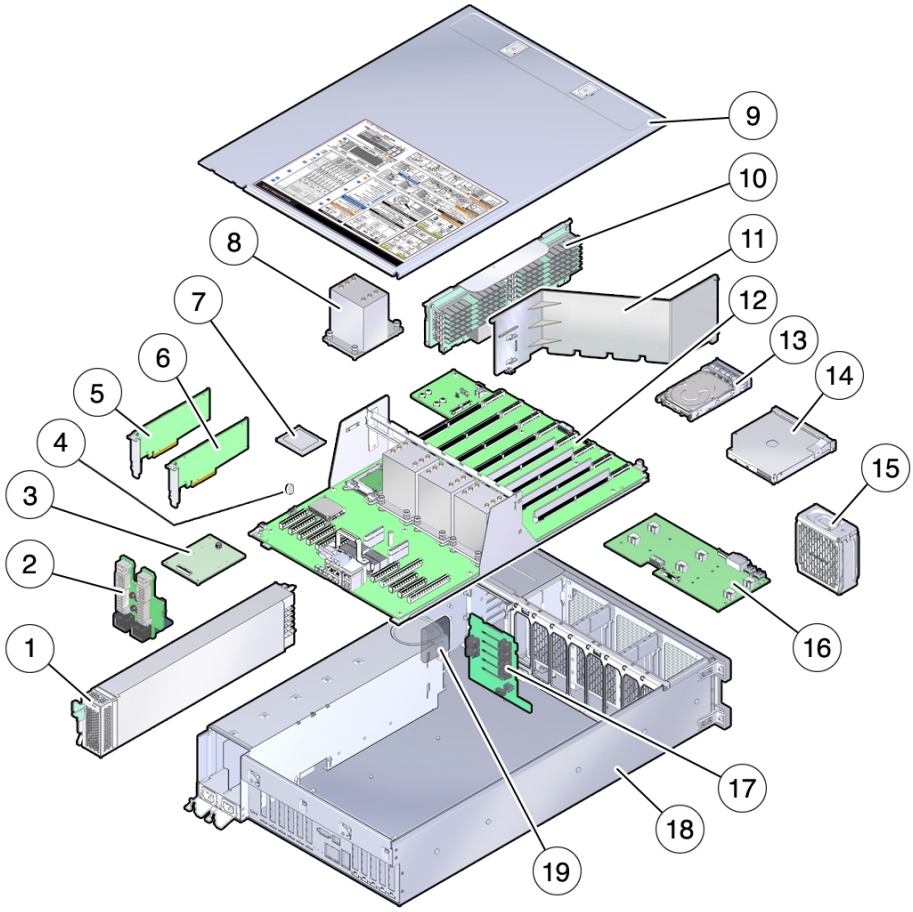
## Replaceable Components




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Motherboard | 10 | HBA SAS cables (2) |
| 2 | SP card | 11 | Storage drive backplane board |
| 3 | HBA card | 12 | Heatsinks and CPUs (2 or 4) |
| 4 | PCIe NVMe Switch card | 13 | Memory riser cards (4 or 8) |
| 5 | Power supplies (2) | 14 | Fan modules (6) |
| 6 | System battery | 15 | Fan board |
| 7 | Power supply backplane | 16 | DVD Drive |

| Callout | Description | Callout | Description |
|---|---|---|---|
| 8 | ESM | 17 | Storage drive slots (6) |
| 9 | NVMe cables (4) | | |

## Components (Exploded View)




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Power supplies | 11 | Air baffle (2-CPU configuration only) |

| Callout | Description | Callout | Description |
|---|---|---|---|
| 2 | Power supply backplane board | 12 | Motherboard |
| 3 | SP card | 13 | Storage drive |
| 4 | System battery | 14 | DVD drive |
| 5 | PCIe NVMe Switch card | 15 | Fan module |
| 6 | HBA card | 16 | Fan board |
| 7 | CPU | 17 | Storage drive backplane board |
| 8 | Heatsink | 18 | Server chassis |
| 9 | Cover | 19 | ESM (Energy Storage Module for HBA) |
| 10 | Memory riser card | | |

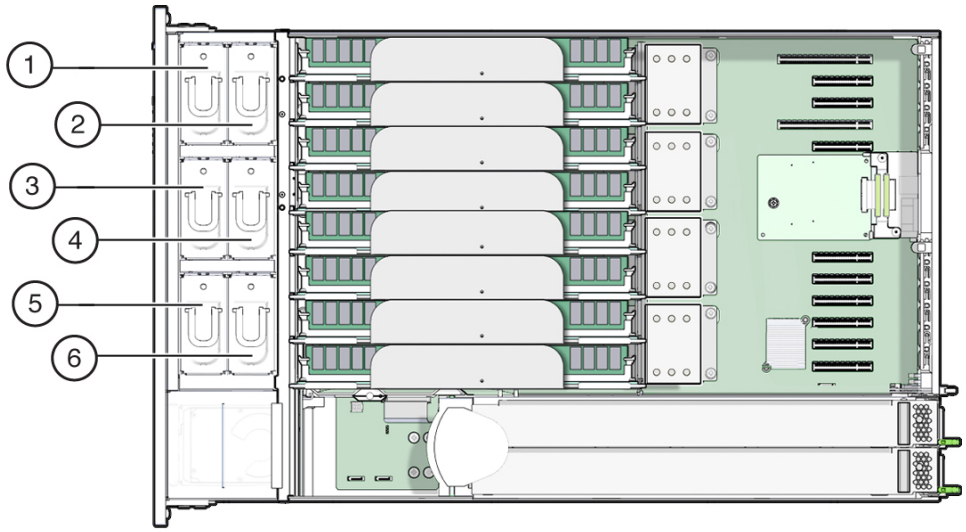
# Component Designations

This section describes the naming designations for internal and external slots:


- "Fan Module Slot Designations" on page 73
- "CPUs and Memory Riser Card Slots Designations" on page 74
- "DIMM Slot Designations" on page 75
- "Power Supply Designations" on page 76
- "PCIe Slot Designations" on page 77
- "DVD, Storage Drive, and USB Designations" on page 78


## Fan Module Slot Designations

The six fan module slots are at the front of the server and are set in two rows of three slots. The slots are designated from left to right. As pictured in the illustration below, the three front row slots are designated as: FM0, FM1, and FM2. The three back row slots are: FM3, FM4, and FM5.



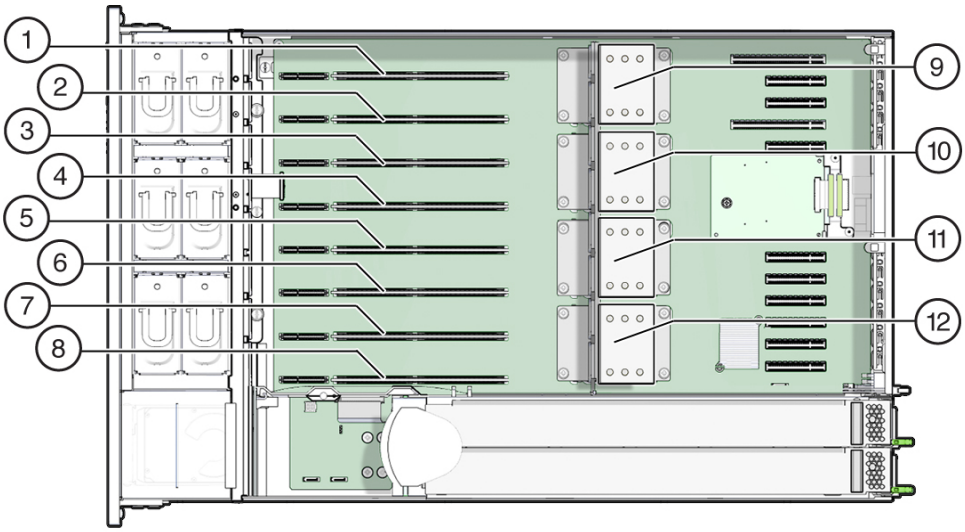

| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Fan Module, FM 0 | 4 | Fan Module, FM 3 |
| 2 | Fan Module, FM 1 | 5 | Fan Module, FM 4 |
| 3 | Fan Module, FM 2 | 6 | Fan Module, FM 5 |

## CPUs and Memory Riser Card Slots Designations

The four CPU sockets are located in the middle of the server and are designated consecutively from right to left (from the front of the server). The rightmost socket is CPU-0 and is designated as P0, and the leftmost socket is CPU-3, designated as P3.

The eight memory riser (MR) card slots are located between the fan module slots and the CPU sockets. Consecutively from right to left, the rightmost slot is slot 0, and the leftmost slot is slot 7.

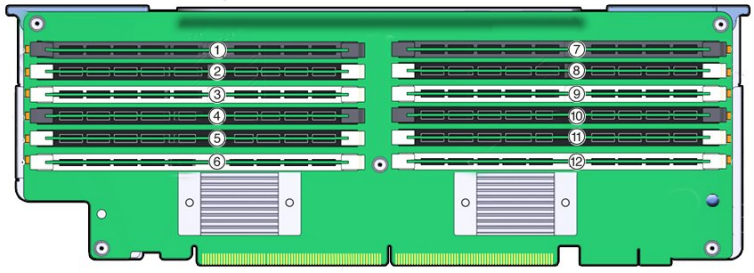
The slots are also designated by their association with the four CPU sockets (P0-P3). Two slots are assigned to each CPU socket. For example, slots 0 and 1 are paired with CPU socket, P0, and are designated as P0/MR0 and P0/MR1. Slots 2 and 3 are paired with CPU socket, P1 and are designated as P1/MR0 and P1/MR1. This numbering pattern continues for the remaining slots.




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | MR card slot P3/MR1 | 7 | MR card slot P0/MR1 |
| 2 | MR card slot P3/MR0 | 8 | MR card slot P0/MR0 |
| 3 | MR card slot P2/MR1 | 9 | CPU-3 (P3) |
| 4 | MR card slot P2/MR0 | 10 | CPU-2 (P2) |
| 5 | MR card slot P1/MR1 | 11 | CPU-1 (P1) |
| 6 | MR card slot P1/MR0 | 12 | CPU-0 (P0) |

## DIMM Slot Designations

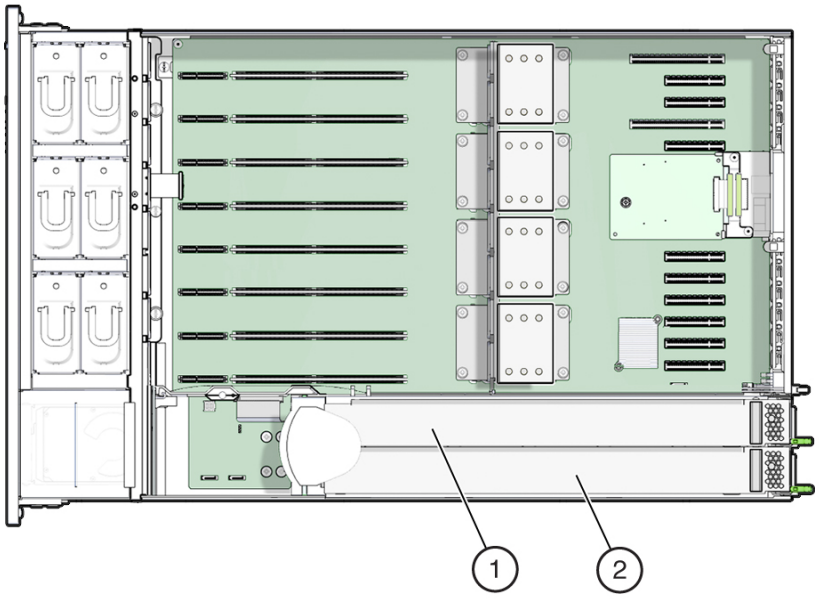
The DIMM slots are located on the memory riser cards. The DIMMs are arranged in two banks of six slots for a total of 12 slots. The slots are designated numerically from top to bottom. The left bank of slots are designated as D0–D6. The right bank of slots are designated as D7–D11.




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Slot D0 | 7 | Slot D6 |
| 2 | Slot D1 | 8 | Slot D7 |
| 3 | Slot D2 | 9 | Slot D8 |
| 4 | Slot D3 | 10 | Slot D9 |
| 5 | Slot D4 | 11 | Slot D10 |
| 6 | Slot D5 | 12 | Slot D11 |

## Power Supply Designations

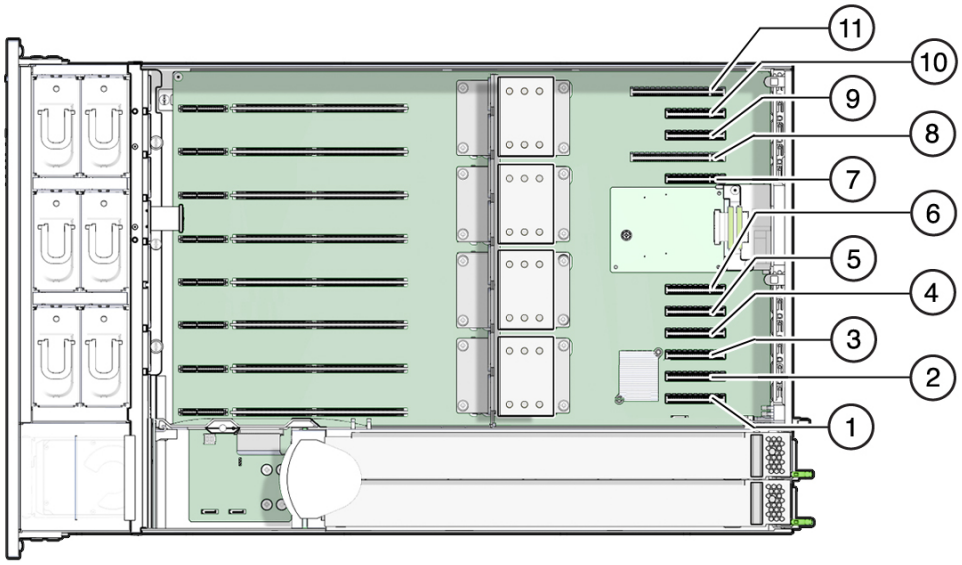
The two power supply slots are located on the right side of the server (from the front of the server) and are designated from right to left. The slots are accessible from the back of the server. From the back of the server, the left slot is designated as PS-0, and the right slot is PS-1.




| Callout | Description |
|---|---|
| 1 | PS 1 |
| 2 | PS 0 |

## PCIe Slot Designations

The eleven PCIe slots are located inside the server at the back. As viewed from the front of the server, the slots are divided into two groups, a group of six on the right of the SP card and a group of five on the left of the SP card. The slots are designated from right to left. The six slots on the right side are designated as PCI-1 to PCI-6. The five slots on the left are designated as PCI-7 to PCI-11.



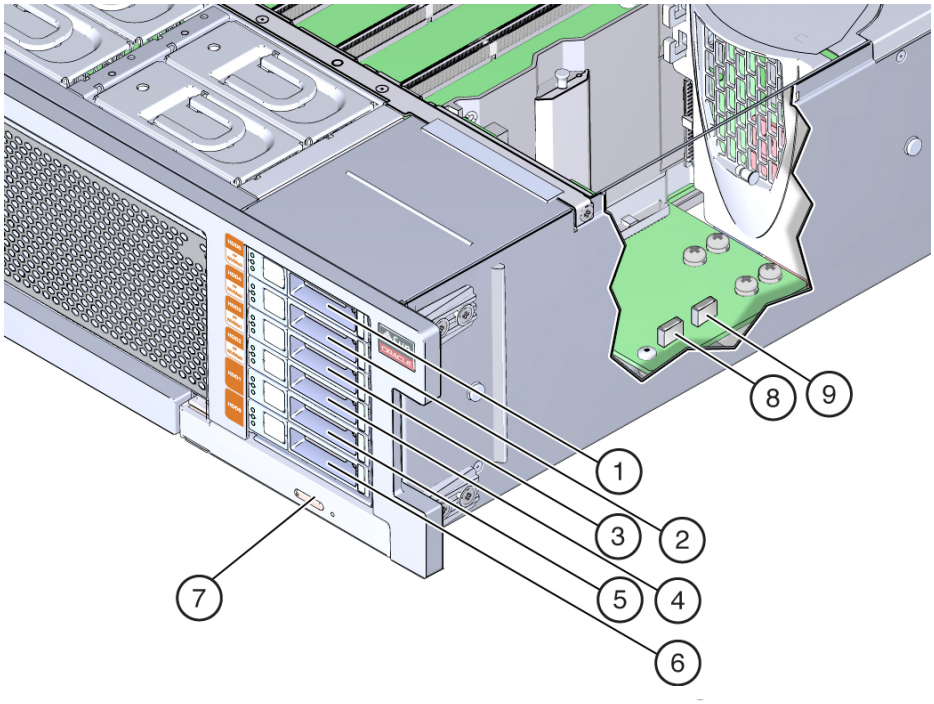

| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | PCIe 1 | 7 | PCIe 7 |
| 2 | PCIe 2 | 8 | PCIe 8 |
| 3 | PCIe 3 | 9 | PCIe 9 |
| 4 | PCIe 4 | 10 | PCIe 10 |
| 5 | PCIe 5 | 11 | PCIe 11 |
| 6 | PCIe 6 | | |

## DVD, Storage Drive, and USB Designations

The DVD drive is located at the right lower front side of the front of the server.

The six storage drive slots are on the right side of the server and are designated consecutively from bottom to top. The bottommost slot is designated as HDD-0, and the topmost slot is HDD-5.

The two internal USB slots are located between the disk backplane board and the power supply backplane board. An optional Oracle System Assistant flash drive is installed in the port marked "OSA USB."




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | HDD5/NVMe3 | 6 | HDD0 |
| 2 | HDD4/NVMe2 | 7 | DVD |
| 3 | HDD3/NVMe1 | 8 | OSA USB port |
| 4 | HDD2/NVMe0 | 9 | USB port |
| 5 | HDD1 | | |

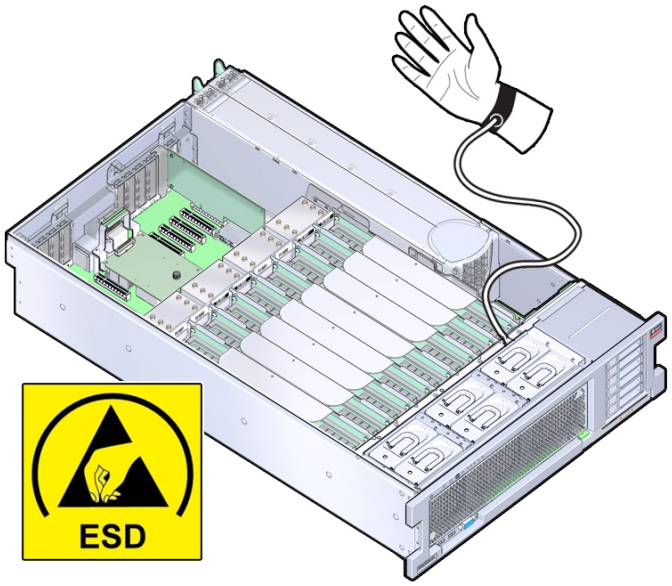
# Performing Electrostatic Discharge and Static Prevention Measures

Electrostatic discharge (ESD) sensitive devices, such as the PCIe cards, hard drives, CPUs, and memory cards, require special handling.

## Using an Anti-static Wrist Strap

Wear an anti-static wrist strap when handling components such as disk drive assemblies, circuit boards, or PCIe cards. When servicing or removing server components, attach an anti-static strap to your wrist and then to a metal area on the server chassis. Following this practice equalizes the electrical potentials between you and the server.

**Note -** An anti-static wrist strap is not shipped with the servers. However, anti-static wrist straps are included with customer-replaceable units (CRUs), field-replaceable units (FRUs), and optional components.




## Using an Anti-Static Mat

In addition to wearing an anti-static wrist strap when handling components, create an ESD-free work place by using an anti-static mat as a work surface and as a place to set ESD-sensitive components such as printed circuit boards, DIMMs, and CPUs. You can use the following items as anti-static mats:

- Anti-static bag used to wrap a replacement part
- ESD mat (orderable from Oracle)
- A disposable ESD mat (shipped with some optional system components)

# Tools and Equipment

To service the system, you need the following tools:

- No. 2 Phillips screwdriver
- Anti-static wrist strap
- ESD mat and grounding strap

You might also need a system console device, such as one of the following:

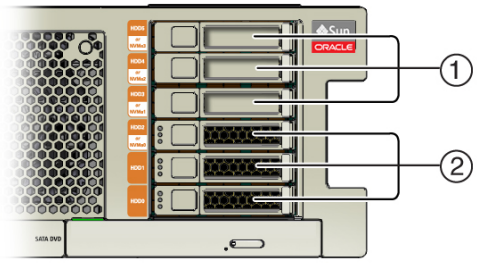
- PC or workstation with RS-232 serial port
- ASCII terminal
- Terminal server
- Patch panel connected to a terminal server

# Component Filler Panels

Your server might be shipped with module-replacement filler panels for CPUs, storage drives (HDD or SSD), the DVD drive, and the PCIe cards. A filler panel is an empty metal or plastic enclosure that does not contain any functioning system hardware or cable connectors.

The filler panels are installed at the factory and must remain in the server until you replace them with components. This seals system and provides noise, EMI, and airflow containment. If you remove a filler panel and continue to operate your system with an empty module slot, the server might overheat due to improper airflow. For instructions on removing or installing a filler panel for a server component, refer to the section in this guide about servicing that component.

The following illustration shows the storage drives and storage drive filler panels installed in the server.




| Callout | Description |
|---|---|
| 1 | Storage drive filler panels |
| 2 | Storage drives |

# Locating a Failed Memory Riser Card, DIMM, or CPU

This section describes the system and DIMM Fault Remind test circuits and provides a procedure for using the circuits to locate faulty components:


- "Fault Remind Circuits and Internal Fault Indicator Locations" on page 82
- "DIMM Fault Remind Circuit Components" on page 85
- "Locate a Failed Memory Riser Card, DIMM, or CPU" on page 86

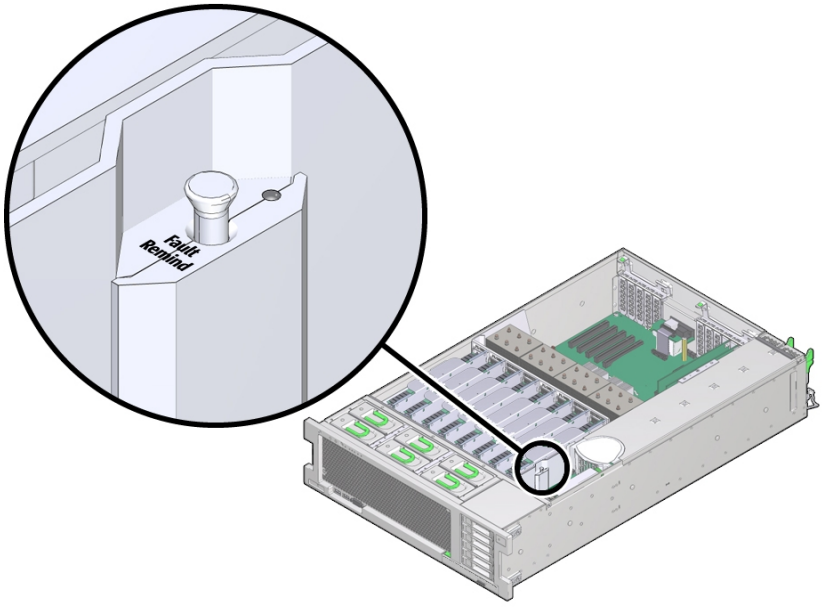

## Fault Remind Circuits and Internal Fault Indicator Locations

This section describes the locations of the system Fault Remind circuit components:


- "System Fault Remind Button and Charge Status Indicator" on page 83
- "Memory Riser Card and CPU Fault Indicators" on page 83
- "CPU Fault Indicators" on page 84

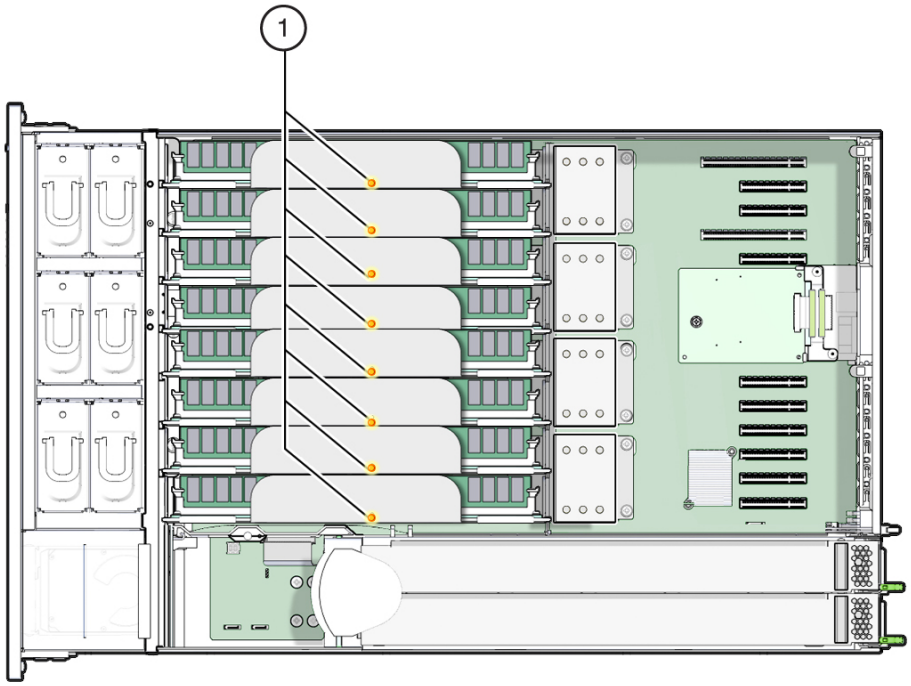
## System Fault Remind Button and Charge Status Indicator

The Fault Remind Button is located on the divider between the cooling zone 1 and cooling zone 2. The Charge Status Indicator is located next to the button.




## Memory Riser Card and CPU Fault Indicators

The memory riser card Fault indicators are visible through the small hole on top of the card.

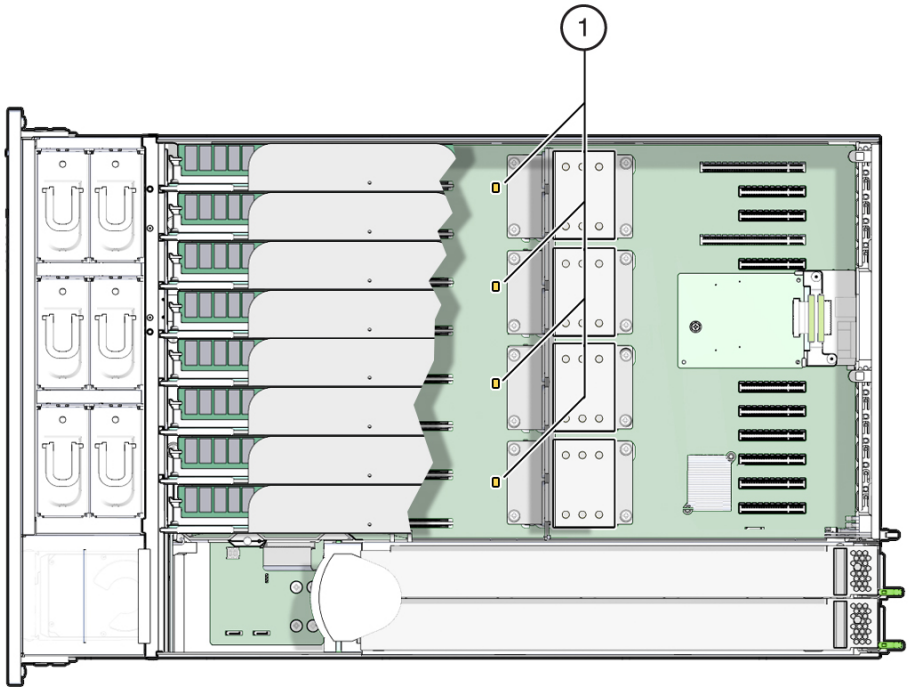



| Callout | Description |
|---|---|
| 1 | Memory riser card Fault indicators |

## CPU Fault Indicators

The CPU Fault indicators are located on the motherboard between the memory riser cards and the CPU. To see a lit CPU Fault indicator, look down from the top of the server and sight through the memory riser cards and the support bracket near the CPU. The following illustration shows the location of the CPU Fault indicators.

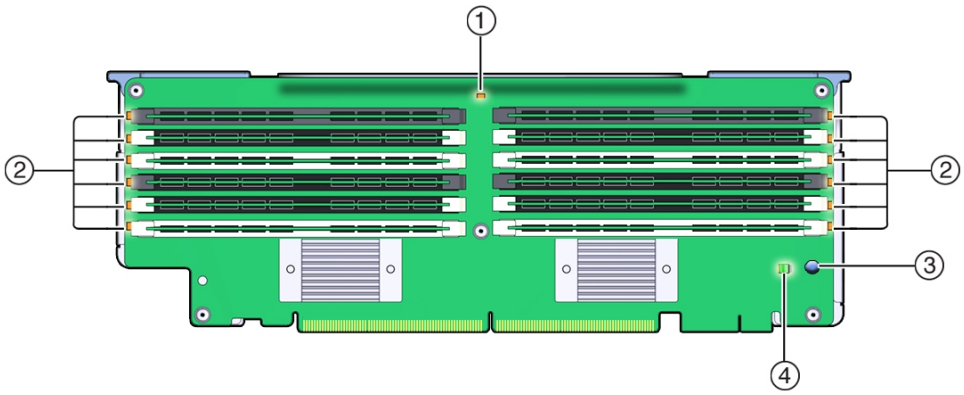
**Note -** When a CPU fails the fault indicators of its two memory riser cards also light, making it easier to identify the failed CPU.




| Callout | Description |
|---|---|
| 1 | CPU Fault indicators |

# DIMM Fault Remind Circuit Components

The DIMM Fault Remind Test Circuit is located on the memory riser card. The Fault Remind Button and Charge Status Indicator are located near the right-side bank of DIMM slots at the front edge of the card. The DIMM Fault indicators are located next to the DIMM slots.




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | MR card Fault indicator | 3 | Fault Remind button |
| 2 | DIMM Fault indicators | 4 | Charge Status indicator† |

†The indicator lights when the circuit is charged.

# ▼ Locate a Failed Memory Riser Card, DIMM, or CPU

To locate a failed memory riser card, DIMM or CPU, use the fault remind circuits inside the server. The circuit uses board-mounted indicators to identify the failed component. If the failed component is a memory riser card or a CPU, the indicators identify the component directly. If the failed component is a DIMM, the indicators identify the memory riser card containing the DIMM. Then to locate the failed DIMM, you need to remove the memory riser card and use the card's DIMM Fault Remind circuitry.

For more information about the system and DIMM Fault Remind circuits, see “Troubleshooting Using the Fault Remind Test Circuits” on page 51.

**Before You Begin** To troubleshoot faulty hardware components, see “Troubleshooting Server Hardware Component Faults” on page 37.

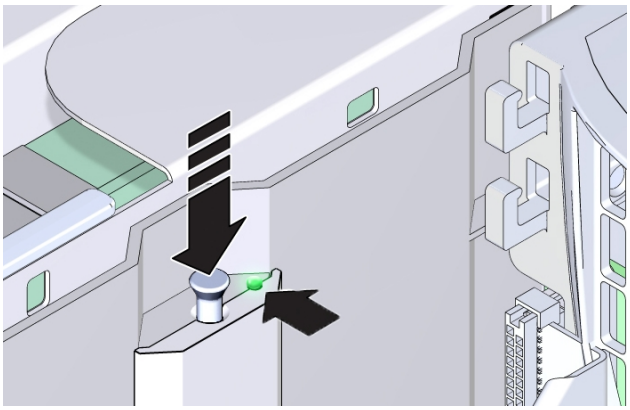
**Note -** The test circuits are charged, time-limited circuits. Once power is removed from the server you have 10 minutes to use the DIMM Fault Remind circuit and 30-60 minutes to use the System Fault Remind circuit.

1. **Prepare for service.**

See “Prepare the Server for Cold Service” on page 94.

2. **Press and hold the system Fault Remind button.**

   The Fault Remind button is located on the divider between the cooling zone 1 and cooling zone 2.



3. **Verify that the system Fault Remind circuit is usable.**

   When the Fault Remind button is pressed, the Fault Remind power indicator illuminates (green) to indicate that the remind circuitry is usable.

4. **Look for the lit Fault indicators:**

   If the circuit is usable, identify the failed component by the lit Fault indicators. Use the information in the following table to help you find the component.

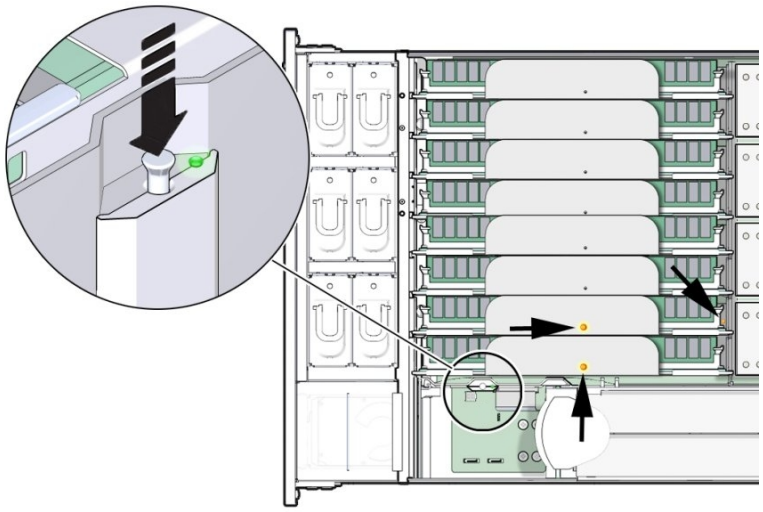
| Faulted Component | Memory Riser Indicator | CPU Indicator | DIMM Indicator |
|---|---|---|---|
| CPU | On<br><br>The indicators for both memory riser cards associated with the failed CPU turn on. | On | Off |
| Memory riser card | On | Off | Off |
| DIMM | On<br><br>To locate the failed DIMM, remove the MR card | Off | On |

| Faulted Component | Memory Riser Indicator | CPU Indicator | DIMM Indicator |
|---|---|---|---|
| | and use the DIMM Fault Remind circuit. | | |

- **To locate a failed CPU, look for the lit MR card Fault indicators and the lit CPU Fault indicator.**

  When a CPU is in a fault state, the Fault indicators for the CPU and both MR cards associated with the CPU light when the system Fault Remind button is pressed.

  The following illustration shows the lit indicators for a failed CPU, P0. In this example, the Fault indicators for memory riser cards, P0/MR0 and P0/MR1 are lit, as is the Fault indicator for CPU, P0.

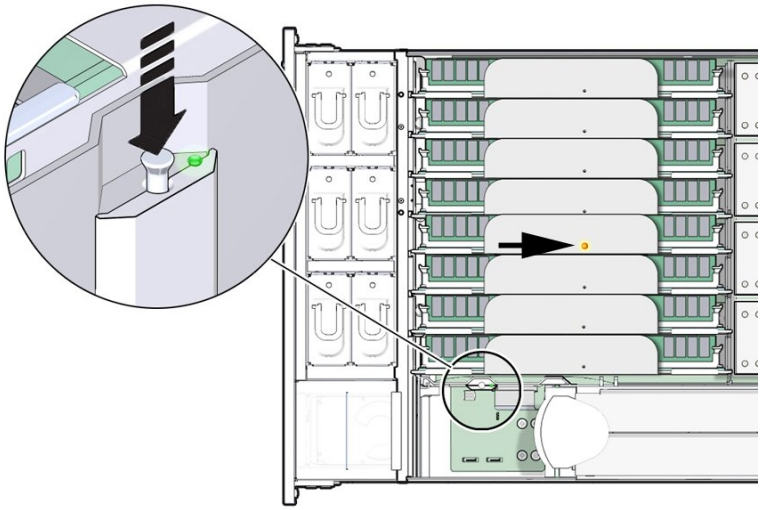


  For more information, see "CPU Fault Indicators" on page 84.

- **To locate a failed MR card, look for the MR card Fault indicator.**

  When an MR card is in a fault state, the Fault indicator for the card lights when the system Fault Remind button is pressed. The indicator is visible through the small hole on top of the card.

The following illustration shows a lit Fault indicator for memory riser card, P1/MR1.

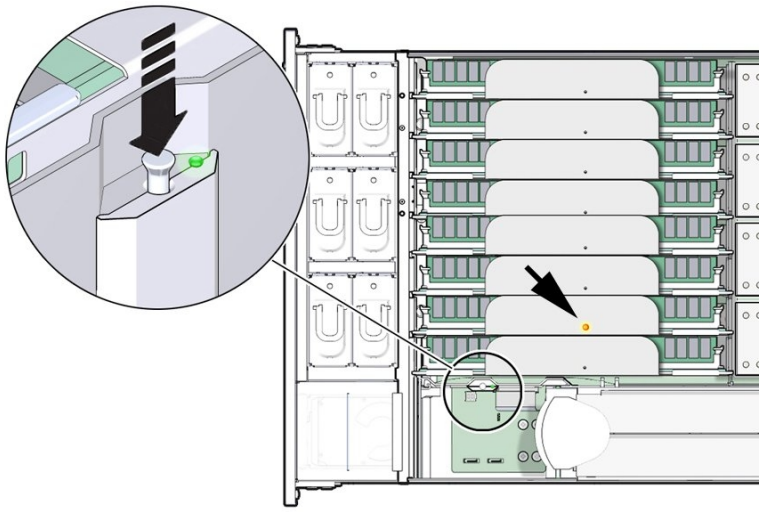


For more information, see “Memory Riser Card and CPU Fault Indicators” on page 83.

- **To locate a failed DIMM, look for an MR card Fault indicator.**

  When a DIMM is in a fault state, the Fault indicator for the MR card containing the DIMM lights when the system Fault Remind button is pressed.

The following illustration shows a lit Fault indicator for memory riser card, P0/MR1. This card contains the faulty DIMM. To locate the DIMM, remove the card and use the DIMM Fault Remind circuit.



For more information, see "DIMM Fault Remind Circuit Components" on page 85.

5. **Replace the failed component:**

   - **To replace a failed CPU, see "Replace a Faulty CPU (FRU)" on page 180.**
   - **To replace a failed memory riser card or a DIMM, see "Replace a Faulty Memory Riser Card" on page 144.**

**Next Steps**

- "Replace a Faulty CPU (FRU)" on page 180

  or
- "Remove a Memory Riser Card" on page 145

  or
- "Replace a Faulty DIMM" on page 143

# Clear Hardware Fault Messages

This section provides instructions for clearing component faults in Oracle ILOM.

After servicing a component, you might need to manually clear the fault using Oracle ILOM. Faults are captured by Oracle ILOM's fault manager and stored in the fault management database. If a component fault needs to be manually cleared, use the fmadm command from the Oracle ILOM Fault Management shell. The Fault Management shell is accessible by logging in to the Oracle ILOM CLI. For events logged in the Oracle ILOM event log, use the Oracle ILOM web interface.

For information about using fmadm, refer to the Oracle ILOM User Guide at http://www.oracle.com/goto/ILOM/docs

**Before You Begin** This procedure requires the use of the Oracle ILOM CLI interface.

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@***ipadress*

   where *ipadress* is the IP address of the server SP.

   For more information on accessing Oracle ILOM, refer to the *Oracle X5 Series Servers Administration Guide* at http://www.oracle.com/goto/x86AdminDiag/docs.

   The Oracle ILOM CLI prompt appears:

   ```
   ->
   ```

2. **To access fmadm, type:**

   **start /SP/faultmgmt/shell**

   The fmadm prompt appears:

   ```
   faultmgmtsp>
   ```

3. **To get a listing of command options for displaying or clearing a fault with fmadm, type:**

   **help fmadm**

   The following output appears:

   ```
   Usage: fmadm <subcommand>
     where <subcommand> is one of the following:
       faulty [-asv] [-u <uuid>]   : display list of faults
   ```

```
faulty -f [-a]              : display faulty FRUs
faulty -r [-a]              : display faulty ASRUs
acquit <FRU>                : acquit faults on a FRU
acquit <UUID>               : acquit faults associated with UUID
acquit <FRU> <UUID>         : acquit faults specified by
                              (FRU, UUID) combination
replaced <FRU>              : replaced faults on a FRU
repaired <FRU>              : repaired faults on a FRU
repair <FRU>                : repair faults on a FRU
rotate errlog               : rotate error log
rotate fltlog               : rotate fault log
```

4. **Use `fmadm faulty` and the following options to display active faulty components:**

   - -a – Show active faulty components
   - -f – Show active faulty FRUs.
   - -r – Show active fault FRUs and their fault management states.
   - -s – Show a one-line fault summary for each fault event.
   - -u uuid – Show fault diagnosis events that match a specific universal unique identifier (uuid).

   For command specifics, see the *Oracle ILOM User's Guide for System Monitoring and Diagnostics* for your version of Oracle ILOM at: `http://www.oracle.com/goto/ILOM/docs`

5. **Use `fmadm` to clear the fault.**

   When you clear a fault, you can specify either `acquit`, `repair`, `replaced`, or `repaired` for the component in question.

6. **Close the Oracle ILOM session.**

# Preparing to Service the Server

This section provides procedures for preparing the server for service.

| Description | Links |
|---|---|
| Procedural information for preparing to perform **hot** service on the server. | “Prepare the Server for Hot Service” on page 93 |
| Procedural information for preparing to perform **cold** service on the server. | “Prepare the Server for Cold Service” on page 94 |
| Procedural information for releasing the Cable Management Arm (CMA) | “Release the CMA” on page 98 |
| Procedural information for server power-off options. | “Powering Off the server” on page 101 |
| Procedural information for using the Locator indicator. | “Managing the Locator Indicator” on page 107 |
| Procedural information for the server cover. | “Remove the Server Cover” on page 110 |

## ▼ Prepare the Server for Hot Service

The following hot-service components can be removed and replaced while the server is operating in full power mode:

- Storage drives
- Fan modules
- Power supplies

For more information about component serviceability, see “Component Serviceability” on page 70.

**Before You Begin**

- **Important**: Review the server *Product Notes* document before performing removal and installation procedures.
- For troubleshooting information, see “Troubleshooting and Diagnostics” on page 37.

- This procedure uses the Oracle ILOM web interface. However, the procedure can also be performed using the Oracle ILOM CLI. For more information, refer to the Oracle ILOM documentation.

1. **Log in to the 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. For more information, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

   The Summary screen appears.

2. **In the Actions section of the Summary screen, click the Locator Indicator Turn On button.**

   This action activates the Locator indicator on the server front panel. For more Locator indicator management options, see "Managing the Locator Indicator" on page 107.

3. **Once at the server, press the Locator indicator button to deactivate the indicator.**

   See "Manage the Locator Indicator Locally" on page 110.

4. **Set up an ESD-safe space at the service location.**

   See "Performing Electrostatic Discharge and Static Prevention Measures" on page 79.

**Next Steps** The following components can be hot-serviced:

- "Servicing Storage Drives (CRU)" on page 113
- "Servicing Fan Modules (CRU)" on page 130
- "Servicing Power Supplies (CRU)" on page 137

# ▼ Prepare the Server for Cold Service

**Note -** This procedure uses a combination of the Oracle ILOM web and CLI interfaces. However, the procedure can also be performed using only the Oracle ILOM CLI interface. For more information about the Oracle ILOM CLI interface, refer to the Oracle ILOM documentation.

A **cold-service** component must be serviced when the server is completely powered off. For more information about component serviceability, see "Component Serviceability" on page 70.

This procedure describes how to prepare the server for service, so you can:

- Remove, replace, or install cold-serviceable components
- Remove, replace, or install internal components
- Use the motherboard processor and DIMM fault remind circuitry

**Before You Begin**

- **Important**: Review the server *Product Notes* document before performing removal and installation procedures.
- For troubleshooting information, see "Troubleshooting Server Hardware Component Faults" on page 37.

1. **To power down the server and activate the front panel Locator indicator, do the following:**

   a. **Log in to the Oracle ILOM web interface.**

      Type the server SP IP address into a web browser and log in as a user with root or administrator privileges. For more information, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

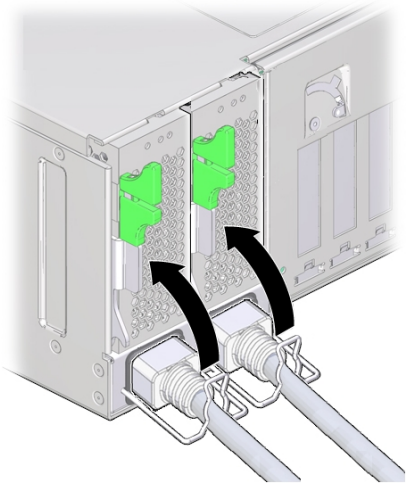
   b. **In the Actions section of the Summary screen, click the Power State Turn Off button.**

      This action powers off the server to standby power mode. For more power off options, see "Powering Off the server" on page 101.

   c. **In the Actions section of the Summary screen, click the Locator Indicator Turn On button.**

      This action activates the Locator indicator on the server front panel. For more Locator indicator management options, see "Managing the Locator Indicator" on page 107.

2. **Remove the power cord retainer clips by lifting them up to disengage them from the power cords.**



3. **Remove both server power cords.**

**Caution -** Data loss. Removing the power cords when the server is in full power mode results in an immediate shut down of the server. Do not remove the power cords if the server is in full power mode.

4. **To slide the server out of the rack to the maintenance position, do the following:**

Most component service procedures can be performed without removing the server entirely from the rack. Instead, the server can be slid out of the rack on its support rails to an extended and locked position called the maintenance position.

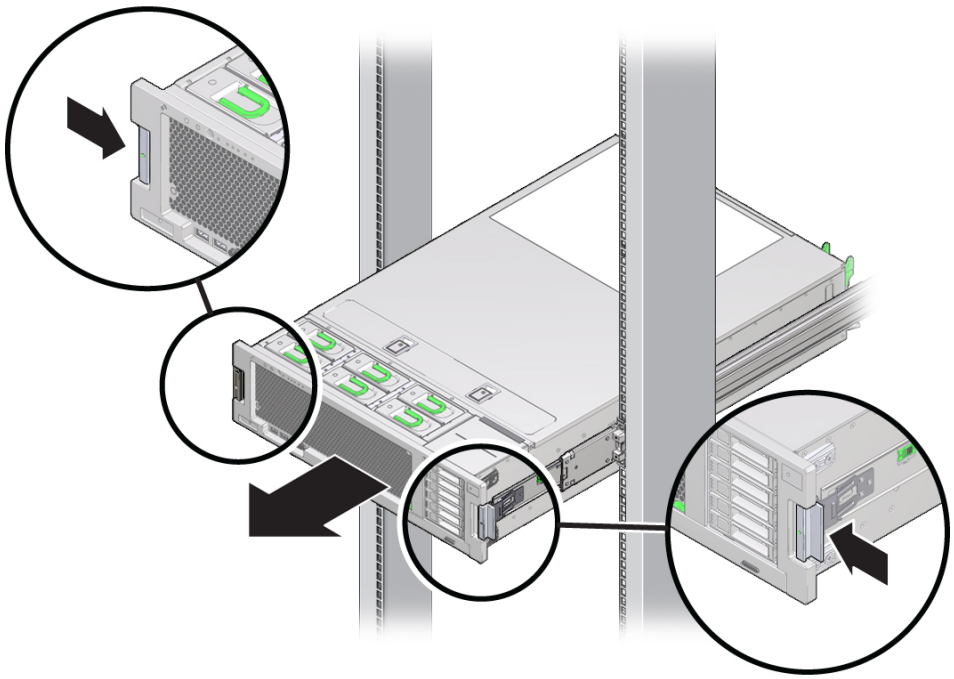
a. **At the back of the server, verify that the cables have sufficient length and clearance to extend the server to the maintenance position without damaging or overextending the cables.**

The cable management arm (CMA) that is supplied with the server is hinged to facilitate extending the server to the maintenance position. Ensure the sliding movement does not impede or damage the cables. If necessary, label and remove cables from the back of the server.

b. **(Optional) Release and reposition the CMA to access to the back of the server.**

   See "Release the CMA" on page 98.

c. **At the front of the server, release the slide rails by pushing the two green latches inward.**



d. **Slowly pull the server forward until both slide rails lock at the fully extended maintenance position.**

   The locking action is accompanied by an audible click. The server is now in the maintenance position and ready for service.

5. **(Optional) Remove the server entirely from the rack.**

   See "(Optional) Remove the Server from the Rack" on page 99.

6. **Set up an ESD-safe service location.**

See “Performing Electrostatic Discharge and Static Prevention Measures” on page 79.

7. **Remove the top cover.**

   See “Remove the Server Cover” on page 110.

**Caution -** Component ESD damage. Circuit boards and hard drives contain electronic components that are extremely sensitive to static electricity. Do not touch or handle components unless you are wearing a properly grounded anti-static wrist strap.

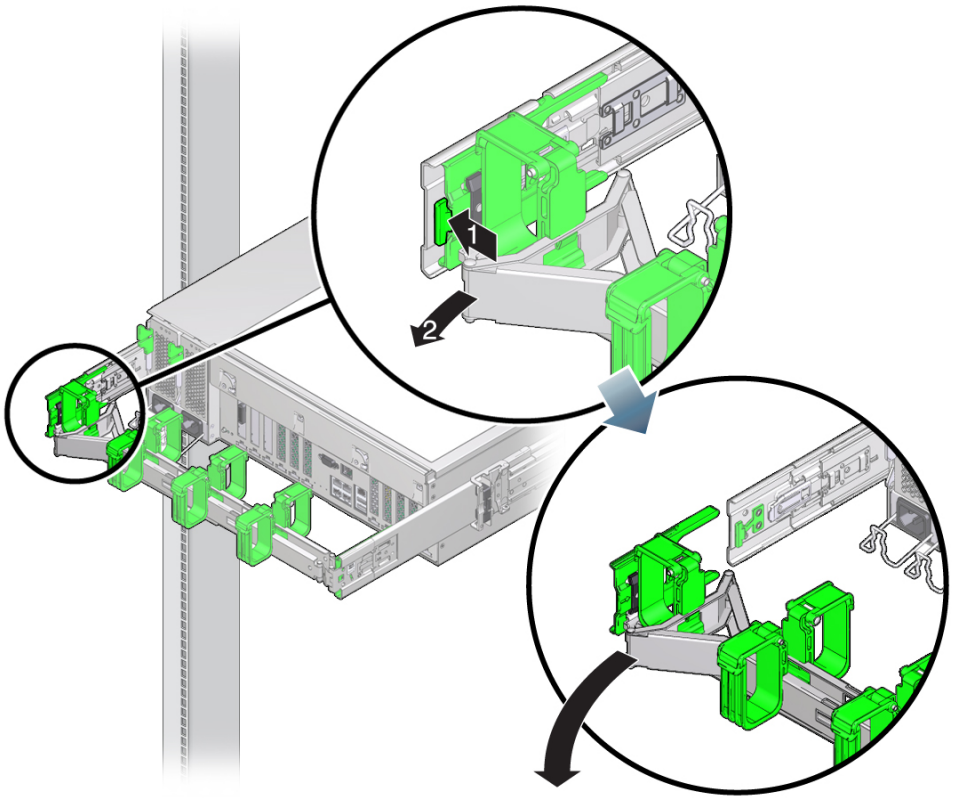
**Next Steps** For component cold-service procedures, see:

- “Servicing CRU Components” on page 113
- “Servicing FRU Components” on page 179

# ▼ Release the CMA

If you are using a cable management arm (CMA), to gain additional access to the back of the server, release and reposition the CMA.

1. **Press and hold the tab.**




2. **Swing the CMA away from the server.**

# ▼ (Optional) Remove the Server from the Rack

To perform some service procedures, you might find it necessary or more convenient to completely remove the server from the rack, rather than work on the server while it is the maintenance position. These optional steps show you how to remove the server entirely from the rack.

**Caution -** Physical or component damage. The server is heavy and cannot be safely removed from the rack by a single person. Use two or more personnel and a mechanical lift to remove the server from the rack.

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

   See “Prepare the Server for Cold Service” on page 94.

2. **Ensure that the server is in the maintenance position.**

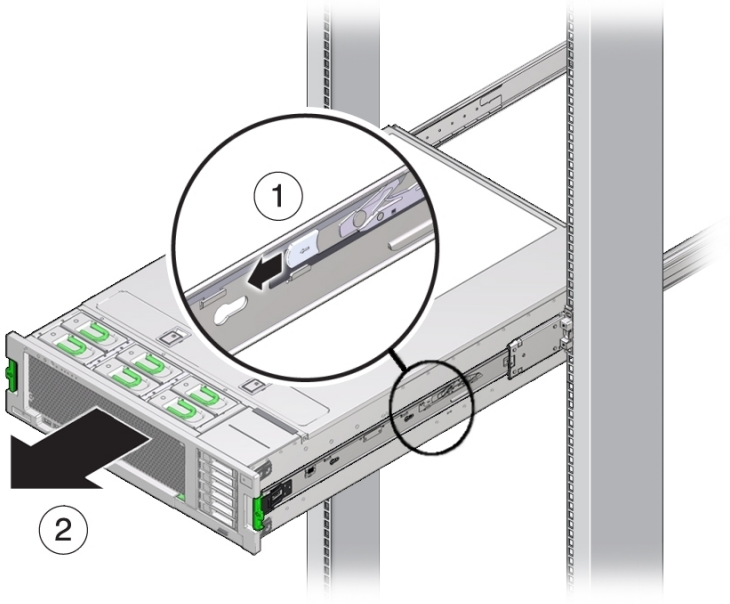
3. **Set up an ESD-safe service location.**

**Caution -** Component ESD damage. Circuit boards and hard drives contain electronic components that are extremely sensitive to static electricity. Do not touch or handle components unless you are wearing a properly grounded anti-static wrist strap.

See “Performing Electrostatic Discharge and Static Prevention Measures” on page 79.

4. **Pull the mounting release brackets [1] toward the front of the server.**

The brackets are located on each side of the server. This action releases the server from the rails.




5. **Using multiple personnel, slide the server entirely out of the rack.**

   Slide the server out of the rack and onto a mechanical lift.

6. **Place the server chassis on an anti-static mat before servicing internal components.**

7. **Remove the top cover.**

   See “Remove the Server Cover” on page 110.

# Powering Off the server

This section provides procedures for powering off the server.

- “Power Off, Graceful (Power Button)” on page 102

- "Power Off, Immediate (Power Button)" on page 103
- "Power Off, Remote (Oracle ILOM CLI)" on page 104
- "Power Off, Remote (Oracle ILOM Web Interface)" on page 105
- "Remove Power" on page 106


## Power Off the Server Using the Server OS

If the server OS is running, you can use the OS shutdown procedure to power off the server to standby power mode. The OS shutdown procedure provides a graceful shutdown of the server.

- **To power off the server, use the OS-specific shutdown procedure.**

**See Also**


- "Power Subsystem" on page 28


## Power Off, Graceful (Power Button)

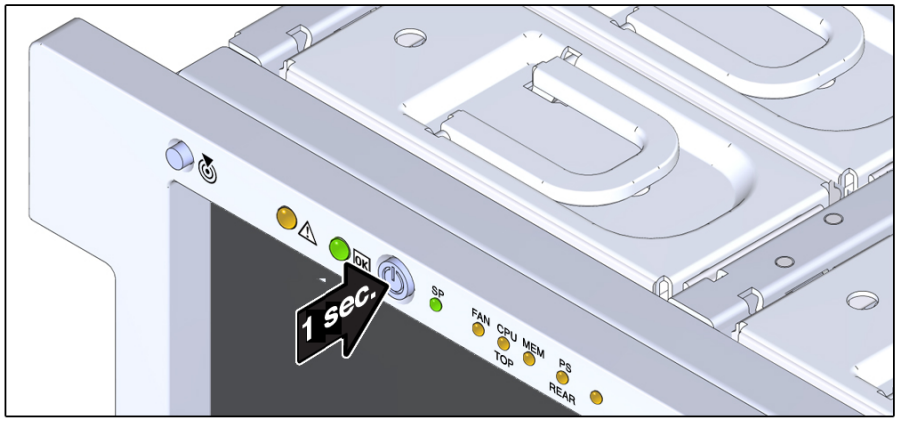
**Note -** This procedure is performed locally and requires access to the server front panel.

Powering off the server by pressing the front panel Power button causes operating systems with Advanced Configuration and Power Interface (ACPI) to perform an orderly shutdown of the OS. Non-ACPI enabled operating systems might ignore this event and not shut down the host. If your OS ignores this event, shut down the server using the server OS or Oracle ILOM.

Use this procedure to perform a graceful power off and place the server in standby power mode.

1. **To power off the server gracefully, press and** *immediately* **release the front panel Power button.**

**Caution -** Potential for loss of data. Do *not* press in and hold the power button for longer than five seconds. Doing so initiates an immediate server shutdown. Press in and release the button immediately.




2. **Verify that the server is in standby power mode.**

   The OK indicator on the front panel blinks, indicating that the server is in standby power mode.

**See Also** ■ "Power Subsystem" on page 28

# ▼ Power Off, Immediate (Power Button)

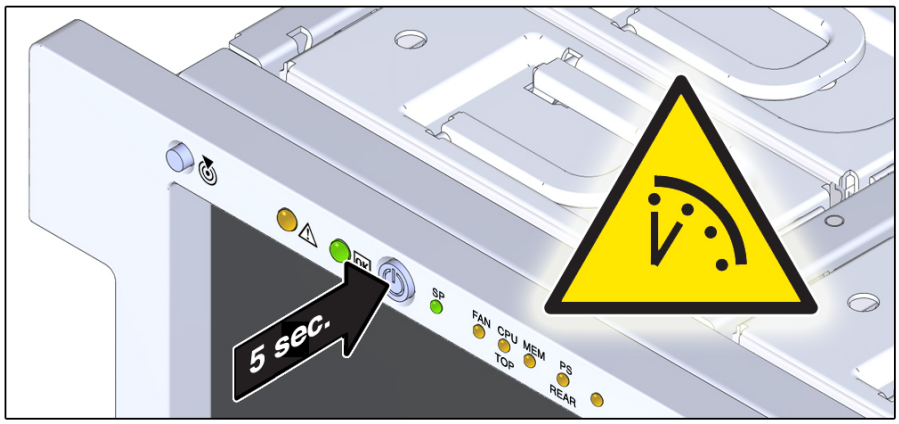
Use this procedure to immediately power off the server to standby power mode.

An immediate shutdown should be used in emergency situations or when you know that the loss of data is nonexistent or acceptable.

**Caution -** Data loss. All applications and files close abruptly without saving. Warn users and close all applications before powering off.

This procedure is performed locally and requires physical access to the server front panel.

1. **Press and hold the Power button for at least five seconds until full power is off and the server enters standby power mode.**




2. **Verify that the full power is off, and that the OK indicator on the front panel blinks, indicating that the server is in standby power mode.**

**See Also**

- "Power Subsystem" on page 28

# ▼ Power Off, Remote (Oracle ILOM CLI)

You can use the Oracle ILOM SP command-line interface (CLI) to remotely power off the server to standby power mode.

1. **Open an SSH session and log in to the Oracle ILOM CLI.**

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

   `ssh root@`*ipadress*

   where *ipadress* is the IP address of the server SP.

   For more information, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

   The Oracle ILOM CLI prompt appears:

   ```
   ->
   ```

2. **At the prompt, type one of the following commands:**

   - For *graceful* power off:

     ```
     stop /System
     ```

   - For *immediate* power off:

     An immediate shutdown should be used in emergency situations or when you know that the loss of data is nonexistent or acceptable.

     ```
     stop -force /System
     ```

**See Also**

- Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: http://www.oracle.com/goto/ILOM/docs

# ▼ Power Off, Remote (Oracle ILOM Web Interface)

You can use the Oracle ILOM web interface to remotely power off the server to standby power mode.

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

   To log in, open a web browser and enter the IP address of the server SP. Log in as root or a user with administrator privileges. For more information, refer to the *Oracle X5 Series Servers Administration Guide* at http://www.oracle.com/goto/x86AdminDiag/docs.

   The Summary screen appears.

2. **In the Actions section of the Summary screen, verify that the power state is ON.**

3. **To perform a graceful power off of the server, click the Turn Off button.**

   Power off options are also available under Host Management > Power Control.

4. **Click OK.**

**See Also**

- "Power Subsystem" on page 28
- Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: http://www.oracle.com/goto/ILOM/docs

# Remove Power

To completely remove power from the server, disconnect the AC power cables from the back of the server.

This might be necessary to perform a cold reset, or to place it in a non-powered state for cold servicing.

1. **Place the server in standby power mode.**

   Use one of the power off methods. See "Powering Off the server" on page 101.

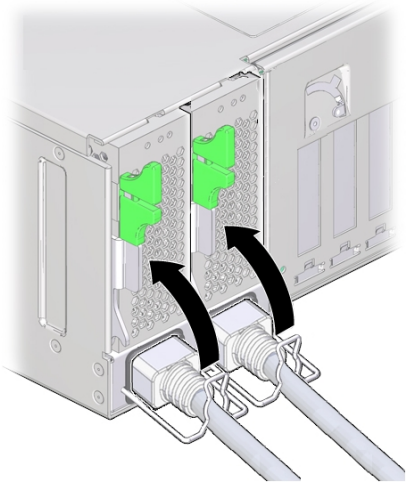
2. **If necessary, do the following:**

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

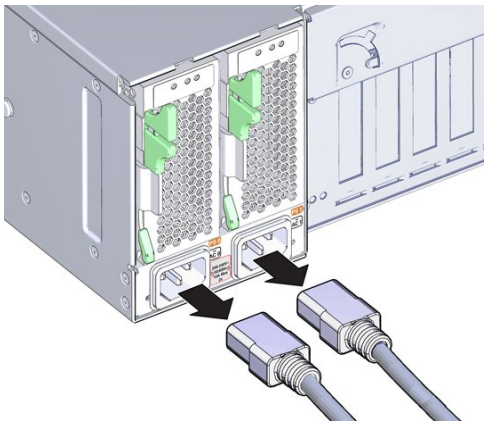
   b. **Position the CMA.**

3. **Access the back of the server.**

4. **Remove the power cord retainer clips by lifting them up to disengage them from the power cords.**



5. **To remove power from the server, disconnect the AC power cables from the power supplies.**



This action completely removes power from the server.

6. **If you are performing a cold reset, wait at least 60 seconds before connecting the AC power cables to the power supplies.**

For information about cold resets, see “Power Subsystem” on page 28.

# Managing the Locator Indicator

This section provides procedures for turning the Locator indicator on and off remotely using Oracle ILOM, and locally using the front panel Locator button.

# ▼ Turn On the Locator Indicator Remotely (Oracle ILOM CLI)

The Locator indicator helps you identify the a specific server in a rack.

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

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

   **ssh root@***ipadress*

   where *ipadress* is the IP address of the server SP.

   For more information, refer to the *Oracle X5 Series Servers Administration Guide* at http://www.oracle.com/goto/x86AdminDiag/docs.

   The Oracle ILOM CLI prompt appears:

   ```
   ->
   ```

2. **To** *turn on* **the Locator indicator, type the following command at the prompt:**

   ```
   set /System/ locator_indicator=on
   ```

   **Note -** To *turn off* the Locator indicator, type: **`set /System/ locator_indicator=off`**.

3. **To verify the status of the Locator indicator, type:**

   ```
   –> show /System/ locator_indicator
   ```

   The output of the command appears:

   ```
   /System

   Properties:

   locator_indicator = Off
   ```

   The value `locator_indicator` shows the status as either `On` or `Off`.

**See Also**

- Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: http://www.oracle.com/goto/ILOM/docs

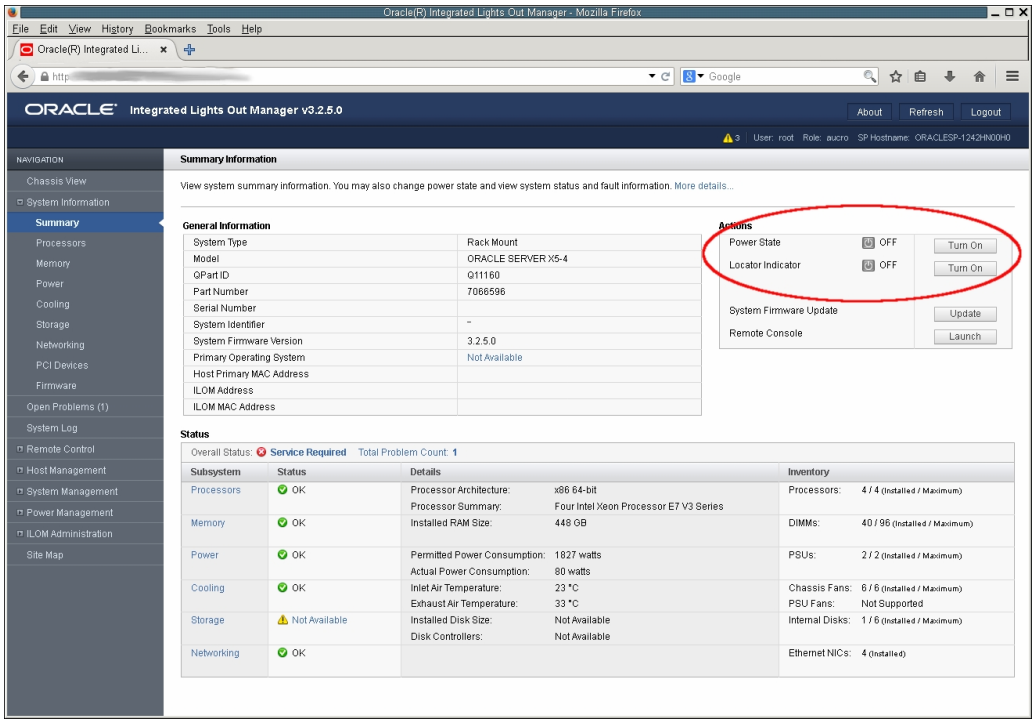
# ▼ Turn On the Locator Indicator Remotely (Oracle ILOM Web Interface)

The Locator indicator helps you identify the a specific server in a rack.

1. **Log in to the 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. For more information, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

   The Summary screen appears.




2. **In the Actions section, verify that the Locator indicator is off, and then click the Turn On button.**

3. **Click OK.**

The Locator indicator on the Summary screen changes to indicate the status of the Locator indicator.

**See Also**

- Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: http://www.oracle.com/goto/ILOM/docs

## Manage the Locator Indicator Locally

Once you have identified the server by its blinking Locator indicator, use this procedure to turn off the Locator indicator.

**Before You Begin**

- You must be physically present at the server.
- For button and indicator location information, see "Server Front Panel Features" on page 17.

- **To manage the Locator indicator locally, do one of the following:**

  - **To turn the Locator indicator off, press the Locator indicator button.**
  - **To turn on the Locator indicator, press the Locator indicator button.**

**Note -** Some Oracle ILOM security procedures require that you turn on the Locator indicator locally, as part of a physical presence verification step.

  - **To perform a lamp test of all front panel indicator LEDs, press the Locator indicator three times within a five-second period.**
    All of the front panel LEDs light up and remain lit for 15-20 seconds.

**See Also**

- Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: http://www.oracle.com/goto/ILOM/docs

# Remove the Server Cover

This section provides instructions for removing the server cover.

The server cover has an interlock switch which is a safety mechanism that prevents power from being applied to the server when the cover is off. The switch prevents accidental contact with

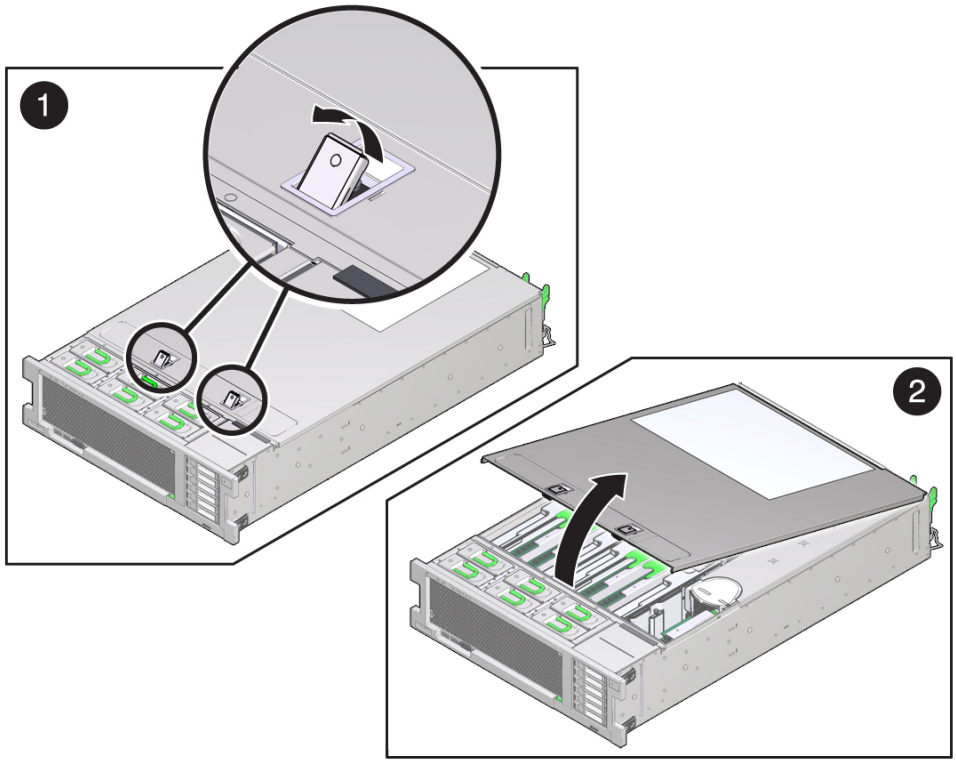
high-voltage areas inside the server. It also prevents an over-temperature condition which would result from a disruption of the server cooling system.

Removing the cover when the server is powered on performs an immediate power off of the server, which can cause loss of data and possible component damage.

**Caution -** Loss of data and possible component damage. Do not remove the server top cover until the server has been shut down to standby power mode. Removing the top cover from a fully powered-on server results in an immediate server power off.

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

2. **To unlatch the server top cover, simultaneously lift both release latches and pull the cover upward.**



3. **To remove the cover, slide it slightly toward the front of the server chassis and lift it away from the server.**

**Caution -** Component damage. Part of the power interlock switch is mounted on the underside of the cover It can be damaged (or misaligned) if the cover is dropped or the component jarred. Take care not to damage the switch.

# Servicing CRU Components

This section provides procedures for replacing and installing customer-replaceable units (CRUs).

| Description | Link |
|---|---|
| Server storage drives | “Servicing Storage Drives (CRU)” on page 113 |
| Fan modules | “Servicing Fan Modules (CRU)” on page 130 |
| Power supplies | “Servicing Power Supplies (CRU)” on page 137 |
| Memory riser cards and DIMMs | “Servicing Memory Riser Cards and DIMMs (CRU)” on page 142 |
| PCIe cards | “Servicing PCIe Cards” on page 160 |
| DVD drive | “Servicing the DVD Drive (CRU)” on page 168 |
| Server system battery | “Replace the System Battery (CRU)” on page 172 |

## Servicing Storage Drives (CRU)

This section describes server storage drives and provides procedures for removing and installing storage drives and slot filler panels.

# 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 the operating system and any application from accessing the drive.

**Caution -** Data loss. Although the system can remain fully powered on, NVMe drives must be powered off using operating system commands before removal. Failure to do so can result in data loss and/or cause the operating system to crash.

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 above restrictions is true, then you must shut down the system before you replace the drive. See “Powering Off the server” on page 101.

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

# Storage Drive Failure and RAID

A single storage drive failure does not cause a data failure if the storage drives are configured as a RAID (level 1 or higher). The storage drive can be removed and a new storage drive inserted, which is then automatically rebuilt with data from the rest of the array with no need to reconfigure the RAID parameters. If a hot-spare was configured to replace the failed drive, the new replacement storage drive should be automatically configured as the new hot-spare.

For instructions for configuring RAID on the server, refer to “Configuring Server Drives for OS Installation” in *Oracle Server X5-4 Installation Guide*.

If optional NVMe drives are part of the RAID, special replacement instructions must be followed to prevent an operating system crash. See:

- “Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 121
- “Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 125

## NVMe Storage Drive Virtual PCIe Slot Designation

If NVMe storage drives are installed, they are labeled on the system front panel as NVMe0, NVMe1, NVMe2, and NVMe3. However, the server BIOS internally identifies these drives by their virtual PCIe slot numbers. When using operating system commands to power NVMe drives off before removal, you need to know the virtual PCIe slot number of the drive.

The following table lists the drive front panel label and its corresponding virtual PCIe slot number used by the operating system.

| Front Panel Storage Drive Label | Virtual PCIe Slot Number |
|---|---|
| NVMe0 | PCIe slot 100 |
| NVMe1 | PCIe slot 101 |
| NVMe2 | PCIe slot 102 |
| NVMe3 | PCIe slot 103 |

# ▼ Remove a Storage Drive Filler Panel (CRU)

For information about component filler panels, see “Component Filler Panels” on page 81.

1. **Prepare the server for service.**
   See “Preparing to Service the Server” on page 93.
2. **If necessary, press the Locator indicator button to deactivate the indicator.**
3. **Identify the storage drive filler panel you want to remove.**
4. **Push the release button to open the latch.**
5. **To remove the filler panel, use the latch to pull the filler panel out of the slot.**

# ▼ Remove a Storage Drive (CRU)

Use this procedure to remove a storage drive from the server.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.

- For storage drive designation information, see "DVD, Storage Drive, and USB Designations" on page 78.
- NVMe storage drives **must** first be prepared using operating system commands to prevent data loss and an operating system crash.

1. **Determine whether you can replace the storage drive using the hot-plug or hot-swap procedure or whether you need to power off the server and use the cold-swap procedure.**

   A cold-swap is required if the storage drive:

   - **Contains the operating system, and the operating system is not mirrored on another drive.**
   - **Cannot be logically isolated from the online operations of the server.**

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

   - **To hot-plug a SAS drive:**

     a. **Take the drive offline.**

        This removes the logical software links to the drive and prevents any applications from accessing it. To take a storage drive offline, use OS-specific commands or the HBA software (MegaRAID or StorCLI).

     b. **Prepare the server for service.**

        See "Prepare the Server for Hot Service" on page 93.

   - **To hot-plug an NVMe drive:**

     a. **Use operating system commands to prepare the drive for removal:**

        - "Removing and Replacing an NVMe Storage Drive Using Oracle Solaris" on page 121
        - "Removing and Replacing an NVMe Storage Drive Using Oracle Linux" on page 125

     b. **Prepare the server for service.**

        See "Prepare the Server for Hot Service" on page 93.

   - **To cold-swap a drive:**

a. **Power off the server.**

   Use one of the power-off options described in “Prepare the Server for Cold Service” on page 94.

3. **Once physically at the server, If necessary, press the Locator indicator button to deactivate the indicator.**

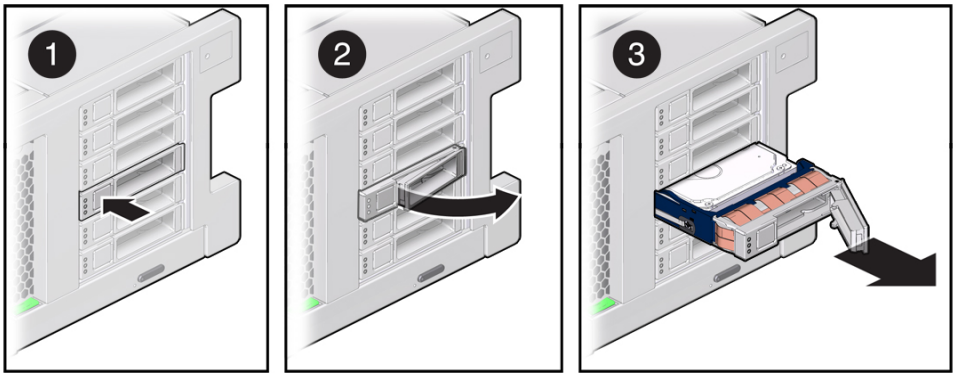
4. **Identify the storage drive you want to remove.**

   If you are hot-plugging a drive, ensure that the blue Ready to Remove indicator is lit.

   See “Storage Drive Reference” on page 119.

5. **Push the storage drive's release button to open the latch.**

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




7. **Consider your next steps:**

   - If you are replacing the drive, continue to “Install a Storage Drive (CRU)” on page 118.
   - If you are not replacing the drive, “Install a Storage Drive Filler Panel (CRU)” on page 119 in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

     If you performed a cold-service procedure, power on the server.

# Install a Storage Drive (CRU)

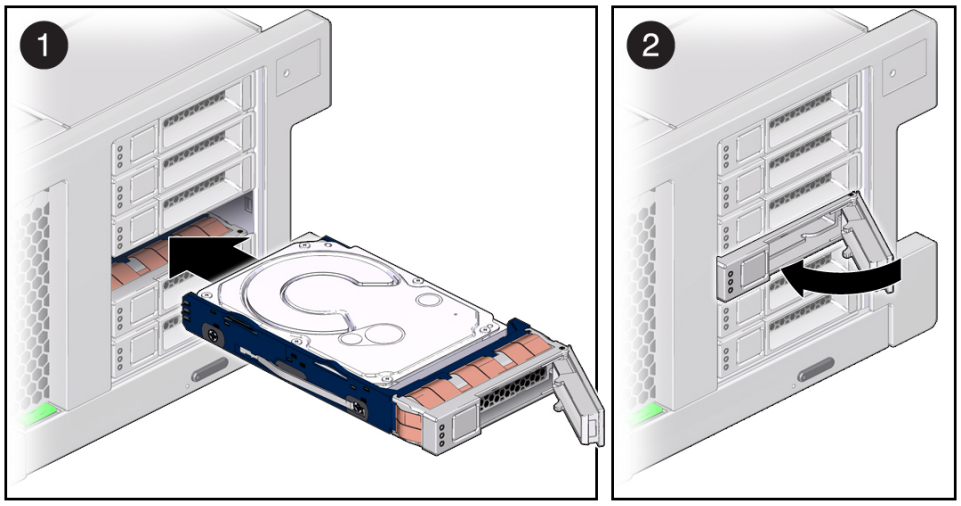
Installing a storage drive into a server is a two-step process. You must first install the storage drive into the drive slot, and then configure that drive to the server.

**Note -** If you removed an existing storage drive from a slot in the server, you must install the replacement drive in the same slot as the drive that was removed. Storage drives are physically addressed according to the slot in which they are installed.

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For storage drive designation information, see "DVD, Storage Drive, and USB Designations" on page 78.

1. **Prepare the server:**
   - **For hot service, see "Prepare the Server for Hot Service" on page 93.**
   - **For cold service, see "Prepare the Server for Cold Service" on page 94.**
2. **Verify that the release lever on the storage drive is fully opened.**
3. **Slide the drive into the drive slot until it is fully seated.**



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

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

   - **If you have replaced an NVMe drive using a hot-service procedure, refer to the following for powering on the device:**
     - “Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 121
     - “Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 125

   - **If you have replaced a storage drive using a cold-service procedure, power on the server and configure the storage drive.**
     Use one of the power options described in “Power On the Server” on page 271.

6. **Perform administrative tasks 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.

**See Also**

- “Storage Drive Reference” on page 119

# ▼ Install a Storage Drive Filler Panel (CRU)

For information about component filler panels, see “Component Filler Panels” on page 81.

1. **Verify that the release lever on the storage drive filler panel is fully opened.**
   To open the lever, push the release button on the front of the filler panel.

2. **Slide the storage drive filler panel into the drive slot until it is fully seated.**

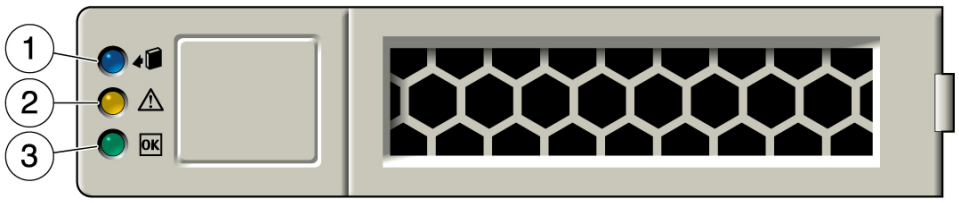
3. **Close the latch to lock the filler panel in place.**

**See Also**

- “Storage Drive Reference” on page 119

# Storage Drive Reference

This section shows the location and explains the functions of the storage drive status indicators.

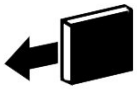



| Callout | Description |
|---|---|
| 1 | OK to Remove indicator |
| 2 | Service Action Required indicator |
| 3 | OK/Activity indicator |

The functions of the drive status indicators are described below.

For indicator blink rate information, see “Indicator Blink Rates” on page 46.

## OK to Remove Indicator



Blue indicator. Indicates that the storage drive can be removed safely during a hot-service operation.

## Service Action Required Indicator

Amber indicator. Indicates that the storage drive is faulty. The front and back panel Service Action Required indicators are also lit if the system detects a storage drive fault.

### OK/Activity Indicator


Green indicator. Indicates that the drive is properly inserted into the system. Indicator flashes when the drive is being accessed.

**See Also**: "Servicing Storage Drives (CRU)" on page 113

# Removing and Replacing an NVMe Storage Drive Using Oracle Solaris

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

**Caution -** The virtual PCIe slot for an NVMe storage drive must be powered off before replacement. The power off procedure is done using operating system commands. Failure to power off the virtual PCIe slot for an NVMe drive before a hotplug action can not only cause data loss, but it can also crash the operating system.

This section provides instructions for how to remove and replace an NVMe storage drive on a server that is running the Oracle Solaris operating system.



## ▼ Prepare an NVMe Storage Drive for Removal

**Before You Begin**

- To perform this task, the hotplug daemon must be enabled on the host.

- For a list of the virtual PCIe slots of NVMe drives as seen by the operating system, see "NVMe Storage Drive Virtual PCIe Slot Designation" on page 115. Note that the virtual PCIe slot name is not the same as the name on the server front panel label.

1. **Log in to the Oracle Solaris host.**

2. **Find the NVMe drive virtual PCIe 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
------------------------------------------------------
pcie100              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@4
pcie101              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@5
pcie102              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@6
pcie103              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@7
```

3. **Prepare the NVMe drive for removal by powering off the drive slot.**

   For example, to prepare NVMe0 for removal, type the following commands:

   # **hotplug poweroff pcie100**

   # **hotplug list –lc**

   The following output appears for the NVMe0 drive that has been unmounted:

```
# hotplug list -lc
Connection           State          Description
Path
------------------------------------------------------
pcie100              PRESENT        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@4
pcie101              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@5
pcie102              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@6
pcie103              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@7
```

4. **Verify that the blue OK to Remove indicator on the NVMe 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 “DVD, Storage Drive, and USB Designations” on page 78.
2. **Verify that the blue OK to Remove indicator on the NVMe storage drive is lit.**
   See “Prepare an NVMe Storage Drive for Removal” on page 121.
3. **On the drive you plan to remove, push the latch release button to open the drive latch.**
   See “Remove a Storage Drive (CRU)” on page 115.
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 “Install an NVMe Storage Drive in the Server” on page 124.
   - 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 “Install a Storage Drive Filler Panel (CRU)” on page 119.

# Verify Removal of an NVMe Storage Drive

**Before You Begin** To perform this task, the hotplug daemon must be enabled on the host.

- **Verify that the NVMe drive has been removed. Type:**

  # **`hotplug list –lc`**

  The following output appears (the removed drive will show the EMPTY state):

```
# hotplug list -lc
Connection           State          Description
Path
------------------------------------------------------
pcie100              EMPTY          PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@4
```

```
pcie101              ENABLED         PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@5
pcie102              ENABLED         PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@6
pcie103              ENABLED         PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@7
```

# 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 a Storage Drive (CRU)” on page 118.
5. **Close the drive latch to lock the drive in place.**

# Power On an NVMe Storage Drive

**Before You Begin**

- To perform this task, the hotplug daemon must be enabled on the host.
- For a list of the virtual PCIe slots of NVMe drives as seen by the operating system, see “NVMe Storage Drive Virtual PCIe Slot Designation” on page 115. Note that the virtual PCIe slot name is not the same as the name on the server front panel label.

1. **Power on the slot for the drive. Type:**

   # **`hotplug enable pcie100`**

   In this example, `pcie100` is the drive labeled NVMe0 on the server front panel.

2. **Confirm that the drive has been enabled and is seen by the system. Type:**

   # **hotplug list –lc**

   The following status is displayed (installed NVMe drives show the ENABLED state).

```
# hotplug list -lc
Connection           State          Description
Path
------------------------------------------------------
pcie100              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@4
pcie101              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@5
pcie102              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@6
pcie103              ENABLED        PCIe-Native
/pci@0,0/pci8086,2f06@2,2/pci111d,80b5@0/pci111d,80b5@7
```

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

   # **nvmeadm list**

### Related Information

- “Storage Drive Reference” on page 119
- “Storage Drives Hot-Plug Conditions” on page 114
- “Storage Drive Failure and RAID” on page 114
- “DVD, Storage Drive, and USB Designations” on page 78

# Removing and Replacing an NVMe Storage Drive Using Oracle Linux

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

**Caution -** The virtual PCIe slot for an NVMe storage drive must be powered off before replacement. The power off procedure is done using operating system commands. Failure to power off the virtual PCIe slot for an NVMe drive before a hotplug action can not only cause data loss, but it can also crash the operating system.

This section provides instructions for how to remove and replace an NVMe storage drive on a server that is running the Oracle Linux operating system.



# ▼ Prepare an NVMe Storage Drive for Removal

**Before You Begin**

- Linux NVMe hot plug requires the kernel boot argument "pci=pcie_bus_perf" be set in order to get proper MPS (MaxPayloadSize) and MRR (MaxReadRequest). Fatal errors will occur without this argument.
- For a list of the virtual PCIe slots of NVMe drives as seen by the operating system, see "NVMe Storage Drive Virtual PCIe Slot Designation" on page 115. Note that the virtual PCIe slot name is not the same as the name on the server front panel label.

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

2. **Obtain information about available NVMe storage devices.**

   a. **Obtain the PCIe addresses (Bus Device Function) of enabled NVMe drives. Type:**

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

   This commands returns output similar to the following:

```
/sys/devices/pci0000:00/0000:00:02.2/0000:10:00.0/0000:11:04.0/0000:12:00.0/misc/
nvme0
/sys/devices/pci0000:00/0000:00:02.2/0000:10:00.0/0000:11:05.0/0000:13:00.0/misc/
nvme1
/sys/devices/pci0000:00/0000:00:02.2/0000:10:00.0/0000:11:06.0/0000:14:00.0/misc/
nvme2
/sys/devices/pci0000:00/0000:00:02.2/0000:10:00.0/0000:11:07.0/0000:15:00.0/misc/
nvme3
```

   For example, `0000:12:00.0` matches the PCIe address of the drive labeled NVMe0 on the system front panel.

   b. **Obtain the PCIe virtual slot number (APIC ID). Type:**

   # **`egrep -H '.*' /sys/bus/pci/slots/*/address`**

This commands returns output similar to the following:

```
/sys/bus/pci/slots/100/address:0000:12:00
/sys/bus/pci/slots/101/address:0000:13:00
/sys/bus/pci/slots/102/address:0000:14:00
/sys/bus/pci/slots/103/address:0000:15:00
```

For example, the PCIe address `0000:12:00.0` matches the PCIe slot number (100) for the drive labeled NVMe0 on the system front panel.

3. **Remove the NVMe storage device path.**

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

      In Linux, NVMe drives do not use the standard block device labeling, such as /dev/sd*. For example, NVMe drive 0 that has a single namespace block device would be /dev/nvme0n1. If you formatted and partitioned that namespace with a single partition, that would be /dev/nvme0n1p1.

   b. **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.

   c. **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.**

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

4. **Prepare the NVMe drive for removal by powering off the NVMe drive slot. Type:**

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

   Where *slot_number* is the PCIe slot number (e.g., `100`, which represents the drive labeled NVMe0 on the system front panel).

5. **Verify that the blue OK to Remove indicator on the NVMe 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 location of the NVMe drive that you want to remove.**

   For storage drive locations, see "DVD, Storage Drive, and USB Designations" on page 78

2. **Verify that the blue OK to Remove indicator on the NVMe drive is lit.**

   Refer to "Prepare an NVMe Storage Drive for Removal" on page 126.

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

   See "Remove a Storage Drive (CRU)" on page 115.

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 128.
   - 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 "Install a Storage Drive Filler Panel (CRU)" on page 119.

# Verify Removal of an NVMe Storage Drive

- **Verify that the NVMe drive has been removed. Type:**

  # **lspci -nnd :0953**

  This commands returns output similar to the following:

```
# lspci -nnd :0953
13:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0953] (rev
 01)
14:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0953] (rev
 01)
15:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0953] (rev
 01)
```

Note that address `12:00.0`, which represents PCIe slot 100 and is the drive labeled NVMe0 on the system front panel and the drive powered off in the example shown in "Prepare an NVMe Storage Drive for Removal" on page 126, is not listed.

# ▼ Install an NVMe Storage Drive In the Server

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

**Before You Begin** 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 a Storage Drive (CRU)" on page 118.
5. **Close the drive latch to lock the drive in place.**

# ▼ Power On an NVMe Storage Drive

**Before You Begin**

- Linux NVMe hot plug requires the kernel boot argument "pci=pcie_bus_perf" be set in order to get proper MPS (MaxPayloadSize) and MRR (MaxReadRequest). Fatal errors will occur without this argument.
- For a list of the virtual PCIe slots of NVMe drives as seen by the operating system, see "NVMe Storage Drive Virtual PCIe Slot Designation" on page 115. Note that the virtual PCIe slot name is not the same as the name on the server front panel label.

1. **To power on the slot for the drive. Type:**

   # **`echo 1 /sys/bus/pci/slots/`***slot_number*`/power`**

   Where *slot_number* is the PCIe slot number (e.g., `100`, which represents the drive labeled NVMe0 on the system front panel).

2. **Confirm that the drive has been enabled and is seen by the system.**
   Do one of the following:

   - Check the `/var/log/messages` log file.
   - List available NVMe devices. Type:

     # **`ls -l /dev/nvme*`**.

### Related Information

- “Storage Drive Reference” on page 119
- “Storage Drives Hot-Plug Conditions” on page 114
- “Storage Drive Failure and RAID” on page 114
- “DVD, Storage Drive, and USB Designations” on page 78

# Servicing Fan Modules (CRU)

This section provides instructions for removing and installing a fan module.

- “Remove a Fan Module” on page 130
- “Install a Fan Module” on page 133
- “Fan Module Reference” on page 135

## ▼ Remove a Fan Module

Fan modules provide server cooling to the motherboard and its components. The fan modules are arranged in stacked pairs (a front row and a back row) to provide redundancy. If you remove a fan module, replace it immediately.

Fan modules are hot-serviceable components. It is not necessary to power off the server or to remove the server cover to service a fan module. However, depending on server rack configuration, it might be necessary to partially extend the server from the rack to access the fan modules. (Optional steps for partially extending the server from the rack are included in this procedure.) Take care when partially extending the server from the rack during hot service. Ensure that the cables at the back of the server do not become dislodged, particularly the power cables. As an option, you can also perform this procedure using cold service.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For fan module designation information, see “Component Designations” on page 73.

1. **Prepare the server:**

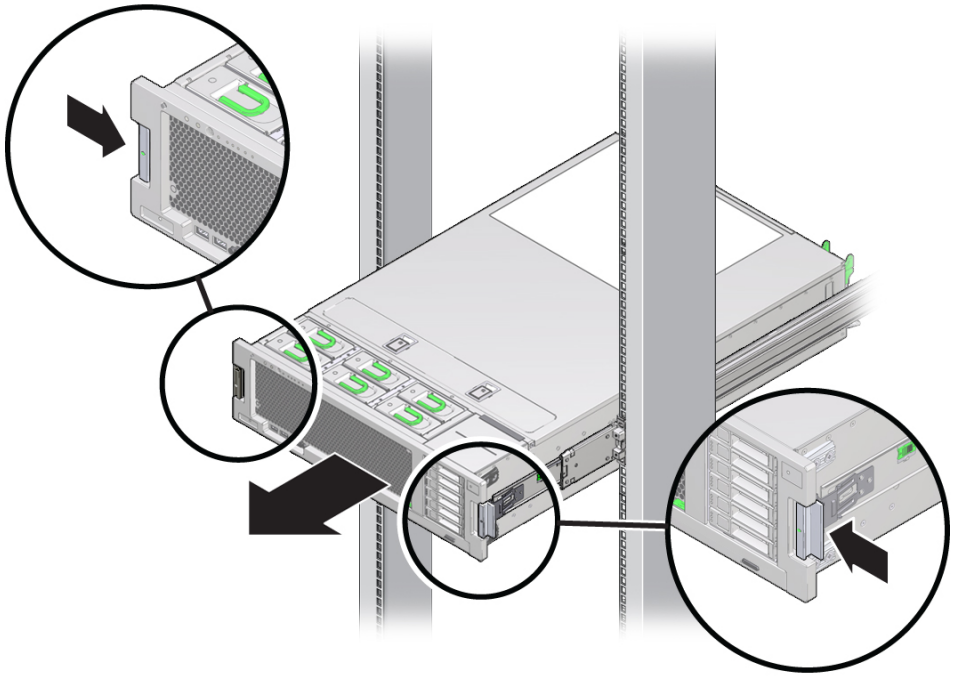
   - **For hot service, see “Prepare the Server for Hot Service” on page 93.**
   - **For cold service, see “Prepare the Server for Cold Service” on page 94.**

2. **If necessary, slide the server partially out from the rack.**

   a. **At the back of the server, verify that the cables have sufficient length and clearance to extend the server.**

      The cable management arm (CMA) that is supplied with the server is hinged to facilitate extending the server to the maintenance position. However, ensure that the cables do not impede the sliding movement and are not damaged or overextended by it.

   b. **At the front of the server, release the slide rails by pushing the two green latches inward.**

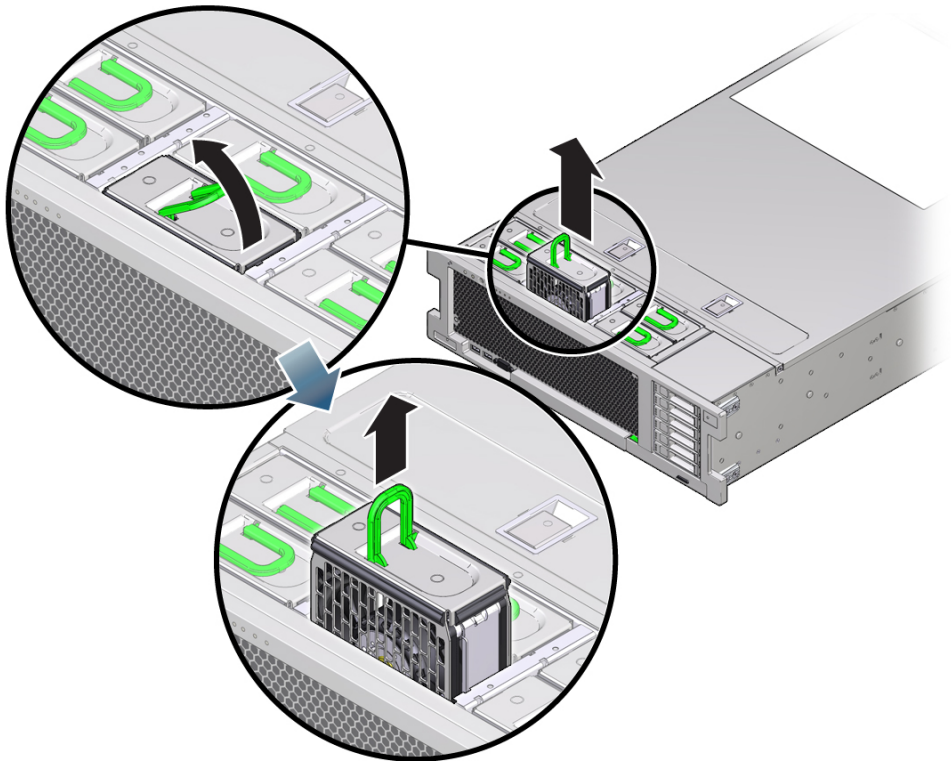


3. **Identify the faulty fan module using the fan module indicators.**

The Service Action Required indicators are located on the fan module. A lit amber color Service Action Required indicator identifies a faulty component. For more information, see “Fan Module Reference” on page 135.

4. **Lift the green handle on the fan module and use it to pull the module straight up and out of the server.**

**Caution -** Component damage. Excessive movement or rocking of the fan module during removal can cause damage to the internal connector on the fan module board. When removing a fan module, do not rock it back and forth.



**Next Steps** “Install a Fan Module” on page 133

# Install a Fan Module

This procedure describes how to install a replacement fan module in the server.

**Before You Begin**

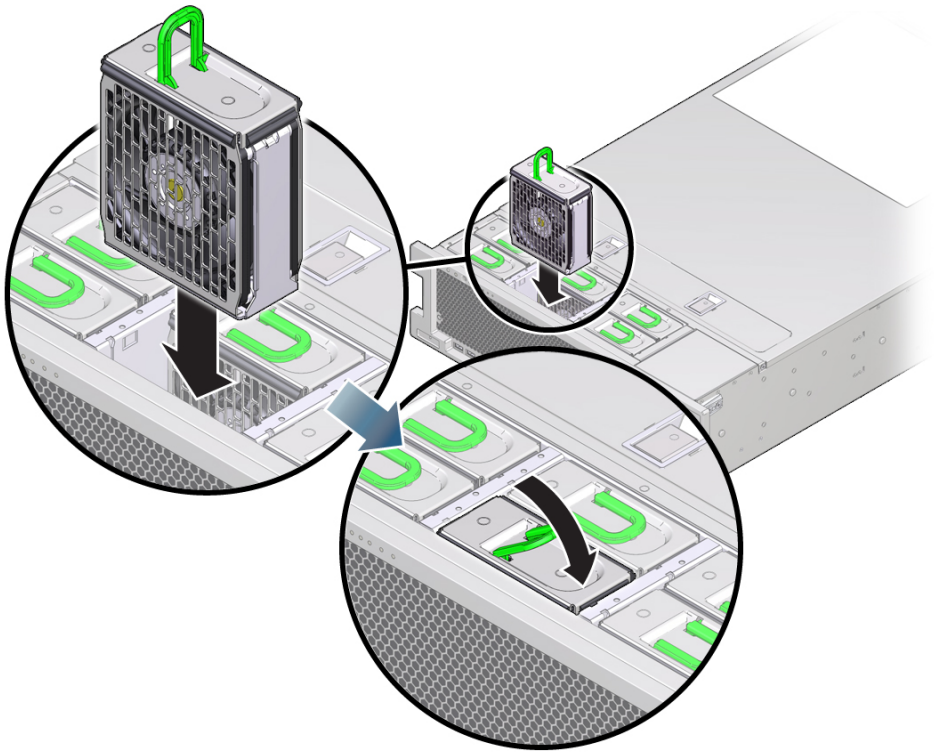
- For serviceability considerations, see “Component Serviceability” on page 70.
- For fan module designation information, see “Component Designations” on page 73.
- For instructions on removing a fan, see “Remove a Fan Module” on page 130.

1. **If you are installing a replacement fan module for one that has failed, check the indicator of the failed fan slot to ensure the fault indicator is no longer lit.**

   This is necessary to ensure the indicator status is cleared before you insert the new fan. See “Fan Module Reference” on page 135 for fan module indicator locations.

2. **Orient the fan module so the connector on the bottom of the module is aligned with the connector on the inside of the slot and all keying and labeling are correctly positioned.**

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



3. **Slide the fan module into the slot until is stops.**

4. **Press downward on the top of the fan module at the Press Here to Latch label until the fan module is fully seated.**

5. **Verify that the green OK indicator is lit.**

6. **Verify that the Top Fan indicator and the Service Action Required indicator on the server front panel are not lit.**

   See “Server Front Panel Features” on page 17 and “Server Back Panel Features” on page 18 for locations of system indicators.

7. **If necessary, return the server to the normal rack position.**

a. **Ensure the cables are free from binding and pinching.**

b. **Slide the server into the rack until it locks into place.**

8. **If you performed a cold-service procedure, power on the server.**

# Fan Module Reference

The six fan modules are located at the front of the chassis and provide cooling for the three motherboard cooling zones (for more information, see “Cooling Subsystem” on page 25). The fans are hot-serviceable and accessible by partially extending the server from the rack. You do not have to remove the server cover to service the fan modules.

**Caution -** Server shutdown or component damage due to over-temperature condition. Fan modules provide system cooling. If a fan module fails, replace it as soon as possible. When you remove one of the fans in the back row, you must replace it within 30 seconds to prevent overheating of the server.

**Note -** If a failed fan is replaced too quickly, the fan indicator might still show a fault even after the new fan is installed. When replacing a faulty fan, wait for the fan indicator to turn off after removing the old fan and before installing the new fan. This will only take a few seconds.

The functions of the fan module status indicators is described below.

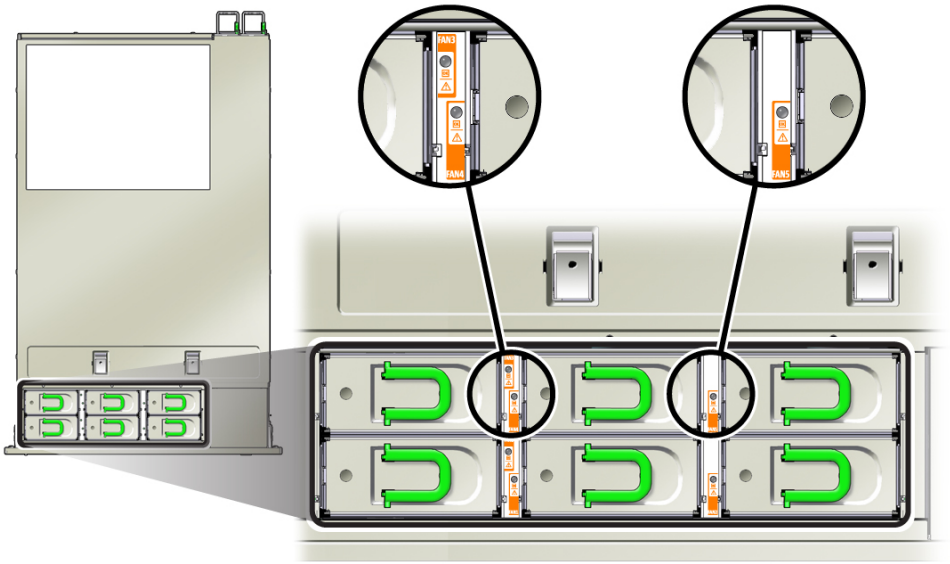
## Front and Back Panel Indicators for Fan Failure

One or more of the following indicators might light when a fan module fault is detected:

- Front and back Service Action Required indicators. See “Server Front Panel Features” on page 17 and “Server Back Panel Features” on page 18 for locations of system indicators.
- Fan module Service Action Required indicator.
- Over Temperature Warning indicator. This indicator might also light if a fan fault causes an unacceptable increase in system operating temperature.

## Fan Module Indicator

Next to each fan module slot are indicators that are visible from the top of the server.



## Power OK Indicator

OK

Green indicator. The system is powered on and the fan module is functioning correctly.

## Service Action Required Indicator

Amber indicator. The fan module is faulty.

The server front and back panel Service Action Required indicators are also lit if the system detects a fan module fault.

# Servicing Power Supplies (CRU)

The following sections provide procedures for removing and installing a power supply.



## ▼ Remove a Power Supply

**Caution -** If a power supply fails and you do not have a replacement available, ensure proper airflow by leaving the failed power supply installed in the server until you replace it.

This procedure describes how to remove a power supply from the server.

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For power supply designation information, see "Component Designations" on page 73.
- The server can be configured to use low-line 110VAC input voltage in a 2-processor configuration, however 4-processor configurations require power supplies to be configured with high-line 220VAC input.

1. **Prepare the server:**

   - **For hot service, see "Prepare the Server for Hot Service" on page 93.**
   - **For cold service, see "Prepare the Server for Cold Service" on page 94.**

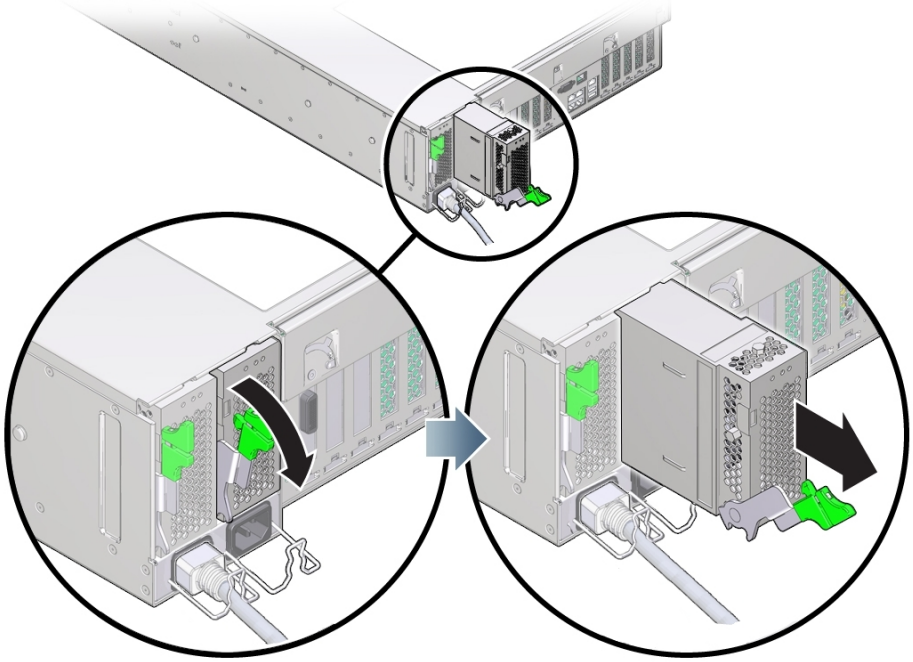
2. **Identify the power supply that needs to be replaced.**

   An amber Service Action Required indicator lights on the failed power supply. For more information, see "Power Supply Reference" on page 140.

3. **Lift up on the power cord retaining clip to disengage it from the cord.**

4. **Disconnect the power cord from the failed power supply.**

5. **To unlock the power supply handle, squeeze the release latch.**



6. **To disengage the power supply, rotate the release latch fully downward.**

   This action disengages the power supply from the internal power supply backplane connector.

7. **To remove the power supply, use the latch to slide it partially out of the chassis until you can support it with your free hand and remove it completely.**

**Next Steps** “Install a Power Supply” on page 138

# ▼ Install a Power Supply

This procedure describes how to install a power supply (PSU). When installing a PSU, ensure that the pawl near the hinge of the latch engages the slot in the sidewall of the PSU bay. The pawl supplies the necessary leverage to seat the PSU connector with the PSU backplane.

**Caution -** System overheat and shut down. Installing the incorrect model of power supply can cause the server to over heat. Install only the supported model.

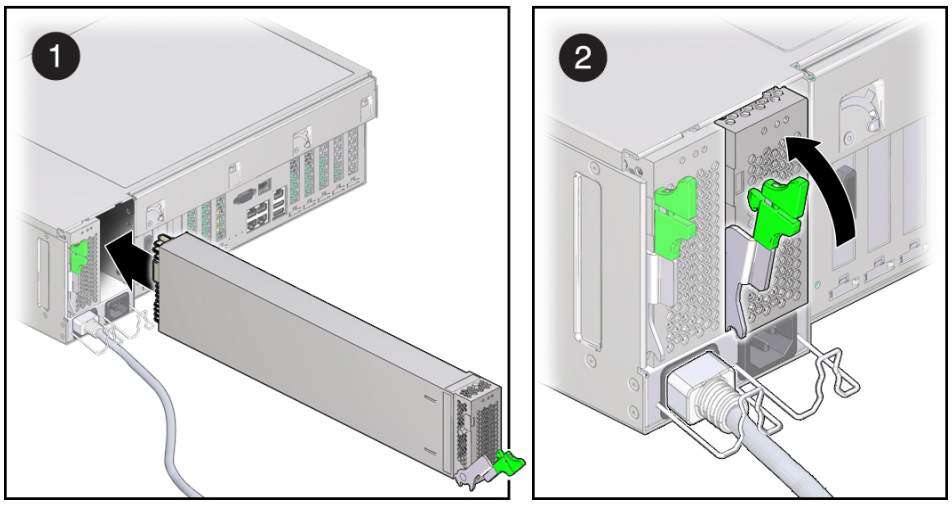
**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For power supply designation information, see “Component Designations” on page 73.

1. **Ensure that the replacement power supply handle is in the open position.**
2. **Align the power supply with the empty power supply bay.**
3. **Slide the power supply into the bay until it stops.**
4. **To seat the power supply, rotate the release handle upward until it locks in place.**

**Note -** The pawl at the hinge of the handle must engage the slot at the bottom of the power supply bay.

This action of rotating the handle upward draws the power supply into the server and engages it with the internal connector.




5. **Connect the AC power cord to the power supply.**
6. **Reattach the power cord retaining clip.**

7. **Verify that the AC Present indicator is lit.**

   For more information, see “Power Supply Reference” on page 140.

8. **If you performed a cold-service procedure, power on the server.**

9. **Verify that the following indicators are not lit:**

   - Service Action Required indicator on the power supply
   - Front and back Service Action Required indicators
   - Rear PS Failure indicator on the bezel of the server

     See “Server Front Panel Features” on page 17 and “Server Back Panel Features” on page 18 for locations of system indicators.

# Power Supply Reference

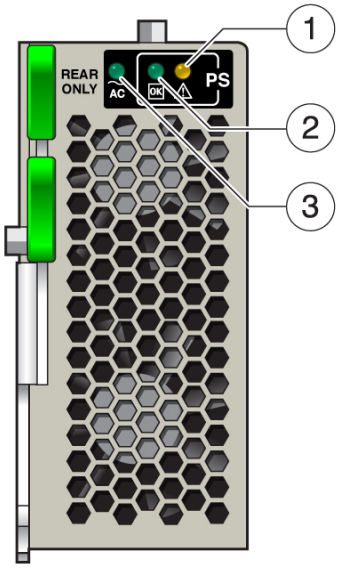
The server has two power supplies. This ensures reduncancy by allowing the server to operate when one of the power supplies fails. However, when the server is operating on one power supply, redundancy no longer exists, and the risk for an unexpected shut down and a loss of data is high. When a power supply or any component that is part of a redundant configuration fails, replace it immediately.

## Power Supply Indicators

Each power supply contains an indicator panel. The following indicators are lit when a power supply fault is detected:

- Front and back Service Action Required indicators
- Rear PS Fault indicator on the front bezel of the server
- Service Action Required indicator on the faulty power supply

See “Server Front Panel Features” on page 17 and “Server Back Panel Features” on page 18 for locations of system indicators.




| Callout | Description |
|---|---|
| 1 | Amber Service Action Required |
| 2 | Green DC OK |
| 3 | Green AC OK |

## Service Action Required Indicator

Amber indicator. Indicates that the power supply is faulty and service-related action is required.

### DC OK Indicator


Green indicator. Indicates that both DC outputs (3.3V standby and 12V main) are active and within acceptable ranges.

### AC OK Indicator


Green or Amber indicator. Indicates:

- Green: AC voltage within operating range is applied to the power supply.
- Amber: AC range below operating range is applied to the power supply.

# Servicing Memory Riser Cards and DIMMs (CRU)

This section provides instructions for removing and installing memory riser cards and DIMMs.


- “Removing and Installing Memory Riser Cards and DIMMs” on page 142
- “Memory Riser Card and DIMM Reference” on page 154


## Removing and Installing Memory Riser Cards and DIMMs

Use the following procedures to remove and install memory risers, DIMMs, and filler panels.

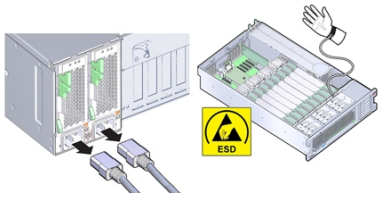

- “Replace a Faulty DIMM” on page 143
- “Replace a Faulty Memory Riser Card” on page 144
- “Remove a Memory Riser Card” on page 145

- "Identify a Faulty DIMM" on page 146
- "Remove a DIMM" on page 148
- "Install a DIMM" on page 150
- "Install a Memory Riser Card" on page 152

## ▼ Replace a Faulty DIMM

Use this procedure to replace a faulty DIMM.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For DIMM designation information, see "Component Designations" on page 73.
- For reference information, see "Memory Riser Card and DIMM Reference" on page 154.

1. **Identify the MR card containing the faulty DIMM.**
   See "Locate a Failed Memory Riser Card, DIMM, or CPU" on page 86.
2. **Remove the MR card.**
   See "Remove a Memory Riser Card" on page 145.
3. **Identify the faulty DIMM.**
   See "Identify a Faulty DIMM" on page 146.
4. **Remove the faulty DIMM.**
   See "Remove a DIMM" on page 148.
5. **Install the replacement DIMM.**
   See "Install a DIMM" on page 150.

6. **Install the MR card.**

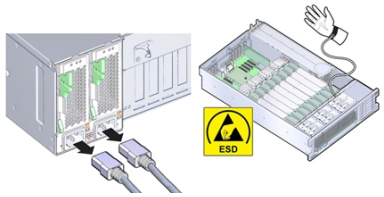
   See “Install a Memory Riser Card” on page 152.

7. **Prepare the server for operation.**

   See “Prepare the Server for Operation” on page 259.

## ▼ Replace a Faulty Memory Riser Card

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For memory riser card designation information, see “Component Designations” on page 73.
- For reference information, see “Memory Riser Card and DIMM Reference” on page 154.

1. **Identify the faulty MR card.**

   See “Locate a Failed Memory Riser Card, DIMM, or CPU” on page 86.

2. **Remove the MR card.**

   See “Remove a Memory Riser Card” on page 145.

3. **Set the faulty card next to the replacement card on an ESD-safe work space.**

   **Tip -** Position the cards in the same orientation. This makes it easier to transfer the DIMMs.

4. **Make note of the DIMM population configuration on the faulty card.**

   You must replicate this same DIMM population configuration on the replacement card. The slots are color coded. For more information, see “Memory Riser Card and DIMM Reference” on page 154.

**Note -** Ensure that you replicate the same DIMM configuration on the replacement card.

5. **Transfer the DIMMs from the slots on the faulty MR card to the same slots on the replacement card:**

**Tip -** Transfer the DIMMs from the faulty card to the replacement card one at a time.

   a. **Remove a DIMM from the faulty MR card.**

      See "Remove a DIMM" on page 148.

   b. **Install the DIMM on the replacement card.**

      See "Install a DIMM" on page 150.

   c. **Repeat the above steps until all DIMMs are transferred from the faulty card to the replacement card.**

6. **Install the MR card.**

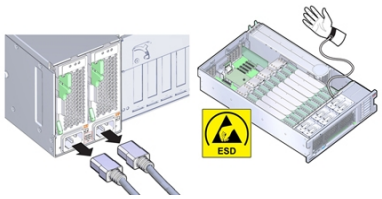
   See "Install a Memory Riser Card" on page 152.

7. **Prepare the server for operation.**

   See "Prepare the Server for Operation" on page 259.

## ▼ Remove a Memory Riser Card

When servicing the components in this section, unplug the AC power cords and use ESD protection.




Use this procedure to remove a memory riser (MR) card to:

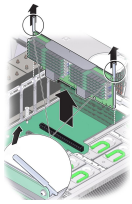
- "Replace a Faulty DIMM" on page 143
- "Replace a Faulty Memory Riser Card" on page 144

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For memory riser card designation information, see "Component Designations" on page 73.
- For reference information, see "Memory Riser Card and DIMM Reference" on page 154.

1. **Prepare for service.**
   See "Prepare the Server for Cold Service" on page 94.

2. **To remove the MR card, pull the handles upward to disengage the connector from the motherboard and carefully lift the memory riser straight up and out of the server.**



The MR card is designed to fit tightly into the MR connector on the motherboard. Th handles on the MR card provide leverage against the chassis to disengage the card's edge connector from the connector on the motherboard.

**Next Steps**

- "Install a Memory Riser Card" on page 152

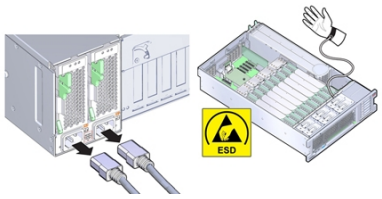
  -or-
- "Remove a DIMM" on page 148

  -or-
- "Install a DIMM" on page 150

  -or-
- "Replace the Motherboard (FRU)" on page 247

## ▼ Identify a Faulty DIMM

When servicing the components in this section, unplug the AC power cords and use ESD protection.




To identify a faulty DIMM, use the DIMM Fault Remind circuitry that is located on the memory riser (MR) card.

---

**Note -** Once power is removed from the server, you have 10 minutes to use the DIMM fault remind test cirduit.

---

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For DIMM designation information, see “Component Designations” on page 73.
- For reference information, see “Memory Riser Card and DIMM Reference” on page 154.

1. **Use Oracle ILOM to identify the failed DIMM in the system.**

   See “Troubleshooting Hardware Faults Using Oracle ILOM” on page 38

   Oracle ILOM can provide the memory riser card and DIMM designations for the failed DIMM.

2. **If Oracle ILOM is showing multiple DIMMs in a failed state, see “Troubleshooting a Multi-DIMM Failure State” on page 159.**

3. **Identify the memory riser card that contains the failed DIMM.**

   See “Locate a Failed Memory Riser Card, DIMM, or CPU” on page 86.

4. **Remove the MR card.**

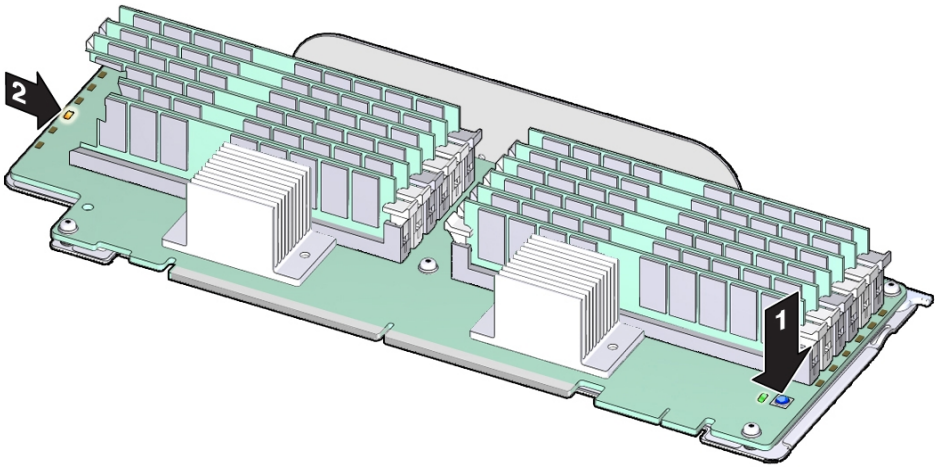
   See “Remove a Memory Riser Card” on page 145.

5. **Press and hold the DIMM Fault Remind button located on the memory riser.**

   When the DIMM Fault Remind button is pressed, an indicator next to the button lights to confirm that the fault remind circuit has power and is usable.

6. **With the Fault Remind button pressed, look for a lit DIMM Fault indicator.**

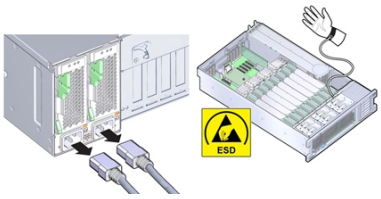
The indicators are located next to each DIMM slot. A lit indicator identifies the slot containing the faulty DIMM.




**Next Steps** “Remove a DIMM” on page 148

## ▼ Remove a DIMM

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Note -** DIMMs are cold-service components. The server must be completely removed from its power source.

Use this procedure to remove a DIMM from its slot on the memory riser (MR) card.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For DIMM designation information, see “Component Designations” on page 73.
- For reference information, see “Memory Riser Card and DIMM Reference” on page 154

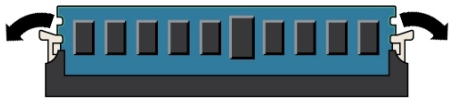
1. **If necessary, identify the faulty DIMM.**

   See “Identify a Faulty DIMM” on page 146.

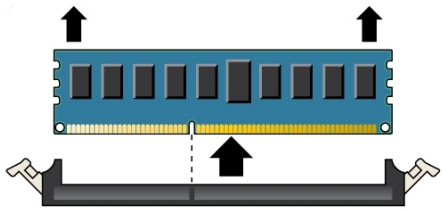
2. **To remove the DIMM do the following:**

   a. **Rotate both DIMM slot ejector levers outward as far as they will go.**

   The action unlocks the DIMM and expels it from the socket.



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

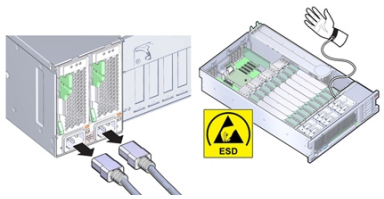


3. **Repeat the above steps until all faulty DIMMs are removed.**

**Next Steps** “Install a DIMM” on page 150

# ▼ Install a DIMM

When servicing the components in this section, unplug the AC power cords and use ESD protection.




Use this procedure to install a DIMM into a slot on a memory riser (MR) card.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For DIMM designation information, see “Component Designations” on page 73.
- For reference information, see “Memory Riser Card and DIMM Reference” on page 154.

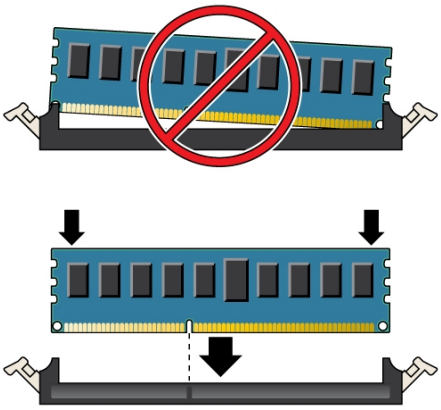
1. **Ensure that the DIMM ejector levers at both ends of the DIMM slot are in their fully open position.**

2. **Align the DIMM with the empty slot.**

   Align the notch on the DIMM with the protrusion on the DIMM slot to ensure that the DIMM is installed correctly.

3. **Gently and evenly push the DIMM into the slot until the ejector levers rise and lock the DIMM into place.**

The levers rise as the DIMM is pushed further into the slot.



4. **Ensure that the levers have risen completely and have locked the DIMM in the slot.**

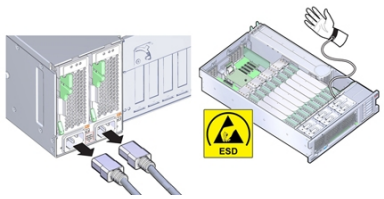
5. **Repeat the above steps until all replacement DIMMs are installed.**

**Caution -** Component damage. Ensure that all levers are closed and locked. Open DIMM ejector levers can break off during the installation of the memory riser (MR) card. All populated and unpopulated DIMM slot ejector levers on the MR card must be in the fully-closed position before installing the card in the server.

**Next Steps** “Install a Memory Riser Card” on page 152

# ▼ Install a Memory Riser Card

When servicing the components in this section, unplug the AC power cords and use ESD protection.




Use this procedure to install a memory riser (MR) card into its slot.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For DIMM designation information, see “Component Designations” on page 73.
- For reference information, see “Memory Riser Card and DIMM Reference” on page 154.

### 1. Ensure that all populated and unpopulated DIMM slot ejector levers are in the closed and locked position.

**Caution -** Component damage. Open DIMM ejector levers can break off during the installation of the memory riser (MR) card. All populated and unpopulated DIMM slot ejector levers on the MR card must be in the fully-closed and locked position before installing the card in the server.

### 2. Install the MR card as follows:

#### a. Ensure that the MR card ejector levers are in the closed position.

The ejector levers are only used to remove a MR card and are **not** used to install a card. See the illustration below.

#### b. Align the MR card with its slot on the motherboard.

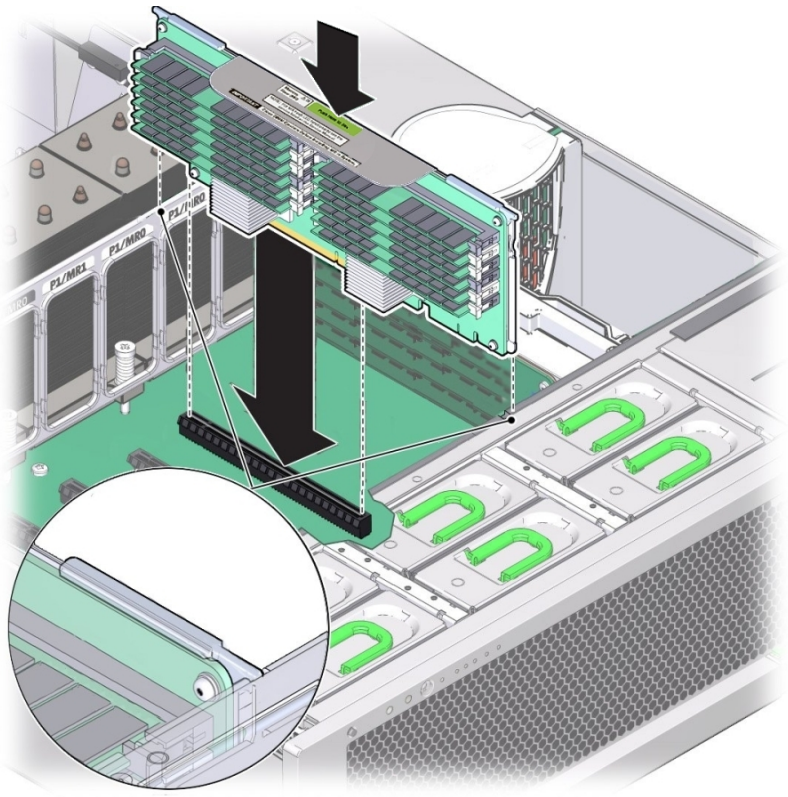
The DIMMs on the card must face the left (when looked at from the front of the server).

#### c. Carefully lower the card on to the slot.

Ensure that the card is in the provided card guide channels. See the illustration below.

d. **To seat the card into the slot, firmly push down on the green "Press here to insert" label on the metal bracket on top of the card.**

This action seats the card in the connector on the motherboard.




3. **Prepare the server for operation.**

See “Prepare the Server for Operation” on page 259.

**See Also** “Replace the Motherboard (FRU)” on page 247

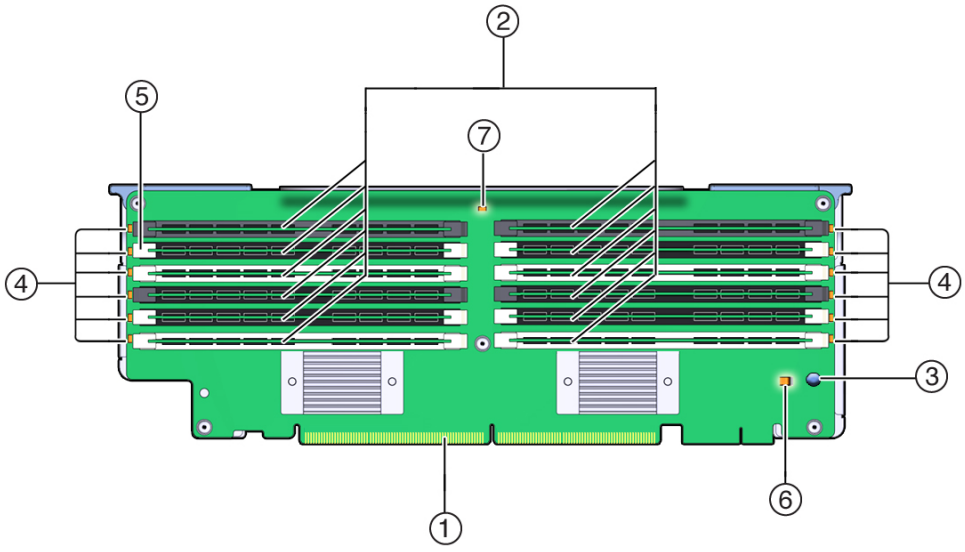
# Memory Riser Card and DIMM Reference

The following sections contain information about memory riser cards and DIMMs:



## Memory Riser Card Components

The following illustration shows the components of the memory riser card.




| Callout | Description | Callout | Description |
|---|---|---|---|
| 1 | Connector | 5 | DIMM ejector/locking levers (two on each slot) |

| Callout | Description | Callout | Description |
|---|---|---|---|
| 2 | DIMM slots (12) | 6 | Charge status indicator (green) |
| 3 | Fault Remind button | 7 | Memory riser card fault indicator |
| 4 | DIMM fault indicators | | |

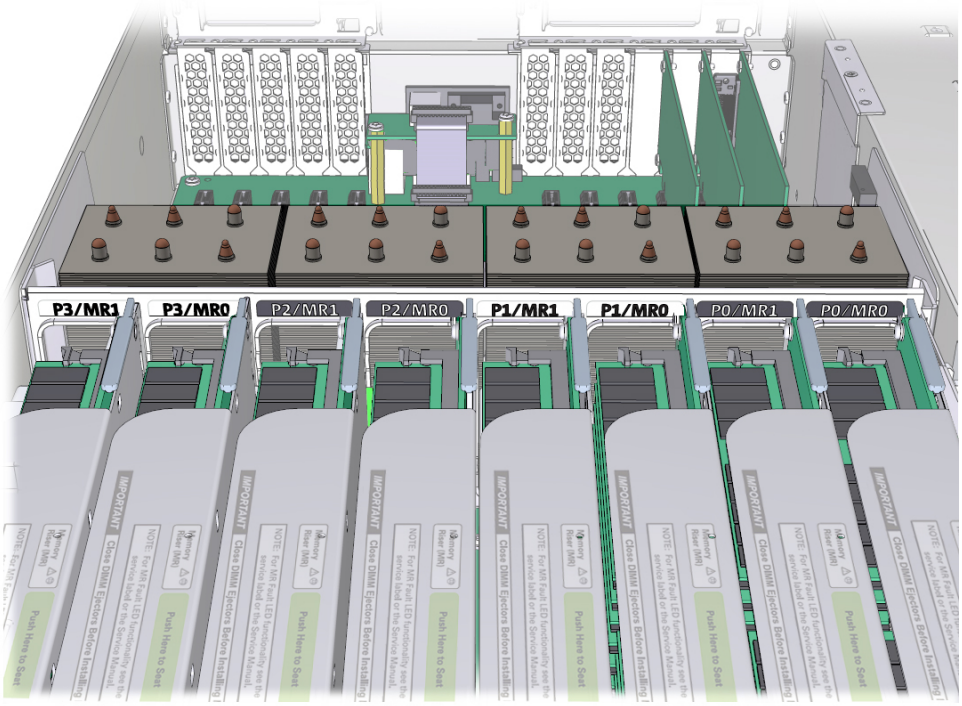
## Memory Riser Cards Physical Layout

The memory riser cards are located behind the fan module bay. The designations each memory riser (MR) card and its associated CPU are located inside the server on labels affixed to the rear MR card bracket. The cards are designated as MR, and the CPUs are designated as P. The slots and CPUs are labeled from right to left when viewed from the front of the server as follows:

**Note -** Each CPU has two assigned card slots (MR0 and MR1).

- P0/MR0 (rightmost slot)
- P0/MR1
- P1/MR0
- P1/MR1
- P2/MR0
- P2/MR1
- P3/MR0
- P3/MR1 (leftmost slot)

The following illustration shows the numbering for the memory riser slots and their associated CPUs as described above:




## Memory Riser Card Population Rules

The memory riser population rules for the server are as follows:

1. Each CPU has two dedicated memory riser card slots (MR0 and MR1).
2. The dedicated memory riser slots for each installed CPU must contain a memory riser card.
   - A two CPU system must contain four memory riser cards
   - A four CPU system must contain eight memory riser cards
3. When populating the server with memory riser cards:
   - First populate riser slot MR0 for each CPU, starting with the lowest numbered CPU (P0).
   - Then populate riser slot MR1 for each CPU, starting with the lowest numbered CPU (P0).

## Supported DIMMs and DIMM Population Rules

This section describes the supported DIMM configuration and population rules for memory risers in the system. Use only Oracle supported DIMMs in the system.

**Supported configurations:**

- Minimum supported configuration:
  - Two or Four-CPU system:

    Two DDR3 (Double Data Rate 3) 16 GB low voltage RDIMMs (Registered Dual In-Line Memory Modules) installed in each memory riser, slots D0 and D3.
- Maximum supported configuration:
  - Two-CPU system:

    Up to 48 DDR3 low voltage RDIMMs *or* LRDIMMs (Load Reduced Dual In-Line Memory Modules) are supported.
  - Four-CPU system:

    Up to 96 DDR3 low voltage RDIMMs *or* LRDIMMs are supported.

**Supported DIMM types and sizes available from Oracle:**

---

**Note -** DIMM system performance speed maximum is 1600 MHz in one or two DIMM per channel configuration, or up to 1333 MHz in three DIMM per channel configuration (even if the DIMMs are rated higher).

---

| DIMM Size | Type | Organization |
|---|---|---|
| 16 GB | DDR3-1600 LV RDIMM | Dual-rank by-4 (2Rx4) |
| 32 GB | DDR3-1600 LV LRDIMM | Quad-rank by-4 (4Rx4) |

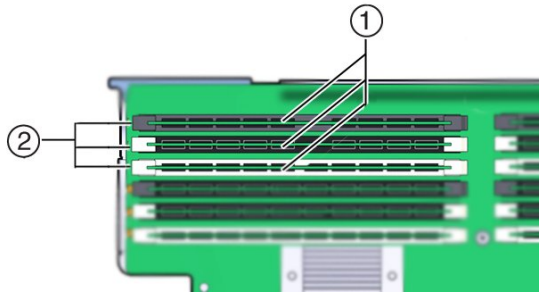
**Population rules:**

- Only one type and size DIMM is supported in the system at any time. Mixing DIMMs of different size or technology (such as RDIMMs and LRDIMMs) is not supported.
- When upgrading to a different size DIMM, replace all DIMMs in the system to match the new capacity.
- All memory riser cards must be populated identically.
- Install DIMMs in the following sequence for each memory riser card (refer to the illustrations that follow for additional details):

1. For a system with the minimum configuration (two DIMMs per riser), add two more DIMMs to memory riser slots D6 and D9 for each memory riser in the system. The end result being that DIMM slots D0, D3, D6 and D9 (black/black slots) are all populated. This provides one DIMM per channel configuration across memory buffers.

   Additional memory upgrades are done in increments of *four* DIMMs per riser, as follows:
2. Next, populate riser slots D1, D4, D7 and D10 (black/white slots). This provides two DIMMs per channel.
3. And finally, populate riser slots D2, D5, D8 and D11 (white/white slots). This provides three DIMMs per channel.

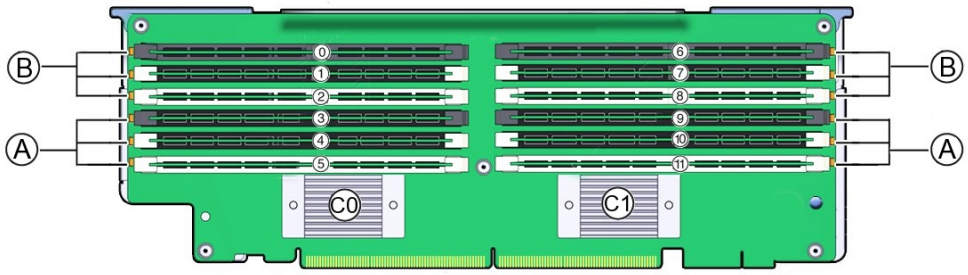
The memory slots and ejector levers are color coded using a black and white color scheme. Slots can have a black slot with black levers (black/black slots), black slot with white levers (black/white slots), or white slot with white levers (white/white slots) as shown in the following illustration:




| Call Out | Description |
|---|---|
| 1 | Slots |
| 2 | Levers |

**Memory Riser layout:**

The following illustration shows the DIMM slot and channel designations on the memory riser card:




| Call Out | Description |
|---|---|
| 0 - 11 | DIMM slot numbers. Board labeling prepends a "D" to the slot number (for example: D0–D11). |
| B | Channel B slots: D0–D2 for memory buffer 0; D6–D8 for memory buffer 1. |
| A | Channel A slots: D3–D5 for memory buffer 0; D9–D11 for memory buffer 1. |
| C0 | Memory buffer 0. |
| C1 | Memory buffer 1. |

## Troubleshooting a Multi-DIMM Failure State

A multi-DIMM failure state is when a single DIMM failure causes other DIMMs in the same channel or a second channel on a memory riser card to become disabled or appear as if they have failed.

When a DIMM failure occurs, check the Oracle ILOM system event log (SEL) to:

- Identify the first DIMM that failed.
- Note any additional DIMM failures occurring closely after the initial DIMM failure.
- Identify the memory riser card that contains the failed DIMM.
- Note the channel(s) in which any additional DIMM failures have occurred.

If another DIMM (or DIMMs) has failed after the initial occurrence of a single DIMM failure, and, if the DIMM failure is on the same memory riser card, then the server might be in multi-DIMM failure state.

For example, you might see the following in the system error log:

```
135 Sun May 21 00:53:57 2000 DIMM Service Required Memory P0/MR0/D9 (CPU
Memory Riser 0 DIMM 9)
  A failure has occurred during Memory Reference Code (MRC) DIMM module
training. (Probability:100, UUID:2a182715-983f-c4fb-e94f-b5a5b50d3650, Part
Number:001-0003-01,HMT42GR7AFR4A-PB, Serial Number:00AD011321345849FF,
Reference Document:http://support.oracle.com/msg/SPX86A-8004-67)

126 Sun May 21 00:53:56 2000 DIMM Service Required Memory P0/MR0/D6 (CPU
Memory Riser 0 DIMM 6)
  A failure has occurred during Memory Reference Code (MRC) DIMM module
training. (Probability:33, UUID:9014a82c-7bf9-ee96-b61b-9c7ccedc9aed, Part
Number:001-0003-01,HMT42GR7AFR4A-PB, Serial Number:00AD01132129B11E9E,
Reference Document:http://support.oracle.com/msg/SPX86A-8004-67)
```

In this scenario, the DIMM in D6 failed at 00:53:56, and that failure is subsequently followed by a reported failure of the DIMM in D9, which failed at 00:53:57. Both DIMMs are on the same memory riser card (P0/MR0). Each DIMM is on a separate channel, but both are linked to the same memory buffer ASIC. Additionally, all of the DIMMs in both channels might have been disabled by the system. This scenario could be an instance of a multi-DIMM failure state.

### How to Troubleshoot a Multi-DIMM Failure State

To troubleshoot this issue, replace only the DIMM that logged the initial failure and return the server to operation to see if the multi-DIMM failure state persists. If a multi-DIMM failure state had occurred, replacing only the DIMM that failed initially would rectify the fault state of the initial DIMMs and the subsequent DIMMs. If the failures persists, the issue could be with the DIMMs or with the memory riser card.

## Servicing PCIe Cards

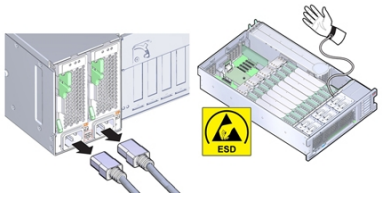
This section provides procedures for removing and installing PCIe cards and PCIe card filler panels.



**Note -** The factory installed Oracle Storage 12 Gb/s SAS RAID PCIe HBA (Internal) and Oracle NVMe Switch PCIe card are only serviceable by Oracle Service personnel, see “Servicing the Factory Installed SAS 12 Gb/s Internal HBA and ESM” on page 200 or “Servicing the Factory Installed PCIe NVMe Switch Card” on page 212.

# Remove a PCIe Card

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Caution -** Component damage. Ensure that all power is removed from the server before removing or installing expansion cards. You must disconnect the power cables before performing this procedure.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For PCIe slot designation information, see “Component Designations” on page 73.

1. **Prepare for service.**

   See “Prepare the Server for Cold Service” on page 94.

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

   See “Server Back Panel Features” on page 18 for information about PCIe slots and their locations.

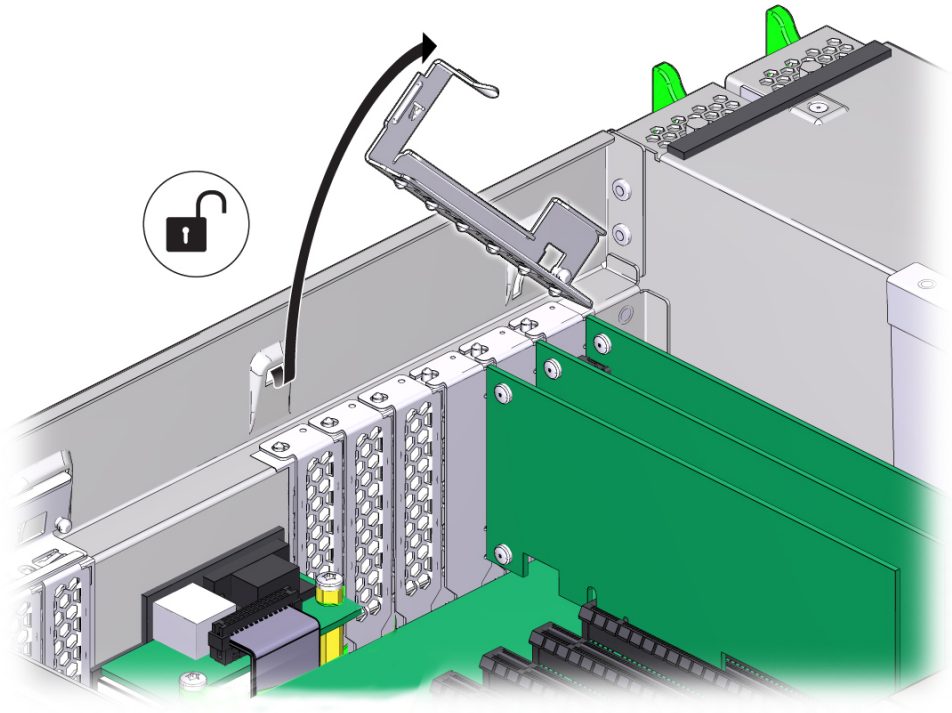
3. **If are replacing a PCIe card with a card of the same type, make a note of where the PCIe card is installed.**

   A list of supported PCIe cards and their population order is listed in the *Product Notes* for the server.

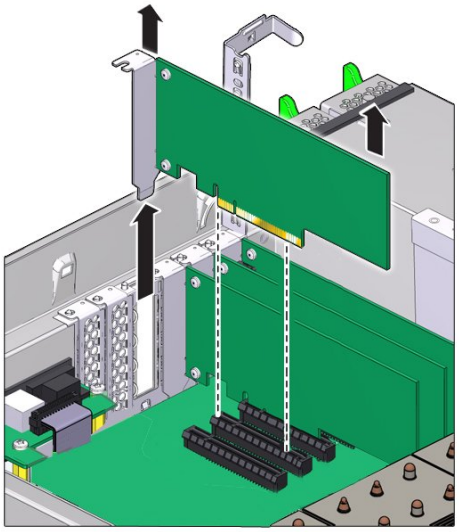
4. **Unplug all data cables from the PCIe card.**

   Make note of the cables, so you can install them in the same connectors on the replacement card.

5. **To disengage the PCIe card retaining bar, push down on the bar, move it away from the server back wall, and lift it to an upright position.**



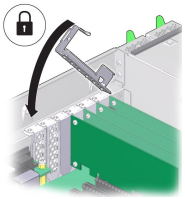
6. **Carefully remove the PCIe card from the PCIe card slot.**



**Caution -** Server over temperature. Whenever you remove a PCIe card, you should replace it with another PCIe card or a filler panel; otherwise, the server might overheat.

7. **If you are not installing a card in the slot, install a PCIe slot filler.**

8. **Return the PCIe card slot crossbar to its closed and locked position.**



**Next Steps**

- “Install a PCIe Card” on page 164

-or-

- “Replace the Motherboard (FRU)” on page 247

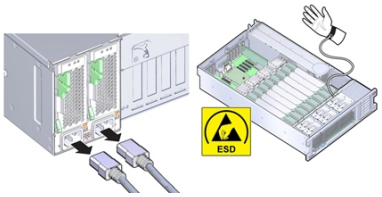
-or-

- “Prepare the Server for Operation” on page 259

# ▼ Install a PCIe Card

When servicing the components in this section, unplug the AC power cords and use ESD protection.

For PCIe card support and installation order information, refer to “PCIe Slot Reference” on page 167 and the *Product Notes* for the server.




This procedure describes how to install a PCIe card.

**Caution -** Component damage. Ensure that all power is removed from the server before removing or installing PCIe cards. You must disconnect the power cables before performing this procedure.

**Before You Begin**

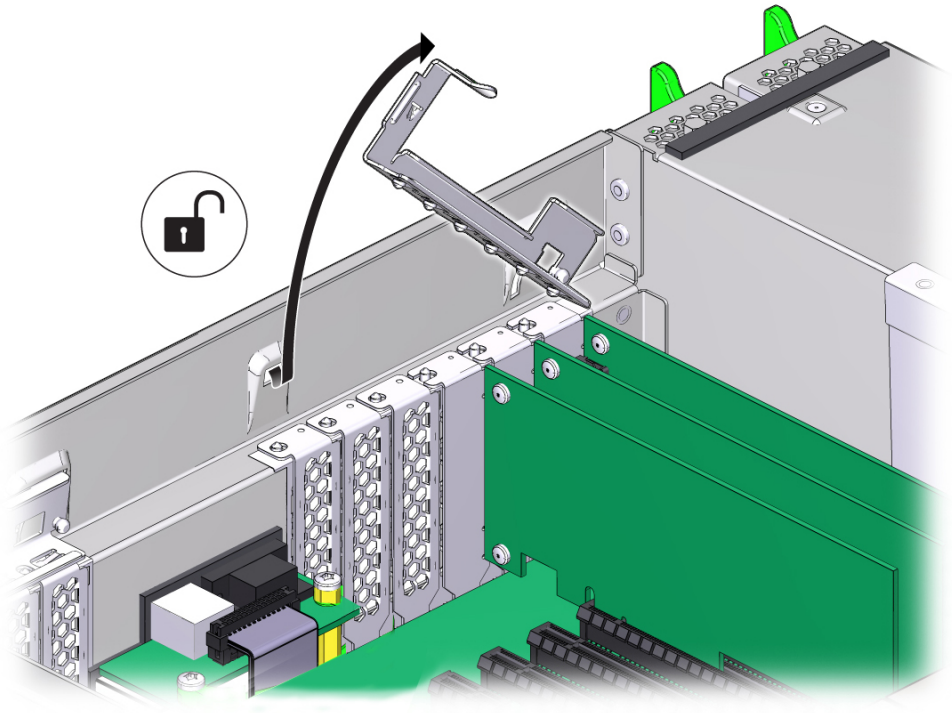
- For serviceability considerations, see “Component Serviceability” on page 70.
- For PCIe slot designation information, see “Component Designations” on page 73.

1. **Unpack the PCIe card and place it on an antistatic mat.**

2. **Prepare the server for service.**

   See “Prepare the Server for Cold Service” on page 94.

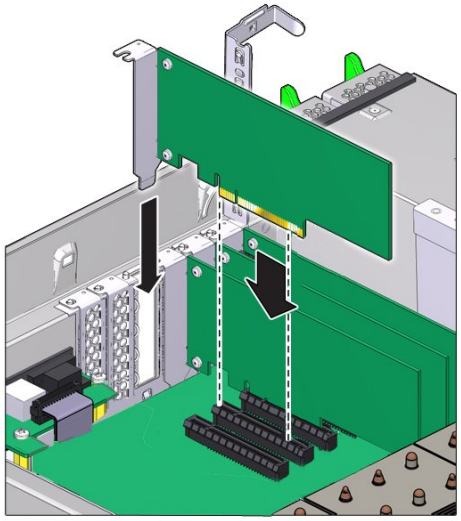
3. **To disengage the PCIe card retaining bar, push down on the bar, move it away from the server back wall, and lift it to an upright position.**



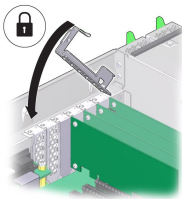
4. **If the slot has a PCIe filler panel, remove it.**

5. **Install the PCIe card into the PCIe card slot.**

If you are replacing a PCIe card with a card of the same type, install the replacement card into the same slot. Otherwise, a list of supported PCIe cards and their population order is listed in the *Product Notes* for the server



6. **Return the PCIe card slot crossbar to its closed and locked position.**



7. **Attach cables to the PCIe card, as needed.**

8. **Prepare the server for operation.**

   See "Prepare the Server for Operation" on page 259.

9. **If the PCIe card being installed is replacing a faulty PCIe card, manually clear the PCIe card fault using Oracle ILOM.**

See “Clear Hardware Fault Messages” on page 91.

10. **Configure the PCIe card, as needed.**

**See Also**

- “Replace the Motherboard (FRU)” on page 247

# PCIe Slot Reference

This section describesPCIe slot information.



For slot designation information, see “PCIe Slot Designations” on page 77.

For details about supported PCIe cards, card quantity, and slot restrictions, refer to the *Product Notes*.

## PCIe Slot Length and Capabilities

The server contains 11 low-profile PCIe 2.0 card slots, which have the following length and capabilities:

- Slots 1, 2, 3, 4, 5, 6, 7, 9 and 10 have x8 connectors (x8 electrical interface)
- Slots 8 and 11 have x16 connectors (x8 or x16 electrical interface)

## PCIe Card Slot Population Order

The total number of PCIe cards and the slot population order depends on the server CPU configuration.

- A two-CPU configuration only supports PCIe slots 1,2,3,4,5, and 6.
- A four-CPU configuration supports all 11 PCIe slots.

In both configurations, PCIe slot 2 is reserved for the storage drive HBA, which leaves five available slots for a two-CPU configuration and 10 available slots for a four-CPU configuration.

**Note -** If the system was ordered from the factory with optional NVMe drives, a PCIe NVMe Switch card is installed in PCIe slot 1.

As a general rule, when installing a PCIe card in the server, use the following population order:

- For a two-CPU configuration, the slot population order is: slot 6, 4, 5, 3, 1.

  For example: When installing a PCIe card in a two-CPU configured server, first, determine if slot 6 is available. If it is available, install the card in the slot. If it is not available, determine if slot 4 is available. If slot 4 is not available, determine if slot 5 is available. Continue this process with slots 3, and 1 until you find an available slot.
- For a four-CPU configuration, the slot population order is: slot 11, 8, 6, 4, 10, 7, 5, 3, 9, 1

  For example, when installing a PCIe card in a four-CPU configured server, first determine if slot 11 is available. If it is available, install the card in the slot. If it is not available, determine if slot 8 is available. If slot 8 is not available, determine if slot 6 is available. Continue this process with slots 4, 10, 7, 5, 3, 9, and 1 until you find an available slot.

### PCIe Cards With Boot Devices

If the server has several PCIe cards that provide boot devices, disable the Option ROM on the PCIe slots not used for booting. By default, the BIOS enables Option ROMs for PCIe slot 2 and the four on-board 10 Gigabit Ethernet ports.

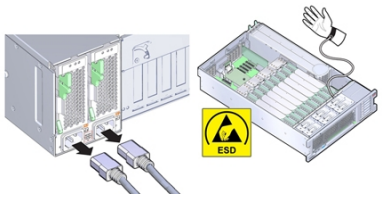
# Servicing the DVD Drive (CRU)

This section provides procedures for removing and installing the DVD drive and filler panel.


- "Remove the DVD Drive or DVD Drive Filler Panel" on page 168
- "Install the DVD Drive or DVD Drive Filler Panel" on page 170


## ▼ Remove the DVD Drive or DVD Drive Filler Panel

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Caution -** Component damage. Ensure that all power is removed from the server before removing or installing the DVD drive. You must disconnect the power cables before performing this procedure.

This procedure describes how to remove the DVD drive or a DVD drive filler panel.

**Before You Begin**

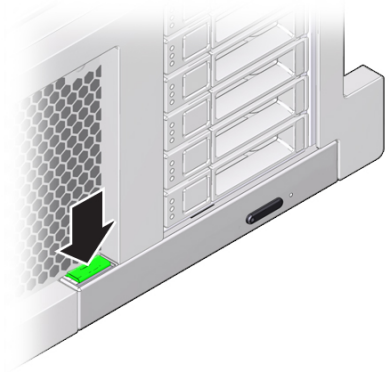
- For serviceability considerations, see "Component Serviceability" on page 70.

1. **Prepare for service.**

   See "Prepare the Server for Cold Service" on page 94.

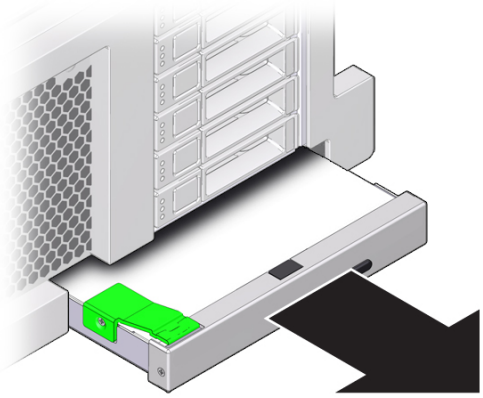
   To replace the DVD drive, the server must be disconnected from the power source.

2. **At the front of the server, push down on the latch on the top left corner of the DVD drive or filler panel.**



3. **Slide the DVD drive or filler panel out of the server.**

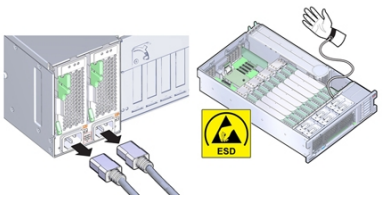
**Caution -** Whenever you remove the DVD drive or filler panel, you should replace it with another DVD drive or a filler panel; otherwise the server might overheat due to improper airflow.



**Next Steps** "Install the DVD Drive or DVD Drive Filler Panel" on page 170

# ▼ Install the DVD Drive or DVD Drive Filler Panel

When servicing the components in this section, unplug the AC power cords and use ESD protection.



**Caution -** Component damage. Ensure that all power is removed from the server before removing or installing the DVD drive. You must disconnect the power cables before performing this procedure.

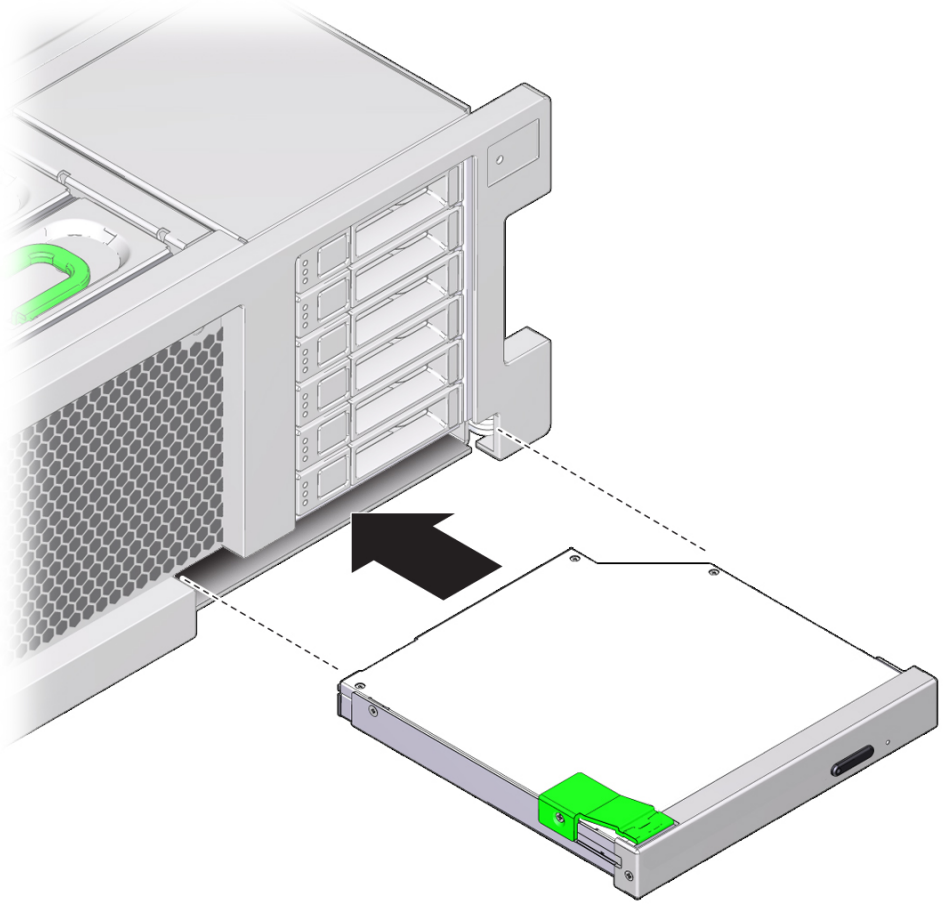
This procedure describes how to install the DVD drive or a DVD drive filler panel.

**Before You Begin** "Remove the DVD Drive or DVD Drive Filler Panel" on page 168

1. **Unpack the DVD drive or filler panel.**

   If it is a DVD drive, place it on an anti static mat.

2. **Slide the DVD drive or filler panel into the front of the chassis until it seats.**



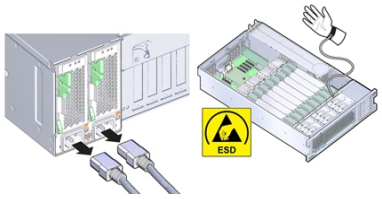
3. **Prepare the server for operation.**

See “Prepare the Server for Operation” on page 259.

# ▼ Replace the System Battery (CRU)

This section provides instructions for replacing the server system (RTC) battery.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




The system battery maintains system time when the server is off or disconnected from AC power. Use the following procedures to remove and replace the system battery when it has failed.

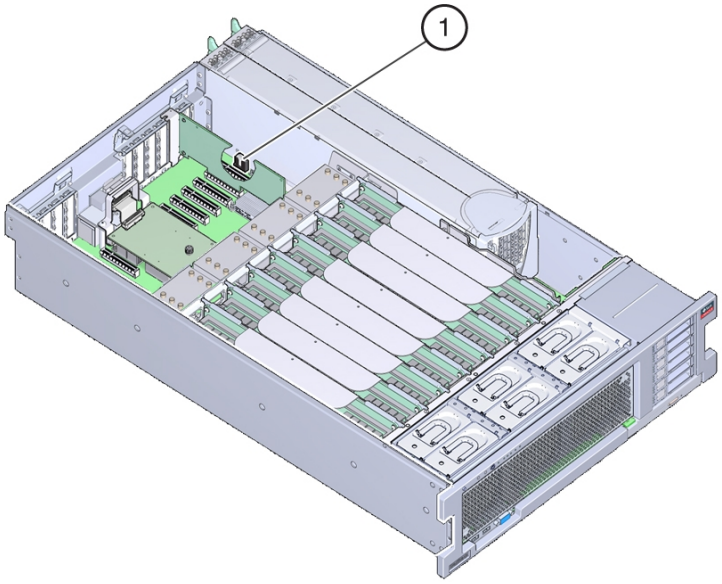
**Caution -** Ensure that all power is removed from the server before removing or installing the battery. You must disconnect the power cables from the system before performing these procedures.

1. **Prepare for service.**

   See “Prepare the Server for Cold Service” on page 94.

2. **Locate the system battery.**

The battery is located toward the back of the server between PCIe slot 1 and the power supply side wall.




| Callout | Description |
|---|---|
| 1 | System battery |

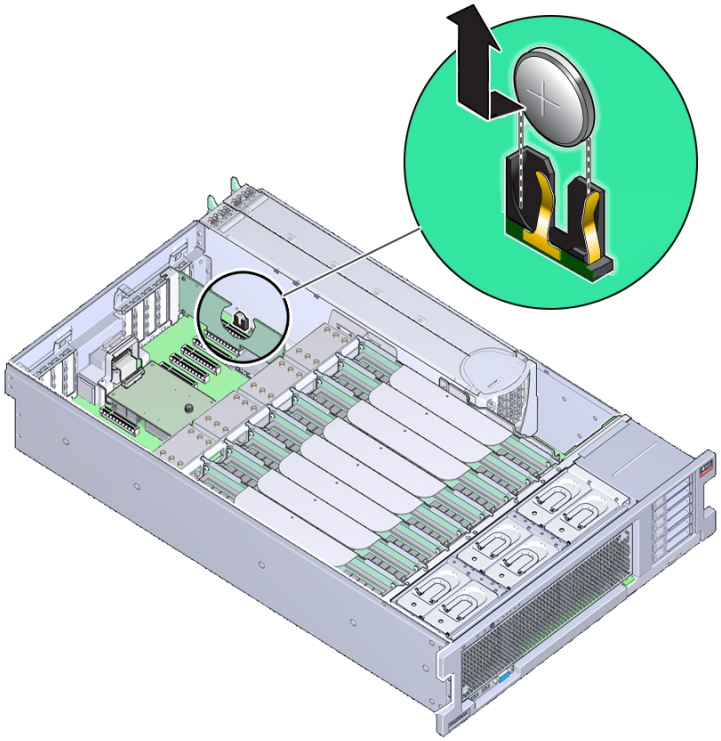
3. **If necessary, remove the PCIe card in slot 1.**

   You might need to remove the card to access the battery. See "Remove a PCIe Card" on page 161.

4. **Remove the battery from the battery holder by pushing the back of the battery (negative side) toward the metal tab (on the positive side) and lifting the battery up and out of the battery holder.**

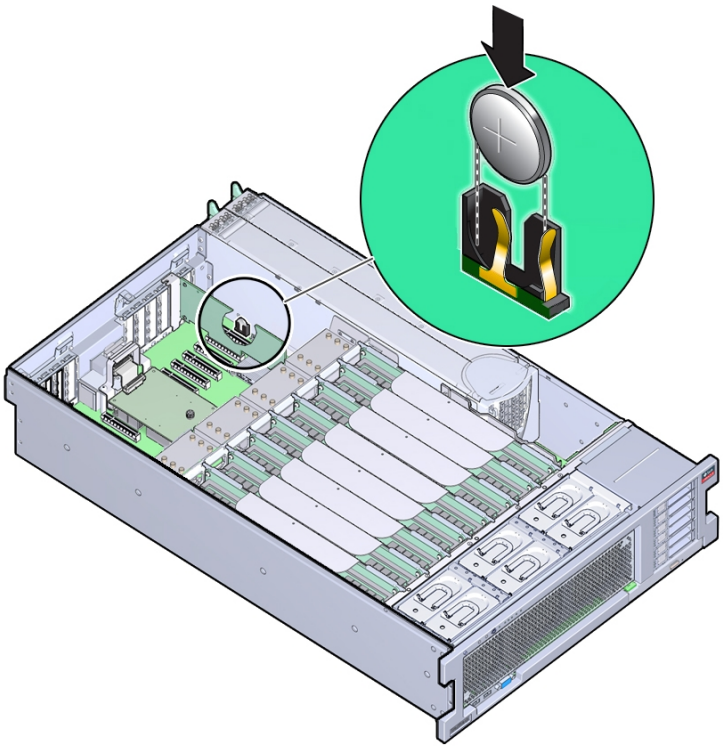
   Take care not to deform the tab when pushing against it.

**Caution -** Component damage. Do not deform the metal tab on the positive side of the battery. The metal tab maintains the positive battery connection and secures the battery in the holder.



5. **Press the new battery into the battery holder with the positive side facing the metal tab that holds it in place.**

The positive side of the battery is marked with a plus sign (cross).



6. **If the service processor is not configured to use NTP, you must reset the Oracle ILOM clock using the Oracle ILOM CLI or the web interface.**

   If the service processor is configured to synchronize with a network time server using the Network Time Protocol (NTP), the Oracle ILOM clock resets as soon as the server is powered on and connected to the network.

   For instructions, see the Oracle Integrated Lights Out Manager 3.2.x Documentation Library at: `http://www.oracle.com/goto/ILOM/docs`

7. **Prepare the server for operation.**

   See "Prepare the Server for Operation" on page 259.

8. **Use the BIOS Setup Utility to update the System Time and System Date.**

Refer to “BIOS Setup Utility Menu Options” on page 273 for information about using the BIOS Setup Utility.

# Servicing FRU Components

This section provides procedures for replacing and installing field-replaceable units (FRUs). For serviceability information, see “Component Serviceability” on page 70.

**Note -** Only Oracle-authorized service providers should service FRU components.

| Description | Link |
|---|---|
| Removal and installation procedures and reference information for the server processors and heatsinks. | “Servicing Processors and Heatsinks (FRU)” on page 180 |
| Replacement procedures and reference information for the factory installed SAS 12 Gb/s HBA card and ESM. | “Servicing the Factory Installed SAS 12 Gb/s Internal HBA and ESM” on page 200 |
| Replacement procedures and reference information for the optional factory installed PCIe NVMe Switch card. | “Servicing the Factory Installed PCIe NVMe Switch Card” on page 212 |
| Replacement procedures and reference information for the server fan board. | “Replace the Fan Board (FRU)” on page 221 |
| Replacement procedures and reference information for the server power supply backplane board. | “Replace the Power Supply Backplane Board (FRU)” on page 226 |
| Replacement procedures and reference information for the server disk drive backplane. | “Replace the Disk Drive Backplane (FRU)” on page 238 |
| Removal and installation procedures and reference information for the server service processor. | “Servicing the SP Card (FRU)” on page 243 |
| Replacement procedures and reference information for the server motherboard. | “Replace the Motherboard (FRU)” on page 247 |

# Servicing Processors and Heatsinks (FRU)

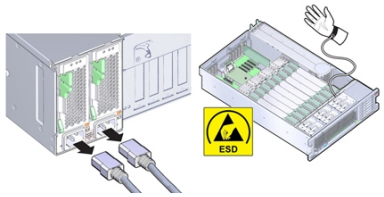
This section provides procedures for removing and installing CPUs and heatsinks.

For processor overview information, see “Processor Subsystem” on page 22. For serviceability information related to this component, see “Component Serviceability, Locations, and Designations” on page 69.



## ▼ Replace a Faulty CPU (FRU)

Disconnect the server from the AC power and protect components from ESD by wearing an antistatic wrist strap.




For processor overview information, see “Processor Subsystem” on page 22.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For CPU designation information, see “Component Designations” on page 73.

1. **Remove the heatsink and CPU.**

   See “Remove a Heatsink and CPU (FRU)” on page 186.

2. **Install the CPU and the heatsink.**

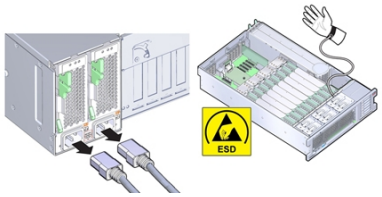
   See “Install a Heatsink and CPU (FRU)” on page 193.

3. **Prepare the server for operation.**

   See “Returning the Server to Operation” on page 259.

# ▼ Remove a CPU Cover Plate (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.




Cover plates are plastic inserts that attach to the CPU load plate and protect the pins of an unoccupied CPU socket. Cover plates are used in the unoccupied sockets of a two-CPU server and on replacement motherboards. When replacing a motherboard, remove the covers and install them on the failed board.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.
- For CPU designation information, see “Component Designations” on page 73.

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

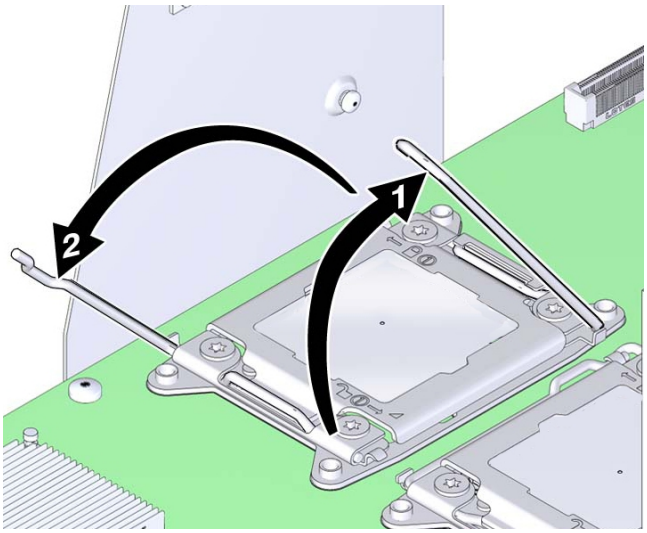
   See “Prepare the Server for Cold Service” on page 94.

2. **Disengage the CPU load plate release levers by pushing them down and moving them slightly toward the CPU socket and away from their retaining clips.**

   The levers are numbered with their required order of operation. The left-side lever (when viewed from the front of the server) must be operated first.

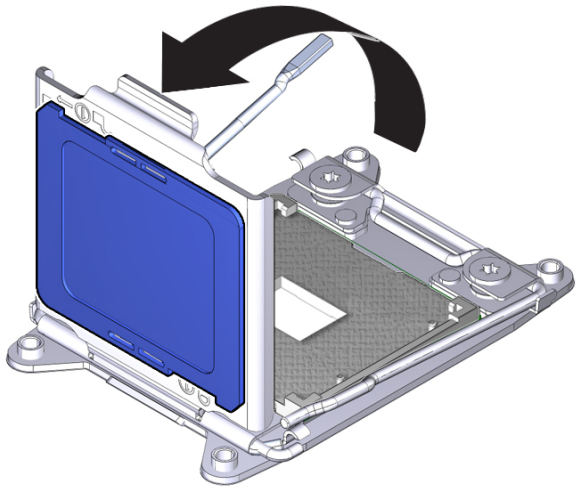
3. **Rotate the levers to the fully-open position.**

When the second lever is in its fully-open position, the load plate is unlocked.



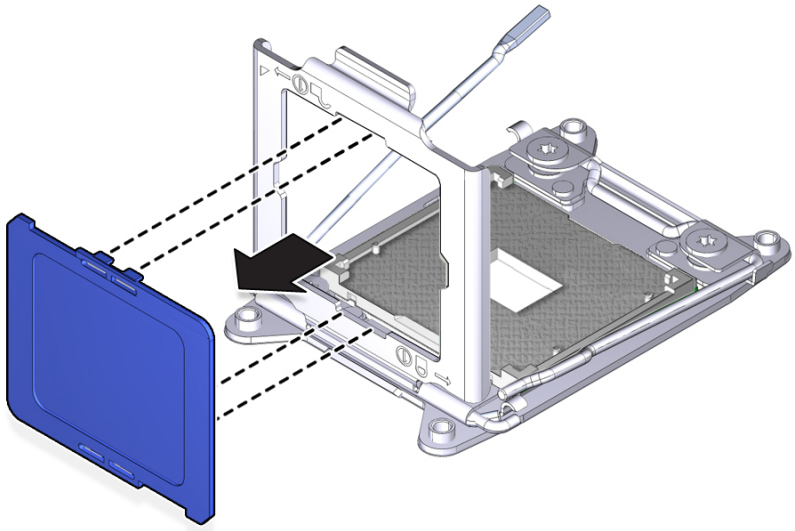

4. **To open the load plate, lift the unhinged end to its fully-open position.**

   A black plastic cover (CPU cover plate) is attached to the load plate.



5. **To remove the CPU cover plate, push on the underside of the plate.**

   The cover is snap-fitted into the opening in the load plate.

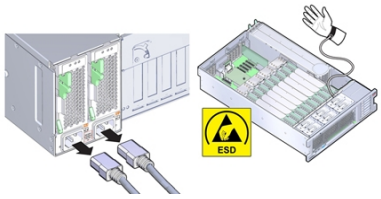


**Next Steps**

- “Install a CPU Cover Plate” on page 183
- “Install a Heatsink and CPU (FRU)” on page 193

# ▼ Install a CPU Cover Plate

When servicing the components in this section, unplug the AC power cords and use ESD protection.



Cover plates are plastic inserts that attach to the CPU load plate and protect the pins of an unoccupied CPU socket. Cover plates are used in a two-CPU server (for the unoccupied slots) and on replacement motherboards. When replacing a motherboard, remove the covers and install them on the failed board.

**Before You Begin**

- "Remove a CPU Cover Plate (FRU)" on page 181
- For serviceability considerations, see "Component Serviceability" on page 70.
- For CPU designation information, see "Component Designations" on page 73.

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

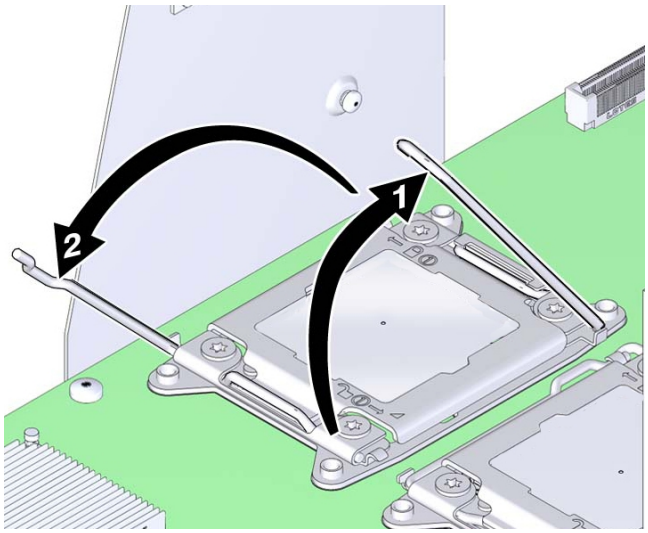
   See "Prepare the Server for Cold Service" on page 94.

2. **Disengage the CPU load plate release levers by pushing them down and moving them slightly toward the CPU socket and away from their retaining clips.**

   The levers are numbered with their required order of operation. The left-side lever (when viewed from the front of the server) must be operated first.

3. **Rotate the levers to the fully-open position.**

   Opening the second lever completes unlocking the load plate.



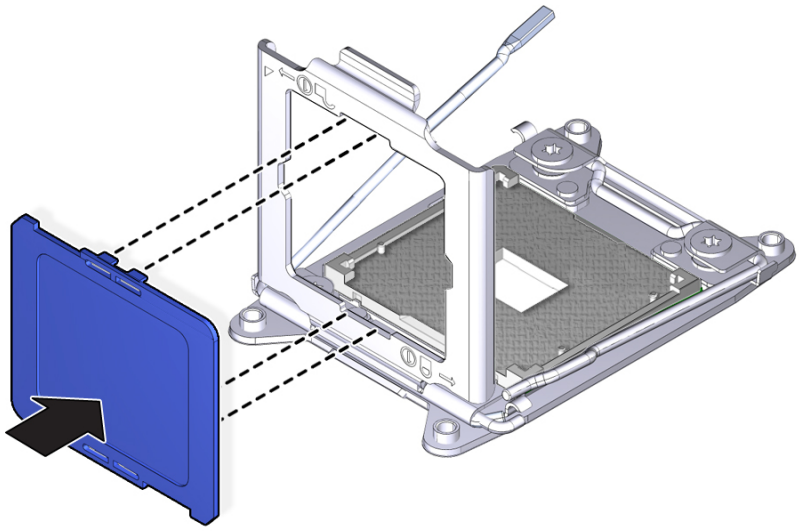

4. **To open the load plate, lift the unhinged end to its fully-open position.**

5. **If necessary remove the CPU using the CPU replacement tool.**

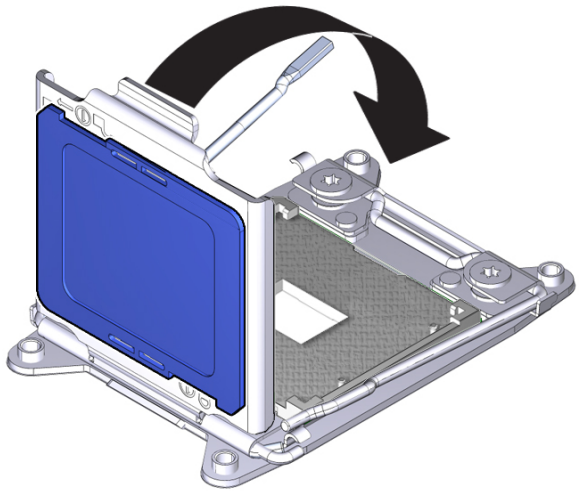
   See “Remove a Heatsink and CPU (FRU)” on page 186.

6. **To install the CPU cover plate, push it onto the top side of the load plate.**

   The cover snap into the opening in the load plate.

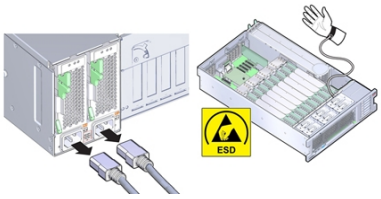


7. **Close and lock the load plate.**



# ▼ Remove a Heatsink and CPU (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.




When replacing a failed CPU, use this procedure to remove a heatsink and CPU.

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For CPU designation information, see "Component Designations" on page 73.

1. **Prepare for service.**

See “Prepare the Server for Cold Service” on page 94.

2. **Identify the failed CPU.**

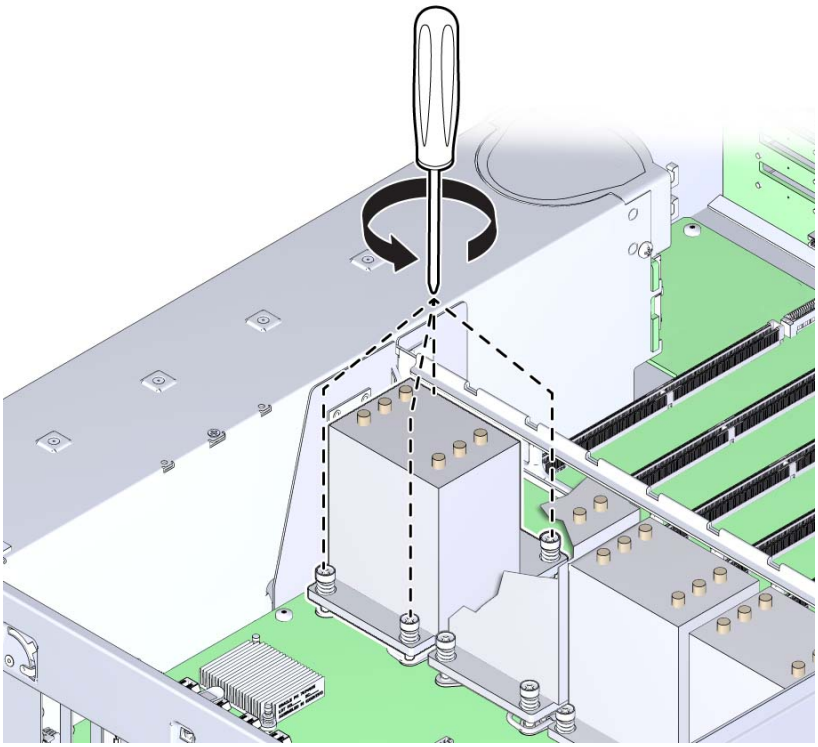
   See “Locate a Failed Memory Riser Card, DIMM, or CPU” on page 86.

3. **Remove the two memory riser cards associated with the failed CPU.**

4. **Remove the heatsink:**

   a. **Unscrew the four Phillips screws from the heatsink.**

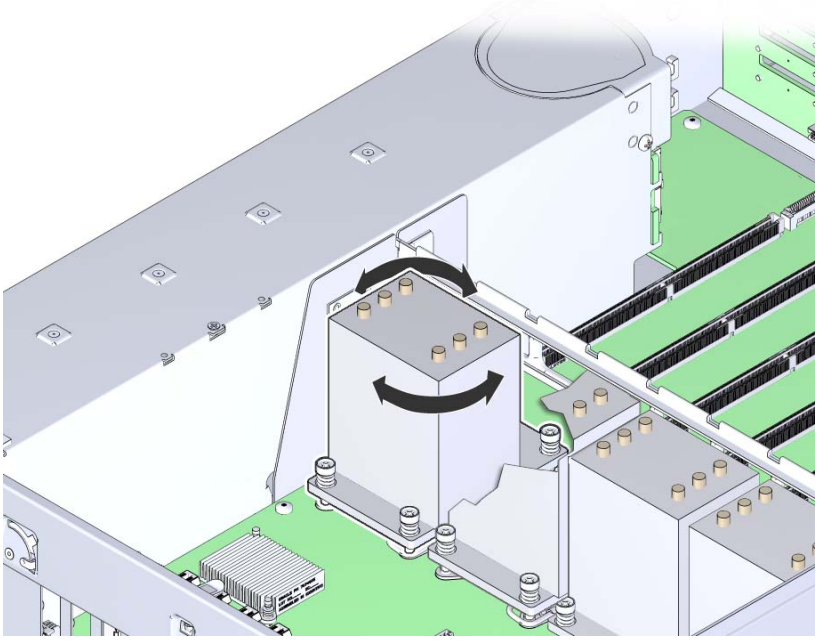
      Turn the screws alternately one and one half turns until they are fully removed.



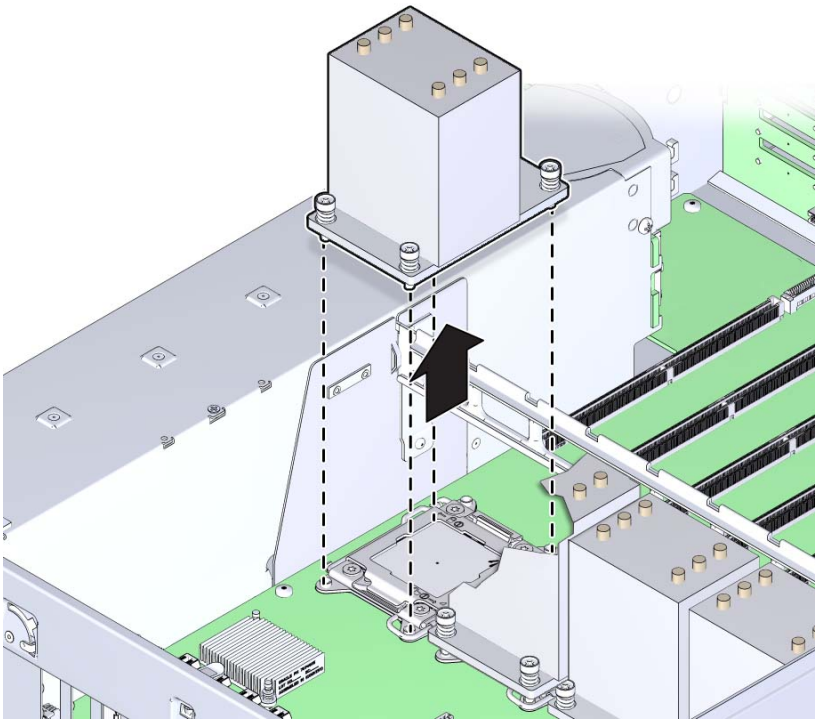
A thermal compound applied to the top of the CPU facilitates heat transfer to the heatsink and acts as an adhesive.

**b. To remove the heatsink, break the seal created by the thermal compound by slightly twisting the heatsink left and right while pulling it upward.**

Do not allow the thermal compound to contaminate other components. Retain the heatsink. You need to reuse it.



**c. Remove the heatsink from the server.**



**d. Place the heatsink upside down on the work space.**

**e. Use an alcohol pad to clean the thermal compound from both the bottom of the heatsink and the top of the CPU.**

**Caution -** Component damage. Failure to clean the thermal compound from the heatsink and the CPU prior to removing the CPU could result in accidental contamination of the CPU socket, the removal tool, or other components. Also, be careful not to get the grease on your fingers as this could result in contamination of components.

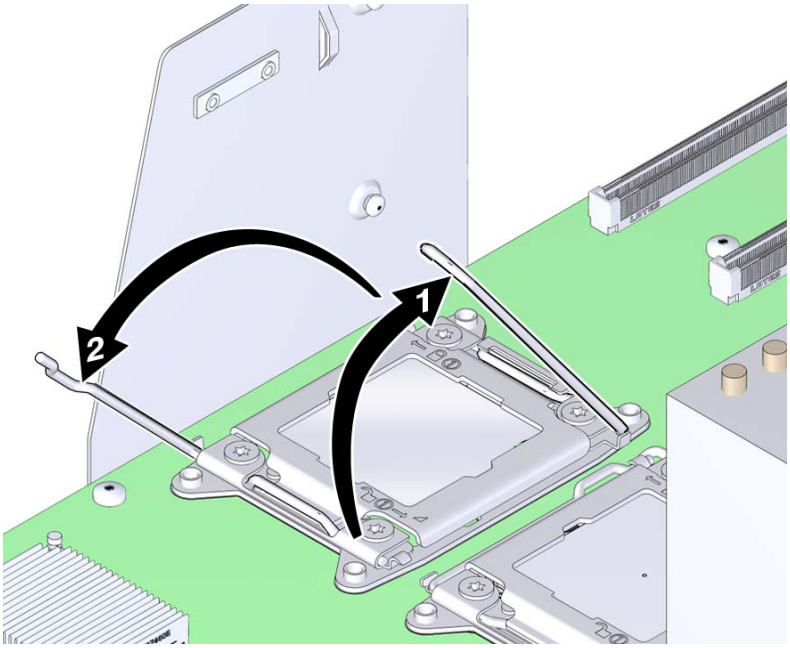
To access the CPU, the CPU load plate needs to be opened. The load plate is locked in its closed position by the load plate lever.

5. **Open the spring-loaded CPU load plate release levers by pushing them down and moving them slightly toward the CPU socket and away from their retaining clips**

   The levers are numbered by their required order of operation. The left-side lever (when viewed from the front of the server) must be opened first.

6. **Rotate the levers to the fully-open position.**

   When the second lever is in its fully-open position, the load plate is unlocked.




7. **To open the load plate, lift the unhinged end to its fully-open position.**

**Caution -** Component damage. The pins of the CPU socket can be easily damaged. To remove the CPU, use the correct CPU replacement tool.

8. **To remove the CPU, use the CPU replacement tool:**

   The tool is used to remove and install the CPU in the socket. The top side of the replacement tool has a button in the center and a tab on one side. Pressing down on the button opens the tool. Pressing the tab closes the tool (and releases the button).

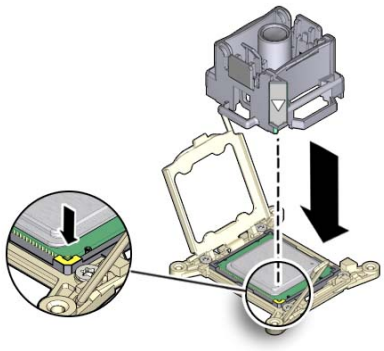
**Note -** Ensure that you use the correct CPU replacement tool. The correct tool has part number G29477-002 affixed to the side, and it has a green label. However, the label color alone is not an indicator of the correct tool. Verify that the part number is correct.

**a. Press down on the release button on top of the replacement tool.**

This action opens the tool.

On one corner of the tool there is a label with a downward pointing triangle. Likewise, the CPU is marked with a triangle on one of its corners. This is a key that aligns the tool and the CPU with the CPU socket. The tool and the CPU are correctly positioned with the socket when all of the triangles are aligned.

**b. Orient the bottom of the tool over the CPU, ensuring that the triangle on the tool aligns with the triangle on the CPU.**

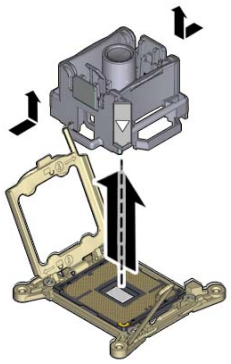


**c. Lower the tool onto the CPU, ensuring that it sits evenly on the CPU.**

**d. Push the release tab away from the center button.**

This action is accompanied by a click sound as the tool closes and grabs the CPU.

e. **To remove the CPU, lift the tool upward and out of the server.**



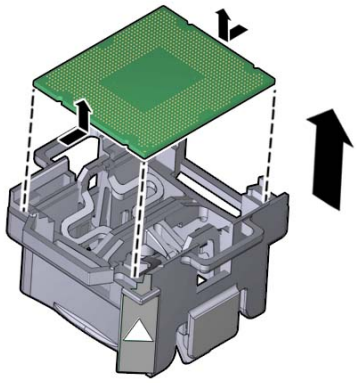
f. **Turn the tool over, so the metal CPU contacts are facing upward and the topside of the tool is facing downward.**

g. **Hold the CPU by its edges.**

h. **On the topside of the tool (which is facing downward), pull the release tab away from the center button.**

This action is accompanied by a click sound as the tool releases its hold on the CPU.

i. **Remove the CPU from the tool taking care not to touch the metal contacts on the underside.**



**Next Steps**

- “Replace a Faulty CPU (FRU)” on page 180

-or-

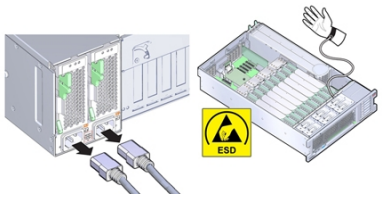
- “Install a Heatsink and CPU (FRU)” on page 193

-or-

- “Replace the Motherboard (FRU)” on page 247

# ▼ Install a Heatsink and CPU (FRU)

Disconnect the server from the AC power and protect components from ESD by wearing an antistatic wrist strap.



Depending on whether you are adding a new CPU and heatsink, or replacing one or both of these components because they are damaged, your kit might contain the following:

- CPU and a heatsink with thermal compound applied
- Heatsink with thermal compound applied
- CPU with a syringe of thermal compound

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- For CPU designation information, see "Component Designations" on page 73.

1. **At the CPU socket, ensure that the CPU load plate and both load plate release levers are in their fully open position.**

2. **To install a CPU, use the CPU replacement tool.**

---

**Note -** Ensure that you use CPU replacement tool, part number G29477-002. The part number is printed on the side of the tool. The tool is shipped with a new CPU.

---

The tool is used to remove and install the CPU in the socket. The top side of the replacement tool has a button in the center and a tab on one side. Pressing down on the button opens the tool. Pressing the tab releases the button and closes the tool.

a. **Press down on the release button on top of the replacement tool.**
   This action opens the tool.
   On one corner of the tool there is a label with a downward pointing triangle. Likewise, the CPU is marked with a triangle on one of its corners. This is a key that aids in correctly positioning the tool and the CPU with the CPU socket. The tool and the CPU are correctly positioned with the socket when all of the triangles are aligned.

b. **Turn the replacement tool upside down, noting the corner of the tool that is marked with a triangle (alignment key).**

c. **Note the corner of the CPU that is marked with a triangle (alignment key).**

d. **Lift the CPU by its edges, taking care not to touch the metal contacts on the underside of the CPU.**

e. **Turn the CPU upside down (metal contacts facing upward) and set it on the replacement tool, ensuring that the triangle on the CPU aligns with the triangle on the tool and that the CPU sits flat in the tool. Do *not* release your hold the CPU.**

The CPU is not yet secured in the tool.

f. **With the tool and the CPU in the topside down position, press the topside release tab outward, away from the center button.**

This action is accompanied by a click sound as the tool closes and grabs the CPU. The CPU should now be secured in the tool.

g. **Ensure that the CPU is secured in the tool.**

When the CPU is secured in the tool, there is no side-to-side movement of the CPU within the tool.

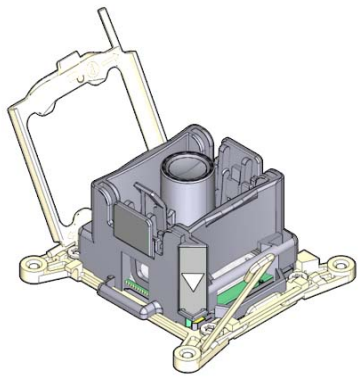
3. **Turn the tool over, so that the CPU contacts are facing downward.**

This positions the tool with the topside facing upward.

4. **Orient the tool so that the triangle on the tool aligns with the triangle on the socket.**

5. **Lower the tool onto the socket, ensuring that the CPU is correctly positioned and sits flat and evenly in the socket.**

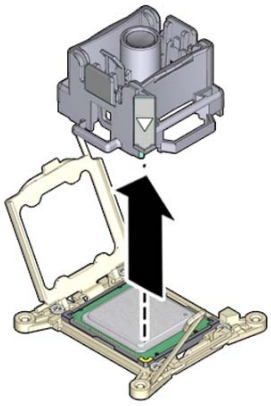
When the CPU is correctly positioned, there is no side-to-side movement of the CPU within the socket.



6. **To release the CPU from the tool, press the center button.**

This action is accompanied by a click sound as the tool opens and releases the CPU.

7. **Remove the tool.**



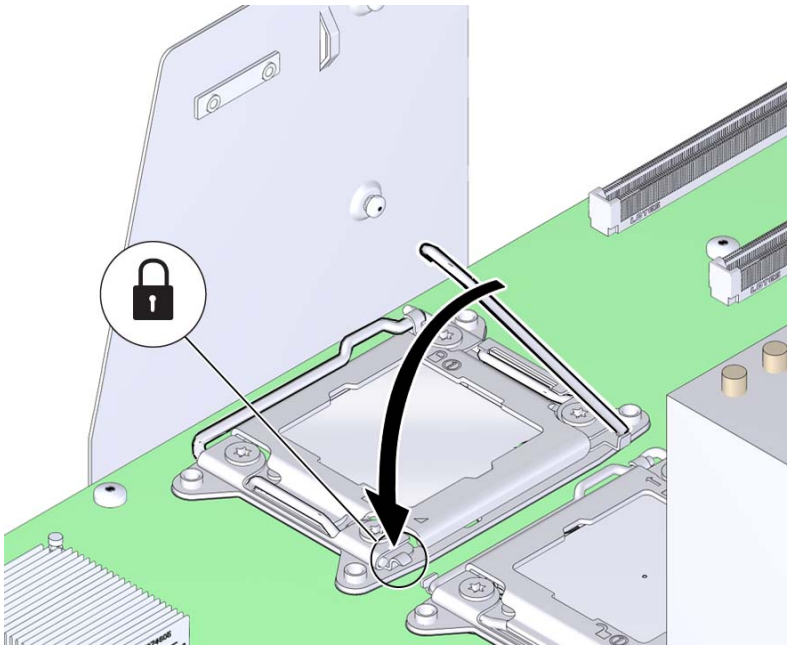
8. **Inspect the CPU to ensure that it sits evenly within the socket.**

9. **Close the CPU load plate.**

10. **Lower and lock the right side lever, ensuring that the lever is secured under its retaining clip and that the bend in the lever locks the cover plate.**

    The right side lever must be closed first.

11. **Lower and lock the left side load plate lever, ensuring that it is secured under its retaining clip.**

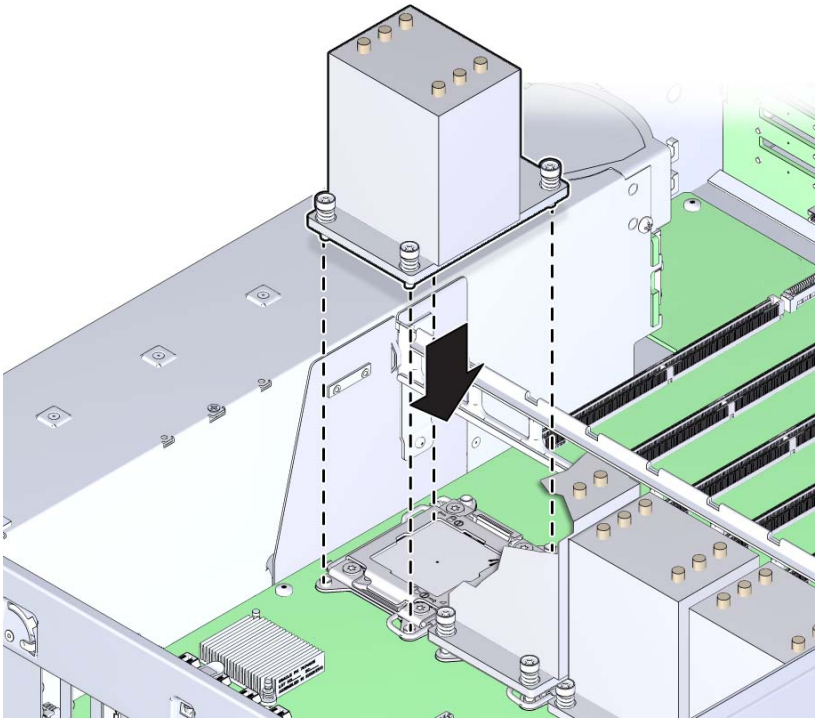


12. **To apply the thermal compound, dispense the contents of the syringe as a single dollop in the center on the top of the CPU.**

    Do not spread the thermal compound. The pressure applied during the heatsink installation performs this action.

13. **To install the heatsink:**

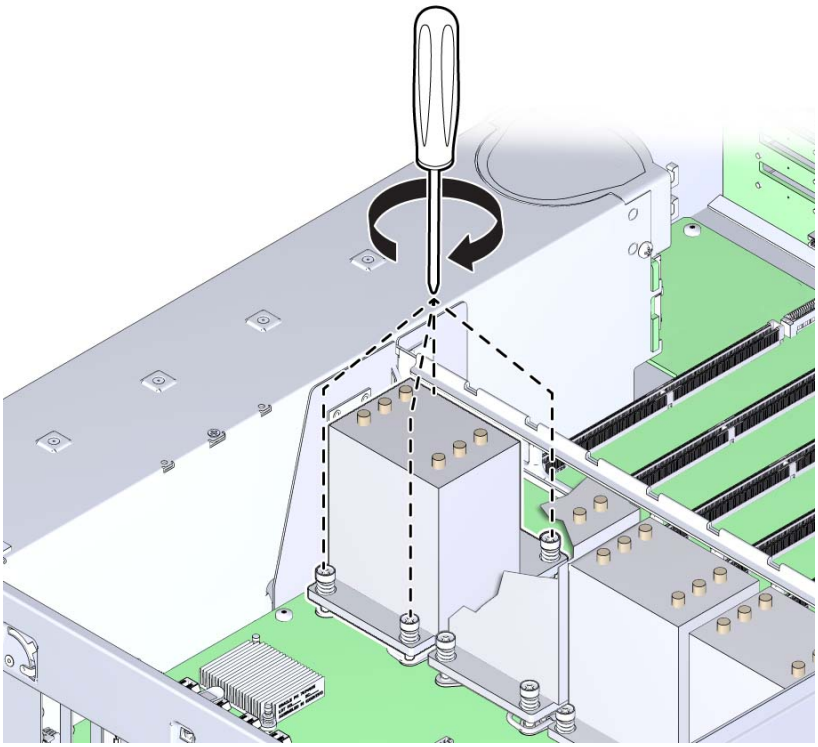
**a. Align the captive spring-loaded heatsink screws with the threaded standoffs on the motherboard.**



**b. Set the heatsink on top of the CPU.**

Once the heatsink is in contact with the CPU, avoid extra movement of the heatsink.

c. **Use a number 2 Phillips screwdriver and alternately tighten each screw one-half turn until all screws are completely tightened.**



14. **Prepare the server for operation.**

    See “Prepare the Server for Operation” on page 259.

15. **If the CPU being installed is replacing a faulty CPU, manually clear the CPU fault using Oracle ILOM.**

    See “Clear Hardware Fault Messages” on page 91.

**See Also**

- “Replace a Faulty CPU (FRU)” on page 180
- “Replace the Motherboard (FRU)” on page 247

# Servicing the Factory Installed SAS 12 Gb/s Internal HBA and ESM

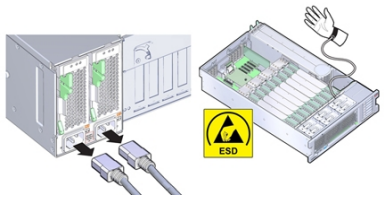
This section provides procedures for removing and installing the factory-installed SAS HBA card and ESM.

For information about the factory installed SAS 12 Gbit/sec HBA, see "Storage Subsystem" on page 30. For serviceability information, see "Component Serviceability, Locations, and Designations" on page 69.



## ▼ Replace the SAS 12 Gb/s Internal HBA (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.



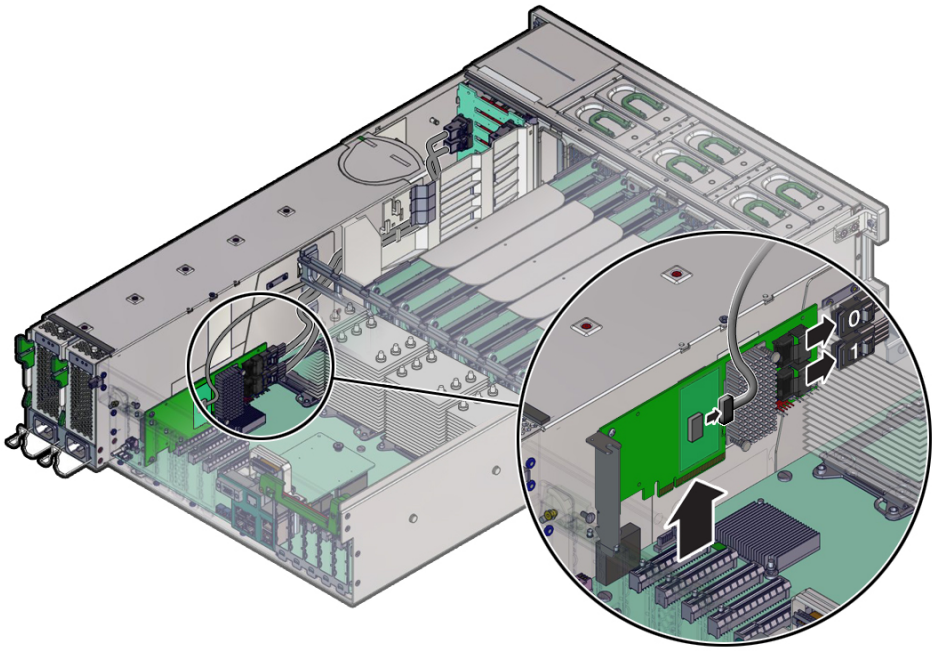

**Before You Begin** If the HBA being replaced is already configured with RAID, and its configurations have been saved to a RAID configuration file, be sure to have that file on hand to restore to the replacement HBA card. Refer to the HBA documentation for details.

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

   See "Prepare the Server for Cold Service" on page 94.

2. **Remove the HBA card from PCIe slot 2 slot and disconnect cables attached to it.**

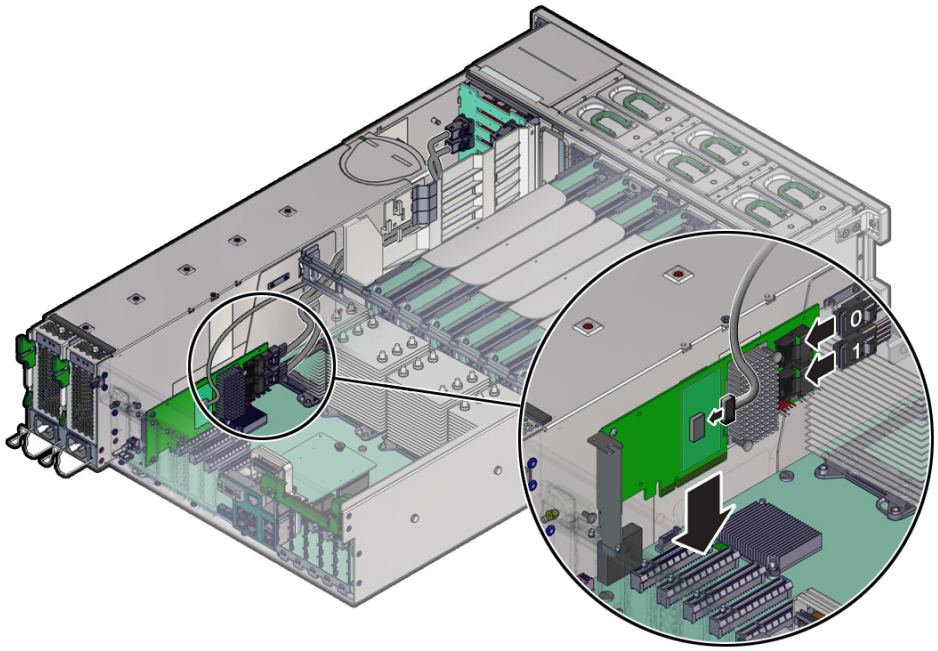
Removing the card from the slot allows easy access to the connected cables. For details on removing a card, see “Remove a PCIe Card” on page 161.




3. **To install the replacement card, connect the cables to the replacement HBA card and install the card in PCIe slot 2.**

   The HBA card has two SAS cables (the white labeled cable is 0, and the yellow labeled cable is 1) and an ESM cable that need to be connected before installing the card in the slot.

For details on installing a card, see “Install a PCIe Card” on page 164.




4. **Prepare the server for operation.**

   See “Prepare the Server for Operation” on page 259.

5. **Restore configurations from the old card to the replacement card.**

   If you are replacing an HBA that was already configured for RAID, obtain the saved configuration file to restore to the replacement HBA card.

   For details on configuring or recovering RAID configurations, refer to the Avago Technologies LSI Storage *12Gb/s MegaRAID SAS Software User's Guide*, which is available at the following location: `http://www.lsi.com/sep/Pages/oracle/index.aspx`

# ▼ Replace the SAS 12 Gb/s Internal HBA ESM Module (FRU)

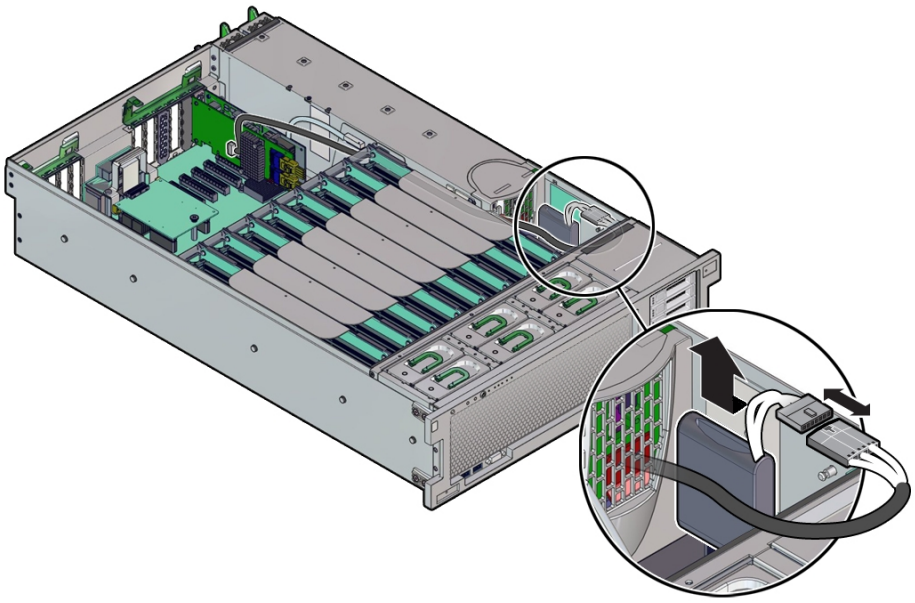
When servicing the components in this section, use ESD protection.

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

   See “Prepare the Server for Cold Service” on page 94.

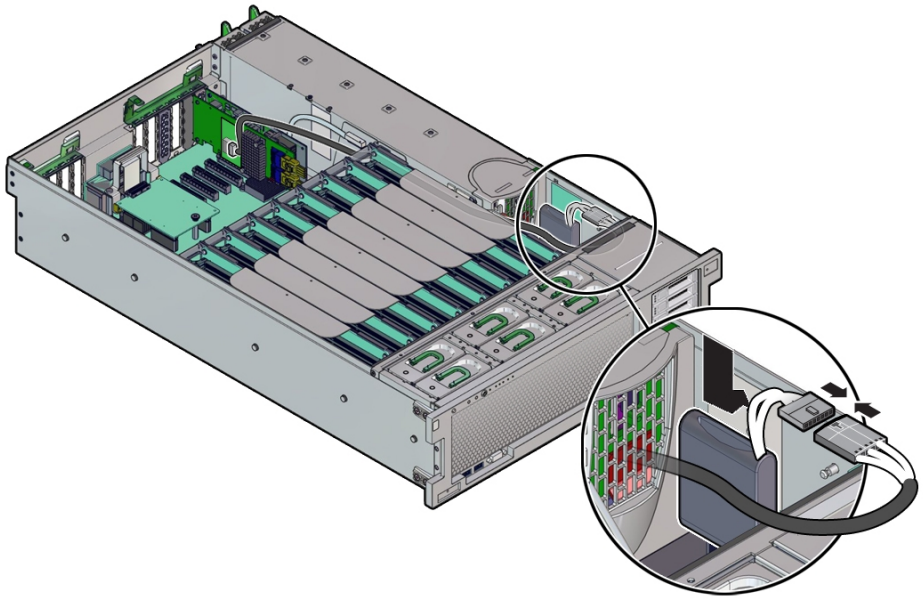
2. **Disconnect the ESM cable from the ESM and remove the ESM by prying it off the dual lock securing tape on the chassis.**

   The ESM is held securely by a heavy-duty dual lock strip and might not come off easily.



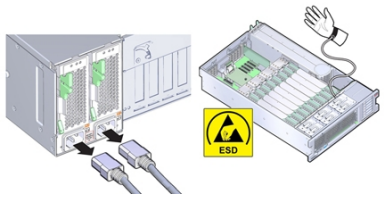
3. **Install the new ESM and attach the ESM cable.**

Extra force might be required to securely attach the ESM to the heavy-duty dual lock strip on the chassis. Double-check to ensure the dual lock connection is secure.



## ▼ Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.



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

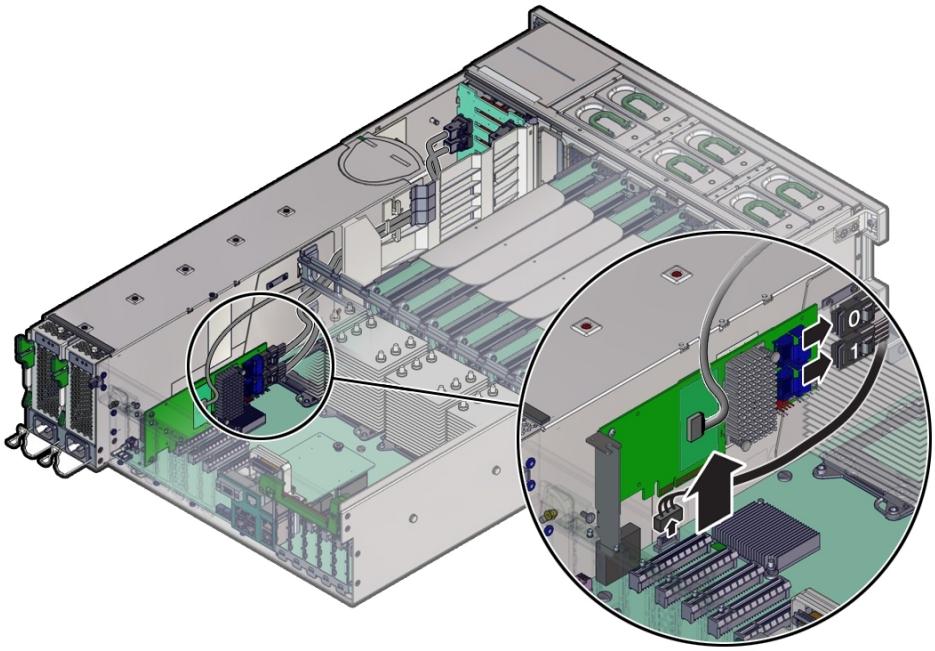
   See “Prepare the Server for Cold Service” on page 94.

2. **Remove the P0 MR0/MR1 memory risers.**

   This gives you room to access the cables for removal. See “Remove a Memory Riser Card” on page 145.

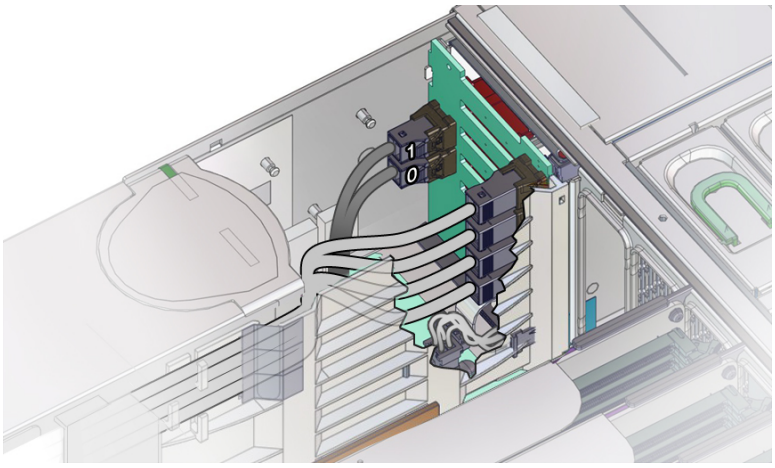
3. **Disconnect the two SAS cables from the HBA card in PCIe slot 2 and the DVD SATA cable (that branches off of the HBA SAS cables) from the motherboard.**

   If needed, you can first remove the HBA card from its PCIe slot to gain better access to the cable connectors.




4. **Disconnect the two SAS HBA cables (0 and 1) from the disk backplane board.**

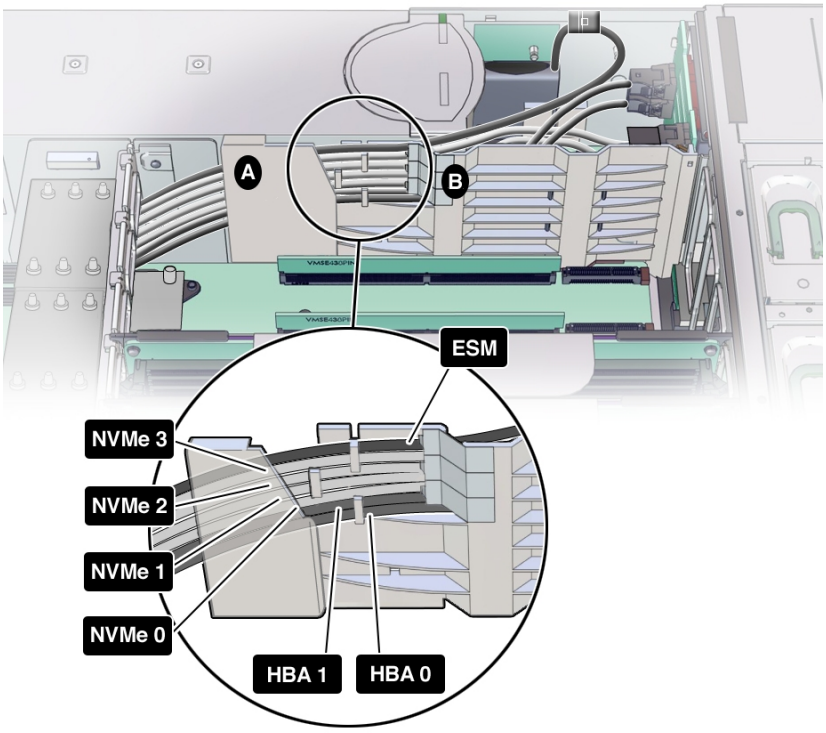
The white labeled cable is 0, and the yellow labeled cable is 1.




5. **Remove the SAS HBA cables from the air divider, as follows.**

   a. **Detach the NVMe (if installed), HBA, and ESM cables from the three cable clips on the memory riser side of the air divider. Then, carefully lift the cables up and out of the cable slot [B] in the air divider that provides access to the disk backplane area.**

There are three clips. The HBA cables are attached to the bottom clip.




b. **Once the HBA cable is clear of the air divider clips, gently pry the air divider cable shield [A in the figure above] away from the power supply just enough to allow you to slide out the HBA cables.**

   The HBA cables need to be completely free of the air divider.

6. **Carefully thread the ends of HBA cables you detached from the HBA through the narrow space between the P0 heat sink and the power supply cage and up and out of the system.**

   The space between the P0 heat sink and the power supply cage is narrow;.the SAS cable connectors will only fit through one way.

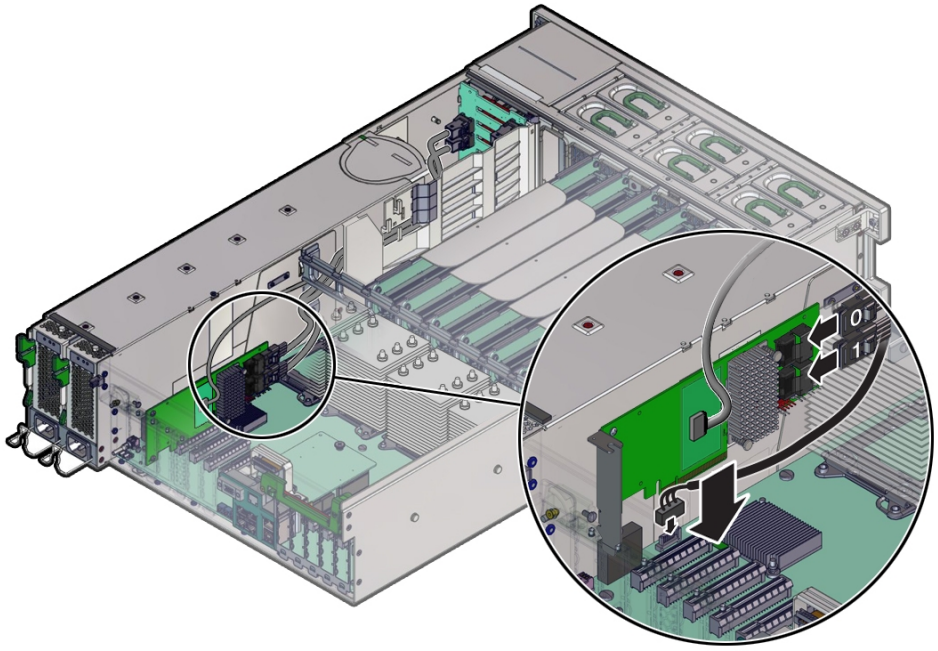
**Caution -** Hardware damage. Try not to allow the SAS and NVMe (if installed) cables to rub against the CPU0 heatsink radiator fins. They are sharp and can damage the cable insulation.

7. **To install the replacement cable, carefully thread the to-HBA end of the cables through the narrow space between the P0 heat sink and the power supply cage.**

8. **Reconnect the SAS HBA cables to the HBA card and the SATA cable to the motherboard.**

   The white labeled cable is 0, and the yellow labeled cable is 1.

   If needed, reinstall the HBA card to PCIe slot 2 if you removed it earlier.




9. **Reroute the SAS HBA cables through the air divider to the disk backplane area.**

   Refer to the figure in step 5 for cable routing.

10. **Reconnect the SAS HBA cables to their connectors on the disk backplane.**

    Refer to the figure in step 4 to determine proper connections.

**Note -** Any excess cable length should be in the PCIe card area to allow better air flow through the disk backplane area.

11. **Reinstall the P0 MR0/MR1 memory risers you removed earlier.**

    See "Install a Memory Riser Card" on page 152.

12. **Prepare the server for operation.**

    See "Prepare the Server for Operation" on page 259.

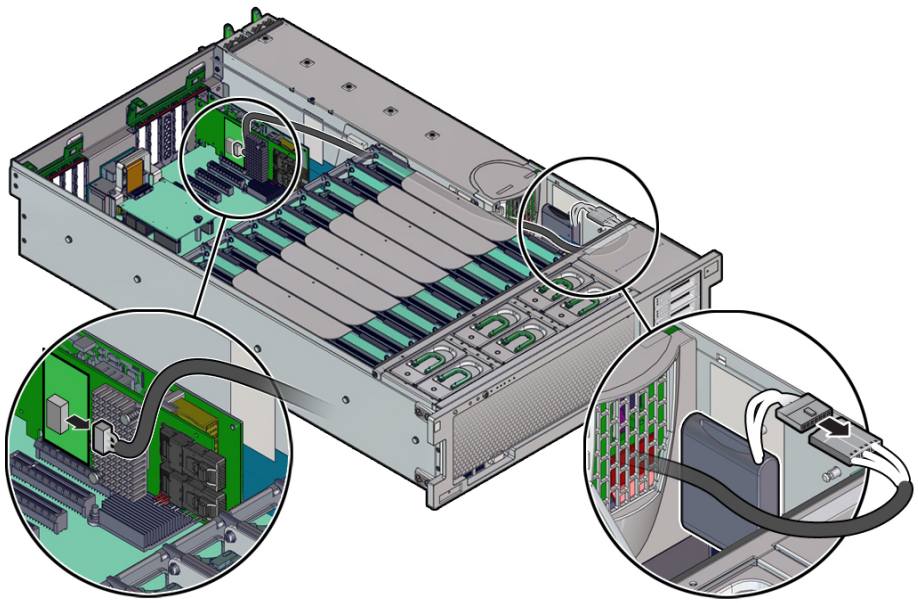
# ▼ Replace the SAS 12 Gb/s Internal HBA ESM Cable (FRU)

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

   See "Prepare the Server for Cold Service" on page 94.

2. **Disconnect the ESM cable from the HBA card in PCIe slot 2 and the ESM module.**

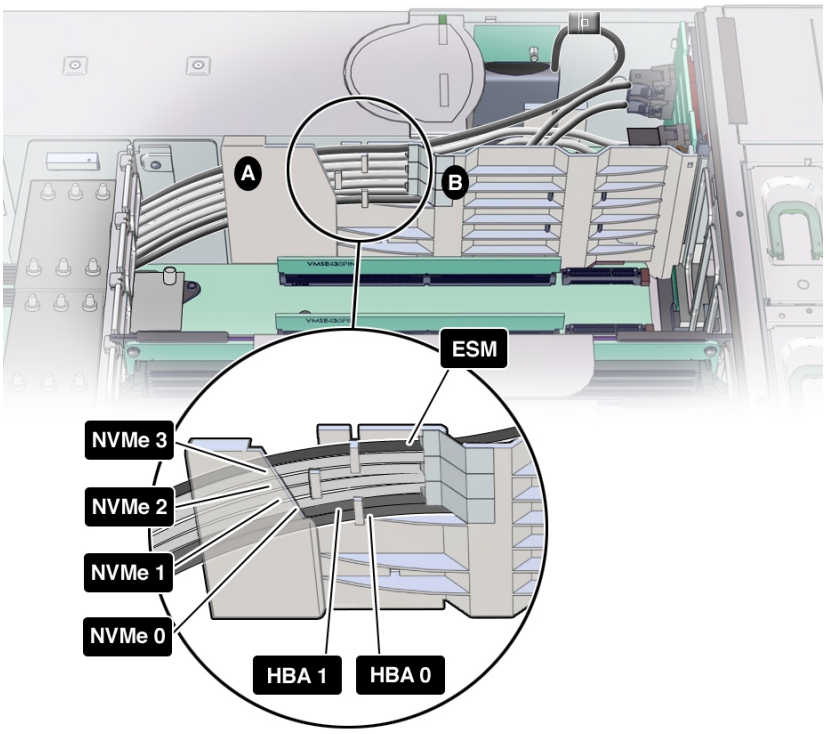
If needed, you can first remove the HBA card from its PCIe slot to gain better access to the cable connections.



3. **Remove the SAS HBA cables from the air divider, as follows.**

   a. **Detach the ESM cable from the cable clip on the memory riser side of the air divider. Then, carefully lift the cable up and out of the cable slot [B] in the air divider that provides access to the disk backplane area.**

There are three clips, the ESM cable is attached to the top clip.



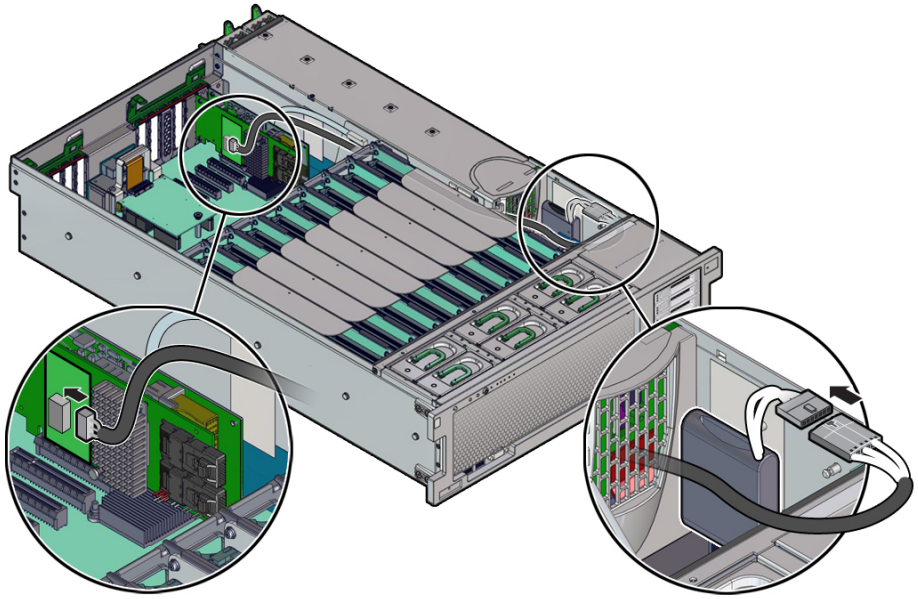

b. **Once the ESM cable is clear of the air divider clip, gently pry the air divider cable shield [A in the figure above] away from the power supply just enough to allow you to slide out the ESM cable.**
The ESM cable needs to be completely free of the air divider.

4. **Carefully thread the end of ESM cable you detached from the HBA through the narrow space between the P0 heat sink and the power supply cage, and up and out of the system.**

5. **To install the replacement cable, carefully thread the to-HBA end of the cable through the narrow space between the P0 heat sink and the power supply cage.**

6. **Attach the ESM cable to both the HBA card in PCIe slot 2 and the ESM module located in the disk backplane area.**

**Note -** Any excess cable length should be in the PCIe card area to allow better air flow through the disk backplane area.



7. **Prepare the server for operation.**

   See “Prepare the Server for Operation” on page 259.

# Servicing the Factory Installed PCIe NVMe Switch Card

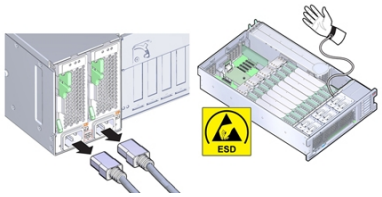
This section provides procedures replacing the NVMe Switch card and cables.

For overview information on the factory installed PCIe NVMe Switch card, see “Storage Subsystem” on page 30. For serviceability information related to this component, see “Component Serviceability, Locations, and Designations” on page 69.

- “Replace the NVMe Switch Card (FRU)” on page 213
- “Replace the NVMe Switch Card Cables (FRU)” on page 215

# ▼ Replace the NVMe Switch Card (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.



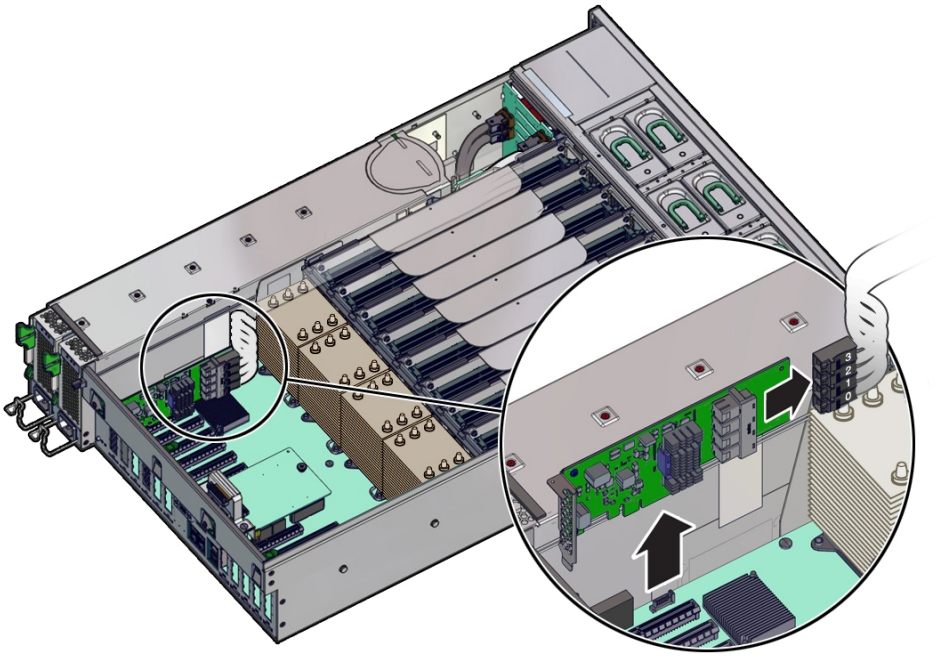

1. **Prepare the server for service.**

   See “Prepare the Server for Cold Service” on page 94.

2. **Remove the NVMe Switch card from PCIe slot 1 slot and disconnect cables attached to it.**

   Removing the card from the slot allows easy access to the connected cables. For details on removing a card, see “Remove a PCIe Card” on page 161.

The NVMe card has four cables (0 through 3) that need to be disconnected.

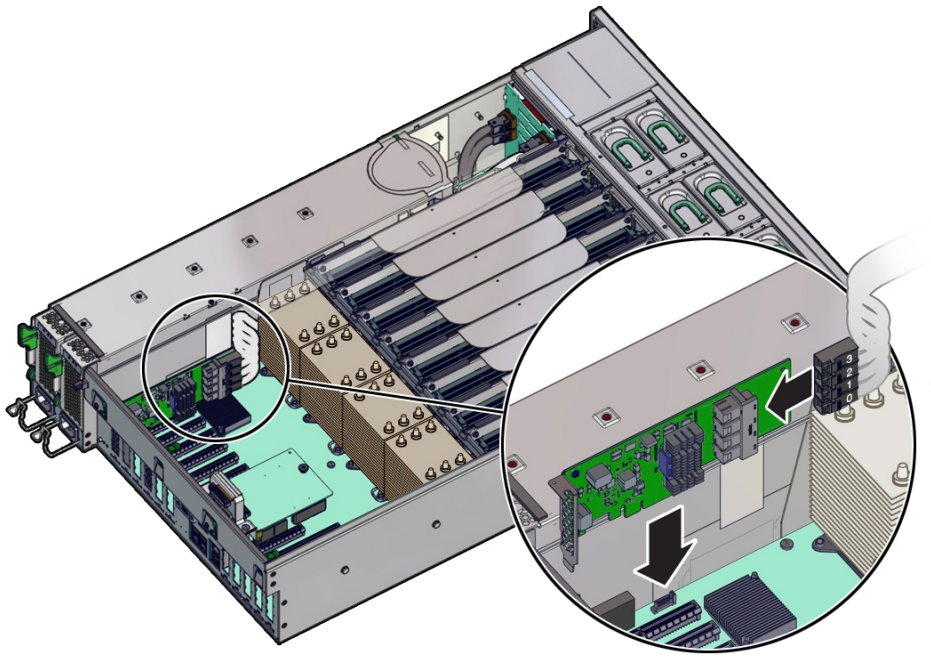



3. **To install the replacement card, connect the cables to the replacement NVMe Switch card and install the card in PCIe slot 1.**

   The NVMe Switch card has four cables (0 through 3) that need to be connected before installing the card in the slot.

   For details on installing a card, see "Install a PCIe Card" on page 164.

**Note -** The NVMe Switch card only works in PCIe slot 1.

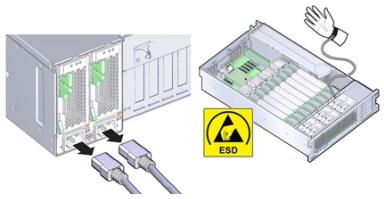


4. **Prepare the server for operation.**

   See “Prepare the Server for Operation” on page 259.

# ▼ Replace the NVMe Switch Card Cables (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.




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

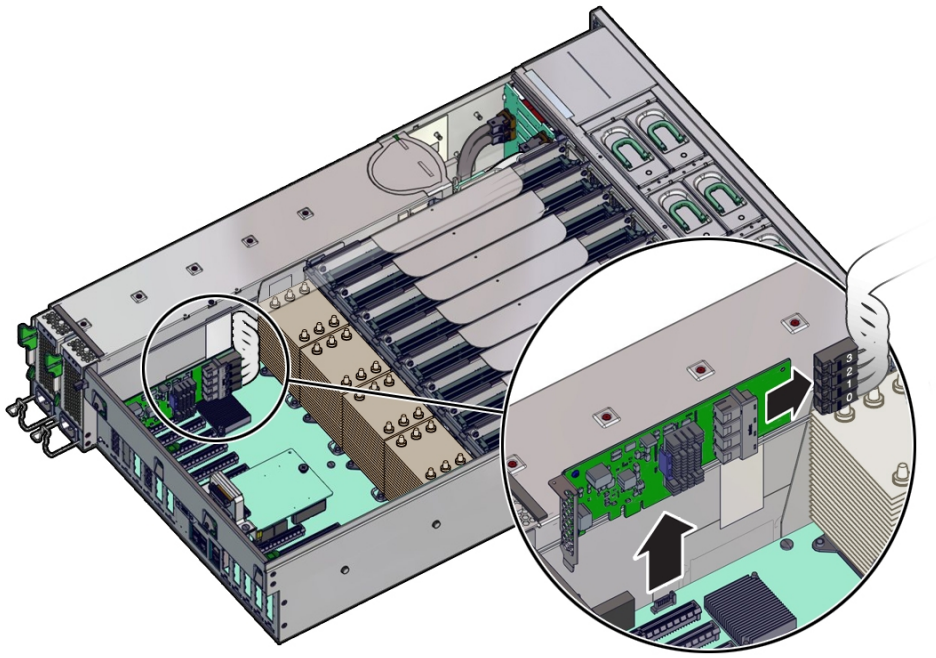
   See “Prepare the Server for Cold Service” on page 94.

2. **Remove the P0 MR0/MR1 memory risers.**

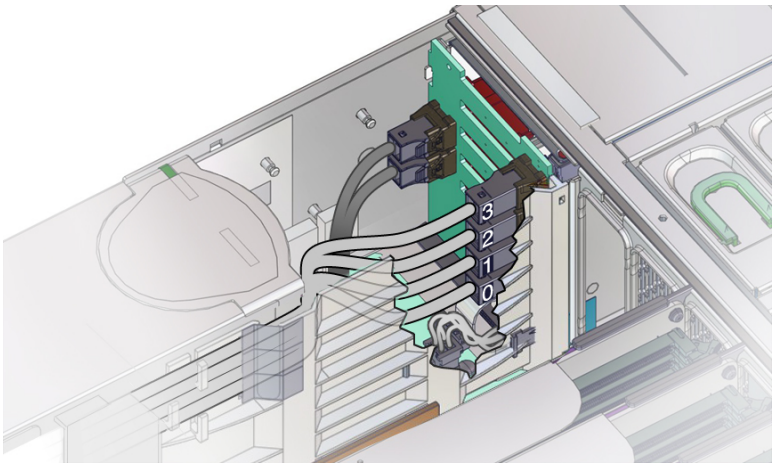
   This gives you room to access the cables for removal. See “Remove a Memory Riser Card” on page 145.

3. **Disconnect the four NVME cables (0 through 3) from the switch card in PCIe slot 1.**

If needed, first remove the NVMe Switch card from its PCIe slot to gain better access to the cable connectors.



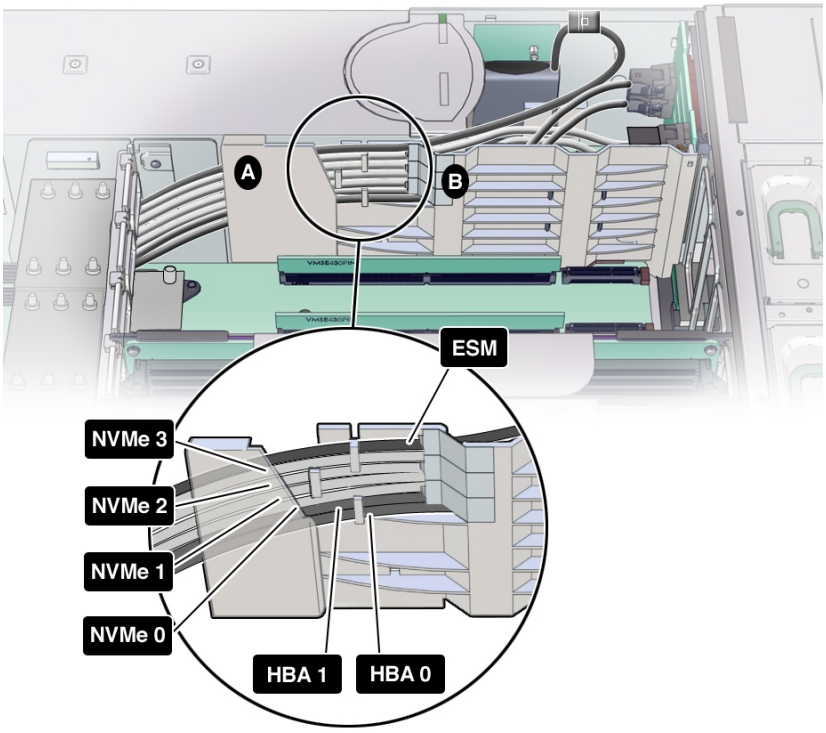
4. **Disconnect the four NVMe cables (0 through 3) from the disk backplane board.**




5. **Remove the NVMe cables from the air divider, as follows.**

   a. **Detach the NVMe, HBA, and ESM cables from the three cable clips on the memory riser side of the air divider. Then, carefully lift the cables up and out of the cable slot [B] in the air divider that provides access to the disk backplane area.**

There are three clips, NVMe cables attached to each.




b. **Once the NVMe cables are clear of the air divider clips, gently pry the air divider cable shield [A in the figure above] away from the power supply just enough to allow you to slide out the NVMe cables.**

   The NVMe cables need to be completely free of the air divider.

6. **Carefully thread the ends of NVMe cables you detached from the NVMe Switch card through the narrow space between the P0 heat sink and the power supply cage and up and out of the system.**

   The space between the P0 heat sink and the power supply cage is narrow, the NVMe cable connectors will only fit through one way.

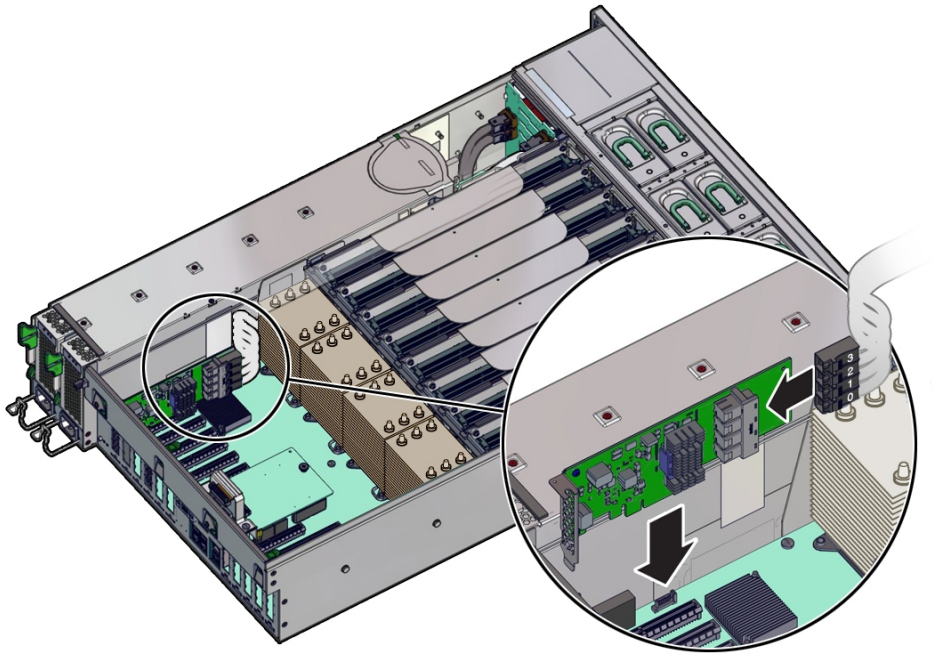
**Caution -** Hardware damage. Try not to allow the SAS and NVMe (if installed) cables to rub against the CPU0 heatsink radiator fins. They are sharp and can damage the cable insulation.

7. **To install the replacement cables, carefully thread the NVMe Switch card end of the cables through the narrow space between the P0 heat sink and the power supply cage.**

8. **Reconnect the NVMe cables to the NVMe Switch card.**

   If needed, reinstall the NVMe Switch card in PCIe slot 1 if you removed it earlier.

   **Note -** The NVMe Switch card only works in PCIe slot 1.




9. **Reroute the NVMe cables through the air divider to the disk backplane area.**

   Refer to the figure in step 5 for cable routing.

10. **Reconnect the NVMe cables to their connectors on the disk backplane.**

Refer to the figure in step 4 to determine proper connections.

**Note -** Any excess cable length should be in the PCIe card area to allow better air flow through the disk backplane area.

11. **Reinstall the P0 MR0/MR1 memory risers you removed earlier.**

    See “Install a Memory Riser Card” on page 152.

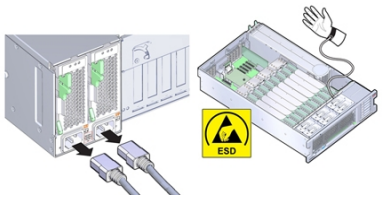
12. **Prepare the server for operation.**

    See “Prepare the Server for Operation” on page 259.

# ▼ Replace the Fan Board (FRU)

This section provides instructions for replacing the fan board.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin** For serviceability considerations, see “Component Serviceability” on page 70.

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

   See “Prepare the Server for Cold Service” on page 94.

2. **Remove all fan modules.**

   See “Remove a Fan Module” on page 130.

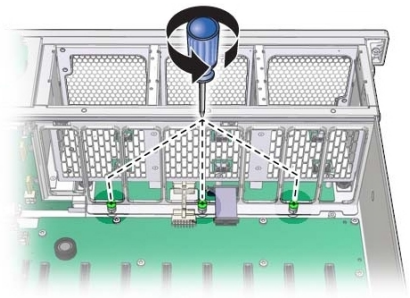
3. **Remove all memory risers.**

   See “Remove a Memory Riser Card” on page 145.

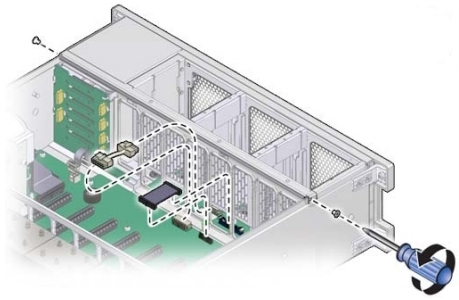
4. **Disconnect any cables plugged into the USB or video connectors on the front of the server.**

5. **Remove the fan board:**

   a. **Loosen the three captive screws connecting the front-side memory riser guide to the motherboard.**

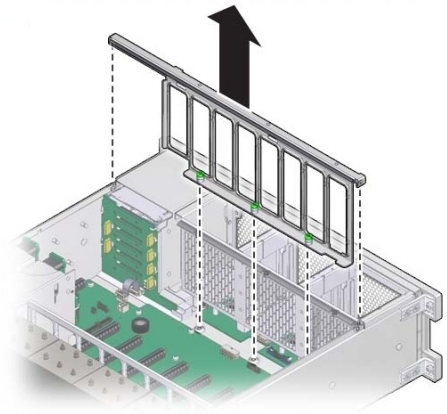


   b. **Remove the two screws on each side of the outside of the chassis that hold the fan board unit in place.**

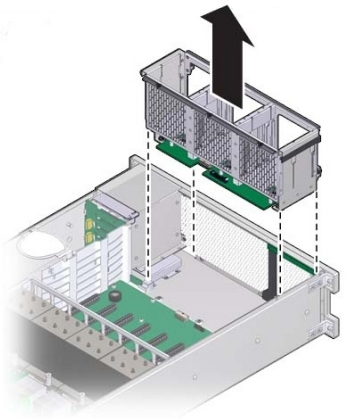


   c. **Unplug the fan board data and power cables from motherboard.**

d. **Remove the front memory riser guide by pulling it up and out of the chassis.**



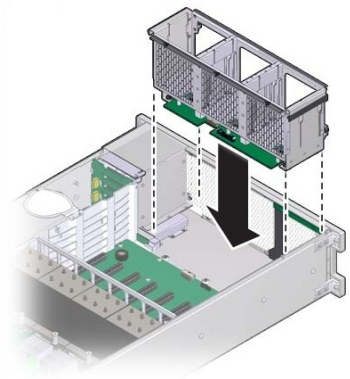
e. **To remove the fan board unit, slide it away from the front of the server to clear the lip at the front of the chassis, and lift it out of the server.**



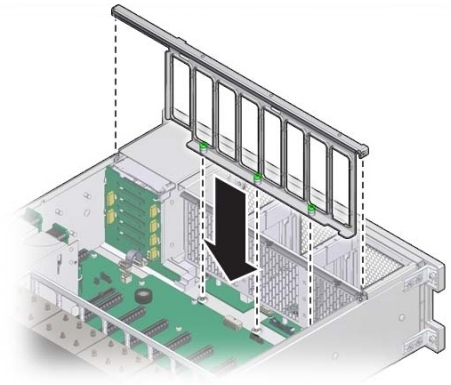
6. **Remove the fan board data and power cables from the faulty fan board unit and plug them into the fan board on the replacement fan board unit.**

7. **To install the fan board unit:**

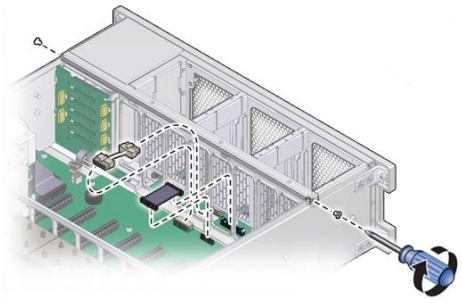
**a. Insert the fan board unit into the chassis, moving it down and toward the front.**



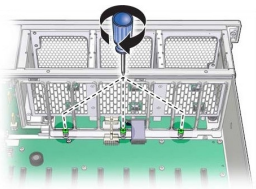
**b. Reposition the front memory riser guide, routing the fan board and power cable through the riser guide.**



c. **Connect the fan board data and power cables into the connectors on the motherboard and partially tighten the two screws that secure the riser guide to the chassis.**



d. **Tighten the three captive screws to hold the front memory riser guide in place.**



e. **To secure the fan board unit in place, fully tighten the two screws that secure the riser guide to the chassis.**

8. **Install the fan modules.**

   See “Install a Fan Module” on page 133.

9. **Install the memory risers.**

   See “Install a Memory Riser Card” on page 152.

10. **Prepare the server for operation.**

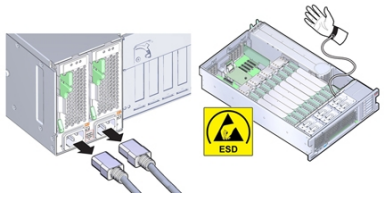
    See “Prepare the Server for Operation” on page 259.

**Note -** The product serial number used for service entitlement and warranty coverage might need to be reprogrammed by authorized service personnel with the correct product serial number.

# ▼ Replace the Power Supply Backplane Board (FRU)

This section provides instructions for replacing the power supply backplane board.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Caution -** Hazardous voltage. The system supplies power to the power board even when the server is in standby power mode. Disconnect power cords before servicing the power supply backplane board.

**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.

1. **Prepare the server for service.**
   See “Prepare the Server for Cold Service” on page 94.
2. **Disconnect the SAS/SATA cables and the NVMe cables (if installed) from the disk drive backplane and their PCIe card connections.**
   See “Replace the NVMe Switch Card Cables (FRU)” on page 215 and “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204.
3. **Disconnect the ESM cable from the ESM module and its connection on the HBA.**
   See “Replace the SAS 12 Gb/s Internal HBA ESM Cable (FRU)” on page 209.
4. **Remove all PCIe cards from the server, disconnecting any external or internal cables and taking care to note their slot assignments.**

See “Remove a PCIe Card” on page 161.

Make a note of where each PCIe card installed so they can be put back in the same slots. The internal SAS/SATA cables and NVMe cables do not need to be removed, but must be out of the way as the motherboard needs to be removed.

5. **If the server has only two CPUs, remove the air baffle.**

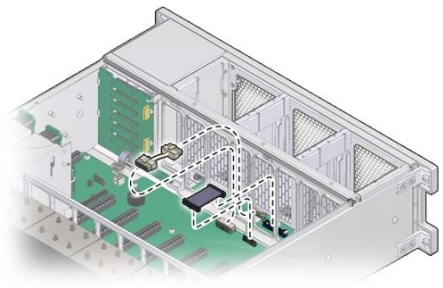
   The air baffle simply lifts straight up and out of the system. It is not attached to anything.

6. **Remove all memory riser cards.**

   See “Remove a Memory Riser Card” on page 145.

7. **Disconnect the fan board power and data cables from motherboard.**

   These cables do not need to be removed from the system and can remain plugged into the fan board. However, care must be taken not to damage these cables when removing or inserting the motherboard.



8. **To disconnect the power supplies from the backplane connectors, remove or pull both power supplies at least part way out of the chassis.**

   See “Remove a Power Supply” on page 137.

9. **Move the air divider.**

   The air divider separates the disk drive backplane area from the rest of the chassis and includes the system Fault Remind button mechanism. It must be moved to allow access to the power supply backplane board and allow removal of the motherboard. The air divider is mounted to the power supply side wall using two tabs that are inserted into slots in the side wall. For this procedure, you can leave the cables attached to the air divider.

**Caution -** Hardware damage. Try not to allow the SAS and NVMe (if installed) cables to rub against the CPU0 heatsink radiator fins. They are sharp and can damage the cable insulation.

a. **Lift the air divider so the tabs clear the slots in the power supply side wall.**

   You might need to create cable slack where the SAS and NVMe (if installed) cables route through from the PCIe area. Doing this enables the air divider to move more easily. Carefully arrange the cables in the PCIe area to ensure they can move easily in the gap between the power supply side wall and CPU0 without hanging on the CPU0 heatsink radiator fins.

b. **Move the air divider away from the side wall and gently rotate the divider and the cables attached to it away from the backplane area and set it down on the motherboard in the empty memory riser area.**

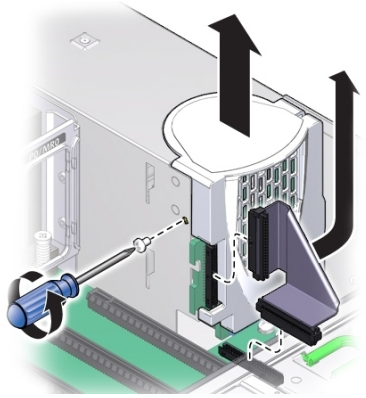
10. **Disconnect the disk drive backplane power and data cables from the disk drive backplane.**

    See “Replace the Disk Drive Backplane (FRU)” on page 238.

11. **Remove the ribbon cable connecting the power supply backplane to the motherboard.**

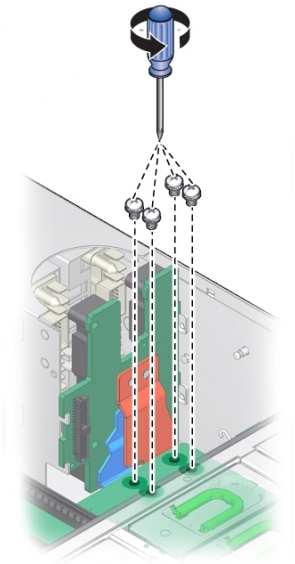
    See the illustration in step 8.

12. **Remove the screw holding the power supply cover in place and remove the power supply cover.**



13. **Remove the four screws securing the backplane bus bar to the motherboard.**

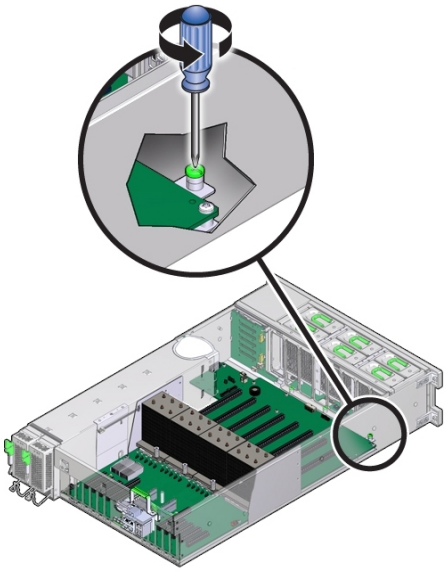
    The backplane board rests on the two support flanges.



14. **Disconnect the two power supply cables from the back of the power supply backplane board.**

15. **Loosen the green captive screw that secures the motherboard to the chassis.**

The screw is located at the left front corner of the motherboard behind FM3.



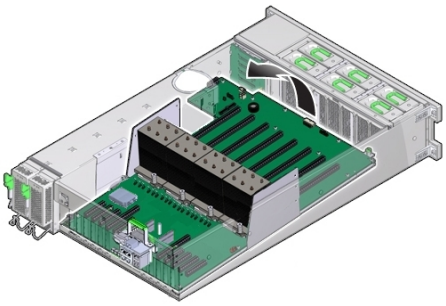
16. **To unlock the motherboard, use the memory riser card guide by the processors and the handle above the SP card slot to slide the motherboard toward the front of the server.**

    This action unlocks the motherboard and plate assembly.

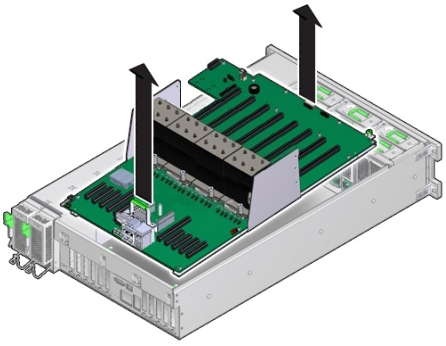
    **Note -** As you slide the motherboard forward, check that the Locator indicator light pipe extension piece slides out of its hole in the chassis back wall.

17. **While gently sliding it away from the back of the server, carefully lift the front end of the motherboard several inches.**

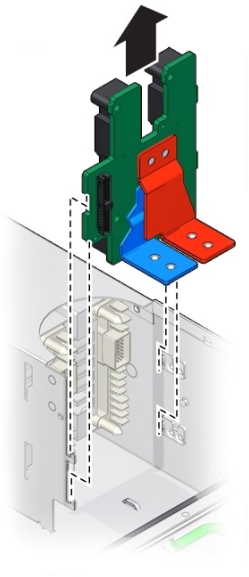
**Note -** If Locator indicator light pipe extension detaches during removal, ensure that you retrieve it from the server. The extension is a clear plastic piece that transmits light and allows you to activate the Locator indicator switch from the back of the server.



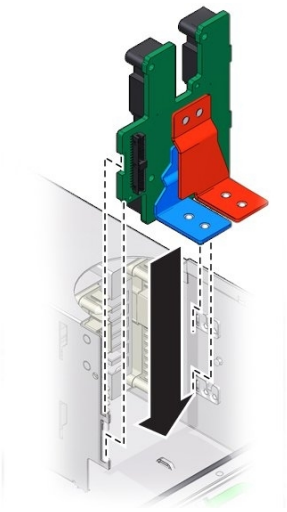
18. **To remove the motherboard, slowly guide it up and out of the server.**



19. **Lift the power supply backplane board off the support flanges and out of the chassis.**



20. **Insert the replacement power supply backplane board into the server. The tabs on the power board must slide onto the flanges on the power supply cage.**

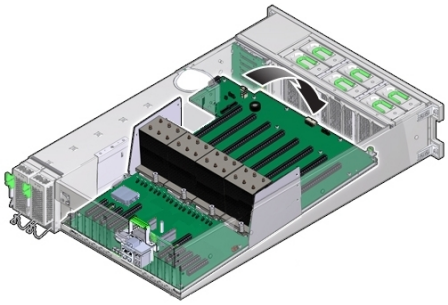


21. **Connect the two power supply cables to the connectors on the back side of the power supply backplane board.**

22. **Lower the motherboard into the server and guide the light pipe extension piece for the Locator indicator at the back of the motherboard into its hole on the server back wall.**

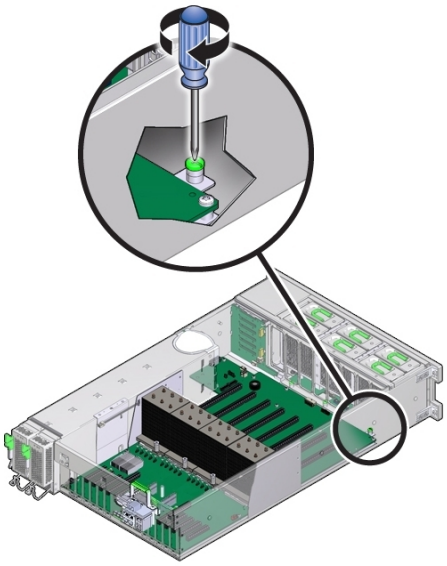
    This should also align the bus bar holes on the motherboard to the power supply backplane bus bar connector holes.

**Note -** Ensure that the red and blue bus bar connectors are under the motherboard bus bar connection pads.

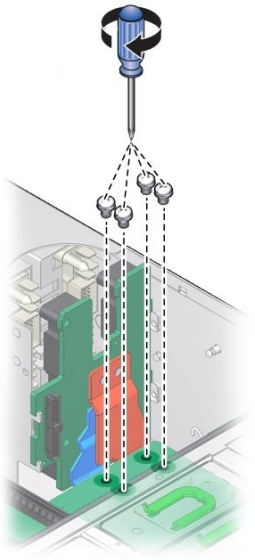


23. **Ensure that the Locator indicator switch at the back of the server operates easily and is not stuck in the depressed position.**

24. **To secure the motherboard to the chassis, tighten the captive screw.**

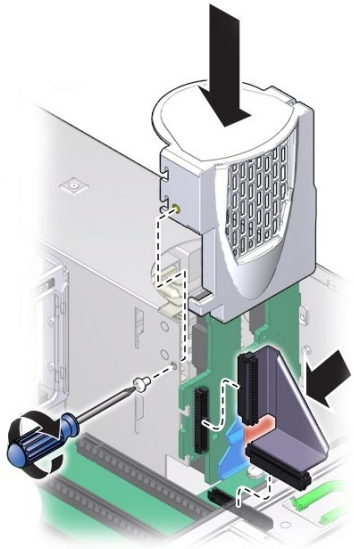


25. **Use the four screws to secure the bus bar to the motherboard.**



26. **Replace the power supply cover and connect the ribbon cable from the motherboard to the power supply backplane.**

The power supply backplane cover is secured with a screw.



27. **Connect the data and power cables from the fan board to the motherboard.**

28. **Connect the disk drive backplane power cable and ribbon data cable.**

29. **To install the air divider:**

**Note -** The air divider contains the Fault Remind button mechanism. To ensure that the mechanism can engage the motherboard-mounted switch, the divider *must* be installed correctly.

a. **Gently rotate the air divider and cables from where you set it down in step 9 back to its proper position.**

   Ensure that all cables lay flat against the power supply side wall and do not cross over each other. Do not allow the cables to interfere with the Fault Remind button mechanism (button extension or light pipe).

**Caution -** Hardware damage. Try not to rub the cables against the CPU0 heatsink radiator fins. They are sharp and can damage the cable insulation.

b. **Align the two tabs on the divider with the two slots in the power supply side wall.**

c. **Push the tabs into the slots so that the air divider is flush with the power supply side wall.**

d. **Then, slide the air divider downward to lock the tabs in the slots and secure it against the wall.**

   To ensure proper alignment of the Fault Remind switch, both tabs *must* be engaged with their slots.

30. **Reconnect the SAS cables and NVMe cables (if installed) to the disk backplane.**

    See “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204 and “Replace the NVMe Switch Card Cables (FRU)” on page 215.

31. **Reconnect the ESM cable to the ESM.**

    See “Replace the SAS 12 Gb/s Internal HBA ESM Cable (FRU)” on page 209.

    Or, if you removed the ESM, reattach it to the dual lock strip on the chassis.

32. **Reinstall the memory risers.**

    See “Install a Memory Riser Card” on page 152.

33. **For a two-CPU system, install the air baffle.**

    The air baffle simply drops into place using existing memory riser guides.

34. **Install all PCIe cards.**

    See “Install a PCIe Card” on page 164.

---

**Note -** When reinstalling the HBA card and NVMe switch card (if installed), it might be easier to reconnect the SAS/SATA and NVMe cables before installing the cards their PCIe slots.

---

35. **Install the power supplies.**

    See “Install a Power Supply” on page 138.

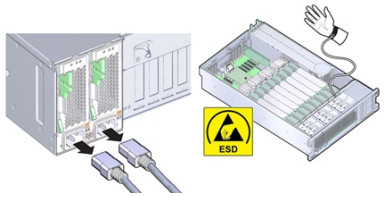
36. **Prepare the server for operation.**

    See “Prepare the Server for Operation” on page 259.

# Replace the Disk Drive Backplane (FRU)

This section provides instructions for replacing the disk drive backplane.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin**

- For serviceability considerations, see “Component Serviceability” on page 70.

1. **Prepare the server for service.**
   See “Prepare the Server for Cold Service” on page 94.

2. **Remove and label all disk drives and fillers.**
   See “Remove a Storage Drive (CRU)” on page 115.
   To ensure that the drives are returned to their slots, label the drives with their slot position.

3. **Remove the DVD drive.**
   See “Remove the DVD Drive or DVD Drive Filler Panel” on page 168.

4. **Disconnect the SAS/SATA cables and any NVMe cables (if present) from the disk backplane.**
   See “Replace the NVMe Switch Card Cables (FRU)” on page 215 and “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204.
   This will help provide the room needed to remove the disk backplane and its cables.
   You do not need to remove the cables from the HBA or NVMe boards.

5. **Disconnect the ESM cable from the ESM module.**
   See “Replace the SAS 12 Gb/s Internal HBA ESM Cable (FRU)” on page 209.
   Or, simply remove the ESM module from its dual lock strip on the chassis.

6. **Move the air divider.**

You need to move the air divider so you can access the disk drive backplane board. The divider is mounted to the power supply side wall using two tabs that are inserted into slots in the side wall.

a. **Lift the air divider so the tabs clear the slots in the power supply side wall.**

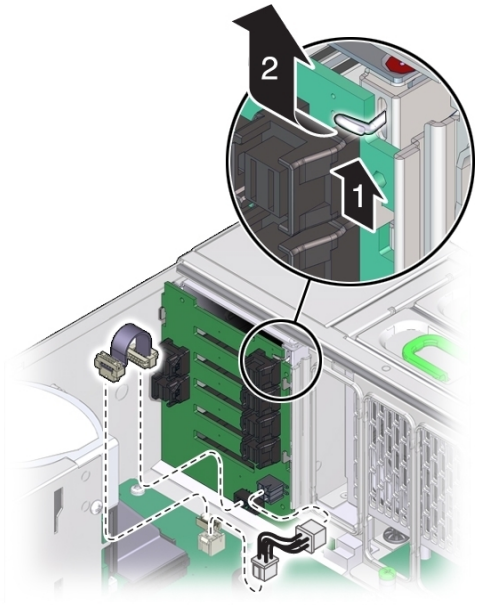
b. **Move the air divider away from the side wall and gently rotate the divider and the cables attached to it away from the backplane area and set it on top of installed memory risers.**

7. **Disconnect the ribbon data cable and the power cable at the bottom of the disk backplane board.**

   See the illustration shown in step 8.

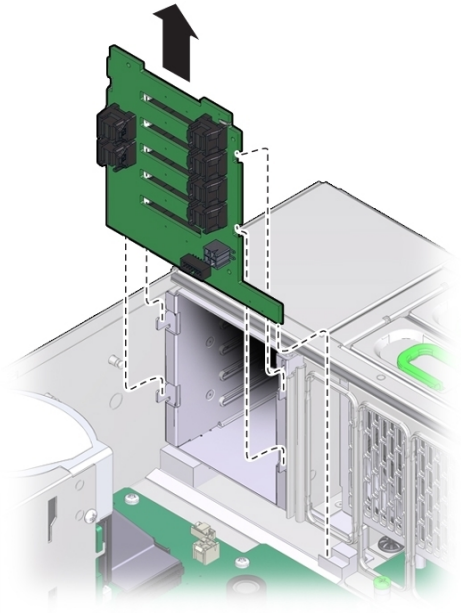
8. **To release the spring-loaded lever [1], lift it upward [2].**

   The disk drive backplane sets on metal flanges and is secured by a spring-loaded lever.




9. **To remove the disk drive backplane, lift it, so it clears the support flanges, and remove it from the server.**

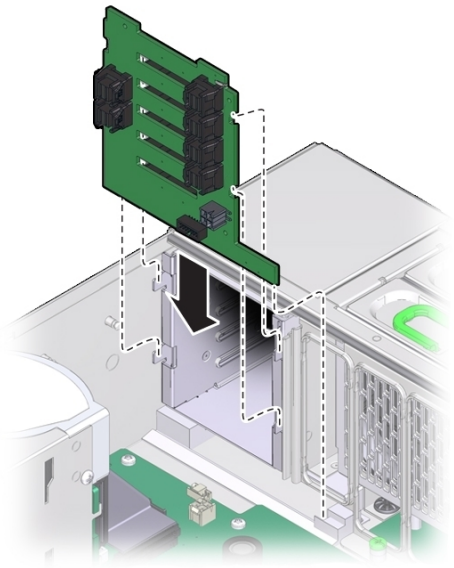
You might need to tilt the board slightly while removing it to slide the DVD connector out from under the disk drive mounting cage.



10. **Orient the replacement disk drive backplane board in the chassis.**

11. **Tilt the backplane board and insert its bottom edge in the plastic slot at the bottom of the server.**

The DVD connector on the bottom of the back side of the board needs to be positioned under the disk drive mounting cage.

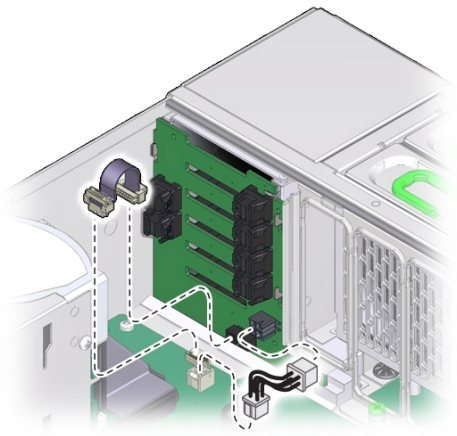


12. **Lift the spring-loaded metal hook and tilt the backplane board to its upright position.**

13. **Set the board on its support flanges.**

14. **To secure the board, release the metal hook.**

15. **Reconnect the ribbon data cable and power cable to the bottom of the disk backplane board.**



16. **To install the air divider:**

---

**Note -** The air divider contains the Fault Remind button mechanism. To ensure that the mechanism can engage the motherboard-mounted switch, the divider *must* be installed correctly.

---

a. **Gently rotate the air divider and cables from where you set it down in step 6 back to its proper position.**

   Ensure that all cables lay flat against the power supply side wall and do not cross over each other. Do not allow the cables to interfere with the Fault Remind button mechanism (button extension or light pipe).

b. **Align the two tabs on the divider with the two slots in the power supply side wall.**

c. **Push the tabs into the slots so that the air divider is flush with the power supply side wall.**

d. **Then, slide the divider downward to lock the tabs in the slots and secure it against the wall.**

   To ensure proper alignment of the Fault Remind switch, both tabs *must* be engaged with their slots.

17. **Reconnect the SAS and any NVMe cables to the disk backplane.**

    See “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204 and “Replace the NVMe Switch Card Cables (FRU)” on page 215.

18. **Reconnect the ESM cable to the ESM.**

    See “Replace the SAS 12 Gb/s Internal HBA ESM Cable (FRU)” on page 209.

    Or, if you removed the ESM, reattach it to the dual lock strip on the chassis.

19. **Install all disk drives and filler panels.**

    See “Install a Storage Drive (CRU)” on page 118.

20. **Install the DVD drive.**

    See “Install the DVD Drive or DVD Drive Filler Panel” on page 170.

21. **Prepare the server for operation.**

    See “Prepare the Server for Operation” on page 259.

**Note -** The product serial number used for service entitlement and warranty coverage might need to be reprogrammed by authorized service personnel with the correct product serial number.

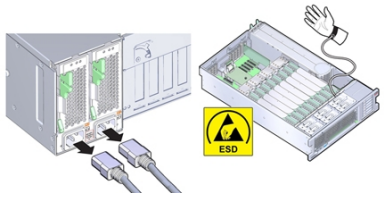
# Servicing the SP Card (FRU)

This section provices procedures for removing and installing the motherboard-mounted service processor (SP) card.

The replaceable SP card contains the embedded server management software, Oracle ILOM.

# ▼ Remove the SP Card (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin**

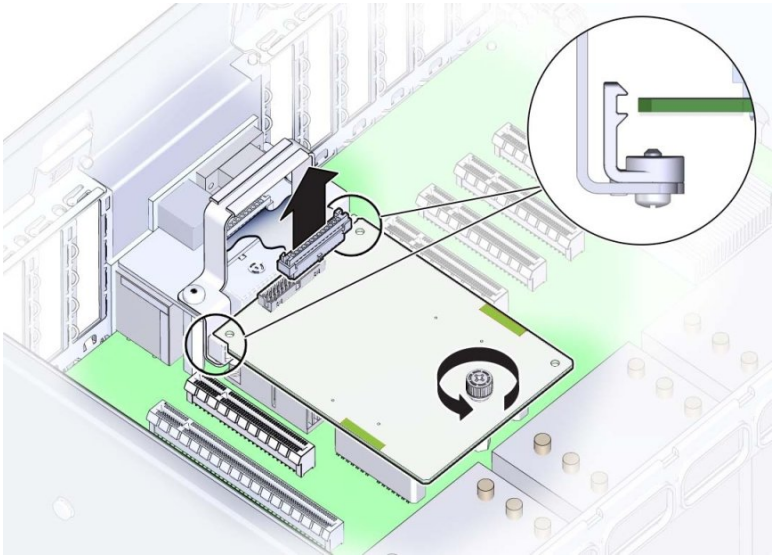
- For serviceability considerations, see “Component Serviceability” on page 70.

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

   See “Prepare the Server for Cold Service” on page 94.

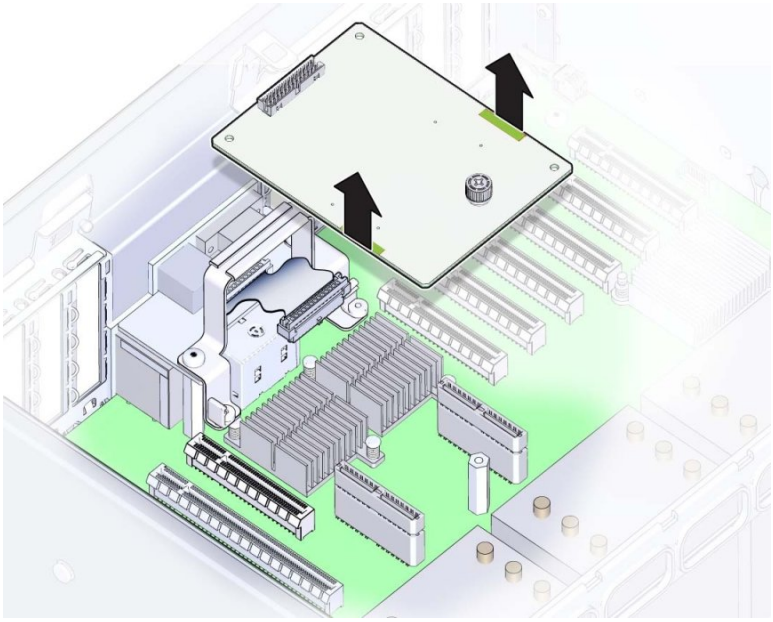
2. **Disconnect the SP card cable.**

   The SP card is mounted on the motherboard between the two groups of PCIe slots.



3. **Completely loosen the green captive screw on the top of the SP card.**

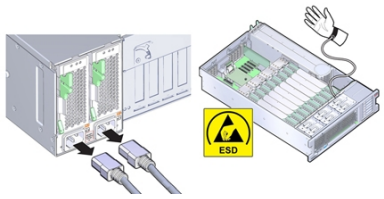
4. **To remove the SP card, disconnect it by pulling it upward and then lift it out of the server.**



**Next Steps** “Install the SP Card (FRU)” on page 245

# ▼ Install the SP Card (FRU)

When servicing the components in this section, unplug the AC power cords and use ESD protection.




**Before You Begin**

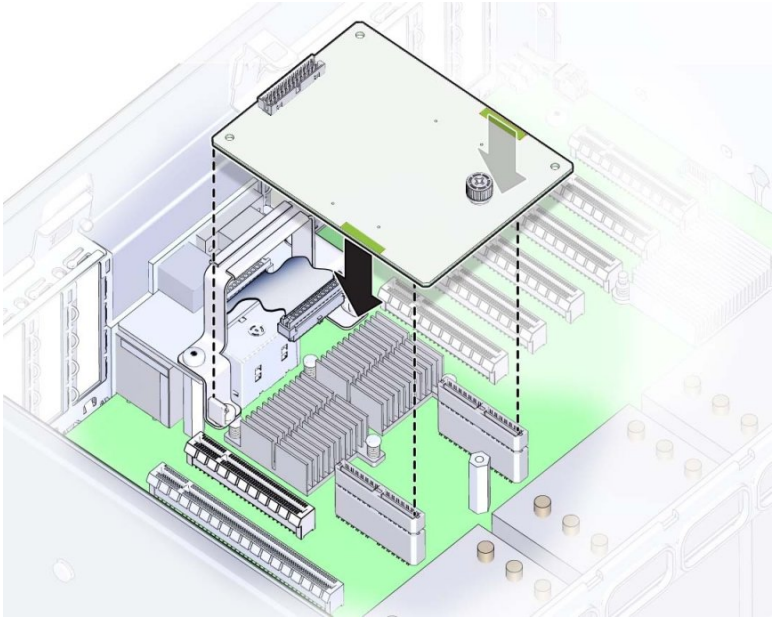
- For serviceability considerations, see "Component Serviceability" on page 70.

1. **Position the SP card with the two motherboard connectors facing downward.**

   The green captive screw head faces upward.

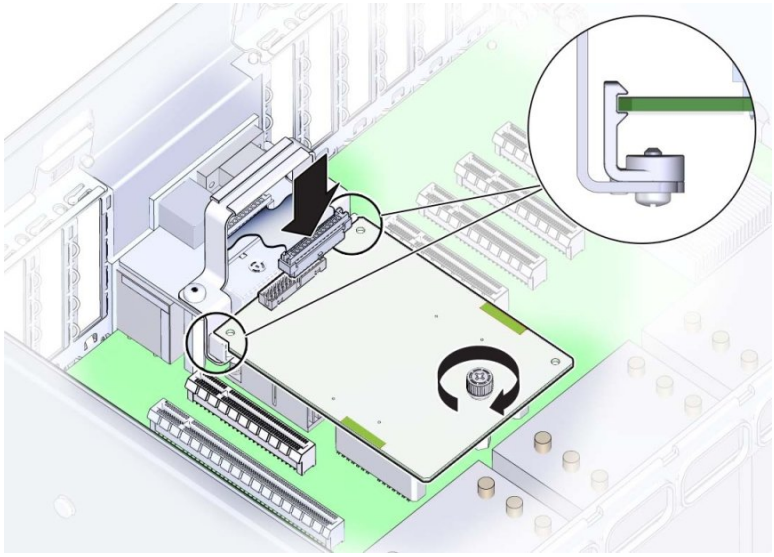
2. **Align the connectors on the bottom of the SP card with the connectors on the motherboard.**

   Use the screw hole and card mounting bracket to assist with the alignment. When correctly positioned, the mounting bracket cradles the edges of the card.



3. **To engage the two connectors, gently push the card downward at the two green pressure points on the edges of the card.**

4. **Connect the SP card cable to the connector on the SP Card.**



5. **To secure the card, tighten the green captive screw.**

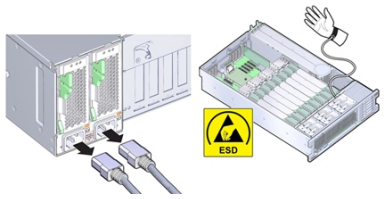
6. **Prepare the server for operation.**

   See “Prepare the Server for Operation” on page 259.

# ▼ Replace the Motherboard (FRU)

This section provides instructions for replacing the server motherboard.

When servicing the components in this section, unplug the AC power cords and use ESD protection.




To replace the motherboard, remove and retain internal motherboard-mounted components.

**Before You Begin**

- For serviceability considerations, see "Component Serviceability" on page 70.
- To complete this procedure, you need:
  - Alcohol wipes
  - Thermal compound

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

   See "Prepare the Server for Cold Service" on page 94.

2. **Remove the SP card.**

   See "Remove the SP Card (FRU)" on page 244.

3. **Remove all PCIe cards from the server, disconnecting any external or internal cables and taking care to note their cable arrangement and slot assignments.**

   See "Remove a PCIe Card" on page 161.

   The slot population on the replacement motherboard needs to match the population on the failed board.

4. **If the server has only two CPUs, remove the air baffle.**

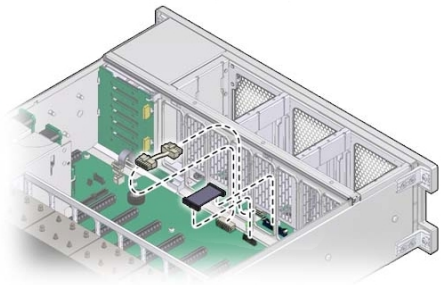
   The air baffle simply lifts straight up and out of the system. It is not attached to anything.

5. **Remove all memory riser cards.**

   See "Remove a Memory Riser Card" on page 145.

6. **Disconnect the fan board power and data cables from motherboard.**

These cables do not need to be removed from the system and can remain plugged into the fan board. However, care must be taken not to damage these cables when removing or inserting the motherboard.



7. **Disconnect the SAS/SATA cables and any NVMe cables (if present) from the disk backplane.**

   See “Replace the NVMe Switch Card Cables (FRU)” on page 215 and “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204.

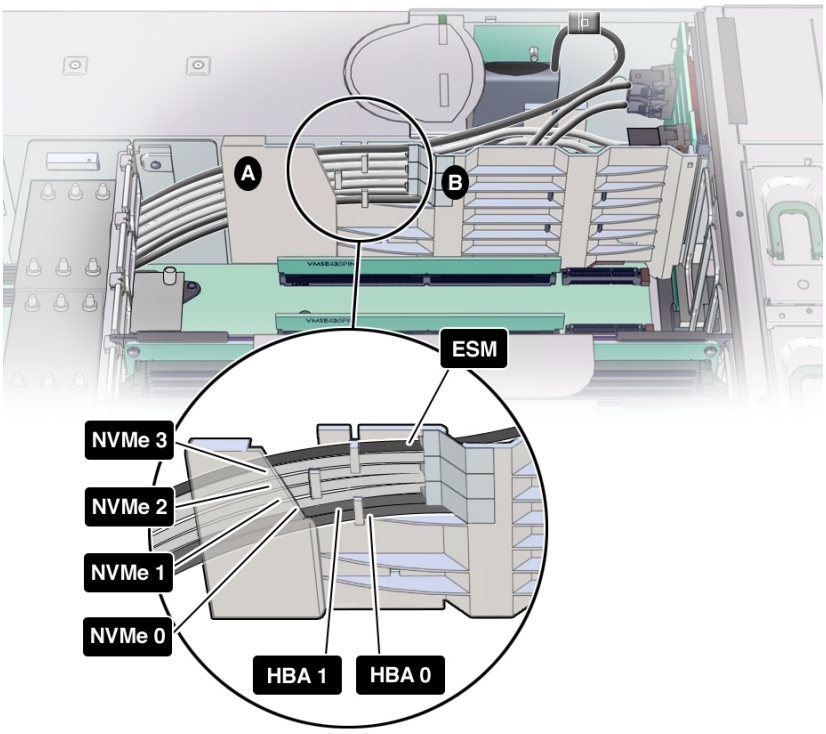
8. **Remove the ESM module from its dual lock strip on the chassis.**

   See “Replace the SAS 12 Gb/s Internal HBA ESM Module (FRU)” on page 203.

9. **Remove the air divider.**

   The divider is mounted to the power supply side wall using two tabs, which are inserted into slots in the side wall.

a. **Lift the disconnected cables (SAS, NVMe, ESM) out of the slot in the air divider [B in the illustration below] that routes them into the disk backplane area.**




b. **Then slid each cable up and out of the three air divider cable clips so that they are loose, and gently place them on the memory riser side of the air divider.**

c. **Slide the air divider upwards so its tabs clear the slots in the power supply side wall.**

d. **Lift the air divider out of the system, leaving the cables (SAS, NVMe, ESM).**

10. **To remove the SAS, NVMe (if present), and ESM cables from the system, carefully thread each one between the CPU 0 heatsink and the power supply side wall, and out towards the front of the system.**

    Some of the cable connectors only fit one way between the CPU 0 heat sink and power supply side wall as the space is very narrow.

11. **Remove the data and power cables for the disk backplane.**

    See “Replace the Disk Drive Backplane (FRU)” on page 238.

12. **Remove the power supply cable from the motherboard.**

    Connected to the motherboard from the power supply backplane.

13. **Remove any USB flash drives attached to the internal USB ports.**

    Make note of the ports for each USB flash drive.

14. **Remove the heatsinks and CPUs from the motherboard.**

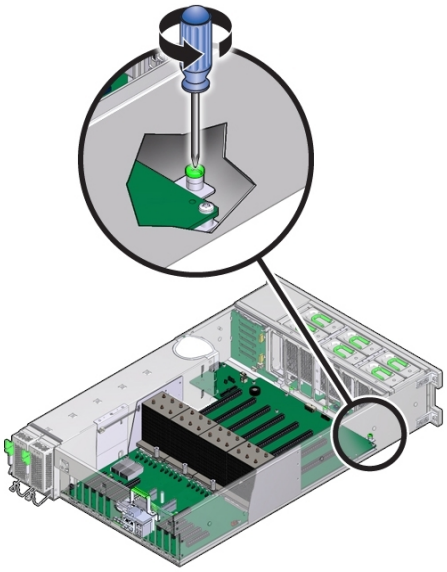
    See “Remove a Heatsink and CPU (FRU)” on page 186.

15. **Remove the system battery.**

    See “Replace the System Battery (CRU)” on page 172.

16. **Loosen the green captive screw that secures the motherboard to the chassis.**

The screw is located at the left front corner of the motherboard behind FM3.



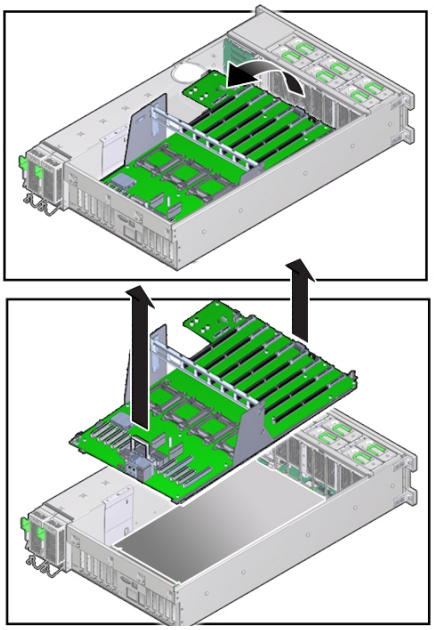
17. **Ensure there are no cables left attached to the motherboard, and that there are no cables draped inside of the chassis that might be in the way of removing the motherboard.**

18. **Holding the metal memory riser card guide (over the CPU sockets) and the metal handle above the SP card slot, slide the motherboard toward the front of the server. If extra force is required to break loose the fit around the motherboard rear connectors and the chassis, use the rear handle (by the SP connector) and not the memory riser guide, as it might bend.**

    The motherboard is mounted to a metal plate. The plate has eight keyed slots that align with eight mushroom head standoffs mounted to the bottom of the chassis. The standoffs lock the motherboard and plate assembly to the chassis. To unlock the assembly, you need to slide the assembly toward the front of the server.

19. **Once the motherboard has been slid forward as far as it will go, lift the front end of the motherboard while gently sliding it away from the back of the server, ensuring that the Locator indicator light pipe extension piece slides out of its hole at the back of the chassis.**

**Note -** If the Locator indicator light pipe extension detaches during removal, ensure that you retrieve it from the server. The extension is a clear plastic piece that transmits light and allows you to activate the Locator indicator switch from the back of the server. It is needed for the replacement motherboard.



20. **To remove the motherboard, slowly guide it up and out of the server.**

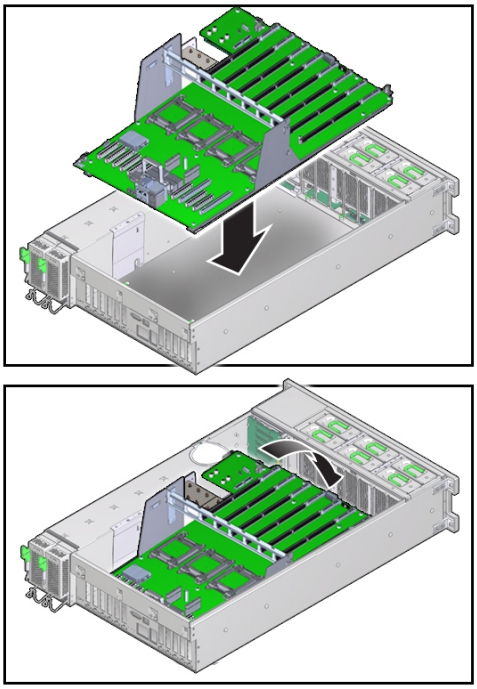
21. **Lift the replacement motherboard by the memory riser card guide and the handle above the SP card slot.**

**Note -** Ensure that the removable light pipe extension piece for the Locator indicator is attached to the indicator switch. The extension is a clear plastic piece that transmits light and allows you to activate the Locator switch from the back of the server.

22. **Align the motherboard over the server with the memory riser card slots toward the front.**

23. **Lower the motherboard into the server and carefully guide the light pipe extension piece for the Locator indicator at the back of the motherboard into its hole at the rear of the chassis.**

    Ensure that the switch operates easily and is not stuck in the depressed position.

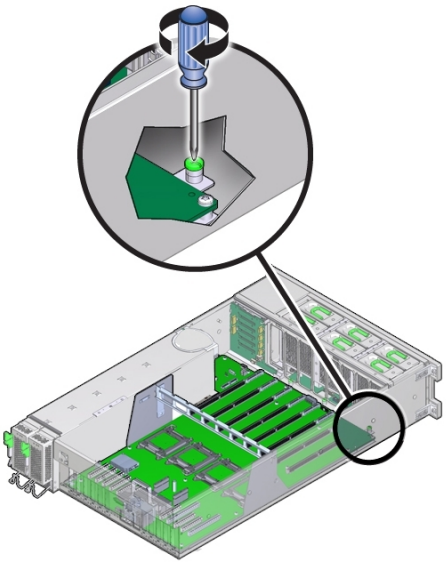


24. **Ensure that the keyed holes in the plate attached to the underside of the motherboard are aligned with the locking standoffs in the chassis.**

25. **Slide the motherboard toward the back of the server. Ensure that motherboard rear connectors fit completely into the holes provided in the chassis sheet metal.**

    This action locks the motherboard and aligns the captive screw on the motherboard plate (towards the front of the server) with its thread hole in the chassis.

26. **To secure the motherboard to the chassis, tighten the captive screw.**



27. **Remove the CPU cover plates from the relevant sockets.**
See “Remove a CPU Cover Plate (FRU)” on page 181.

28. **Reinstall the CPUs and heatsinks.**
See “Install a Heatsink and CPU (FRU)” on page 193.

29. **Reinstall the power supply cable to the motherboard.**
Connects to the motherboard from the power supply backplane.

30. **Reinstall the disk backplane power and data cables.**

31. **Reinstall any USB flash drives that were removed from the internal USB ports.**

32. **Reinstall the system battery.**

33. **Carefully thread the to-PCIe card end of each cable, SAS, NVMe (if present), and, ESM, between the CPU 0 heatsink and the power supply side wall and in to the PCIe area.**
Some of the cable connectors only fit one way between the CPU 0 heat sink and power supply side, as the space is very narrow.

**34. Reinstall the air divider.**

The divider is mounted to the power supply side wall using two tabs that are inserted into slots in the side wall.

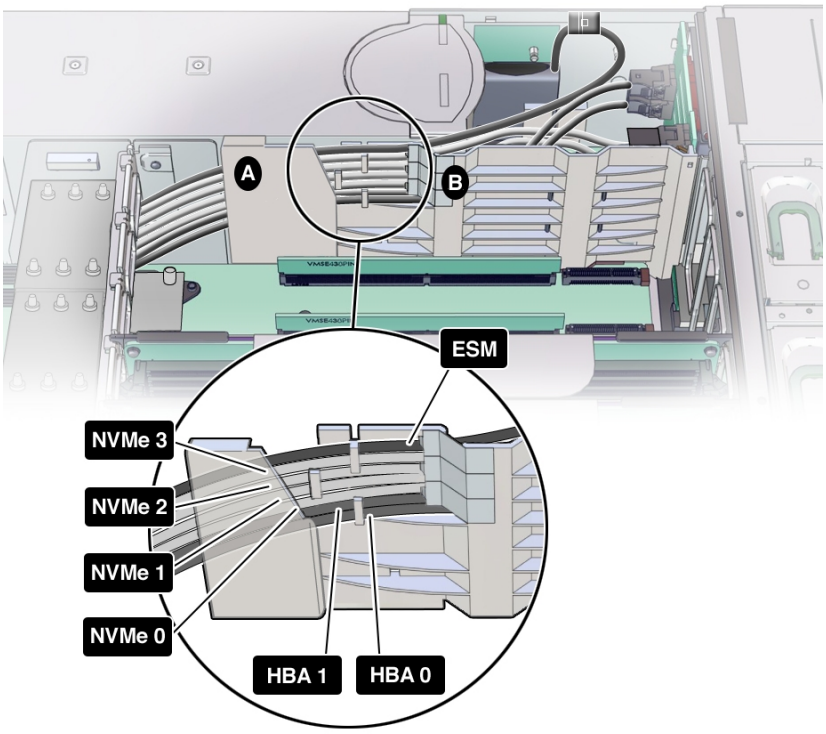
**a. Position the air divider so that its two tabs align with the two slots in the power supply side wall.**

**b. Slide the air divider downwards so its tabs fully engage with the slots in the power supply side wall.**

Ensure that the flanges on the divider enter their respective slots on the side wall and that the Fault Remind button extender is aligned with the button on the motherboard.

**c. Insert cables (SAS, NVMe, ESM) into the air divider cable shield by gently prying the shield [A in the illustration below] away from the power supply side wall enough to slide the cables inside one at a time; starting with SAS, then NVMe (if present), then ESM.**

Each cable should be flat against the power supply side wall and not crossing over any other cable. For the proper cable routing order, see the following illustration.




**d. Attach cables to the three air divider cable clips in the order shown in the illustration above.**

**e. Then, route the cables through the slot in the air divider [B in the illustration above] to the disk backplane area.**

**35. Reinstall the ESM module to its dual lock strip on the chassis.**

See “Replace the SAS 12 Gb/s Internal HBA ESM Module (FRU)” on page 203.

**36. Reconnect the SAS/SATA cables and any NVMe cables (if present) to the disk backplane.**

See “Replace the NVMe Switch Card Cables (FRU)” on page 215 and “Replace the SAS 12 Gb/s Internal HBA SAS Cables (FRU)” on page 204.

37. **To ensure proper cooling through the disk backplane area, slide excess cable length of the SAS, NVMe (if present) and ESM cables towards the PCIe card area.**

38. **Reconnect the fan board power and data cables to the motherboard.**

---

**Note -** If the fan board connectors are not reattached to the motherboard, there will be no front panel lights and the fans will not spin up at power on.

---

39. **Install all memory risers.**

See“Install a Memory Riser Card” on page 152.

40. **For a two-CPU system, install the air baffle.**

The air baffle is simply lowered into place on the motherboard utilizing available memory riser slot guides. It does not attach to anything.

41. **Install all PCIe cards.**

See “Install a PCIe Card” on page 164.

Reconnect internal SAS, NVMe (if present) and ESM cables, and external cables as applicable.

42. **Install the SP card.**

See “Install the SP Card (FRU)” on page 245.

43. **Prepare the server for operation.**

See “Prepare the Server for Operation” on page 259.

---

**Note -** The product serial number used for service entitlement and warranty coverage might need to be reprogrammed by authorized service personnel with the correct product serial number.

---

# Returning the Server to Operation

This section provices procedures for how to return the server to operation after performing service procedures.

| Description | Link |
|---|---|
| Procedure to prepare the server for service. | “Prepare the Server for Operation” on page 259 |
| Optional procedure to reinstall the server in the rack. | “(Optional) Install the Server Into the Rack” on page 262 |
| Optional procedure to reinstall CMA. | “(Optional) Install Cable Management Arm” on page 266 |
| Procedure to check the installation of the server in the rack. | “Verify Operation of Slide-Rails and CMA” on page 268 |
| Procedure to reposition the server in the rack. | “Return the Server to the Normal Rack Position” on page 270 |
| Procedure to power-on the server. | “Power On the Server” on page 271 |

## ▼ Prepare the Server for Operation

1. **Ensure that all components are completely installed.**

   Check for disconnected cables and unseated components and connect and install them correctly.

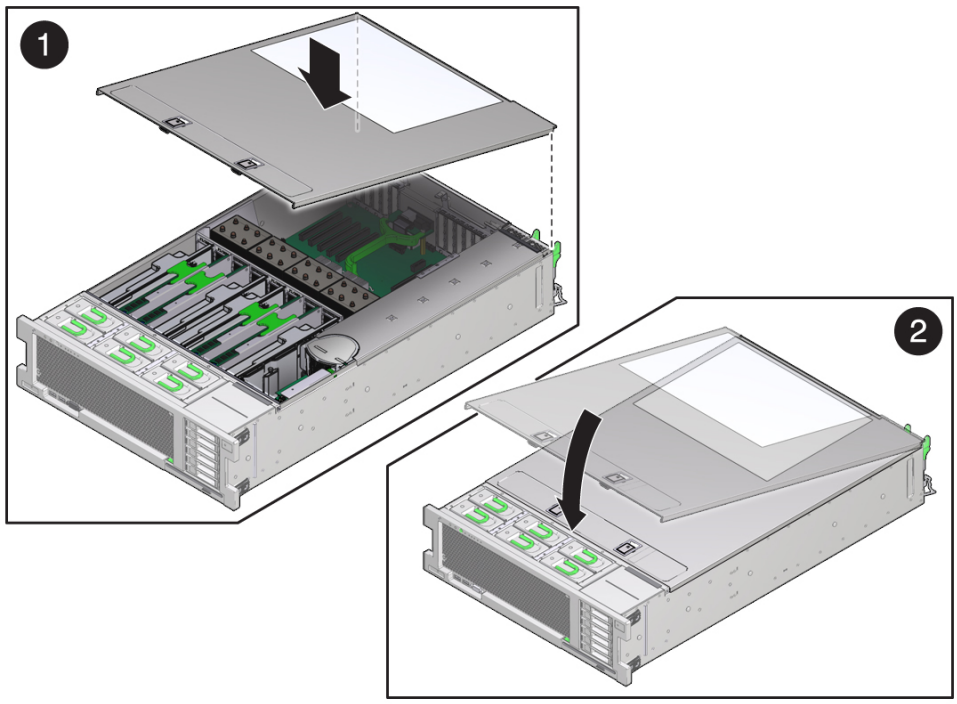
2. **Place the cover on top of the server with the two latches at the front.**

3. **Ensure that the edges of the cover encapsulate the server sidewalls.**

4. **Lift the front edge of the cover and slide the cover away from the rear of the server about 1 inch (2.54 cm).**

   This action ensures that the rear edge of the cover is positioned correctly.

5. **Slide the top cover toward the rear of the server, so that the rear edge of the cover slips under the retaining clip on the back wall of the server.**




6. **Set the front edge of the cover on the server.**

   Ensure that the cover is properly seated and that both latches are fully engaged.

7. **Lift both latches and firmly push down on the front edge of the cover until both latches lock with an audible click.**

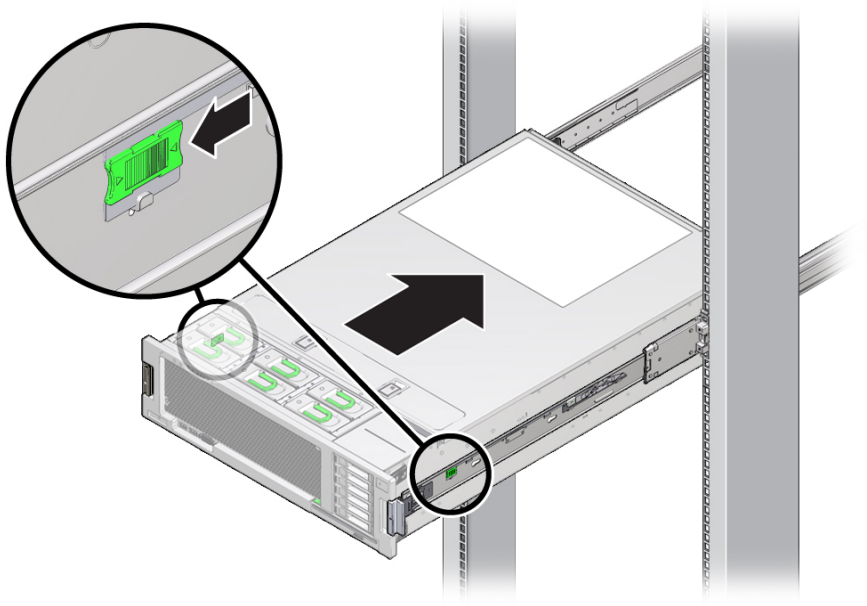
8. **Release the latches and verfy that the cover is locked down.**

9. **(Optional) If you removed the server entirely from the rack, install it now.**

   See "(Optional) Install the Server Into the Rack" on page 262.

10. **To return the server to its normal rack position, do the following:**

a. **Pull the both side rail release tabs toward the front of the server and slowly push the server into the rack.**

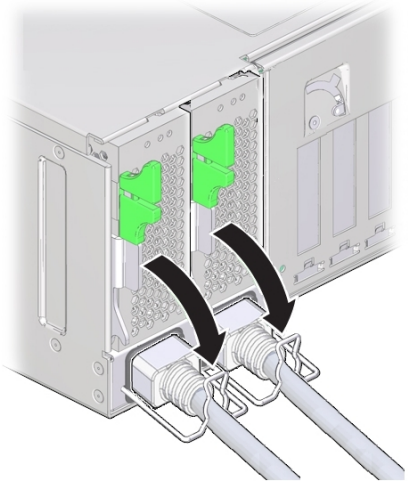


11. **Verify that the server is securely mounted in the rack and that the slide-rail locks are engaged with the mounting brackets.**

12. **At the rear of the server, connect the AC power cords to the server power supplies.**

    When the power cords are connected to the server, the server powers on to standby power mode.

13. **Secure the power cords with the power cord retaining clips.**



14. **Connect any other cables to their connectors or ports on the back of the server.**

    If the cable management arm (CMA) is in the way, disconnect the left CMA release and swing the CMA open.

15. **If necessary, reconnect the CMA.**

    See "(Optional) Install Cable Management Arm" on page 266.

    Swing the CMA closed and latch it to the left rack rail.

16. **Power on the server.**

    See "Power On the Server" on page 271.

# ▼ (Optional) Install the Server Into the Rack

**Before You Begin** When preparing the server for operation, use these optional steps to install the server in the rack.

**Caution -** Physical or component damage. The server is heavy and cannot be safely installed in the rack by a single person. Use multiple personnel and a mechanical lift to install the server in the rack.

1. **Push the slide-rails as far as possible into the slide-rail assemblies that are mounted in the rack.**

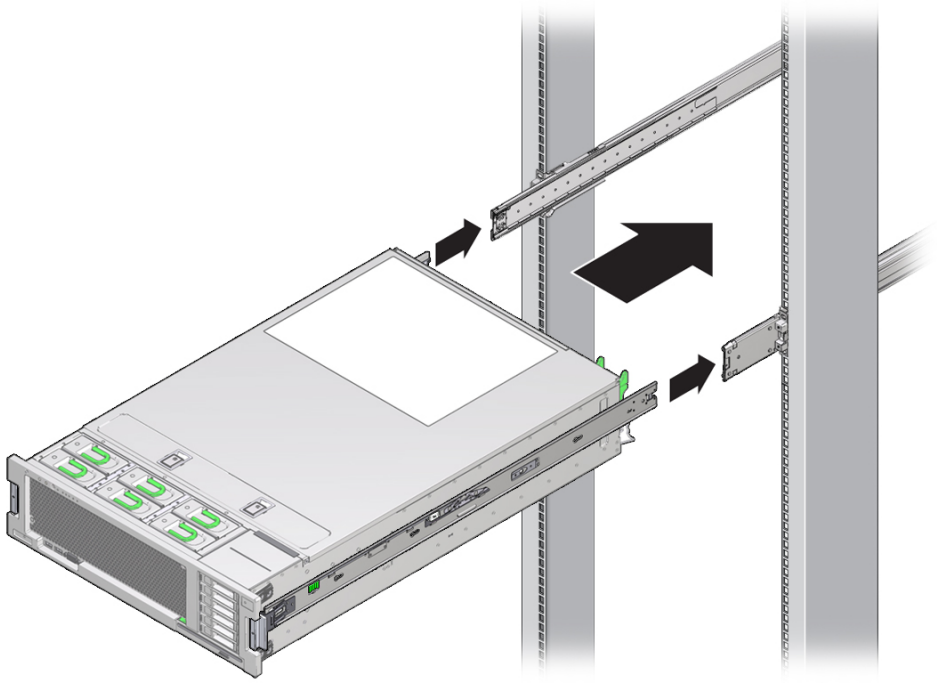
2. **Raise the server so that the ends of the mounting brackets are aligned with the slide-rail assemblies that are mounted in the rack.**

3. **Ensure that both the top and bottom mounting lips of the mounting brackets are aligned with the slide-rails.**

**Caution -** Physical or component damage. The server might fall if the mounting brackets are not inserted properly into the slide rails. Ensure that the mounting lips are properly aligned, and then insert the brackets into the slide rails properly.

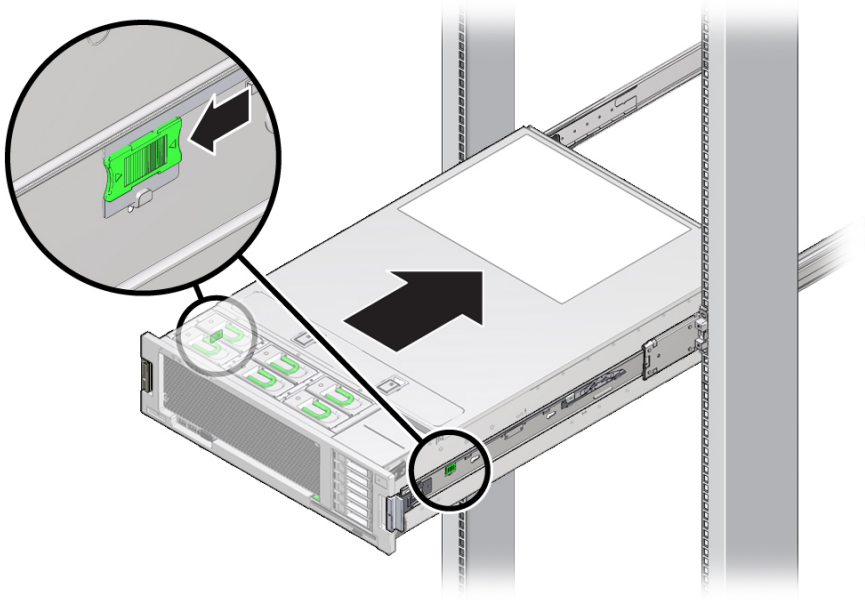
4. **Insert the mounting brackets into the slide-rails and push the server into the rack until the mounting brackets encounter the slide-rail stops (approximately 12 inches, or 30 cm) and the server rails lock the server into the maintenance position.**

The server cannot be slid past the slide rail stops. If correctly installed, the server should slide easily. If the server does not slide easily, it might not be inserted properly.



5. **To unlock the server and slide it the rest of the way into the rack, simultaneously pull and hold the green slide-rail release buttons on each mounting bracket and push the server into the rack until it locks into place with an audible click.**

The server should be flush with the front of the rack.



6. **Verify that the server is securely mounted in the rack and that the slide-rail locks are engaged with the mounting brackets.**

7. **At the rear of the server, connect the AC power cables to the server power supplies.**

   When the power cables are connected to the server, the server powers on to standby power mode.

8. **Connect any other cables to their connectors or ports on the back of the server.**

   If the cable management arm (CMA) is in the way, disconnect the left CMA release and swing the CMA open.

9. **If necessary, reconnect the CMA.**

   See "(Optional) Install Cable Management Arm" on page 266.

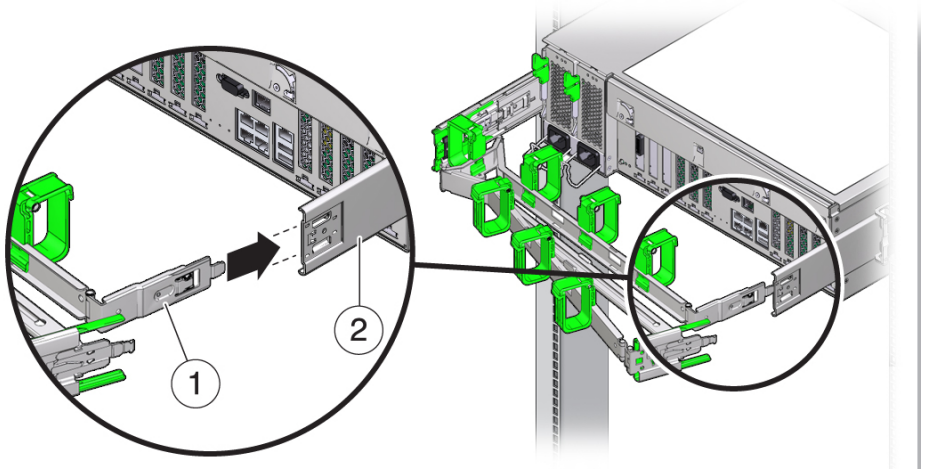
   Swing the CMA closed and latch it to the left rack rail.

10. **Power on the server.**

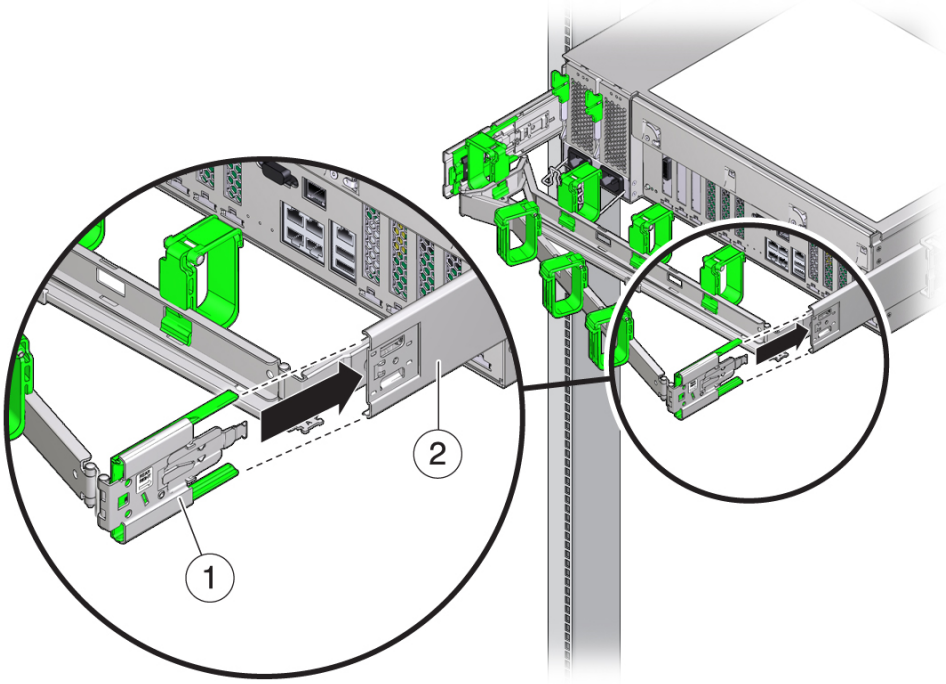
See “Power On the Server” on page 271.

# ▼ (Optional) Install Cable Management Arm

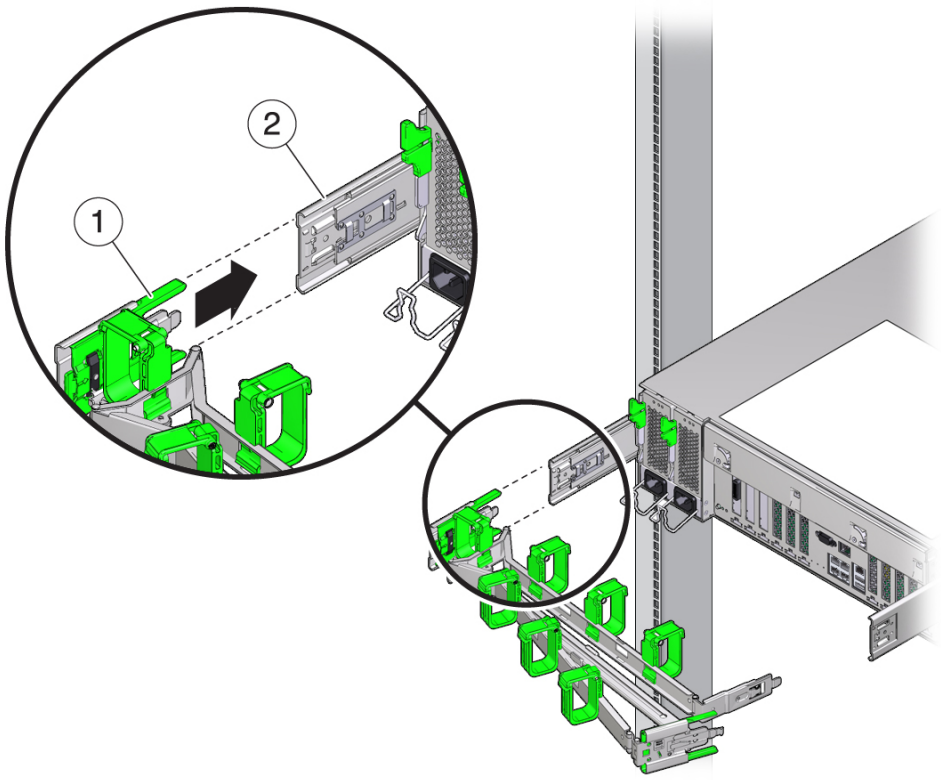
1. **Insert the CMA's mounting bracket connector into the right slide rail until the connector locks into place with an audible click.**



2. **Insert the right CMA slide-rail connector [1] into the right slide-rail assembly [2] until the connector locks into place with an audible click.**



3. **Insert the left CMA slide-rail connector [1] into the left slide-rail assembly [2] until the connector locks into place with an audible click.**




4. **Install and route cables to your server.**

5. **If required, re-attach the cable hook and loop straps to the CMA, and press them into place to secure the cables.**

   For best results, place three evenly spaced cable straps on the rear-facing side of the CMA and three cable straps on the side of the CMA nearest the server.

# ▼ Verify Operation of Slide-Rails and CMA

Use the following procedure to ensure that the slide-rails and CMA are operating correctly.

**Note -** Two people are recommended for this procedure: one to move the server in and out of the rack, and one to observe the cables and CMA.

1. **Slowly pull the server out of the rack until the slide-rails reach their stops.**

2. **Inspect the attached cables for any binding or kinks.**

3. **Verify that the CMA extends fully from the slide-rails.**

4. **Push the server back into the rack, as described in the following sub-steps.**

   When the server is fully extended, you must release two sets of slide-rail stops to return the server to the rack:

   a. **Push in both green levers simultaneously and slide the server toward the rack.**

      The first set of stops are levers located on the inside of each slide-rail, just behind the back panel of the server.

      The server slides in approximately 18 inches (46 cm) and stops.

      Verify that the cables and the CMA retract without binding before you continue.

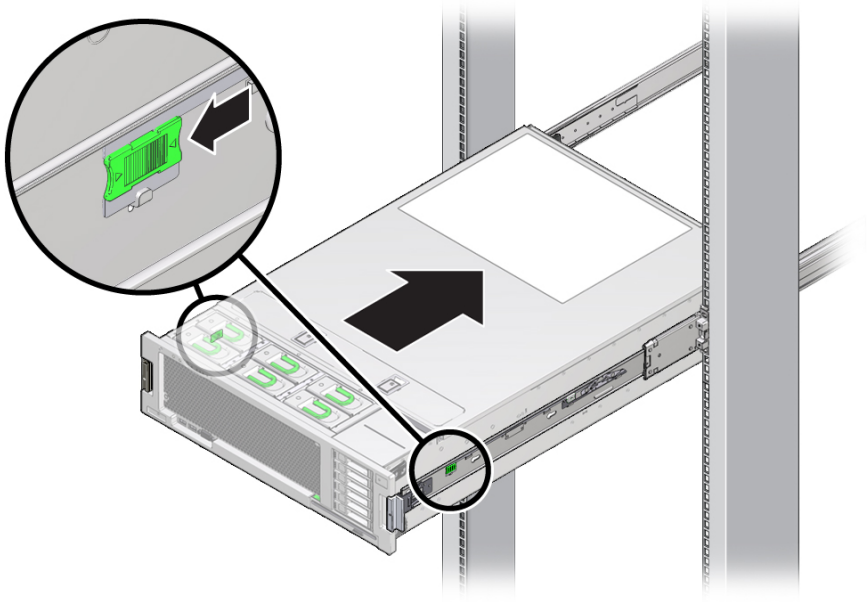
   b. **Push the server completely into the rack until both slide-rail locks engage.**

      The second set of stops are the slide-rail release buttons, located near the front of each mounting bracket. Simultaneously push both of the green slide-rail release buttons.

5. **Adjust the cable straps and CMA, as required.**

# Return the Server to the Normal Rack Position

1. **Release the slide rails from the fully extended position by pushing the release tabs on the side of each rail.**



2. **While pushing on the release tabs, slowly push the server into the rack.**

   Ensure that the cables do not get in the way.

3. **Reconnect the cables to the back of the server.**

   If the cable management arm (CMA) is in the way, disconnect the left CMA release and swing the CMA open.

4. **Reconnect the CMA.**

   Swing the CMA closed and latch it to the left rack rail.

# Power On the Server

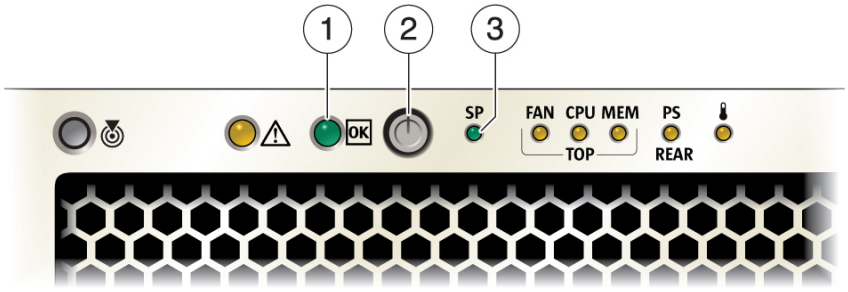
If you removed power from the server during maintenance, use the following procedure to reapply main power for all server components.

1. **Verify that the power cords are connected to the server and that standby power is on.**

   - Shortly after AC power cords are plugged into the server, the SP OK indicator blinks as the service processor boots.
   - The SP OK indicator is illuminated solid green when the service processor has successfully booted.
   - After the service processor has booted, the System OK indicator on the front panel begins flashing slowly, indicating that the host is in standby power mode.

2. **Press and release the recessed Power button on the server front panel.**

   - When full power is applied to the server, the System OK indicator begins to blink more quickly as the system begins the boot process.
   - During the boot process, the server initiates a power-on self-test (POST) which might take several minutes to complete.
   - Once the host boot process is complete, the System OK indicator and lights solidly.




| Callout | Description |
|---|---|
| 1 | System OK indicator |
| 2 | Power Button |
| 3 | SP OK indicator |

# BIOS Setup Utility Menu Options

This section describes the Basic Input/Output System (BIOS) Setup Utility.

**Note -** For more information about BIOS, refer to the *Oracle X5 Series Servers Administration Guide* at `http://www.oracle.com/goto/x86AdminDiag/docs`.

| Description | Link |
|---|---|
| BIOS basics and screens | "About the BIOS Setup Utility" on page 273 |
| BIOS screens | "Access the BIOS Setup Utility" on page 338 |

## About the BIOS Setup Utility

The server's Basic Input/Output System (BIOS) is stored on the motherboard and managed using the BIOS setup utility. The utility reports system information and provides a graphical user interface that allows you to change the server BIOS settings from the factory-configured defaults.

The BIOS has two operational boot modes, Legacy and UEFI. Changing modes changes the content of some utility screens. The legacy boot mode is the default.

For a listing of the BIOS Setup Utility menus, see "Legacy Mode BIOS Setup Utility Screens" on page 274.

## BIOS Setup Utility Screens

This section contains screen captures of the higher-level BIOS Setup Utility menus.

- "Legacy Mode BIOS Setup Utility Screens" on page 274

- "UEFI Mode BIOS Setup Utility Screens" on page 333


## Legacy Mode BIOS Setup Utility Screens

This section contains screen captures of legacy mode BIOS Setup Utility screens. To access the BIOS Setup Utility, see "Access the BIOS Setup Utility" on page 338.

### BIOS Menu Top-Level

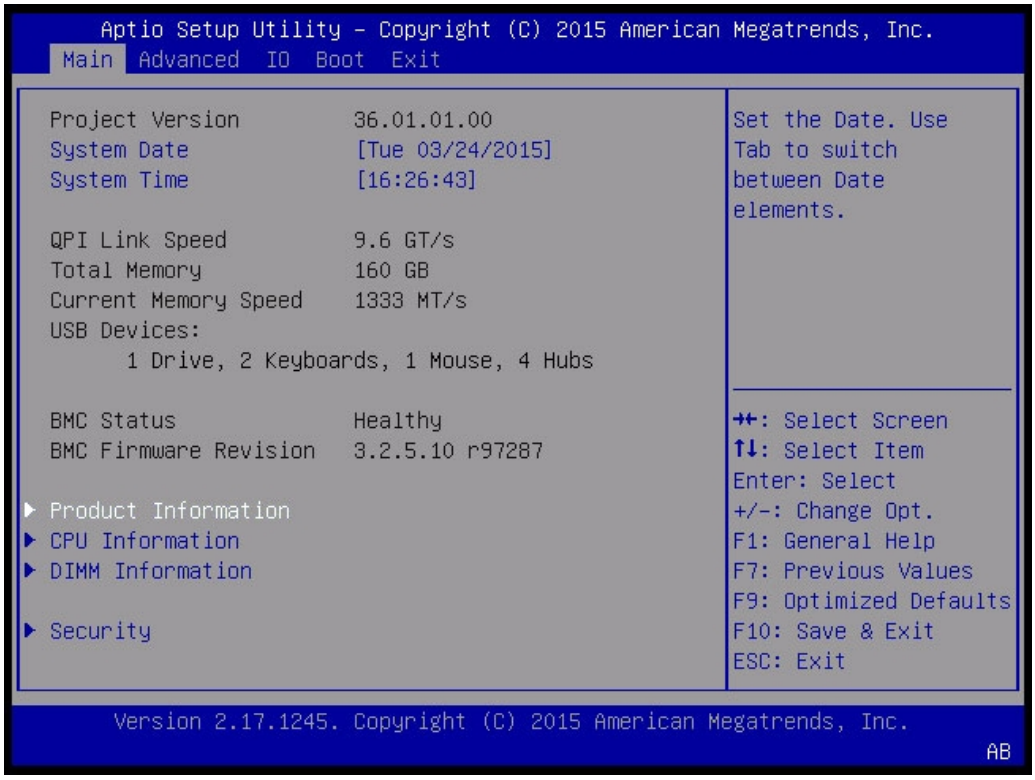
The following table provides descriptions for the Legacy mode top-level BIOS setup menus.

| Menu | Description |
|---|---|
| Main | General system and product information, including date and time, security, hardware configuration and CPU, and DIMM information. |
| Advanced | Configuration information for processors, CPU power management, USB ports, serial ports, trusted computing, network stack, legacy iSCSI, BMC network configuration, and UEFI iSCSI configuration. |
| IO | Configuration interface for plug-and-play (PnP) devices, virtualization, internal devices,and add-in cards. |
| Boot | Configuration interface for boot settings, including boot mode (Legacy, UEFI), Oracle System Assistant Configuration, and boot option priority. |
| Exit | Save or discard changes. |

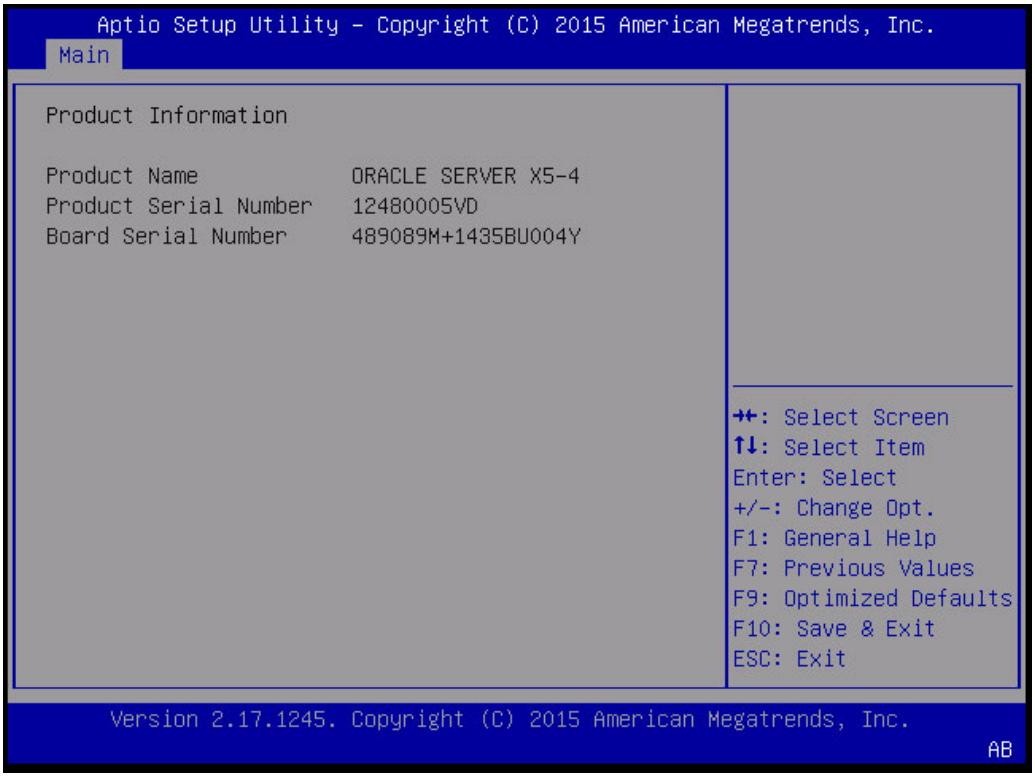
The following illustration identifies the sub-menus that you can access from each of the top-level BIOS menus.

### Main Screen (Legacy)

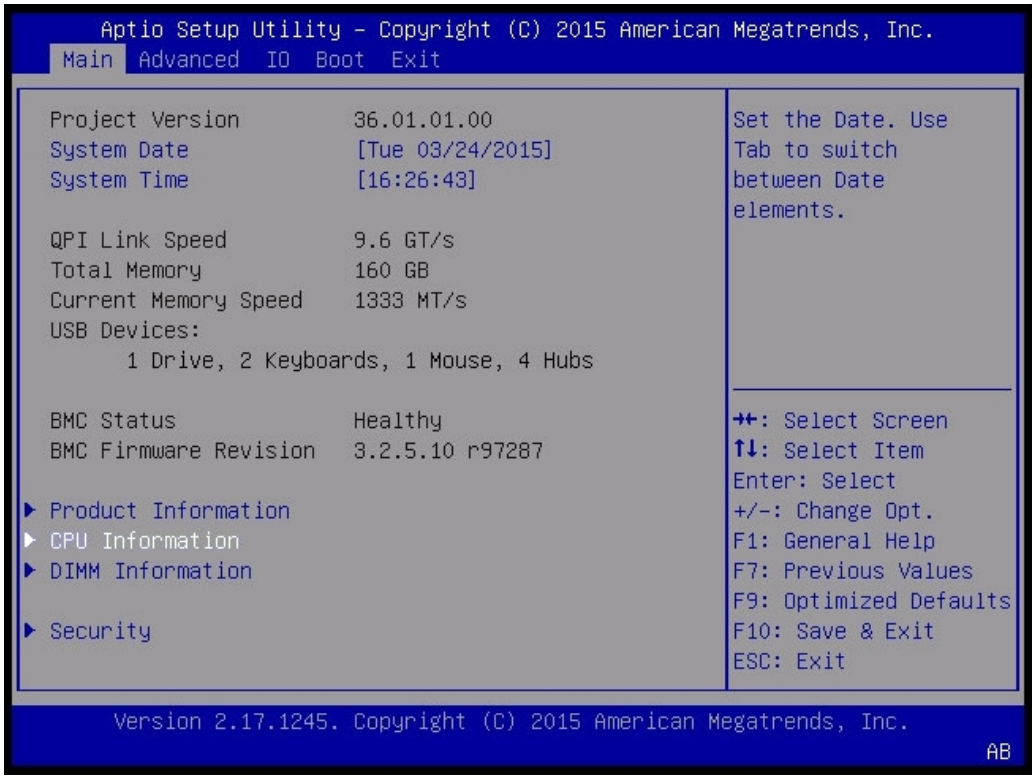
**Note -** To facilitate search, a list of keywords appears after each screen capture.



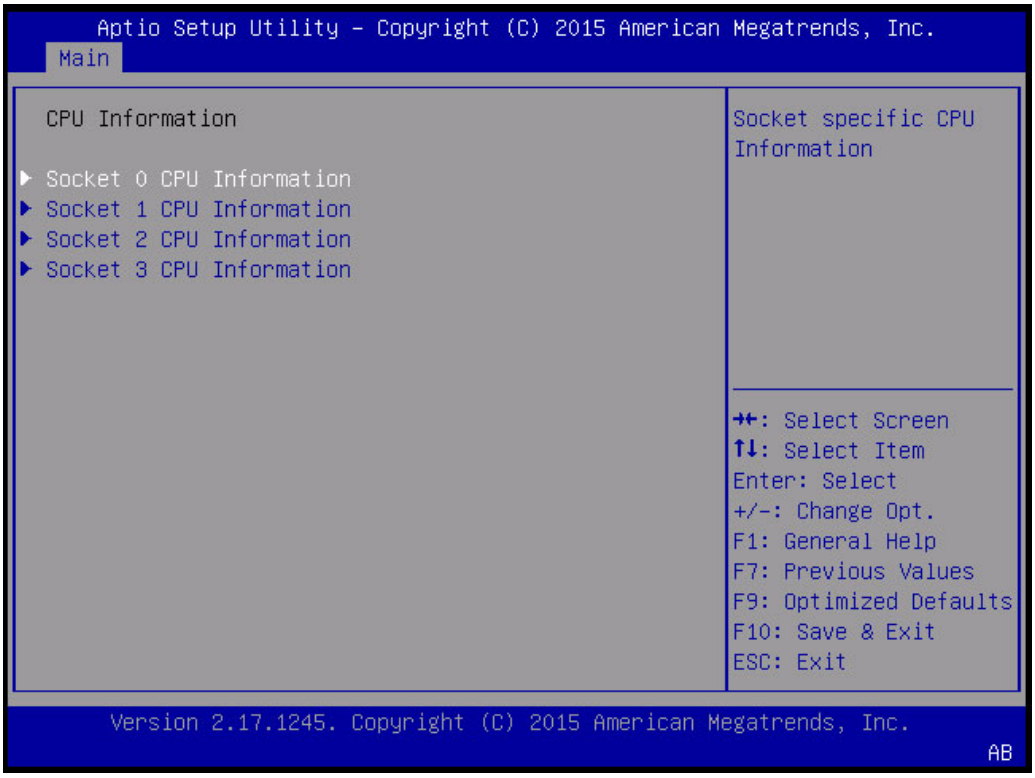

Keywords: Main Screen, Project Version, System Date, System Time, QPI Link Speed, Total Memory, Current Memory Speed, USB Devices, BMC Status, BMC Firmware Revision, Product Information, CPU Information, DIMM Information, Security



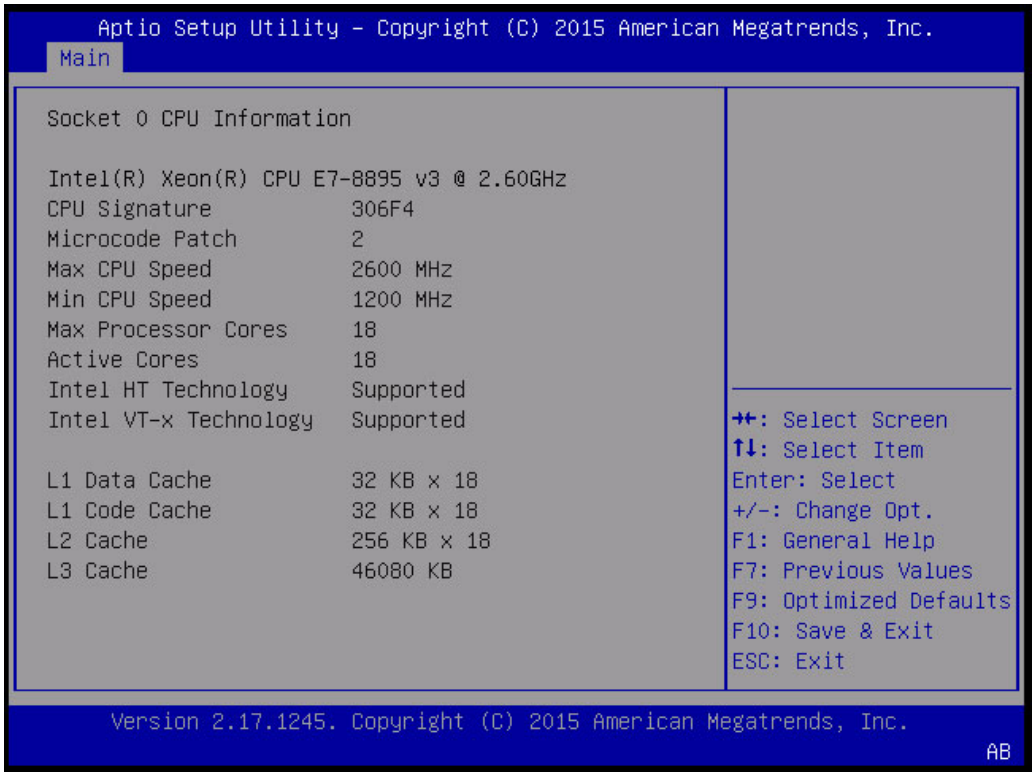

Keywords: Main, Product Information, Product Name, Product Serial Number, Board Serial Number



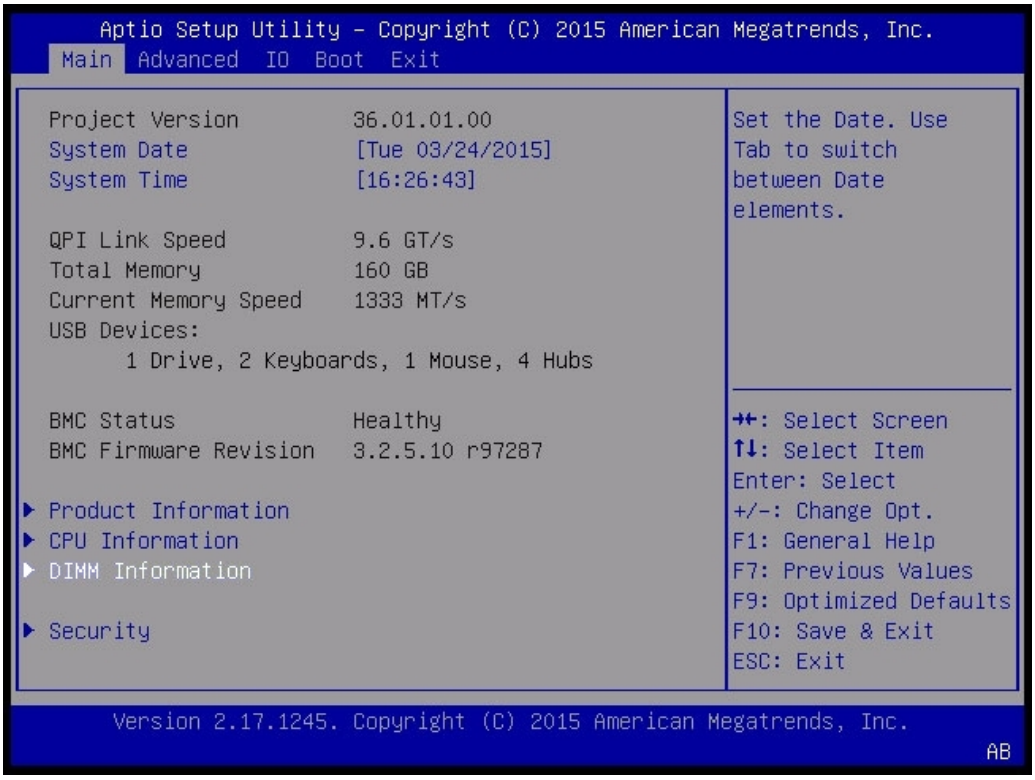

Keywords: Main Screen, Project Version, System Date, System Time, QPI Link Speed, Total Memory, Current Memory Speed, USB Devices, BMC Status, BMC Firmware Revision, Product Information, CPU Information, DIMM Information, Security



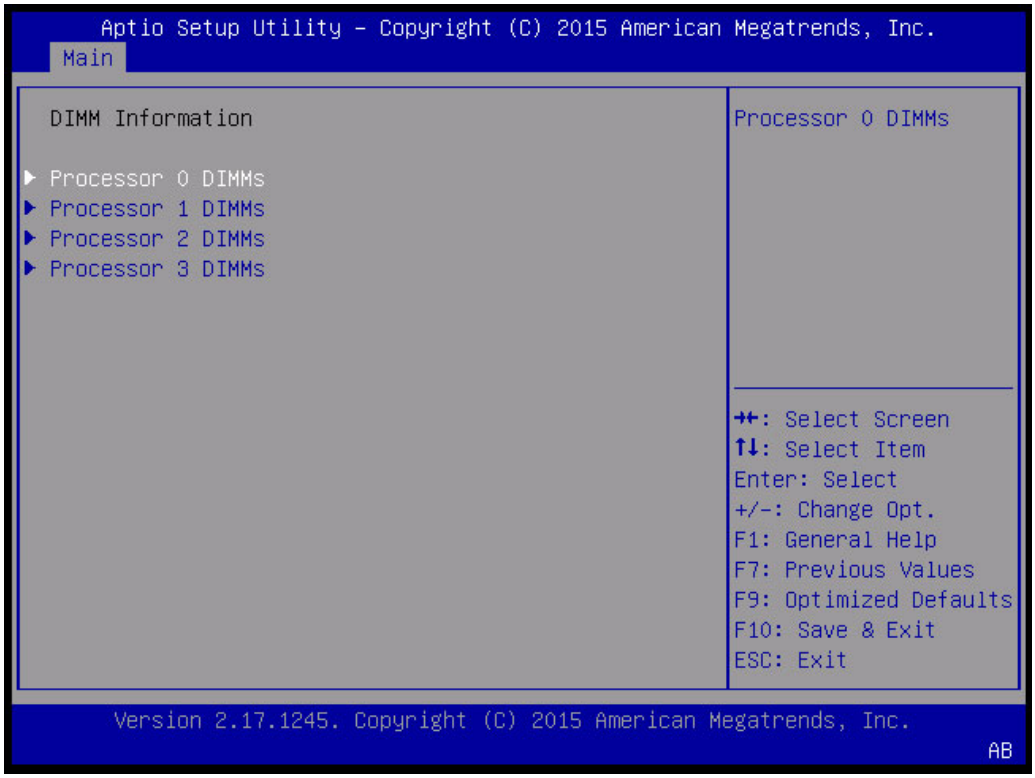

Keywords: Main, CPU Information Socket 0 CPU Information, Socket 1 CPU Information, Socket 2 CPU Information, Socket 3 CPU Information. Socket Specific CPU Information.



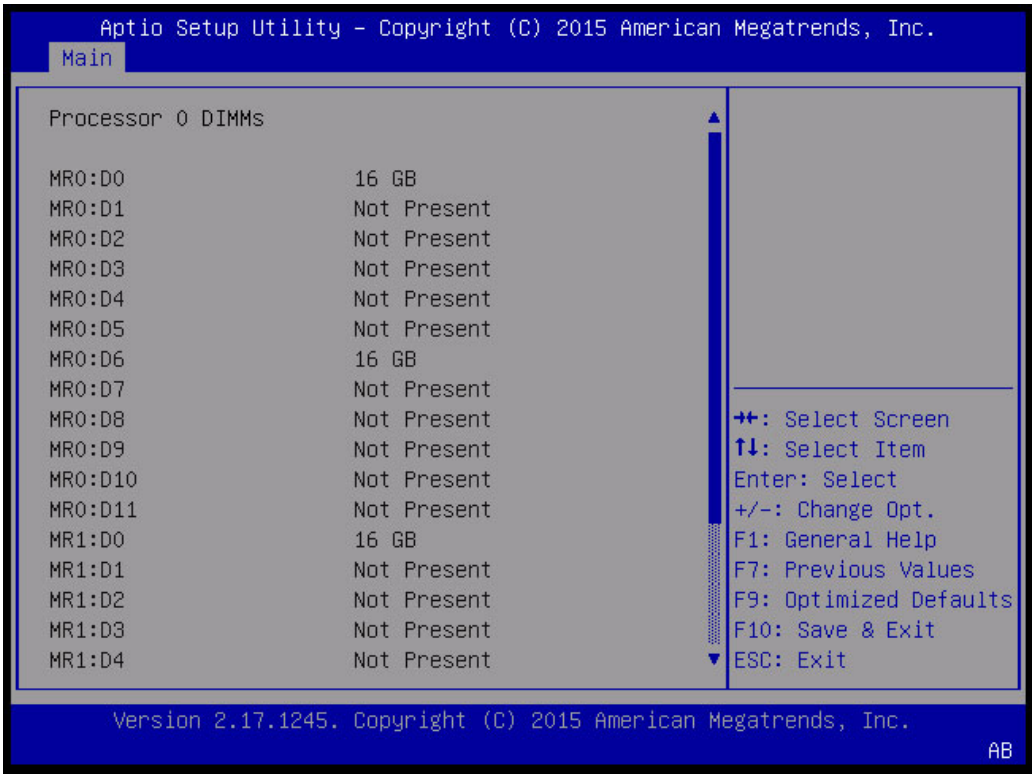

Keywords: Main, CPU Information Socket 0 CPU Information, Intel Xeon CPU Et-4890 v2, CPU Signature, Microcode Patch, Max CPU Speed, min CPU Speed, Processor Cores, Intel HT Technology, Intel VT-x Technology, L1 Data Cache, L1 Code Cache, L2 Cache, L3 Cache



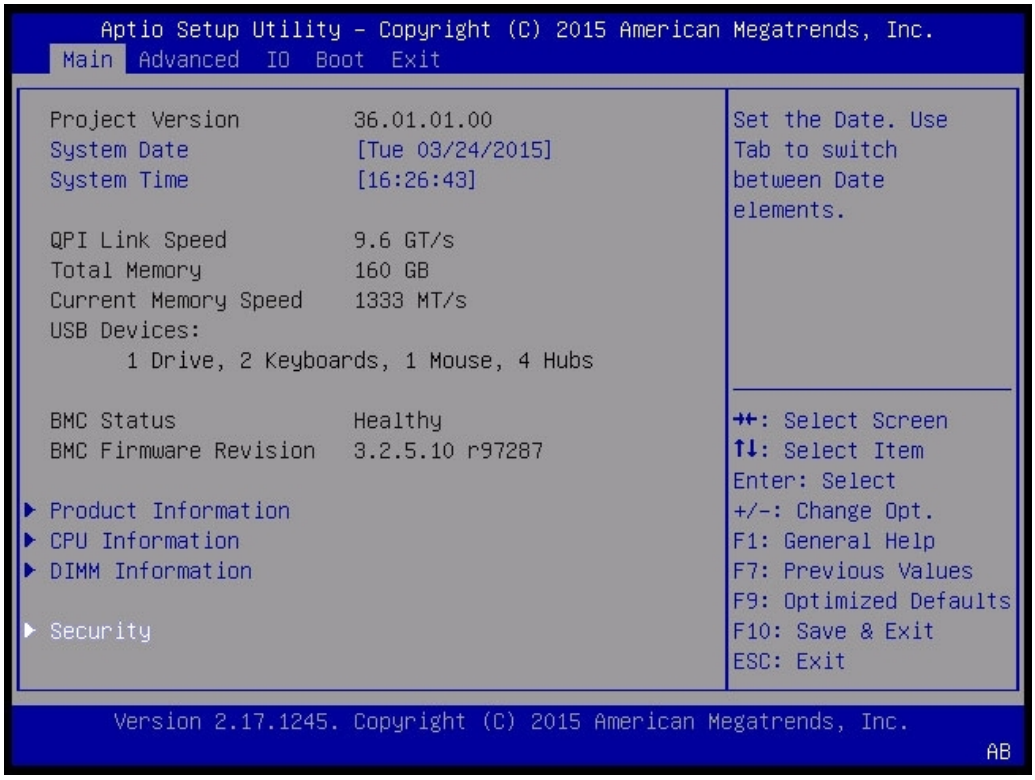

Keywords: Main Screen, Project Version, System Date, System Time, QPI Link Speed, Total Memory, Current Memory Speed, USB Devices, BMC Status, BMC Firmware Revision, Product Information, CPU Information, DIMM Information, Security



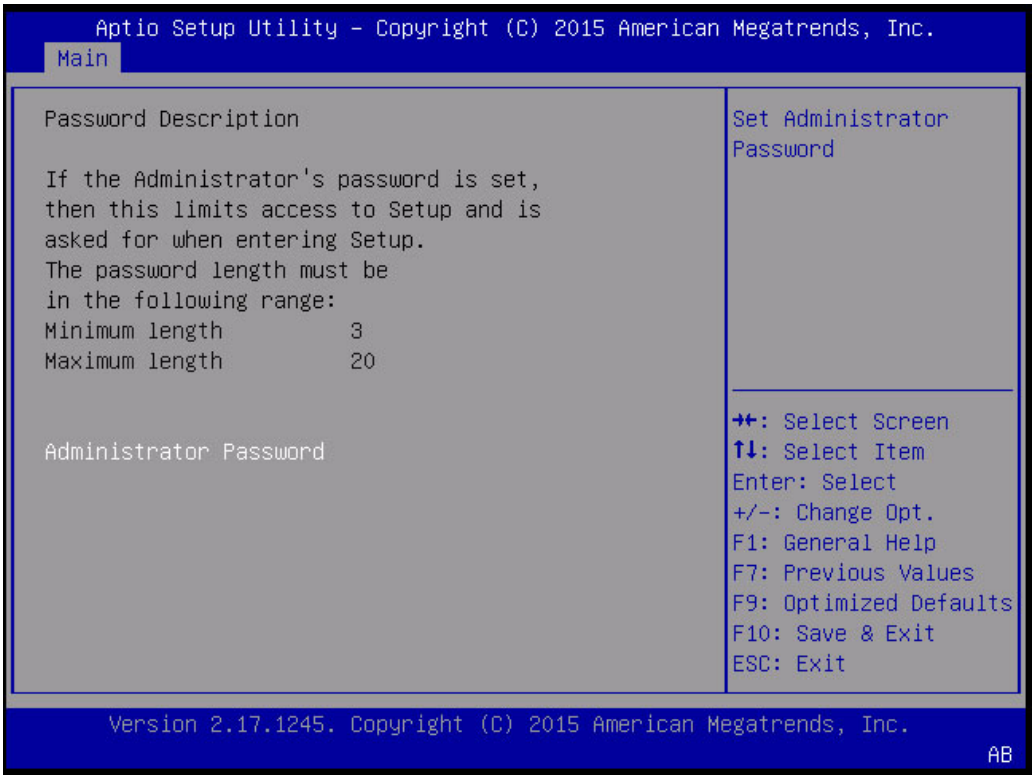

Keywords: Main, DIMM Information, Processor 0 DIMMs




Keywords: Main, Processor 0 DIMMs, Not Present

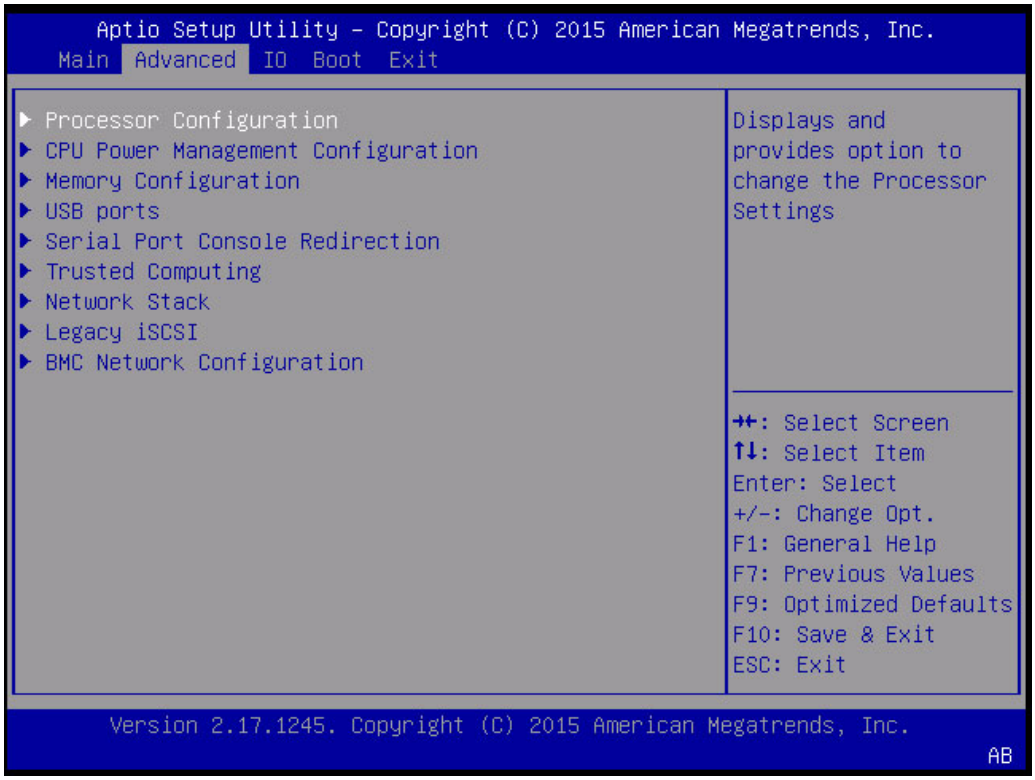



Keywords: Main Screen, Project Version, System Date, System Time, QPI Link Speed, Total Memory, Current Memory Speed, USB Devices, BMC Status, BMC Firmware Revision, Product Information, CPU Information, DIMM Information, Security

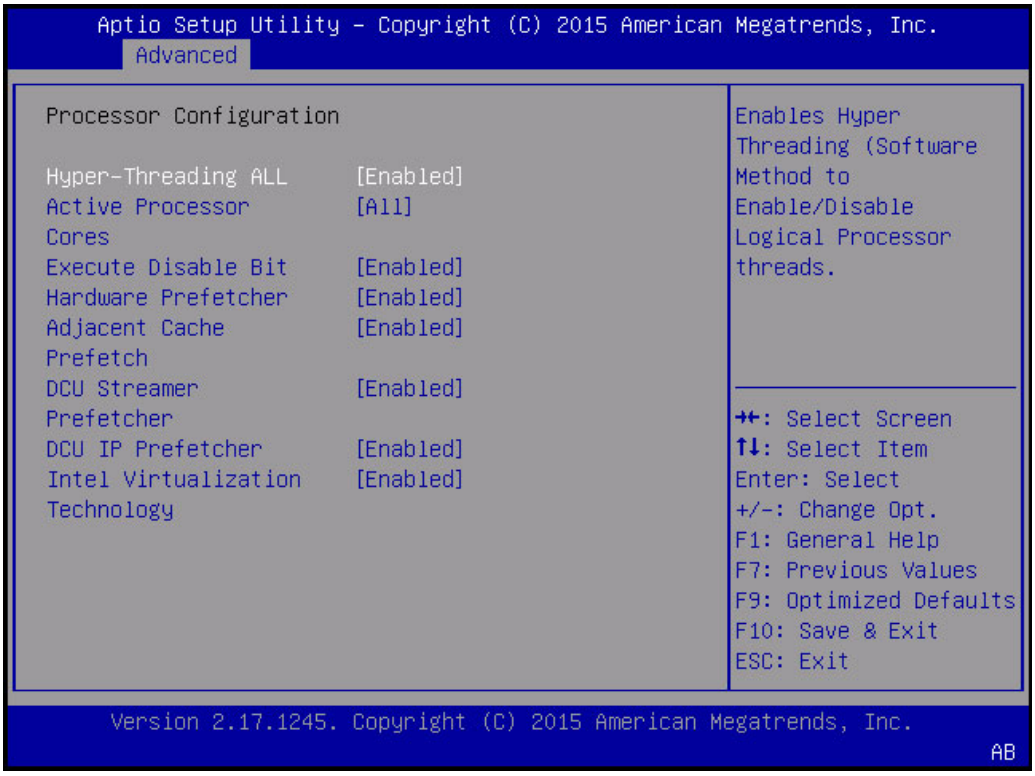



Keywords: Main security screen, set administrator password, password description, minimum length, maximum length, administrator password

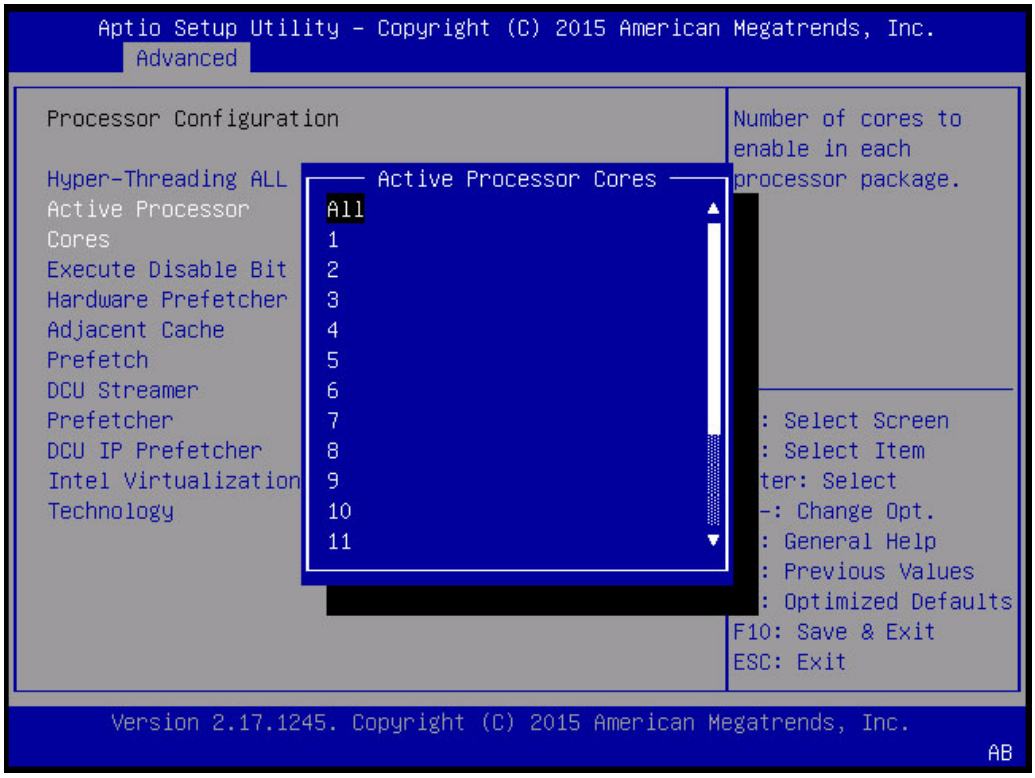
## Advanced Screen (Legacy)



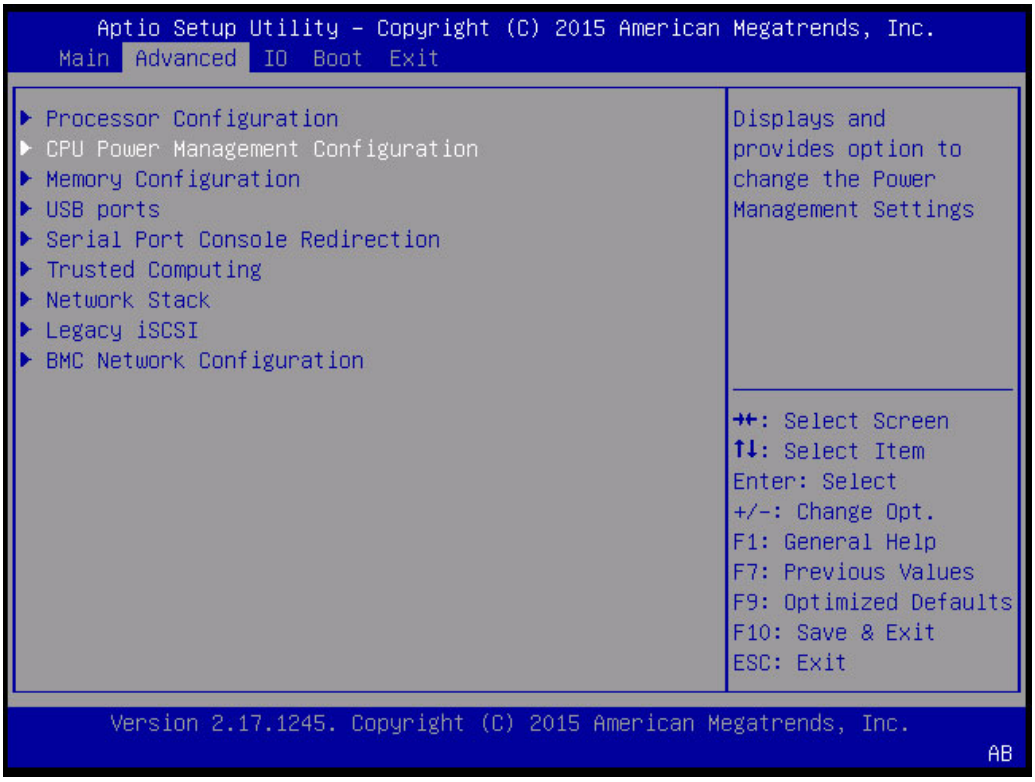

Keywords: Advanced, processor configuration, CPU power management configuration, USB ports, serial port console redirection, trusted computing, network stack, legacy iSCSI, BMC network configuration



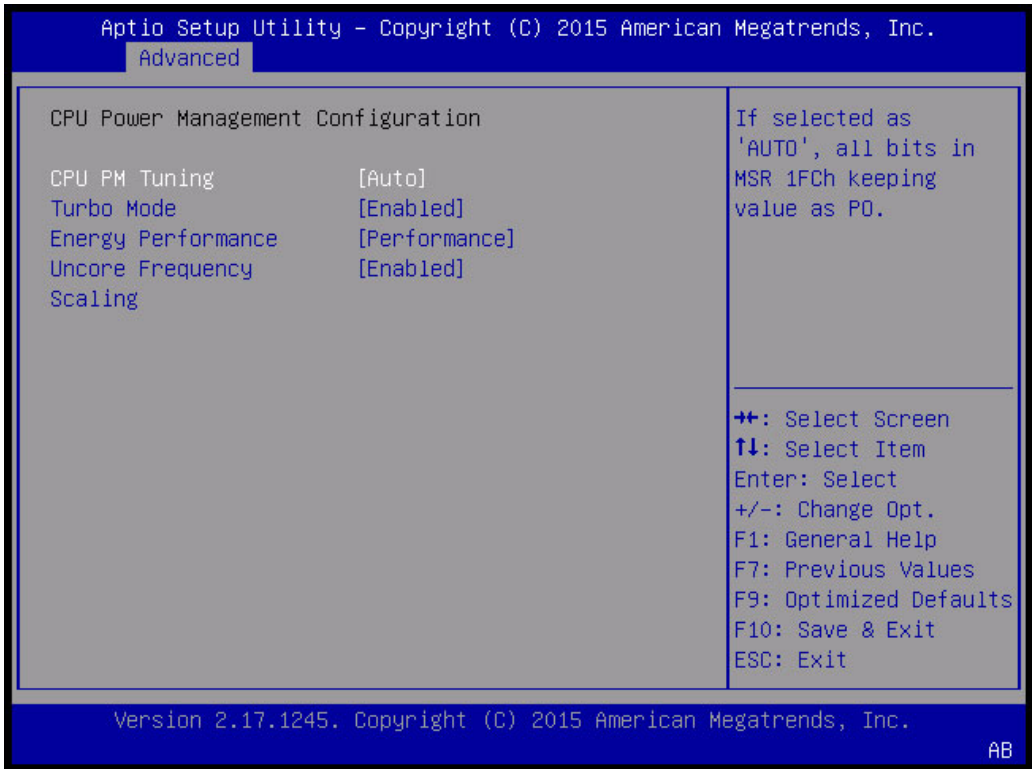

Keywords: Processor configuration, hyper-threading all, active processor, cores, execute disable bit, hardware prefetcher, adjacent cache, prefetch, DCU streamer, prefetcher, DCU IP prefetcher, Intel virtualization technology. Enables hyper-threading (software method) to enable/disable logical processor threads



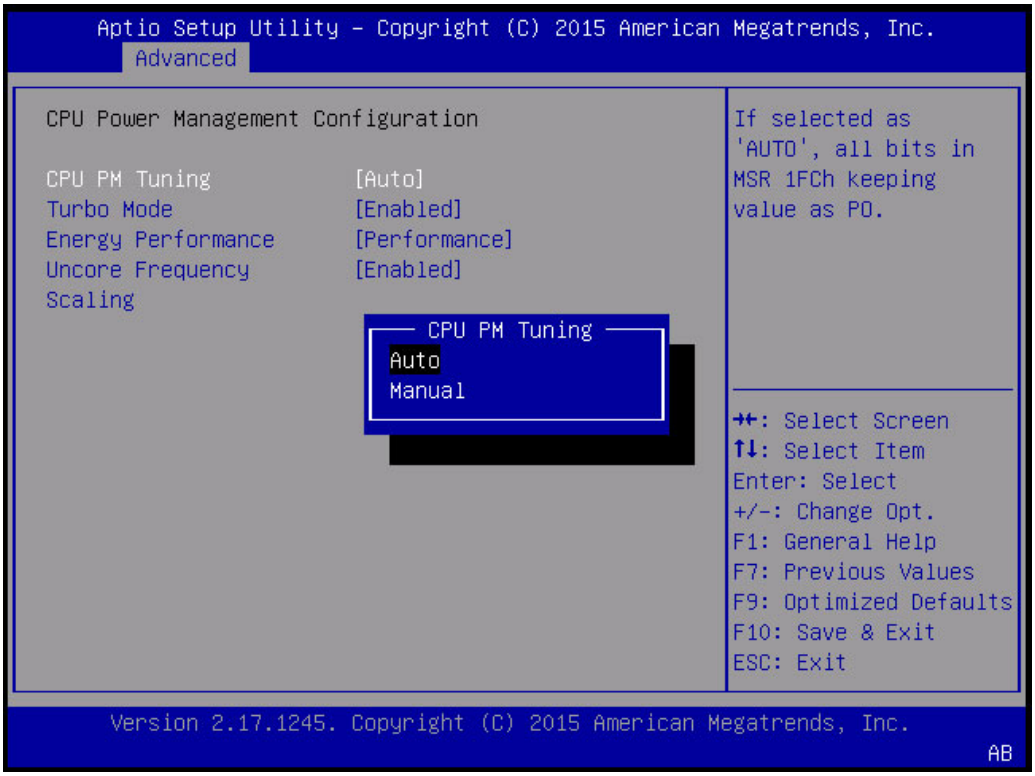

Keywords: Processor Configuration, Active Processor Cores, Number of cores to enable in each processor package



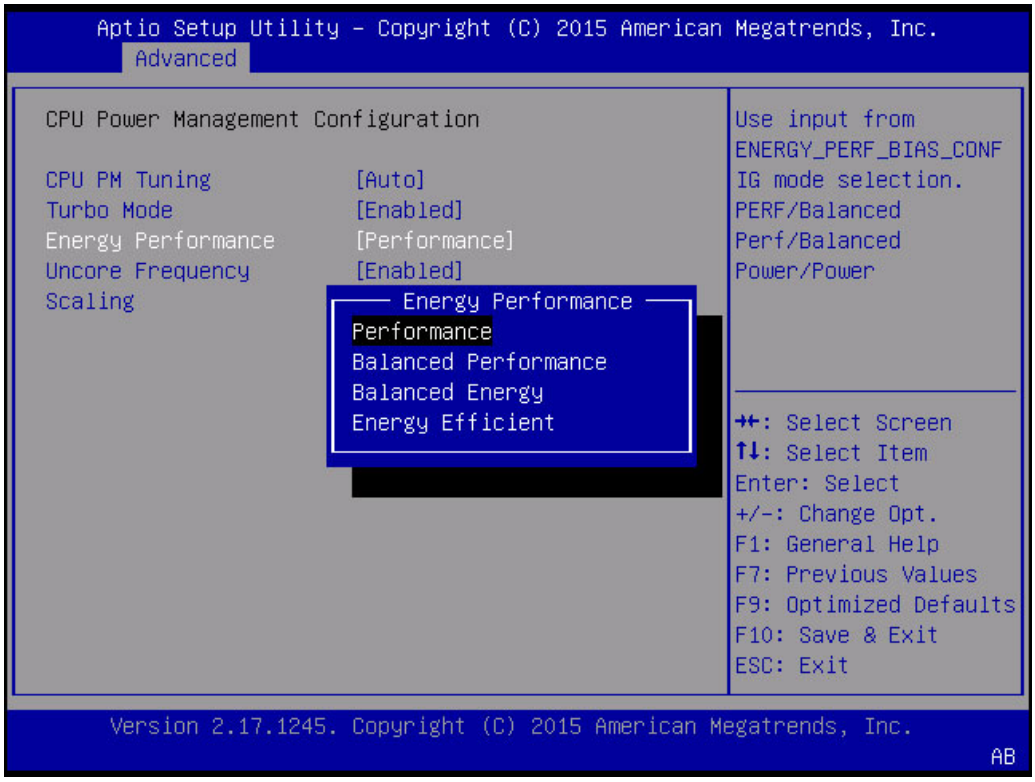

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



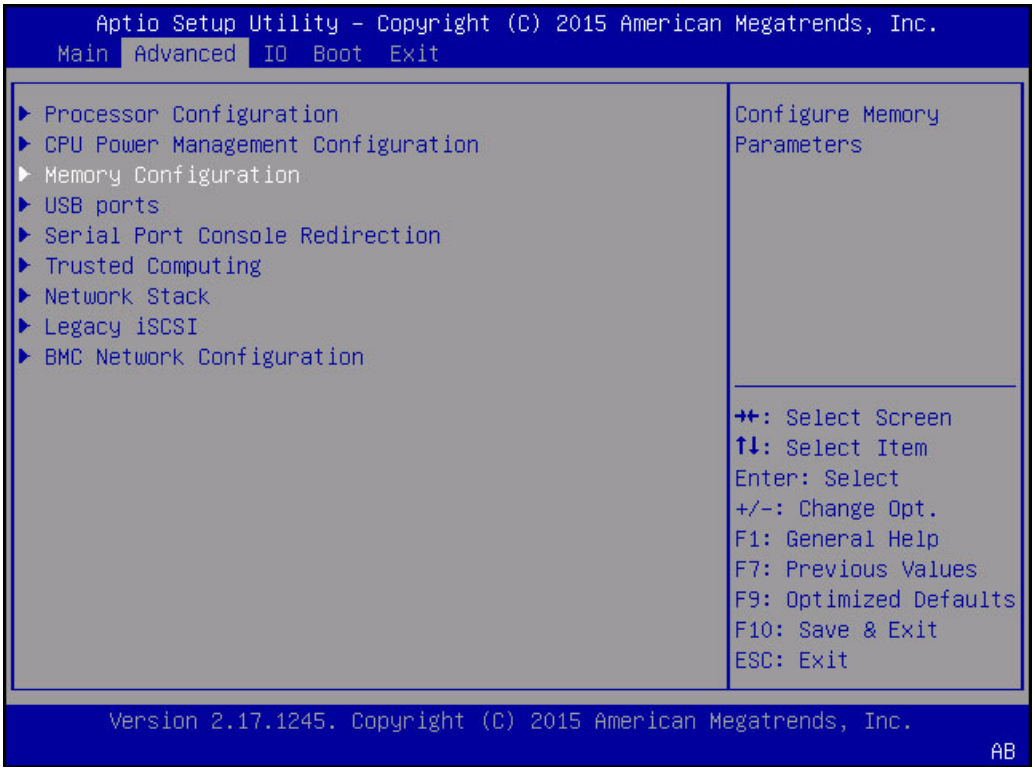

Keywords: CPU Power Management Configuration, CPU PM Tuning,Turbo Mode, Energy Performance, Balanced Performance



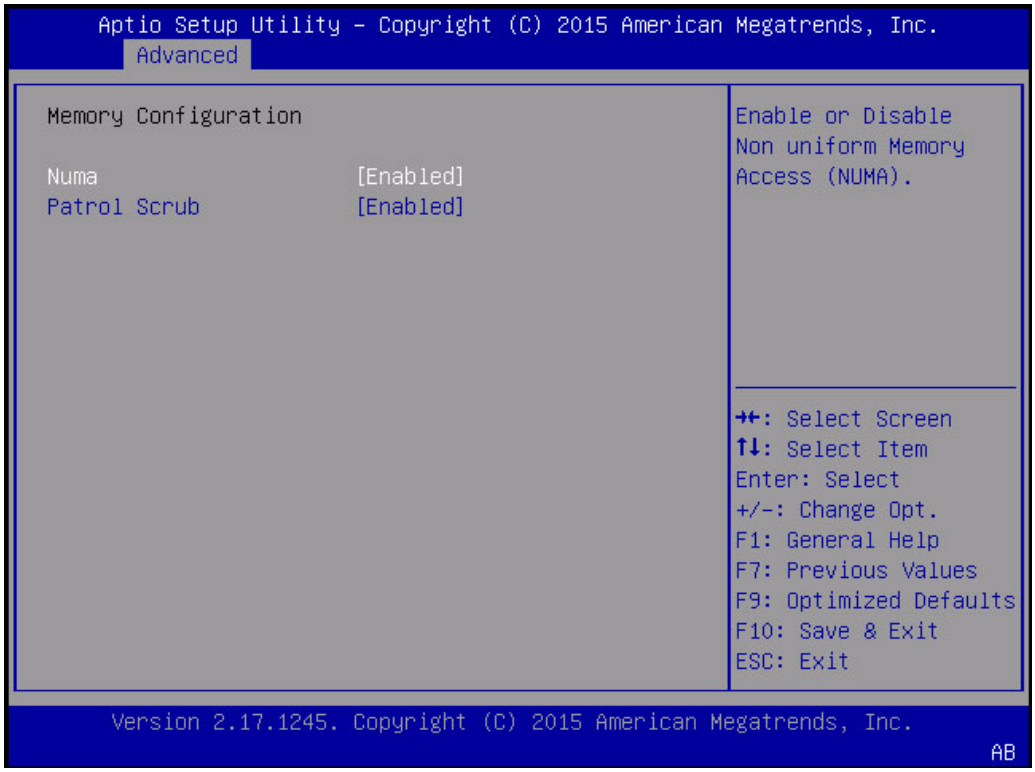

Keywords: CPU Power Management Configuration, CPU PM Tuning Auto Manual,Turbo Mode, Energy Performance, Balanced Performance



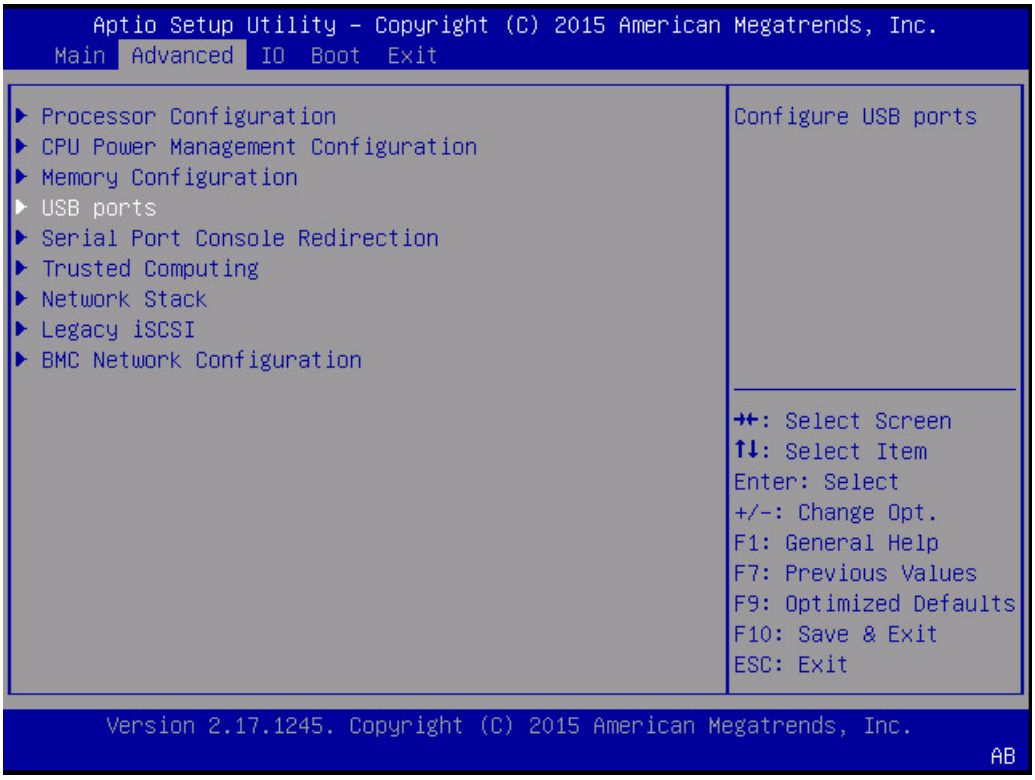

Keywords: CPU Power Management Configuration, CPU PM Tuning,Turbo Mode, Energy Performance, Performance, Balanced Performance, Balanced Energy, Energy Efficient



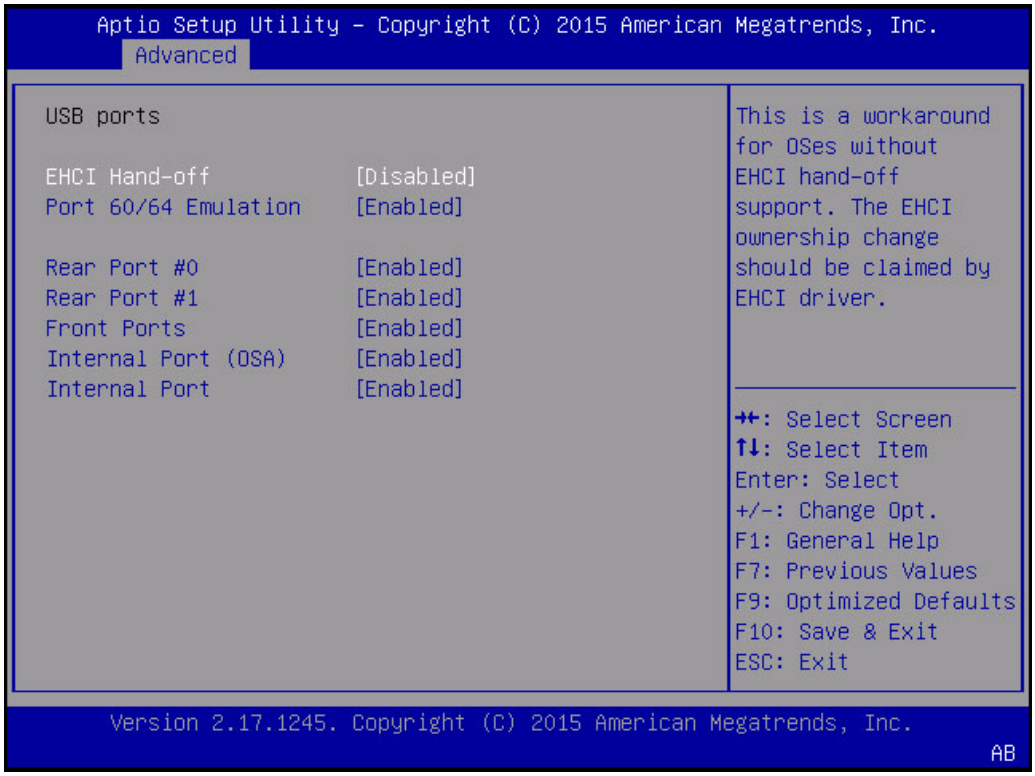

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



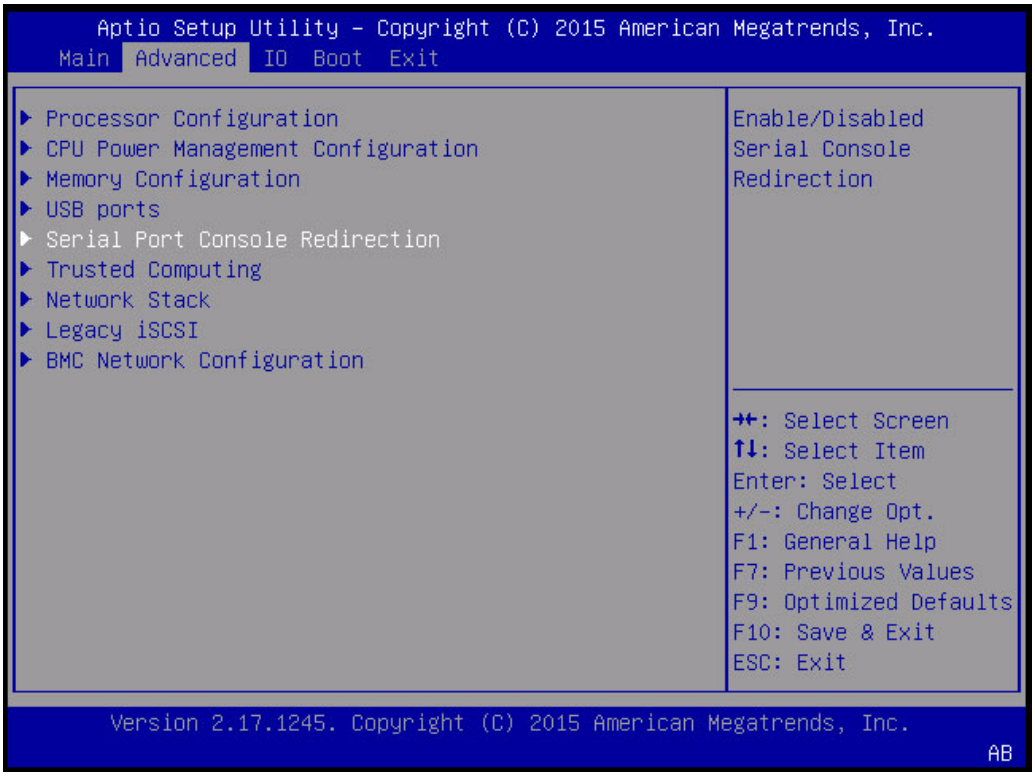

Keywords: Memory Configuration, Numa, Patrol Scrub



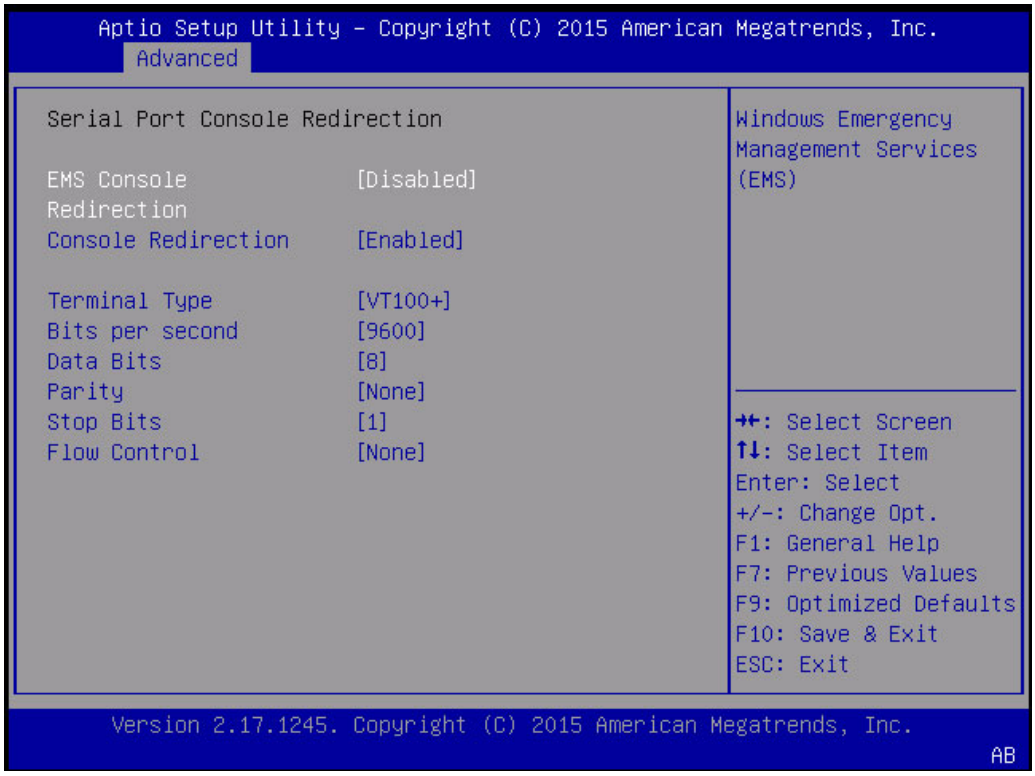

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



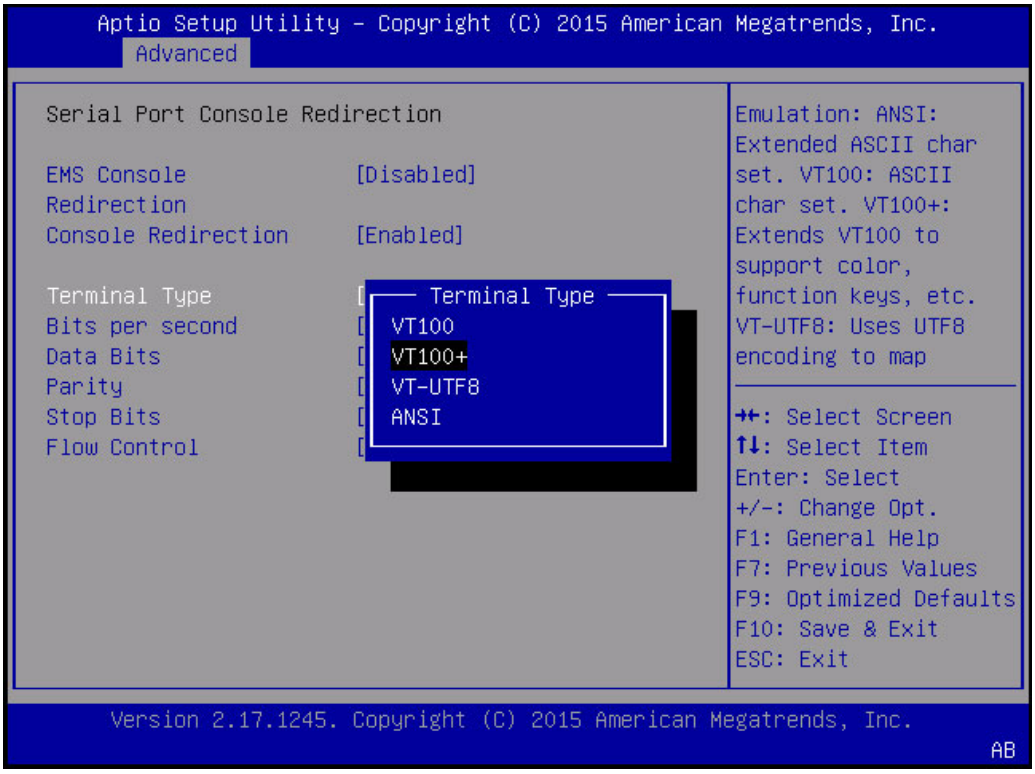

Keywords: USB Ports, EHCI Handoff, Port 60/64 Emulation, Rear Port, Front Port, Internal Port



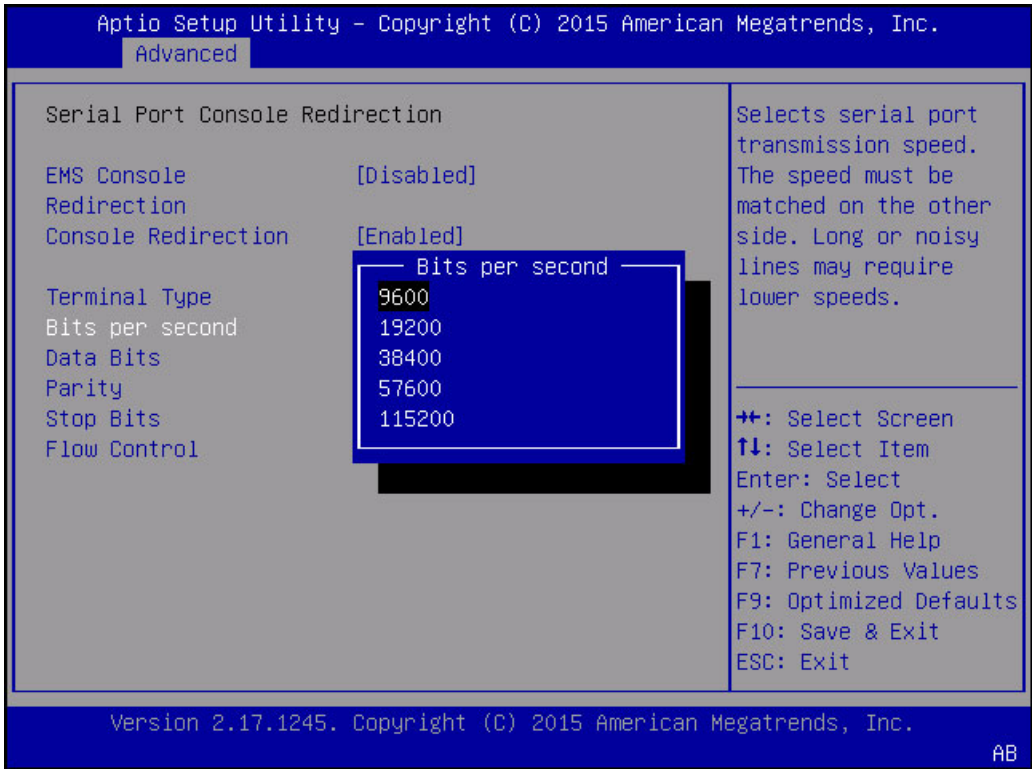

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



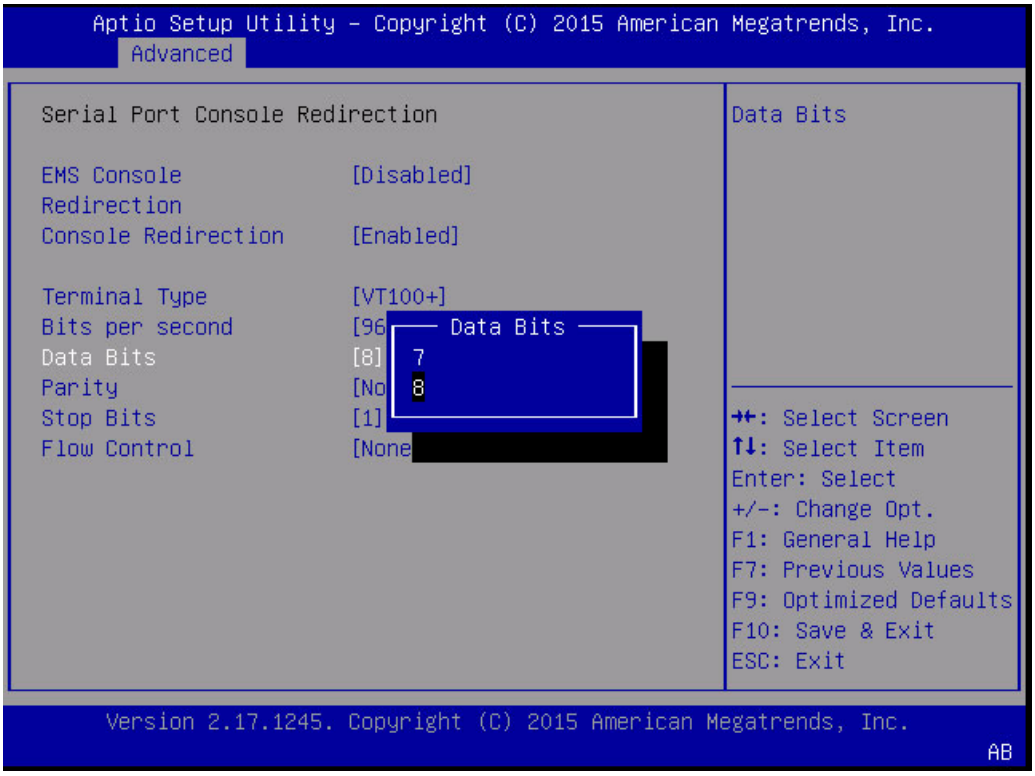

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, Data Bits, Parity, Stop Bits, Flow Control



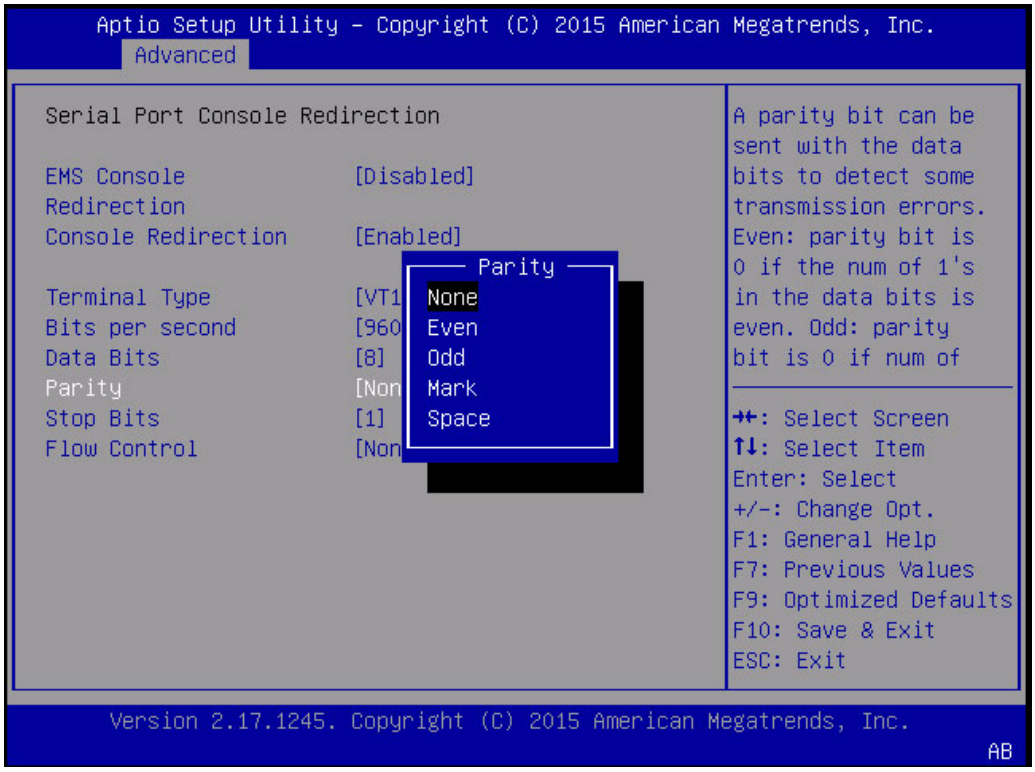

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, VT100, VT100+, VT-UTF8, ANSI



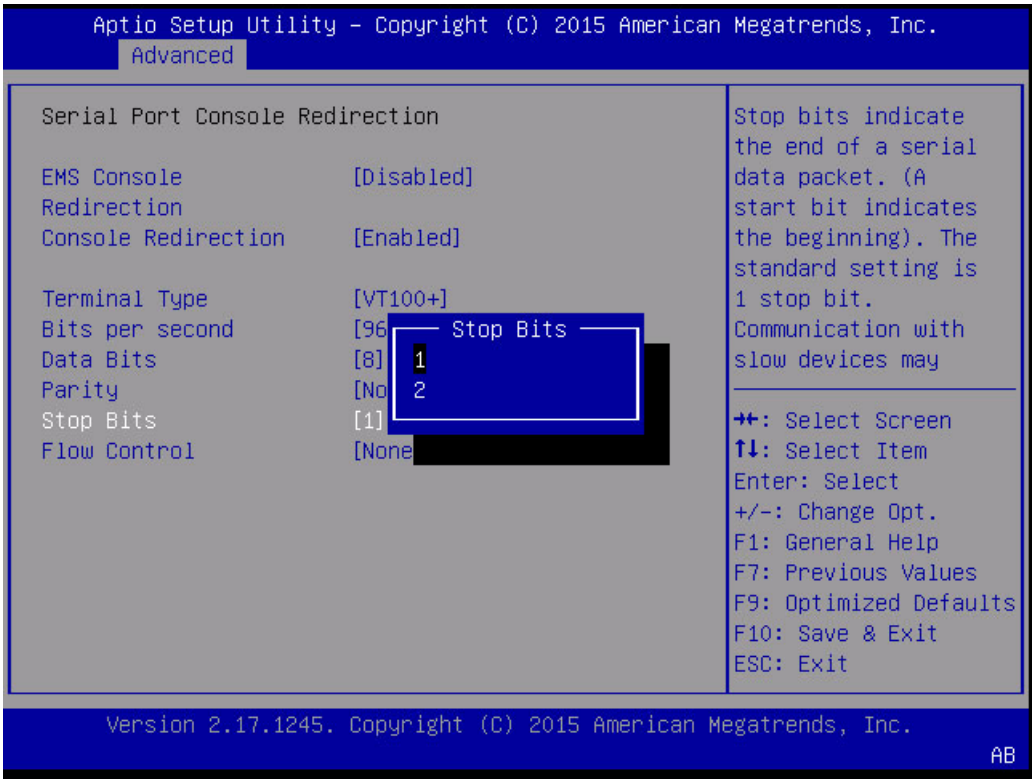

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, 9600, 19200, 38400, 57600, 115200



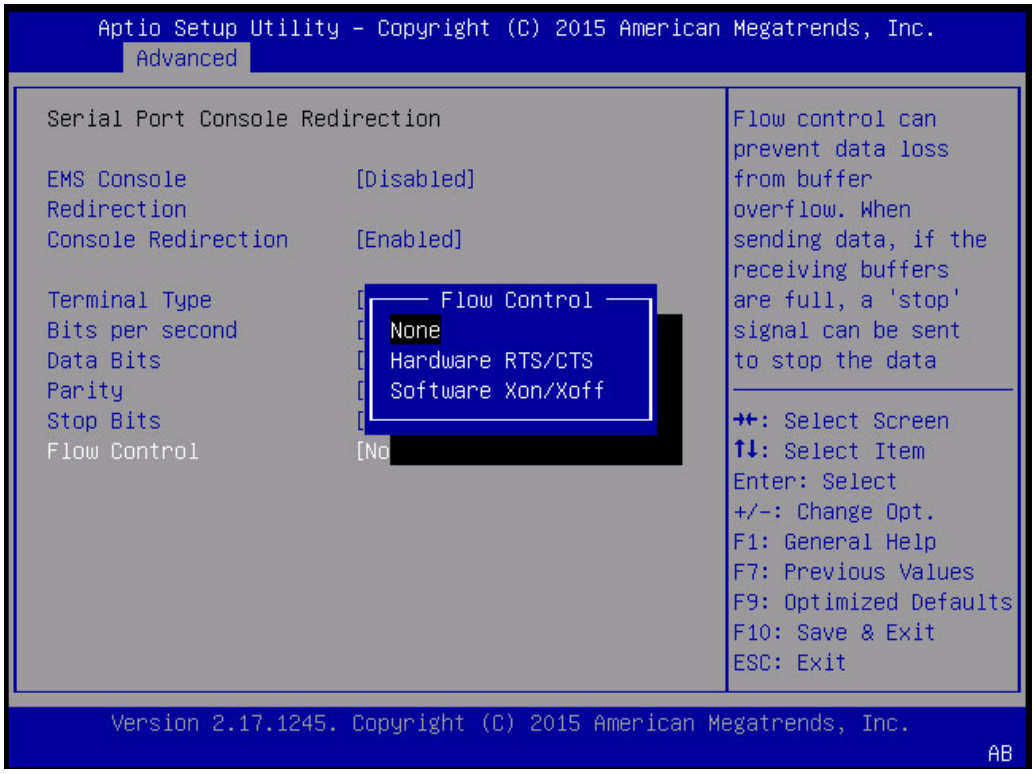

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, Data Bits, 7, 8



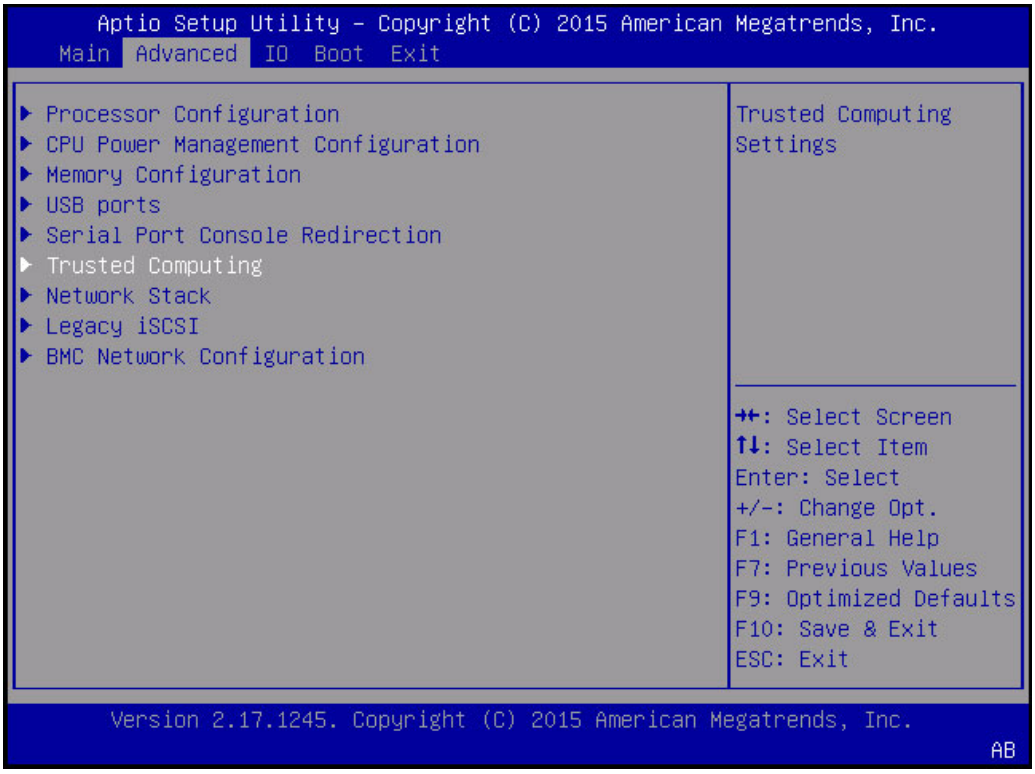

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, Data Bits, Parity, None, Even, Odd, Mark, Space



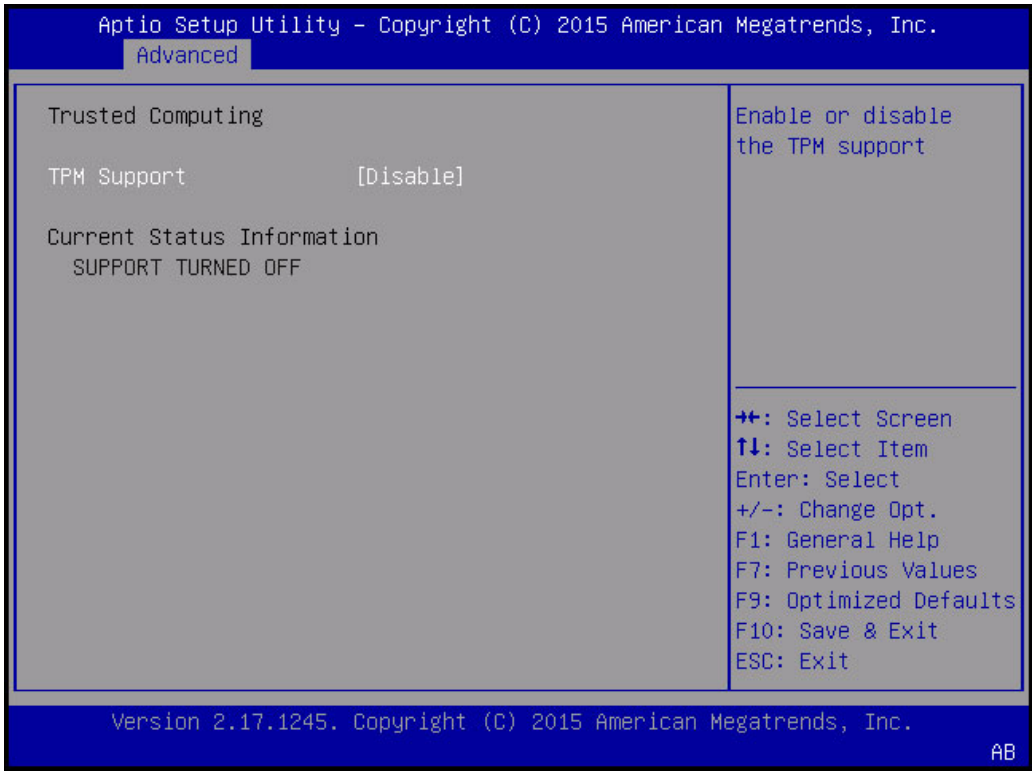

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, Data Bits, Parity, Stop Bits, 1, 2



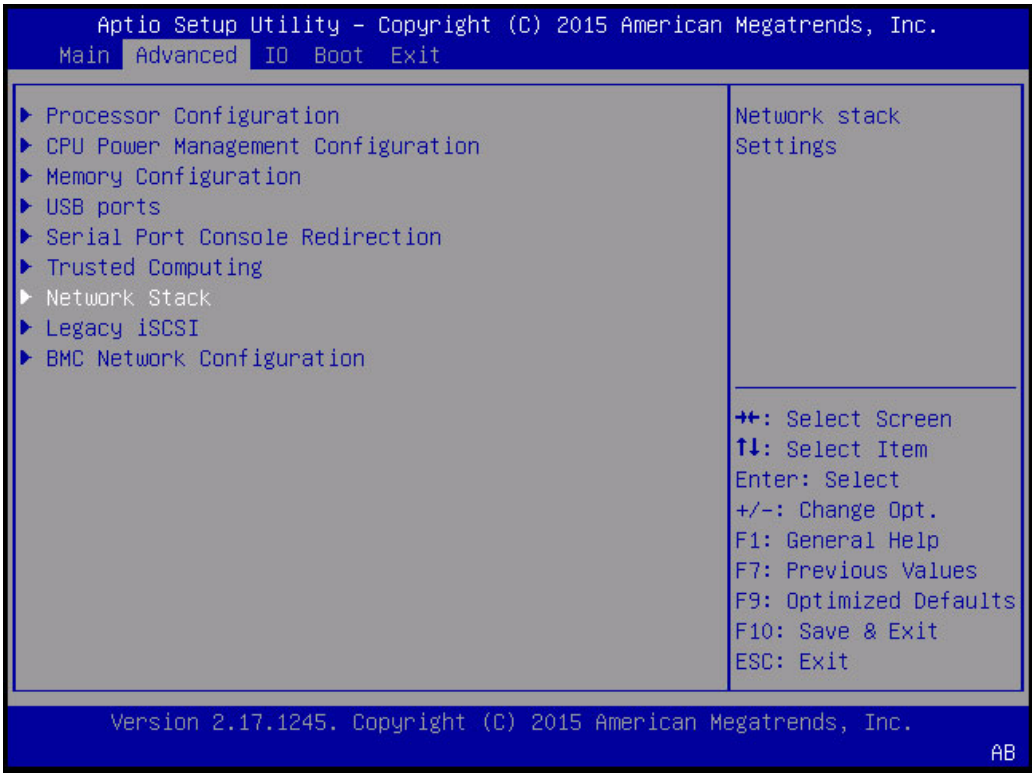

Keywords: Serial Port Redirection, EMS Console Redirection, Terminal Type, Bits per second, Data Bits, Parity, Stop Bits, Flow Control, None, Hardware RTS/CTS



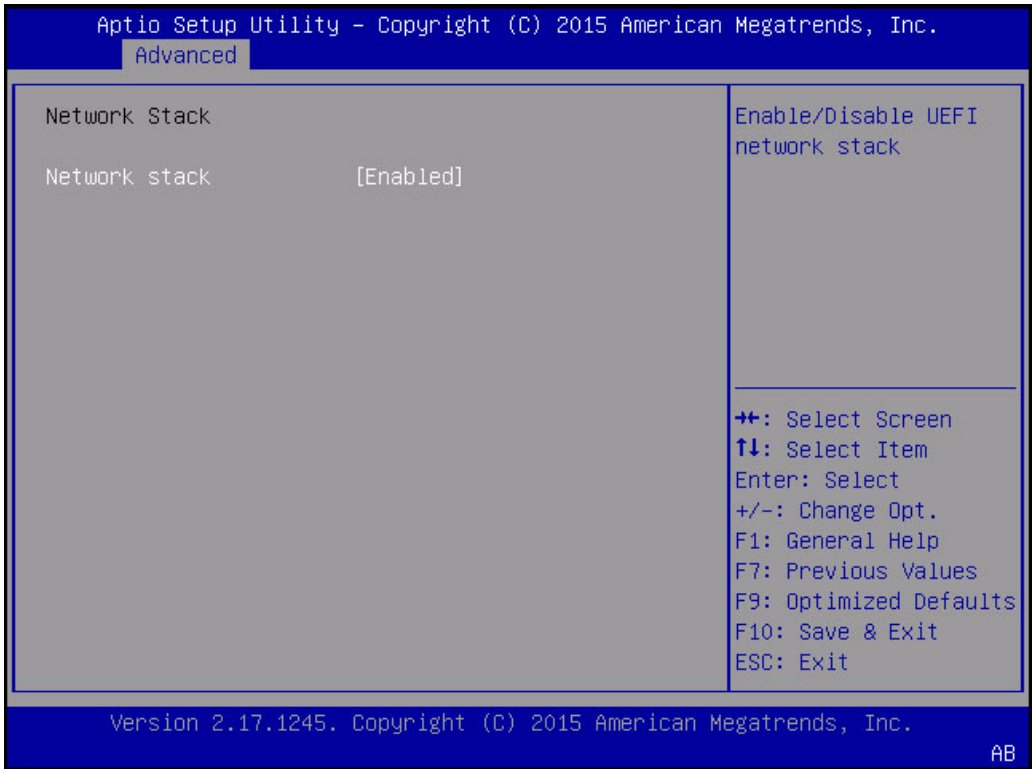

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



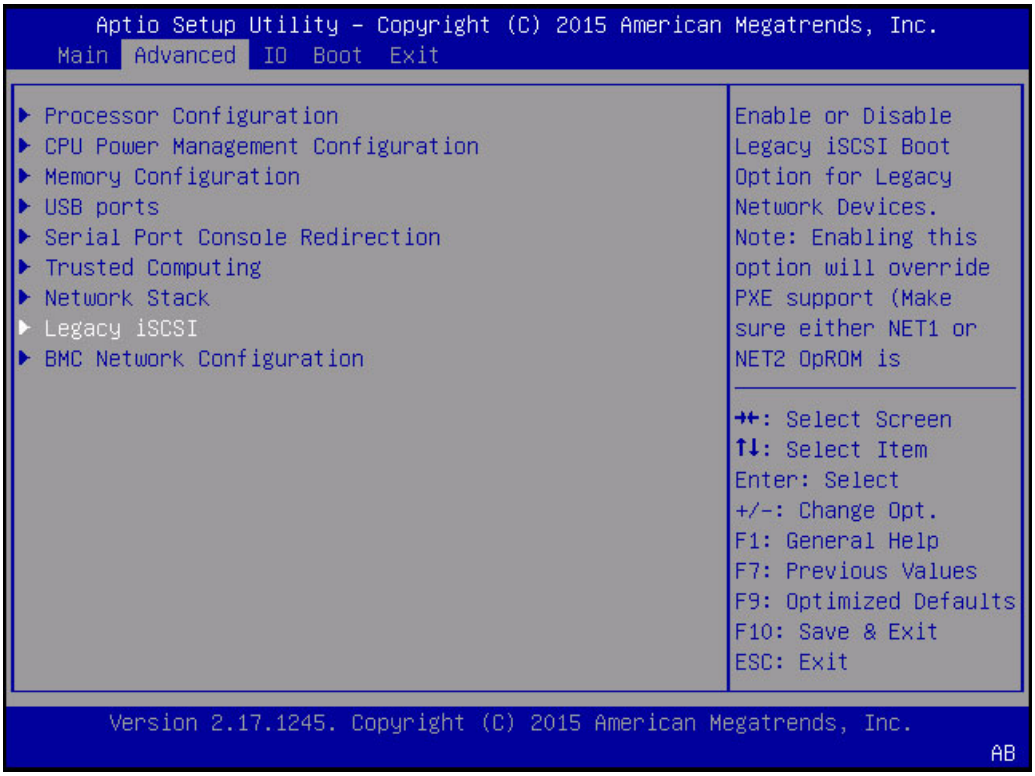

Keywords: Advanced, Trusted Computing, TPM Support, Enable, Disable



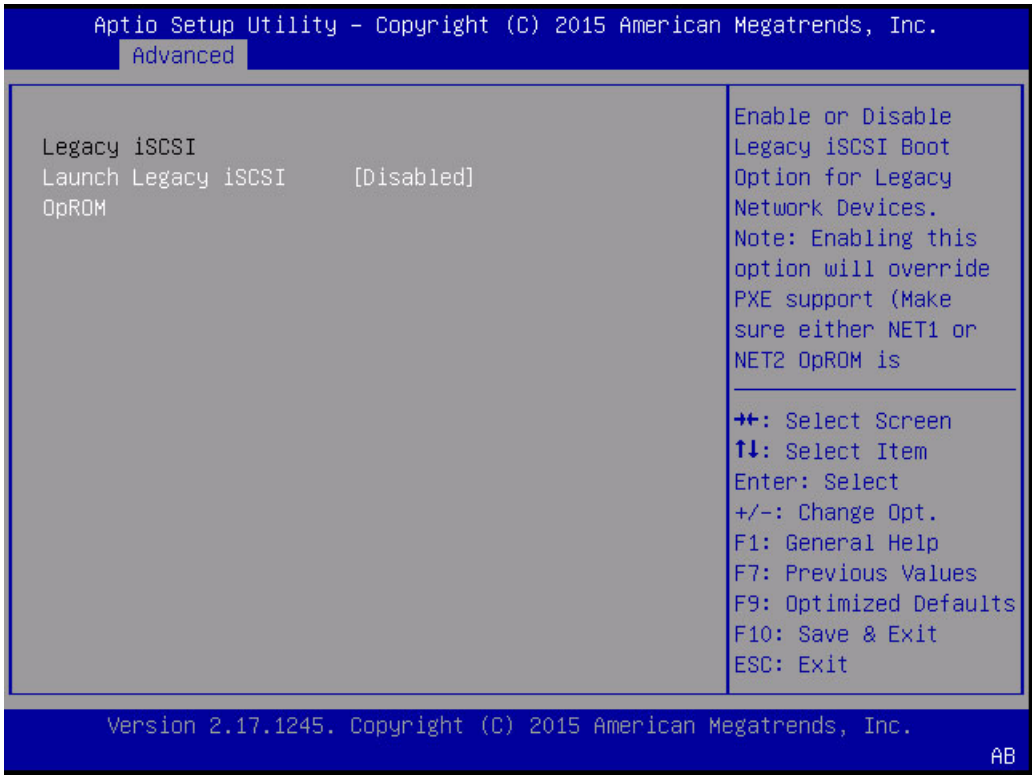

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



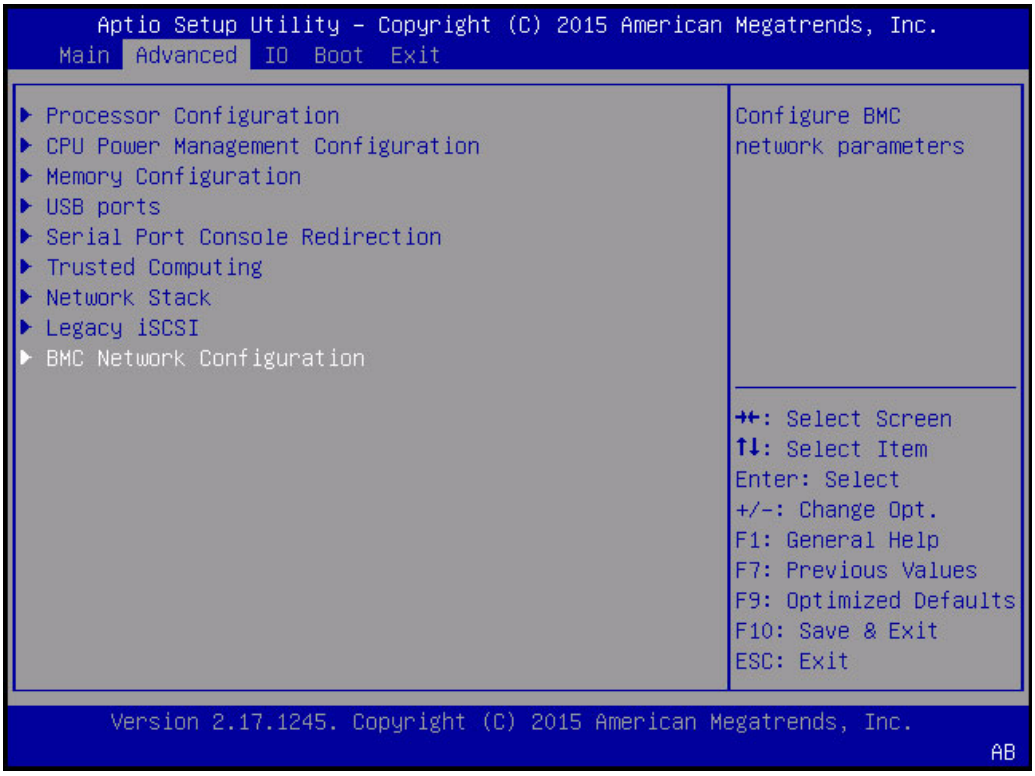

Keywords: Advanced, Network Stack



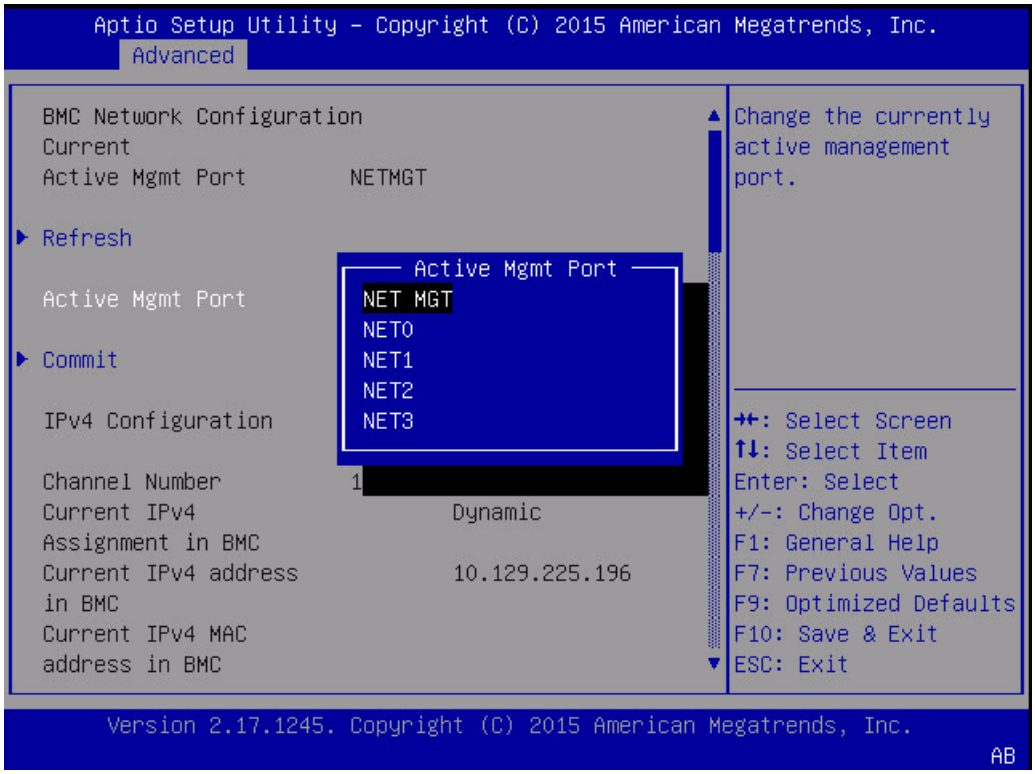

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



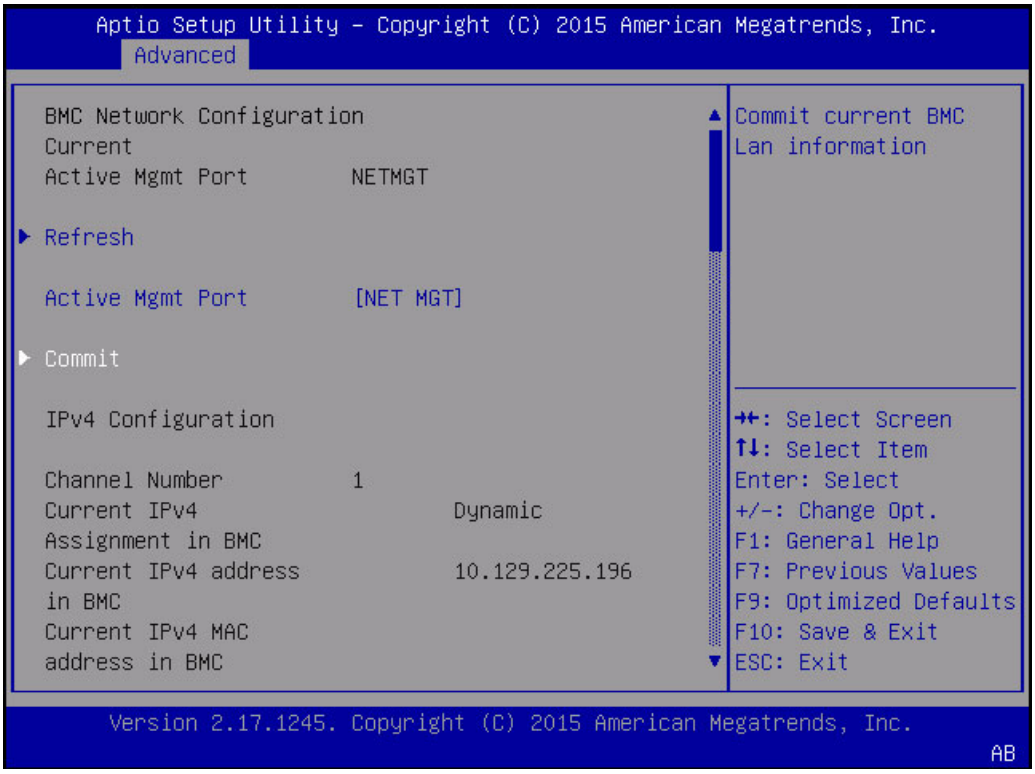

Keywords: Advanced, Legacy iSCSI, Launch Legacy iSCSI, OpROM



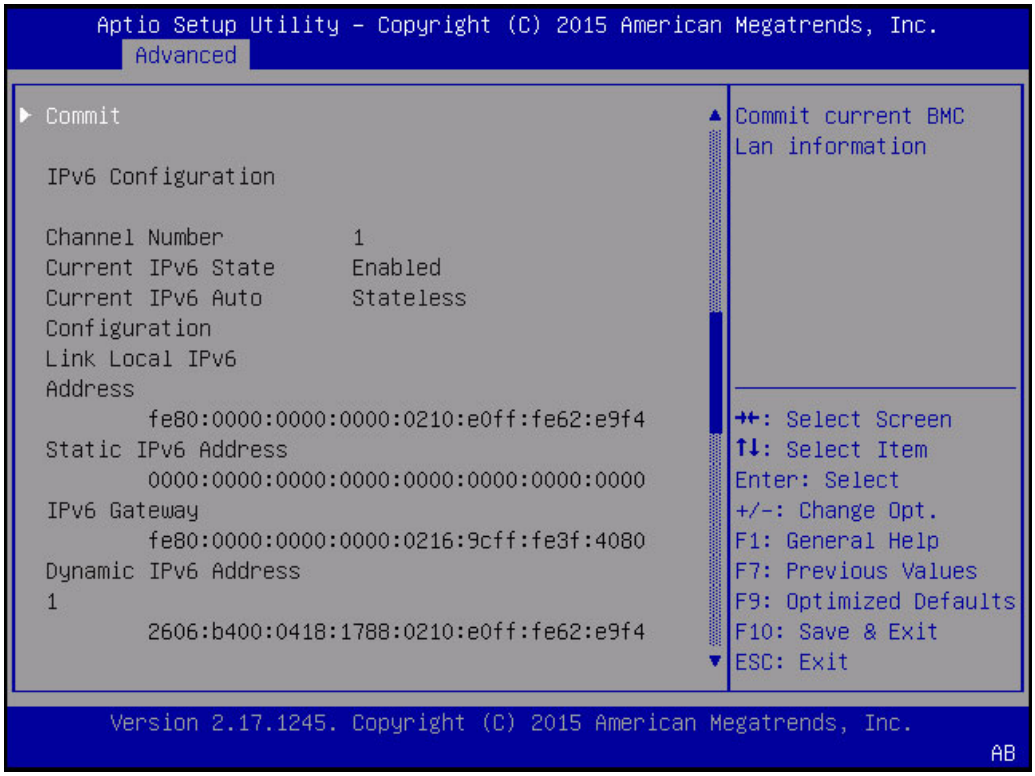

Keywords: Advanced, Processor Configuration, CPU Power Management Configuration, USB Ports, Serial Port Console Redirection, Trusted Computing, Network Stack, Legacy iSCSI, BMC Network Configuration



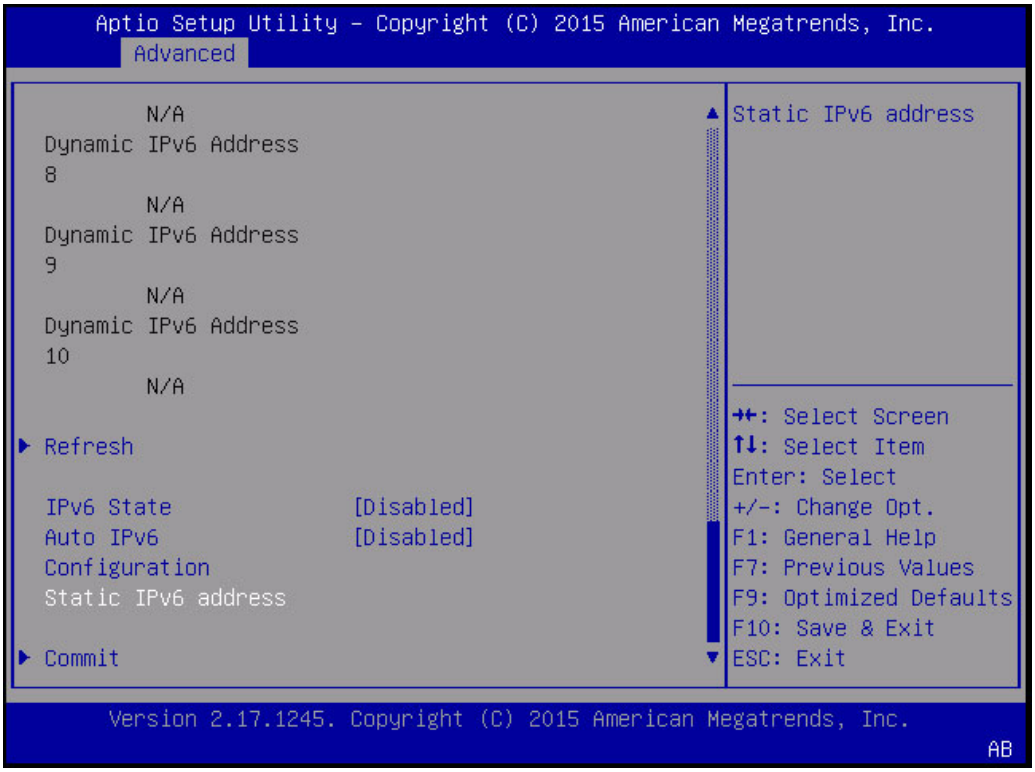

Keywords: Advanced, BMC Network Configuration, Refresh Active Mgmt Port, NET MGT, NET0, NET1, NET2, NET3




Keywords: Advanced, BMC Network Configuration, Commit IPv4 Configuration, Channel Number, Current IPv4 State, Current IPv4 Address, Current IPv4 MAC



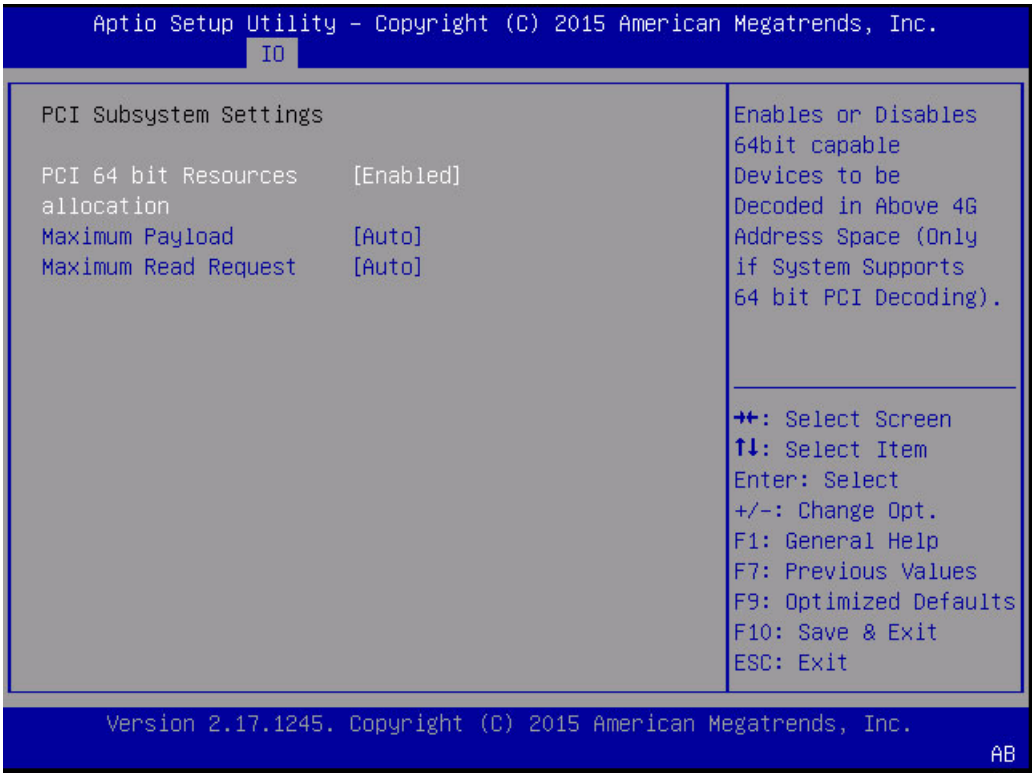

Keywords: Advanced, BMC Network Configuration, Commit IPv6 Configuration, Channel Number, Current IPv6 state, Current IPv6 Auto configuration, Link Local IPv6 Address, Static IPv6 Address, IPv6 Gateway, Dynamic IPv6 Address



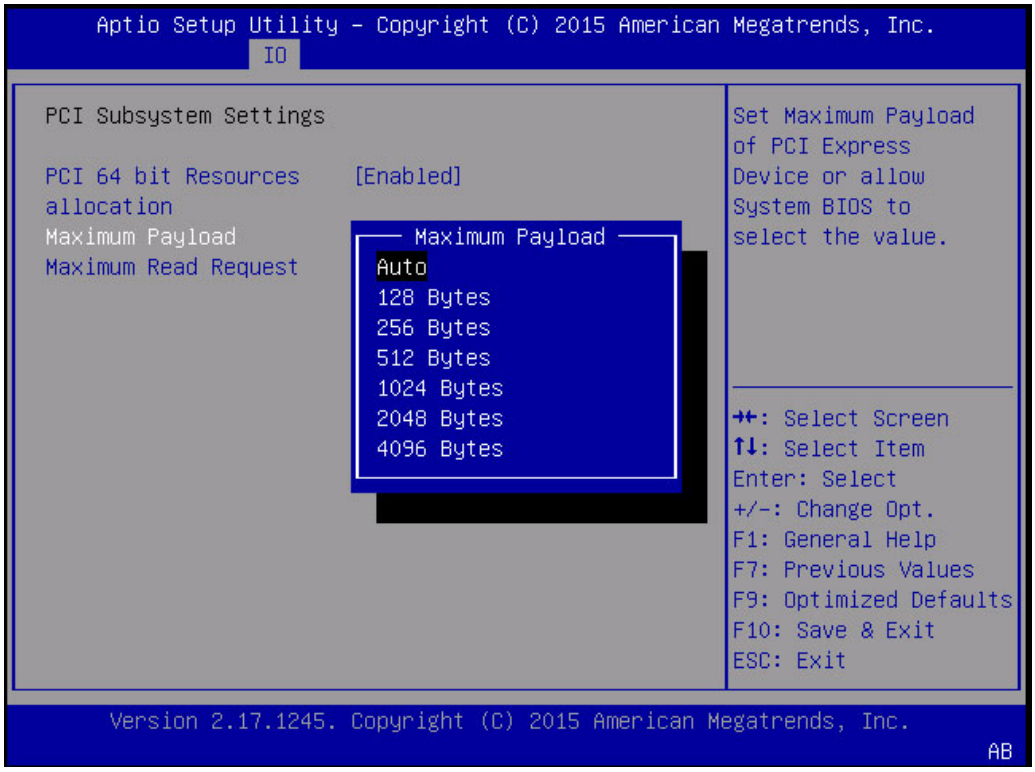

Keywords: Advanced, BMC Network Configuration, Refresh, IPv6 State, Auto IPv6 Configuration, Static IPv6 Address

## IO Screen

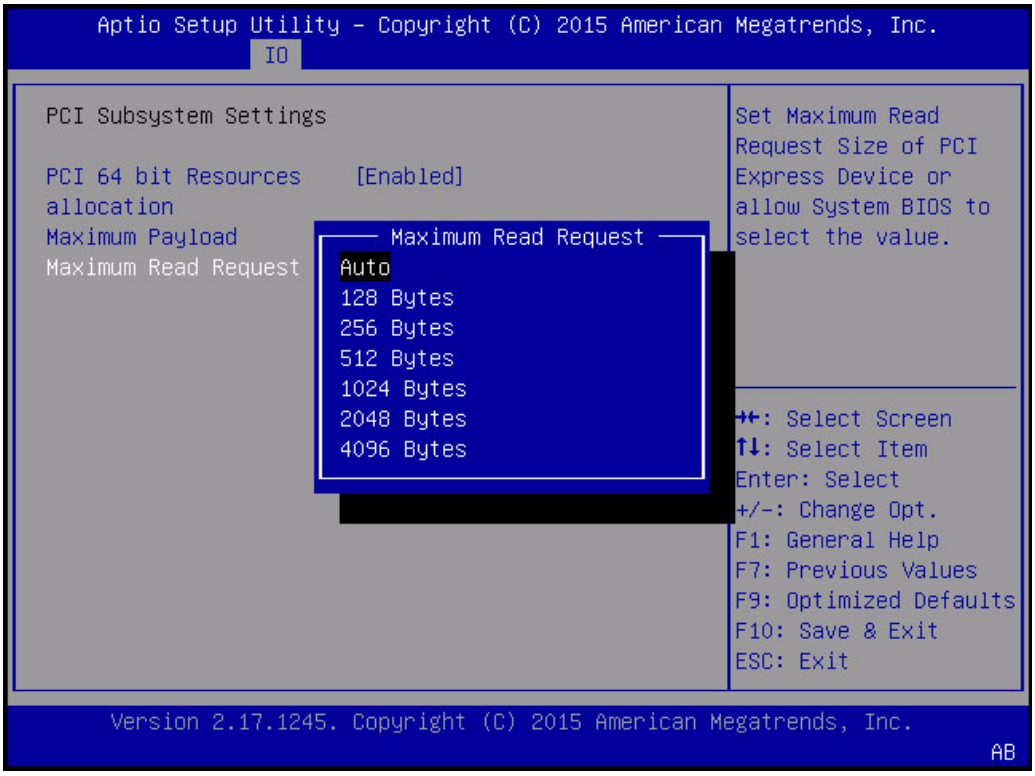

Keywords: IO, PCI Subsystem Settings, IO Virtualization, IOAT Configuration, Internal Devices, Add-In Cards



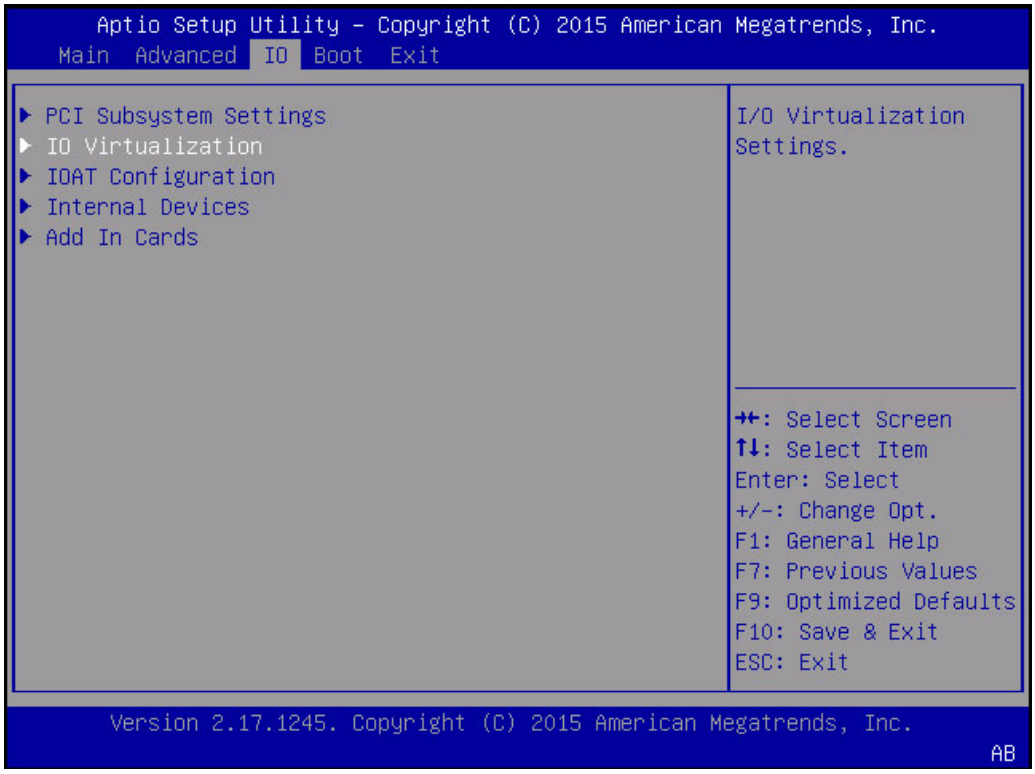

Keywords: IO, PCI Subsystem Settings,PCI 64-bit Resources allocation, Maximum Payload, Maximum Read Request



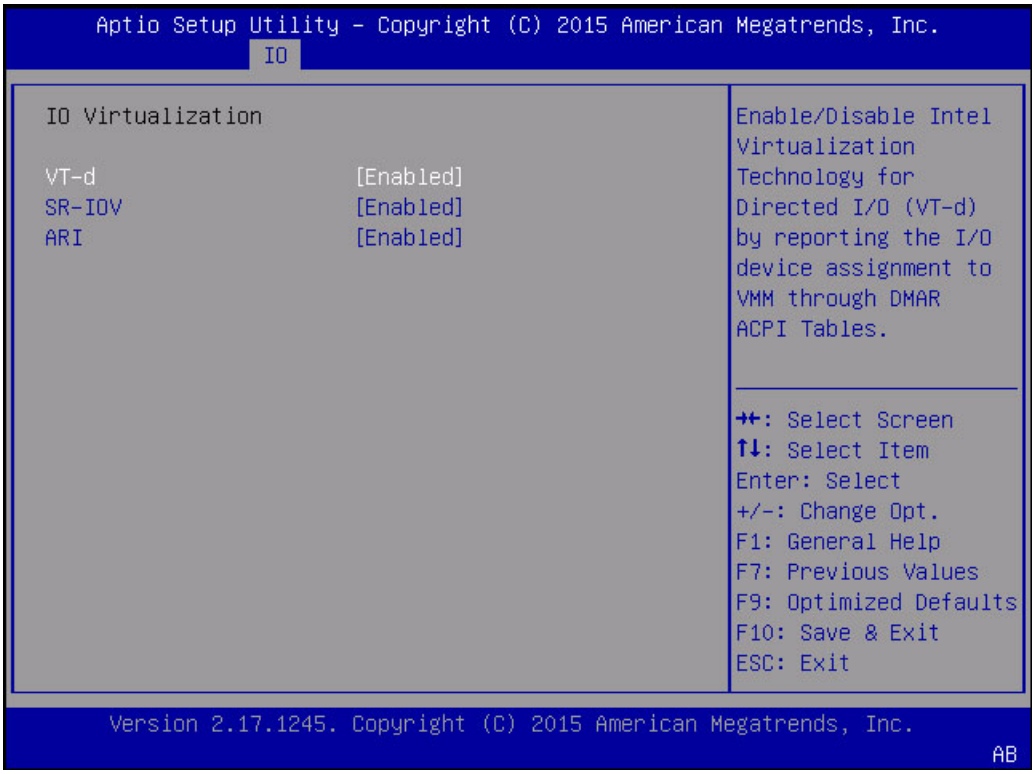

Keywords: IO, PCI Subsystem Settings,PCI 64-bit Resources allocation, Maximum Payload, Auto, 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes



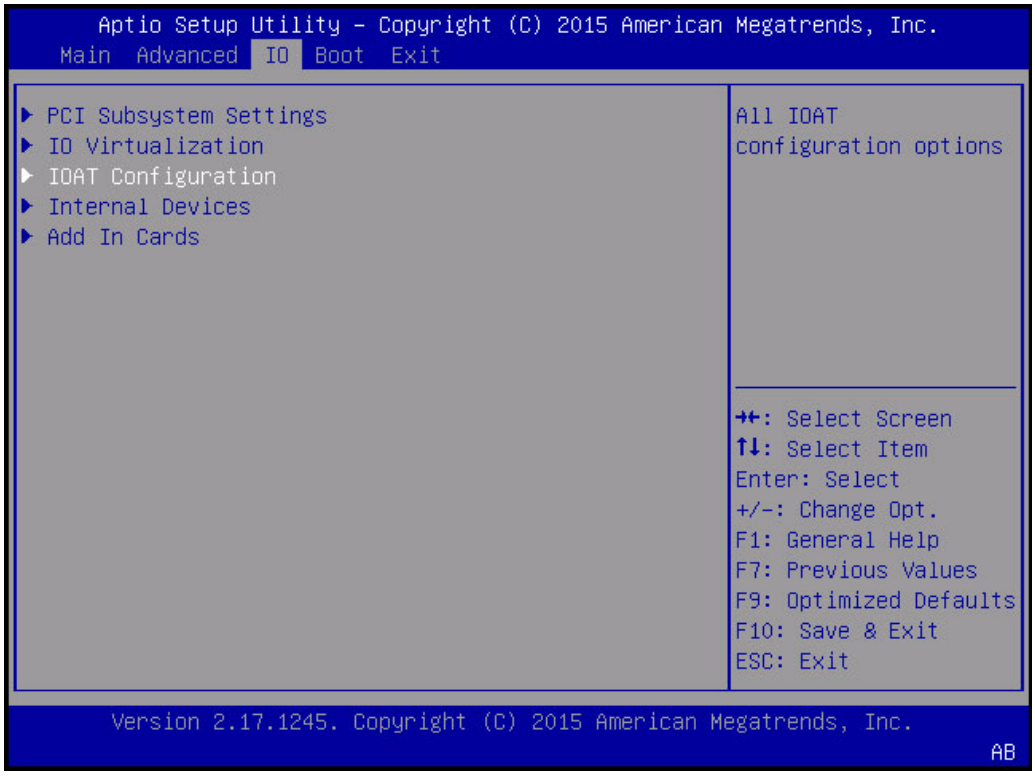

Keywords: IO, PCI Subsystem Settings,PCI 64-bit Resources allocation, Maximum Read Request, Auto, 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes



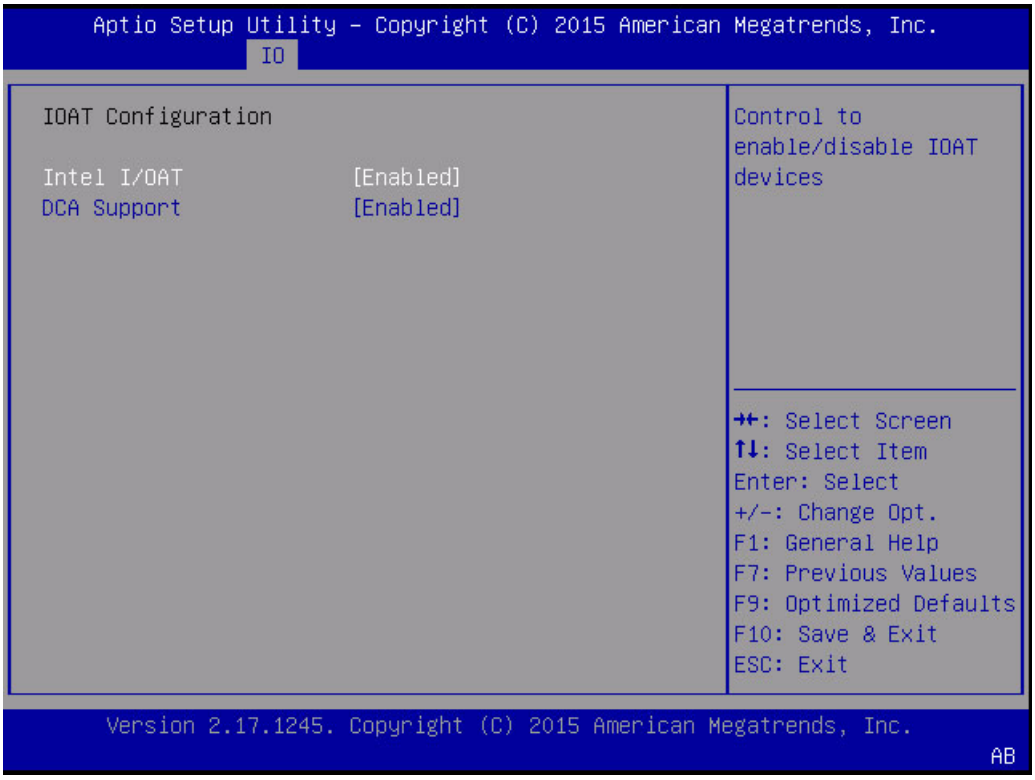

Keywords: IO, PCI Subsystem Settings, IO Virtualization, IOAT Configuration, Internal Devices, Add-In Cards



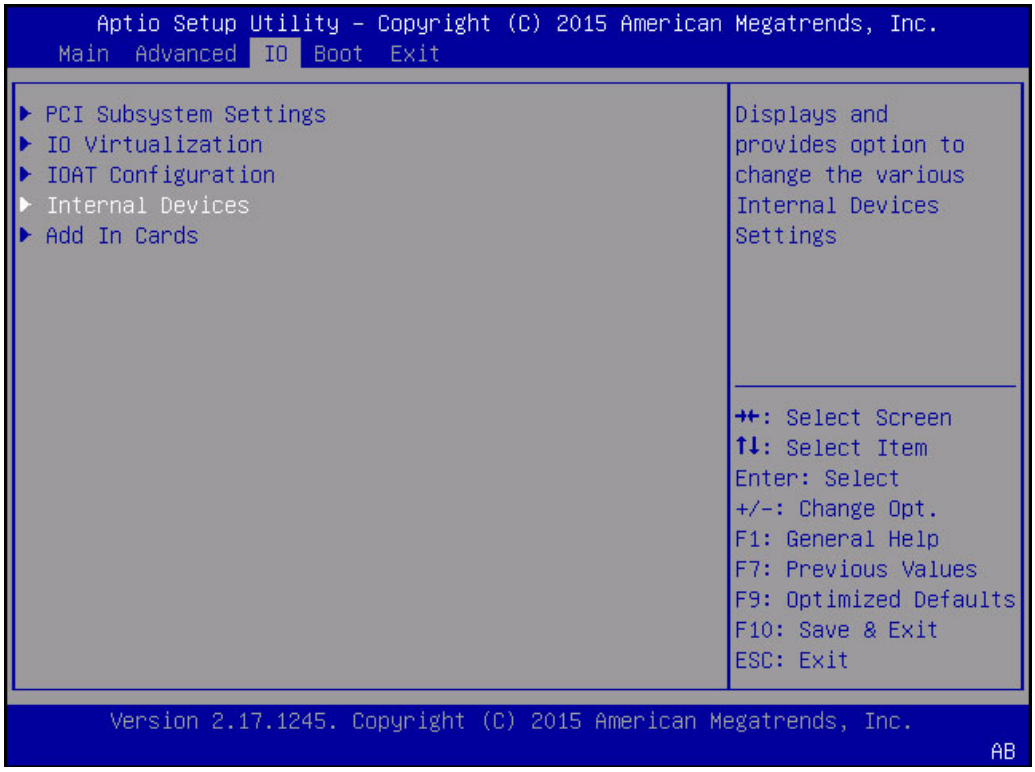

Keywords: IO, IO Virtualization, VT-d, SR-IOV, ARI



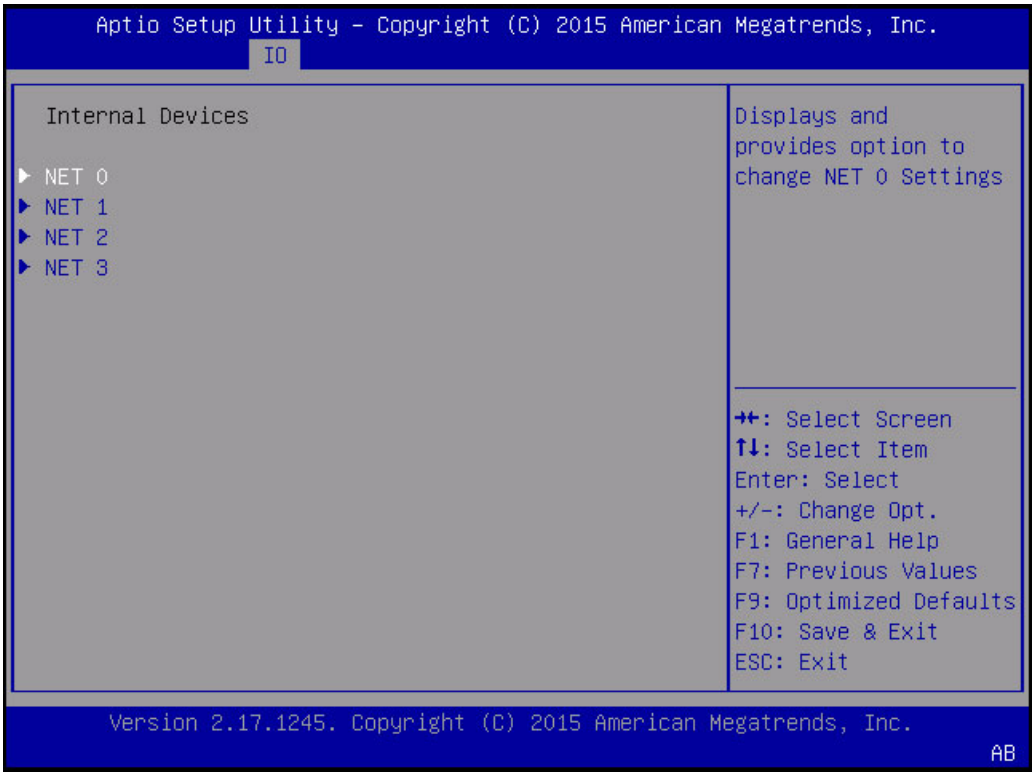

Keywords: IO, PCI Subsystem Settings, IO Virtualization, IOAT Configuration, Internal Devices, Add-In Cards



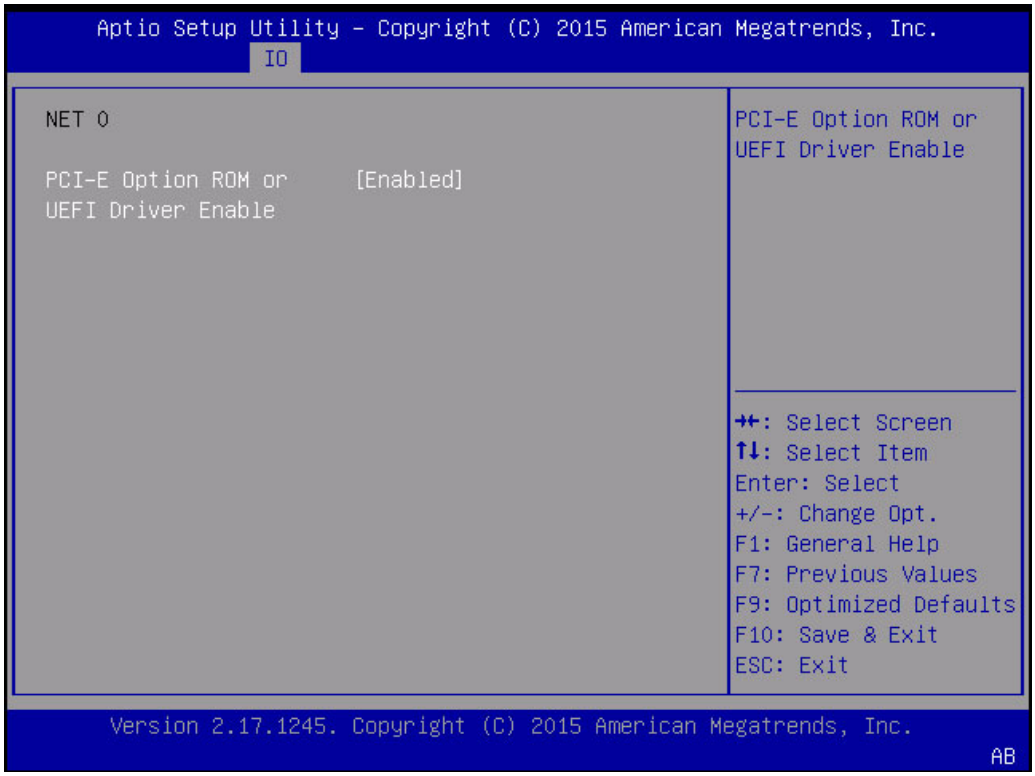

Keywords: IO, IOAT Configuration, Intel I/OAT, DCA Support



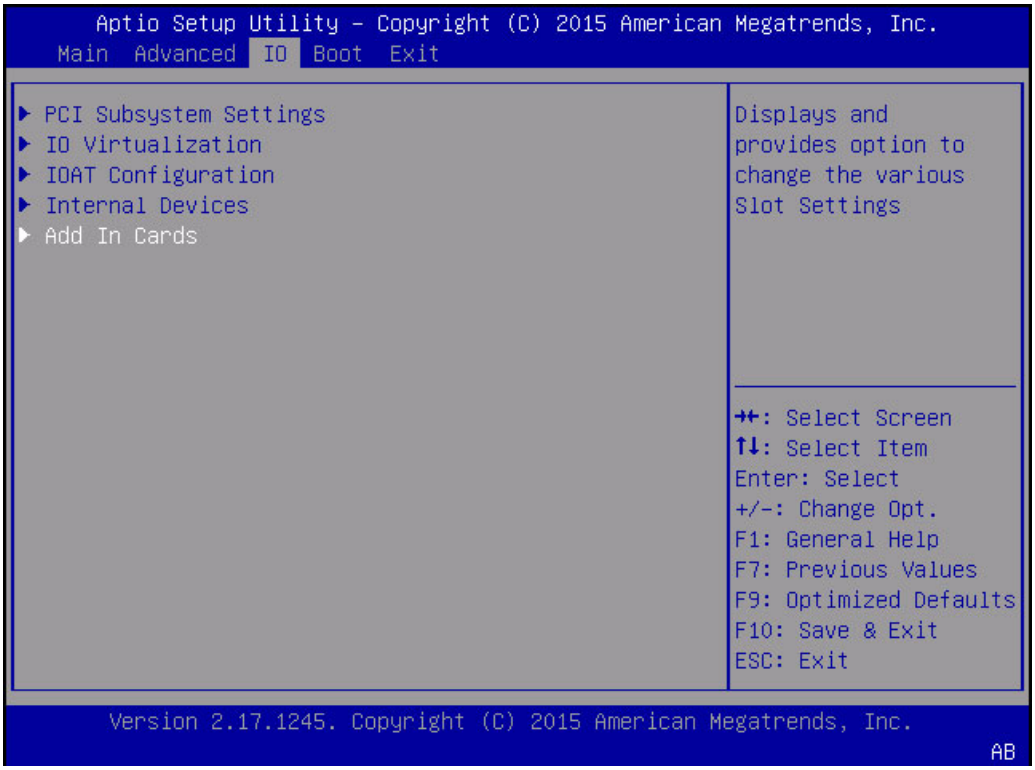

Keywords: IO, PCI Subsystem Settings, IO Virtualization, IOAT Configuration, Internal Devices, Add-In Cards



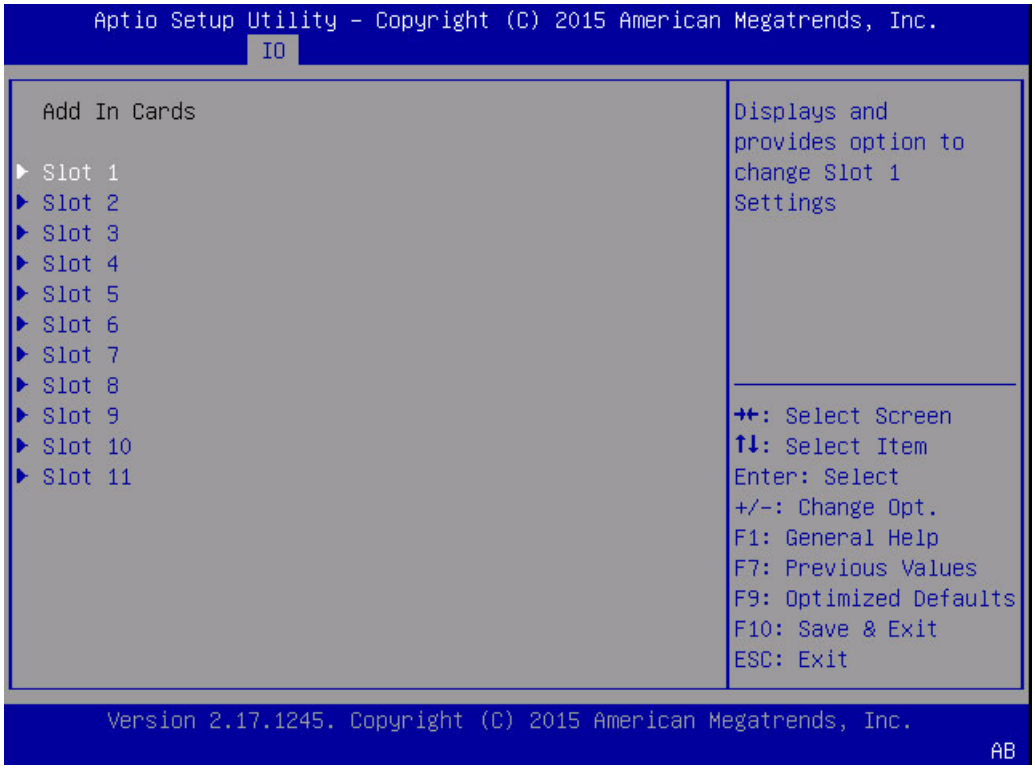

Keywords: IO, Internal Devices, Net0, Net1, Net2, Net3



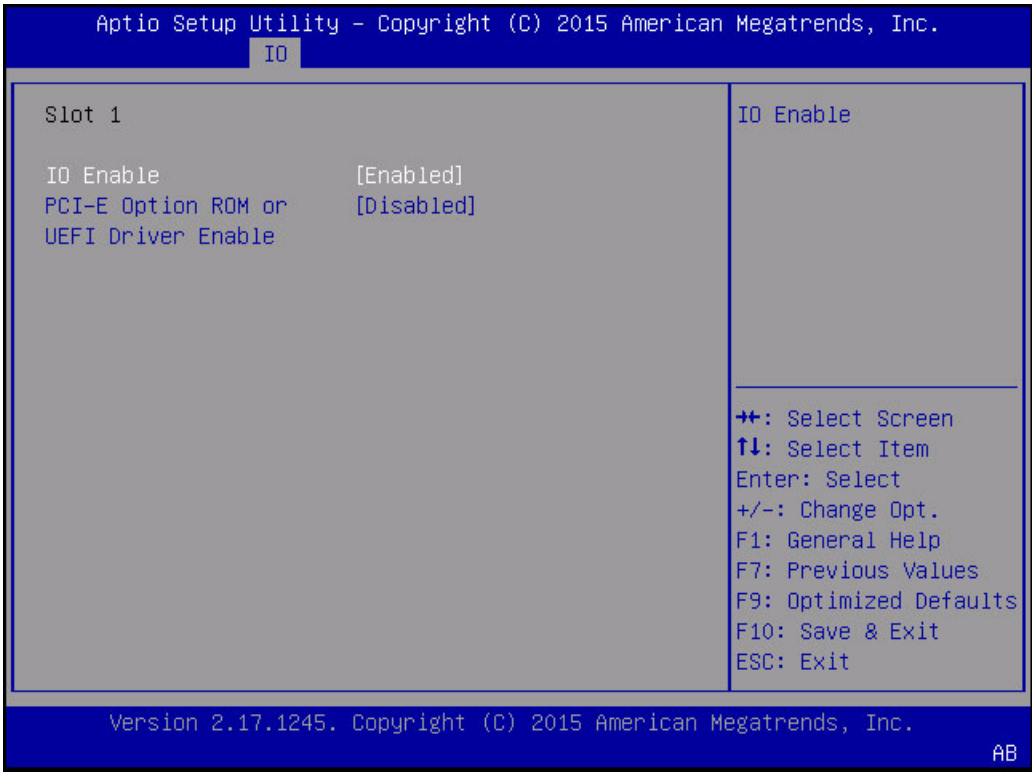

Keywords: IO, Net 0, PCIE Option ROM or UEFI Driver Enable




Keywords: IO, PCI Subsystem Settings, IO Virtualization, IOAT Configuration, Internal Devices, Add-In Cards

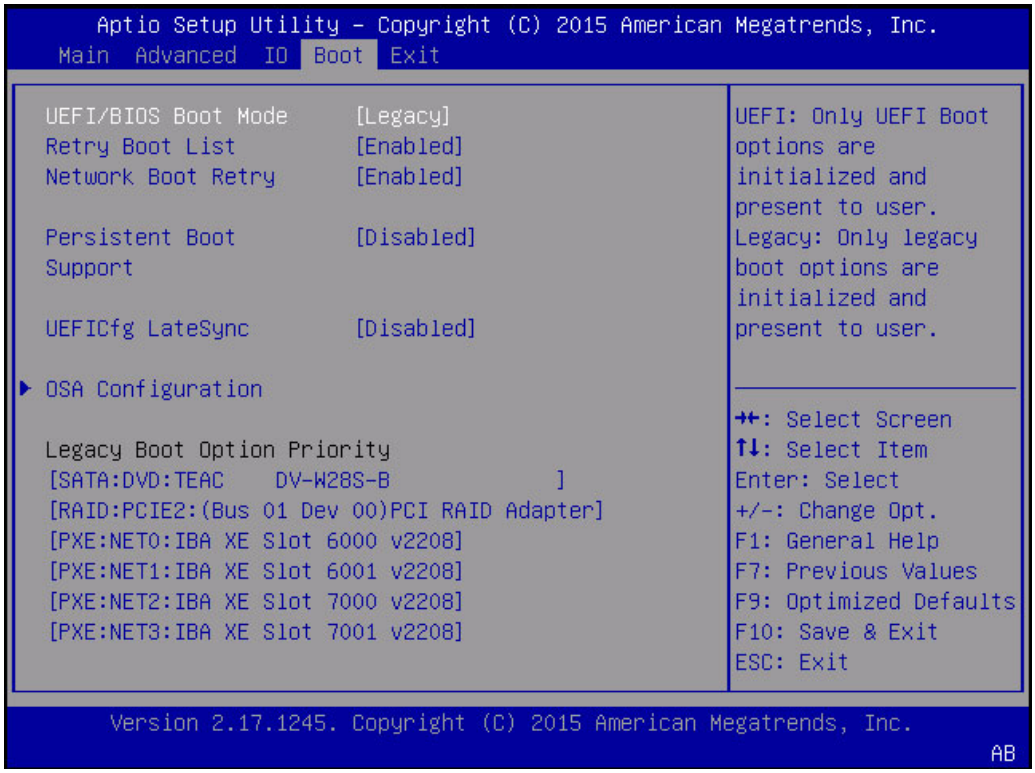



Keywords: IO, Add-In Cards, Slot 1 - Slot 11

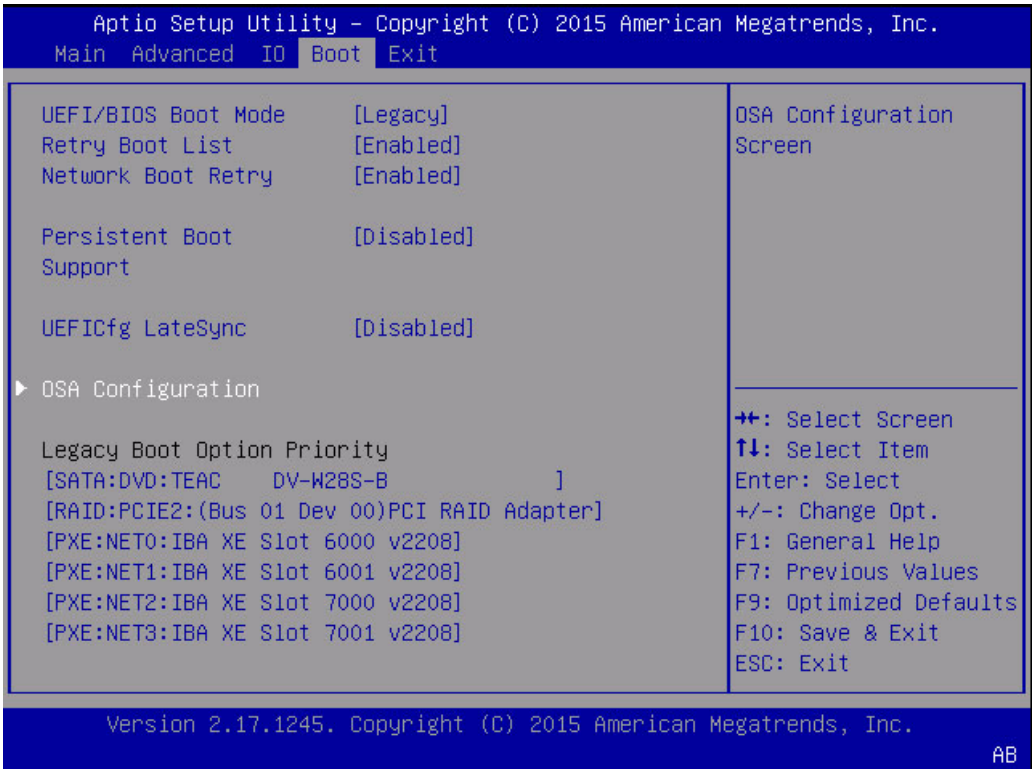



Keywords: IO, Add-In Cards, Slot 1, IO Enable, PCIE Option ROM or UEFI Driver Enable

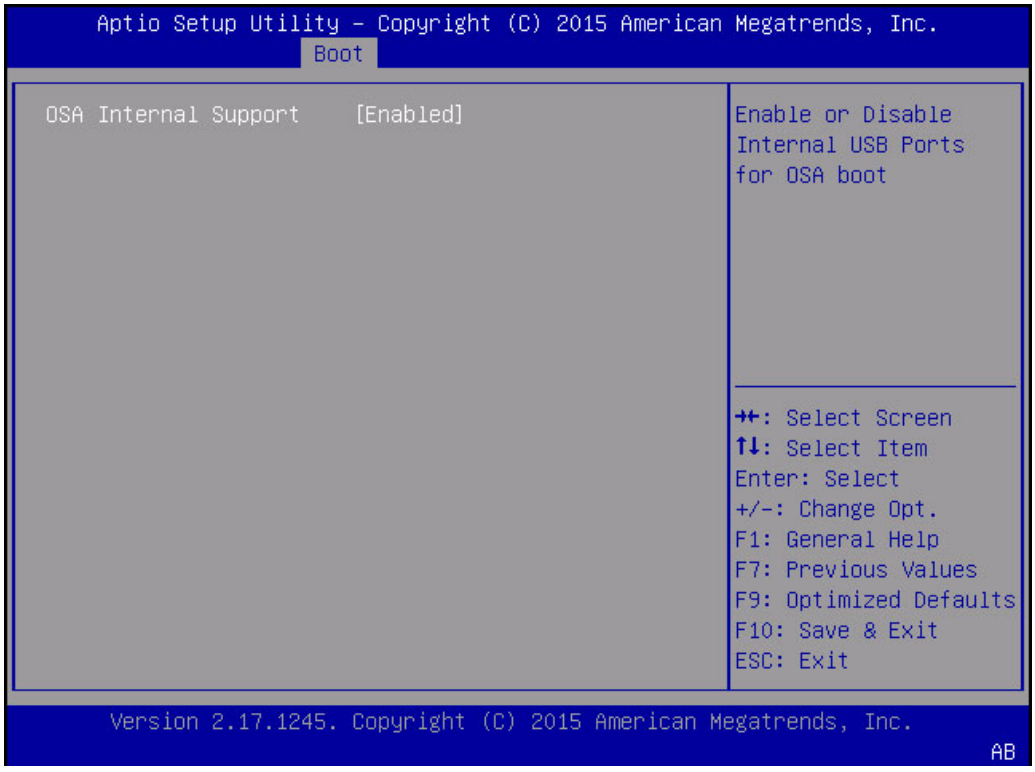
## Boot Screen (Legacy)



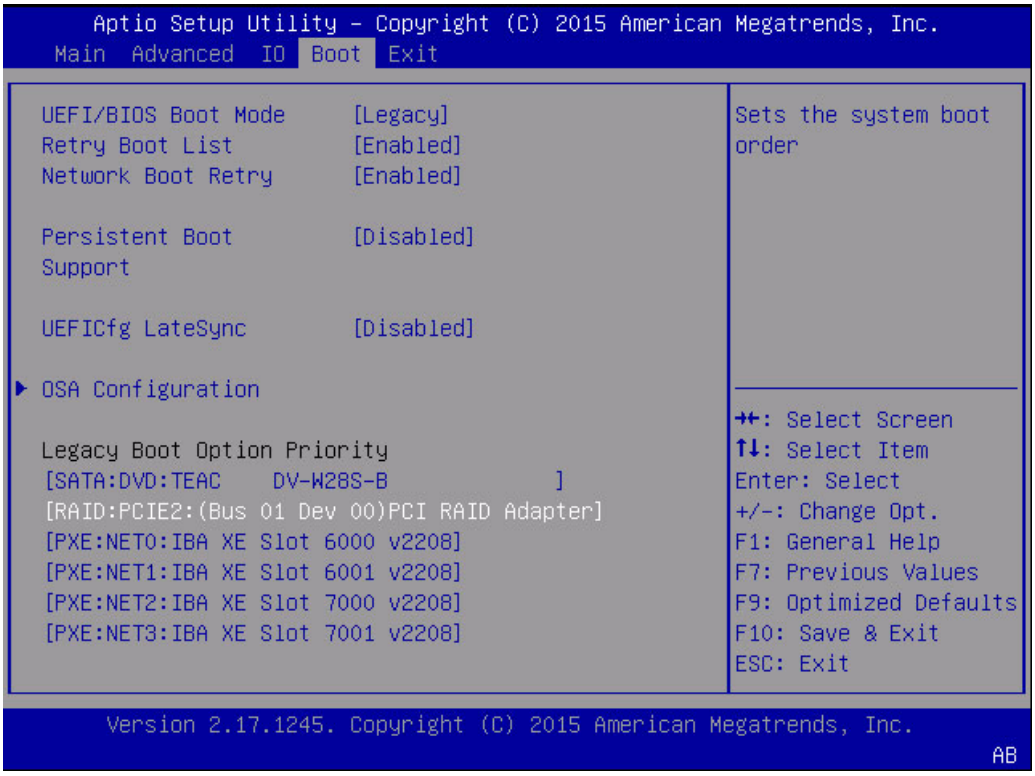

Keywords: UEFI/BIOS Boot Mode, Retry Boot List, Network Boot Retry, Persistent Boot Support, UEFICfg LateSync, OSA Configuration, Legacy Boot Option Priority



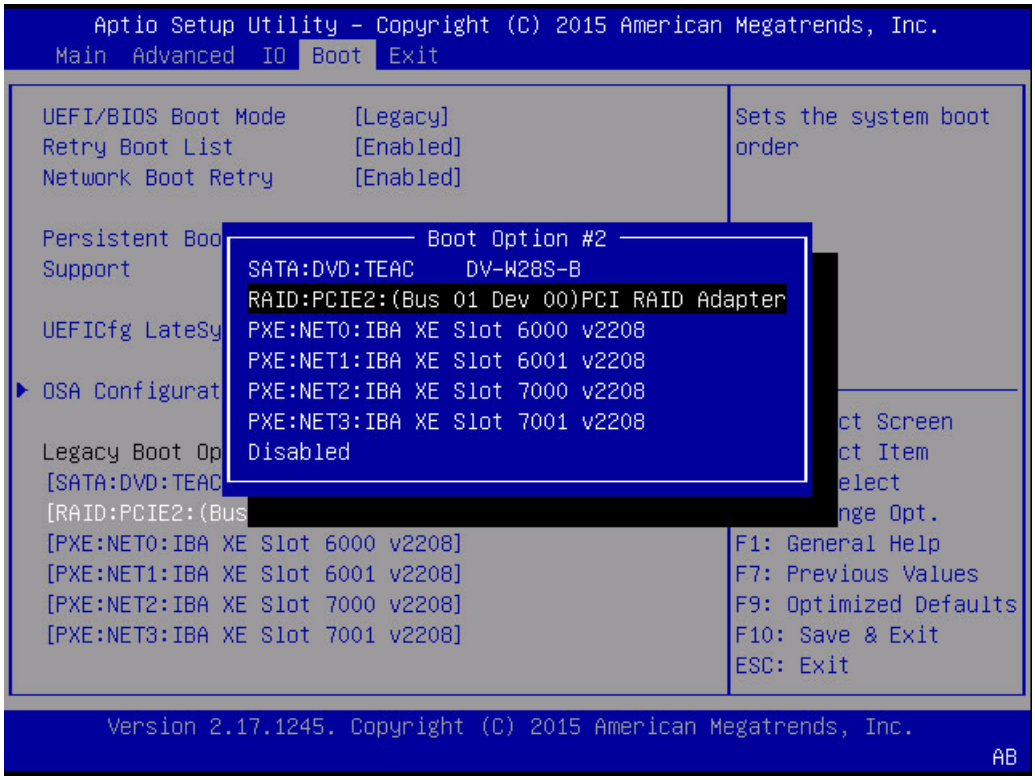

Keywords: UEFI/BIOS Boot Mode, Retry Boot List, Network Boot Retry, Persistent Boot Support, UEFICfg LateSync, OSA Configuration, Legacy Boot Option Priority




Keywords: OSA Internal Support, Disabled, Enabled




Keywords: UEFI/BIOS Boot Mode, Retry Boot List, Network Boot Retry, Persistent Boot Support, UEFICfg LateSync, OSA Configuration, Legacy Boot Option Priority

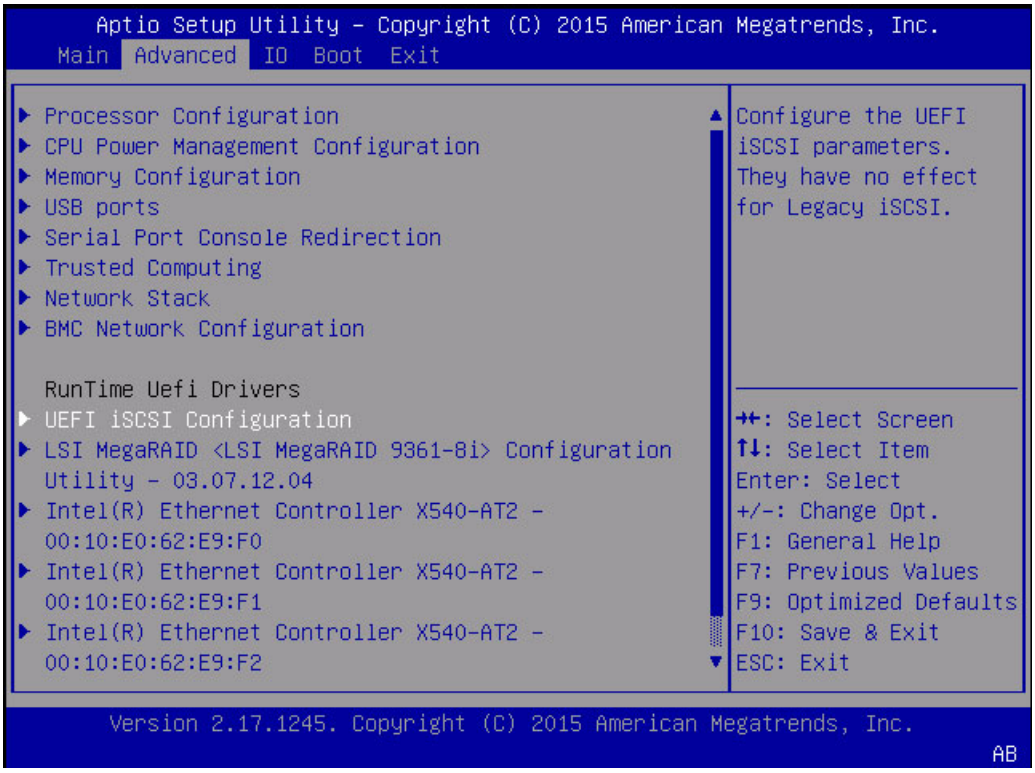



Keywords: Boot Options, SATA DVD, PCIE RAID Adapter, PXE NET0, PXE NET1, PXE NET2, PXE NET3

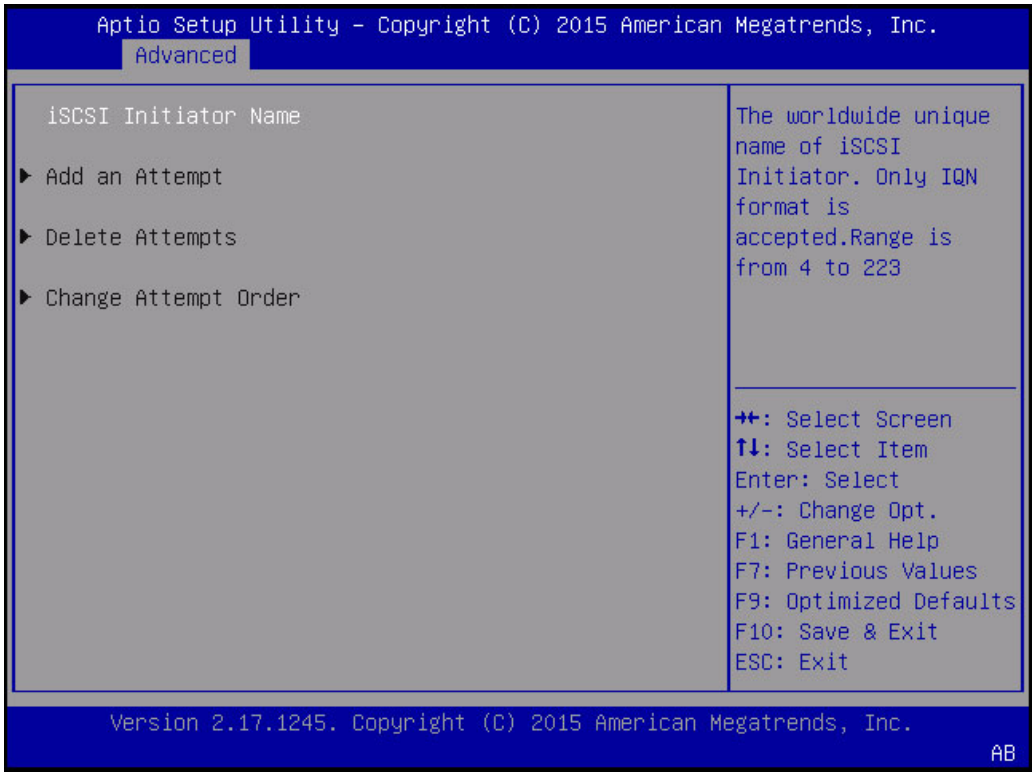
## UEFI Mode BIOS Setup Utility Screens

This section shows the BIOS screens specific to UEFI mode.

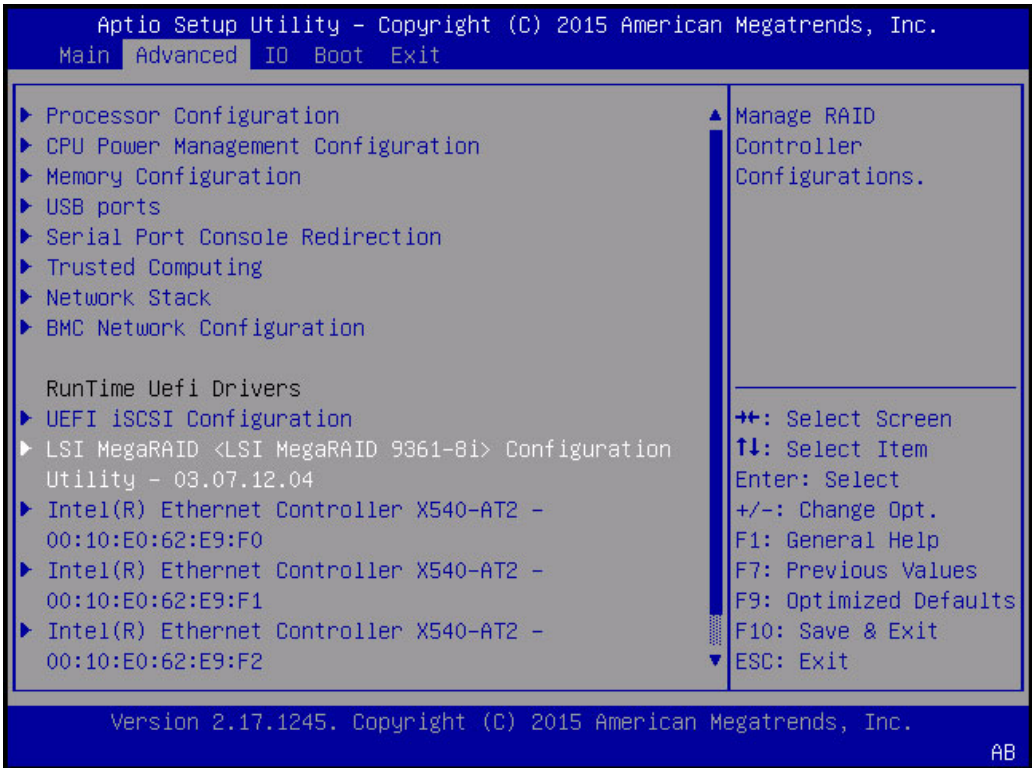
## Advanced Screen (UEFI)



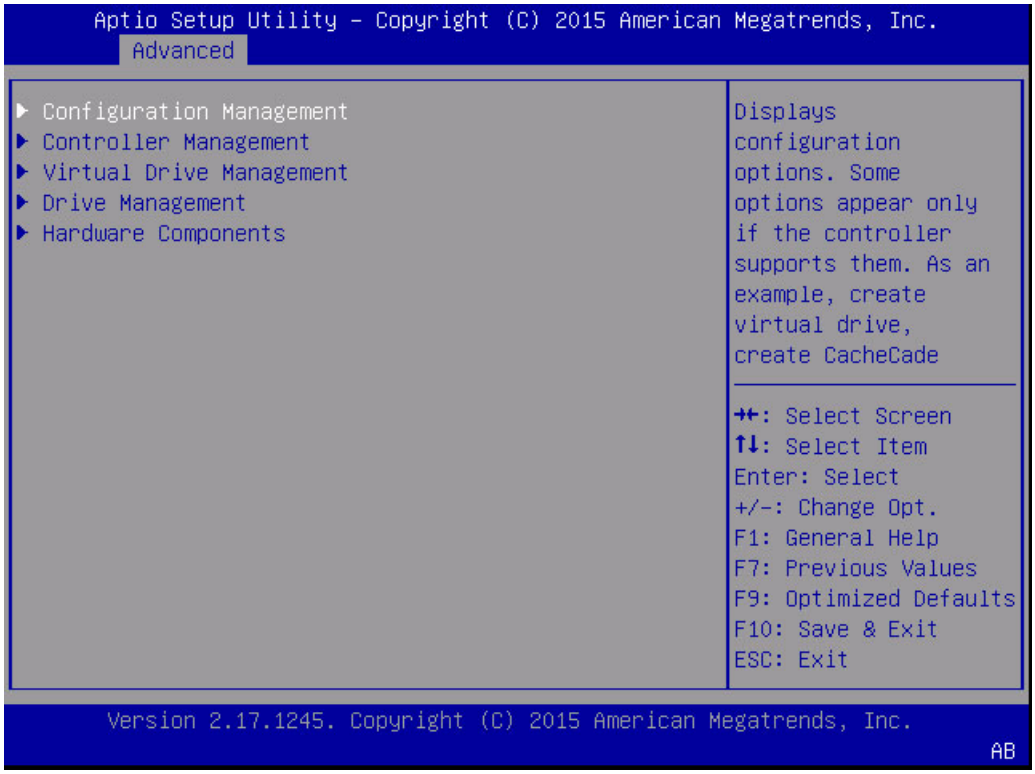

Keywords: Advanced, processor configuration, CPU power management configuration, USB ports, serial port console redirection, trusted computing, network stack, legacy iSCSI, BMC network configuration, RunTime UEFI drivers, UEFI iSCSI configuration, LSI MegaRAID Configuration, Intel Ethernet Controller




Keywords: iSCSI Initiator Name, Add an attempt, Delete attempts, Change attempt order



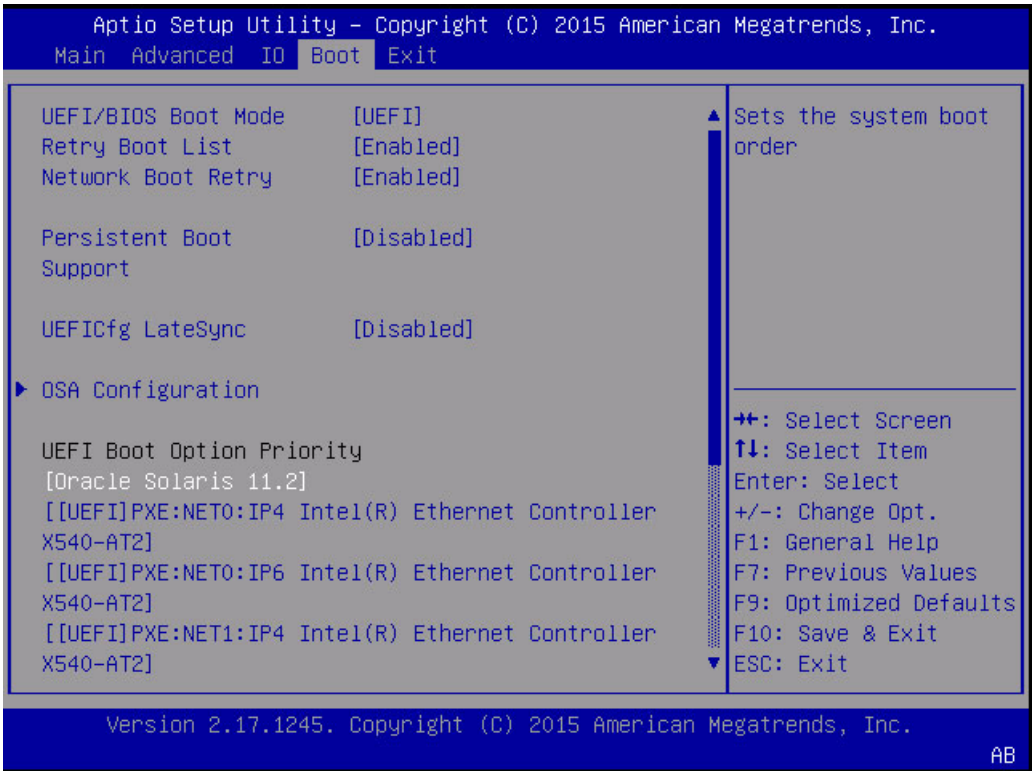

Keywords: Advanced, processor configuration, CPU power management configuration, USB ports, serial port console redirection, trusted computing, network stack, legacy iSCSI, BMC network configuration, RunTime UEFI drivers, UEFI iSCSI configuration, LSI MegaRAID Configuration, Intel Ethernet Controller




Keywords: Advanced, Configuration management, Controller management, Virtual drive management, Drive management, Hardware components

**Note -** The above configuration options, too numerous to list here, are described in the MegaRAID User's Guide. Refer to: http://www.lsi.com/sep/Pages/oracle/index.aspx

### Boot Screen (UEFI)




Keywords: UEFI/BIOS Boot Mode, Retry Boot List, Network Boot Retry, Persistent Boot Support, UEFICfg LateSync, OSA Configuration, UEFI Boot Option Priority

## ▼ Access the BIOS Setup Utility

To access the BIOS Setup Utility, complete the following steps:

1. **Power-on or power-cycle the server.**
2. **Press the F2 key while the system is performing the power-on self-test (POST).**

**Note -** If there is an error during the boot process, you can press `F1` to access the BIOS Setup Utility.

Alternatively, you can use the following hot key combinations to access the BIOS Setup Utility from a serial connection:

- F1 Control-Q
- F2 Control-E.
- F7 Control-D
- F8 Control-P
- F9 Control-O
- F10 Control-S
- F12 Control-N

The BIOS Setup Utility Main screen appears (“Main Screen (Legacy)” on page 274.

# POST and Checkpoint Codes

This section describes the server boot POST and checkpoint codes.

As the system powers on, it displays power-on self test (POST) codes that provide information about the state of the system. The codes are primarily generated by the system BIOS (exceptions are noted).

## AMI Checkpoint Ranges

| Status Code Range | Description |
|---|---|
| 0x01 - 0x0B | SEC execution (PEI). |
| 0x0C - 0x0F | SEC errors. |
| 0x10 - 0x2F | PEI execution up to and including memory detection. |
| 0x30 - 0x4F | PEI execution after memory detection. |
| 0x50 - 0x5F | PEI errors. |
| 0x60 - 0x8F | DXE execution up to BDS. |
| 0x90 - 0xCF | BDS execution. |
| 0xD0 - 0xDF | DXE errors. |
| 0xE0 - 0xE8 | S3 fesume (PEI). |
| 0xE9 - 0xEF | S3 resume errors (PEI). |
| 0xF0 - 0xF8 | Recovery (PEI). |
| 0xF9 - 0xFF | Recovery errors (PEI). |

# Standard Checkpoints - SEC Phase

| Status Code Range | Description |
|---|---|
| 0x00 | Not used. |
| 0x01 | Power on. Reset type detection (soft/hard). |
| 0x02 | AP initialization before microcode loading. |
| 0x03 | North Bridge initialization before microcode loading. |
| 0x04 | South Bridge initialization before microcode loading. |
| 0x05 | OEM initialization before microcode loading. |
| 0x06 | Microcode loading. |
| 0x07 | AP initialization after microcode loading. |
| 0x08 | North Bridge initialization after microcode loading. |
| 0x09 | South Bridge initialization after microcode loading. |
| 0x0A | OEM initialization after microcode loading. |
| 0x0B | Cache initialization. |
| 0x0C - 0x0D | Reserved for future AMI SEC error codes. |
| 0x0E | Microcode not found. |
| 0x0F | Microcode not loaded. |

# SEC Beep Codes

There are no SEC beep codes.

# PEI Phase

| Progress Codes | Description |
|---|---|
| 0x10 | PEI core is started. |
| 0x11 | Pre-memory CPU initialization is started. |
| 0x10 | PEI core is started. |
| 0x11 | Pre-memory CPU initialization is started. |
| 0x12 | Pre-memory CPU initialization (CPU module specific). |
| 0x13 | Pre-memory CPU initialization (CPU module specific). |
| 0x14 | Pre-memory CPU initialization (CPU module specific). |

| Progress Codes | Description |
|---|---|
| 0x15 | Pre-memory North Bridge initialization is started. |
| 0x16 | Pre-memory North Bridge initialization (North Bridge module specific). |
| 0x17 | Pre-memory North Bridge initialization (North Bridge module specific). |
| 0x18 | Pre-memory North Bridge initialization (North Bridge module specific). |
| 0x19 | Pre-memory South Bridge initialization is started. |
| 0x1A | Pre-memory South Bridge initialization (South Bridge module specific). |
| 0x1B | Pre-memory South Bridge initialization (South Bridge module specific). |
| 0x1C | Pre-memory South Bridge initialization (South Bridge module specific). |
| 0x1D - 0x2A | OEM pre-memory initialization codes. |
| 0x2B | Memory initialization. Serial presence detect (SPD) data reading. |
| 0x2C | Memory initialization. memory presence detection. |
| 0x2D | Memory initialization. Programming memory timing information 0x2E memory initialization. Configuring memory. |
| 0x2F | Memory initialization (other). |
| 0x30 | Reserved for ASL (see ASL Status Codes section below). |
| 0x31 | Memory installed. |
| 0x32 | CPU post-memory initialization is started. |
| 0x33 | CPU post-memory initialization. Cache initialization. |
| 0x34 | CPU post-memory initialization. Application processor(s) (AP) initialization. |
| 0x35 | CPU post-memory initialization. Boot strap processor (BSP) selection. |
| 0x36 | CPU post-memory initialization. System management mode (SMM) initialization. |
| 0x37 | Post-memory North Bridge initialization is started. |
| 0x38 | Post-memory North Bridge initialization (North Bridge module specific). |
| 0x39 | Post-memory North Bridge initialization (North Bridge module specific). |
| 0x3A | Post-memory North Bridge initialization (North Bridge module specific). |
| 0x3B | Post-memory South Bridge initialization is started. |
| 0x3C | Post-memory South Bridge initialization (South Bridge module specific). |
| 0x3D | Post-memory South Bridge initialization (South Bridge module specific). |
| 0x3E | Post-memory South Bridge initialization (South Bridge module specific). |
| 0x3F - 0x4E | OEM post memory initialization codes. |
| 0x4F | DXE IPL is started. |

# PEI Error Codes

| Codes | Description |
|---|---|
| 0x50 | Memory initialization error. Invalid memory type or incompatible memory speed. |
| 0x51 | Memory initialization error. SPD reading has failed. |
| 0x52 | Memory initialization error. Invalid memory size or memory modules do not match. |
| 0x53 | Memory initialization error. No usable memory detected. |
| 0x54 | Unspecified memory initialization error. |
| 0x55 | Memory not installed. |
| 0x56 | Invalid CPU type or speed. |
| 0x57 | CPU mismatch. |
| 0x58 | CPU self test failed or possible CPU cache error. |
| 0x59 | CPU micro-code is not found or micro-code update is failed. |
| 0x5A | Internal CPU error. |
| 0x5B | Reset PPI is not available. |
| 0x5C-0x5F | Reserved for future AMI error codes. |

# S3 Resume Progress Codes

| Codes | Description |
|---|---|
| 0xE0 | S3 resume is started (S3 resume PPI is called by the DXE IPL). |
| 0xE1 | S3 boot script execution. |
| 0xE2 | Video repost. |
| 0xE3 | OS S3 wake vector call. |
| 0xE4 - 0xE7 | Reserved for future AMI progress codes. |
| 0x00E0 | S3 Resume is stared (S3 Resume PPI is called by the DXE IPL). |

# S3 Resume Error Codes

| Codes | Description |
|---|---|
| 0xE8 | S3 resume failed. |
| 0xE9 | S3 resume PPI not Found. |
| 0xEA | S3 resume Boot Script Error. |

| Codes | Description |
|---|---|
| 0xEB | S3 OS wake error. |
| 0xEC - 0xEF | Reserved for future AMI error codes. |

# Recovery Progress Codes

| Codes | Description |
|---|---|
| 0xF0 | Recovery condition triggered by firmware (Auto recovery). |
| 0xF1 | Recovery condition triggered by user (Forced recovery). |
| 0xF2 | Recovery process started. |
| 0xF3 | Recovery firmware image is found. |
| 0xF4 | Recovery firmware image is loaded. |
| 0xF5 - 0xF7 | Reserved for future AMI progress codes. |

# Recovery Error Codes

| Codes | Description |
|---|---|
| 0xF8 | Recovery PPI is not available. |
| 0xF9 | Recovery capsule is not found. |
| 0xFA | Invalid recovery capsule. |
| 0xFB – 0xFF | Reserved for future AMI error codes. |

# PEI Beep Codes

| Number of Beeps | Description |
|---|---|
| 1 | Memory not Installed. |
| 1 | Memory was installed twice (InstallPeiMemory routine in PEI Core called twice). |
| 2 | Recovery started. |
| 3 | DXEIPL was not found. |
| 3 | DXE core firmware volume was not found. |
| 4 | Recovery failed. |
| 4 | S3 resume failed. |

| Number of Beeps | Description |
|---|---|
| 7 | Reset PPI is not available. |

# DXE Phase DXE Status Codes

| Codes | Description |
|---|---|
| 0x60 | DXE core is started. |
| 0x61 | NVRAM initialization. |
| 0x62 | Installation of the South Bridge runtime services. |
| 0x63 | CPU DXE initialization is started. |
| 0x64 | CPU DXE initialization (CPU module specific). |
| 0x65 | CPU DXE initialization (CPU module specific). |
| 0x66 | CPU DXE initialization (CPU module specific). |
| 0x67 | CPU DXE initialization (CPU module specific). |
| 0x68 | PCI host bridge initialization. |
| 0x69 | North Bridge DXE initialization is started. |
| 0x6A | North Bridge DXE SMM initialization is started. |
| 0x6B | North Bridge DXE initialization (North Bridge module specific). |
| 0x6C | North Bridge DXE initialization (North Bridge module specific). |
| 0x6D | North Bridge DXE initialization (North Bridge module specific). |
| 0x6E | North Bridge DXE initialization (North Bridge module specific). |
| 0x6F | North Bridge DXE initialization (North Bridge module specific). |
| 0x70 | South Bridge DXE initialization is started. |
| 0x71 | South Bridge DXE SMM initialization is started. |
| 0x72 | South Bridge devices initialization. |
| 0x73 | South Bridge DXE initialization (South Bridge module specific). |
| 0x74 | South Bridge DXE initialization (South Bridge module specific). |
| 0x75 | South Bridge DXE initialization (South Bridge module specific). |
| 0x76 | South Bridge DXE initialization (South Bridge module specific). |
| 0x77 | South Bridge DXE initialization (South Bridge module specific). |
| 0x78 | ACPI module initialization. |
| 0x79 | CSM initialization. |
| 0x7A – 0x7F | Reserved for future AMI DXE codes. |
| 0x80 – 0x8F | OEM DXE initialization codes. |
| 0x90 | Boot device selection (BDS) phase is started. |

| Codes | Description |
|---|---|
| 0x91 | Driver connecting is started. |
| 0x92 | PCI Bus initialization is started. |
| 0x93 | PCI bus hot plug controller initialization. |
| 0x94 | PCI bus enumeration. |
| 0x95 | PCI bus request resources. |
| 0x96 | PCI bus assign resources. |
| 0x97 | Console output devices connect. |
| 0x98 | Console input devices connect. |
| 0x99 | Super IO initialization. |
| 0x9A | USB initialization is started. |
| 0x9B | USB reset. |
| 0x9C | USB detect. |
| 0x9D | USB enable. |
| 0x9E – 0x9F | Reserved for future AMI codes. |
| 0xA0 | IDE initialization is started. |
| 0xA1 | IDE reset. |
| 0xA2 | IDE detect. |
| 0xA3 | IDE enable. |
| 0xA4 | SCSI initialization is started. |
| 0xA5 | SCSI reset. |
| 0xA6 | SCSI detect. |
| 0xA7 | SCSI enable. |
| 0xA8 | Setup verifying password. |
| 0xA9 | Start of Setup. |
| 0xAA | Reserved for ASL (see ASL tatus Codes section below). |
| 0xAB | Setup input wait 0xAC reserved for ASL (see ASL Status Codes section below). |
| 0xAD | Ready to boot event. |
| 0xAE | Legacy boot event. |
| 0xAF | Exit boot services event. |
| 0xB0 | ■ AMI: Runtime set virtual address MAP begin.<br>■ Intel: STS_DIMM_DETECT |
| 0xB1 | ■ AMI: Runtime set virtual address MAP end<br>■ Intel: STS_CLOCK_INIT |
| 0xB2 | ■ Legacy option ROM initialization.<br>■ Intel: STS_SPD_DATA |
| 0xB3 | ■ System reset.<br>■ Intel: STS_GLOBAL_EARLY |

| Codes | Description |
|---|---|
| 0xB4 | ■ USB hot plug.<br>■ Intel: STS_RNK_DETECT |
| 0xB5 | ■ PCI bus hot plug.<br>■ Intel: STS_CHANNEL_EARLY |
| 0xB6 | ■ Clean-up of NVRAM.<br>■ Intel: STS_JEDEC_INIT |
| 0xB7 | ■ Configuration reset (reset of NVRAM settings).<br>■ Intel: STS_CHANNEL_TRAINING |
| 0xB8 – 0xBF | Reserved for future AMI codes. |
| 0x00B8 | ■ Reserved for future AMI code.<br>■ Intel: STS_INIT_THROTTLING |
| 0x00B9 | ■ Reserved for future AMI code.<br>■ Intel: Memory BIST (Built In Self Test). |
| 0x00BA | ■ Reserved for future AMI code.<br>■ Intel Memory initialization. |
| 0x00BB | ■ Reserved for future AMI code.<br>■ Intel: DDR memory Map |
| 0x00BC | ■ Reserved for future AMI code.<br>■ Intel: RAS Configuration. |
| 0x00BD | Reserved for future AMI code. |
| 0x00BE | Reserved for future AMI code. |
| 0x00BF | ■ Reserved for future AMI code.<br>■ Intel: MRC done. |
| 0xC0 – 0xCF | OEM BDS initialization codes. |

# DXE Error Codes

| Codes | Description |
|---|---|
| 0xD0 | CPU initialization error. |
| 0xD1 | North Bridge initialization error. |
| 0xD2 | South Bridge initialization error. |
| 0xD3 | Some of the architectural protocols are not available. |
| 0xD4 | PCI resource allocation error. Out of resources. |
| 0xD5 | No space for legacy option ROM. |
| 0xD6 | No console output devices are found. |
| 0xD7 | No console input devices are found. |

| Codes | Description |
|---|---|
| 0xD8 | Invalid password. |
| 0xD9 | Error loading boot option (LoadImage returned error). |
| 0xDA | Boot Option is failed (StartImage returned error). |
| 0xDB | Flash update is failed. |
| 0xDC | Reset protocol is not available. |

# DXE Beep Codes

| Number of Beeps | Description |
|---|---|
| 1 | Invalid password. |
| 4 | Some of the architectural protocols are not available. |
| 5 | No console output devices are found. |
| 5 | No console Input devices are found. |
| 6 | Flash update failed |
| 7 | Reset protocol is not available. |
| 8 | Platform PCI resource requirements cannot be met. |

# ACPI/ASL Checkpoints

| Codes | Description |
|---|---|
| 0x01 | System is entering S1 sleep state. |
| 0x02 | System is entering S2 sleep state. |
| 0x03 | System is entering S3 sleep state. |
| 0x04 | System is entering S4 sleep state. |
| 0x05 | System is entering S5 sleep state. |
| 0x10 | System is waking up from the S1 sleep state. |
| 0x20 | System is waking up from the S2 sleep state. |
| 0x30 | System is waking up from the S3 sleep state. |
| 0x40 | System is waking up from the S4 sleep state. |
| 0xAC | System has transitioned into ACPI mode. Interrupt controller is in PIC mode. |
| 0xAA | System has transitioned into ACPI mode. Interrupt controller is in APIC mode. |

# OEM-Reserved Checkpoint Ranges

| Codes | Description |
|---|---|
| 0x05 | OEM SEC initialization before microcode loading. |
| 0x0A | OEM SEC initialization after microcode loading. |
| 0x1D – 0x2A | OEM pre-memory initialization codes. |
| 0x3F – 0x4E | OEM PEI post memory initialization codes. |
| 0x80 – 0x8F | OEM DXE initialization codes. |
| 0xC0 – 0xCF | OEM BDS initialization codes. |

# Post Codes From hostdiags

| Codes | Description |
|---|---|
| 0x69DA | Oracle OSC - Entered OSC method. |
| 0x69DB | Oracle OSC - Forced Legacy mode (granted OS nothing). |
| 0x69DC | Oracle OSC - Granted OS native hot plug. |
| 0x69DD | Oracle OSC - Granted OS native PME. |
| 0x69DF | Oracle Legacy Hot Plug (Attn PB) SCI interrupt (Attn Push Button). |
| 0x69D0 | Oracle Legacy hot plug cleared presence change detect. |
| 0x69D1 | Oracle Legacy hot plug (Attn PB) SCI power-on sequence started. |
| 0x69D2 | Oracle legacy hot plug (Attn PB) power on error. |
| 0x69D3 | Oracle Legacy HotPlug (Attn PB) Link training(ed) failure. |
| 0x69D4 | Oracle legacy hot plug (OS PS0) OS power-on sequence started. |
| 0x69D5 | Oracle legacy hot plug (OS PS0) power-on error. |
| 0x69D6 | Oracle legacy hot plug (OS PS0) Link training(ed) failure. |
| 0x69D7 | Oracle legacy hot plug (OS EJ0) OS power-down sequence started. |

# Index

## D



## E

## S

## T

## U



## V



## W