

Oracle® Server X7-2 Service Manual

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Using This Documentation

- **Overview** – Describes how to troubleshoot and maintain the Oracle Server X7-2.
- **Audience** – Technicians, system administrators, authorized service providers, and trained hardware service personnel who have been instructed on the hazards within the equipment and are qualified to remove and replace hardware.
- **Required knowledge** – Advanced experience troubleshooting and replacing hardware.

Product Documentation Library

Documentation and resources for this product and related products are available at <https://www.oracle.com/goto/x7-2/docs>.

Feedback

Provide feedback about this documentation at <https://www.oracle.com/goto/docfeedback>.

About the Oracle Server X7-2

These sections describe the controls, connectors, status indicators, system components, and replaceable components of the server:

- [“Product Description” on page 15](#)
- [“Front and Back Panel Components” on page 16](#)
- [“About System Components” on page 19](#)

Note - Always update the server with the latest firmware, drivers, and other hardware-related software by downloading the latest software release package when you first receive the server, and for every new software release. For information about the software release packages and how to download the software, refer to [“Getting Firmware and Software” in Oracle Servers X7-2 and X7-2L Installation Guide](#).

Product Description

The Oracle Server X7-2 is an enterprise-class, one rack unit (1U) server. It supports the following components:

- Up to two Intel processors. Processors with the following capabilities are supported:
 - Intel Xeon 8160, 24-core, 2.1 GHz, 150W processors
 - Intel Xeon 6140, 18-core, 2.3 GHz, 140W processors
 - Intel Xeon 6128, 6-core, 3.4 GHz, 115W processors
 - Intel Xeon 4114, 10-core, 2.0-2.2 GHz, 85W processors
- Up to 12 DDR4 DIMMs per processor for a maximum of 24 RDIMMs (16GB and 32GB) and LRDIMMs (64GB) with speeds up to 2667 MT/sec are supported in dual-processor systems.
- Four PCIe Gen3 slots in dual-processor systems: one slot, slot 4, is dedicated to the internal HBA. PCIe slot 1 is nonfunctional in single-processor systems.
- Storage drive configurations can comprise both hard disk drives (HDDs) or solid state disk drives (SSDs). Configurations include:

- Up to eight 2.5-inch hot-pluggable SAS3 HDDs/SSDs, or up to eight 2.5-inch NVMe-Express (NVMe) SSDs
- Two internal SATA M.2 flash SSDs
- Two hot-pluggable, redundant 1200W power supplies.
- An on-board Oracle Integrated Lights Out Manager (Oracle ILOM) service processor (SP) based on the ASPEED Pilot 4 chip.

Front and Back Panel Components

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

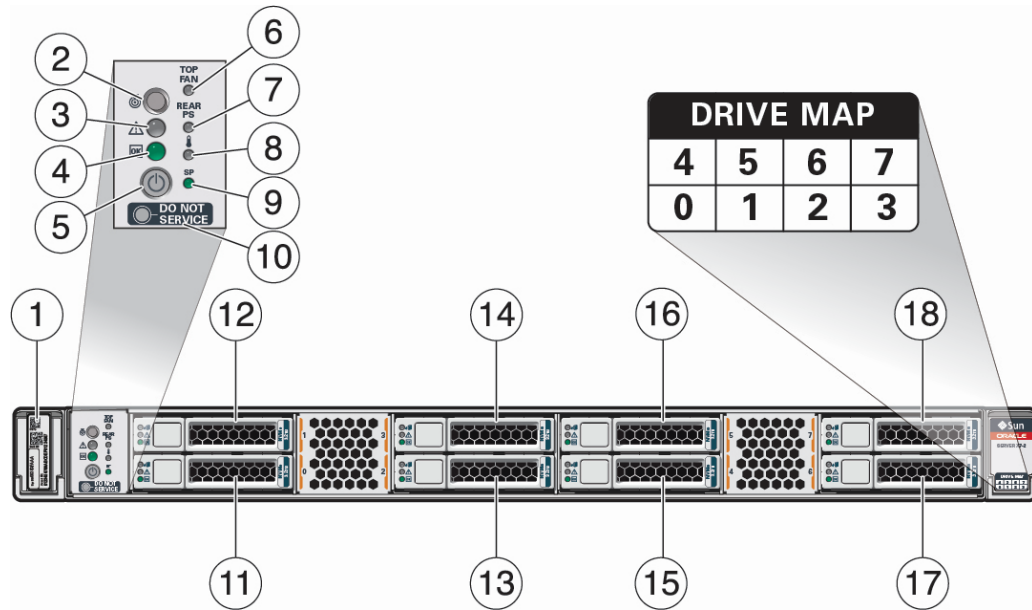
- [“Front Panel Controls and Indicators” on page 16](#)
- [“Back Panel Components and Cable Connections” on page 18](#)

Related Information

- [“About System Components” on page 19](#)
- [“Illustrated Parts Breakdown” on page 19](#)

Front Panel Controls and Indicators

The following figure shows the controls, status indicators (LEDs), connectors, and drives on the front panel of Oracle Server X7-2.



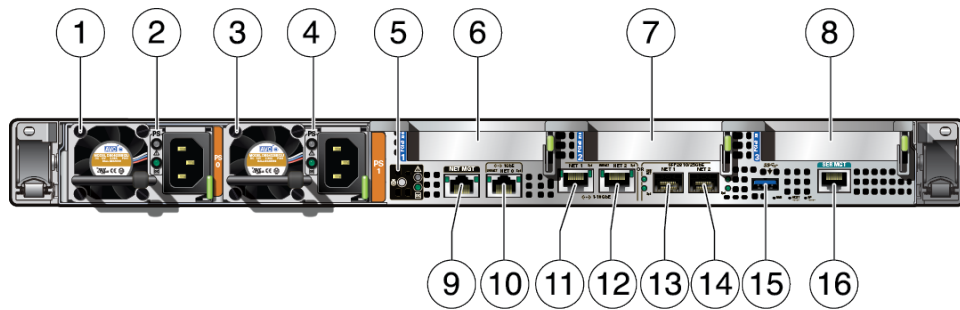
Call Out	Description
1	Product Serial Number (PSN) label and Radio Frequency Identification (RFID) tag
2	Locate Button/LED: white
3	Fault-Service Required LED: amber
4	System OK LED: green
5	On/Standby button
6	Fault-Service Required LED: Top: Fan Module (amber)
7	Fault-Service Required LED: Rear: Power Supply (amber)
8	Fault-Service Required LED: Overtemp Icon: System Over Temperature Warning (amber)
9	SP OK LED: green
10	DO NOT SERVICE LED: white
11	Storage drive 0 HDD/SSD/NVMe
12	Storage drive 1 HDD/SSD/NVMe
13	Storage drive 2 HDD/SSD/NVMe
14	Storage drive 3 HDD/SSD/NVMe
15	Storage drive 4 HDD/SSD/NVMe
16	Storage drive 5 HDD/SSD/NVMe
17	Storage drive 6 HDD/SSD/NVMe
18	Storage drive 7 HDD/SSD/NVMe

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“About System Components” on page 19](#)

Back Panel Components and Cable Connections

The following figure shows the Oracle Server X7-2 back panel and the location of power supplies, status indicators (LEDs), connectors, and PCIe slots.



Call Out	Description
1	Power Supply (PS) 0
2	Power Supply (PS) 0 status indicators: Fault-Service Required LED: amber; AC OK LED: green
3	Power Supply (PS) 1
4	Power Supply (PS) 1 status indicators: Fault-Service Required LED: amber; AC OK LED: green
5	System status indicators: Locate Button/LED: white; Fault-Service Required LED: amber; System OK LED: green
6	PCIe card slot 1 (Nonfunctional in single-processor systems)
7	PCIe card slot 2
8	PCIe card slots 3 and 4
9	Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management (NET MGT) RJ-45 10/100/1000BASE-T port
10	Network (NET) 100/1000BASE-T RJ-45 Gigabit Ethernet (GbE) port: NET 0
11	Network (NET) 10GBASE-T RJ-45 GbE port: NET 1
12	Network (NET) 10GBASE-T RJ-45 GbE port: NET 2

Call Out	Description
13	Network (NET) 10/25GbE enhanced small form-factor pluggable (SFP+) port: NET 1
14	Network (NET) 10/25GbE SFP+ port: NET 2
15	USB 3.0 connector
16	Serial management (SER MGT) RJ-45 serial port

Note - For more information on back panel components and connections, see [“Back Panel Connector Locations”](#) on page 40. See also [“Back Panel Pinhole Switches”](#) on page 45.

Related Information

- [“Front Panel Controls and Indicators”](#) on page 16
- [“About System Components”](#) on page 19

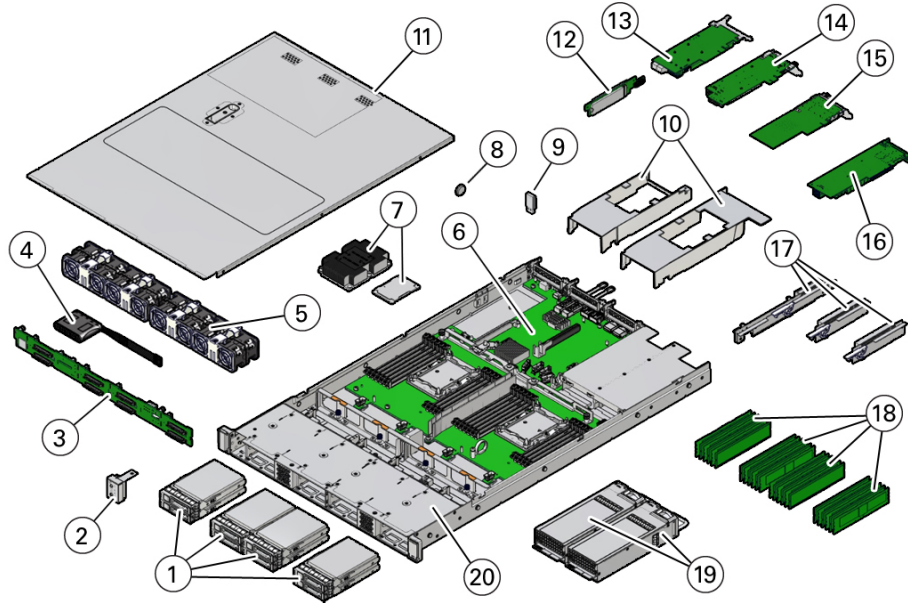
About System Components

These sections describe the components of the server:

- [“Illustrated Parts Breakdown”](#) on page 19
- [“Customer-Replaceable Units”](#) on page 21
- [“Field-Replaceable Units”](#) on page 22

Illustrated Parts Breakdown

The following figure identifies the major components of the server.



Callout	Description
1	Eight storage drives
2	Front LED indicator module
3	Disk backplane
4	Super capacitor (Energy storage module for the Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card in PCIe slot 4.)
5	Fan modules
6	Motherboard
7	Processors and heatsinks (Single-processor systems contain only a single processor in socket P0; socket P1 contains a cover to protect processor socket pins.)
8	Battery
9	(Optional) Internal USB drive
10	Air baffle
11	Top cover
12	Internal M.2 flash SSDs
13	(Optional) PCIe card in slot 3
14	Oracle Storage 12 Gb/s SAS PCIe RAID HBA card in PCIe slot 4
15	(Optional) PCIe card in slot 2
16	(Optional) PCIe card in slot 1

Callout	Description
	Note - PCIe slot 1 is nonfunctional in single-processor systems.
17	PCIe risers (3)
18	DIMMs (Only twelve DIMMs are supported in single-processor systems and the DIMMs must be installed in P0 DIMM sockets.)
19	Power supplies
20	Server chassis

Customer-Replaceable Units

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

CRU	Description	Replacement Instructions
Battery	Lithium coin-cell battery that powers the CMOS BIOS and real-time clock.	“Servicing the Battery (CRU)” on page 133
DIMMs	Add or replace memory modules in the system.	“Servicing the DIMMs (CRU)” on page 97
Storage drives	Supports SAS hard-disk drives (HDDs), solid-state drives (SSDs), or NVMe SSDs.	“Servicing Storage Drives (CRU)” on page 65
Internal USB flash drive	Optional support for one internal USB flash drive.	“Servicing an Internal USB Flash Drive (CRU)” on page 93
Internal M.2 flash SSDs	Supports up to two internal SATA M.2 flash SSDs.	“Servicing the Internal M.2 Flash SSDs (CRU)” on page 127
Fan modules	Four fan modules for cooling the motherboard assembly and installed components.	“Servicing Fan Modules (CRU)” on page 81
PCIe cards	Optional add-on PCIe cards that can expand the functionality of the server. Note - The Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card is a field replaceable unit (FRU) and should only be serviced by authorized Oracle Service personnel.	“Servicing PCIe Cards (CRU)” on page 121
PCIe risers	Houses and connects the PCIe cards.	“Servicing PCIe Risers (CRU)” on page 111
Power supplies	Two fully redundant AC power supplies.	“Servicing Power Supplies (CRU)” on page 87

Related Information

- [“Field-Replaceable Units” on page 22](#)

- [“Illustrated Parts Breakdown” on page 19](#)

Field-Replaceable Units

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

FRU	Description	Replacement Instructions
Processor and heatsink	Carries out the instructions of the system.	“Servicing Processors (FRU)” on page 137
Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card	Located in internal PCIe slot 4, the Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card manages SAS storage drives.	“Servicing the Internal HBA Card and HBA Super Capacitor (FRU)” on page 169
Disk backplane	Serves as the interface between storage drives and the internal host bus adapter (HBA) card or Oracle PCIe NVMe signals from the motherboard.	“Servicing the Disk Backplane (FRU)” on page 151
Front LED indicator module	Contains the push-button circuitry and LEDs that are displayed on the front panel.	“Servicing the Front LED Indicator Module (FRU)” on page 157
Motherboard assembly	Provides connectors for the fans, DIMMs, processors, PCIe risers, internal USB port, and power supplies.	“Servicing the Motherboard Assembly (FRU)” on page 199
SAS cables	Provide signals and backup power between the disk backplane and the super capacitor and the Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card.	“Servicing the Internal HBA Cables (FRU)” on page 179
NVMe cables	Provide signals between the disk backplane and the motherboard NVMe connectors.	“Servicing the NVMe Cables” on page 185

Related Information

- [“Customer-Replaceable Units” on page 21](#)
- [“Illustrated Parts Breakdown” on page 19](#)

Troubleshooting and Diagnostics

This section includes information about troubleshooting hardware component faults for the Oracle Server X7-2. It contains the following topics:

- “Troubleshooting Server Component Hardware Faults” on page 23
- “Troubleshooting With Diagnostic Tools” on page 37
- “Attaching Devices to the Server” on page 39
- “Getting Help” on page 46
- “Auto Service Requests” on page 48

For more information about server troubleshooting and diagnostics, refer to the *Oracle x86 Servers Diagnostics and Troubleshooting Guide for Servers With Oracle ILOM 5.0.x* at <https://www.oracle.com/goto/x86adminddiag/docs>.

Troubleshooting Server Component Hardware Faults

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

- “Troubleshooting Server Hardware Faults” on page 23
- “Troubleshooting and Diagnostic Information” on page 27
- “Troubleshooting Using the Server Front and Back Panel Status Indicators” on page 28
- “Troubleshooting System Cooling Issues” on page 34
- “Troubleshooting Power Issues” on page 36

Troubleshooting Server Hardware Faults

When a server hardware fault event occurs, the system lights the Fault-Service Required LED and captures the event in the Oracle ILOM event log. If you set up notifications through Oracle

ILOM, you also receive an alert through the notification method you chose. When you become aware of a hardware fault, address it immediately.

To investigate a hardware fault, see the following:

- [“Basic Troubleshooting Process” on page 24](#)
- [“Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface” on page 25](#)

Basic Troubleshooting Process

Use the following process to address a hardware fault (for the step-by-step procedure, see [“Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface” on page 25](#)).

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

You can use Oracle ILOM to identify the failed component.

2. **Review the *Oracle Server X7-2L Product Notes*.**

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

3. **Prepare the server for service using Oracle ILOM.**

If you determined that the hardware fault requires service (physical access to the server), use Oracle ILOM to take the server offline, activate the Locate button/LED, and if necessary, power off the server.

4. **Prepare the service work space.**

Before servicing the server, prepare the work space, ensuring Electrostatic Discharge Safety (ESD) protection for the server and components.

See [“Preparing for Service” on page 49](#).

5. **Service the components.**

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

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

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

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

Related Information

- [“Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface” on page 25](#)

▼ Troubleshoot Hardware Faults Using the Oracle ILOM Web Interface

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

This procedure uses the basic troubleshooting steps described in [“Basic Troubleshooting Process” on page 24](#).

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

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

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

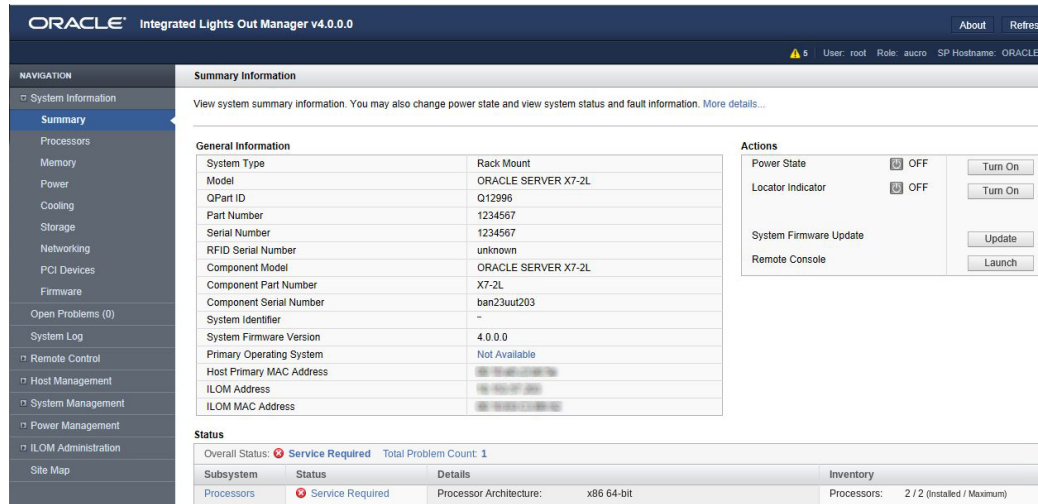
Open a browser and direct it using the IP address of the server SP. Enter a user name (with administrator privileges) and password at the Login screen. The Summary Information page appears.

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

- Processors
- Memory
- Power
- Cooling
- Storage
- Networking

2. In the Status section of the Oracle ILOM Summary Information page, identify the server subsystem that requires service.

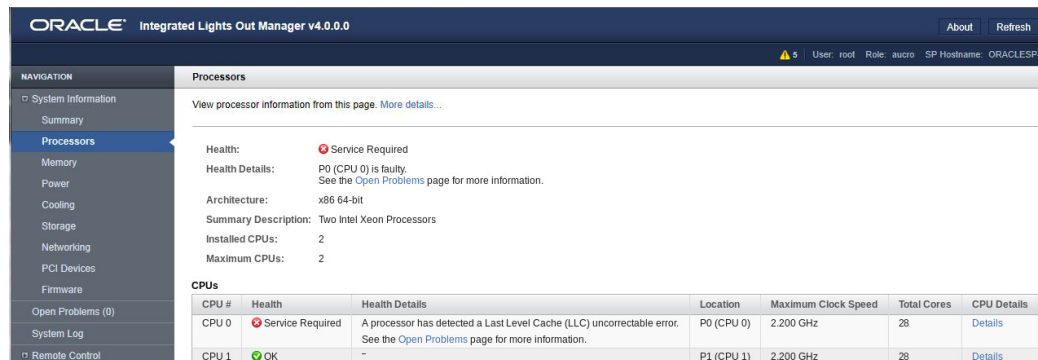
In the following example, the Status page shows that the Processor subsystem requires service, which indicates that a hardware component in the subsystem is in a fault state.



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

The Oracle ILOM Processors page appears.

The following example shows the Processors subsystem section, which indicates that CPU 0 has a fault.



4. To get more information, click the Open Problems link.

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

Tip - The System Log provides a chronological list of all the system events and faults that 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 the devices not reported in the Status section. To access the System Log, in the left panel, click System Log.

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

5. **Before going to the server, review the *Oracle Server X7-2 Product Notes* for information related to the issue or the component.**

The Product Notes contain up-to-date information about the server, including hardware-related issues. To access the Product Notes, go to <https://www.oracle.com/goto/x7-2/docs>.

6. **To prepare the server for service, see “[Preparing for Service](#)” on page 49.**

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

7. **Service the component.**

Troubleshooting and Diagnostic Information

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

- [Oracle x86 Servers Diagnostics and Troubleshooting Guide for Servers With Oracle ILOM 5.0.x](#)
- [Oracle X7 Series Servers Administration Guide](#)
- “[Troubleshooting Using the Server Front and Back Panel Status Indicators](#)” on page 28
- “[Managing Server Hardware Faults Through the Oracle ILOM Fault Management Shell](#)” on page 37

Troubleshooting Using the Server Front and Back Panel Status Indicators

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

- [“Server Boot Process and Normal Operating State Indicators” on page 28](#)
- [“Server System-Level Status Indicators” on page 29](#)
- [“Server Fan Status Indicators” on page 30](#)
- [“Storage Drive Status Indicators” on page 31](#)
- [“Power Supply Status Indicators” on page 31](#)
- [“Network Management Port Status Indicators” on page 32](#)
- [“Ethernet Ports Status Indicators” on page 32](#)
- [“Motherboard Status Indicators” on page 33](#)

Related Information

- [“Front Panel Controls and Indicators” on page 16](#)
- [“Back Panel Components and Cable Connections” on page 18](#)

Server Boot Process and Normal Operating State Indicators

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

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

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




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



1. The System OK LED blinks slowly (0.5 seconds on, 0.5 seconds off), and the SP OK LED remains lit (no blinking).
2. When the server successfully boots, the System OK LED remains lit. When the System OK LED and the SP OK LED indicators remain lit, the server is in Main power mode.

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

Server System-Level Status Indicators


There are seven system-level status indicators (LEDs), some of which are located on both the server front panel and the back panel. For the location of the status indicators, see [“Front and Back Panel Components”](#) on page 16. The following table describes these indicators.

Status Indicator Name	Icon	Color	State and Meaning
Locate Button/ LED		White	<p>Indicates the location of the server.</p> <ul style="list-style-type: none"> ■ OFF – Server is operating normally. ■ FAST BLINK (250 ms) – Use Oracle ILOM to activate this LED indicator to enable you to locate a particular system quickly and easily. ■ Pressing the Locate button toggles the LED indicator fast blink on or off.
Fault-Service Required		Amber	<p>Indicates the fault state of the server.</p> <ul style="list-style-type: none"> ■ OFF – The server is operating normally. ■ STEADY ON – A fault is present on the server. This LED indicator lights whenever a fault indicator lights for a replaceable component on the server. <p>Note - When this LED indicator is lit, a system console message might appear that includes a recommended service action.</p>
System OK		Green	<p>Indicates the operational state of the chassis.</p> <ul style="list-style-type: none"> ■ OFF – AC power is not present or the Oracle ILOM boot is not complete. ■ STANDBY BLINK (on for 100 ms, off for 2900 ms) – Standby power is on, but the chassis power is off and the Oracle ILOM SP is running. ■ SLOW BLINK (1000 ms) – Startup sequence was initiated on the host. This pattern begins soon after you power on the server. This status indicates either: power-on self-test (POST) code checkpoint tests

Status Indicator Name	Icon	Color	State and Meaning
			<p>are running on the server host system, or the host is transitioning from the powered-on state to the standby state on shutdown.</p> <ul style="list-style-type: none"> ■ STEADY ON – The server is powered on, and all host POST code checkpoint tests are complete. The server is in one of the following states: the server host is booting the operating system (OS), or the server host is running the OS.
SP OK	SP	Green	<p>Indicates the state of the service processor.</p> <ul style="list-style-type: none"> ■ OFF – Service processor (SP) is not running. ■ SLOW BLINK – SP is booting. ■ STEADY ON – SP is fully operational.
Top Fan	TOP FAN	Amber	<p>Indicates that one or more of the internal fan modules failed.</p> <ul style="list-style-type: none"> ■ OFF – Indicates steady state; no service is required. ■ STEADY ON – Indicates service required.
Back Power Supply Fault	REAR PS	Amber	<p>Indicates that one of the server power supplies failed.</p> <ul style="list-style-type: none"> ■ OFF – Indicates steady state; no service is required. ■ STEADY ON – Indicates service required; service the power supply.
System Over Temperature Warning		Amber	<p>Indicates a warning for an overtemperature condition.</p> <ul style="list-style-type: none"> ■ OFF – Normal operation; no service is required. ■ STEADY ON – The system is experiencing an overtemperature warning condition. <p>Note - This is a warning indication, not a fatal overtemperature. Failure to correct this might result in the system overheating and shutting down unexpectedly.</p>
DO NOT SERVICE		White	<p>Indicates that the system is not ready to service.</p> <ul style="list-style-type: none"> ■ OFF – Normal operation. ■ STEADY ON – The system is not ready for service. <p>Note - The DO NOT SERVICE indicator is application specific. This indicator is only illuminated on demand by the Host application.</p>




Server Fan Status Indicators

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

Status Indicator Name	Icon	Color	State and Meaning
Fan Status		Amber	<ul style="list-style-type: none"> ■ Off – The fan module is correctly installed and operating within specification. ■ Amber – The fan module is faulty. The front TOP FAN LED and the front and back panel Fault-Service Required LEDs are also lit if the system detects a fan module fault.


Storage Drive Status Indicators


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

Status Indicator Name	Icon	Color	State and Meaning
OK/Activity		Green	<ul style="list-style-type: none"> ■ OFF – Power is off or installed drive is not recognized by the system. ■ STEADY ON – The drive is engaged and is receiving power. ■ RANDOM BLINK – There is disk activity. Status indicator LED blinks on and off to indicate activity.
Fault-Service Required		Amber	<ul style="list-style-type: none"> ■ OFF – The storage drive is operating normally. ■ STEADY ON – The system detected a fault with the storage drive.
OK to Remove		Blue	<ul style="list-style-type: none"> ■ STEADY ON – The storage drive can be removed safely during a hot-plug operation. ■ OFF – The storage drive is not prepared for removal.

Power Supply Status Indicators

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

Status Indicator Name	Icon	Color	State and Meaning
AC OK/ DC OK		Green	<ul style="list-style-type: none"> ■ OFF – No AC power is present. ■ SLOW BLINK – Normal operation. Input power is within specification. DC output voltage is not enabled. ■ STEADY ON – Normal operation. Input AC power and DC output voltage are within specification.

Status Indicator Name	Icon	Color	State and Meaning
Fault-Service Required		Amber	<ul style="list-style-type: none"> ■ OFF – Normal operation. No service action is required. ■ STEADY ON – The power supply (PS) detected a PS fan failure, PS overtemperature, PS over current, or PS over or under voltage.

Network Management Port Status Indicators

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

Status Indicator Name	Location	Color	State and Meaning
Activity	Top left	Green	<ul style="list-style-type: none"> ■ ON – Link up. ■ OFF – No link or down link. ■ BLINKING – Packet activity.
Link speed	Top right	Green	<ul style="list-style-type: none"> ■ ON – 1000BASE-T link. ■ OFF – 10/100BASE-T link.

Ethernet Ports Status Indicators

The server has five Gigabit Ethernet (GbE) ports:

- One 100/1000BASE-T RJ-45 GbE port, labeled NET 0
- Two 10GBASE-T RJ-45 GbE ports, labeled NET 1 and NET 2
- Two 10/25GbE enhanced small form-factor pluggable (SFP+) ports, labeled NET 1 and NET 2

SFP+ ports support up to 10GbE when using SFP+ transceivers, and up to 25GbE when using SFP28 transceivers.

Note - The 10/25GbE SFP+ (NET 1 and NET 2) ports are the default network ports for the server. When using an SFP+ port, network connectivity is disabled on the 10GBASE-T RJ-45 GbE (NET 1 and NET 2) ports.

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

Status Indicator Name	Location	Color	State and Meaning
RJ-45 GbE Port (NET 0)			
Activity	Top left	Green	<ul style="list-style-type: none"> ■ ON – Link up. ■ OFF– No activity. ■ BLINKING – Packet activity.
Link speed	Top right	Green	<ul style="list-style-type: none"> ■ OFF – 100BASE-T link (if link up). ■ Green ON – 1000BASE-T link.
RJ-45 10GbE Ports (NET 1 and NET 2)			
Activity	Top left	Green	<ul style="list-style-type: none"> ■ ON – Link up. ■ OFF– No activity. ■ BLINKING – Packet activity.
Link speed	Top right	Bi-colored: Amber/Green	<ul style="list-style-type: none"> ■ OFF – 1000BASE-T link (if link up). ■ Green ON – 1000BASE-T link.
SFP+ 10/25GbE Ports (NET 1 and NET 2)			
Activity	Top	Green	<ul style="list-style-type: none"> ■ OFF– No activity. ■ BLINKING – Packet activity.
Link Speed	Bottom	Bi-colored: Amber/Green	<ul style="list-style-type: none"> ■ OFF – No activity. ■ Amber ON – 10GbE link. ■ Green ON – 25GbE link.

Motherboard Status Indicators

The motherboard contains the following status indicators (LEDs).

Status Indicator	Description
DIMM Fault Status Indicators	<ul style="list-style-type: none"> ■ Each of the 24 DIMM slots on the motherboard has an amber fault status indicator (LED) associated with it. ■ If Oracle ILOM determines that a DIMM is faulty, pressing the Fault Remind button on the motherboard I/O card signals the service processor to light the fault LED associated with the failed DIMM. ■ For more information on DIMM fault status indicators and the location of the Fault Remind button, see “Servicing the DIMMs (CRU)” on page 97.
Processor Fault Status Indicators	<ul style="list-style-type: none"> ■ The motherboard includes a fault status indicator (LED) adjacent to each of the two processor sockets. ■ These LEDs indicate when a processor fails. ■ Pressing the Fault Remind button on the motherboard I/O card signals the service processor to light the fault status indicators associated with the failed processors. ■ For more information on processor fault status indicators and the location of the Fault Remind button, see “Servicing Processors (FRU)” on page 137.
Fault Remind Status Indicator	<ul style="list-style-type: none"> ■ This status indicator (LED) is located next to the Fault Remind button and is powered from the super capacitor that powers the fault LEDs on the motherboard.

Status Indicator	Description
	<ul style="list-style-type: none"> ■ This LED lights to indicate that the fault remind circuitry is working properly in cases where no components failed and, as a result, none of the component fault LEDs illuminate. ■ For more information on the fault remind status indicator and the location of the Fault Remind button, see “Using the Server Fault Remind Button” on page 105.
STBY PWRGD Status Indicator	<ul style="list-style-type: none"> ■ This green status indicator (LED) is labeled STBY PWRGD and is located on the motherboard near the back of the server. ■ This LED lights to inform a service technician that the motherboard is receiving Standby power from at least one of the power supplies. ■ This LED is provided to help prevent service actions on the server internal components while the AC power cords are installed and power is being supplied to the server.

Troubleshooting System Cooling Issues

Maintaining the proper internal operating temperature of the server is crucial to the health of the server. To prevent server shutdown and damage to components, address over temperature and hardware-related issues as soon as they occur. If your server has a temperature-related fault, use the information in the following table to troubleshoot the issue.

Cooling Issue	Description	Action	Prevention
External Ambient Temperature Too High	The server fans pull cool air into the server from its external environment. If the ambient temperature is too high, the internal temperature of the server and its components increases. This can cause poor performance and component failure.	Verify the ambient temperature of the server space against the environmental specifications for the server. If the temperature is not within the required operating range, remedy the situation immediately.	Periodically verify the ambient temperature of the server space to ensure that it is within the required range, especially if you 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.	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.	Periodically inspect and clean the server vents using an ESD certified vacuum cleaner. Ensure that all components, such as cards, cables, fans, air baffles and dividers are properly installed. Never operate the server without the top cover installed.
Cooling Areas Compromised	The air baffle, component filler panels, and server top cover maintain and direct the flow of cool air through the server.	Inspect the server interior to ensure that the air baffle is properly installed. Ensure that all external-facing	When servicing the server, ensure that the air baffle is installed correctly and that the server has no unoccupied

Cooling Issue	Description	Action	Prevention
	<p>These server components must be in place for the server to function as a sealed system. If these components are not installed correctly, the airflow inside the server can become chaotic and non-directional, which can cause server components to overheat and fail.</p>	<p>slots (storage drive, 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.</p>	<p>external-facing slots. Never operate the server without the top cover installed.</p>
<p>Hardware Component Failure</p>	<ul style="list-style-type: none"> ■ Components, such as power supplies and fan modules, are an integral part of the server cooling system. When one of these components fails, the server internal temperature can rise. This rise in temperature can cause other components to enter into an over-temperature state. Additionally, some components, such as processors, might overheat when they are failing, which can also generate an over-temperature event. ■ To reduce the risk related to component failure, power supplies and fan modules are installed in pairs to provide redundancy. Redundancy ensures that if one component in the pair fails, the other functioning component can continue to maintain the subsystem. For example, power supplies serve a dual function; they provide both power and airflow. If one power supply fails, the other functioning power supply can maintain both the power and the cooling subsystems. 	<p>Investigate the cause of the overtemperature event, and replace failed components <i>immediately</i>. For hardware troubleshooting information, see “Troubleshooting Server Hardware Faults” on page 23.</p>	<p>Component redundancy is provided to allow for component failure in critical subsystems, such as the cooling subsystem. However, once a component in a redundant system fails, the redundancy no longer exists, and the risk for server shutdown and component failures increases. Therefore, it is important to maintain redundant systems and replace failed components <i>immediately</i>.</p>

Troubleshooting Power Issues

If your server does not power on, use the information in the following table to troubleshoot the issue.

Power Issue	Description	Action	Prevention
AC Power Connection	The AC power cords are the direct connection between the server power supplies and the power sources. The server power supplies need separate stable AC circuits. Insufficient voltage levels or fluctuations in power can cause server power problems. The power supplies are designed to operate at a particular voltage and within an acceptable range of voltage fluctuations (refer to “Electrical Requirements” in Oracle Servers X7-2 and X7-2L Installation Guide).	Verify that both AC power cords are connected to the server. Verify that the correct power is present at the outlets and monitor the power to verify that it is within the acceptable range. You can verify proper connection and operation by verifying the power supply (PS) indicator panels, which are located at the back of the server on the power supplies. Lit green AC OK indicators show a properly functioning power supply. An amber AC OK indicator indicates that the AC power to the power supply is insufficient.	Use the AC power cord Velcro retaining clips and position the cords to minimize the risk of accidental disconnection. Ensure that the AC circuits that supply power to the server are stable and not overburdened.
Power Supplies (PSUs)	The server power supply units (PSUs) provide the necessary server voltages from the AC power outlets. If the power supplies are inoperable, unplugged, or disengaged from the internal connectors, the server cannot power on. Note - Use the Velcro straps on the back of the server to secure the power cord connectors to the back of the power supplies. The Velcro retaining straps	Verify that the AC cables are connected to both power supplies. Verify that the power supplies are operational (the PSU indicator panel must have a lit green AC OK indicator). Ensure that the power supply is properly installed. A power supply that is not fully engaged with its internal connector does not have power applied and does not have a lit green AC OK indicator.	When a power supply fails, replace it immediately. To ensure redundancy, the server has two power supplies. This redundant configuration prevents server downtime, or an unexpected shutdown, due to a failed power supply. The redundancy allows the server to continue to operate if one of the power supplies fails. However, when a server is being powered by a single power supply, the

Power Issue	Description	Action	Prevention
	minimize the risk of accidental disconnection.		redundancy no longer exists, and the risk for downtime or an unexpected shutdown increases. When installing a power supply, ensure that it is fully seated and engaged with its connector inside the drive bay. A properly installed power supply has a lit green AC OK indicator.
Top Cover	The server top cover maintains the air pressures inside the server, prevents accidental exposure to hazardous voltages, and protects internal components from physical and environmental damage.	Do not operate the server without the top cover installed unless you are hot-plugging a fan module, and then ensure that you complete the operation and replace the cover within 20 seconds. For instructions for properly replacing fan modules, see “Servicing Fan Modules (CRU)” on page 81 . For instructions for installing the server top cover, see “Install the Server Top Cover” on page 212 .	Be careful to avoid bending or otherwise warping the top cover.

Managing Server Hardware Faults Through the Oracle ILOM Fault Management Shell

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

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

Troubleshooting With Diagnostic Tools

The server and its accompanying software and firmware contain diagnostic tools and features that can help you isolate component problems, monitor the status of a functioning system,

and exercise one or more subsystem to disclose more subtle or intermittent hardware-related problems.

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

- [“Diagnostic Tools” on page 38](#)
- [“Diagnostic Tool Documentation” on page 39](#)

Diagnostic Tools

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

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

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
Oracle ILOM	SP firmware	Monitors environmental condition and component functionality sensors, generates alerts, performs fault isolation, and provides remote access.	Can function on either Standby power mode or Main power mode and is not OS dependent.	Designed for remote and local access.
Hardware-based LED indicators	Hardware and SP firmware	Indicates status of overall system and particular components.	Available when system power is available.	Local, but sensor and indicators are accessible from Oracle ILOM web interface or command-line interface (CLI).
Power-On Self-Test (POST)	Host firmware	Tests core components of system: CPUs, memory, and motherboard I/O bridge integrated circuits.	Runs on startup. Available when the operating system is not running.	Local, but can be accessed through Oracle ILOM Remote System Console Plus.
UEFI Diagnostics	SP firmware	UEFI diagnostics can test and detect problems on all processors, memory, disk drives, and network ports.	You can use either the Oracle ILOM web interface or the command-line interface	Remote access through Oracle ILOM Remote System Console Plus.

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
			(CLI) to run UEFI diagnostics.	
HWdiag	SP firmware	The HWdiag utility checks the status of a system and its components. You run the HWdiag utility within the Oracle ILOM Diag shell.	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.
Oracle Solaris commands	Operating system software	Displays various kinds of system information.	Requires operating system.	Local, and over network.
Oracle Linux commands	Operating system software	Displays various kinds of system information.	Requires operating system.	Local, and over network.
Oracle VTS	Diagnostic tool standalone software	Exercises and stresses the system, running tests in parallel.	Requires the Solaris operating system. Install Oracle VTS software separately.	View and control over network.

Diagnostic Tool Documentation

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

Diagnostic Tool	Documentation	Location
Oracle ILOM	Oracle Integrated Lights Out Manager 5.0 Documentation Library	https://www.oracle.com/goto/ilom/docs
UEFI Diagnostics or HWdiag	<i>Oracle x86 Servers Diagnostics and Troubleshooting Guide for Servers With Oracle ILOM 5.0.x</i>	https://www.oracle.com/goto/x86admindiag/docs
System indicators and sensors	This document	“Troubleshooting Using the Server Front and Back Panel Status Indicators” on page 28
Oracle VTS	Oracle VTS software and documentation	https://docs.oracle.com/cd/E83848_01/

Attaching Devices to the Server

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

- [“Attach Devices to the Server” on page 40](#)
- [“Back Panel Connector Locations” on page 40](#)
- [“Configuring Serial Port Sharing” on page 42](#)
- [“Server Operating System Names for the NVMe Storage Drives” on page 44](#)
- [“Ethernet Port Boot Order and Device Naming” on page 44](#)
- [“Back Panel Pinhole Switches” on page 45](#)

▼ Attach Devices to the Server

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

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

See [“Back Panel Connector Locations” on page 40](#).

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

See [“Back Panel Connector Locations” on page 40](#).

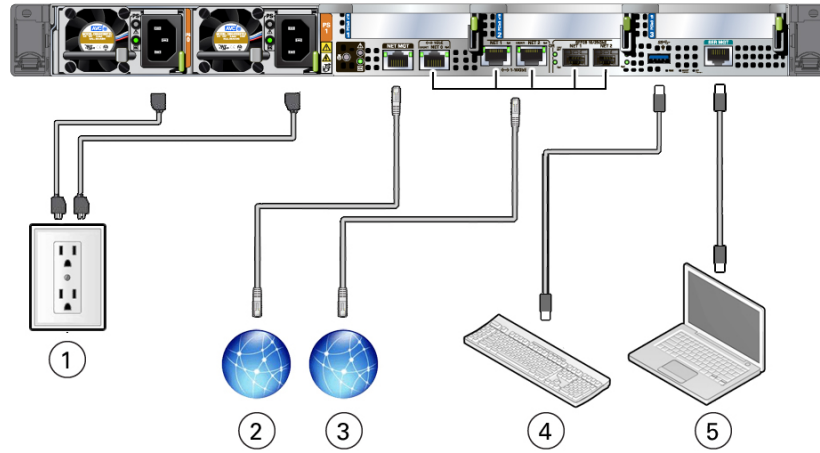
3. **To access the Oracle ILOM command-line interface (CLI) locally, connect a serial null modem cable to the RJ-45 serial port labeled SER MGT.**

To access the system console, connect the RJ-45 cable to a terminal or terminal emulator, log on to Oracle ILOM, and type `start /HOST/console`.

See [“Back Panel Connector Locations” on page 40](#).

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



No.	Cable Port or Expansion Slot	Description
1	Power supply 0 input power Power supply 1 input power	<p>The server has two power supply connectors, one for each power supply.</p> <p>Do not attach power cables to the power supplies until you finish connecting the data cables to the server. The server goes into Standby power mode, and the Oracle ILOM service processor initializes when the AC power cables are connected to the power source. System messages might be lost after 60 seconds if the server is not connected to a terminal, PC, or workstation.</p> <p>Note - Oracle ILOM signals a fault on any installed power supply that is not connected to an AC power source, since it might indicate a loss of redundancy.</p>
2	Network management port (NET MGT)	<p>The service processor NET MGT port is the optional connection to the Oracle ILOM service processor. The NET MGT port is configured by default to use Dynamic Host Configuration Protocol (DHCP). The service processor NET MGT port uses an RJ-45 cable for a 10/100/1000BASE-T connection.</p>
3	Ethernet ports:	<p>The five Gigabit Ethernet (GbE) ports enable you to connect the system to the network.</p>

No.	Cable Port or Expansion Slot	Description
	<ul style="list-style-type: none"> ■ NET 0, 100/1000BASE-T RJ-45 GbE port ■ NET 1 and NET 2, 10GBASE-T RJ-45 GbE ports ■ NET 1 and NET 2, 10/25GbE SFP+ ports <p>Note - SFP+ ports support up to 10GbE when using SFP+ transceivers, and up to 25GbE when using SFP28 transceivers.</p>	<p>Note - The 10/25GbE SFP+ ports are the default network ports for the server. When using an SFP+ port, network connectivity is disabled on the 10GBASE-T RJ-45 GbE ports.</p>
4	USB port	The USB port supports hot-plugging. You can connect and disconnect a USB cable or a peripheral device while the server is running without affecting system operations.
5	Serial management port (SER MGT)	<p>The service processor SER MGT port uses an RJ-45 cable and terminal (or emulator) to provide access to the Oracle ILOM command-line interface (CLI). Using Oracle ILOM, you can configure it to connect to the system console.</p> <p>Note - This port does not support network connections.</p>

Configuring Serial Port Sharing

By default, the service processor (SP) controls the serial management (SER MGT) port and uses it to redirect the host serial console output. Using Oracle ILOM, you can assign the host console (COM1) as owner of the SER MGT port output, which allows the host console to output information directly to the SER MGT port. Serial port sharing is useful for Windows kernel debugging, because you can view non-ASCII character traffic output from the host console.

Set up the network on the SP before attempting to change the serial port owner to the host server. If the network is not set up first, and you switch the serial port owner to the host server, you cannot connect using the CLI or web interface to change the serial port owner back to the SP. To return the serial port owner setting to the SP, restore access to the serial port on the server. For details, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

If you accidentally lose access to Oracle ILOM, contact Oracle Service and follow the process to return the serial port ownership back to the SP.

You can assign serial port output using either the Oracle ILOM CLI interface or web interface, as described in the following sections:

- [“Assign Serial Port Output Using the Oracle ILOM CLI” on page 43](#)
- [“Assign Serial Port Output Using the Oracle ILOM Web Interface” on page 43](#)

▼ Assign Serial Port Output Using the Oracle ILOM CLI

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

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

```
ssh root@ipaddress
```

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

For more information, see “Accessing Oracle ILOM” in the [Oracle X7 Series Servers Administration Guide](#).

The Oracle ILOM CLI prompt (->) appears.

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

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

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

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

▼ Assign Serial Port Output Using the Oracle ILOM Web Interface

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

Open a web browser and direct it using the IP address of the server SP. Log in as root or a user with administrator privileges. See “Accessing Oracle ILOM” in the *Oracle X7 Series Servers Administration Guide*.

The Summary Information page appears.

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

The Serial Port Settings page appears.

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

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

5. **Click save for the changes to take effect.**
6. **Connect a serial host to the server.**

Server Operating System Names for the NVMe Storage Drives

If NVMe storage drives are installed in the server front panel, they are labeled NVMe0 through NVMe7. The server operating systems assign these storage drives different names. For the corresponding names assigned by the operating systems, see the following table.

Note - The drive names provided in the table assume that NVMe cabling between the motherboard NVMe connectors and the disk backplane is correct.

Storage Drive Labels	Names Assigned by the Server Operating Systems
NVMe0	PCIe Slot 100
NVMe1	PCIe Slot 101
NVMe2	PCIe Slot 102
NVMe3	PCIe Slot 103
NVMe4	PCIe Slot 104
NVMe5	PCIe Slot 105
NVMe6	PCIe Slot 106
NVMe7	PCIe Slot 107

Ethernet Port Boot Order and Device Naming

This section contains information about the boot order and device naming for the Gigabit Ethernet ports on the back panel of the server. For location information, see [“Back Panel Connector Locations”](#) on page 40.

Ethernet Port Boot Order

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

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

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

Ethernet Port Device Naming

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

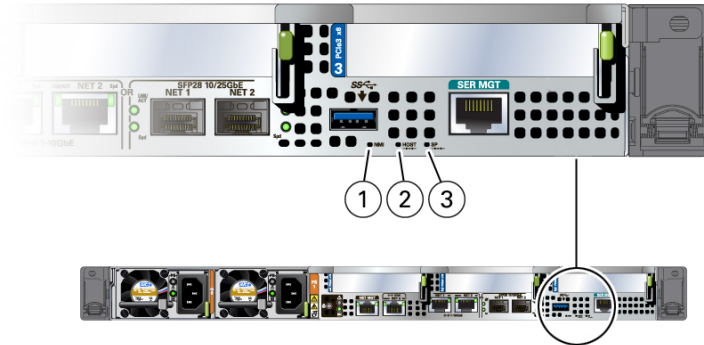
Note - Naming used by the interfaces might vary from that listed below depending on which devices are installed in the system.

Port	Solaris	Linux 6	Linux 7	Windows (example default names, see note below)
Net 0	igb0	eth0	enp1	Ethernet
Net 1	igb1	eth1	enp2	Ethernet 2
Net 2	igb2	eth2	enp3	Ethernet 3

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

Back Panel Pinhole Switches

Oracle Service personnel might instruct you to use the back panel pinhole switches to reset the NMI, Host Warm Reset, or SP, as shown in the following figure.



Callout	Icon	Description
1	NMI	Non-maskable interrupt (NMI) [†]
2	HOST ↔	Host Warm Reset
3	SP ↔	SP Reset

[†]Oracle Service use only.



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

Getting Help

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

- [“Contacting Support” on page 47](#)
- [“Locating the Chassis Serial Number” on page 47](#)

Contacting Support

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

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

Related Information

- [“Locating the Chassis Serial Number” on page 47](#)

Locating the Chassis Serial Number

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

- The serial number is located on the Radio-frequency Identification (RFID) label on the bottom left side of the front panel bezel, below the general status LEDs.
For illustrations of the server front panel, see “[Front and Back Panel Components](#)” on page 16.
- The serial number is recorded on a label that is attached to the top-front surface of the system.
- The serial number is recorded on the yellow Customer Information Sheet (CIS) that is attached to your server packaging.
- Using Oracle ILOM:
 - From the command-line interface (CLI), type the command: `show /System`
 - From the web interface, view the serial number on the System Information screen.

Auto Service Requests

Oracle Auto Service Requests (ASR) is a feature available to customers having Oracle Premier Support and is provided to those customers at no additional cost. Oracle ASR is the fastest way to restore system availability if a hardware fault occurs. Oracle ASR software is secure and customer installable, with the software and documentation downloadable from My Oracle Support at <https://support.oracle.com>. When you log in to My Oracle Support, refer to the "Oracle Auto Service Request" knowledge article document (ID 1185493.1) for instructions on downloading the Oracle ASR software.

When a hardware fault is detected, Oracle ASR opens a service request with Oracle and transfers electronic fault telemetry data to help expedite the diagnostic process. Oracle diagnostic capabilities then analyze the telemetry data for known issues and delivers immediate corrective actions. For security, the electronic diagnostic data sent to Oracle includes only what is needed to solve the problem. The software does not use any incoming Internet connections and does not include any remote access mechanisms.

For more information about Oracle ASR, go to: <https://www.oracle.com/support/premier/auto-service-request.html>.

Preparing for Service

These sections describe safety considerations and provide prerequisite procedures and information to replace components within the server:

- [“Safety Precautions” on page 49](#)
- [“Safety Symbols” on page 50](#)
- [“Electrostatic Discharge Safety” on page 50](#)
- [“FRU Key Identity Properties \(KIP\) Automated Update” on page 51](#)
- [“Required Tools” on page 52](#)
- [“Preparing the Server for Component Replacement” on page 52](#)

Related Information

- [“Returning the Server to Operation” on page 211](#)

Safety Precautions

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

- Follow all standard cautions, warnings, and instructions marked on the equipment and described in the *Oracle Server X7-2 Safety and Compliance Guide* and in the printed *Important Safety Information for Oracle's Hardware Systems*.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Follow the electrostatic discharge safety practices as described in [“Electrostatic Discharge Safety” on page 50](#).
- Disconnect both power supply cords (if necessary) before servicing components.

Related Information

- [“Safety Symbols” on page 50](#)

- [“Electrostatic Discharge Safety” on page 50](#)

Safety Symbols

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



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



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



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

Related Information

- [“Safety Precautions” on page 49](#)
- [“Electrostatic Discharge Safety” on page 50](#)

Electrostatic Discharge Safety

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



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

Do the following when handling ESD-sensitive components:

- Use an antistatic wrist strap.
Wear an antistatic wrist strap when handling components such as drive assemblies, boards, or cards. When servicing or removing server components, disconnect the power cords from the server and then attach an antistatic strap to your wrist and then to a metal area on the

chassis. Following this practice equalizes the electrical potentials between you and the server.

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

- Use an antistatic mat.
Place ESD-sensitive components such as the motherboard, DIMMs (memory modules), and other printed circuit boards on an antistatic mat. The following items can be used as an antistatic mat:
 - An antistatic bag used to wrap an Oracle replacement part
 - An Oracle ESD mat (orderable item)
 - A disposable ESD mat (shipped with some replacement parts or optional system components)

Related Information

- [“Safety Precautions” on page 49](#)
- [“Safety Symbols” on page 50](#)
- [“Preparing the Server for Component Replacement” on page 52](#)
- [“Returning the Server to Operation” on page 211](#)

FRU Key Identity Properties (KIP) Automated Update

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

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

The quorum members include:

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

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

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

Related Information

- [“Servicing Power Supplies \(CRU\)” on page 87](#)
- [“Servicing the Disk Backplane \(FRU\)” on page 151](#)
- [“Servicing the Motherboard Assembly \(FRU\)” on page 199](#)

Required Tools

The server can be serviced with the following tools:

- Antistatic wrist strap
- Antistatic mat
- No. 2 Phillips screwdriver
- Torx (6 lobe) T10, T15, T25, and T30 screwdrivers
- 12.0 in-lbs/ft (inch-pounds/foot) torque driver
- Non-conducting stylus

Related Information

- [“Preparing for Service” on page 49](#)

Preparing the Server for Component Replacement

Before you can remove and install components that are inside the server, you must perform the procedures in some or all of the following tasks:

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

- [“Powering Down the Server” on page 53](#)
- [“Disconnect Cables From the Server” on page 59](#)
- [“Extend the Server to the Maintenance Position” on page 59](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Remove the Server Top Cover” on page 63](#)

Related Information

- [“Returning the Server to Operation” on page 211](#)

Powering Down the Server

To determine how you want to power off the server, view the options in the following table.

Note - Some server components, such as storage drives, power supplies, and fan modules are hot-pluggable. Components that are hot-pluggable do not require the server to be powered down when performing service procedures.

Description	Link
Power down the server gracefully to save all data and to prevent data from being corrupted. Performing a graceful shutdown ensures that the system is ready for restart.	<ul style="list-style-type: none"> ■ “Power Down Server Gracefully Using the Oracle ILOM CLI” on page 54 ■ “Power Down Server Gracefully Using the Oracle ILOM Web Interface” on page 55 ■ “Power Down Server Gracefully Using the On/Standby Button” on page 56
If the server is not responding, or you must shut down the server quickly, perform an immediate shutdown.	<ul style="list-style-type: none"> ■ “Power Down the Server for Immediate Shutdown Using the On/Standby Button” on page 57 ■ “Power Down the Server for Immediate Shutdown Using the Oracle ILOM CLI” on page 57 ■ “Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface” on page 58

Related Information

- [“Power On the Server” on page 216](#)

▼ Power Down Server Gracefully Using the Oracle ILOM CLI

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

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

Depending on the nature of the problem, you might want to view the system status or the log files or run diagnostics before you shut down the system. For more information, see the Oracle ILOM 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

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

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

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

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

Refer to “[Accessing Oracle ILOM](#)” in *Oracle Servers X7-2 and X7-2L Installation Guide*.

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

```
-> stop /System
```

Note - The `stop /System` command does not guarantee a system shutdown. This command is only a request to the host operating system (OS) to perform a system shutdown. To ensure a system shutdown, see “[Power Down the Server for Immediate Shutdown Using the Oracle ILOM CLI](#)” on page 57.

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

The host server performs an orderly power shutdown to Standby power mode, and the System OK LED on the front panel begins blinking. See “[Server System-Level Status Indicators](#)” on page 29.

6. Disconnect the power and cables from the server.

See “[Disconnect Cables From the Server](#)” on page 59.



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

Related Information

- [“Power Down Server Gracefully Using the Oracle ILOM Web Interface” on page 55](#)
- [“Power Down Server Gracefully Using the On/Standby Button” on page 56](#)
- [“Power Down the Server for Immediate Shutdown Using the On/Standby Button” on page 57](#)
- [“Power On the Server” on page 216](#)

▼ Power Down Server Gracefully Using the Oracle ILOM Web Interface

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

Depending on the nature of the problem, you might want to view the system status or the log files or run diagnostics before you shut down the system. For more information, refer to the Oracle ILOM 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

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

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

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

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

Refer to [“Accessing Oracle ILOM” in *Oracle Servers X7-2 and X7-2L Installation Guide*](#).

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

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

6. Click Save and then click OK.

The host server performs an orderly power shutdown to Standby power mode, and the System OK LED on the front panel begins blinking. See [“Server System-Level Status Indicators” on page 29](#).

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

See [“Disconnect Cables From the Server”](#) on page 59.



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

Related Information

- [“Power Down Server Gracefully Using the Oracle ILOM CLI”](#) on page 54
- [“Power Down Server Gracefully Using the On/Standby Button”](#) on page 56
- [“Power Down the Server for Immediate Shutdown Using the On/Standby Button”](#) on page 57
- [“Power On the Server”](#) on page 216

▼ Power Down Server Gracefully Using the On/Standby Button

1. Press and quickly release the On/Standby button on the front panel.

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

When main power is off, the System OK LED on the front panel begins blinking, indicating that the server is in Standby power mode. See [“Server System-Level Status Indicators”](#) on page 29.

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

See [“Disconnect Cables From the Server”](#) on page 59.



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

Related Information

- [“Power Down Server Gracefully Using the Oracle ILOM CLI”](#) on page 54
- [“Power Down Server Gracefully Using the Oracle ILOM Web Interface”](#) on page 55
- [“Power Down the Server for Immediate Shutdown Using the On/Standby Button”](#) on page 57
- [“Power On the Server”](#) on page 216

▼ Power Down the Server for Immediate Shutdown Using the On/Standby Button



Caution - An immediate power-off might corrupt system data, therefore, use this procedure to power down the server only after attempting the graceful power down procedure.

1. **Press and hold the On/Standby button for four seconds to force the Main power off and to enter Standby power mode.**

When Main power is off, the System OK LED on the front panel begins blinking, indicating that the server is in Standby power mode. See [“Server System-Level Status Indicators” on page 29](#).

2. **Disconnect the power and data cables from the server.**
See [“Disconnect Cables From the Server” on page 59](#).



Caution - When you press the On/Standby button to enter Standby power mode, power is still directed to the service processor and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- [“Power Down Server Gracefully Using the Oracle ILOM CLI” on page 54](#)
- [“Power Down Server Gracefully Using the Oracle ILOM Web Interface” on page 55](#)
- [“Power Down Server Gracefully Using the On/Standby Button” on page 56](#)
- [“Power Down the Server for Immediate Shutdown Using the Oracle ILOM CLI” on page 57](#)
- [“Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface” on page 58](#)
- [“Power On the Server” on page 216](#)

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



Caution - An immediate power-off might corrupt system data, therefore, use this procedure to power down the server only after attempting the graceful power down procedure.

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

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

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

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

The server powers down immediately to Standby power mode.

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

See [“Disconnect Cables From the Server” on page 59](#).



Caution -When the server is powered down, it enters Standby power mode. In standby power mode, power is still directed to the service processor and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- [“Power Down the Server for Immediate Shutdown Using the On/Standby Button” on page 57](#)
- [“Power Down the Server for Immediate Shutdown Using the Oracle ILOM Web Interface” on page 58](#)

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



Caution - An immediate power-off might corrupt system data, therefore, use this procedure to power down the server only after attempting the graceful power down procedure.

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

The Oracle ILOM web interface System Information page appears.

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

3. Click Save, then click OK.

The server powers down immediately to Standby power mode.

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

See [“Disconnect Cables From the Server” on page 59](#).



Caution -When the server is powered down, it enters Standby power mode. In standby power mode, power is still directed to the service processor and power supply fans. To completely power off the server, you must disconnect the power cords from the power supplies.

Related Information

- [“Power Down the Server for Immediate Shutdown Using the On/Standby Button” on page 57](#)
- [“Power Down Server Gracefully Using the Oracle ILOM CLI” on page 54](#)
- [“Power On the Server” on page 216](#)

▼ Disconnect Cables From the Server



Caution -The system supplies Standby power to the circuit boards when the power cords are connected even when the system is powered off.

1. **Label all cables connected to the server.**
2. **Power down the server.**
See [“Powering Down the Server” on page 53](#).
3. **Disconnect the power cords from the rear of the server.**
4. **Disconnect all data cables from the rear of the server.**

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Powering Down the Server” on page 53](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

▼ Extend the Server to the Maintenance Position

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

- Storage drives
- Fan modules
- Power supplies
- PCIe risers
- PCIe cards and cables
- SAS cables
- NVMe cables
- DIMMs
- Internal USB flash drive
- M.2 flash SSDs
- System battery
- Processors
- Disk backplane
- Front LED indicator module
- Motherboard assembly

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

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

Refer to “[Stabilize the Rack](#)” in *Oracle Servers X7-2 and X7-2L Installation Guide*. Also refer to the *Oracle Rack Cabinet 1242 User's Guide* at https://docs.oracle.com/cd/E85660_01/index.html.

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

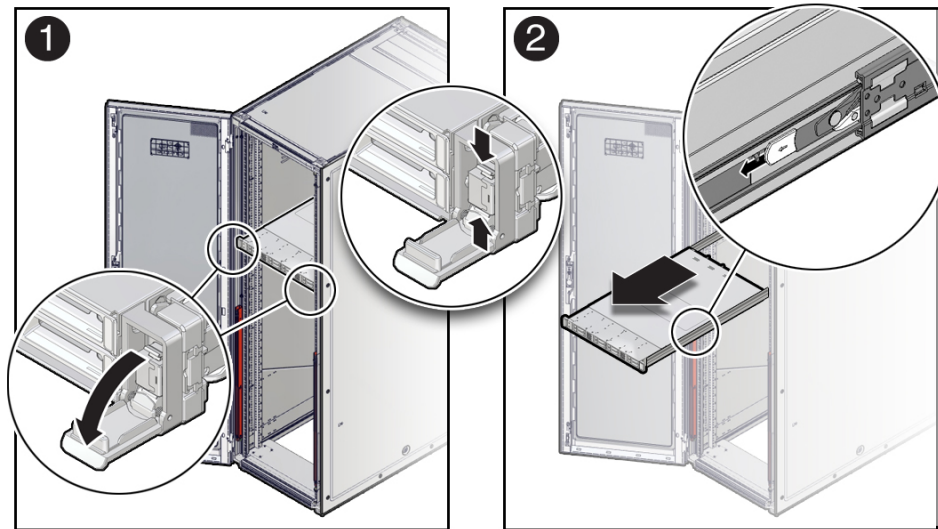
Although the cable management arm (CMA) that is supplied with the server is hinged to accommodate extending the server, you should ensure that all cables and cords are capable of extending.

3. **From the front of the server, open and hold the left and right release latch covers in the open position [1].**

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



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



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

Related Information

- [“Disconnect Cables From the Server” on page 59](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Reinstall the Server Into the Rack” on page 213](#)

▼ Remove the Server From the Rack



Caution - The server weighs approximately 35.0 lbs (15.88 kg). Two people are required to dismount and carry the chassis.

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

2. Remove the cable management arm (CMA).

Refer to [“Remove the Cable Management Arm”](#) in *Oracle Servers X7-2 and X7-2L Installation Guide*.

3. Extend the server to the maintenance position.

See [“Extend the Server to the Maintenance Position”](#) on page 59.

4. From the front of the server, pull the green slide-rail release tabs toward the front of the server, and pull the server out of the rack until it is free of the rack rails.

A slide-rail release tab is located on each slide-rail.

Note - To pull the green slide-rail release tab, place your finger in the center of the tab, not on the end, and apply pressure as you pull the tab toward the front of the server.

5. Set the server on a sturdy work surface.

Related Information

- [“Disconnect Cables From the Server”](#) on page 59
- [“Take Antistatic Measures”](#) on page 62
- [“Extend the Server to the Maintenance Position”](#) on page 59
- [“Reinstall the Server Into the Rack”](#) on page 213

▼ Take Antistatic Measures

1. Prepare an antistatic surface on which to set parts during removal and installation.

Place electrostatic discharge (ESD)-sensitive components such as the printed circuit boards on an antistatic mat. The following items can be used as an antistatic mat:

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

2. Attach an antistatic wrist strap.

When servicing or removing server components, attach an antistatic strap to your wrist and then to a metal area on the chassis. Then disconnect the power cords from the server.

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

Related Information

- [“Remove Antistatic Measures” on page 213](#)

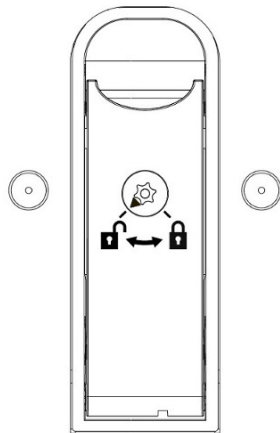
▼ Remove the Server Top Cover

Servicing some components requires that the top cover be removed.

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

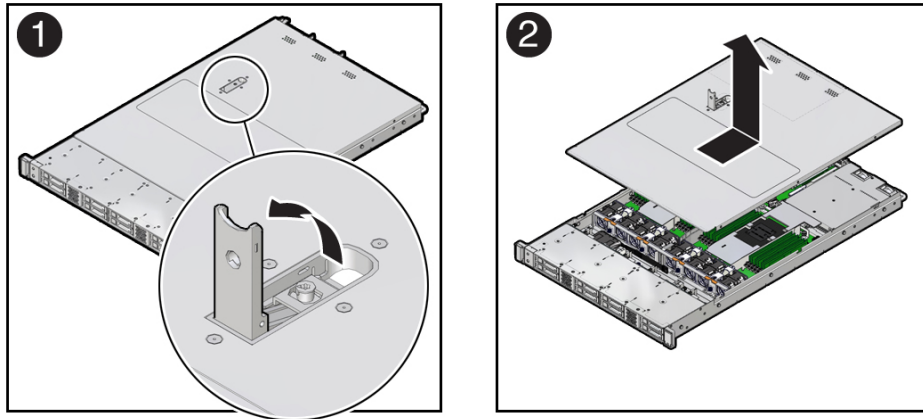
Note - Fan modules are hot-pluggable and do not require AC power cables to be disconnected from the server power supplies.

2. **If the release button latch is in the locked position, use a Torx T15 screwdriver to turn the release button latch clockwise to the unlocked position.**



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

Lift up on the release button on top of the server cover. Lifting the release button causes the server cover to slide toward the rear of the chassis for easy removal.



4. **Lift up and remove the top cover [2].**

Related Information

- [“Take Antistatic Measures” on page 62](#)
- [“Install the Server Top Cover” on page 212](#)

Servicing Storage Drives (CRU)

This section describes how to service storage drives. Storage drives are customer-replaceable units (CRUs) that do not require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

- [“Storage Drives Hot-Plug Conditions” on page 65](#)
- [“Storage Drive Failure and RAID” on page 66](#)
- [“Storage Drive Locations and Numbering” on page 66](#)
- [“Removing and Replacing a Storage Drive” on page 67](#)
- [“Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 71](#)
- [“Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 74](#)
- [“Removing and Replacing an NVMe Storage Drive Using Microsoft Windows Server” on page 78](#)

Related Information

- [“Remove and Install Filler Panels” on page 211](#)

Storage Drives Hot-Plug Conditions

The hard-disk drives (HDDs), solid-state drives (SSDs), or NVMe SSD drives that are installed in the server are in most cases hot-pluggable. This capability depends on how the drives are configured and whether the drive is an NVMe device. To hot-plug a drive you must take the drive offline before you can remove it. When you take the drive offline, you prevent any application from accessing the drive and remove the logical software links to the drive. For an NVMe storage drive, you must not only take the drive offline, but also power down the drive slot.

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.
- The operating system does not support hot plug for the drive.

If any of these disk drive conditions are true, then you must shut down the system before you replace the drive. See [“Powering Down the Server” on page 53](#).

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

Related Information

- [“Storage Drive Status Indicators” on page 31](#)
- [“Removing and Replacing a Storage Drive” on page 67](#)
- [“Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 71](#)
- [“Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 74](#)
- [“Removing and Replacing an NVMe Storage Drive Using Microsoft Windows Server” on page 78](#)

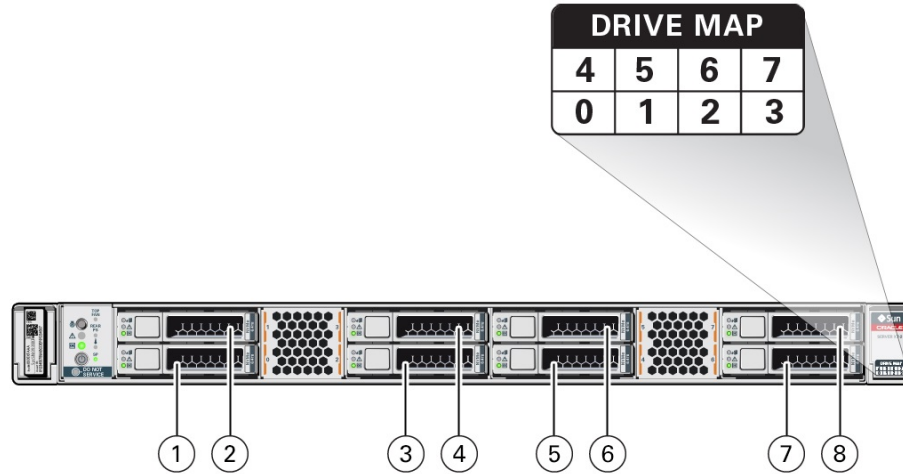
Storage Drive Failure and RAID

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

For instructions for configuring RAID on the server, refer to [“Configuring Storage Drives for Operating System Installation” in *Oracle Servers X7-2 and X7-2L Installation Guide*](#).

Storage Drive Locations and Numbering

The following illustration shows the location of the drives and the internal system software designations for the drives. For information on storage drive status indicators (LEDs), see [“Storage Drive Status Indicators” on page 31](#).



Callout	Description
1	Storage drive 0 HDD/SSD/NVMe
2	Storage drive 1 HDD/SSD/NVMe
3	Storage drive 2 HDD/SSD/NVMe
4	Storage drive 3 HDD/SSD/NVMe
5	Storage drive 4 HDD/SSD/NVMe
6	Storage drive 5 HDD/SSD/NVMe
7	Storage drive 6 HDD/SSD/NVMe
8	Storage drive 7 HDD/SSD/NVMe

Note - The NVMe storage drives are labeled NVMe0 through NVMe7; however, operating systems installed on the server assign different names to the NVMe storage drives. For the corresponding names assigned to the NVMe storage drives by server operating systems, see [“Server Operating System Names for the NVMe Storage Drives” on page 44.](#)

Removing and Replacing a Storage Drive

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

- [“Remove a Storage Drive” on page 68](#)

- [“Install a Storage Drive” on page 70](#)

▼ Remove a Storage Drive

1. Prepare the system for the drive removal.

See [“Take Antistatic Measures” on page 62](#).

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

For storage drive locations, see [“Storage Drive Locations and Numbering” on page 66](#).

3. Remove the storage drive.

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

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

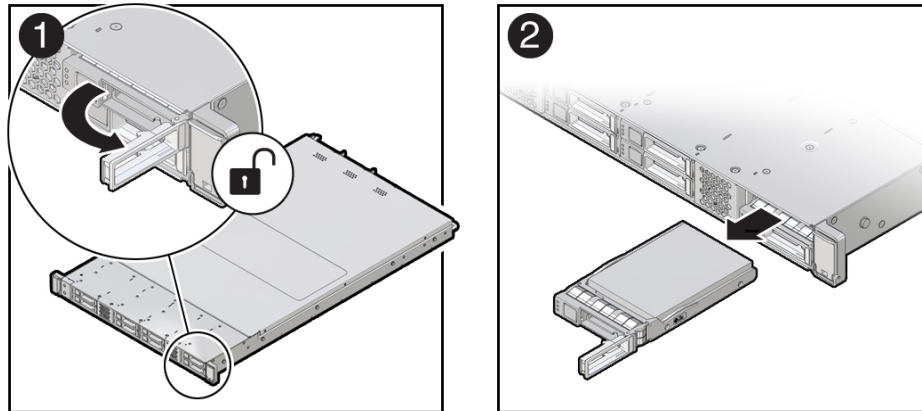
Note - The blue OK to Remove status indicator LED on the drive might not light, as support for this varies depending on the operating system in use. For information on storage drive status indicators (LEDs), see [“Storage Drive Status Indicators” on page 31](#).

- **If you are removing an NVMe storage drive, see the procedures for your operating system.**

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

- [“Removing and Replacing an NVMe Storage Drive Using Oracle Solaris” on page 71](#)
- [“Removing and Replacing an NVMe Storage Drive Using Oracle Linux” on page 74](#)
- [“Removing and Replacing an NVMe Storage Drive Using Microsoft Windows Server” on page 78](#)

4. Push the latch release button to open the drive latch [1].



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

5. Grasp the latch and pull the drive out of the drive slot [2].
6. Consider your next steps:
- If you are replacing the drive, continue to [“Install a Storage Drive” on page 70](#).
 - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.
- For information on how to install a storage drive filler panel, see [“Remove and Install Filler Panels” on page 211](#).

Related Information

- [“Storage Drive Status Indicators” on page 31](#)
- [“Storage Drives Hot-Plug Conditions” on page 65](#)
- [“Storage Drive Failure and RAID” on page 66](#)
- [“Install a Storage Drive” on page 70](#)

▼ Install a Storage Drive

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

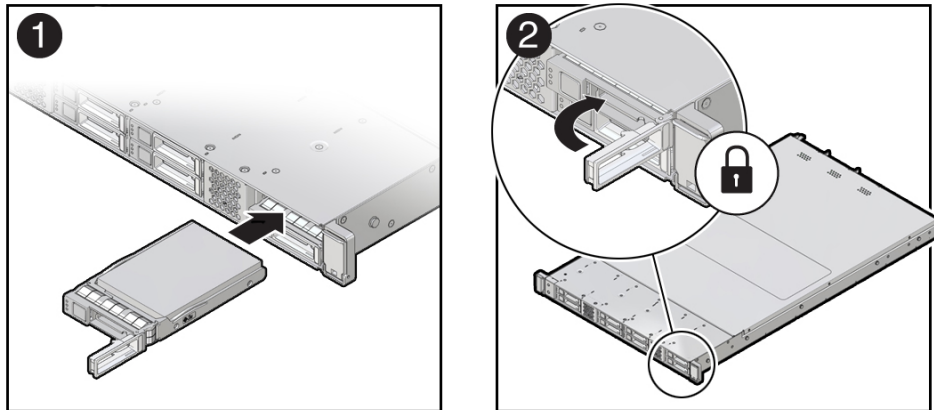
2. **If necessary, remove the drive filler panel.**

See [“Remove and Install Filler Panels”](#) on page 211.

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 [1].**



5. **Close the drive latch to lock the drive in place [2].**

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.

Related Information

- [“Storage Drive Status Indicators”](#) on page 31
- [“Storage Drives Hot-Plug Conditions”](#) on page 65

- [“Storage Drive Failure and RAID” on page 66](#)
- [“Remove a Storage Drive” on page 68](#)

Removing and Replacing an NVMe Storage Drive Using Oracle Solaris

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

- [“Unmount an NVMe Storage Drive” on page 71](#)
- [“Remove an NVMe Storage Drive” on page 72](#)
- [“Verify Removal of an NVMe Storage Drive” on page 72](#)
- [“Install an NVMe Storage Drive” on page 73](#)
- [“Power On an NVMe Storage Drive and Attach a Device Driver” on page 73](#)

▼ Unmount an NVMe Storage Drive

1. **Log in to Oracle Solaris that is running on the server.**
2. **To find the NVMe drive slot number, type:**

```
# hotplug list -lc
```

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

```
# hotplug list -lc
Connection State Description Path
-----
Slot100      ENABLED  PCIe-Native /pci@13,0/pci8086,2030@0/pci111d,80b5@0/pci111d,80b5@5
```

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

```
# hotplug poweroff Slot100
```

```
# hotplug list -lc
```

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

```
# hotplug list -lc
Connection State Description Path
```

```
-----
Slot100    PRESENT  PCIe-Native /pci@13,0/pci8086,2030@0/pci111d,80b5@0/pci111d,80b5@5
```

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

▼ Remove an NVMe Storage Drive

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 [“Storage Drive Locations and Numbering” on page 66](#).
2. **Verify that the OK to Remove indicator (LED) on the NVMe storage drive is lit.**
3. **On the drive that you plan to remove, push the latch release button to open the drive latch.**
4. **Grasp the latch and pull the drive out of the drive slot.**
See [“Remove a Storage Drive” on page 68](#).
5. **Consider your next steps:**
 - If you are replacing the drive, continue to [“Install an NVMe Storage Drive” on page 73](#).
 - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.
For information on how to install a storage drive filler panel, see [“Remove and Install Filler Panels” on page 211](#).

▼ Verify Removal of an NVMe Storage Drive

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

```
# hotplug list -lc
```

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

```
# hotplug list -lc
Connection State Description Path
-----
Slot100    EMPTY  PCIe-Native /pci@13,0/pci8086,2030@0/pci111d,80b5@0/pci111d,80b5@5
```

▼ Install an NVMe Storage Drive

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” on page 70](#).

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

See [“Install a Storage Drive” on page 70](#).

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

1. **Type: # hotplug enable Slot100**

2. **Type: # hotplug list -lc**

The following status is displayed for the NVMe storage drive.

```
# hotplug list -lc
Connection State Description Path
-----
Slot100 Enabled PCIe-Native /pci@13,0/pci8086,2030@0/pci111d,80b5@0/pci111d,80b5@5
```

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

```
# nvmeadm list
```

Related Information

- [“Storage Drive Status Indicators” on page 31](#)
- [“Storage Drives Hot-Plug Conditions” on page 65](#)
- [“Storage Drive Failure and RAID” on page 66](#)
- [“Storage Drive Locations and Numbering” on page 66](#)

Removing and Replacing an NVMe Storage Drive Using Oracle Linux

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

- [“Unmount an NVMe Storage Drive” on page 74](#)
- [“Remove an NVMe Storage Drive” on page 76](#)
- [“Verify Removal of an NVMe Storage Drive” on page 77](#)
- [“Install an NVMe Storage Drive” on page 77](#)
- [“Power On an NVMe Storage Drive and Attach a Device Driver” on page 78](#)
- [“Verify Operation of an NVMe Storage Drive” on page 78](#)

▼ Unmount an NVMe Storage Drive

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

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

This command returns output similar to the following:

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

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

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

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

This command returns output similar to the following:

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

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

Note - In the above output, notice that the instance names for the NVMe drives do not correspond to the NVMe drive labels on the front of the server, that is, pci/slots/12/address:0000:b2:00 corresponds to instance nvme0; however, on the front of the server, this drive is labeled NVMe2. For a table that shows the relationship between the pci/slot# and the NVMe storage drive label on the front of the server, see [“Server Operating System Names for the NVMe Storage Drives” on page 44](#).

- c. **Disconnect all users of the NVMe drive and back up the NVMe drive data as needed.**
- i. **Use the `umount` command to unmount any file systems that are mounted on the device.**
 - ii. **Remove the device from any multiple device (md) and Logical Volume Manager (LVM) volume using it.**

If the device is a member of an LVM Volume group, then it might 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 metadata from the disk.
 - iii. **If the device uses multipathing, run `multipath -l` and note all the paths to the device. Then, remove the multipathed device using the `multipath -f device` command.**

- iv. Run the `blockdev --flushbufs device` command to flush any outstanding I/O to all paths to the device.
3. To prepare the NVMe drive for removal, that is, to detach the NVMe device driver and power off the NVMe drive slot, type:

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

Where `$slot` is the slot number obtained in step [Step 2b](#) above.
4. Verify that the OK to Remove indicator (LED) on the NVMe drive is lit.

▼ Remove an NVMe Storage Drive

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

1. **Identify the location of the NVMe drive that you want to remove.**
For storage drive locations, see [“Storage Drive Locations and Numbering”](#) on page 66.
2. **Verify that the OK to Remove indicator (LED) on the NVMe drive is lit.**
3. **On the NVMe drive you plan to remove, push the latch release button to open the drive latch.**
4. **Grasp the latch and pull the drive out of the drive slot.**
[“Remove a Storage Drive”](#) on page 68.
5. **Consider your next steps:**
 - If you are replacing the drive, continue to [“Verify Removal of an NVMe Storage Drive”](#) on page 77.
 - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.
For information on how to install a storage drive filler panel, see [“Remove and Install Filler Panels”](#) on page 211.

▼ Verify Removal of an NVMe Storage Drive

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

```
# lspci -nnd :0a54
```

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

This commands returns output similar to the following:

```
86:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0a54]
8d:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0a54]
d9:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0a54]
e0:00.0 Non-Volatile memory controller [0108]: Intel Corporation Device [8086:0a54]
```

▼ Install an NVMe Storage Drive

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

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” on page 70](#).

5. **Close the drive latch to lock the drive in place [2].**

See [“Install a Storage Drive” on page 70](#).

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

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

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

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

▼ Verify Operation of an NVMe Storage Drive

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

Related Information

- [“Storage Drive Status Indicators” on page 31](#)
- [“Storage Drives Hot-Plug Conditions” on page 65](#)
- [“Storage Drive Failure and RAID” on page 66](#)
- [“Storage Drive Locations and Numbering” on page 66](#)

Removing and Replacing an NVMe Storage Drive Using Microsoft Windows Server

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

Note - NVMe storage drive hot plug is not supported for an Oracle Server X7-2 running Microsoft Windows Server. The system must be powered down before removing and replacing an NVMe storage drive.

- [“Remove an NVMe Storage Drive” on page 79](#)
- [“Install an NVMe Storage Drive” on page 79](#)

▼ Remove an NVMe Storage Drive

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

- 1. Power down the server that contains the storage drive to be removed.**
See [“Powering Down the Server” on page 53](#).
- 2. On the NVMe drive you plan to remove, push the latch release button to open the drive latch.**
See [“Remove a Storage Drive” on page 68](#).
- 3. Grasp the latch and pull the drive out of the drive slot.**
- 4. Consider your next steps:**
 - If you are replacing the drive, continue to [“Install an NVMe Storage Drive” on page 79](#).
 - If you are not replacing the drive, install a filler panel in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive.

For information on how to install a storage drive filler panel, see [“Remove and Install Filler Panels” on page 211](#).

▼ Install an NVMe Storage Drive

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

- 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” on page 70](#).
- 5. Close the drive latch to lock the drive in place.**

6. Power on the server.

See [“Power On the Server”](#) on page 216.

Related Information

- [“Storage Drive Status Indicators”](#) on page 31
- [“Storage Drives Hot-Plug Conditions”](#) on page 65
- [“Storage Drive Failure and RAID”](#) on page 66
- [“Storage Drive Locations and Numbering”](#) on page 66

Servicing Fan Modules (CRU)

This section describes how to service fan modules. Fan modules are customer-replaceable units (CRUs) that do not require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

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

- [“Remove a Fan Module” on page 81](#)
- [“Install a Fan Module” on page 84](#)

Related Information

- [“Remove the Server Top Cover” on page 63](#)

▼ Remove a Fan Module

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

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



Caution - When removing and replacing a fan module in the Oracle Server X7-2, you must complete the entire procedure within 20 seconds to maintain adequate cooling within the system. Remove and replace only one fan module at a time. Ensure that you have obtained the replacement fan module and that it is ready for installation before starting the replacement procedure. Each fan module contains two fans, with two fan motors per fan. The four fan motors provide separate tachometer signals so that the fan module reports four tach signals to Oracle ILOM. Even if only one fan motor is faulted within the fan module, the Oracle ILOM service processor detects that four fan motors have failed to spin while the fan module is removed. If the fan module is not replaced within 20 seconds of removal, Oracle ILOM will take the protective action to shut down the system to prevent thermal damage to the system.

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

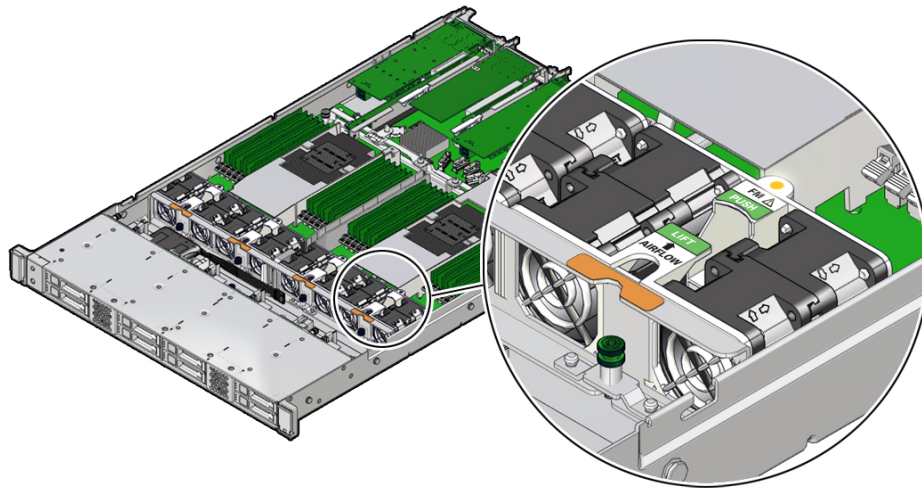
See “Extend the Server to the Maintenance Position” on page 59.

2. To access the fan modules, remove the server top cover.

See “Remove the Server Top Cover” on page 63.

3. Identify the faulty fan module.

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



LED Color and State Meaning

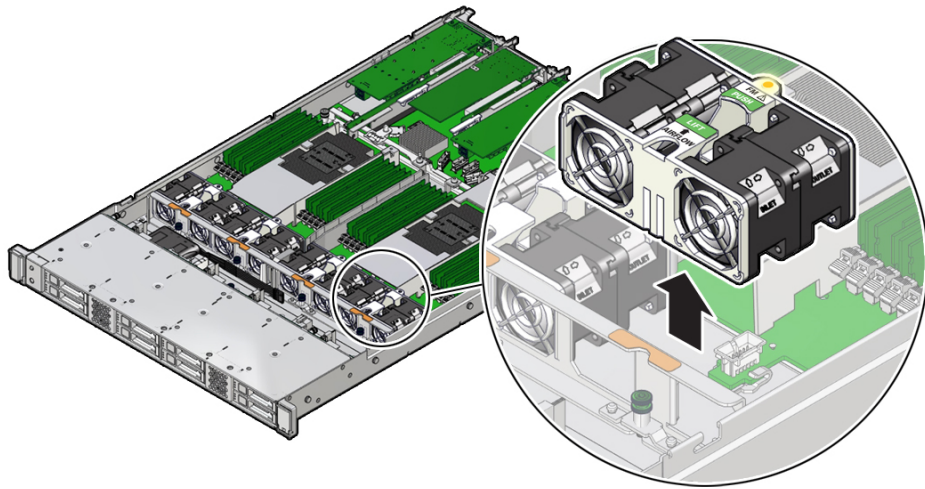
Amber – The fan module is faulty. The front Top Fan LED and the front and back panel Fault-Service Required LEDs are also lit if the system detects a fan module fault.

4. Remove the faulty fan module.

- a. **Using your thumb and forefinger, grasp the fan module in the finger recesses located in the plastic between the fans.**
- b. **Lift the fan module straight up and out of the chassis.**



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



5. Set the fan module aside.



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

6. Consider your next step:

- If you removed the fan assembly as part of another procedure, return to that procedure.
- Otherwise, continue to [“Install a Fan Module” on page 84](#).

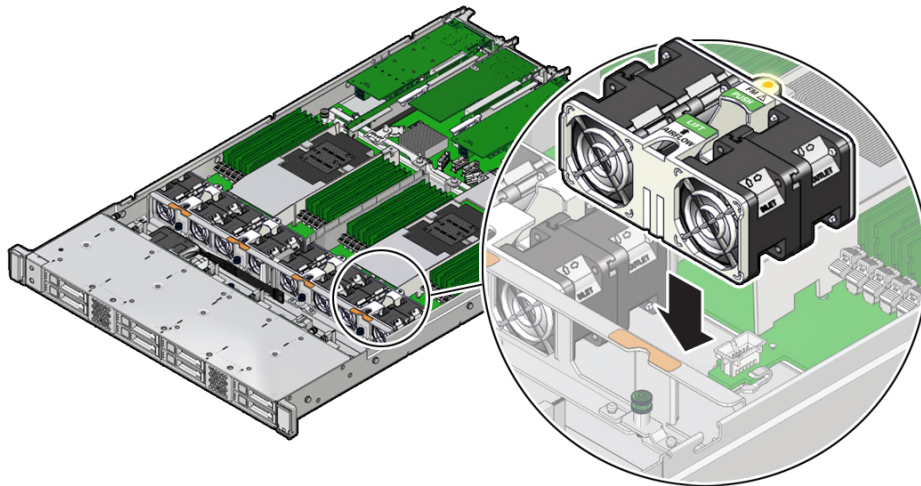
Related Information

- [“Install a Fan Module” on page 84](#)

▼ Install a Fan Module

1. **Remove the replacement fan module from its packaging and place it on an antistatic mat.**
2. **With the server top cover removed, position the replacement fan module into the server.**

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



3. **Press down on the fan module and apply firm pressure to fully seat the fan module.**
4. **Verify that the fan module status indicator (LED) that aligns with the replaced fan module is extinguished.**
5. **Install the server top cover.**
See [“Install the Server Top Cover”](#) on page 212.
6. **Verify that the Top Fan Fault LED on the front of the server and the Fault-Service Required LEDs on the front and back of the server are extinguished.**
See [“Troubleshooting Using the Server Front and Back Panel Status Indicators”](#) on page 28 for more information about identifying and interpreting system indicators.

7. Consider your next step:

- If you installed the fan module as part of another procedure, return to that procedure.
- Otherwise, return the server to operation. See [“Returning the Server to Operation” on page 211](#).

Related Information

- [“Remove a Fan Module” on page 81](#)

Servicing Power Supplies (CRU)

This section describes how to service power supplies. Power supplies are customer-replaceable units (CRUs) that do not require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

The power supplies are located at the back of the server. See the following procedures:

- [“Power Supply Overview” on page 87](#)
- [“Remove a Power Supply” on page 88](#)
- [“Install a Power Supply” on page 90](#)

Power Supply Overview

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

The server supports model A266 (1200 watt) power supplies. The A266 power supply unit (PSU) provides conversion from the AC lines to the system, accepting ranges from 100-240 volts AC (VAC). These PSUs are designed to be hot-pluggable, and in most cases will provide fully redundant “1+1” power, allowing the system to suffer the loss of a PSU or an AC feed with no loss to system availability.

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

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

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

For more information, see [“Power Supply Status Indicators”](#) on page 31.

If a power supply fails and you do not have a replacement available, leave the failed power supply installed to ensure proper airflow in the server.

Related Information

- [“Troubleshooting Using the Server Front and Back Panel Status Indicators”](#) on page 28

▼ Remove a Power Supply

1. **Prepare the system for power supply removal.**
See [“Take Antistatic Measures”](#) on page 62.
2. **Identify which power supply requires replacement.**



Callout	Description
1	Power supply 0

Callout	Description
2	Power supply 1

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

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

Note - The fans of a failed power supply might still be spinning when the system is powered on. You can remove a power supply while the fans are still spinning.

3. **Gain access to the rear of the server where the failed power supply is located.**
4. **If the cable management arm (CMA) is installed, disconnect both CMA left-side connectors and move the CMA out of the way.**

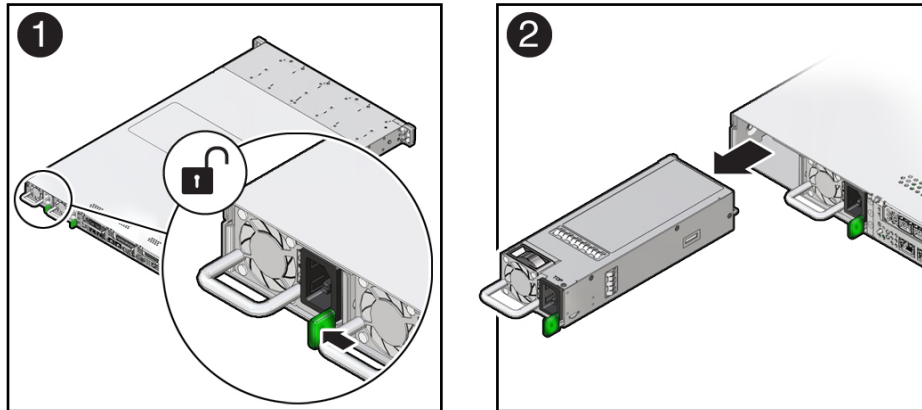
Refer to “[Remove the Cable Management Arm](#)” in *Oracle Servers X7-2 and X7-2L Installation Guide*.



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

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

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



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



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

8. Continue to [“Install a Power Supply” on page 90](#).

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Power Supply Status Indicators” on page 31](#)
- [“Install a Power Supply” on page 90](#)

▼ Install a Power Supply

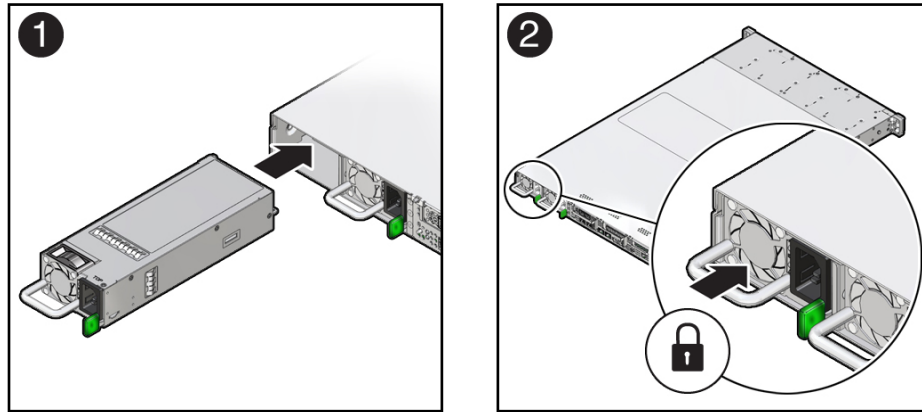


Caution - Always replace a failed power supply with a power supply of the same type (model).

1. Remove the replacement power supply from its packaging and place it on an antistatic mat.
2. Align the replacement power supply with the empty power supply slot [1].

3. Slide the power supply into the bay until it is fully seated [2].

You will hear an audible click when the power supply fully seats.



- 4. Reconnect the power cord to the power supply.**
- 5. Verify that the amber Fault-Service Required LED on the replaced power supply and the Fault-Service Required LEDs on the front and back panels of the server are not lit.**

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

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

Refer to “Install the Cable Management Arm (Optional)” in *Oracle Servers X7-2 and X7-2L Installation Guide*.

Related Information

- “Back Panel Components and Cable Connections” on page 18
- “Power Supply Status Indicators” on page 31

- [“Remove a Power Supply” on page 88](#)

Servicing an Internal USB Flash Drive (CRU)

This section describes how to service a USB flash drive. The USB flash drive is a customer-replaceable unit (CRU) that requires you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).



Caution - These procedures require that you handle components that are sensitive to static discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow antistatic practices as described in [“Electrostatic Discharge Safety” on page 50](#).



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

This section covers the following procedures:

- [“Remove an Internal USB Flash Drive” on page 93](#)
- [“Install an Internal USB Flash Drive” on page 94](#)

Related Information

- [“USB Ports” on page 223](#)

▼ Remove an Internal USB Flash Drive

The server can be equipped with one internal USB flash drive.

1. **Prepare the server for service.**
 - a. **Power off the server, and disconnect the power cords from the power supplies.**
See [“Powering Down the Server” on page 53](#).

2. **Insert the USB flash drive into the internal USB port.**
3. **Return the server to operation.**
 - a. **Install the server top cover.**

See [“Install the Server Top Cover”](#) on page 212.
 - b. **Return the server to the normal rack position.**

See [“Return the Server to the Normal Rack Position”](#) on page 214.
 - c. **Reconnect the power cords to the server power supplies and reconnect the data cables.**

See [“Reconnect Data Cables and Power Cords”](#) on page 216.
 - d. **Power on the server.**

See [“Power On the Server”](#) on page 216.
 - e. **Verify that the power supply AC OK LED is lit.**

Related Information

- [“Install an Internal USB Flash Drive”](#) on page 94

Servicing the DIMMs (CRU)

This section describes how to service memory modules (DIMMs). DIMMs are customer-replaceable units (CRUs) that require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

The Oracle Server X7-2 supports a variety of DIMM configurations that can include quad-rank (QR) and dual-rank (DR) DIMMs.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in [“Electrostatic Discharge Safety” on page 50](#).



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

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

- [“DIMM and Processor Physical Layout” on page 98](#)
- [“DIMM Population Scenarios” on page 99](#)
- [“DIMM Population Rules” on page 100](#)
- [“Populating DIMMs for Optimal System Performance” on page 101](#)
- [“Populating DIMMs in Single-Processor Systems for Optimal System Performance” on page 101](#)
- [“Populating DIMMs in Dual-Processor Systems for Optimal System Performance” on page 103](#)
- [“DIMM Operating Speeds” on page 104](#)
- [“DIMM Rank Classification Labels” on page 104](#)
- [“Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Failed DIMMs” on page 105](#)

- [“Using the Server Fault Remind Button” on page 105](#)
- [“Identify and Remove a DIMM” on page 106](#)
- [“Install a DIMM” on page 108](#)

Related Information

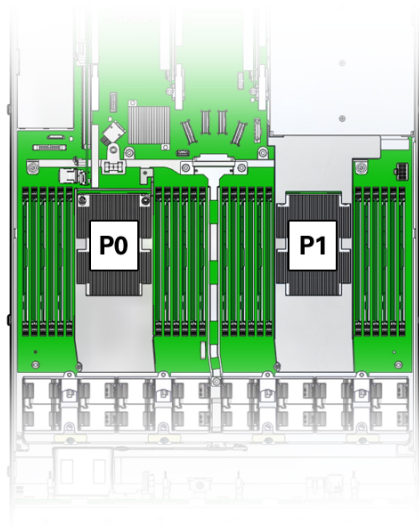
- [“Servicing Processors \(FRU\)” on page 137](#)

DIMM and Processor Physical Layout

The physical layout of the DIMMs and processor(s) is shown in the following figure. When viewing the server from the front, processor 0 (P0) is on the left.

Each processor, P0 and P1, has twelve DIMM slots organized into six memory channels. Each channel contains two DIMM slots: a white DIMM slot (channel slot 0) and a black DIMM slot (channel slot 1).

Memory Channels	DIMM Slot 0 (White)	DIMM Slot 1 (Black)
A	D6	D7
B	D8	D9
C	D10	D11
D	D5	D4
E	D3	D2
F	D1	D0



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

Related Information

- [“DIMM Population Scenarios” on page 99](#)
- [“DIMM Population Rules” on page 100](#)
- [“Populating DIMMs for Optimal System Performance” on page 101](#)
- [“DIMM Operating Speeds” on page 104](#)
- [“DIMM Rank Classification Labels” on page 104](#)
- [“Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Failed DIMMs” on page 105](#)

DIMM Population Scenarios

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

- A DIMM fails and needs to be replaced.
In this scenario, you can use the Fault Remind button to determine the failed DIMM, then remove the failed DIMM and replace it. To ensure that system performance is maintained,

you must replace the failed DIMM with a DIMM of the same size (in gigabytes) and type (quad-rank or dual-rank). In this scenario, you should not change the DIMM configuration.

- You have purchased new DIMMs and you want to use them to upgrade the server's memory. In this scenario, you should adhere to DIMM population rules and follow the recommended DIMM population order for optimal system performance.

Related Information

- [“DIMM Population Rules” on page 100](#)
- [“Populating DIMMs for Optimal System Performance” on page 101](#)
- [“Using the Server Fault Remind Button” on page 105](#)
- [“Identify and Remove a DIMM” on page 106](#)
- [“Install a DIMM” on page 108](#)

DIMM Population Rules

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

- The server supports 64-GB quad-rank (QR) Load-Reduced DIMMs (LRDIMMs) and 32-GB dual-rank (DR) and 16-GB DR Registered DIMMs (RDIMMs).
- Mixing of single-rank and dual-rank DIMMs is not supported.
- Do not mix DIMM types in the server. For example, do not mix 64-GB LRDIMMs and 16-GB or 32-GB RDIMMs in the same server. If the server has 64-GB LRDIMMs installed, you cannot install 16-GB or 32-GB RDIMMs and vice versa.
- If you are installing a mix of RDIMM sizes (for example, 16-GB and 32-GB), install the larger size RDIMMs first, then the smaller RDIMMs, until all of the RDIMMs are installed.
- Each memory channel is composed of a black slot (channel slot 0) and a white slot (channel slot 1). Populate the black slot first, and then populate the white slot.

Note - The black slot for each channel must be populated first because it is considered furthest away from the processor.

- The server supports either one DIMM per channel (1DPC) or two DIMMs per channel (2DPC).
- The server operates properly with a minimum of one DIMM installed per processor.

Populating DIMMs for Optimal System Performance

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

- In single-processor systems, populate DIMMs of the same size in multiples of six.
- In dual-processor systems, populate DIMMs of the same size in multiples of twelve.
- Populate the DIMM slots in the order described in the following sections.

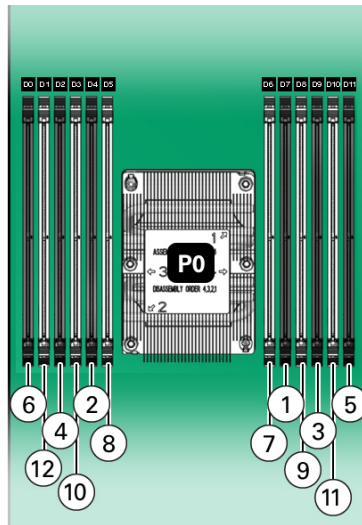
The following sections provide an example of how to populate the DIMM slots to achieve optimal system performance.

Note - Not all possible configurations are shown here.

- [“Populating DIMMs in Single-Processor Systems for Optimal System Performance” on page 101](#)
- [“Populating DIMMs in Dual-Processor Systems for Optimal System Performance” on page 103](#)

Populating DIMMs in Single-Processor Systems for Optimal System Performance

In single-processor systems, install DIMMs only into DIMM slots associated with processor 0 (P0). Starting with slot P0 D7, first fill the black slots, and then fill the white slots, as shown in the following figure.

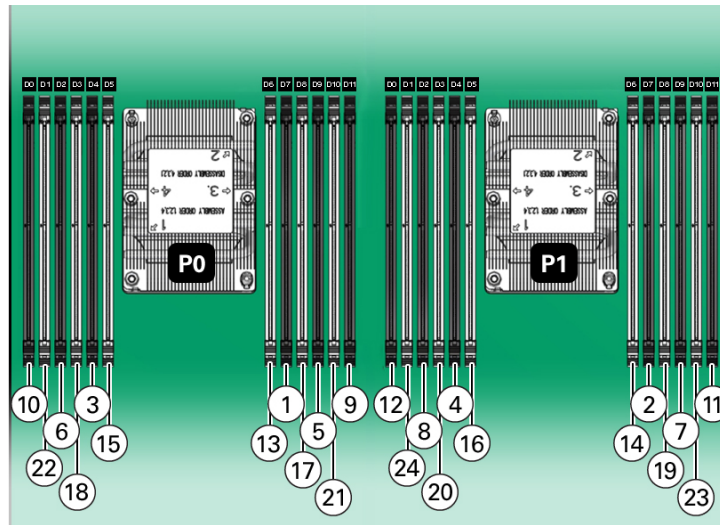


The following table describes the proper order in which to populate DIMMs in a single-processor system using the numbered callouts in the above figure, and the DIMM slot labels (D0 through D11).

Population Order	Processor/DIMM Slot
Populate black slots first in the following order:	<ol style="list-style-type: none"> 1. P0/D7 2. P0/D4 3. P0/D9 4. P0/D2 5. P0/D11 6. P0/D0
After black slots have been populated, populate white slots in the following order:	<ol style="list-style-type: none"> 1. P0/D6 2. P0/D5 3. P0/D8 4. P0/D3 5. P0/D10 6. P0/D1

Populating DIMMs in Dual-Processor Systems for Optimal System Performance

In dual-processor systems, populate DIMMs into DIMM slots starting with processor 0 (P0) D7, then, alternating between slots associated with processor 0 (P0) and matching slots for processor 1 (P1). Fill the black slots, and then the white slots, as shown in the following figure.



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

Population Order	Processor/DIMM Slot
Populate black slots first in the following order:	1. P0/D7
	2. P1/D7
	3. P0/D4
	4. P1/D4
	5. P0/D9
	6. P0/D2
	7. P1/D9
	8. P1/D2
	9. P0/D11
	10. P0/D0

Population Order	Processor/DIMM Slot
	11. P1/D11
	12. P1/D0
After black slots have been populated, populate white slots in the following order:	1. P0/D6
	2. P1/D6
	3. P0/D5
	4. P1/D5
	5. P0/D8
	6. P0/D3
	7. P1/D8
	8. P1/D3
	9. P0/D10
	10. P0/D1
	11. P1/D10
	12. P1/D01

DIMM Operating Speeds

The maximum supported memory speed is 2667 MT/s. However, not all system configurations will support operation at this speed. The maximum attainable memory speed is limited by the maximum speed supported by the specific type of processor. All memory installed in the system operates at the same speed, or frequency.

DIMM Rank Classification Labels

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

TABLE 1 DIMM Rank Classification Labels

Rank Classification	Label
Quad-rank LRDIMM	4Rx4
Dual-rank RDIMM	2Rx4

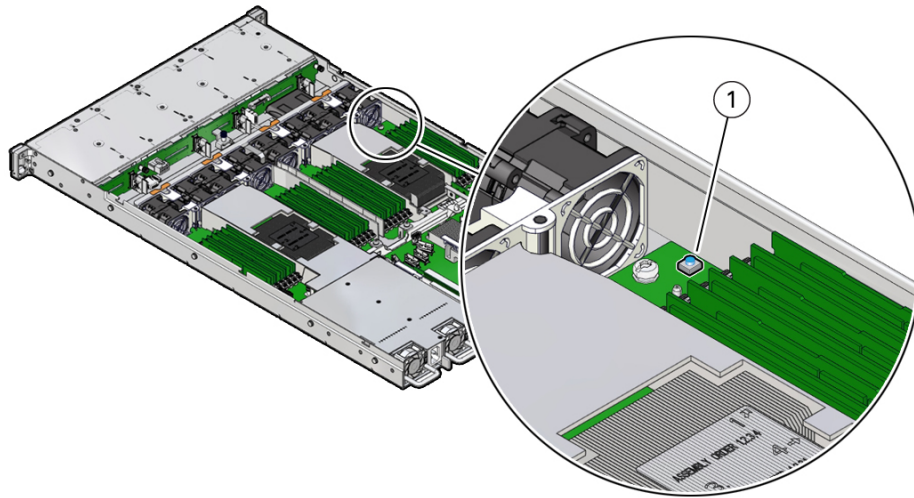
Inconsistencies Between DIMM Fault Indicators and the BIOS Isolation of Failed DIMMs

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

Using the Server Fault Remind Button

When the server Fault Remind button [1] is pressed, an LED located next to the Fault Remind button lights green to indicate that there is sufficient voltage present in the fault remind circuit to light any fault LEDs that were lit due to a component failure. If this LED does not light when you press the Fault Remind button, it is likely that the capacitor powering the fault remind circuit has lost its charge. This can happen if the Fault Remind button is pressed for several minutes with fault LEDs lit or if power has been removed from the server for more than 15 minutes.

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



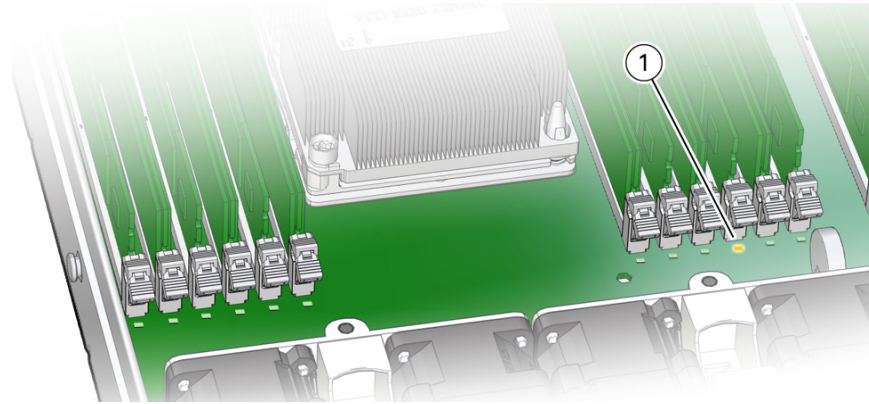
▼ Identify and Remove a DIMM

1. **Prepare the server for service.**
 - a. **Power off the server, and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.
2. **Identify and note the location of the failed DIMM by pressing the Fault Remind button on the motherboard.**

See [“Using the Server Fault Remind Button”](#) on page 105.

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

- If the DIMM Fault LED is off, then the DIMM is operating properly.
- If the DIMM Fault LED is on (amber), then the DIMM is failed and should be replaced [1].



3. To remove the failed DIMM do the following:

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

The DIMM is partially ejected from the slot.

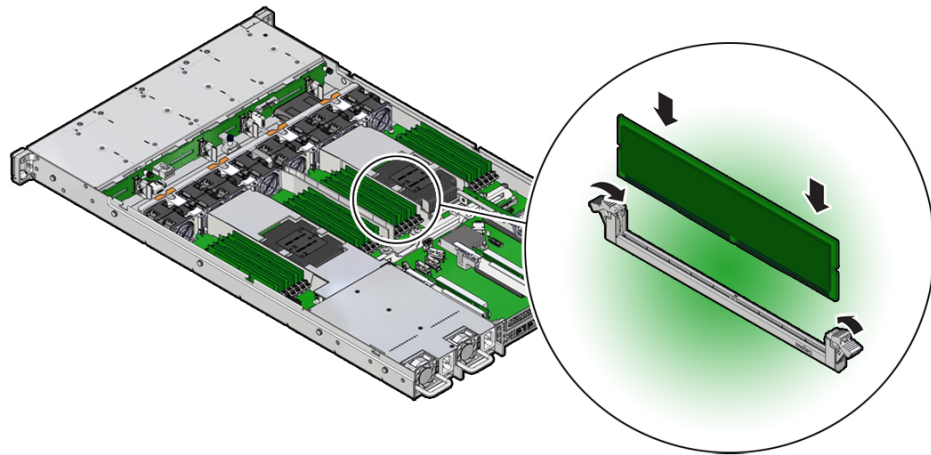
3. Install a DIMM.

- a. **Ensure that the ejector tabs are in the open position.**
- b. **Align the notch in the replacement DIMM with the connector key in the connector slot.**

The notch ensures that the DIMM is oriented correctly.

- c. **Push the DIMM into the connector slot until the ejector tabs lock the DIMM in place.**

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



4. **Repeat [Step 3](#) until all replacement DIMMs are installed.**
5. **Return the server to operation.**
 - a. **Install the server top cover.**

See [“Install the Server Top Cover”](#) on page 212.
 - b. **Return the server to the normal rack position.**

See [“Return the Server to the Normal Rack Position”](#) on page 214.

- c. **Reconnect the power cords to the server power supplies and reconnect the data cables.**

See “Reconnect Data Cables and Power Cords” on page 216.

- d. **Power on the server.**

See “Power On the Server” on page 216.

- e. **Verify that the power supply AC OK LED is lit.**

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

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

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

Related Information

- “DIMM and Processor Physical Layout” on page 98
- “DIMM Population Rules” on page 100
- “Populating DIMMs for Optimal System Performance” on page 101
- “Identify and Remove a DIMM” on page 106

Servicing PCIe Risers (CRU)

This section describes how to service PCIe risers. PCIe risers are customer-replaceable units (CRUs) that require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

PCIe cards in all slots are installed on vertical risers. You must remove the associated riser to remove and replace a PCIe card. You must remove all three PCIe risers when replacing the motherboard.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in [“Electrostatic Discharge Safety” on page 50](#).



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

The following sections provide information to assist you in servicing PCIe risers:

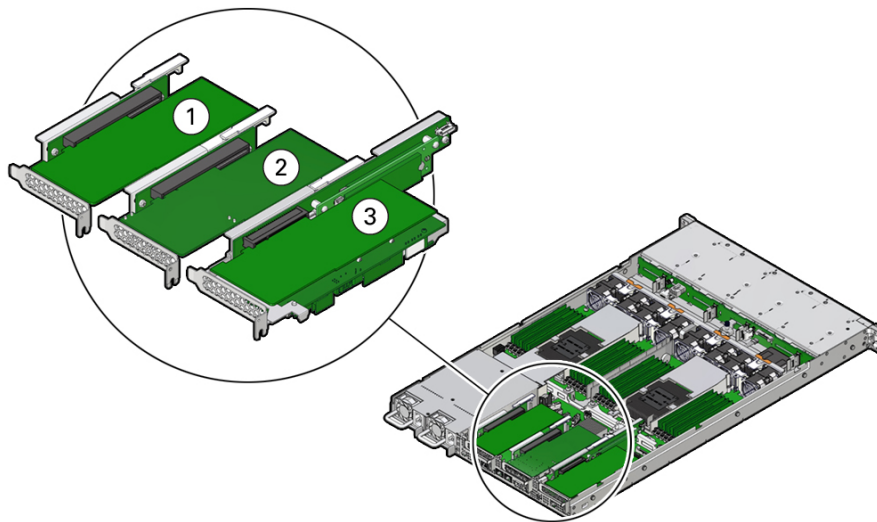
- [“PCIe Riser Location and Differences” on page 112](#)
- [“Remove a PCIe Riser From PCIe Slot 1 or 2” on page 113](#)
- [“Install a PCIe Riser Into PCIe Slot 1 or 2” on page 114](#)
- [“Remove the PCIe Riser From PCIe Slots 3 and 4” on page 116](#)
- [“Install the PCIe Riser Into PCIe Slots 3 and 4” on page 118](#)

Related Information

- [“Servicing PCIe Cards \(CRU\)” on page 121](#)

PCIe Riser Location and Differences

The PCIe riser that installs in PCIe slots 3 and 4 is different than the risers in PCIe slots 1 and 2. The riser for slots 3 and 4 supports an M.2 mezzanine and two PCIe cards: a standard PCIe card and the internal HBA card. Do not attempt to install the PCIe riser for PCIe slots 3 and 4 in slots 1 or 2, and vice versa.



Callout	Description
1	PCIe riser with installed PCIe card in slot 1 (This slot is nonfunctional in single-processor systems.)
2	PCIe riser with installed PCIe card in slot 2
3	PCIe riser with M.2 mezzanine and installed cards (2) in slots 3 and 4 (the internal HBA card is installed in slot 4 of this riser.)

Callout	Description
	Note - This riser is different from the risers in slots 1 and 2.

Related Information

- [“PCIe Slot Characteristics” on page 122](#)

▼ Remove a PCIe Riser From PCIe Slot 1 or 2

Note - PCIe slot 1 is nonfunctional in single-processor systems.

- 1. Prepare the server for service.**
 - a. Power off the server and disconnect the power cords from the power supplies.**

See [“Powering Down the Server” on page 53](#).
 - b. Extend the server to the maintenance position.**

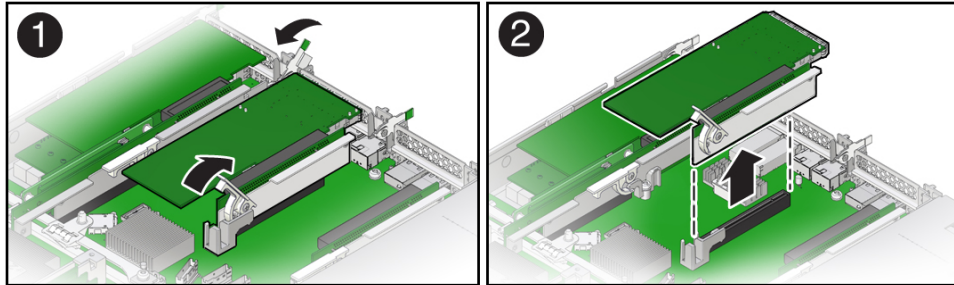
See [“Extend the Server to the Maintenance Position” on page 59](#).
 - c. Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis.**

See [“Take Antistatic Measures” on page 62](#).
 - d. Remove the server top cover.**

See [“Remove the Server Top Cover” on page 63](#).
- 2. Select the PCIe riser that you want to remove.**

See [“PCIe Slot Characteristics” on page 122](#).
- 3. If a PCIe card is installed in the riser, disconnect any external cables from the card.**

4. **Lift the green-tabbed latch on the rear of the server chassis next to the applicable PCIe slot to release the rear bracket on the PCIe card [1].**



Note - If the riser does not have a PCIe card installed, then lift the latch to release the PCIe slot filler panel.

5. **Lift the green-tabbed riser release lever on the PCIe riser with one hand and use your other hand to remove the riser from the motherboard connector [1, 2].**
6. **If there is a PCIe card installed in the riser, place the riser on an antistatic mat and note the slot in which the PCIe riser was originally installed; otherwise, set the PCIe riser aside.**

Related Information

- [“Install a PCIe Riser Into PCIe Slot 1 or 2” on page 114](#)
- [“Install a PCIe Card in PCIe Slot 1 or 2” on page 123](#)

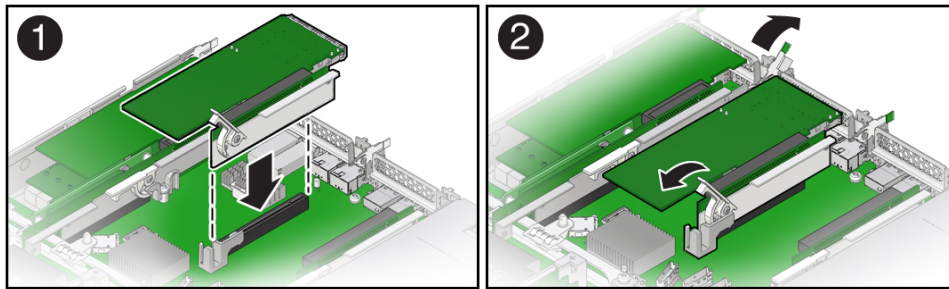
▼ Install a PCIe Riser Into PCIe Slot 1 or 2

Note - PCIe slot 1 is nonfunctional in single-processor systems.

Note - The PCIe riser in slots 3 and 4 is different than the PCIe risers in slots 1 and 2. Do not attempt to install a PCIe riser from slot 1 or 2 into PCIe slots 3 and 4 and vice versa.

1. **Determine into which slot you will install the PCIe riser.**
2. **Retrieve the PCIe riser and any PCIe cards attached to it.**

3. **Raise the green-tabbed release lever on the PCIe riser to the open (up) position [1].**
4. **Gently press the riser into the motherboard connector until it is seated, and then press the green-tabbed release lever on the PCIe riser to the closed (down) position [1, 2].**



5. **Close the green-tabbed latch on the rear of the server chassis next to the applicable PCIe slot to secure the rear bracket on the PCIe card to the server chassis [2].**

Note - If the riser does not have a PCIe card installed, install a PCIe slot filler panel and close the green-tabbed latch to secure the filler panel.

6. **If there were any external cables connected to the PCIe card, reconnect them.**
7. **Return the server to operation.**
 - a. **Install the server top cover.**
See [“Install the Server Top Cover”](#) on page 212.
 - b. **Return the server to the normal rack position.**
See [“Return the Server to the Normal Rack Position”](#) on page 214.
 - c. **Reconnect the power cords to the server power supplies and reconnect the data cables.**
See [“Reconnect Data Cables and Power Cords”](#) on page 216.
 - d. **Power on the server.**

See [“Power On the Server”](#) on page 216.

e. **Verify that the System OK status indicator is steady on.**

8. Use Oracle ILOM to clear the server PCIe riser fault.

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

Related Information

- [“Remove a PCIe Riser From PCIe Slot 1 or 2”](#) on page 113
- [“Remove a PCIe Card From PCIe Slot 1 or 2”](#) on page 122

▼ Remove the PCIe Riser From PCIe Slots 3 and 4

Note - This PCIe riser is actually installed in PCIe slot 3, but it supports an M.2 mezzanine and up to two PCIe cards. The upper slot, referred to as slot 3, can be used for any supported PCIe card, and, therefore, is optionally populated. The lower slot, referred to as slot 4, is dedicated to the internal HBA card, and, therefore is always populated. The internal HBA card is a field replaceable unit (FRU). For instructions for servicing the internal HBA card, see [“Servicing the Internal HBA Card and HBA Super Capacitor \(FRU\)”](#) on page 169.

1. Prepare the server for service.

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

See [“Powering Down the Server”](#) on page 53

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

See [“Extend the Server to the Maintenance Position”](#) on page 59.

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

See [“Take Antistatic Measures”](#) on page 62.

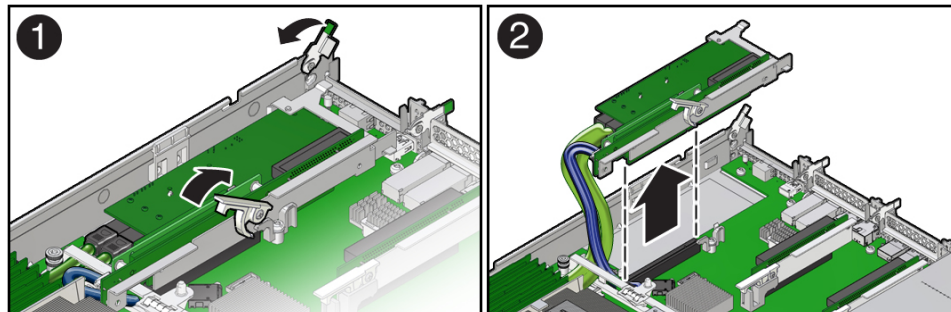
d. **Remove the server top cover.**

See “Remove the Server Top Cover” on page 63.

2. **If there is a PCIe card installed in PCIe slot 3, disconnect any external or internal cables.**

Note - Do not disconnect the SAS cables from the internal host bus adapter card in slot 4 until after you have removed the riser from the server.

3. **Open the green-tabbed latch located on the rear of the server chassis next to PCIe slot 3 to release the rear bracket on the PCIe card [1].**



Note - If the riser does not have a PCIe card installed in slot 3, then lift the latch to release the PCIe slot 3 filler panel.

4. **To release the riser from the motherboard connector, lift the green-tabbed release lever on the PCIe riser to the open position [1].**
5. **Grasp the riser with both hands and remove it from the server [2].**
6. **Disconnect the M.2 SATA cable between the PCIe riser and motherboard SATA connector.**
7. **Disconnect the SAS cables from the internal HBA card installed in PCIe slot 4.**
8. **Disconnect the super capacitor cable from the internal HBA card in slot 4.**
9. **Place the riser on an antistatic mat.**

Related Information

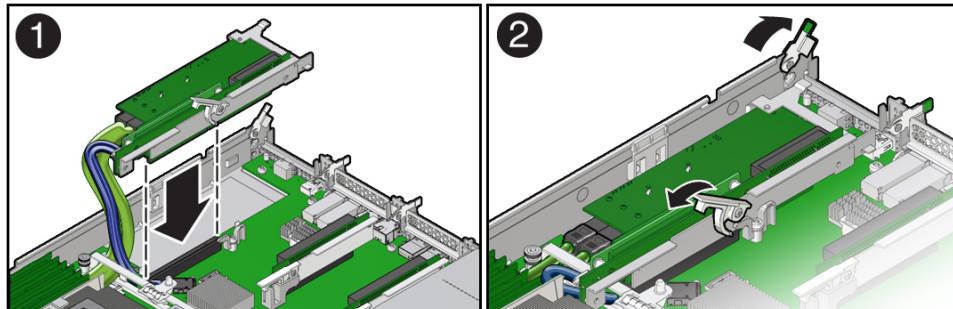
- [“Install the PCIe Riser Into PCIe Slots 3 and 4” on page 118](#)
- [“Install a PCIe Card in PCIe Slot 3” on page 125](#)

▼ Install the PCIe Riser Into PCIe Slots 3 and 4

Note - The PCIe riser in slots 3 and 4 is different than the PCIe risers in slots 1 and 2. Do not attempt to install a PCIe riser from slot 1 or 2 into PCIe slots 3 and 4 and vice versa.

1. **Retrieve the PCIe riser and any PCIe cards attached to it.**
2. **Reconnect the SAS cables and the super capacitor cable to the internal HBA card in slot 4.**

To ensure SAS cables are properly connected to the internal HBA card, see [“Install the Internal HBA Cables” on page 182](#).



3. **Reconnect the M.2 SATA cable between the PCIe riser and the motherboard SATA connector.**
4. **Raise the green-tabbed release lever on the PCIe riser to the open (up) position, and then gently press the riser into the motherboard connector until it is seated [1].**
5. **Ensure that the rear bracket on the internal HBA card in PCIe slot 4 is connected to the slot in the server chassis side wall.**

If the bracket is not connected, remove the riser and reposition it so that the rear bracket connects to the side wall, and then gently press the riser into the motherboard connector.

6. **Press the green-tabbed release lever on the PCIe riser to the closed (down) position [2].**
7. **To secure the rear bracket on the PCIe card to the server, close the green-tabbed latch on the rear of the server chassis [2].**

Note - If the riser does not have a PCIe card installed in slot 3, install a PCIe slot filler panel and close the green-tabbed latch to secure the PCIe slot filler panel.

8. **If there is a PCIe card in PCIe slot 3, reconnect any external or internal cables.**
9. **Return the server to operation.**
 - a. **Install the server top cover.**
See “[Install the Server Top Cover](#)” on page 212.
 - b. **Return the server to the normal rack position.**
See “[Return the Server to the Normal Rack Position](#)” on page 214.
 - c. **Reconnect the power cord to the server power supply and the data cables.**
See “[Reconnect Data Cables and Power Cords](#)” on page 216.
 - d. **Power on the server.**
See “[Power On the Server](#)” on page 216.
 - e. **Verify that the System OK status indicator is lit.**
10. **Use Oracle ILOM to clear the server PCIe riser fault.**

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

Related Information

- “[Remove the PCIe Riser From PCIe Slots 3 and 4](#)” on page 116
- “[Remove a PCIe Card From PCIe Slot 3](#)” on page 124

Servicing PCIe Cards (CRU)

This section describes how to service PCIe cards. PCIe cards are customer-replaceable units (CRUs) that require you to power off the server. For more information about CRUs, see “[Illustrated Parts Breakdown](#)” on page 19 and “[Customer-Replaceable Units](#)” on page 21.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in “[Electrostatic Discharge Safety](#)” on page 50.



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

Note - For a complete list of supported PCIe cards, refer to the *Oracle Server X7-2 Product Notes* at <https://www.oracle.com/goto/x7-2/docs>.

This section covers the following topics and procedures:

- “[PCIe Slot Characteristics](#)” on page 122
- “[Remove a PCIe Card From PCIe Slot 1 or 2](#)” on page 122
- “[Install a PCIe Card in PCIe Slot 1 or 2](#)” on page 123
- “[Remove a PCIe Card From PCIe Slot 3](#)” on page 124
- “[Install a PCIe Card in PCIe Slot 3](#)” on page 125

Related Information

- “[Servicing PCIe Risers \(CRU\)](#)” on page 111

PCIe Slot Characteristics

There are three external PCIe slots and one internal PCIe slot available in the Oracle Server X7-2. The external slots support optional, standard PCIe cards and are numbered 1, 2, and 3 from left to right when you view the server from the rear. The internal slot, which installs on the riser in PCIe slots 3 and 4, supports a required internal SAS controller HBA card. For a view of the back panel that shows PCIe slot numbering, see [“Back Panel Components and Cable Connections”](#) on page 18.

Note - PCIe slot 1 is nonfunctional in single-processor systems.

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

The following table lists the characteristics and requirements of the PCIe slots.

Slot Number	Supported PCIe Card Types	Supported PCIe Specifications	Slot Connector Width/PCI Express Lanes
1	Low-profile cards only	PCIe 1.0, PCIe 2.0, PCIe 3.0	x16 mechanical/x16 electrical
2	Low-profile cards only	PCIe 1.0, PCIe 2.0, PCIe 3.0	x16 mechanical/x16 electrical
3 and 4	Low-profile cards only	PCIe 1.0, PCIe 2.0, PCIe 3.0	x8 mechanical/x8 electrical

Related Information

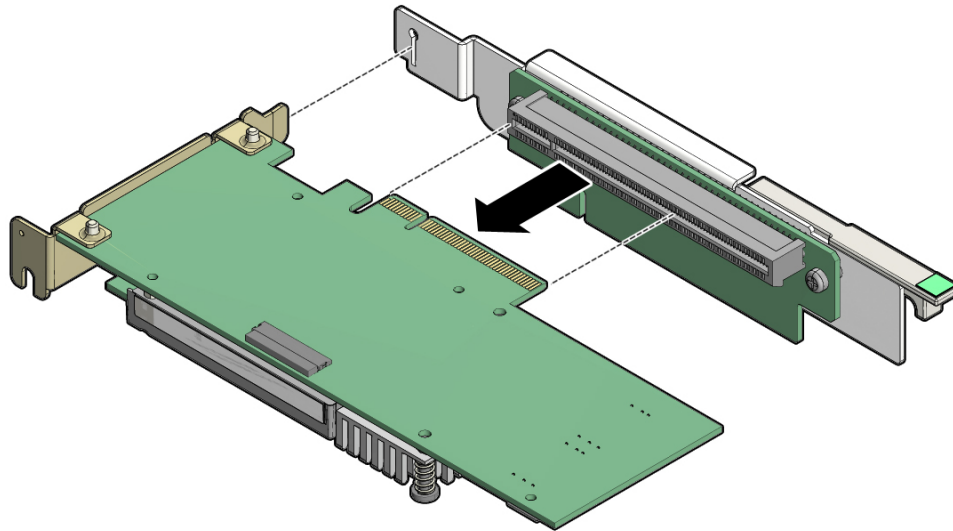
- [“Back Panel Components and Cable Connections”](#) on page 18

▼ Remove a PCIe Card From PCIe Slot 1 or 2

Note - PCIe slot 1 is nonfunctional in single-processor systems.

1. **Remove the PCIe riser from the server.**
See [“Remove a PCIe Riser From PCIe Slot 1 or 2”](#) on page 113.
2. **Remove the PCIe card from the PCIe riser.**

- a. Hold the riser in one hand and use your other hand to carefully pull the PCIe card connector out of the riser.
- b. Disconnect the rear bracket that is attached to the PCIe card from the rear of the PCIe riser.



3. Place the PCIe card on an antistatic mat.



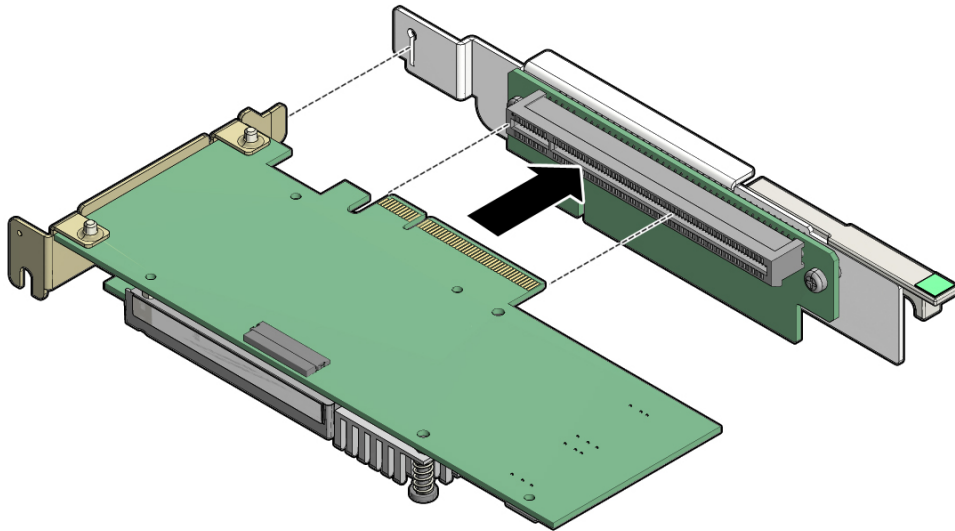
Caution - Whenever you remove a PCIe card, you should replace it with another PCIe card or a PCIe filler panel. Installing PCIe filler panels in vacant PCIe slots helps reduce the level of electromagnetic interference (EMI) emitted by the server. See [“Remove and Install Filler Panels”](#) on page 211.

▼ Install a PCIe Card in PCIe Slot 1 or 2

Note - PCIe slot 1 is nonfunctional in single-processor systems.

1. Retrieve the PCIe card and riser you want to install.

2. Insert the rear bracket that is attached to the PCIe card into the PCIe riser.
3. Hold the riser in one hand and use your other hand to carefully insert the PCIe card connector into the riser.

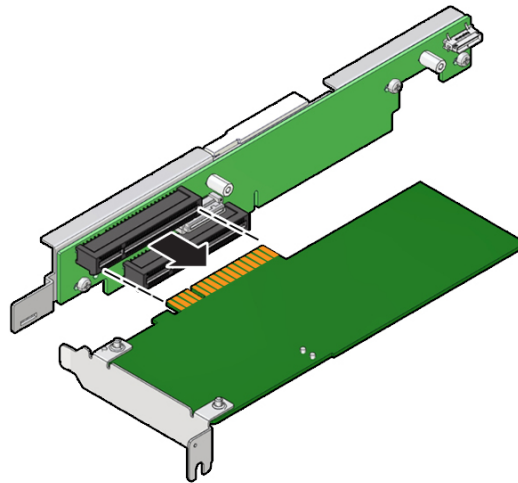


4. Install the PCIe riser into the server.
See [“Install a PCIe Riser Into PCIe Slot 1 or 2”](#) on page 114.

▼ Remove a PCIe Card From PCIe Slot 3

1. Remove the PCIe riser from the server.
See [“Remove the PCIe Riser From PCIe Slots 3 and 4”](#) on page 116.
2. Remove the PCIe card from the riser.
 - a. Hold the riser in one hand and use your other hand to carefully remove the PCIe card connector from the riser.

- b. **Disconnect the rear bracket attached to the PCIe card from the rear of the PCIe riser.**



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

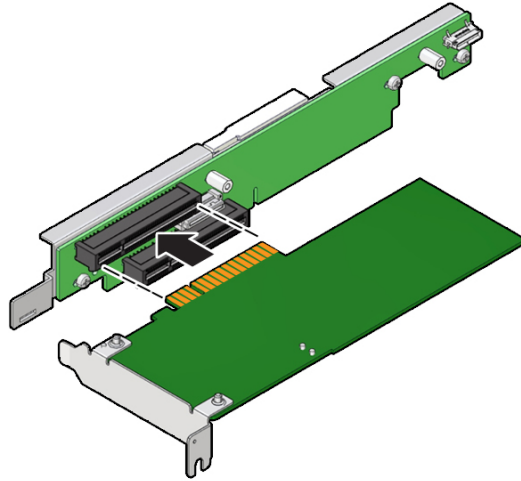


Caution - Whenever you remove a PCIe card, you should replace it with another PCIe card or a PCIe filler panel. Installing PCIe filler panels in vacant PCIe slots helps reduce the level of electromagnetic interference (EMI) emitted by the server. See [“Remove and Install Filler Panels”](#) on page 211.

▼ Install a PCIe Card in PCIe Slot 3

1. **Retrieve the PCIe card and riser you want to install.**
2. **Insert the rear bracket that is attached to the PCIe card into the PCIe riser.**

3. **Hold the riser in one hand and use your other hand to carefully insert the PCIe card connector into the riser.**



4. **Install the PCIe riser.**
See [“Install the PCIe Riser Into PCIe Slots 3 and 4”](#) on page 118.

Servicing the Internal M.2 Flash SSDs (CRU)

This section describes how to service M.2 flash solid-state drives (SSDs). M.2 flash SSDs are customer-replaceable units (CRUs) that require you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow antistatic practices as described in [“Electrostatic Discharge Safety” on page 50](#).



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

This section covers the following procedures:

- [“Remove an M.2 Mezzanine” on page 127](#)
- [“Install an M.2 Mezzanine” on page 129](#)
- [“Remove an M.2 Flash SSD” on page 130](#)
- [“Install an M.2 Flash SSD” on page 131](#)

Related Information

- [“Servicing Storage Drives \(CRU\)” on page 65](#)

▼ Remove an M.2 Mezzanine

1. **Remove the PCIe riser from the server.**

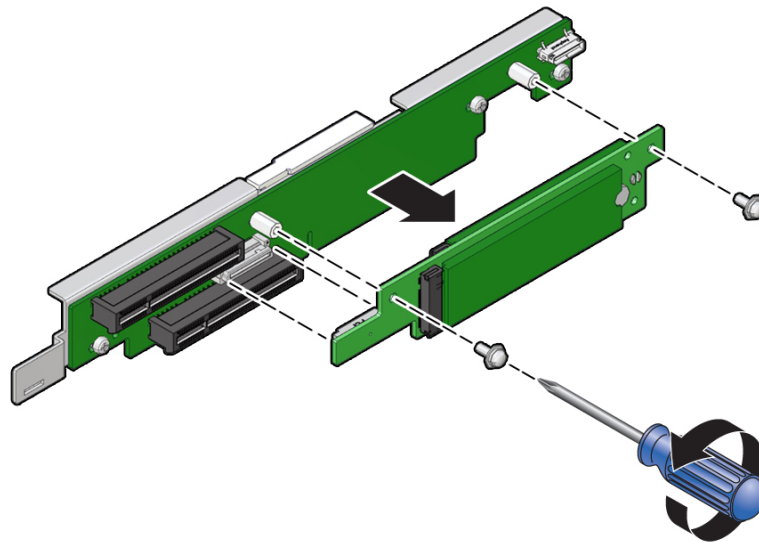
See [“Remove the PCIe Riser From PCIe Slots 3 and 4” on page 116](#).

2. **Remove any PCIe card in PCIe slot 3 and the internal HBA in PCIe slot 4.**

See [“Remove a PCIe Card From PCIe Slot 3”](#) on page 124 and [“Remove the Internal HBA Card and HBA Super Capacitor”](#) on page 170.

Note - You do not need to remove the data cables from the PCIe cards when servicing the M.2 mezzanine. Extract the PCIe cards (with cables attached) from the PCIe slots and set them aside.

3. **Using a T10 Torx screwdriver, remove the screws that secure the M.2 mezzanine to the PCIe riser.**



4. **Lift and remove the M.2 mezzanine from the PCIe riser connector.**

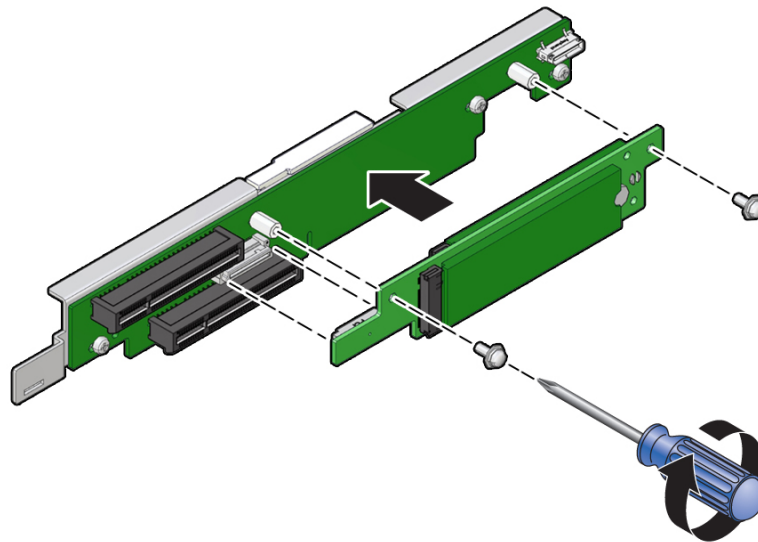
Place the M.2 mezzanine on an antistatic mat. If required, perform the procedures for removing the M.2 flash SSDs from the mezzanine. See [“Remove an M.2 Flash SSD”](#) on page 130.

Related Information

- [“Install an M.2 Mezzanine”](#) on page 129

▼ Install an M.2 Mezzanine

1. **Unpack the replacement M.2 mezzanine and place it on an antistatic mat.**
If required, ensure that you have installed the M.2 flash SSDs on to the M.2 mezzanine before installing the mezzanine on to the PCIe riser. See [“Install an M.2 Flash SSD” on page 131](#).
2. **Align the M.2 mezzanine with the connector and screw holes on the PCIe riser and then insert the mezzanine into the connector.**



3. **Using a T10 Torx screwdriver, install the screws that secure the M.2 mezzanine to the PCIe riser.**
4. **Install the internal HBA card in PCIe slot 4 and any PCIe card in PCIe slot 3.**
See [“Install the Internal HBA Card and HBA Super Capacitor” on page 173](#) and [“Install a PCIe Card in PCIe Slot 3” on page 125](#).
5. **Install the PCIe riser.**
See [“Install the PCIe Riser Into PCIe Slots 3 and 4” on page 118](#).

Related Information

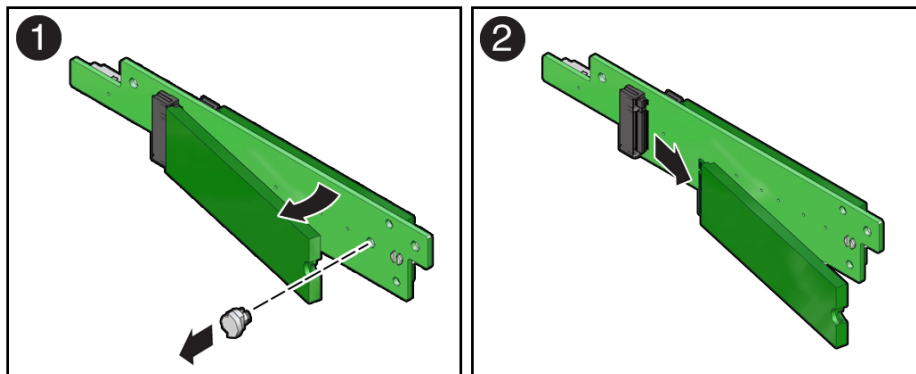
- [“Remove an M.2 Mezzanine” on page 127](#)

▼ Remove an M.2 Flash SSD

1. **Perform the steps to remove the M.2 mezzanine containing the M.2 flash SSDs from PCIe riser.**

See [“Remove an M.2 Mezzanine” on page 127](#). Place the M.2 mezzanine on an antistatic mat.

2. **Using your fingers, push the plastic retainer clip through the M.2 mezzanine to release the M.2 flash SSD from the mezzanine. [1].**



3. **Remove the plastic retainer clip from the M.2 flash SSD.**
4. **Remove the M.2 flash SSD from the mezzanine [2].**
 - a. **Lift up on the end of the M.2 flash SSD where the plastic retainer clip was removed by one-half to one inch.**
 - b. **Gently slide the M.2 flash SSD card rearward and out of the connector to disengage the SSD contacts from the mezzanine socket.**

Place the M.2 flash SSD on an antistatic mat.

5. Repeat [Step 2](#) through [Step 4](#) to remove the second M.2 flash SSD from the opposite side of the M.2 mezzanine.

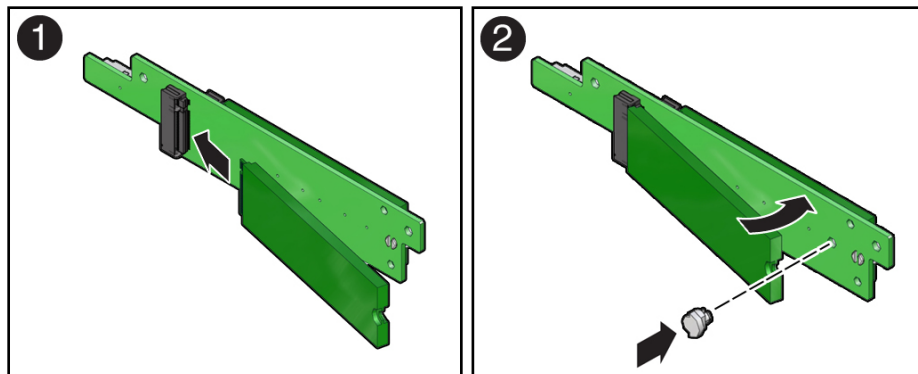
Related Information

- [“Install an M.2 Flash SSD” on page 131](#)

▼ Install an M.2 Flash SSD

Note - The M.2 mezzanine contains two M.2 flash SSD sockets (labeled SSD0 and SSD1). If you are installing a single M.2 flash SSD on to the mezzanine, install the M.2 flash SSD into socket SSD0.

1. **Unpack the replacement M.2 flash SSD.**
2. **Install the M.2 flash SSD.**
 - a. **Align and then insert the plastic retainer clip into the slot on the M.2 flash SSD.**
 - b. **Hold the M.2 flash SSD so that the end of the card containing the plastic retainer clip is approximately one-half to one inch above the M.2 mezzanine and the other end is adjacent to the riser SSD socket [1].**



- a. **Gently slide the M.2 flash SSD forward and into the connector to engage the flash SSD contacts with the M.2 mezzanine socket [2].**

- d. **Using your fingers, push down on the end of the card containing the plastic retainer clip until the M.2 flash SSD snaps into place on the mezzanine [2].**

You will hear an audible click when the M.2 flash SSD is secured to the mezzanine.

3. **Repeat [Step 2](#) to install the second M.2 flash SSD on to the opposite side of the M.2 mezzanine.**

4. **Perform the steps to install the M.2 mezzanine with the replacement M.2 flash SSDs on to the PCIe riser.**

See [“Install an M.2 Mezzanine”](#) on page 129.

Related Information

- [“Remove an M.2 Flash SSD”](#) on page 130

Servicing the Battery (CRU)

This section describes how to service the system battery. The system battery is a customer-replaceable unit (CRU) that requires you to power off the server. For more information about CRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Customer-Replaceable Units” on page 21](#).

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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in [“Electrostatic Discharge Safety” on page 50](#).



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

This section covers the following procedures:

- [“Remove the Battery” on page 133](#)
- [“Install the Battery” on page 135](#)

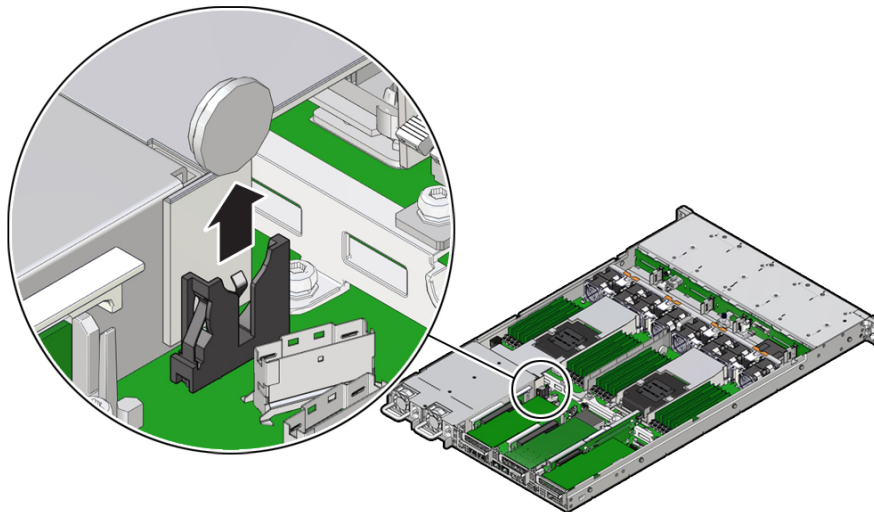
Related Information

- [“Extend the Server to the Maintenance Position” on page 59](#)
- [“Remove the Server Top Cover” on page 63](#)

▼ Remove the Battery

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

- a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.
2. **To dislodge the battery from its retainer, use your finger to gently push the top edge of the battery away from the retainer.**



▼ Install the Battery

1. **Unpack the replacement battery.**
2. **Press the new battery into the battery retainer.**
3. **Return the server to operation.**
 - a. **Install the server top cover.**

See “[Install the Server Top Cover](#)” on page 212.
 - b. **Return the server to the normal rack position.**

See “[Return the Server to the Normal Rack Position](#)” on page 214.
 - c. **Reconnect the power cords to the server power supplies and reconnect the data cables.**

See “[Reconnect Data Cables and Power Cords](#)” on page 216.
 - d. **Power on the server.**

See “[Power On the Server](#)” on page 216.
 - e. **Verify that the System OK LED indicator is lit.**

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

4. **If the service processor is not configured to use NTP, do one of the following:**
 - Reset the Oracle ILOM clock using the Oracle ILOM CLI or the web interface.

Refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.
 - Use the BIOS Setup Utility to reprogram the host clock.

Refer to the *Oracle X7 Series Servers Administration Guide* at <https://www.oracle.com/goto/x86adminddiag/docs>.

Servicing Processors (FRU)

The following section describes how to service processors. Processors are field-replaceable units (FRUs). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



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



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

Note - On single-processor systems, processor socket 1 (P1) is shipped without a heatsink and processor filler cover. To protect the delicate processor socket pins, do not remove the processor cover that was installed on the motherboard.

This section covers the following topics:

- [“Identify and Remove a Processor” on page 138](#)
- [“Install a Processor” on page 144](#)

Related Information

- [“Disconnect Cables From the Server” on page 59](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Remove the Server Top Cover” on page 63](#)

▼ Identify and Remove a Processor



Caution - Be careful not to touch the processor socket pins. The processor socket pins are very fragile. A light touch can bend the processor socket pins beyond repair.



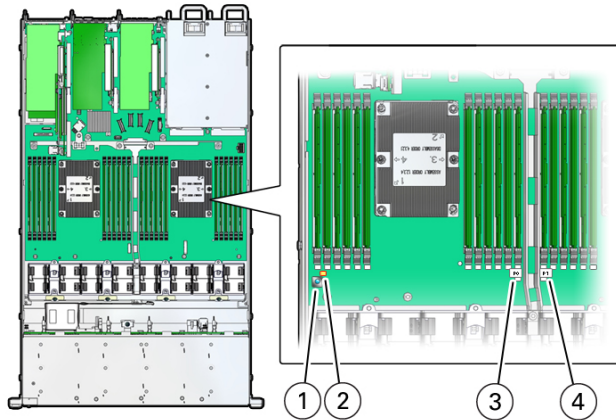
Caution - Whenever you remove a processor, replace it with another processor and reinstall the processor heatsink; otherwise, the server might overheat due to improper airflow. See [“Install a Processor” on page 144](#).

1. **Prepare the server for service.**
 - a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server” on page 53](#).
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position” on page 59](#).
 - c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures” on page 62](#).
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover” on page 63](#).
 - e. **Lift the air baffles up and out of the server and set them aside.**
2. **Identify the location of the failed processor by pressing the Fault Remind button on the motherboard I/O card.**

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

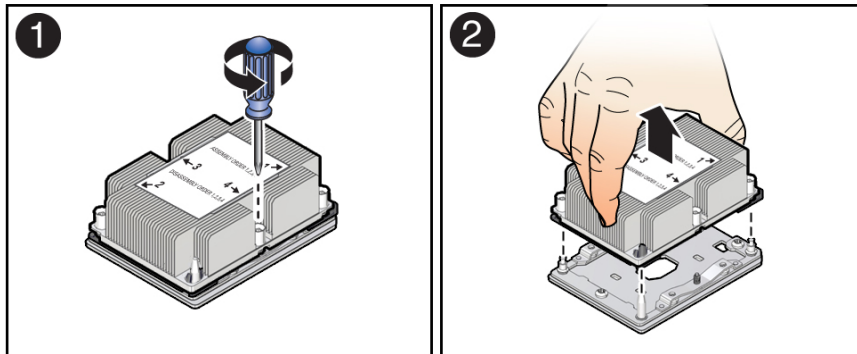
The processor fault LED for the failed processor lights. The processor fault LEDs are located next to the processors. See [“Motherboard Status Indicators” on page 33](#).

- If the processor fault LED is off, the processor is operating properly.
- If the processor fault LED is on (amber), the processor has failed and must be replaced.



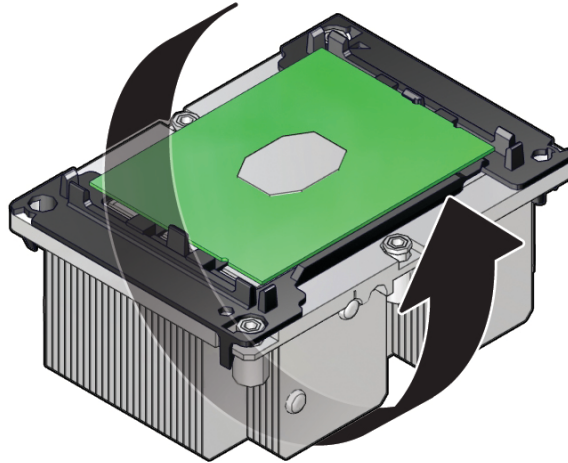
Callout	Description
1	Fault Remind button
2	Fault Remind LED
3	Processor 0 fault LED
4	Processor 1 fault LED

3. Using a Torx T30 screwdriver, loosen the four captive nuts that secure the processor-heatsink module to the socket: fully loosen nut 4, then 3, then 2, then 1 [1].



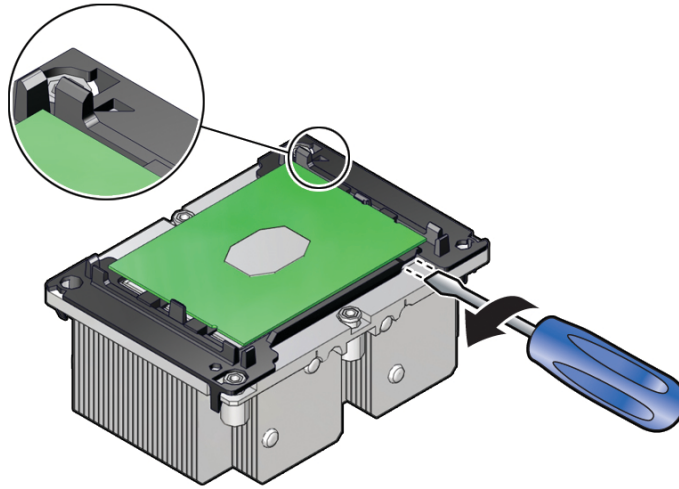
4. Lift the processor-heatsink module from the socket [2].
Always hold the processor-heatsink module along the axis of the fins to prevent damage.
5. Separate the processor from the heatsink.

- a. Flip over the processor-heatsink module, place it on a flat surface, and locate the thermal interface material (TIM) breaker slot.



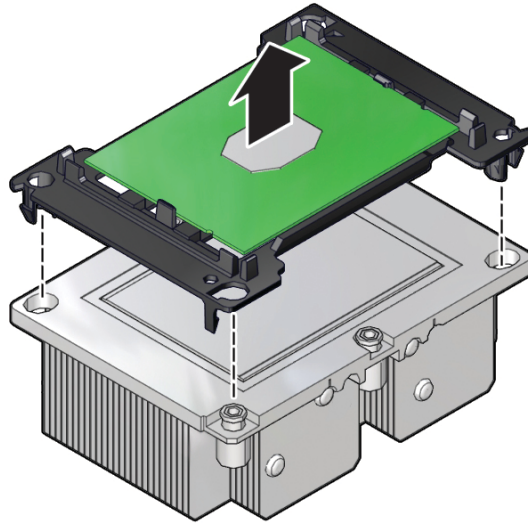
- b. While holding down the processor-heatsink module by the edges, insert a flat blade screwdriver into the TIM breaker slot.

The blade of the screwdriver goes into the slot between the heatsink and processor carrier, not between the processor and processor carrier.



- c. **Using a rocking motion, gently pry the corner of the processor carrier away from the heatsink.**

- d. **Remove the processor carrier (with processor still attached) from the heatsink by prying or pinching the plastic latch tabs that attach the processor to the heatsink.**



Caution - A thin layer of thermal grease separates the heatsink and the processor. This grease acts as an adhesive. Do not allow the thermal grease to contaminate the work space or other components.

6. **If you plan on reusing either the heatsink or processor, use an alcohol pad to clean the thermal grease on the underside of the heatsink and on the top of the processor. If reusing a processor, do not remove it from the processor carrier.**



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

Related Information

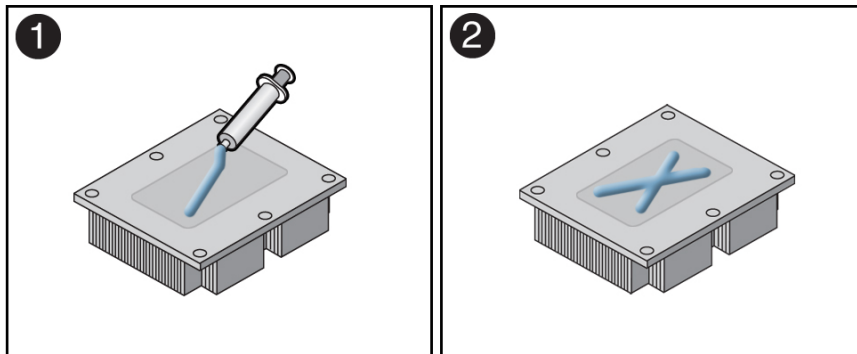
- [“Install a Processor” on page 144](#)

▼ Install a Processor



Caution - Be careful not to touch the processor socket pins. The processor socket pins are very fragile. A light touch can bend the processor socket pins beyond repair.

- 1. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
- 2. Ensure that the replacement processor is identical to the failed processor that you removed.**
For a description of the processors that are supported by the server, see [“Product Description”](#) on page 15.
- 3. Use the syringe supplied with the new or replacement processor [1] to apply 0.3 cc of thermal interface material (TIM) in an "X" pattern to the processor contact area of the heatsink [2].**

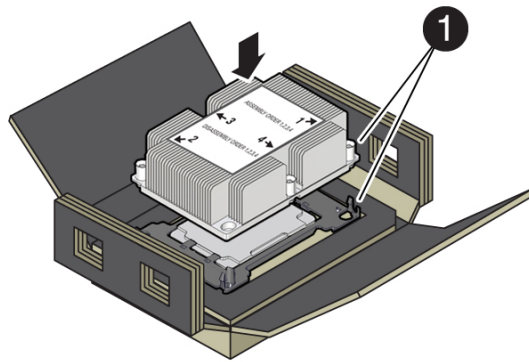


Note - Do not distribute the TIM; the pressure of the heatsink will do so for you when you install the heatsink.

- 4. Install the new processor.**
 - a. Open the box that contains the new processor but do not remove it from its packaging tray.**

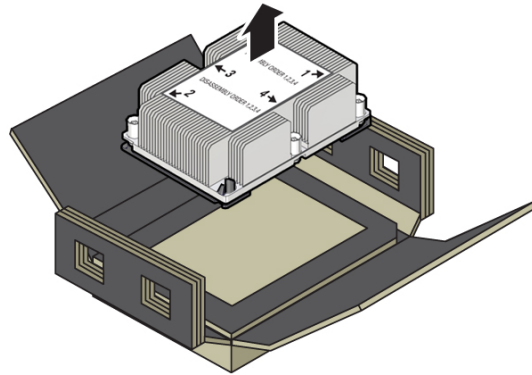
- b. Align the pin 1 indicators between the heatsink and processor carrier in the packaging tray [1], and place the heatsink (thermal side down) onto the processor carrier until it snaps in place and lies flat.

Note - The processor carrier has latching posts at each corner: two that insert into heatsink holes and two that attach to the edge of the heatsink.



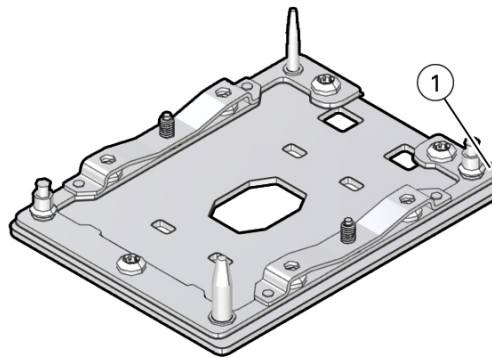
Callout	Description
1	Pin 1 indicator

- c. Lift the processor-heatsink module out of the packaging tray.



- d. Align the processor-heatsink module to the processor socket bolster plate on the motherboard, matching the pin 1 location [1].

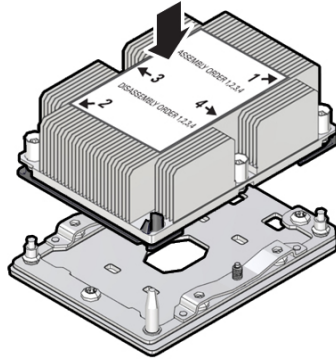
A small pin 1 indicator (triangle) is near the beveled corner of the socket.



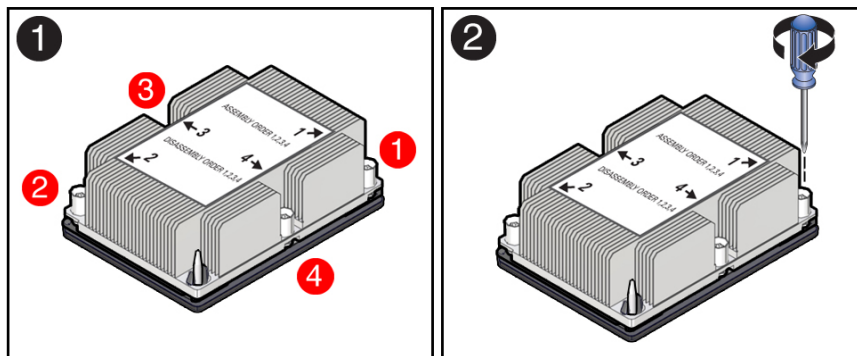
Callout	Description
1	Pin 1 indicator

- e. **Place the processor-heatsink module on the socket on the motherboard.**

The socket bolster plate has alignment pins that go into holes on the processor-heatsink module to help center the module during installation.



- f. **Ensure that the processor-heatsink module lies evenly on the bolster plate and that the captive screws align with the threaded socket posts [1].**



- g. **Using a 12.0 in-lbs (inch-pounds) torque driver with a Torx T30 bit, tighten the processor-heatsink module to the socket. First, fully tighten captive nuts 1 and 2. Then fully tighten nuts 3 and 4 [2].**

As you tighten nuts 3 and 4, some resistance occurs as the bolster leaf spring rises and comes in contact with the heatsink.



Caution - Using an incorrect torque setting or driver bit can damage a processor-heatsink module.

5. Return the server to operation.

a. Install the air baffles.

b. Install the server top cover.

See “[Install the Server Top Cover](#)” on page 212.

c. Return the server to the normal rack position.

See “[Return the Server to the Normal Rack Position](#)” on page 214.

d. Reconnect the power cords to the power supplies, and power on the server.

See “[Reconnect Data Cables and Power Cords](#)” on page 216 and “[Power On the Server](#)” on page 216.

e. Verify that the power supply AC OK LED is lit.

6. Use Oracle ILOM to clear server processor faults.

Refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs> for more information about the following steps.

a. To show server faults, log in to the server as root using the Oracle ILOM CLI, and type the following command to list all known faults on the server:

```
-> show /SP/faultmgmt
```

The server lists all known faults, for example:

```
-> show /SP/faultmgmt
Targets:
  shell
  0 (/SYS/MB/P0)
Properties:
Commands:
  cd
  show
```


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

b. To clear the fault identified in Step 6a, type the following command:

```
-> set /SYS/MB/P0 clear_fault_action=true
```

For example:

```
-> set /SYS/MB/P0 clear_fault_action=true
Are you sure you want to clear /SYS/MB/P0 (y/n)? y
Set 'clear_fault_action' to 'true'
```

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

Related Information

- [“Identify and Remove a Processor” on page 138](#)

Servicing the Disk Backplane (FRU)

The following section describes how to service the disk backplane. The disk backplane is a field-replaceable unit (FRU). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The disk backplane should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

To remove and install the disk backplane, follow these procedures:

- [“Remove the Disk Backplane” on page 151](#)
- [“Install the Disk Backplane” on page 155](#)

Related Information

- [“Disconnect Cables From the Server” on page 59](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Extend the Server to the Maintenance Position” on page 59](#)

▼ Remove the Disk Backplane

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

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

See [“Powering Down the Server”](#) on page 53.

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

See [“Extend the Server to the Maintenance Position”](#) on page 59.

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

See [“Take Antistatic Measures”](#) on page 62.

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

See [“Remove the Server Top Cover”](#) on page 63.

- e. **Lift up the super capacitor to release the capacitor from the reclosable fasteners that secure it to the chassis.**

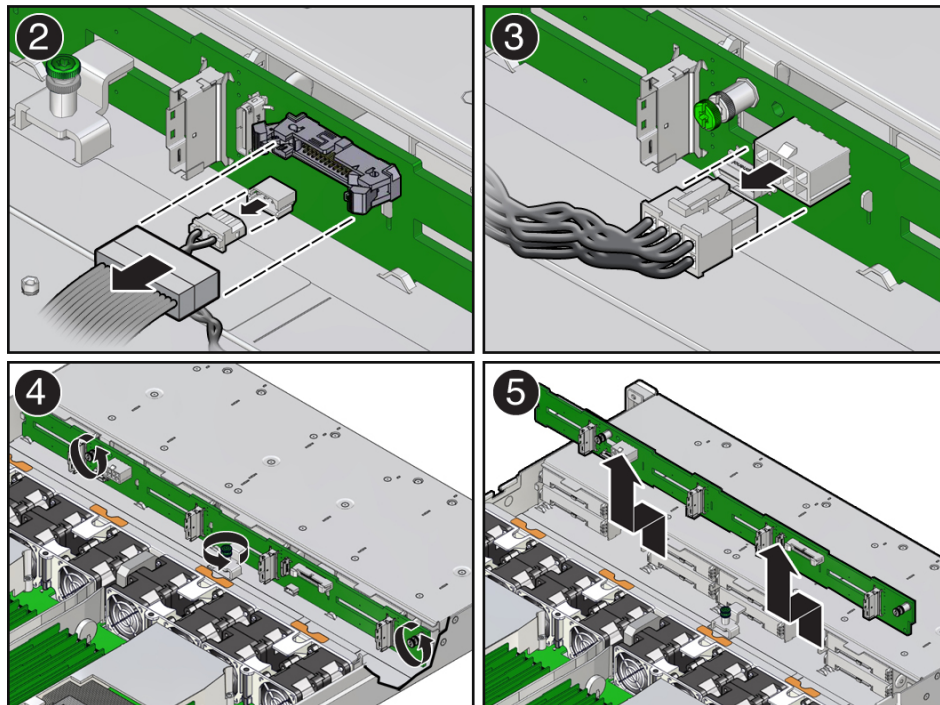
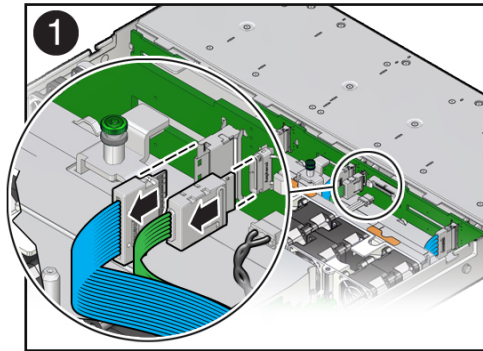
Set the super capacitor aside (leaving the super capacitor cable attached) until you are ready to install the replacement storage drive backplane.

2. **Pull all storage drives out far enough to disengage them from the disk backplane.**

See [“Remove a Storage Drive”](#) on page 68.

Note - It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the disk backplane. If you do remove the storage drives from the server, record their locations so that you can reinstall them in the same locations.

3. Disconnect the SAS cables or the NVMe cables (if present) from the disk backplane [1].



4. Disconnect the disk backplane data cable and the temperature sensor cable from the disk backplane [2].
5. Disconnect the disk backplane power cable from the disk backplane [3].

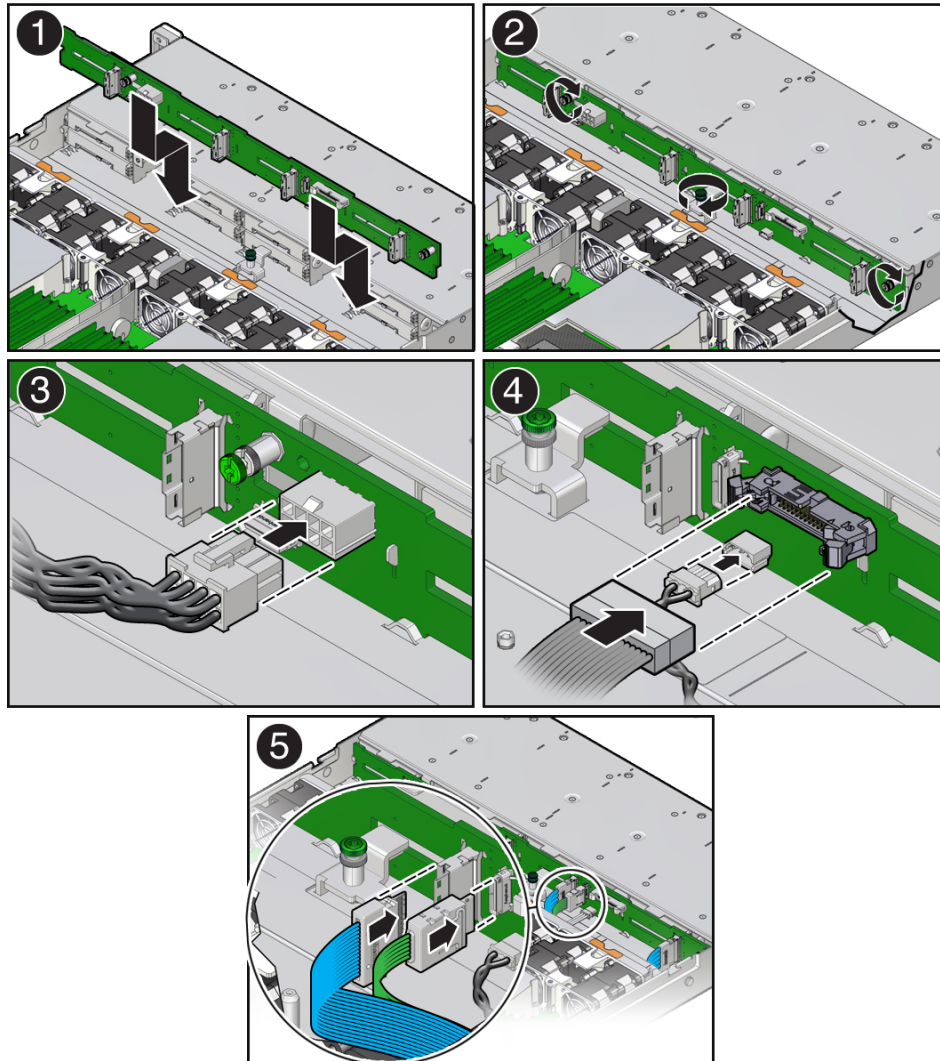
6. **Using a Torx T15 screwdriver, loosen the three captive screws that secure the disk backplane to the chassis [4].**
7. **Lift the backplane up and tilt it toward the rear of the server to free it from the hooks and right-side metal bracket, and lift it out of the server [5].**
8. **Place the disk backplane on an antistatic mat.**

Related Information

- [“Install the Disk Backplane” on page 155](#)

▼ Install the Disk Backplane

1. Install the disk backplane into the server so that it engages the three metal hooks and also sits behind the metal tab located on the right-side chassis wall [1].



2. **Using a Torx T15 screwdriver, tighten the three storage drive backplane captive screws clockwise until the disk backplane is secure [2].**
3. **Reconnect the disk backplane power cable to the disk backplane [3].**
4. **Reconnect the disk backplane data cable and temperature sensor cable to the disk backplane [4].**
5. **Reconnect the SAS cables or the NVMe cables (if present) to the disk backplane [5].**
6. **Reinstall the super capacitor by pressing down on the capacitor to secure it to the reclosable fastener in the chassis.**
7. **Reinstall all of the storage drives into the server.**
See [“Install a Storage Drive” on page 70.](#)
8. **Return the server to operation.**
 - a. **Install the server top cover.**
See [“Install the Server Top Cover” on page 212](#)
 - b. **Return the server to the normal rack position.**
See [“Return the Server to the Normal Rack Position” on page 214.](#)
 - c. **Reconnect the power cords to the power supplies, and power on the server.**
See [“Reconnect Data Cables and Power Cords” on page 216](#) and [“Power On the Server” on page 216.](#)
 - d. **Verify that the System OK status indicator is lit.**

Note - IMPORTANT: When the disk backplane is replaced, the key identity properties (KIP) of the backplane is programmed by Oracle ILOM to contain the same KIP as the other quorum member components. If you have removed other quorum member components, you might need to manually program the product serial number (PSN) into the new backplane. For more information, refer to [“FRU Key Identity Properties \(KIP\) Automated Update” on page 51.](#)

Related Information

- [“Remove the Disk Backplane” on page 151](#)

Servicing the Front LED Indicator Module (FRU)

The following section describes how to service the front indicator module. The front indicator module is a field-replaceable unit (FRU). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The front indicator module should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

Follow these procedures to remove and install the front indicator module (FIM).

- [“Remove the Front LED Indicator Module” on page 157](#)
- [“Install the Front LED Indicator Module” on page 159](#)

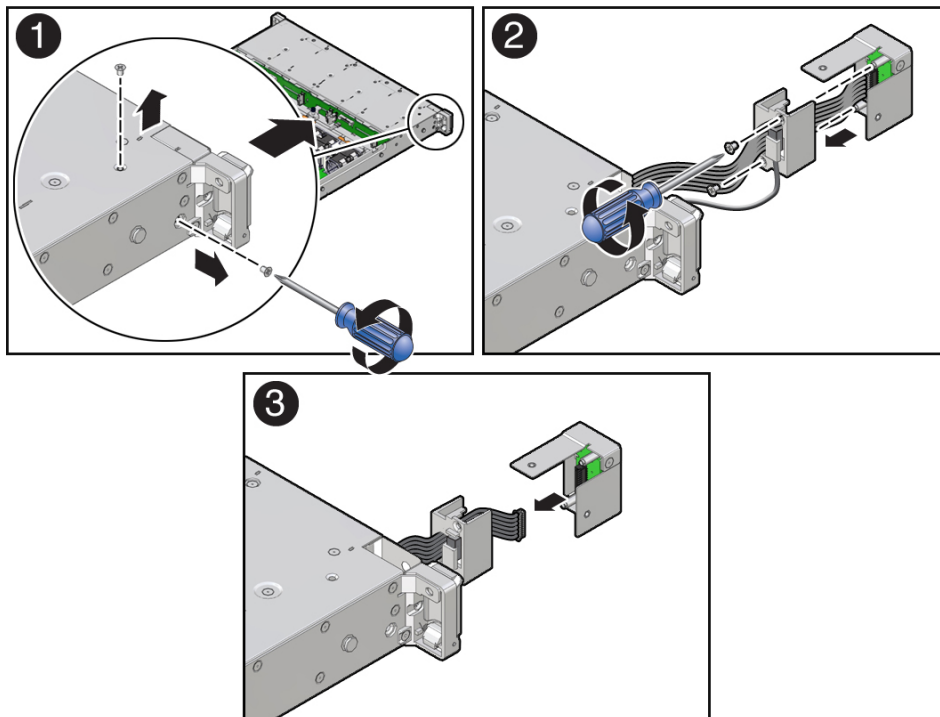
Related Information

- [“Disconnect Cables From the Server” on page 59](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Take Antistatic Measures” on page 62](#)

▼ Remove the Front LED Indicator Module

1. Prepare the server for service.

- a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
2. **Using a Philips screwdriver, remove the two screws that secure the front indicator module (FIM) assembly to the server chassis [1].**



3. Carefully slide the FIM assembly toward the front of the server to remove it from the chassis [2].
4. Using a Phillips screwdriver, remove the two screws that secure the plastic temperature sensor housing to the FIM assembly, and then detach the housing from the FIM assembly [2].

Note - You do not need to remove the temperature sensor from the housing.

5. Disconnect the FIM cable from the FIM assembly and set the FIM assembly aside [3].
6. Continue to [“Install the Front LED Indicator Module” on page 159](#).

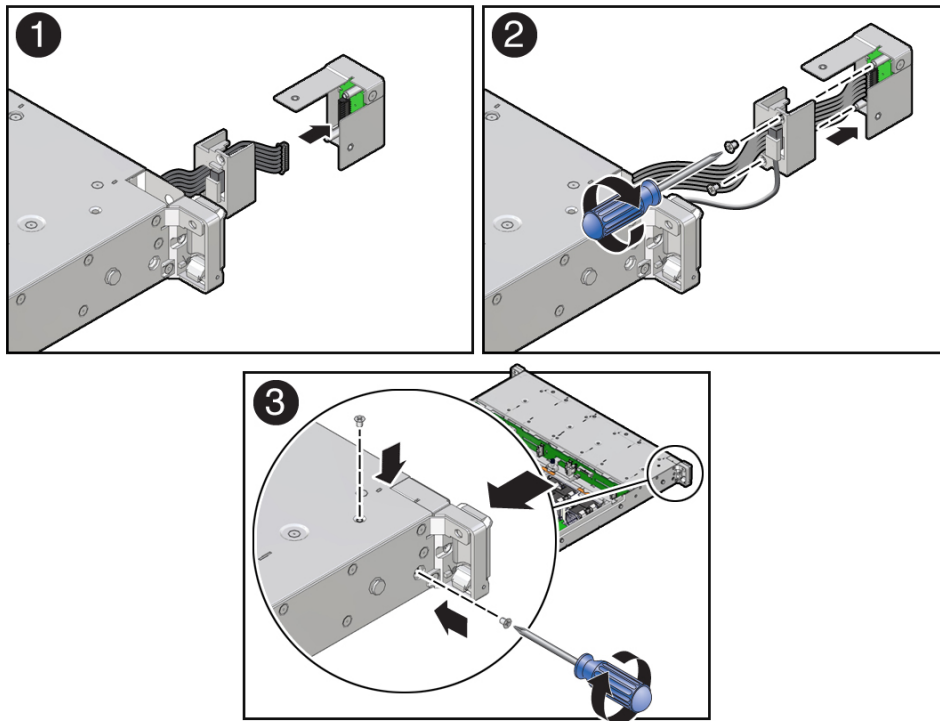
Related Information

- [“Install the Front LED Indicator Module” on page 159](#)

▼ Install the Front LED Indicator Module

1. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.
See [“Take Antistatic Measures” on page 62](#).
2. Unpack the replacement FIM and place it on an antistatic mat.

3. If not installed, install the FIM cable through the plastic temperature sensor housing [1].



4. Connect the FIM cable to the replacement FIM assembly [1, 2].
5. Using a Phillips screwdriver, tighten the two screws to secure the temperature sensor housing to the FIM assembly [2].
6. Carefully insert the FIM assembly into the front panel of the server chassis [3].
7. Install and tighten the two Phillips screws to secure the FIM assembly to the server chassis [3].
8. Return the server to operation.
 - a. Return the server to the normal rack position.
See [“Return the Server to the Normal Rack Position”](#) on page 214.

- b. Reconnect the power cords to the power supplies, and power on the server.**

See [“Reconnect Data Cables and Power Cords”](#) on page 216 and [“Power On the Server”](#) on page 216.

- c. Verify that the System OK status indicator is lit.**

Related Information

- [“Remove the Front LED Indicator Module”](#) on page 157

Servicing the Temperature Sensor (FRU)

The following section describes how to service the temperature sensor. The temperature sensor is a field-replaceable unit (FRU). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The temperature sensor should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

This section covers the following procedures:

- [“Remove the Temperature Sensor” on page 163](#)
- [“Install the Temperature Sensor” on page 166](#)

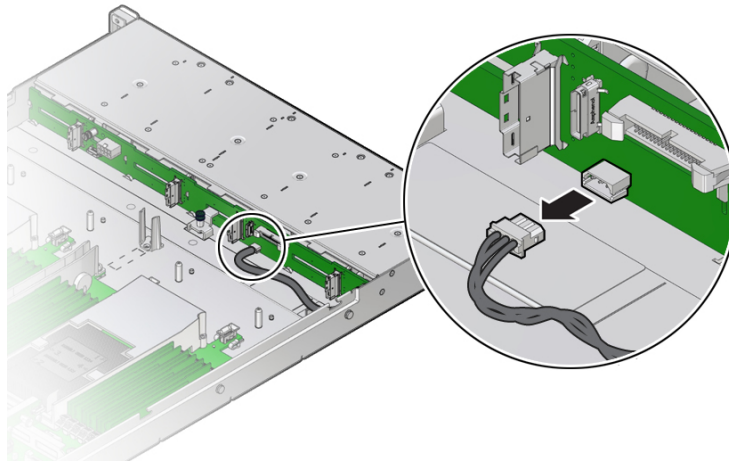
Related Information

- [“Disconnect Cables From the Server” on page 59](#)
- [“Remove the Server From the Rack” on page 61](#)
- [“Take Antistatic Measures” on page 62](#)

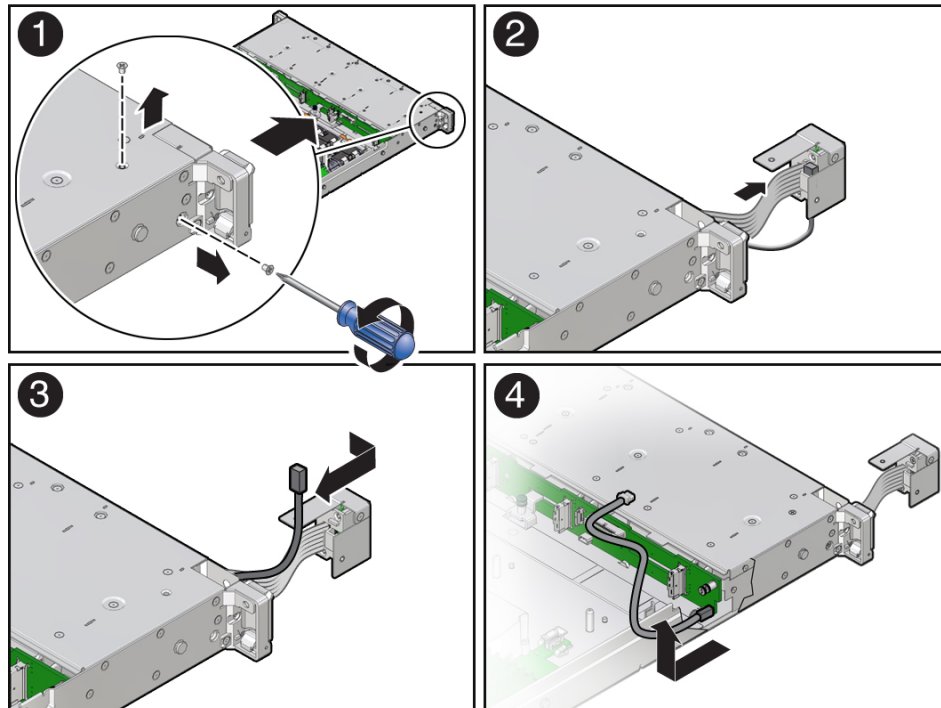
▼ Remove the Temperature Sensor

1. Prepare the server for service.

- a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.
2. **Disconnect the temperature sensor cable from the disk backplane.**



3. Using a Phillips screwdriver, remove the two screws that secure the front indicator module (FIM) assembly to the server chassis [1].



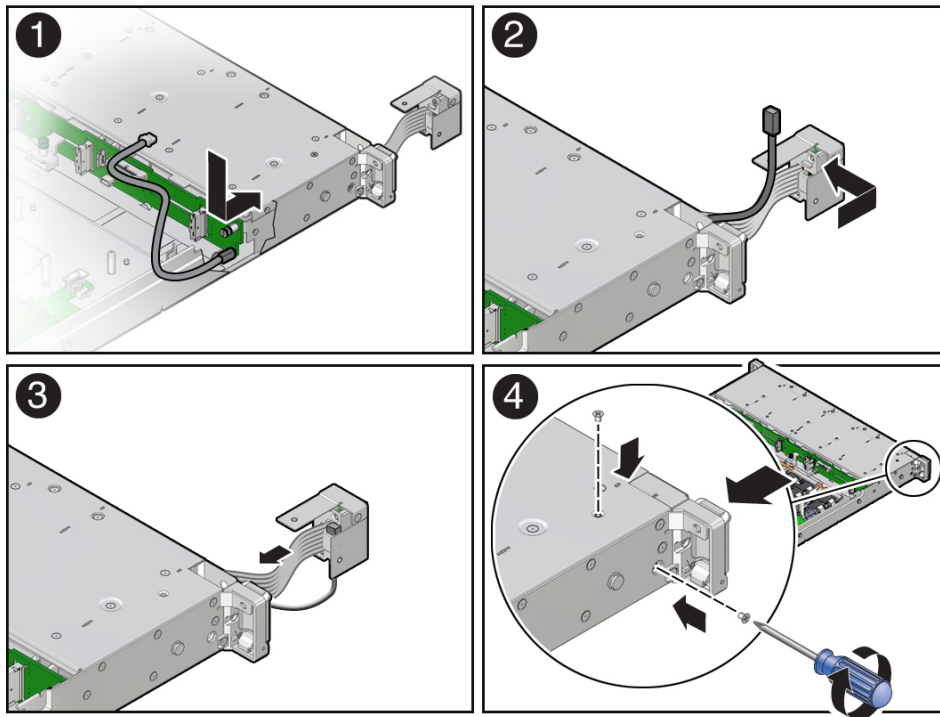
4. Carefully slide the FIM assembly toward the front of the server to remove it from the chassis [2].
5. Remove the temperature sensor from the plastic housing by pulling the sensor from its seated location. Then remove the sensor cable by pulling it through the slit in the housing [2, 3].
6. Remove the temperature sensor and cable by carefully pulling the sensor cable rearward and through the left-front chassis sidewall. Then lift the temperature sensor from the chassis [4].

Related Information

- [“Install the Temperature Sensor” on page 166](#)

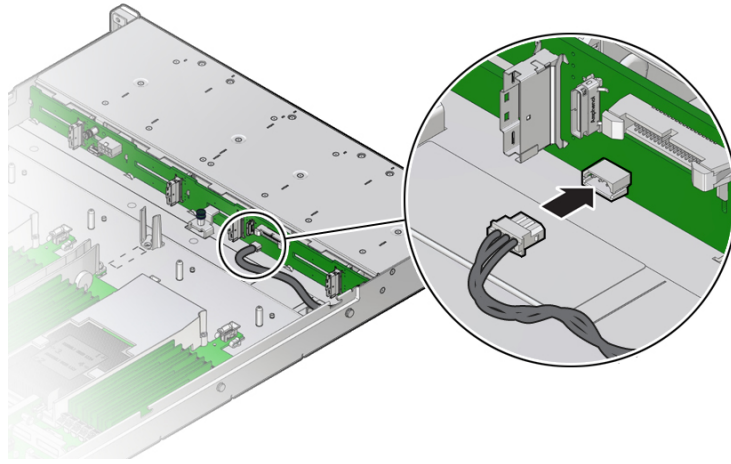
▼ Install the Temperature Sensor

1. Install the temperature sensor by carefully inserting the sensor-end of the cable through the rear opening directly under the left side of the disk backplane. Then push/pull the sensor cable through the left-front chassis sidewall [1].



2. Install the temperature sensor into the plastic housing by inserting the cable through the slit in the housing. Then ensure that the temperature sensor is properly seated into the housing [2, 3].
3. Carefully insert the FIM assembly into the front panel of the server chassis [3].
4. Install and tighten the two Phillips screws to secure the FIM assembly to the server chassis [4].

5. **Reconnect the temperature sensor cable to the disk backplane.**



6. **Return the server to operation.**
 - a. **Install the server top cover.**
See [“Install the Server Top Cover”](#) on page 212.
 - b. **Return the server to the normal rack position.**
See [“Return the Server to the Normal Rack Position”](#) on page 214.
 - c. **Reconnect the power cords to the power supplies, and power on the server.**
See [“Reconnect Data Cables and Power Cords”](#) on page 216 and [“Power On the Server”](#) on page 216.
 - d. **Verify that the power supply AC OK LED is lit.**

Related Information

- [“Remove the Temperature Sensor”](#) on page 163

Servicing the Internal HBA Card and HBA Super Capacitor (FRU)

The following section describes how to service and install the Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card and HBA super capacitor. The internal HBA card and HBA super capacitor are field-replaceable units (FRUs). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).

For more information about the internal HBA card, refer to the *Oracle Storage 12 Gb SAS PCIe RAID HBA Internal: 16 Port and 2 GB Memory Installation Guide For HBA Model 7116970* at https://docs.oracle.com/cd/E87591_01/index.html.



Caution - The internal HBA card and HBA super capacitor should be removed and replaced only by authorized Oracle Service personnel.



Caution - Ensure that all power is removed from the server before removing or installing the internal HBA card and super capacitor. You must disconnect all power cables from the system before performing these procedures.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

This section covers the following procedures:

- [“Remove the Internal HBA Card and HBA Super Capacitor” on page 170](#)
- [“Install the Internal HBA Card and HBA Super Capacitor” on page 173](#)

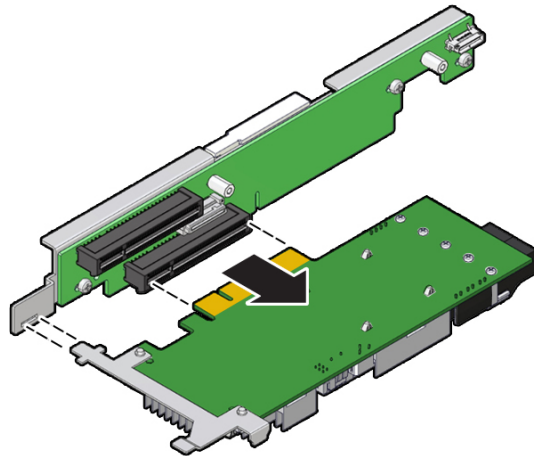
Related Information

- [“Disconnect Cables From the Server” on page 59](#)

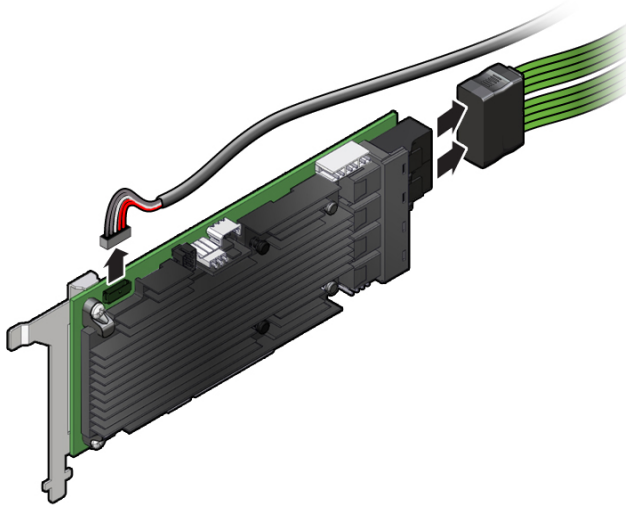
- [“Take Antistatic Measures”](#) on page 62
- [“Extend the Server to the Maintenance Position”](#) on page 59

▼ Remove the Internal HBA Card and HBA Super Capacitor

1. **Remove the PCIe riser from slots 3 and 4.**
See [“Remove the PCIe Riser From PCIe Slots 3 and 4”](#) on page 116.
2. **Remove the internal host bus adapter card from the riser.**
 - a. **Hold the riser in one hand and use your other hand to carefully remove the card from slot 4 of the riser.**
 - b. **Disconnect the rear bracket attached to the PCIe card from the rear of the PCIe riser.**

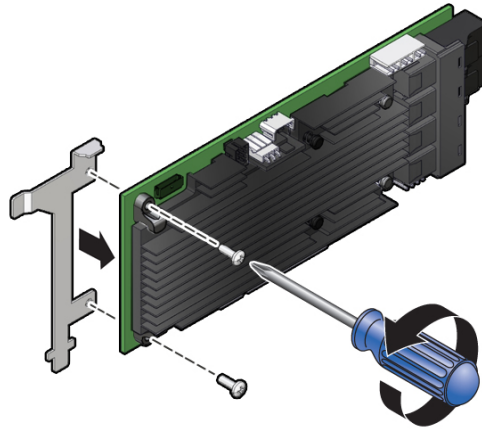


3. **Disconnect the SAS cables and the super capacitor cable from the internal HBA card and place the card on an antistatic mat.**



4. **If you are replacing the internal HBA card, use a No. 2 Philips screwdriver to remove the special fitted bracket from the HBA card.**

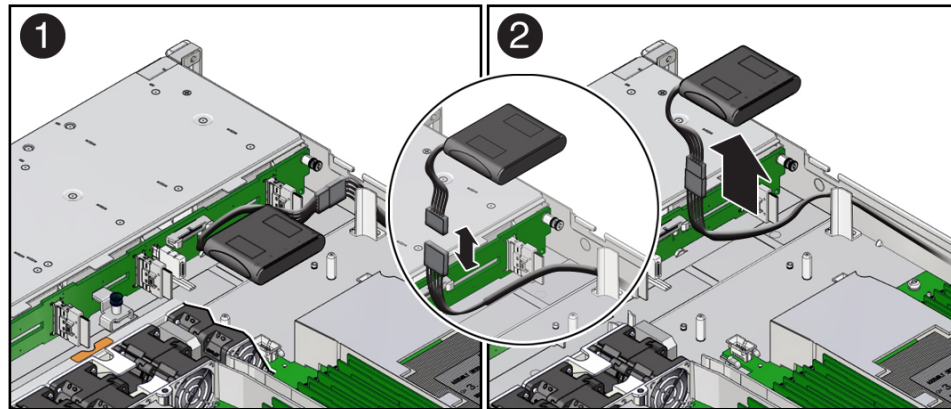
You will need to install the special fitted bracket on the replacement HBA card. Set aside the bracket and screws until you are ready to install the replacement HBA card.



5. **Lift the super capacitor up to release the reclosable fasteners that secure it to the server's chassis [1, 2].**

Note - If you are removing and replacing only the internal HBA card, you do not need to remove the HBA super capacitor. You can disconnect the HBA super capacitor cable from the internal HBA card and then remove the internal HBA card from the system.

Note - (Optional) Disconnect the data cable from the disk backplane to allow easy access to the super capacitor.



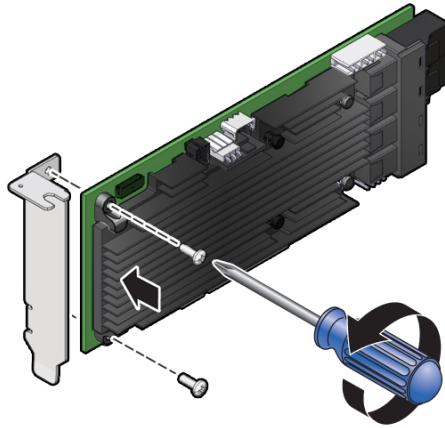
6. Disconnect the super capacitor cable from the super capacitor and place the super capacitor on an antistatic mat [2].
7. Carefully remove the SAS cables and super capacitor cable from the server by lifting them from the left-side cable trough.

See [“Remove the Internal HBA Cables”](#) on page 179.

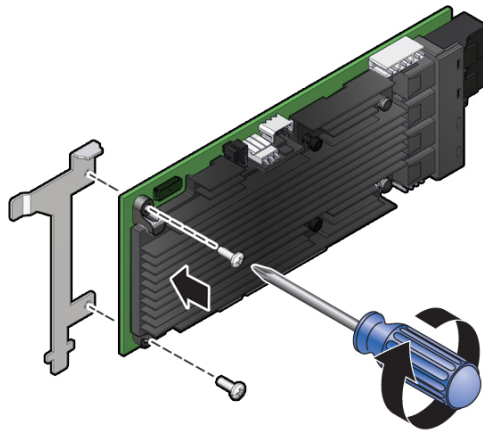
▼ Install the Internal HBA Card and HBA Super Capacitor

1. Unpack the replacement host bus adapter (HBA) card, the SAS cables, super capacitor, and the super capacitor cable, and retrieve the PCIe riser for slot 3.

2. Using a No. 2 Philips screwdriver, remove the standard HBA bracket that shipped with the replacement HBA card.



3. Install the special fitted bracket that was removed in [Step 4](#) in “[Remove the Internal HBA Card and HBA Super Capacitor](#)” on page 170.

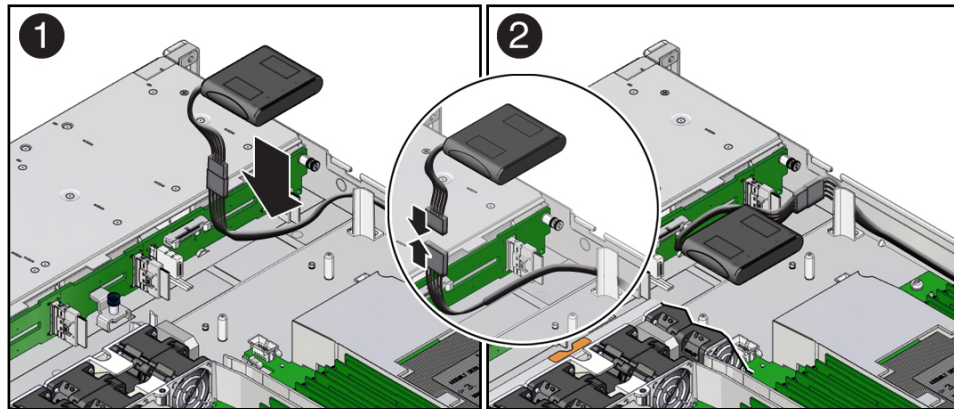


4. Carefully guide the SAS cables and super capacitor cable that connect to the disk backplane and the super capacitor through the left-side cable trough.

See [“Install the Internal HBA Cables”](#) on page 182.

Note - If you did not remove the HBA super capacitor when removing the internal HBA card, reconnect the HBA super capacitor cable to the internal HBA card.

5. **Install the super capacitor into the server.**
 - a. **Attach the reclosable fasteners supplied with the replacement super capacitor to its underside.**
 - b. **Connect the super capacitor cable to the super capacitor [1, 2].**

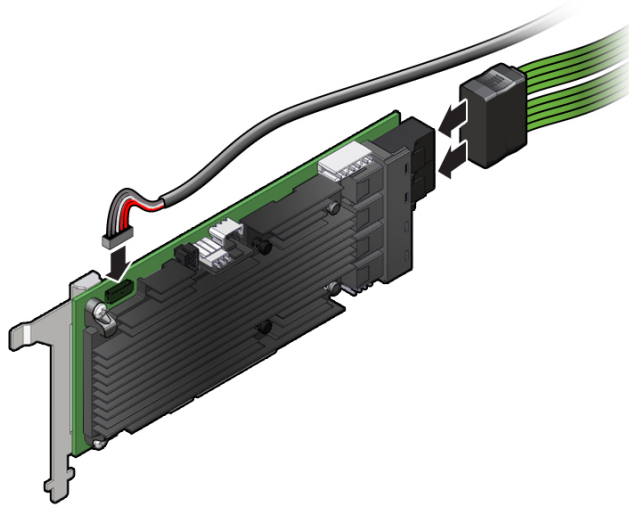


- c. **Press the super capacitor into the server's chassis so that it is secured to the existing reclosable fastener [2].**

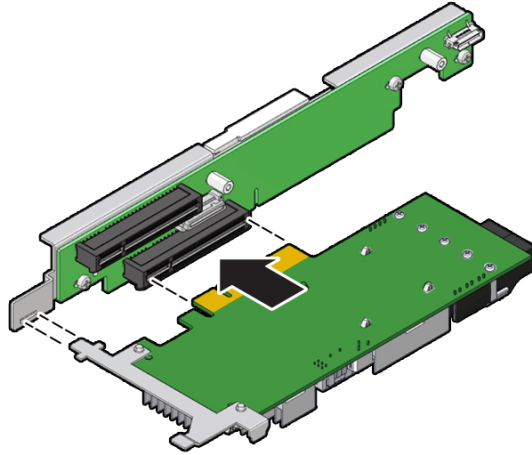
Note - If disconnected during the removal procedure, reconnect the data cable to the disk backplane.

6. **Connect the SAS cables and the super capacitor cable to the internal HBA card.**

To ensure SAS cables are properly connected to the internal HBA card, see [“Install the Internal HBA Cables”](#) on page 182.



7. **Insert the internal HBA card connector into the bottom connector on the riser for PCIe slot 3 and 4. While inserting the HBA, ensure that rear bracket on the HBA card fits into the connector slot on the PCIe riser.**



8. **Install the PCIe riser.**
See [“Install the PCIe Riser Into PCIe Slots 3 and 4”](#) on page 118.

Servicing the Internal HBA Cables (FRU)

The following section describes how to service the internal HBA cables. The HBA SAS cables and super capacitor cable are a field-replaceable units (FRUs). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The HBA SAS cable assembly should be removed and replaced only by authorized Oracle Service personnel.



Caution - Ensure that all power is removed from the server before removing or installing the HBA SAS cable assembly. You must disconnect the power cables before performing this procedure.



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

This section covers the following procedures:

- [“Remove the Internal HBA Cables” on page 179](#)
- [“Install the Internal HBA Cables” on page 182](#)

Related Information

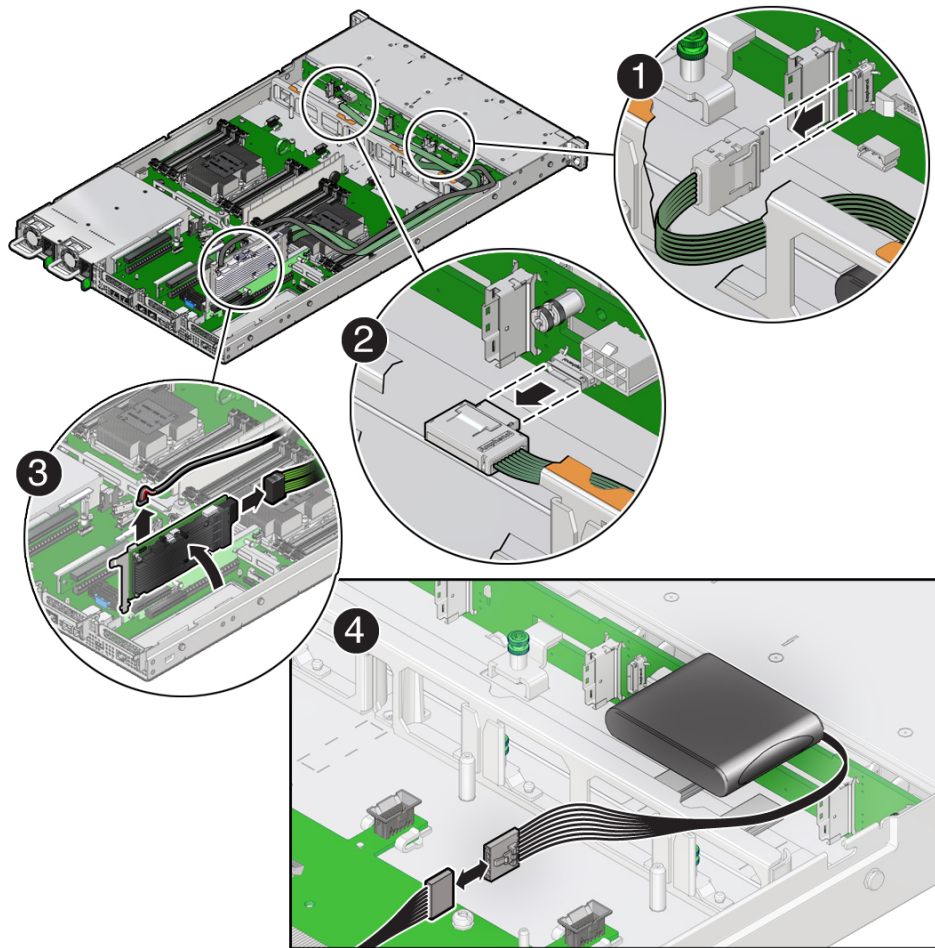
- [“Extend the Server to the Maintenance Position” on page 59](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Remove the Server Top Cover” on page 63](#)
- [“Servicing the Internal HBA Card and HBA Super Capacitor \(FRU\)” on page 169](#)

▼ Remove the Internal HBA Cables

1. Prepare the server for service.

- a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
- b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
- c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
- d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.

2. Disconnect both SAS cables from the disk backplane by pressing the latch on the cable connector and then pulling out the connector [1, 2].



3. Disconnect the SAS cables and the super capacitor cable from the internal host bus adapter (HBA) card.

- a. Remove the PCIe riser from PCIe slot 3 and 4.

See [“Remove the PCIe Riser From PCIe Slots 3 and 4”](#) on page 116

HBA Connector	Disk Backplane Connector	Storage Drives
C0	SAS 0-3	0, 1, 2, and 3
C1	SAS 4-7	4, 5, 6, and 7

4. **Install the SAS cables into the disk backplane [1, 2].**
To ensure proper connections, see the SAS cable connections table in [Step 3](#).
5. **Install the PCIe riser with the internal HBA card into PCIe slot 3 and 4.**
See [“Install the PCIe Riser Into PCIe Slots 3 and 4”](#) on page 118.
6. **Return the server to operation.**
 - a. **Install the server top cover.**
See [“Install the Server Top Cover”](#) on page 212.
 - b. **Return the server to the normal rack position.**
See [“Return the Server to the Normal Rack Position”](#) on page 214.
 - c. **Reconnect the power cords to the power supplies, and power on the server.**
See [“Reconnect Data Cables and Power Cords”](#) on page 216 and [“Power On the Server”](#) on page 216.
 - d. **Verify that the System OK status indicator is lit.**

Related Information

- [“Install the Internal HBA Card and HBA Super Capacitor”](#) on page 173
- [“Remove the Internal HBA Cables”](#) on page 179

Servicing the NVMe Cables

The following section describes how to service the NVMe cables. The NVMe cables are field-replaceable units (FRUs). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The NVMe cables should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

This section covers the following procedures:

- [“Remove the NVMe Cable Assembly” on page 185](#)
- [“Install the NVMe Cable Assembly” on page 189](#)

Related Information

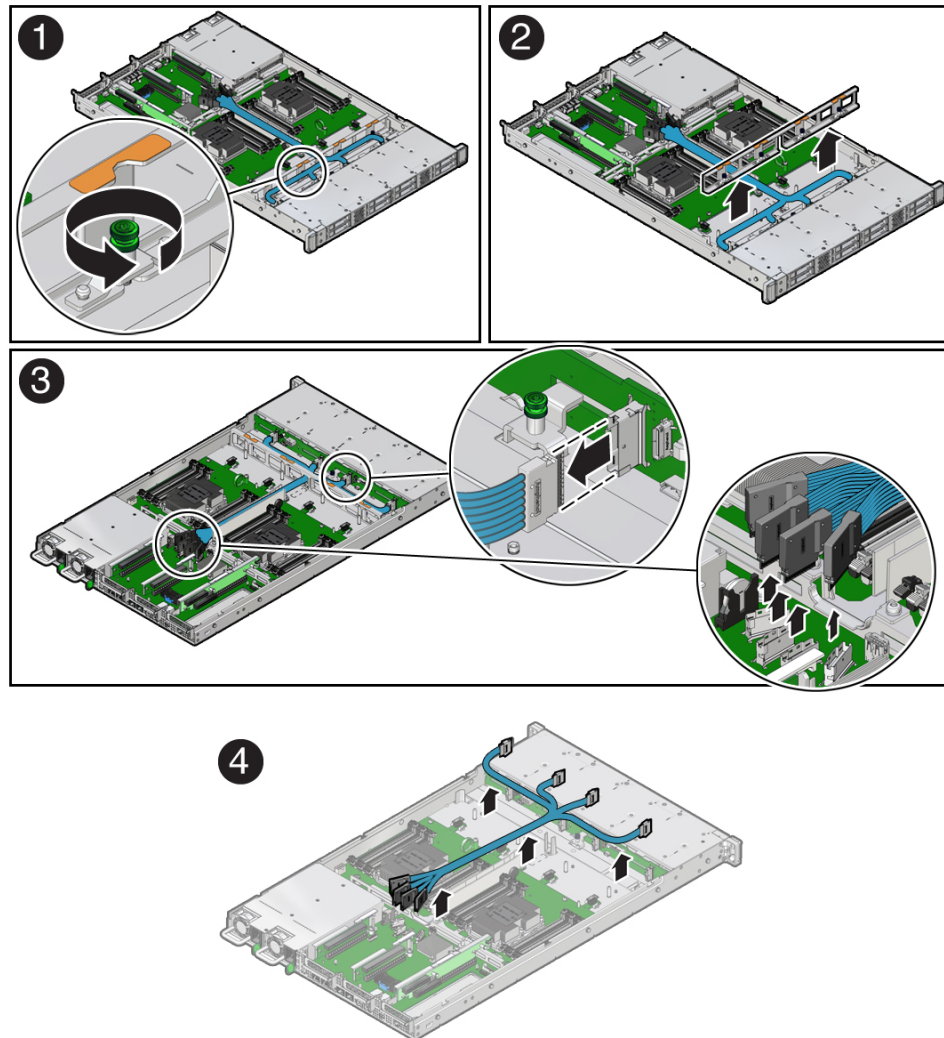
- [“Extend the Server to the Maintenance Position” on page 59](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Remove the Server Top Cover” on page 63](#)

▼ Remove the NVMe Cable Assembly

1. Prepare the server for service.

- a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.
2. **Remove all the server fan modules.**
See [“Remove a Fan Module”](#) on page 81.
 3. **Remove the mid-wall from the server chassis [1, 2].**
 - a. **Using a Torx T15 screwdriver, loosen the four green captive screws that secure the mid-wall to the server chassis.**

- b. Lift the mid-wall from the server chassis and set it aside.



4. Disconnect each NVMe cable from the disk backplane by pressing the latch on the cable connector and then pulling out the connector [3].
5. Disconnect the NVMe cables from the motherboard NVMe connectors [3].

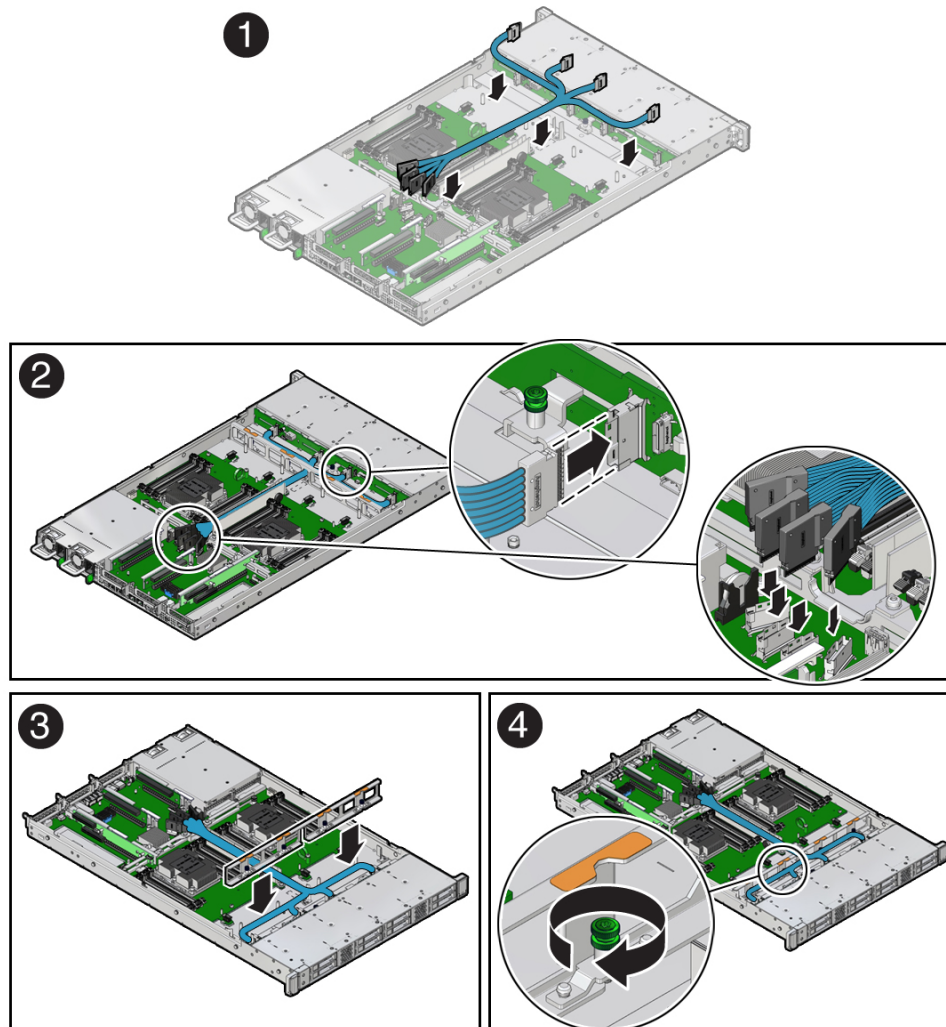
6. **Carefully lift the NVMe cables from the center cable trough and remove them from the server [4].**

Related Information

- [“Install the NVMe Cable Assembly” on page 189](#)

▼ Install the NVMe Cable Assembly

1. Carefully install the NVMe cables through the center cable trough [1].



2. Connect the NVMe cables to the motherboard NVMe connectors [2].

Note - NVMe cable assembly, part number 7115195 is required to connect the motherboard NVMe connectors to the disk backplane.

Note - Each NVMe cable contains a matching label that corresponds to connectors on the motherboard and the disk backplane. For example, the NVMe cable labeled A, plugs into motherboard NVMe A connector and the disk backplane NVMe A connector.

Use the following table to ensure proper NVMe cable connections.

Motherboard NVMe Connector	Disk Backplane Connector	Storage Drives
A	NVMe A	0, 4
B	NVMe B	1, 5
C	NVMe C	2, 6
D	NVMe D	3, 7

3. Connect the NVMe cables to the disk backplane [2].

To ensure proper connections, see the NVMe cable connections table in [Step 2](#).

4. Install the mid-wall into the server chassis [3, 4].

a. Lower the mid-wall into the chassis.

Ensure that the green captive screws are aligned with the screw holes on the bottom of the chassis.

b. Using a Torx T15 screwdriver, tighten the four green captive screws to secure the mid-wall to the server chassis.

5. Install all of the server fan modules.

See [“Install a Fan Module” on page 84](#).

6. Return the server to operation.

a. Install the server top cover.

See [“Install the Server Top Cover” on page 212](#).

b. Return the server to the normal rack position.

See [“Return the Server to the Normal Rack Position” on page 214](#).

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

See [“Reconnect Data Cables and Power Cords”](#) on page 216 and [“Power On the Server”](#) on page 216.

d. Verify that the System OK status indicator is lit.

Related Information

- [“Remove the NVMe Cable Assembly”](#) on page 185

Servicing Other Cables (FRU)

The following section describes how to service the power, front indicator module (FIM), temperature sensor, and disk backplane data cables. These cables are field-replaceable units (FRUs). For more information about FRUs, see [“Illustrated Parts Breakdown” on page 19](#) and [“Field-Replaceable Units” on page 22](#).



Caution - The power, FIM, temperature sensor, and disk backplane data cables should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See [“Electrostatic Discharge Safety” on page 50](#).

This section covers the following procedures:

- [“Remove the Power, FIM, Temperature Sensor, and Disk Backplane Data Cables” on page 194](#)
- [“Install the Power, FIM, Temperature Sensor, and Disk Backplane Data Cables” on page 196](#)

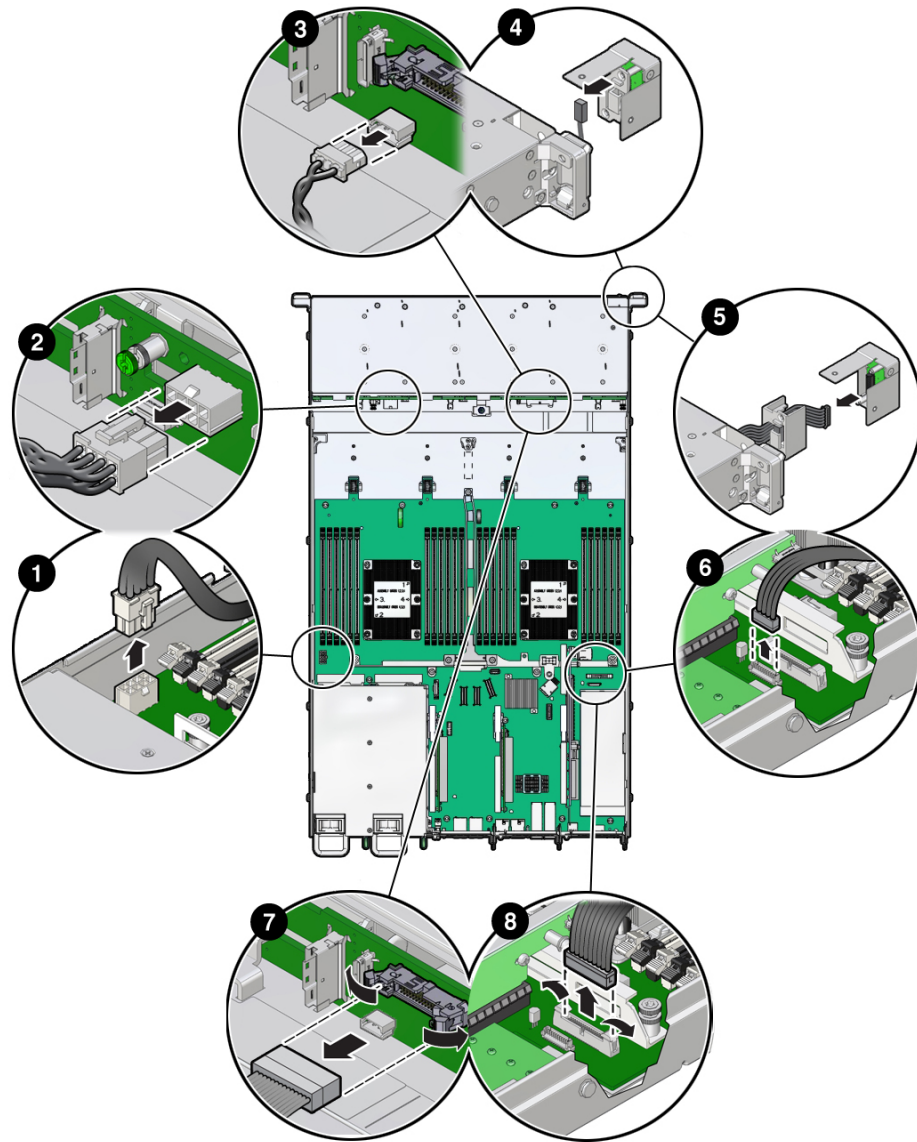
Related Information

- [“Extend the Server to the Maintenance Position” on page 59](#)
- [“Take Antistatic Measures” on page 62](#)
- [“Remove the Server Top Cover” on page 63](#)

▼ Remove the Power, FIM, Temperature Sensor, and Disk Backplane Data Cables

1. **Prepare the server for service.**
 - a. **Power off the server and disconnect the power cords from the power supplies.**
See [“Powering Down the Server”](#) on page 53.
 - b. **Extend the server to the maintenance position.**
See [“Extend the Server to the Maintenance Position”](#) on page 59.
 - c. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures”](#) on page 62.
 - d. **Remove the server top cover.**
See [“Remove the Server Top Cover”](#) on page 63.
2. **Remove the disk backplane power cable.**
 - a. **Disconnect the disk backplane power cable from the motherboard by pressing the release latch on the side of the cable connector and pulling out the connector [1].**

- b. Disconnect the disk backplane power cable from the disk backplane by pressing the release latch on the side of the cable connector and pulling out the connector [2].



3. **Remove the temperature sensor cable.**
 - a. **Remove the FIM from the server.**
See [“Remove the Temperature Sensor” on page 163](#).
 - b. **Disconnect the temperature sensor cable from the disk backplane by pulling the cable from the connector [3].**
 - c. **Remove the temperature sensor and cable from the FIM housing, then pull the cable and sensor through the left-front chassis sidewall [4].**
4. **Remove the FIM cable.**
 - a. **Remove the FIM from the server.**
See [“Remove the Front LED Indicator Module” on page 157](#)
 - b. **Disconnect the FIM cable from the FIM by pulling the cable from the connector [5].**
 - c. **Eject the FIM cable from the motherboard by opening both side latches on the connector [6].**
5. **Remove the disk backplane data cable.**
 - a. **Eject the disk backplane data cable from the disk backplane by opening both side latches on the connector [7].**
 - b. **Eject the disk backplane data cable from the motherboard by opening both side latches on the connector [8].**

Related Information

- [“Install the Power, FIM, Temperature Sensor, and Disk Backplane Data Cables” on page 196](#)

▼ **Install the Power, FIM, Temperature Sensor, and Disk Backplane Data Cables**

1. **Install the disk backplane data cable.**

- a. **Connect the disk backplane data cable to the motherboard by opening both side latches and plugging the data cable connector into the motherboard connector [8].**

The motherboard connector side latches will close, locking the disk backplane data cable connector in place.
- b. **Connect the disk backplane data cable to the disk backplane by opening both side latches and plugging the data cable connector into the disk backplane connector [7].**

The disk backplane connector side latches will close, locking the disk backplane data cable connector in place.
2. **Install the FIM cable.**
 - a. **Install the FIM cable into the motherboard by opening both side latches and plugging the FIM connector into the motherboard connector [6].**

The motherboard connector side latches will close, locking the FIM cable connector in place.
 - b. **Connect the FIM cable to the FIM by plugging the cable connector into the FIM [5].**
 - c. **Install the FIM into the server.**

See [“Install the Front LED Indicator Module” on page 159.](#)
3. **Install the temperature sensor cable.**
 - a. **Route the temperature sensor cable through the left-front chassis sidewall and install the sensor into the FIM housing [4].**
 - b. **Connect the temperature sensor cable to the disk backplane by plugging the cable connector into the disk backplane connector [3].**
 - c. **Install the FIM into the server.**

See [“Install the Temperature Sensor” on page 166.](#)
4. **Install the disk backplane power cable.**
 - a. **Connect the disk backplane power cable to the disk backplane by plugging the cable connector into the disk backplane connector [2].**

Servicing the Motherboard Assembly (FRU)

The following section describes how to service the motherboard assembly. The motherboard assembly is a field-replaceable unit (FRU). For more information about FRUs, see “[Illustrated Parts Breakdown](#)” on page 19 and “[Field-Replaceable Units](#)” on page 22.



Caution - The motherboard assembly should be removed and replaced only by authorized Oracle Service personnel.



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



Caution - These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See “[Electrostatic Discharge Safety](#)” on page 50.

- “[Remove the Motherboard](#)” on page 199
- “[Install the Motherboard](#)” on page 206

Related Information

- “[Remove the Server From the Rack](#)” on page 61
- “[Take Antistatic Measures](#)” on page 62
- “[Remove the Server Top Cover](#)” on page 63

▼ Remove the Motherboard



Caution - Use the Oracle ILOM backup utility prior to removing the motherboard. This utility backs up the Oracle ILOM configuration of the service processor. For more information, see the Oracle ILOM 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

1. Prepare the server for service.

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

See [“Powering Down the Server”](#) on page 53.

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

See [“Extend the Server to the Maintenance Position”](#) on page 59.

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

See [“Take Antistatic Measures”](#) on page 62.

- d. Remove the server top cover.**

See [“Remove the Server Top Cover”](#) on page 63.

2. Remove the following reusable components:

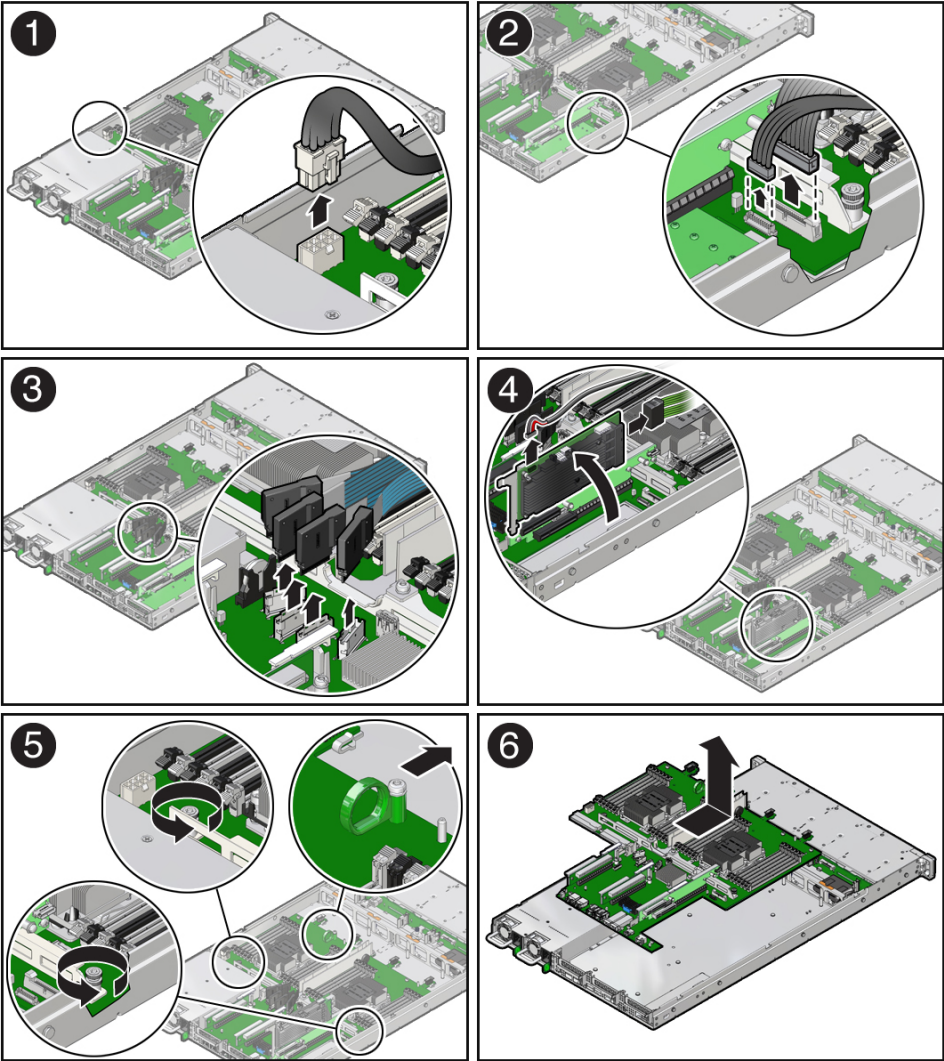


Caution - During the motherboard removal procedure, it is important to label power supplies with the slot numbers from which they were removed (PS0, PS1). This is required because the power supplies must be reinstalled into the slots from which they were removed; otherwise, the server key identity properties (KIP) data might be lost. When a server requires service, the KIP is used by Oracle to verify that the warranty on the server has not expired. For more information on KIP, see [“FRU Key Identity Properties \(KIP\) Automated Update”](#) on page 51.

- Air baffles
- Fan modules
See [“Remove a Fan Module”](#) on page 81.
- Power supplies
See [“Remove a Power Supply”](#) on page 88.
- PCIe risers and attached PCIe cards
See [“Servicing PCIe Risers \(CRU\)”](#) on page 111, [“Servicing PCIe Cards \(CRU\)”](#) on page 121, and [“Servicing the Internal HBA Card and HBA Super Capacitor \(FRU\)”](#) on page 169.

Note - Remove the M.2 SATA cable between the PCIe slot 3 riser and the motherboard SATA connector and set it aside.

- 3. Remove cables from the motherboard.
 - a. Disconnect the disk backplane power cable from the motherboard by pressing in on the connector latch and then pulling out the cable connector [1].



- b. **Disconnect the disk backplane data cable by opening the ejectors and pulling out the cable connector [2].**
- c. **Disconnect the front indicator module (FIM) cable connector by opening the ejectors and pulling out the cable connector [2].**
- d. **Disconnect the NVMe cables (if present) and carefully lift them from the center cable trough and set them aside [3].**

Note - You do not need to remove the NVMe cables or the chassis mid-wall when removing the motherboard from the server chassis.

- e. **Remove the SAS cables and the super capacitor cable that were connected to the internal HBA card, and then carefully lift them from the left-side cable trough and set them aside [4].**
See [“Remove the Internal HBA Cables” on page 179.](#)
4. **Remove the motherboard from the server chassis [5, 6].**
 - a. **Using a Torx T25 screwdriver, loosen the two green captive screws that secure the motherboard bracket/handle to the server chassis.**
 - b. **Grasp the metal bracket located just to the rear of the DIMM slots and the finger loop, and then slide the motherboard toward the front of the server and lift it slightly to disengage it from the eight mushroom-shaped standoffs located on the server chassis under the motherboard.**
 - c. **Lift the motherboard out of the server chassis and place it on an antistatic mat and next to the replacement motherboard.**
 5. **Remove the following reusable components from the motherboard and install them onto the replacement motherboard.**
 - **USB flash drive**
See [“Servicing an Internal USB Flash Drive \(CRU\)” on page 93.](#)
 - **DIMMs**
See [“Servicing the DIMMs \(CRU\)” on page 97.](#)

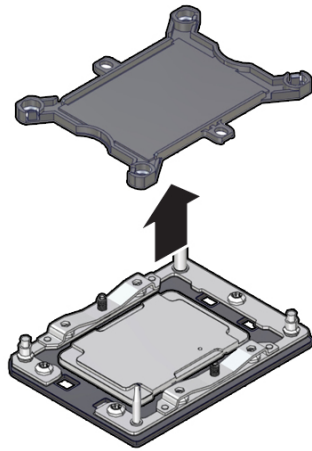
Note - Install the DIMMs only in the slots (connectors) that correspond to the slots from which they were removed. Performing a one-to-one replacement of the DIMMs significantly reduces the possibility that the DIMMs will be installed in the wrong slots. If you do not reinstall the DIMMs in the same slots, server performance might suffer and some DIMMs might not be used by the server.

6. Remove the processors from the failed motherboard.

See [“Identify and Remove a Processor”](#) on page 138.

7. Remove the processor socket covers from the replacement motherboard and install the processors.

- a. Grasp the processor socket cover finger grips (labeled REMOVE) and lift the socket cover up and off the processor socket.



- b. Install a processor into the socket from which you removed the processor socket cover.

See [“Install a Processor”](#) on page 144.

- c. Repeat [Step 7a](#) and [Step 7b](#) to remove the second processor socket cover from the replacement motherboard and install the second processor.

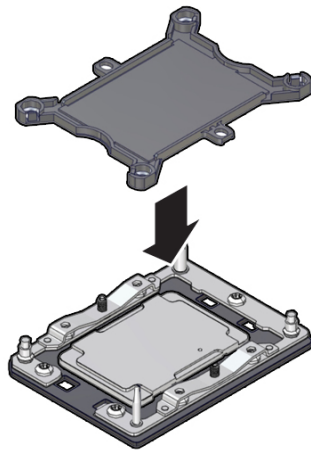
8. Install the processor socket covers on the faulty motherboard.



Caution - The processor socket covers must be installed on the faulty motherboard; otherwise, damage might result to the processor sockets during handling and shipping.

- a. **Align the processor socket cover over the processor socket alignment posts. Install the processor socket cover by firmly pressing down on all four corners (labeled INSTALL) on the socket cover.**

You will hear an audible click when the processor socket cover is securely attached to the processor socket.

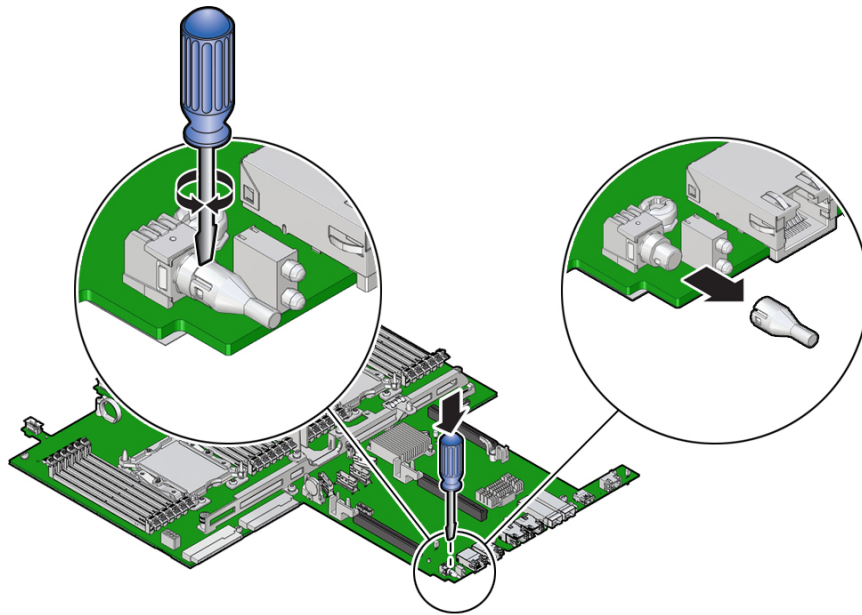


- b. Repeat [Step 8a](#) to install the second processor socket cover on the faulty motherboard.
9. **Check to see if the replacement motherboard has a locate light pipe installed.**
- If it does, no action is necessary.
 - If it does not, perform the following steps.
- a. **Check to see if the replacement motherboard came with a light pipe. It should be in a separate plastic bag.**
- If you find a replacement light pipe, skip to [Step 9b](#).

- If you do not find a replacement light pipe, perform the following steps to remove the light pipe from the faulty motherboard.
 - i. **Insert a flat tool such as a screwdriver or penknife blade between the light pipe housing and the light pipe.**

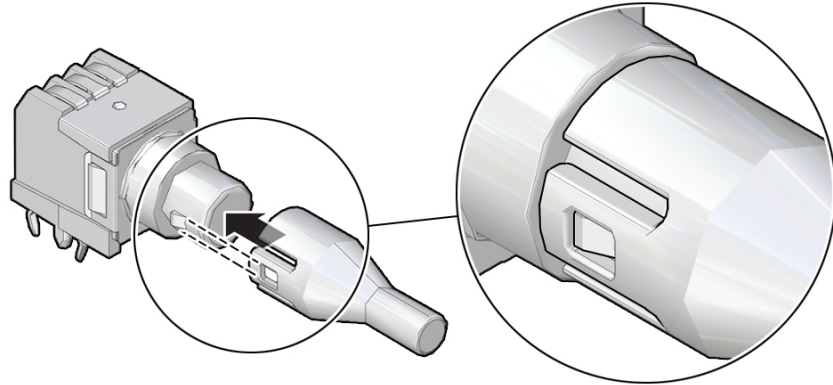


Caution - Equipment damage. The light pipe is fragile. Handle it carefully.



- ii. **Twist the tool back and forth to release the light pipe from the housing.**
 - iii. **Pull the light pipe away from the housing.**
- b. **Install the light pipe on the replacement motherboard.**

- i. Match the rectangular holes on the outside of the light pipe with the retaining clips on the housing.



- ii. Push the light pipe onto the housing until the clips latch in the holes.

Related Information

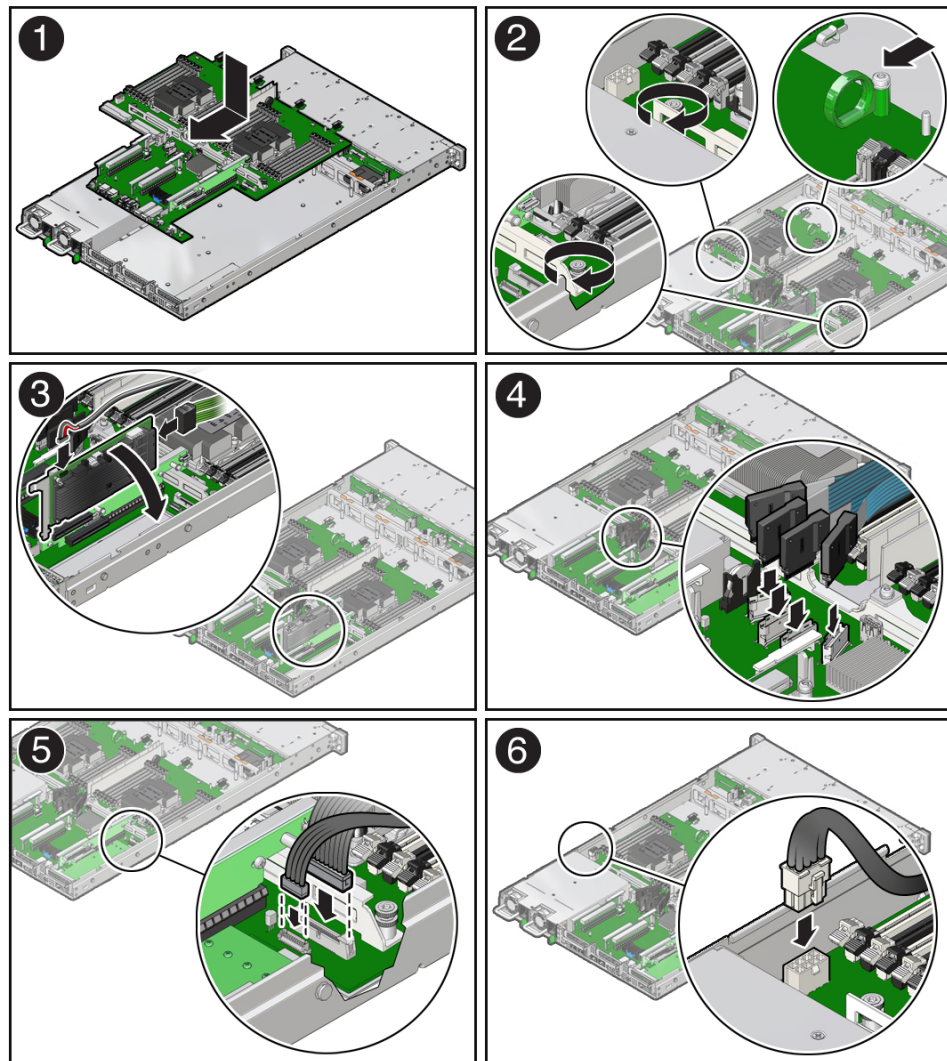
- [“Customer-Replaceable Units” on page 21](#)
- [“Field-Replaceable Units” on page 22](#)
- [“Install the Motherboard” on page 206](#)

▼ Install the Motherboard

1. **Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.**
See [“Take Antistatic Measures” on page 62](#).
2. **Insert the motherboard into the server chassis [1, 2].**
 - a. **Grasp the metal bracket located to the rear of the DIMMs and the finger grasp, and then tilt the front of the motherboard up slightly and push it into the opening in the rear of the server chassis.**

- b. **Lower the motherboard into the server chassis and slide it to the rear until it engages the eight mushroom-shaped standoffs located on the server chassis under the motherboard.**

- c. Ensure that the indicators, controls, and connectors on the rear of the motherboard fit correctly into the rear of the server chassis.



- d. Using a Torx T25 screwdriver, tighten the two green captive screws to secure the motherboard bracket/handle to the server chassis [2].

3. Reinstall cables on to the motherboard.

- a. Carefully reinstall the SAS cables and super capacitor cable along the left-side cable trough [3].

See [“Install the Internal HBA Cables” on page 182.](#)

- b. Carefully reinstall the NVMe cables (if present) into the center cable trough and then reconnect the cables to the motherboard NVMe connectors [4].

- c. Reconnect the front indicator module (FIM) cable to the motherboard connector [5].

- d. Reconnect the disk backplane data cable to the motherboard connector [5].

- e. Reconnect the disk backplane power cable to the motherboard connector [6]

4. Reinstall the following reusable components:

- PCIe risers and attached PCIe cards

See [“Servicing PCIe Risers \(CRU\)” on page 111](#), [“Servicing PCIe Cards \(CRU\)” on page 121](#), and [“Servicing the Internal HBA Card and HBA Super Capacitor \(FRU\)” on page 169.](#)

Note - Reinstall the M.2 SATA cable between the PCIe slot 3 riser and the motherboard SATA connector.

- Power supplies



Caution - When reinstalling power supplies, it is important to reinstall them into the slots from which they were removed during the motherboard removal procedure; otherwise, the server key identity properties (KIP) data might be lost. When a server requires service, the KIP is used by Oracle to verify that the warranty on the server has not expired. For more information on KIP, see [“FRU Key Identity Properties \(KIP\) Automated Update” on page 51.](#)

See [“Install a Power Supply” on page 90.](#)

- Fan modules

See [“Install a Fan Module” on page 84.](#)

- Air baffles

5. Return the server to operation.

a. Install the server top cover.

See [“Install the Server Top Cover”](#) on page 212.

b. Return the server to the normal rack position.

See [“Return the Server to the Normal Rack Position”](#) on page 214.

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

See [“Reconnect Data Cables and Power Cords”](#) on page 216 and [“Power On the Server”](#) on page 216.

d. Verify that the System OK status indicator is lit.

Note - IMPORTANT: After replacing the motherboard, you might need to manually program the product serial number (PSN) into the new motherboard. This is necessary because the motherboard is a secondary member of a select group (or quorum) of components used for maintaining the PSN for service entitlement, and if you replace more than one of the quorum members during any given service procedure, a secondary quorum member might need to be programmed with the PSN. See [“FRU Key Identity Properties \(KIP\) Automated Update”](#) on page 51.

Related Information

- [“Customer-Replaceable Units”](#) on page 21
- [“Field-Replaceable Units”](#) on page 22
- [“Remove the Motherboard”](#) on page 199

Returning the Server to Operation

After replacing components inside of the server, perform the procedures in the following sections:

- [“Server Filler Panel Requirements” on page 211](#)
- [“Remove and Install Filler Panels” on page 211](#)
- [“Install the Server Top Cover” on page 212](#)
- [“Remove Antistatic Measures” on page 213](#)
- [“Reinstall the Server Into the Rack” on page 213](#)
- [“Return the Server to the Normal Rack Position” on page 214](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)
- [“Power On the Server” on page 216](#)

Server Filler Panel Requirements

The server might be shipped with module-replacement filler panels for storage drives and PCIe cards. These filler panels are installed at the factory and must remain in the server until you replace them with a purchased option.

Before you can install an optional server component into the server, you must remove the filler panel from the location into which you intend to install the component. When you remove a storage drive or a PCIe card from the server, you must install either a replacement for the component removed or a filler panel.

▼ Remove and Install Filler Panels

- See the procedures in the following table to remove and install filler panels for storage drives and PCIe cards.

Filler Panel Type	Removal Procedure	Installation Procedure
Storage drive	<ol style="list-style-type: none"> 1. Locate the storage drive filler panel to be removed from the server. 2. To unlatch the storage drive filler panel, pull the release lever, and then tilt the lever out into a fully opened position. 3. To remove the filler panel from the slot, hold the opened release lever, and gently slide the filler panel toward you. 	<ol style="list-style-type: none"> 1. Locate the vacant storage drive module slot in the server, and then ensure that the release lever on the filler panel is fully opened. 2. Slide the filler panel into the vacant slot by pressing the middle of the filler panel faceplate with your thumb or finger. 3. The release lever will close as it makes contact with the chassis. Do not slide the filler panel in all the way. Leave the filler panel out approximately 0.25 to 0.50 inch (6 to 12 mm) from the opening. 4. Using your thumb or finger, press on the middle of the filler panel faceplate until the release lever engages with the chassis. 5. Close the release lever until it clicks into place and is flush with the front of the server
PCIe slot	<ol style="list-style-type: none"> 1. Remove the server top cover. 2. To remove the PCIe slot filler panel, rotate the PCIe locking mechanism, and then lift and remove the PCIe slot filler panel from the location into which you intend to install the PCIe card. <p>Note - In single-processor systems, PCIe slot 1 is nonfunctional; therefore, there is no need to remove the filler panel for slot 1.</p>	<ol style="list-style-type: none"> 1. Remove the server top cover. 2. To install the PCIe slot filler panel, press the PCIe filler panel into the vacant PCIe slot, and then rotate the PCIe locking mechanism to secure the PCIe slot filler panel. <p>Note - In single-processor systems, PCIe slot 1 is nonfunctional; therefore, the server ships with this filler panel installed.</p>

▼ Install the Server Top Cover

1. Place the top cover on the chassis [1].

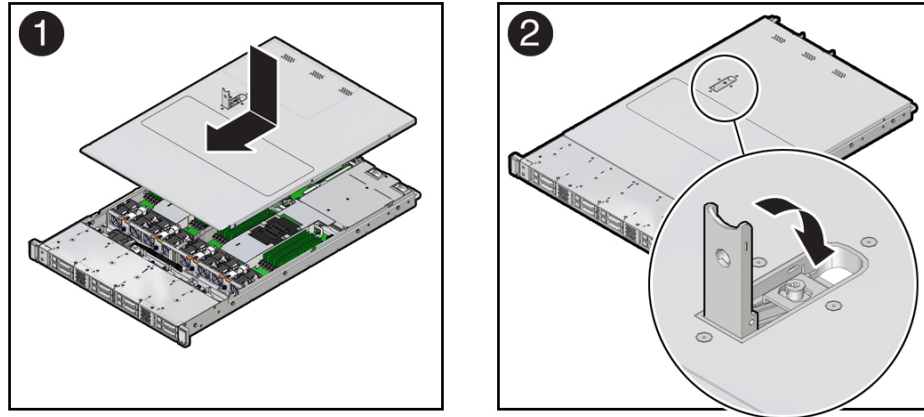
Set the cover down so that it hangs over the back of the server by about 1 inch (25 mm) and the side latches align with the cutouts in the chassis.

2. Check both sides of the chassis to ensure that the top cover is fully down and flush with the chassis.

If the cover is not fully down and flush with the chassis, slide the cover towards the back of the chassis to position the cover in the correct position.

3. Gently slide the cover toward the front of the chassis until it latches into place with an audible click [2].

As you slide the cover toward the front of the server, the release button on the top of the server automatically rotates downward to the closed position. Latch the top cover by pushing down on the button until it is flush with the cover and you hear an audible click. An audible click indicates that the cover is latched.



4. Use a Torx T15 screwdriver to turn the release button latch counter-clockwise to the locked position.

Related Information

- [“Remove the Server Top Cover” on page 63](#)

▼ Remove Antistatic Measures

- Remove any antistatic straps or conductors from the server chassis.

Related Information

- [“Take Antistatic Measures” on page 62](#)

▼ Reinstall the Server Into the Rack

After servicing the system, reinstall it into the rack.



Caution - Deploy any rack anti-tilt mechanisms before installing the server into the rack.



Caution - The server weighs approximately 35.0 lbs (15.88 kg). Two people are required to carry the chassis and install it into the rack.

1. **Lift the server from the antistatic mat, and reinstall the server into the rack.**
Refer to [“Installing the Server Into a Rack”](#) in *Oracle Servers X7-2 and X7-2L Installation Guide* for the installation instructions specific to your rackmount kit.
2. **If the cable management arm (CMA) is not installed, that is, you removed it because you removed the server completely out of the rack, install the CMA.**
For installation instructions for the CMA, refer to [“Install the Cable Management Arm \(Optional\)”](#) in *Oracle Servers X7-2 and X7-2L Installation Guide*.
3. **If the cables are disconnected from the back of the server, that is, you disconnected the cables because you removed the server completely out of the rack, reconnect the cables.**
 - For instructions to reconnect cables to the back of the server, see [“Reconnect Data Cables and Power Cords”](#) on page 216.
 - To identify the location of cable connectors on the back of the server, refer to [“Back Panel Connector Locations”](#) on page 40.

Related Information

- [“Remove the Server From the Rack”](#) on page 61
- [“Reconnect Data Cables and Power Cords”](#) on page 216

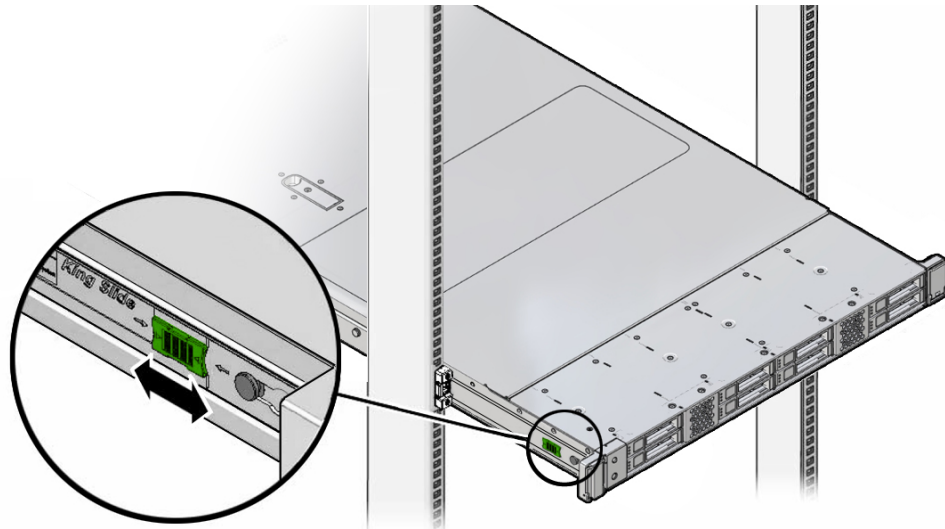
▼ Return the Server to the Normal Rack Position

If the server is in the extended maintenance position, use this procedure to return the server to the normal rack position.

1. **Push the server back into the rack, as described in the following steps.**
 - a. **Simultaneously pull and hold the two green release tabs (one on each side of the slide rails on the server) toward the front of the server while you push the server into the rack.**

As you push the server into the rack, verify that the cable management arm (CMA) retracts without binding.

Note - To pull a green release tab, place your finger in the center of the tab, not on the end, and apply pressure as you pull the tab toward the front of the server.



- b. **Continue pushing the server into the rack until the slide-rail locks (on the front of the server) engage the slide-rail assemblies.**

You will hear an audible click when the server is in the normal rack position.

2. **If the CMA is not installed, that is, you removed it because you removed the server completely out of the rack, install the CMA.**
For installation instructions for the CMA, refer to [“Install the Cable Management Arm \(Optional\)”](#) in *Oracle Servers X7-2 and X7-2L Installation Guide*.
3. **If the cables are disconnected from the back of the server, that is, you disconnected the cables because you removed the server completely out of the rack, reconnect the cables.**
 - For instructions to reconnect cables to the back of the server, see [“Reconnect Data Cables and Power Cords”](#) on page 216.

- To identify the location of cable connectors on the back of the server, see [“Back Panel Connector Locations”](#) on page 40.

Related Information

- [“Reconnect Data Cables and Power Cords”](#) on page 216

▼ Reconnect Data Cables and Power Cords

1. **Reconnect the data cables to the back of the server, as appropriate.**
If the cable management arm (CMA) is in the way, extend the server approximately 13 cm (5 inches) out of the front of the rack.
2. **Reconnect the power cables to the power supplies.**
3. **If necessary, reinstall the cables into the cable management arm and secure them with Velcro straps.**
4. **Power on the server.**
See [“Power On the Server”](#) on page 216.

Related Information

- [“Disconnect Cables From the Server”](#) on page 59
- [“Reinstall the Server Into the Rack”](#) on page 213
- [“Return the Server to the Normal Rack Position”](#) on page 214
- [“Power On the Server”](#) on page 216

▼ Power On the Server

As soon as the power cords are connected, Standby power is applied. In Standby power mode:

- The System OK LED on the server front panel blinks slowly.
- The SP OK LED indicator is steady on.
- The AC power supply LED indicator lights are steady on.

Depending on the firmware configuration, the system might boot. If it does not boot, perform the following procedure.

- **Power on the server to Main power mode by performing one of the following actions:**

- Press the On/Standby button on the front bezel.
- Log in to the Oracle ILOM web interface, click Host Management → Power Control and select Power On from the Select Action list.
- Log in to the Oracle ILOM command-line interface (CLI), and type the following command at the Oracle ILOM prompt:

```
-> start /System
```

When the server is powered on to Main power mode and the power-on self-test (POST) code checkpoint tests have completed, the green System OK LED status indicator on the front panel of the server lights and remains lit.

Related Information

- [“Powering Down the Server” on page 53](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

Identifying the Server Ports

This section describes the pinouts of the server connectors:

- [“Gigabit Ethernet Ports” on page 219](#)
- [“Network Management Port” on page 221](#)
- [“Serial Management Port” on page 222](#)
- [“USB Ports” on page 223](#)

Gigabit Ethernet Ports

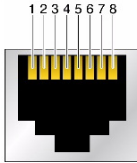
The server has five auto-negotiating gigabit Ethernet (GbE) ports. Three Ethernet ports use standard RJ-45 connectors, and two use enhanced small form-factor pluggable (SFP+) port connectors. The transfer rates are shown in the following table.

TABLE 2 Ethernet Port Transfer Rates

Connection Type	IEEE Terminology	Transfer Rate
Fast Ethernet	100BASE-T	100 Mbps
Gigabit Ethernet	1000BASE-T	1,000 Mbps
10 Gigabit Ethernet	10GBASE-T	10,000 Mbps
10/25 Gigabit Ethernet (SFP+)	10/25GbE	10,000/25,000 Mbps

RJ-45 10GbE Ports

The following figure and table describe the RJ-45 10GbE port pin signals.

**TABLE 3** RJ-45 10GbE Port Signals

Pin	Signal Description	Pin	Signal Description
1	Transmit/Receive Data 0 +	5	Transmit/Receive Data 2 –
2	Transmit/Receive Data 0 –	6	Transmit/Receive Data 1 –
3	Transmit/Receive Data 1 +	7	Transmit/Receive Data 3 +
4	Transmit/Receive Data 2 +	8	Transmit/Receive Data 3 –

SFP+ 10/25GbE Ports

The following table describes the SFP+ 10/25GbE port pin signals.

TABLE 4 SFP+ 10/25GbE Port Signals

Pin	Signal Description	Pin	Signal Description
1	Transmitter ground (VeeT)	11	Receiver ground (VeeR)
2	Transmitter fault indication (TxFault)	12	Inverted received data (RD-)
3	Optical output disabled when high (TxDisable)	13	Received data (RD+)
4	Data for serial ID interface (MOD-DEF (2))	14	Receiver ground (VeeR)
5	Clock for serial ID interface (MOD-DEF (1))	15	Receiver power (VccR)
6	Grounded by the module to indicate module presence (MOD-DEF(0))	16	Transmitter power (VccT)
7	Low selects reduced bandwidth (RateSelect)	17	Transmitter ground (VeeT)
8	When high, indicates received optical power below worst-case receiver sensitivity (LOS)	18	Transmit data (TD+)
9	Receiver ground (VeeR)	19	Inverted transmit data (TD-)
10	Receiver ground (VeeR)	20	Transmitter ground (VeeT)

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Disconnect Cables From the Server” on page 59](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

Network Management Port

The server has one 10/100/1000BASE-T Ethernet management domain interface, labeled NET MGT. For information on configuring this port for managing the server with Oracle ILOM, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

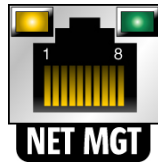


TABLE 5 Network Management Port Signals

Pin	Signal Description	Pin	Signal Description
1	Transmit/Receive Data 0 +	5	Transmit/Receive Data 2 –
2	Transmit/Receive Data 0 –	6	Transmit/Receive Data 1 –
3	Transmit/Receive Data 1 +	7	Transmit/Receive Data 3 +
4	Transmit/Receive Data 2 +	8	Transmit/Receive Data 3 –

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Disconnect Cables From the Server” on page 59](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

Serial Management Port

The serial management connector, labeled SER MGT, is an RJ-45 connector that can be accessed from the back panel. This port is the default connection to the server Oracle ILOM SP. Use this port *only* for server management.

TABLE 6 Default Serial Connections for Serial Port

Parameter	Setting
Connector	SER MGT
Rate	9600 baud
Parity	None
Stop bits	1
Data bits	8

The following figure and table describe the SER MGT port pin signals.



TABLE 7 Serial Management Port Signals

Pin	Signal Description	Pin	Signal Description
1	Request to Send	5	Ground
2	Data Terminal Ready	6	Receive Data
3	Transmit Data	7	Data Set Ready
4	Ground	8	Clear to Send

If you need to connect to the SER MGT port using a cable with either a DB-9 or a DB-25 connector, follow the pin descriptions in the tables to create a crossover adapter appropriate for your serial connection.

TABLE 8 RJ-45 to DB-9 Adapter Crossover Wiring Reference

Serial Port (RJ-45 Connector)		DB-9 Adapter	
Pin	Signal Description	Pin	Signal Description
1	RTS	8	CTS
2	DTR	6	DSR
3	TXD	2	RXD
4	Signal Ground	5	Signal Ground
5	Signal Ground	5	Signal Ground
6	RXD	3	TXD
7	DSR	4	DTR
8	CTS	7	RTS

TABLE 9 RJ-45 to DB-25 Adapter Crossover Wiring Reference

Serial Port (RJ-45 Connector)		DB-25 Adapter	
Pin	Signal Description	Pin	Signal Description
1	RTS	5	CTS
2	DTR	6	DSR
3	TXD	3	RXD
4	Signal Ground	7	Signal Ground
5	Signal Ground	7	Signal Ground
6	RXD	2	TXD
7	DSR	20	DTR
8	CTS	4	RTS

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Disconnect Cables From the Server” on page 59](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

USB Ports

The server has two USB ports for attaching supported USB 3.0-compliant devices. There is one USB port on the server back panel, and one on the motherboard.

The following figure and table describe the USB port pin signals.

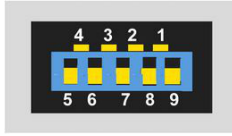


TABLE 10 USB Port Signals

Pin	Signal Description
1	+5 V
2	USB 2.0 DAT-
3	USB 2.0 DAT+
4	Ground
5	USB 3.0 RX-
6	USB 3.0 RX+
7	Ground
8	USB 3.0 TX-
9	USB 3.0 TX+

Related Information

- [“Back Panel Components and Cable Connections” on page 18](#)
- [“Disconnect Cables From the Server” on page 59](#)
- [“Reconnect Data Cables and Power Cords” on page 216](#)

Setting Up BIOS Configuration Parameters

This section provides an overview of BIOS configuration management, UEFI BIOS, and the BIOS Setup Utility:

- [“Manage the BIOS Configuration” on page 225](#)
- [“Accessing the BIOS Setup Utility” on page 226](#)
- [“Using UEFI BIOS” on page 230](#)
- [“Common BIOS Setup Utility Tasks” on page 231](#)

Related Information

- [“BIOS Setup Utility Menu Options” on page 255](#)

Manage the BIOS Configuration

The BIOS configuration parameters on an Oracle x86 server are manageable from the BIOS Setup Utility and Oracle ILOM. For information about using these tools to manage the BIOS configuration, refer to:

- **Oracle ILOM** – “Maintaining x86 BIOS Configuration Parameters” in the *Oracle ILOM Administrator's Guide for Configuration and Maintenance* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.
- **BIOS Setup Utility** – [“Common BIOS Setup Utility Tasks” on page 231](#)

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

Accessing the BIOS Setup Utility

The BIOS Setup Utility provides five main menus that you can use to view product information, and to configure, enable, and disable, or manage system components.

This section provides the following information:

- [“BIOS Setup Utility Menus” on page 226](#)
- [“BIOS Key Mappings” on page 226](#)
- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“Navigate BIOS Setup Utility Menus” on page 228](#)

BIOS Setup Utility Menus

The following table provides descriptions for the top-level BIOS Setup Utility menus.

Menu	Description
Main	General product information, including memory, time/date, security settings, system serial number, and CPU and DIMM information.
Advanced	Configuration information for the CPU, trusted computing, USB, and other information. Set the IP address for the server SP.
IO	Manage configuration settings for I/O devices, such as I/O virtualization settings, and enable and disable Option ROMs.
Boot	Configure the boot device priority.
Save & Exit	Save changes and exit, discard changes and exit, discard changes, or restore the default BIOS settings.

See [“BIOS Setup Utility Menu Options” on page 255](#) for examples of each of these screens.

Related Information

- [“Navigate BIOS Setup Utility Menus” on page 228](#)

BIOS Key Mappings

When viewing the BIOS output from a terminal using the serial console redirection feature, some terminals do not support function keys. BIOS supports the mapping of function keys

to Control key sequences when serial redirection is enabled. The following table provides a description of the function key to Control key sequence mappings.

Function Key	Control Key Sequence	BIOS Setup Function
F1	Ctrl+Q	Activate the Setup Utility Help menu.
F2	Ctrl+E	Enter BIOS Setup Utility while the system is performing power-on self-test (POST).
F8	Ctrl+P	Activate the BIOS Boot Menu.
F10	Ctrl+S	Save and Exit changes.
F12	Ctrl+N	Activate Network boot.

Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“Navigate BIOS Setup Utility Menus” on page 228](#)

▼ Access BIOS Setup Utility Menus

You can access the BIOS Setup Utility screens from the following interfaces:

- Use a terminal (or terminal emulator connected to a computer) through the serial port on the back panel of the server.
- Connect to the server using the Oracle ILOM Remote System Console Plus application.

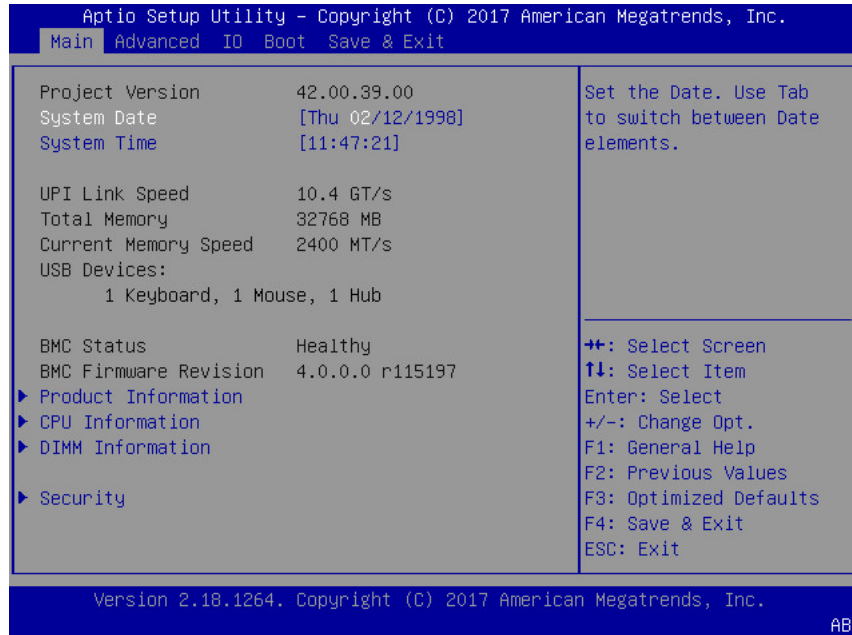
1. Reset or power on the server.

For example, to reset the server:

- **From the local server**, press the On/Standby button on the front panel of the server to power off the server, and then press the On/Standby button again to power on the server.
- **From the Oracle ILOM web interface**, click Host Management → Power Control and select Reset from the Select Action list.
- **From the Oracle ILOM CLI**, type `reset /System`

2. After the server resets, to enter the BIOS Setup Utility, press the F2 key (Ctrl +E from a serial connection) when prompted and while the BIOS is running the power-on self-tests (POST).

The BIOS Setup Utility Main Menu screen appears.



Related Information

- [“BIOS Setup Utility Menus” on page 226](#)
- [“BIOS Key Mappings” on page 226](#)
- [“BIOS Setup Utility Menu Options” on page 255](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Navigate BIOS Setup Utility Menus

To navigate the menus or options listed on a menu, use the arrow keys. The currently selected option or sub-menu is highlighted. For further instructions on how to navigate and change settings in the BIOS Setup Utility, refer to the online information provided on the menu.

1. Access the BIOS Setup Utility.

See [“Access BIOS Setup Utility Menus” on page 227](#).

2. Use the left and right arrow keys to select the different primary menu options.

As you select each menu option, the top-level screen for that menu option appears.

3. To navigate options presented on a top-level screen, use the up and down arrow keys.

Only options that can be modified are highlighted when you press the up and down arrow keys.

- **If an option can be modified, as you select the option, user instructions for modifying the option appear in the right column of the screen.**
- **If an option is a link to a sub-screen, a description of the sub-menu content appears in the right column.**

4. Modify an option by pressing the + or - (plus or minus) keys or by pressing Enter and selecting the desired option from the pop-up menus.

5. Press the Esc key to return from a sub-menu screen to the previous menu screen.

Pressing Esc from a top-level menu is equivalent to selecting the Discard Changes and Exit option from the Save & Exit Menu.

6. Modify parameters as needed.

7. Press the F10 key to save your changes and exit the BIOS Setup Utility.

Alternatively, you can select the Save & Exit menu, and then select Save Changes and Exit to save your changes and exit the BIOS Setup Utility.

Note - After modifying any BIOS settings, the subsequent reboot might take longer than a typical reboot where no settings were modified. The additional delay is required to ensure that changes to the BIOS settings are synchronized with Oracle ILOM.

Related Information

- [“BIOS Setup Utility Menus” on page 226](#)
- [“BIOS Key Mappings” on page 226](#)
- [“BIOS Setup Utility Menu Options” on page 255](#)
- [“Exit BIOS Setup Utility” on page 253](#)

Using UEFI BIOS

Oracle Server X7-2 is equipped with a Unified Extensible Firmware Interface (UEFI)-compatible BIOS, which runs with all operating systems that are supported on the server. The BIOS firmware controls the system from power-on until an operating system is booted, and allows you to configure, enable, disable, or manage system components.

This section includes the following information:

- [“Configuration Utilities for Add-In Cards” on page 230](#)
- [“Configure and Manage BIOS Using Oracle ILOM” on page 230](#)
- [“UEFI Secure Boot” on page 231](#)
- [“Trusted Execution Technology” on page 231](#)

Configuration Utilities for Add-In Cards

In UEFI BIOS, the configuration screens for the add-in cards appear as menu items in the BIOS Advanced Menu as part of the standard BIOS Setup Utility screens. For example, if the Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal card is installed in the server, the configuration utility for the HBA appears as a menu selection.

Configure and Manage BIOS Using Oracle ILOM

Oracle Integrated Lights Out Manager (ILOM) includes BIOS configuration and management tools. You can perform the following BIOS configuration tasks using Oracle ILOM:

- View the BIOS configuration synchronization status and synchronize the configuration parameters
- Reset the factory defaults for the service processor (SP) and Oracle ILOM BIOS
- Backup or restore the BIOS configuration
- Enable UEFI diagnostics to run at system boot

For more information about Oracle ILOM BIOS configuration and management tools, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: <https://www.oracle.com/goto/ilom/docs>.

UEFI Secure Boot

Oracle Server X7-2 UEFI BIOS supports UEFI Secure Boot. UEFI Secure Boot defines how platform firmware can authenticate a digitally signed UEFI image, such as an operating system loader or a UEFI driver.

When enabled, UEFI Secure Boot provides a policy-based invocation of various UEFI executable images, using cryptographic signatures to identify the software publishers. UEFI Secure Boot also requires all third-party UEFI drivers and operating system boot loaders to be signed by Microsoft or with Key Exchange Key (KEK) by using BIOS setup.

UEFI Secure Boot is disabled by default. For configuration information, see [“Configure UEFI Secure Boot” on page 242](#).

Trusted Execution Technology

Oracle Server X7-2 uses Trusted Execution Technology (TXT), which provides authenticity of a platform and its operating system.

When enabled, TXT ensures that the operating system (OS) starts in a trusted environment, and provides the OS with additional security capabilities not available to an untrusted OS. Using cryptographic techniques, TXT provides measurements of software and platform components so that system software as well as local and remote management applications may use those measurements to make trust decisions. Trusted Execution Technology defends against software-based attacks aimed at stealing sensitive information by corrupting system or BIOS code, or modifying a platform's configuration.

Trusted Execution Technology is disabled by default. For configuration information, see [“Configure Trusted Execution Technology” on page 251](#).

Common BIOS Setup Utility Tasks

This section presents the procedures for some of the BIOS setup tasks that you typically perform when setting up and managing the server.

For additional information about BIOS setup tasks, refer to the *Oracle X7 Series Servers Administration Guide* at <https://www.oracle.com/goto/x86admindiag/docs>

- [“Verify BIOS Factory Default Settings” on page 232](#)

- [“Select a Temporary Boot Device” on page 233](#)
- [“Configure TPM Support” on page 234](#)
- [“Configure UEFI Driver Settings” on page 236](#)
- [“Configure I/O Resource Allocation” on page 239](#)
- [“Configure UEFI Secure Boot” on page 242](#)
- [“Configure Trusted Execution Technology” on page 251](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Verify BIOS Factory Default Settings

In the BIOS Setup Utility, you can return the BIOS settings to the optimal factory default values, as well as view and edit settings as needed. Any changes that you make in the BIOS Setup Utility (using the F2 key) persist until the next time you change the settings.

Before you begin, ensure that a console connection is established to the server.

1. **Reset or power on the server.**

For example, to reset the server:

- **From the local server**, press the On/Standby button on the front panel of the server to power off the server, and then press the On/Standby button again to power on the server.
- **From the Oracle ILOM web interface**, click Host Management → Power Control and select Reset from the Select Action list. Click Save, and then click OK.
- **From the Oracle ILOM CLI**, type `reset /System`

2. **After the server resets and begins the initialization process, when prompted, press the F2 key to access the BIOS Setup Utility.**

3. **To ensure that the factory defaults are set, do the following:**

- **Press the F9 key to automatically load the optimal factory default settings.**
- **In responses to the confirmation message to continue, highlight OK, and then press Enter.**

4. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)

- “BIOS Setup Utility Menus” on page 226
- “BIOS Key Mappings” on page 226
- “Exit BIOS Setup Utility” on page 253

▼ Select a Temporary Boot Device

The Boot Options Priority list displays the boot device candidates for the system.

In addition to using the F2 key to view or edit the system BIOS settings, you can use the F8 key during the BIOS startup to specify a temporary boot device. This selected boot device is in effect only for the current system boot. The permanent boot device specified using the F2 key will be in effect after booting from the temporary boot device.

1. Reset or power on the server.

For example, to reset the server:

- **From the local server**, press the On/Standby button on the front panel of the server to power off the server, and then press the On/Standby button again to power on the server.
- **From the Oracle ILOM web interface**, click Host Management → Power Control and select Reset from the Select Action list. Click Save, and then click OK
- **From the Oracle ILOM CLI**, type `reset /System`

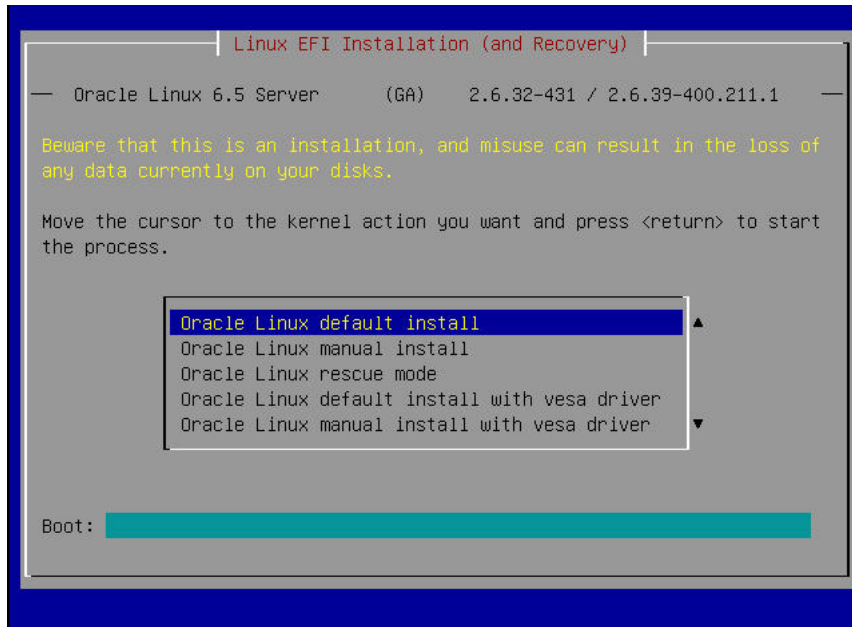
2. After the server resets and begins the initialization process, press the F8 key (or Ctrl+P from a serial connection) when prompted while the UEFI BIOS is running the power-on self-test (POST) to access the boot device menu.

```
Please select boot device:

[UEFI]PXE:NET0:IP4 Intel(R) Ethernet Controller X540-AT2
[UEFI]PXE:NET1:IP4 Intel(R) Ethernet Controller X540-AT2
[UEFI]PXE:NET2:IP4 Intel(R) Ethernet Controller X540-AT2
[UEFI]PXE:NET3:IP4 Intel(R) Ethernet Controller X540-AT2
Enter Setup

↑ and ↓ to move selection
ENTER to select boot device
ESC to boot using defaults
```

3. In the Please Select Boot Device dialog box, select the boot device according to the operating system you elected to use, and then press Enter.



4. Follow the on-screen instructions to install the operating system from the selected boot device.

Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“BIOS Key Mappings” on page 226](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Configure TPM Support

The TPM feature set is enabled by default. If you wish to disable it, or to enable it after it has been disabled, perform the procedure in this section.

Note - TPM enables you to administer the TPM security hardware in your server. For additional information about implementing this feature, refer to the Windows Trusted Platform Module Management documentation provided by your operating system or third-party software vendor.

1. **Access the BIOS Setup Utility menus.**
See “[Access BIOS Setup Utility Menus](#)” on page 227.
2. **In the BIOS Setup Utility menus, navigate to the Advanced Menu.**
3. **On the Advanced Menu screen, select Trusted Computing 2.0.**



4. **On the Trusted Computing 2.0 Configuration screen, select Security TPM Device Support and press Enter. Do one of the following:**
 - **Select Disable to disable Security TPM Device Support.**
 - **Select Enable to enable Security TPM Device Support.**

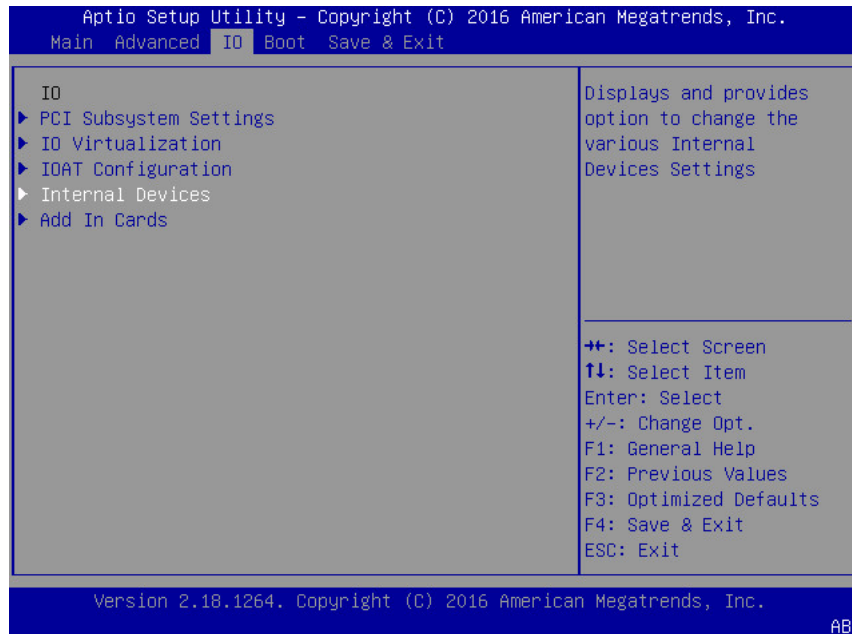
5. On the updated Trusted Computing 2.0 Configuration screen, press the F10 key to save the changes and exit the BIOS Setup Utility.

Related Information

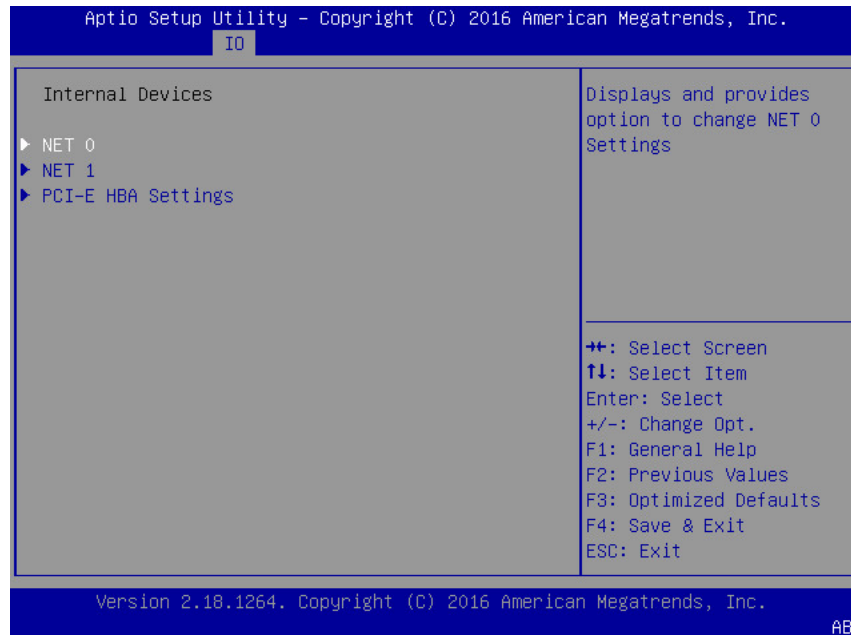
- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“Exit BIOS Setup Utility” on page 253](#)
- Microsoft's Windows Trusted Platform Module Management documentation

▼ Configure UEFI Driver Settings

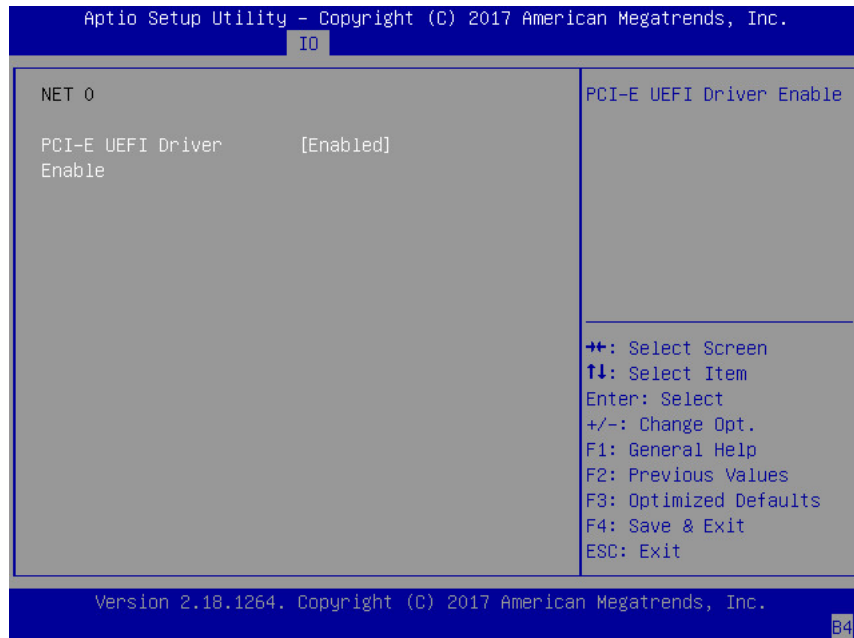
1. Access the BIOS Setup Utility menus.
See [“Access BIOS Setup Utility Menus” on page 227](#).
2. In the BIOS Setup Utility menus, navigate to the IO Menu.



3. On the IO Menu screen, select either Internal Devices or Add In Cards and press Enter to display the internal device or add-in card slot for which you want to enable or disable the PCI-E UEFI Driver.



4. **On the Internal Devices screen, select the internal device or add In card slot that you want to configure.**



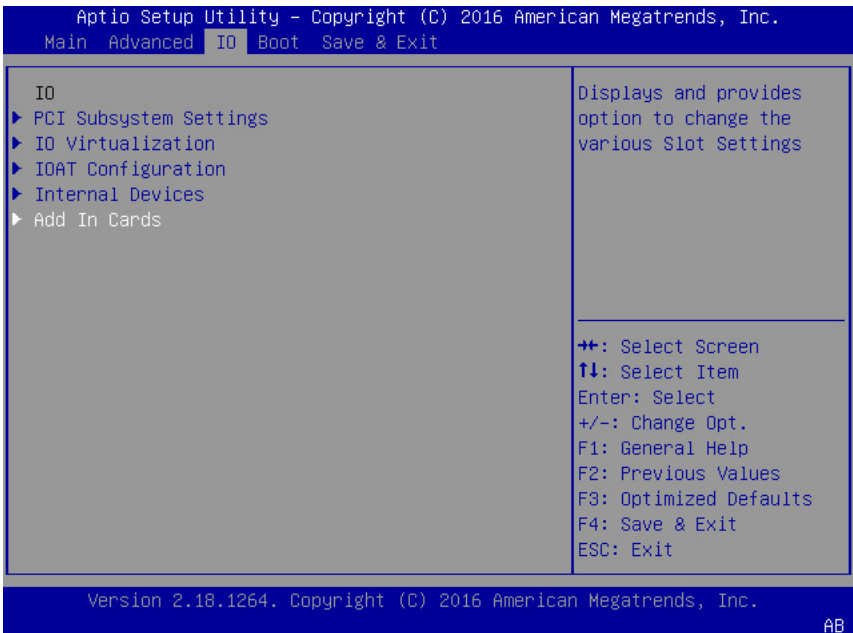
5. **On the PCI-E UEFI Driver Enable screen, select PCI-E UEFI Driver Enable and press Enter. Do one of the following:**
 - **Select Enabled to enable the PCI-E UEFI Driver setting.**
 - **Select Disabled to disable the PCI-E UEFI Driver setting.**
6. **Press the F10 key to save the changes and exit the BIOS Setup Utility.**

Related Information

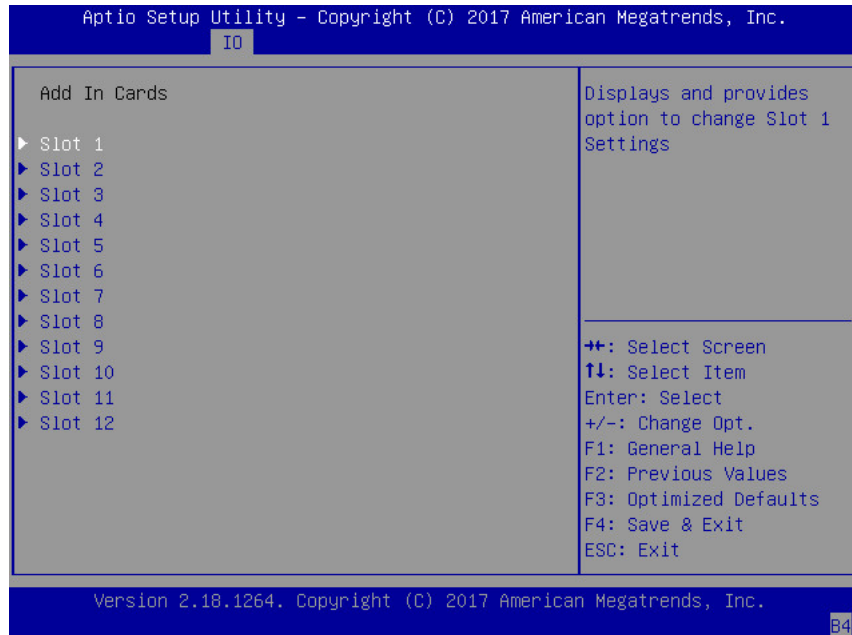
- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Configure I/O Resource Allocation

1. **Access the BIOS Setup Utility menus.**
See “Access BIOS Setup Utility Menus” on page 227.
2. **In the BIOS Setup Utility menus, navigate to the IO Menu.**



3. On the IO Menu screen, select Add In Cards and press Enter to display the add-in card slots.



4. On the Add In Cards screen, select the slot in which you want to configure the card and press Enter.



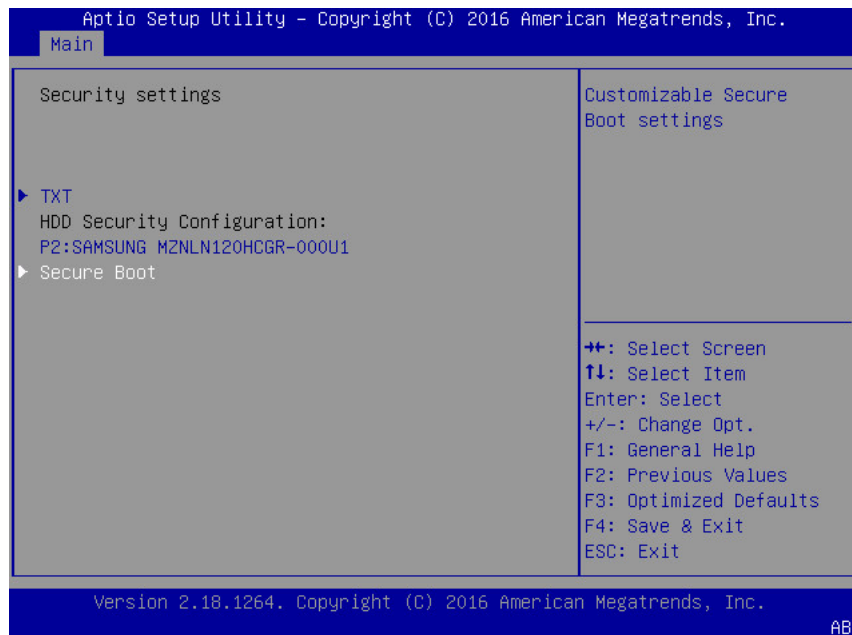
5. On the I/O resource allocation screen for that card, select **I/O Enable** and press Enter. Do one of the following:
 - Select **Enabled** to enable I/O resource allocation for the I/O card.
 - Select **Disabled** to disable I/O resource allocation for the I/O card.
6. Press the **F10** key to save the changes and exit the BIOS Setup Utility.

Related Information

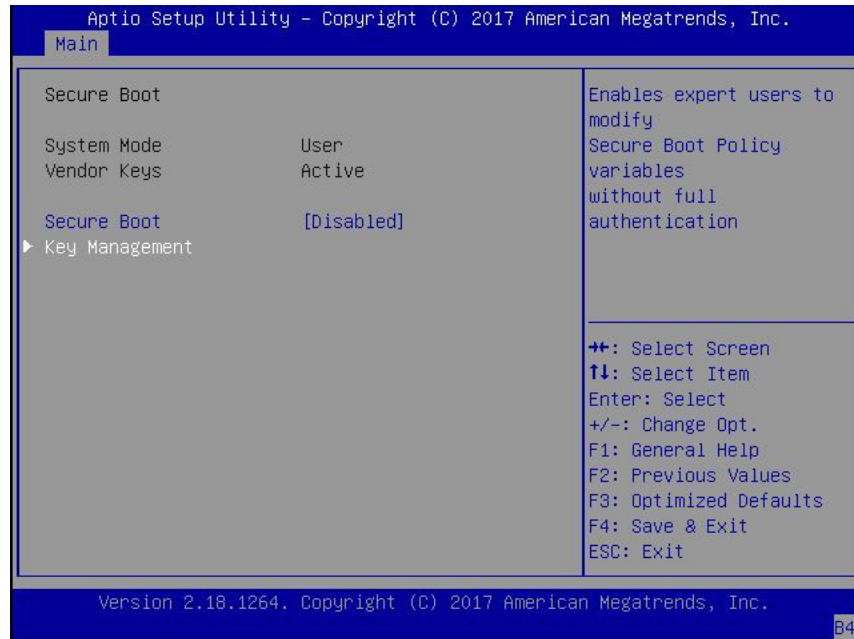
- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Configure UEFI Secure Boot

1. **Access the BIOS Setup Utility menus.**
See [“Access BIOS Setup Utility Menus”](#) on page 227.
2. **On the Main Menu screen, select Security and press Enter.**



3. On the Security Settings screen, select **Secure Boot** and press **Enter**.



4. On the **Secure Boot** screen, select **Secure Boot** and press **Enter**. Do one of the following:

- Select **Enabled** to enable UEFI Secure Boot. Continue with the next step to manage policy variables.
- Select **Disabled** to disable UEFI Secure Boot. Continue with [Step 8](#) to save changes and exit from the BIOS Setup Utility.

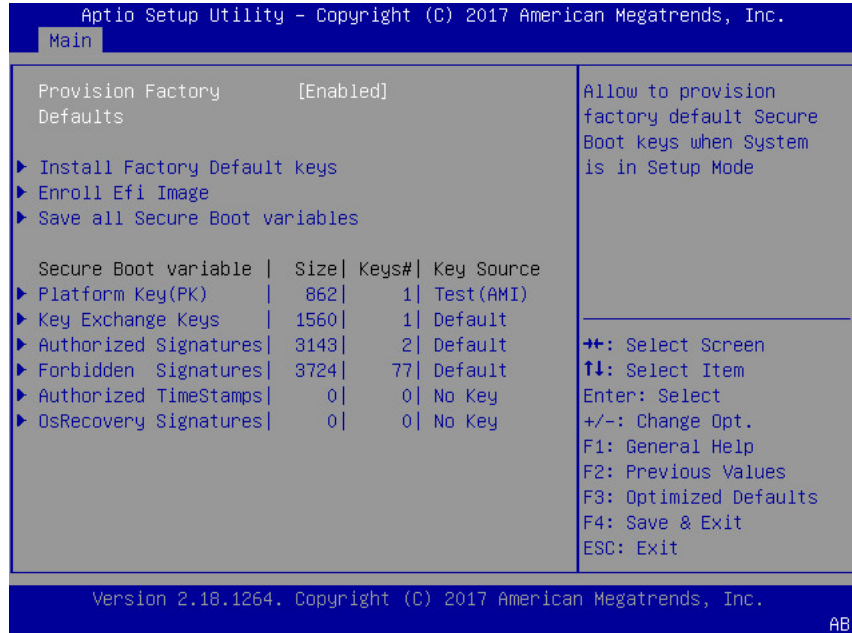
When enabled, Secure Boot allows you to manage Secure Boot policy variables.

5. To manage **Secure Boot** policy variables, select **Key Management** and press **Enter**.

The Key Management screen provides options to provision factory default Secure Boot keys or to enroll an Extensible Firmware Interface (EFI) image.

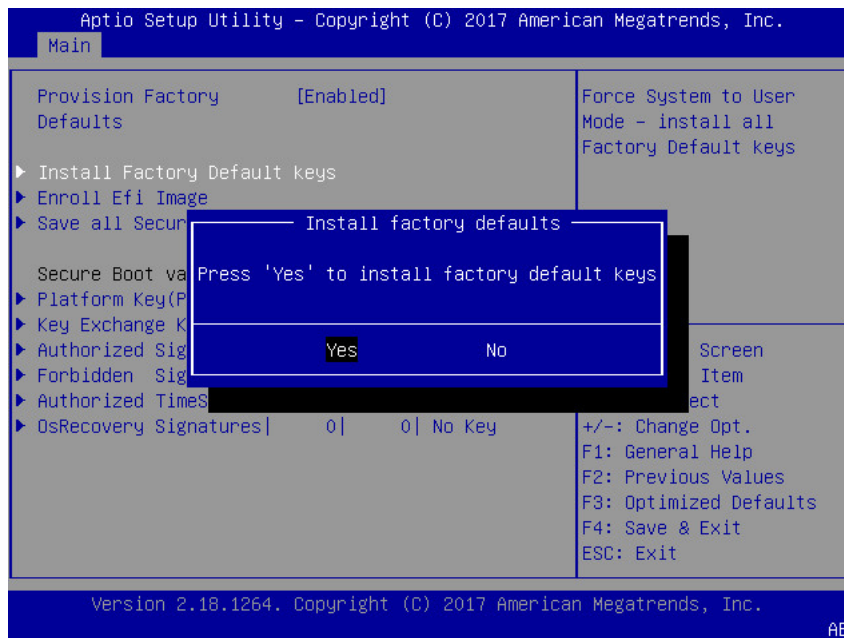
- To provision factory default keys – See [Step 6](#).

- To enroll an EFI image – See [Step 7](#).



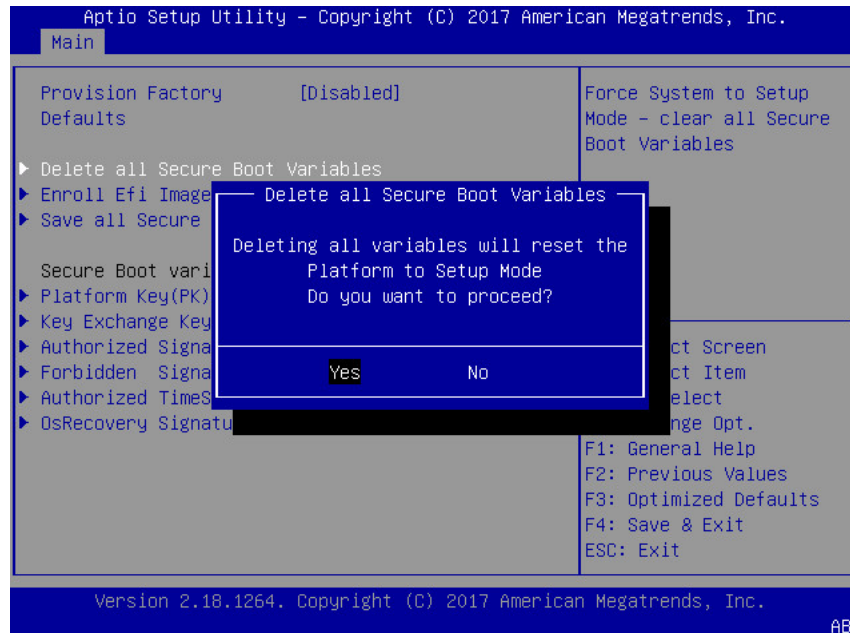
6. **If you want to provision factory default keys, select Provision Factory Defaults and press Enter. Do one of the following:**
 - **Select Enabled to allow the provisioning of factory default Secure Boot keys when the system is in Setup Mode. When enabled, you can select Install**

Factory Default Keys to force the system to User Mode and install all the factory default Secure Boot keys.

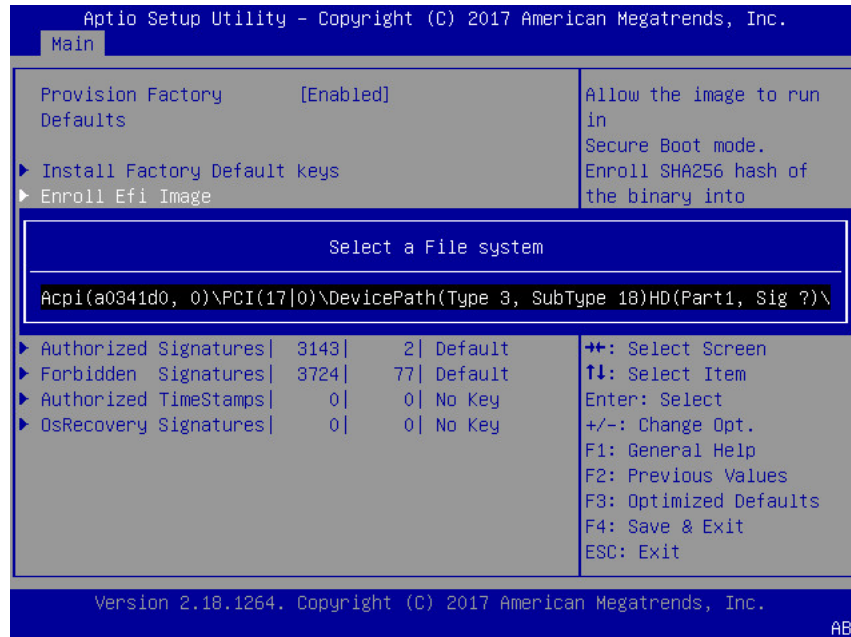


- **Select Disabled to disable the provisioning of factory default Secure Boot keys. When disabled, you can select Delete all Secure Boot Variables to**

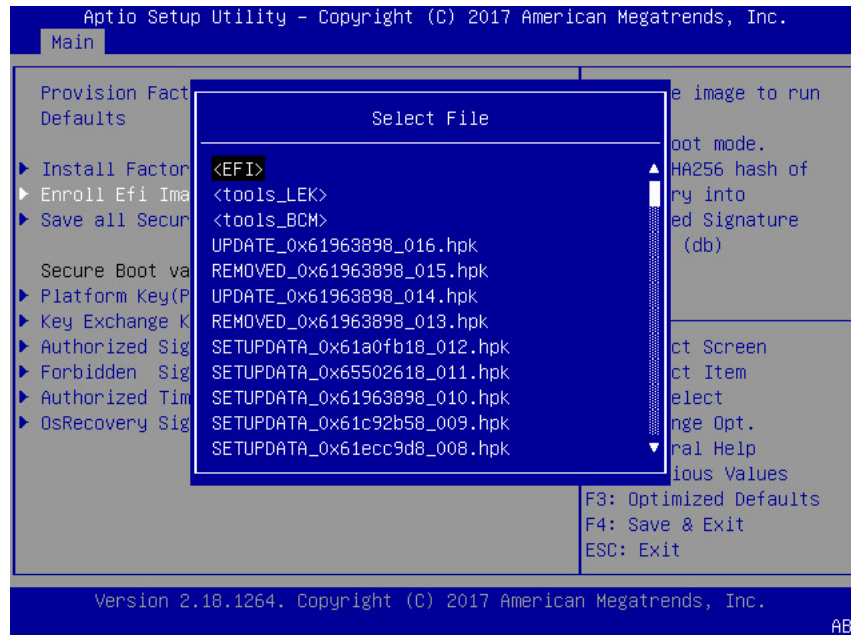
remove all Secure Boot keys from the system. Selecting this option also resets the system to Setup Mode.



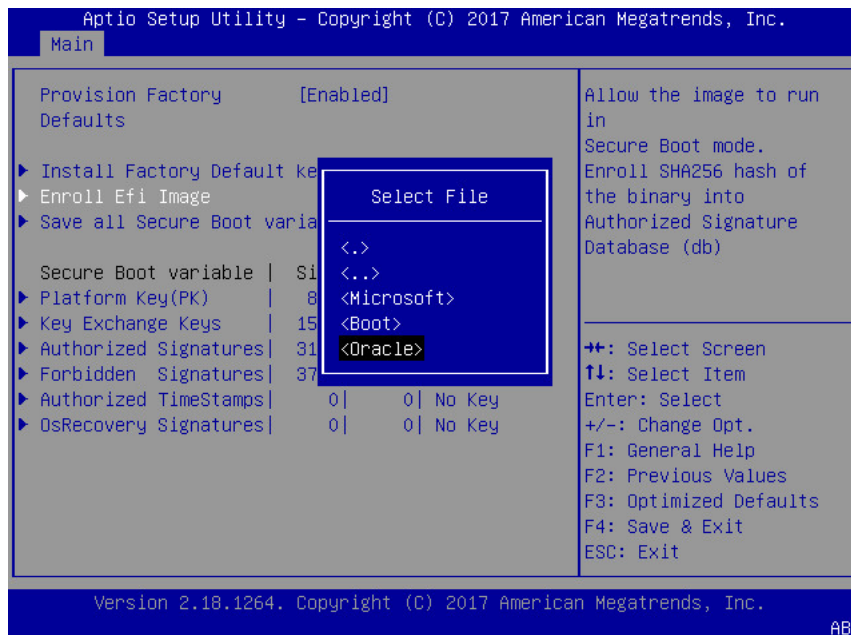
7. If you want to enroll an EFI image, select **Enroll Efi Image** and press **Enter**.



- a. On the Select a File System screen, Scroll through the list and select the file system that contains the EFI file and press Enter.

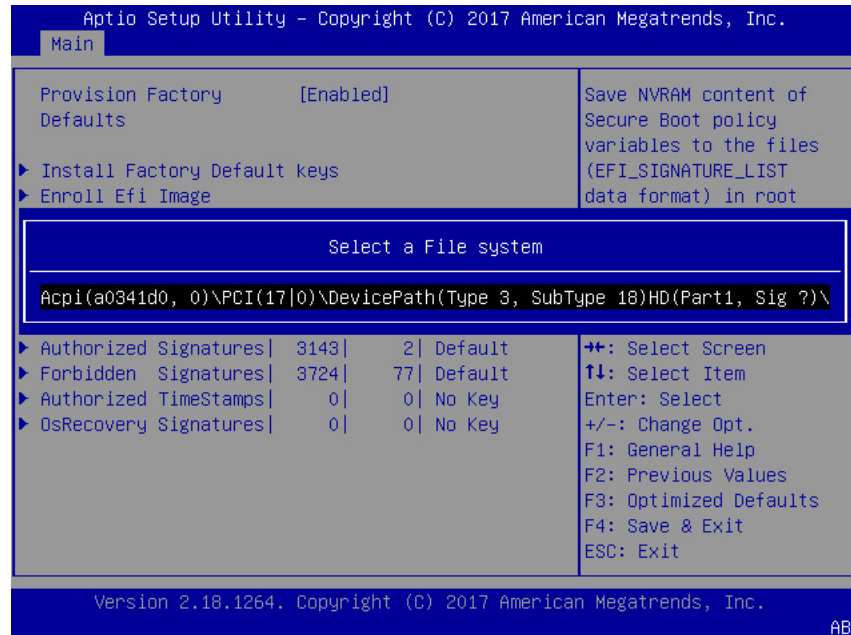


- b. On the Select File screen, scroll through the list and select the EFI file (or another available file) and press Enter.



- c. On the next Select File screen, scroll through the list and select the image file that you want to run in Secure Boot mode and press Enter.

- d. To save all Secure Boot policy variables, select Save all Secure Boot variables and press Enter.



- e. On the Select a File System screen, select the file system where you want to save the EFI file and press Enter.

The Secure Boot policy variables are saved to the root folder in the target file system.

8. Press the F10 key to save the changes and exit the BIOS Setup Utility.

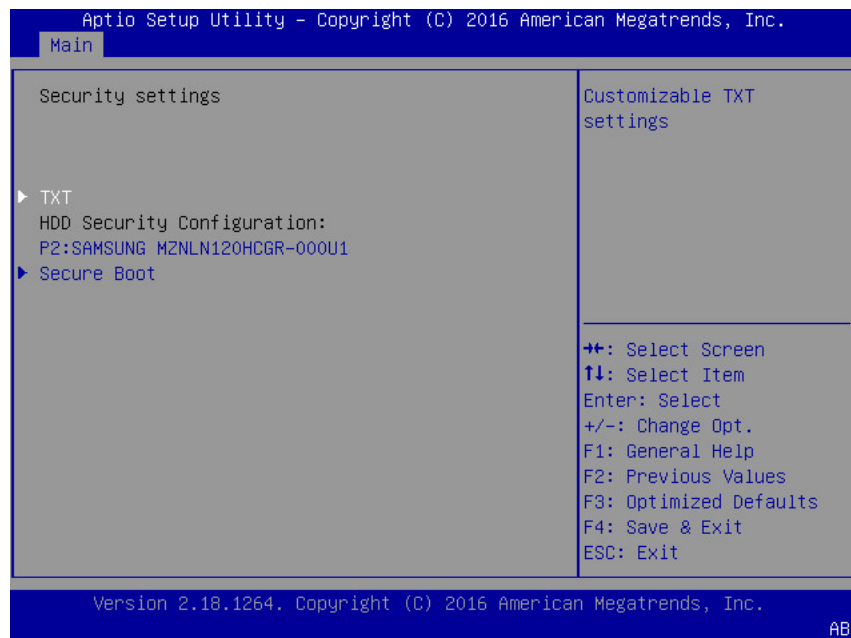
Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“UEFI Secure Boot” on page 231](#)
- [“Exit BIOS Setup Utility” on page 253](#)

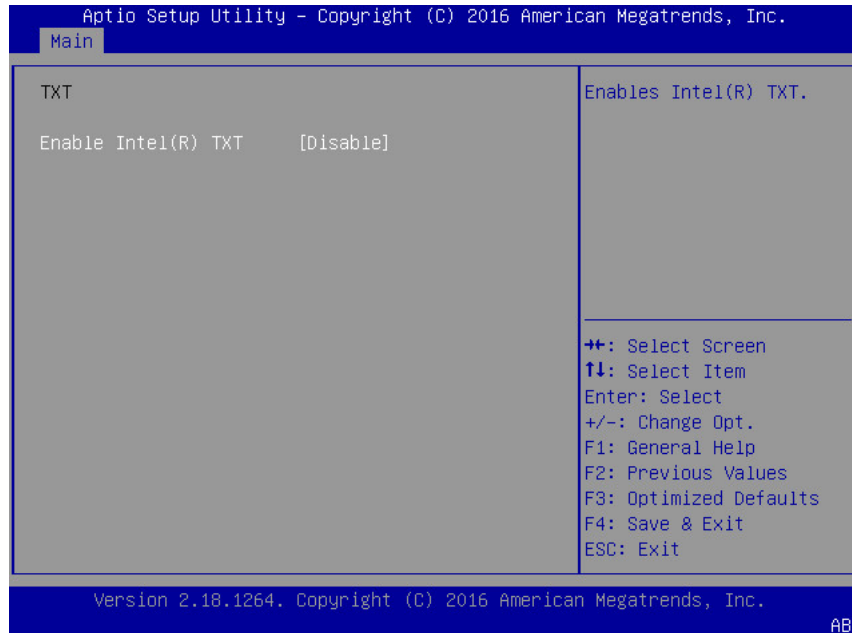
▼ Configure Trusted Execution Technology

The Trusted Platform Module (TPM) feature must be enabled on your server before enabling Trusted Execution Technology (TXT). See [“Configure TPM Support” on page 234](#).

1. **Access the BIOS Setup Utility menus.**
See [“Access BIOS Setup Utility Menus” on page 227](#).
2. **On the Main Menu screen, select security and press Enter.**



3. On the Security Settings screen, select TXT and press Enter.



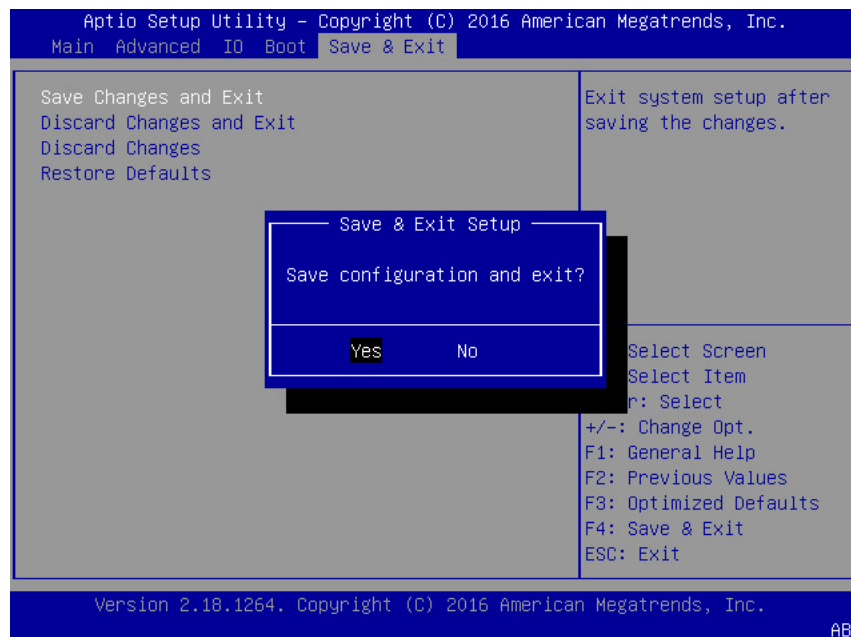
4. On the TXT screen, select Enable Intel(R) TXT and press Enter. Do one of the following:
 - Select Enabled to enable TXT.
 - Select Disabled to disable TXT.
5. Press the F10 key to save the changes and exit the BIOS Setup Utility.

Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)
- [“Trusted Execution Technology” on page 231](#)
- [“Configure TPM Support” on page 234](#)
- [“Exit BIOS Setup Utility” on page 253](#)

▼ Exit BIOS Setup Utility

1. Use the left and right arrow keys to navigate to the top-level Save & Exit Menu.
2. Use the up and down arrow keys to select the desired action.
3. Press Enter to select the option.



4. In the confirmation dialog box, select Yes to proceed and exit the BIOS Setup Utility, or select No to stop the exit process.

Note - After modifying any BIOS settings, the subsequent reboot might take longer than a typical reboot where no settings were modified. The additional delay is required to ensure that changes to the BIOS settings are synchronized with Oracle ILOM.

Related Information

- [“Access BIOS Setup Utility Menus” on page 227](#)
- [“BIOS Setup Utility Menus” on page 226](#)

BIOS Setup Utility Menu Options

This section includes screens of the main menus in the BIOS Setup Utility for Oracle Server X7-2. Following the screen for each menu is a table of the options available from that menu.

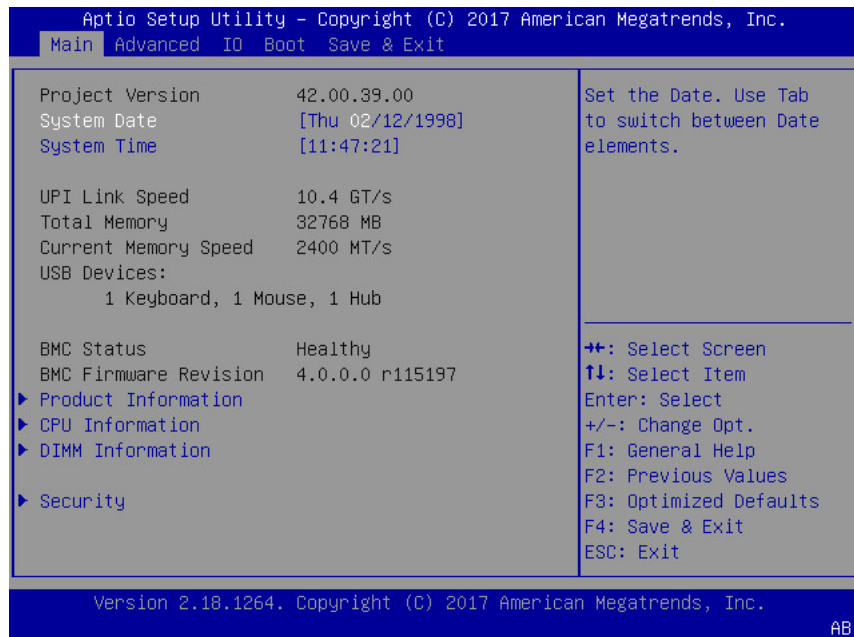
- “BIOS Main Menu Selections” on page 255
- “BIOS Advanced Menu Selections” on page 260
- “BIOS IO Menu Selections” on page 276
- “BIOS Boot Menu Selections” on page 280
- “BIOS Exit Menu Selections” on page 282

Related Information

- *Oracle X7 Series Servers Administration Guide* at: <https://www.oracle.com/goto/x86admindiag/docs>
- “Setting Up BIOS Configuration Parameters” on page 225

BIOS Main Menu Selections

This section includes a screen of the BIOS Main Menu. The options that are available from the Main Menu are described in the table that follows. Options in the table that are marked as “(R/O)” are read-only information and cannot be changed.



The following tables describe the options provided by the BIOS Main Menu and submenus.

Setup Options	Options	Defaults	Description
Project Version (R/O)			<p>BIOS version is displayed. This string is a unique identifier used to reference a specific BIOS release. Format is XXYYZZPP, which indicates:</p> <ul style="list-style-type: none"> ■ XX - Unique project/platform code. ■ YY - BIOS major release. ■ ZZ - BIOS minor release. ■ PP - Build number. <p>Example: 42.01.04.01</p>
System Date			<p>Current date is displayed. You can change the date setting.</p> <p>Example: [Thu 06/20/2017]</p>
System Time			<p>Current time is displayed. You can change the time setting.</p> <p>Example: 13:38:27</p>
UPI Link Speed (R/O)	SLOW/		<p>Intel UltraPath Interconnect (UPI) operational speed is displayed. The</p>

Setup Options	Options	Defaults	Description
	9.6 GT/s 10.4 GT/s		SLOW option displays as unknown in single-processor systems.
Total Memory (R/O)			Memory in gigabytes is displayed. Example: 224 GB
Current Memory Speed (R/O)			Memory speed is displayed. Example: 2400 MT/s
USB Devices (R/O)			Detected USB devices are displayed. Example: 1 Keyboard, 1 Mouse, 1 Hub
BMC Status (R/O)			Detected condition of the service processor. Example: Healthy
BMC Firmware Revision (R/O)			The service processor firmware version is displayed. Example: 4.0.0.0 r115197
PRODUCT INFORMATION (R/O)			Product information is displayed.
Product Name			Product name is displayed. Example: Oracle Server X7-2
Product Serial Number			Product serial number is displayed. Example: 1134FML00V
Board Serial Number			Board serial number is displayed. Example: 489089M+1637E2002E
CPU INFORMATION (R/O)			Attributes of a single processor (CPU) are defined. A separate information structure is provided for each processor supported in the system. Most of the values are dependent on the processor.
Socket 0 CPU Information (R/O)			If CPU socket 0 is populated, the following options are listed. Otherwise, displays "Not Present."
Genuine Intel CPU @ 2.6 GHz			Processor ID brand is displayed.
CPU Signature			Processor information is displayed. Example: 50654
Microcode Patch			Software update (microcode patch) information is displayed. Example: 2000009

BIOS Main Menu Selections

Setup Options	Options	Defaults	Description
Max CPU Speed			Maximum non-turbo speed of the processor is displayed. Example: 2000 MT/s
Min CPU Speed			Minimum speed of the processor is displayed. Example: 1000 MT/s
Max Processor Cores			Number of available processor cores is displayed. Example: 26
Active Cores			Number of active processor cores is displayed.
Intel HT Technology			Indicates whether Intel Hyper Threading is supported.
Intel VT-x Technology			Indicates whether Intel Virtualization Technology is supported.
L1 Data Cache			Example: 32 KB x 26
L1 Code Cache			Example: 32 KB x 26
L2 Cache			Example: 1024 KB x 26
L3 Cache			Example: 36608 KB
Socket 1 CPU Information (R/O)			If CPU socket 1 is populated, the same options as Socket 0 CPU Information are displayed. Otherwise, displays "Not Present."
DIMM INFORMATION (R/O)			Memory module (DIMM) presence and size information are displayed.
Processor 0 DIMMs (R/O)			For D0...D11, if a DIMM is present, memory size (in gigabytes) is displayed. Otherwise, displays "Not Present."
Processor 1 DIMMs (R/O)			Same as Processor 0.
SECURITY			Configure the security settings.
TXT	Enable Intel TXT Disable/ Enable	Disabled	Enables Intel Trusted Execution Technology (TXT).
HDD Security Configuration	Set User Password		Set an HDD user password for the selected drive.
Secure Boot			Customize Secure Boot settings.
Attempt Secure Boot	Disabled/Enabled	Disabled	Secure Boot is activated when Platform Key (PK) is enrolled, System mode is User/Deployed, and Compatibility Support Module (CSM) function is disabled.

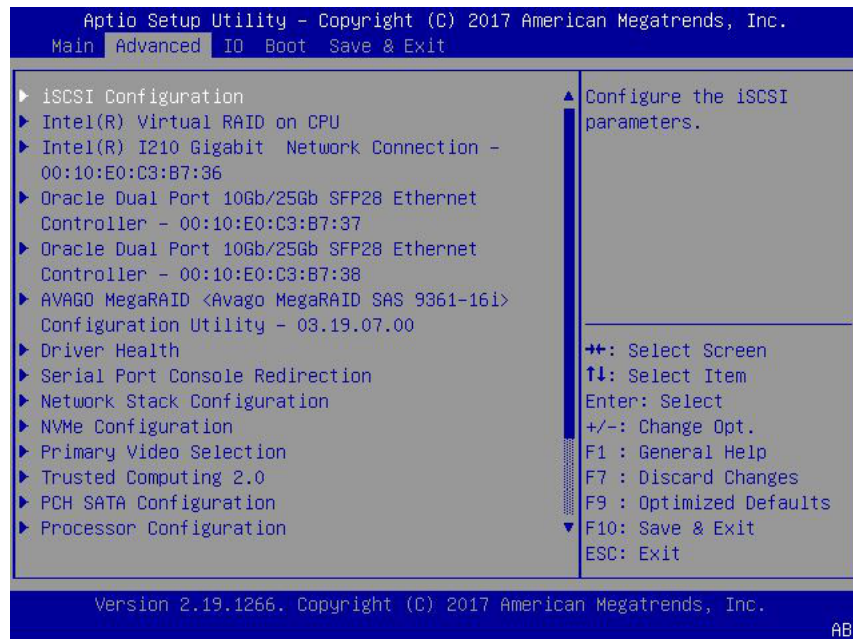
Setup Options	Options	Defaults	Description
Key Management			Enables expert users to modify Secure Boot Policy variables without full authentication.
Provision Factory Defaults	Disabled/Enabled	Disabled	Allows the provisioning of factory default Secure Boot keys when the system is in Setup Mode.
Install Factory Default keys	Yes/No		Force system to User Mode and install Factory Default keys. Note - Displays only when Provision Factory Defaults is Enabled.
Delete all Secure Boot variables	Yes/No		Removes all Secure Boot keys from the system. Also resets the system to Setup Mode. Note - Displays only when Provision Factory Defaults is Disabled.
Enroll Efi Image			Enrolls an EFI image to run in Secure Boot mode.
Save all Secure Boot variables			Saves all Secure Boot variables to the root folder in the chosen file system.
Platform Key (PK)	Save to File/Set New/Erase		Enrolls factory defaults or load certificates from a file.
Key Exchange Keys	Save to File/Set New/Append/Erase		Enrolls factory defaults or load certificates from a file.
Authorized Signatures	Save to File/Set New/Append/Erase		Enrolls factory defaults or load certificates from a file.
Forbidden Signatures	Save to File/Set New/Append/Erase		Enrolls factory defaults or load certificates from a file.
Authorized TimeStamps	Set New/Append		Enrolls factory defaults or load certificates from a file.
OsRecovery Signatures	Save to File/Set New/Append/Erase		Enrolls factory defaults or load certificates from a file.

Related Information

- [“BIOS Advanced Menu Selections” on page 260](#)
- [“BIOS IO Menu Selections” on page 276](#)
- [“BIOS Boot Menu Selections” on page 280](#)
- [“BIOS Exit Menu Selections” on page 282](#)

BIOS Advanced Menu Selections

This section includes a screen of the BIOS Advanced Menu. The options that are available from the Advanced Menu are described in the table that follows. Options in the table that are marked as “(R/O)” are read-only information and cannot be changed.



The following sections describe the BIOS Advanced menu options.

- [“BIOS Advanced Menu iSCSI Configuration Options” on page 261](#)
- [“BIOS Advanced Menu Gigabit Network Connection Options” on page 263](#)
- [“BIOS Advanced Menu Oracle Dual Port 10Gb/25Gb SFP28 Ethernet Controller Options” on page 264](#)
- [“BIOS Advanced Menu Driver Health Options” on page 266](#)
- [“BIOS Advanced Menu Serial Port Console Redirection Options” on page 267](#)
- [“BIOS Advanced Menu Network Stack Options” on page 268](#)
- [“BIOS Advanced Menu NVMe Configuration Options” on page 269](#)
- [“BIOS Advanced Menu Primary Video Selection Option” on page 269](#)
- [“BIOS Advanced Menu Trusted Computing 2.0 Options” on page 270](#)

- [“BIOS Advanced Menu PCH SATA Configuration Options” on page 271](#)
- [“BIOS Advanced Menu Processor Configuration Options” on page 272](#)
- [“BIOS Advanced Menu Memory Configuration Options” on page 273](#)
- [“BIOS Advanced Menu CPU Power Management Configuration Options” on page 274](#)
- [“BIOS Advanced Menu USB Ports Options” on page 275](#)
- [“BIOS Advanced Menu Error Injection Settings Option” on page 275](#)
- [“BIOS Advanced Menu Disk Freeze Lock Settings Option” on page 276](#)

BIOS Advanced Menu iSCSI Configuration Options

The following table lists the BIOS Advance Menu iSCSI Configuration options.

Setup Options	Options	Defaults	Description
iSCSI Initiator Name	NA (must be specified)	None	The worldwide unique name of the iSCSI Initiator. Only IQN format is accepted.
Add an Attempt			
iSCSI Attempt Name	NA (must be specified)	None	The human-readable name that you assigned to this attempt.
iSCSI Mode	Disabled/Enabled/Enabled for MPIO	Disabled	Set to Enabled for multipath I/O (MPIO). MPIO can boost the performance of an application by load-balancing traffic across multiple ports.
Internet Protocol	IP4/IP6/Autoconfigure	IP4	Can be set to IP4, IP6, or Autoconfigure. The initiator IP address is assigned by the system to IP6. In Autoconfigure mode, the iSCSI driver attempts to connect to the iSCSI target using the IPv4 stack. If this fails, then the iSCSI driver attempt to connect using the IPv6 stack.
Connection Retry Count	0 to 16	0	The count range is 0 to 16. If set to 0, there are no retries.
Connection Establishing Timeout	NA	1,000	The timeout value in milliseconds. The minimum value is 100 milliseconds and the maximum is 20 seconds.
Configure ISID	Derived from the MAC address	The default value is derived from the MAC Address	The OUI-format ISID is 6 bytes. The default value is derived

BIOS Advanced Menu Selections

Setup Options	Options	Defaults	Description
			from the MAC address. Only the last 3 bytes are configurable. Example: Update 0ABBCCDDEEFF to 0ABBCCF07901 by inputting F07901
Enable DHCP	Disabled/Enabled	Disabled	Enable or disable DHCP.
Initiator IP Address	NA	0.0.0.0	Set initiator IP address in dotted-decimal notation.
Initiator Subnet Mask	NA	0.0.0.0	Set initiator subnet mask IP address in dotted-decimal notation.
Gateway	NA	0.0.0.0	Set initiator gateway IP address in dotted-decimal notation.
Target Name	NA	NA	The worldwide unique name of the target. Only IQN format is accepted.
Target IP address	0.0.0.0	None	Set target IP address in dotted-decimal notation.
Target Port		3260	Change target port number.
Boot LUN		0	Set the hexadecimal representation of the boot logical unit number (LUN). Example: 4752-3A4F-6b7e-2F99
Authentication Type	CHAP/None	CHAP	Define the Challenge-Handshake Authentication Protocol (CHAP). Available settings are CHAP, Kerberos, and None.
CHAP Type	One Way/Mutual	One Way	Set CHAP type to either One Way or Mutual.
CHAP Name	NA	None	Set CHAP name.
CHAP Secret	NA	None	Set the CHAP secret password. The secret length range is 12 to 16 bytes.
Delete Attempts	NA	NA	Delete one or more attempts.
Change Attempt Order	NA	NA	Change the order of attempts. Use arrow keys to select the attempt, then press plus or minus (+/-) keys to move the attempt up/down in the attempt order list.

BIOS Advanced Menu Gigabit Network Connection Options

The following table describes the BIOS Advanced Menu Gigabit network connection options.

Setup Options	Options	Defaults	Description
NIC configuration			Configure the network interface controller.
Link Speed	Auto Negotiated 10 Mbs Half 10 Mbs Full 100 Mbs Half 100 Mbs Full	NA	Specifies the port speed used for the selected boot protocol.
Wake on LAN	Disable/Enabled	NA	Enable or disable wake on LAN.
Blink LEDs	0/1/2/3	0	Identify the physical network port by blinking the associated LED.
UEFI Driver (R/O)	NA	NA	Identifies the UEFI driver.
Adapter PBA (R/O)	NA	NA	Product board adapter (PBA) number. You can use the Intel Network Adapter PBA number to search for the adapter's model number. The PBA number is a nine-digit number that is the last part of the adapter board serial number. The PBA number is presented in this format: xxxxxx-xxx, for example, C80222-001.
Device Name (R/O)	NA	NA	Device name.
Chip Type (R/O)	NA	NA	Manufacturer and model number.
PCI Device ID (R/O)	NA	1533	Device identifier.
PCI Address (R/O)	NA	NA	Bus device function identifier. Example format: Bus:Device: Function
Link Status (R/O)	NA	Connected	Specifies the link status of the network port.
MAC Address (R/O)	NA	NA	Lists the MAC address of the network interface controller (NIC).

Setup Options	Options	Defaults	Description
Virtual MAC Address (R/O)	NA	NA	Lists the Virtual MAC address of the network interface controller (NIC).

BIOS Advanced Menu Oracle Dual Port 10Gb/25Gb SFP28 Ethernet Controller Options

The following table describes the BIOS Advanced Menu Oracle Dual Port 10Gb/25Gb SFP28 Ethernet controller options.

Setup Options	Options	Defaults	Description
Firmware Image Menu (R/O)	NA	NA	Lists the current firmware versions for the Ethernet controller.
Device Configuration Menu	NA	NA	Configure the device.
Number of VFs per PF	NA	16	Configure the number of VFs (virtual functions) per PF (physical functions) in multiples of 8 (0...128).
SR-IOV	Enabled/Disabled	Disabled	Enable/Disable single root I/O virtualization.
Number of MSI-X Vectors per VF	NA	16	Configure the number MSI-X (message signaled interrupts) Vectors per VF (0...128).
Maximum Number of PF MSI-X Vectors	NA	255	Configure the maximum number of PF MSI-X Vectors (0...470).
Link FEC	Disabled CL74 - Fire Code CL91 - Reed Solomon both CL74 and CL91	Disabled	Configure Link Forward Error Correction mode.
Energy Efficient Ethernet	Enabled/Disabled	Disabled	Configure Energy Efficient Ethernet operation.
Operational Link Speed	AutoNeg 1Gbps 10Gbps 25Gbps	AutoNeg	Configure the link speed setting to be used as the default link speed for the selected port. For dual port adapters, the adapter supports multiple combinations.

Setup Options	Options	Defaults	Description
Firmware Link Speed	AutoNeg 1Gbps 10Gbps 25Gbps	AutoNeg	Configure the link speed setting to be used as the default link speed for the selected port in D3 state. For dual port adapters, the adapter supports multiple combinations.
Physical media selection	SFP28/RJ45	SFP28	Configure PHY selection for dual media devices.
QoS Profile	CoS Queue Profile 3 CoS Queue Profile 4 CoS Queue Profile 6 CoS Queue Profile 7 Default CoS Queue Profile	Default CoS Queue Profile	Select the QoS Profile.
DCB Protocol	Disabled Enabled (IEEE only) CEE (only) Both (IEEE preferred with fallback to CEE)	Enabled	Enable or disable DCB (Data Center Bridging) Protocol.
LLDP nearest bridge	Enabled/Disabled	Enabled	Configure LLDP (Link Layer Discovery Protocol) nearest bridge state. Note - If you disable LLDP nearest bridge, you should also disable DCB Protocol.
LLDP nearest non-TPMR bridge	Enabled/Disabled	Enabled	Configure LLDP nearest non-TPMR bridge state.
MBA Configuration Menu	NA	NA	Configure Multiple Boot Agent (MBA) parameters.
Legacy Boot Protocol	PXE/NONE	NONE	Select non-UEFI Boot Protocol: Preboot Execution Environment (PXE)/iSCSI.
Boot Strap Type	Auto Detect BBS Int 18h Int 19h	Auto Detect	Select the boot strap type.
Hide Setup Prompt	Enabled/Disabled	Disabled	Configure whether the Setup Prompt is displayed during ROM initialization.

BIOS Advanced Menu Selections

Setup Options	Options	Defaults	Description
Setup Key Stroke	Ctrl-S/Ctrl-B	Ctrl-S	Configure key strokes to invoke the configuration menu.
Banner Message Timeout	NA	0	Select the timeout value: <ul style="list-style-type: none"> ■ 0 = 4 seconds ■ 15 = no delay ■ 1-14 = timeout value in seconds
Link Speed	AutoNeg 1Gbps 10Gbps 25Gbps	AutoNeg	Configure the link speed setting to be used when booting the selected protocol. For dual port adapters, the adapter supports multiple combinations of link speeds per port.
VLAN Mode	Enabled/Disabled	Disabled	Configure the virtual LAN (VLAN) mode.
VLAN ID	NA	1	Configure the VLAN ID (1...4094). Note - This selection is available only when VLAN Mode is Enabled.
NIC + RDMA Mode (R/O)	NA	Disabled	
Blink LEDs	NA	0	Configure blink LEDs for a duration of up to 15 seconds.
Link Status (R/O)	NA	Connected	Specifies the link status of the port.
Chip Type (R/O)	NA	NA	Displays the manufacturer and model of the Ethernet controller.
PCI Device ID (R/O)	NA	16E2	Displays the PCI device identifier.
Bus:Device:Function (R/O)	NA	NA	Displays the Bus device function identifier.
Permanent MAC Address(R/O)	NA	NA	Lists the MAC address of the Ethernet controller.
Virtual MAC Address (R/O)	NA	NA	Lists the virtual MAC address of the Ethernet controller.

BIOS Advanced Menu Driver Health Options

The following table describes the BIOS Advanced Menu driver health options.

Note - Depending on the devices that are populating your PCIe slots, you will see different entries if the devices are publishing their driver health status.

Setup Options	Options	Defaults	Description
Intel PRO/1000 PCI-E (R/O)		Healthy	Lists the health status of drivers/controllers.
Controller Child 0 (R/O)		Healthy	
Intel I210 Gigabit Network Connection (R/O)		Healthy	
Apache Pass Driver (R/O)		Healthy	Lists the health status of drivers/controllers.

BIOS Advanced Menu Serial Port Console Redirection Options

The following table lists the BIOS Advanced Menu Serial Console Redirection options.

Setup Options	Options	Defaults	Description
EMS Console Redirection	Disabled/Enabled	Disabled	Enable or disable console redirection for Windows Emergency Management Service (EMS) administration.
Console Redirection	Disabled/Enabled	Enabled	Enable or disable console redirection.
Terminal Type	VT100/VT100+/VT-UTF8/ANSI	VT100+	Select the emulation for the terminal: <ul style="list-style-type: none"> ■ VT100: ASCII character set. ■ VT100+: Extends VT100 to support color, function keys, etc. ■ VT-UTF8: Uses UTF8 encoding to map Unicode characters onto one or more bytes. ■ ANSI: Extended ASCII character set.
Bits per Second	9600 19200	9600	Select the serial port transmission speed. The speed must be matched on the connecting serial device. Long

Setup Options	Options	Defaults	Description
	38400 57600 115200		or noisy lines require lower speeds.
Data Bits	7/8	8	Select the data bits.
Parity	None/Even/Odd/Mark/Space	None	<p>A parity bit can be sent with the data bits to detect some transmission errors.</p> <ul style="list-style-type: none"> ■ None: No parity bits are sent. ■ Even: Parity bit is 0 if the number of 1s in the data bits is even. ■ Odd: Parity bit is 0 if the number of 1s in the data bits is odd. ■ Mark: Parity bit is always 1. ■ Space: Parity bit is always 0. <p>Mark and Space parity do not allow for error detection. They can be used as an additional data bit.</p>
Stop Bits	1/2	1	<p>Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning of a serial data packet.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.</p>
Flow Control	None, Hardware RTS/CTS, Software Xon/Xoff	None	<p>Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a 'stop' signal can be sent to stop the data flow. Once the buffers are empty, a 'start' signal can be sent to restart the flow. Hardware flow control uses two wires to send start/stop signals.</p>

BIOS Advanced Menu Network Stack Options

The following table lists the BIOS Advanced Menu Network Stack options.

Setup Options	Options	Defaults	Description
Network Stack	Disabled/Enabled	Enabled	Enable or disable the UEFI network stack.
Ipv4 PXE Support	Disabled/Enabled	Enabled	Enable or disable IPv4 PXE Boot support. If disable, the IPv4 PXE Boot Option will not be created.
Ipv4 HTTP Support	Disabled/Enabled	Disabled	Enable or disable IPv4 HTTP Boot support. If disable, the IPv4 HTTP Boot Option will not be created.
Ipv6 PXE Support	Disabled/Enabled	Disabled	Enable or disable IPv6 PXE Boot support. If disable, the IPv6 PXE Boot Option will not be created.
Ipv6 HTTP Support	Disabled/Enabled	Disabled	Enable or disable IPv6 HTTP Boot support. If disable, the IPv6 HTTP Boot Option will not be created.
PXE boot wait time	0	0	Wait time to press ESC key to abort the PXE boot.
Media detect count	1	1	Number of times the presence of media will be checked.

BIOS Advanced Menu NVMe Configuration Options

The following table describes the BIOS Advanced Menu NVMe configuration options.

Setup Options	Options	Defaults	Description
Bus:5E Dev:0 Func:0 (R/O)		N/A	Displays the PCIe Bus, Device, and Function for the NVMe controller.
Nvme Size (R/O)		N/A	Displays the size of the NVMe device.

BIOS Advanced Menu Primary Video Selection Option

The following table describes the BIOS Advanced Menu primary video selection option.

Setup Options	Options	Defaults	Description
Add-in Video Card support	Disabled/Enabled	Enabled	Enable or disable video card support.

BIOS Advanced Menu Trusted Computing 2.0 Options

The following table lists the BIOS Advanced Menu Trusted Computing 2.0 options.

Note - The options in this section are available only when the Security TPM Device Support option is set to Enabled.

Setup Options	Options	Defaults	Description
Security TPM Device Support	Disabled/Enabled	Disabled	Enable or disable Trusted Platform Module (TPM) support. If disabled, the OS will not show TPM. Reset of the platform is required.
Active PCR banks (R/O)	N/A	N/A	Displays active Platform Configuration Register (PCR) banks.
Available PCR banks (R/O)	N/A	N/A	Displays available Platform PCR banks.
SHA-1 PCR Bank (R/O)	N/A	N/A	Displays if the SHA-1 PCR bank is enabled/disabled.
SHA256 Bank (R/O)	N/A	N/A	Displays if the SHA256 PCR bank is enabled/disabled.
Pending Operation	None/TPM Clear	None	Schedule an operation for the security device. Note - Your computer reboots during restart to change the state of a security device.
Platform Hierarchy	Disabled/Enabled		Enable or disable platform hierarchy.
Storage Hierarchy	Disabled/Enabled		Enable or disable storage hierarchy.
Endorsement Hierarchy	Disabled/Enabled		Enable or disable endorsement hierarchy.
TPM 2.0 UEFI Spec Version (R/O)	N/A	N/A	Displays the TPM 2.0 UEFI spec version.
Physical Presence Spec Version	1.2/1.3	1.3	Select the physical presence spec version.

Setup Options	Options	Defaults	Description
TPM 20 InterfaceType (R/O)	N/A	N/A	Displays the TPM 20 interface type.
Device Select (R/O)	N/A	N/A	Displays the TPM device.

BIOS Advanced Menu PCH SATA Configuration Options

The following table describes the BIOS Advanced Menu PCH SATA configuration options.

Setup Options	Options	Defaults	Description
SATA Controller	Disable/Enable	Enable	Enable or disable SATA controller.
Configure SATA as	AHCI/RAID	AHCI	Configure SATA as AHCI or RAID.
SATA test mode	Disable/Enable	Disable	Enable or disable SATA test mode.
SATA RSTe Boot Info	Disable/Enable	Enable	Enable this setting to provide full int13h support for SATA controller attached devices. Note - This option is available only if Configure SATA as is set to RAID.
SATA Mode Options			Select SATA mode related options.
SATA HDD Unlock	Disable/Enable	Enable	Enable or disable SATA HDD unlock.
SATA LED Locate	Disable/Enable	Enable	Enable or disable SATA LED locate.
Support Aggressive Link Power Management	Disable/Enable	Enable	Enable or disable aggressive link power management.
Alternate Device ID on RAID	Disable/Enable	Disable	Enable or disable an alternate device ID on RAID devices. Note - This option is available only if Configure SATA as is set to RAID.
Load EFI Driver for RAID	Disable/Enable	Disable	Load EFI driver in RAID mode. Note - This option is available only if Configure SATA as is set to RAID.
NVRAM CYCLE ROUTER 0 ENABLE	Disable/Enable	Disable	Enable or disable cycle router 0 for NVRAM Remapping engine.

Setup Options	Options	Defaults	Description
NVRAM CR0 PCIE Root Port Number	PCI Express Root Port 1...20 None PCI Express Root Port		Choose a RootPort that is enabled for router cycle 0 for NVRAM engine.
NVRAM CYCLE ROUTER 1 ENABLE	Disable/Enable	Disable	Enable or disable cycle router 1 for NVRAM Remapping engine.
NVRAM CR1 PCIE Root Port Number	PCI Express Root Port 1...20 None PCI Express Root Port		Choose a RootPort that is enabled for router cycle 1 for NVRAM engine.
NVRAM CYCLE ROUTER 2 ENABLE	Disable/Enable	Disable	Enable or disable cycle router 2 for NVRAM Remapping engine.
NVRAM CR2 PCIE Root Port Number	PCI Express Root Port 1...20 None PCI Express Root Port		Choose a RootPort that is enabled for router cycle 2 for NVRAM engine.
SATA Port 0 Software Reserve			
Port 0	Disable/Enable	Enable	Enable or disable the SATA port.
Hot Plug	Disable/Enable	Disable	Designates the port as hot-pluggable.
Configure as eSATA	Disable/Enable	Disable	Configures the port as an external SATA (eSATA) device.
Mechanical Presence Switch	Disable/Enable	Enable	Enable or disable device reporting when the device has a mechanical presence switch.
Spin Up Device	Disable/Enable	Disable	Enable or disable staggered spin up on the device.
SATA Device Type	Hard Disk Drive/Solid State Drive	Hard Disk Drive	Identify the type of drive that is connected to the SATA port.
SATA Topology	Unknown/ISATA/Direct Connect/Flex/M2	Unknown	Identify the SATA topology for the SATA port.
SATA Port 1, Port 2, Port 3, Port 4, Port 5, Port 6, and Port 7 Software Reserve			The same options as SATA Port 0 Software Reserve are displayed

BIOS Advanced Menu Processor Configuration Options

The following table lists the BIOS Advanced Menu Processor Configuration options.

Setup Options	Options	Defaults	Description
Hyper-threading ALL	Disabled/Enabled	Enabled	Enable or disable Hyper Threading. When enabled,

Setup Options	Options	Defaults	Description
			two threads are available per enabled core. When disabled, only one thread per enabled core is available.
Active Processor Cores	A minimum of one up to the maximum number of cores available in the processor package.	All	The number of cores to enable in each processor package.
SNC	Disable/Enable/Auto	Disable	Enable, disable, or set sub-NUMA cluster (SNC) to auto.
Hardware Prefetcher	Disabled/Enabled	Enabled	Enable or disable the mid-level cache (MLC) streamer prefetcher (MSR 1A4h bit [0]).
Adjacent Cache Prefetcher	Disabled/Enabled	Enabled	Enable or disable the mid-level cache (MLC) streamer prefetcher (MSR 1A4h bit [1]).
DCU Streamer Prefetcher	Disabled/Enabled	Enabled	Enable or disable DCU streamer prefetcher, which is a L1 data cache prefetcher (MSR 1A4h [2]).
DCP IP Prefetcher	Disabled/Enabled	Enabled	Enable or disable DCU IP prefetcher, which is a L1 data cache prefetcher (MSR 1A4h [3]).
Intel Virtualization Technology	Disabled/Enabled	Enabled	When enabled, a Virtual Machine Manager (VMM) can utilize the additional hardware capabilities provided by Intel Virtualization Technology.
Stale AtoS	Disabled/Enabled/Auto	Disabled	Enable or disable stale A to S Dir optimization.
LLC dead line alloc	Disabled/Enabled/Auto	Enabled	Enable or disable to opportunistically fill dead lines in LLC.
XPT Prefetch	Disable/Enable	Enable	Enable or disable XPT Prefetch.

BIOS Advanced Menu Memory Configuration Options

The following table lists the BIOS Advanced Menu Memory Configuration options.

Setup Option	Options	Defaults	Description
Numa	Enabled/Disabled	Enabled	Enable or disable Non Uniform Memory Access (NUMA).
MMIO High Granularity Size	1G/4G/16G/64G/256G/1024G	64G	Select the allocation size used to assign memory-mapped I/O (MMIO) resources. Total MMIO space can be up to 32x granularity.

BIOS Advanced Menu CPU Power Management Configuration Options

The following table lists the BIOS Advanced Menu Power Management Configuration options.

Setup Options	Options	Defaults	Description
Power Technology	Disabled/Energy Efficient/Custom	Custom	Disable or enable the power management features.
EIST (GV3)	Enabled/Disabled	Enabled	Enable or disable Enhanced Intel SpeedStep Technology (EIST).
Turbo Mode	Enabled/Disabled	Enabled	Enabled mode is supported only if Turbo Mode is supported in the CPU. Enabled mode also requires that Enhanced Multi Threaded Thermal Monitoring (EMTTM) be enabled on the CPU.
CPU C3 report	Enabled/Disabled	Disabled	Enable or disable the CPU C3 (ACPI C3) report to the operating system.
CPU C6 report	Enabled/Disabled	Enabled	Enable or disable the CPU C6 (ACPI C3) report to the operating system.
Package C State limit	Enabled/Disabled	Enabled	Enable or disable Package C State limit.
Energy Performance	Performance Balanced Performance Balanced Energy Energy Efficiency	Balanced Performance	Select the Energy Performance mode.
Uncore Frequency Scaling	Enabled/Disabled	Disabled	Enable or disable Uncore Frequency Scaling (USF).

Setup Options	Options	Defaults	Description
CPU Power Limit	Enabled/Disabled	Disabled	Enable or disable CPU power limit.

BIOS Advanced Menu USB Ports Options

The following table lists the BIOS Advanced Menu USB Ports options.

Setup Options	Options	Defaults	Description
EHCI Hand-off	Disabled/Enabled	Disabled	Enable or disable Enhanced Host Controller Interface (EHCI) hand-off support. This is a workaround for operating systems without EHCI hand-off support. The EHCI change of ownership should be claimed by the EHCI driver.
Port 60/64 Emulation	Disabled/Enabled	Enabled	Enable or disable I/O port 60h/64h emulation support. Enable this setting for the complete USB keyboard legacy support for non-USB aware operating systems.
Rear Port	Disabled/Enabled	Enabled	Enable or disable USB Rear Port.
Internal Port #0	Disabled/Enabled	Enabled	Enable or disable USB Internal Port 0.

BIOS Advanced Menu Error Injection Settings Option

The following table describes the BIOS Advanced Menu error injection settings option.

Setup Options	Options	Defaults	Description
WHEA Error Injection Support	Disable/Enable	Disable	Enable or disable Windows Hardware Error Architecture (WHEA).

BIOS Advanced Menu Disk Freeze Lock Settings Option

The following table describes the BIOS Advanced Menu disk freeze lock settings option.

Setup Options	Options	Defaults	Description
Disk Freeze Lock	Disable/Enable	Disable	Enable or disable disk freeze lock. Enabling this setting prevents disks from being sanitized. Disk types include NVMe and M.2.

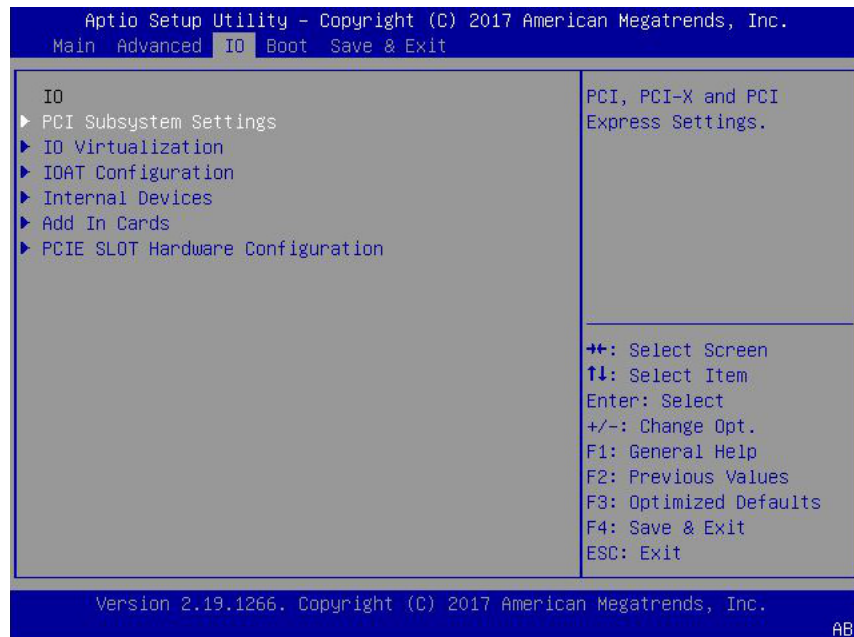
Related Information

- [“BIOS Main Menu Selections” on page 255](#)
- [“BIOS IO Menu Selections” on page 276](#)
- [“BIOS Boot Menu Selections” on page 280](#)
- [“BIOS Exit Menu Selections” on page 282](#)

BIOS IO Menu Selections

This section includes a screen of the BIOS IO Menu. The options that are available from the IO Menu are described in the table that follows.

Note - PCIe slot 1 is nonfunctional in single-processor systems.



The following tables describe the BIOS IO menu options.

- [“BIOS IO Menu PCI Subsystem Settings Options” on page 277](#)
- [“BIOS IO Menu IO Virtualization Options” on page 278](#)
- [“BIOS IO Menu IOAT Configuration Options” on page 279](#)
- [“BIOS IO Menu Internal Devices Options” on page 279](#)
- [“BIOS IO Menu Add-in Cards Options” on page 279](#)
- [“BIOS IO Menu PCIE Hardware Slot Configuration Options” on page 280](#)

BIOS IO Menu PCI Subsystem Settings Options

The following table describes the BIOS IO Menu PCI Subsystem Settings Options.

Setup Options	Options	Defaults	Description
PCI 64 Bit Resources Allocation	Disabled/Enabled	Enabled	Enable or disable 64-bit capable devices to be decoded in above 4G address space. This setting is available only if the system supports 64-bit decoding.

Setup Options	Options	Defaults	Description
Maximum Payload	Auto/128 Bytes/256 Bytes/512 Bytes/1024 Bytes/2048 Bytes/4096 Bytes	Auto	Set the Maximum Payload of the PCI Express device or allow the System BIOS to select the value.
Maximum Read Request	Auto/128 Bytes/256 Bytes/512 Bytes/1024 Bytes/2048 Bytes/4096 Bytes	Auto	Set the Maximum Read Request of the PCI Express device or allow the System BIOS to select the value.

BIOS IO Menu IO Virtualization Options

The following table describes the BIOS IO Menu IO Virtualization Options.

Setup Options	Options	Defaults	Description
VT-d	Disabled/Enabled	Enabled	Enable or disable Intel Virtualization Technology for directed I/O (VT-d) by reporting the I/O device assignment to VMM through DMA remapping reporting (DMAR) Advance Configuration Power Interface (ACPI) tables.
SR-IOV Support	Disabled/Enabled	Enabled	Enable or disable Single Root I/O Virtualization (SR-IOV) to configure devices into multiple virtual devices that can be used on virtual OS installations. If supported by the hardware and set to enabled, all devices within the system that are SR-IOV capable are configured to support SR-IOV and I/O resources are allocated to the device as normal. If set to disabled, I/O resources are not allocated to the device.
ARI	Disabled/Enabled	Enabled	If Alternate Routing ID (ARI) is supported by the hardware and set to enabled, devices are permitted to locate virtual functions (VFs) in function numbers 8 to 255 of the captured bus number, instead of normal function numbers 0 to 7.

BIOS IO Menu IOAT Configuration Options

The following table describes the BIOS IO Menu IOAT Configuration Options.

Setup Options	Options	Defaults	Description
Intel IOAT	Disabled/Enabled	Enabled	Enable or disable Intel I/O Acceleration Technology (I/OAT) devices.
DCA Support	Disabled/Enabled	Enabled	Enable or disable direct cache access (DCA) support.

BIOS IO Menu Internal Devices Options

The following table describes the BIOS IO Internal Devices Options.

Setup Options	Options	Defaults	Description
NET0			Displays and provides options to change the internal device settings.
PCI-E UEFI Driver Enable	Disabled/Enabled	Enabled	Enable or disable PCI-E UEFI Driver. If set to enabled, UEFI Driver for the card executes as normal. If set to disabled, UEFI Driver for the card is not copied into memory and the execution of the UEFI Driver is inhibited.
NET1 and NET2			See NET0 description.

BIOS IO Menu Add-in Cards Options

The following table describes the BIOS IO Menu Add-in Cards Options.

Setup Options	Options	Defaults	Description
Slot 1 Note - PCIe slot 1 is nonfunctional in single-processor systems.			Displays and provides options to change the settings of the devices in PCIe slots.
IO Enable	Disabled/Enabled	Enabled	Disable or enable IO

Setup Options	Options	Defaults	Description
PCI-E UEFI Driver Enable	Disabled/Enabled	Enabled	Enable or disable PCI-E UEFI Driver. If set to enabled, UEFI Driver for the card executes as normal. If set to disabled, UEFI Driver for the card is not copied into memory and the execution of the UEFI Driver is inhibited.
Slot 2, Slot 3, and Slot 4			See Slot 1 description.

BIOS IO Menu PCIE Hardware Slot Configuration Options

The following table describes the BIOS IO Menu hardware slot configuration options.

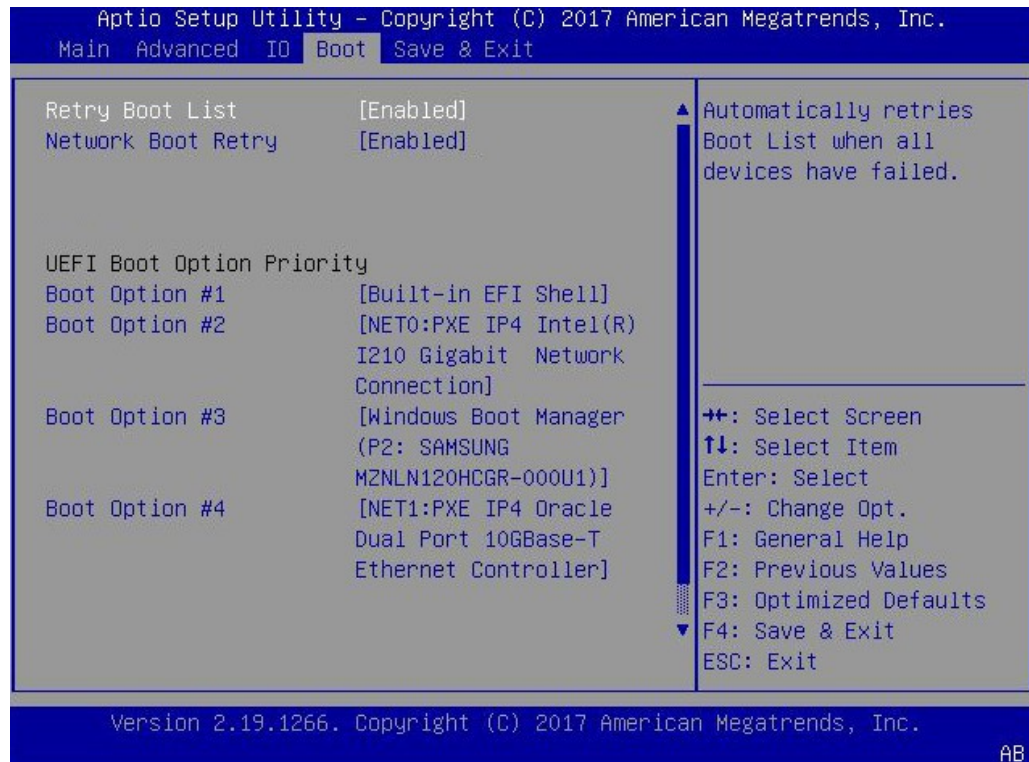
Setup Options	Options	Defaults	Description
Slot 1 Hardware Configuration			Displays and provides options to configure hot-plug functionality or FM10K bifurcation for the PCIe HBA slot.
PCIe Slot Hardware Configuration	HotPlug Disabled/ FM_10_8x8_Bifurcation	HotPlug Disabled	Disable hot-plug or FM10K bifurcation.
Slot 2, Slot 3, and Slot 4			See Slot 1 description.

Related Information

- [“BIOS Main Menu Selections” on page 255](#)
- [“BIOS Advanced Menu Selections” on page 260](#)
- [“BIOS Boot Menu Selections” on page 280](#)
- [“BIOS Exit Menu Selections” on page 282](#)

BIOS Boot Menu Selections

This section includes a screen of the BIOS Boot Menu. The options that are available from the Boot Menu are described in the table that follows.



Setup Options	Options	Defaults	Description
Retry Boot List	Disabled/Enabled	Enabled	Disable or enable automatic retries of the Boot List when all devices fail.
Network Boot Retry	Disabled/Enabled/Boot List	Enabled	If enabled, BIOS automatically retries the PXE list present in the system when all PXE attempts have failed. If set to disabled, the system halts and displays the error message "Network Boot Failed" when all PXE boots fail. If set to Boot List, fail over to the main Boot Options Priority list.
UEFI Boot Option Priority			Displays and sets the system boot order.

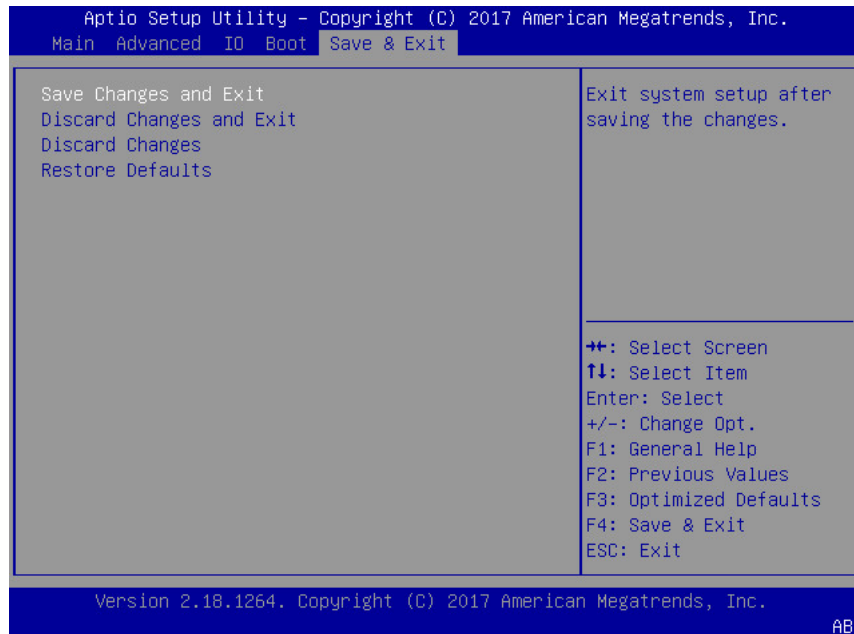
Related Information

- [“BIOS Main Menu Selections” on page 255](#)
- [“BIOS Advanced Menu Selections” on page 260](#)

- “BIOS IO Menu Selections” on page 276
- “BIOS Exit Menu Selections” on page 282

BIOS Exit Menu Selections

This section includes a screen of the BIOS Exit Menu. The options that are available from the Exit Menu are described in the table that follows.



Setup Options	Description
Save Changes and Exit	Save changes and exit the BIOS Setup Utility.
Discard Changes and Exit	Exit the BIOS Setup Utility without saving changes.
Discard Changes	Discard any changes made to the setup options.
Restore Defaults	Restore and load the optimal default values for all of the setup options.

Related Information

- [“BIOS Main Menu Selections” on page 255](#)
- [“BIOS Advanced Menu Selections” on page 260](#)
- [“BIOS IO Menu Selections” on page 276](#)
- [“BIOS Boot Menu Selections” on page 280](#)

Monitoring Components and Identifying SNMP Messages

This section includes information about monitoring components and identifying SNMP messages for the Oracle Server X7-2.

- “Monitoring Component Health and Faults Using Oracle ILOM” on page 285
- “Monitoring System Components” on page 286
- “Identifying SNMP Trap Messages” on page 297

Related Information

- Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at: <https://www.oracle.com/goto/ilom/docs>

Monitoring Component Health and Faults Using Oracle ILOM

The Oracle ILOM 5.0 interfaces provide easy-to-view information about the health status of system components. From the Oracle ILOM web interface or in the Oracle ILOM command-line interface (CLI), you can collect system-specific information about the server, determine the health state of discrete components, and view any open problems on the server. Oracle ILOM automatically detects system hardware faults and environmental conditions on the server. If a problem occurs on the server, Oracle ILOM will automatically do the following:

- Illuminate the Fault-Service Required LED status indicator on the server front and back panels. See “Troubleshooting Using the Server Front and Back Panel Status Indicators” on page 28 and “Monitoring System Components” on page 286.
- Identify the faulted component in the Open Problems table. Open problems detected on a host server or system chassis are viewable from either the Open Problems web page or the /System/Open_problems CLI target. Refer to View Open Problems Detected on a

Managed Device in the *Oracle ILOM User's Guide for System Monitoring and Diagnostics* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

- Record system information about the faulted component or condition in the Oracle ILOM event log. Refer to Managing ILOM Log Entries in the *Oracle ILOM User's Guide for System Monitoring and Diagnostics* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

For further information about administering open problems that are detected and reported by Oracle ILOM, refer to “Administering Open Problems” in the *Oracle ILOM Administrator's Guide for Configuration and Maintenance* in the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

Monitoring System Components

The tables in this section identify the system components and describe the naming conventions applied to the components of Oracle Server X7-2.

Each section corresponds to an IPMI entity ID and lists sensors, indicators, and field-replaceable units (FRUs) related to that entity. The tables contain the following fields:

- **Component Name** – Shows the user-visible component name used in management interfaces to refer to a specific sensor, indicator, or FRU. The IPMI name is a shortened form of the component name, and is indicated by the **boldface** portion of the component name.
- **IPMI Type** – Indicates the type of sensor, indicator, or FRU represented.
- **Description** – Describes the particular component name reference.
- **Values** – Defines the states of the sensor, indicator, or FRU entity, and any specific units or values that are expected, if applicable.

Note - Some component names are hidden in the Oracle ILOM user interfaces. Further, as of Oracle ILOM 3.2, the Oracle ILOM 3.0 legacy targets /SYS and /STORAGE have been replaced by /System. Even though these legacy targets might be hidden, you can still use them to issue commands. For information on legacy targets, see the ILOM 3.2 Documentation Library at <https://www.oracle.com/goto/ilom/docs>.

This section includes information for the following server components:

- “System Chassis Components” on page 287
- “Cooling Unit Components” on page 289

- [“Disk Backplane Components” on page 290](#)
- [“Memory Device Components” on page 291](#)
- [“Power Unit Components” on page 291](#)
- [“Processor Components” on page 293](#)
- [“System Motherboard Components” on page 293](#)
- [“System Firmware Components” on page 295](#)
- [“Hard Disk Drive Components” on page 295](#)

System Chassis Components

The following table lists the system chassis components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS	FRU	Product information only	
/SYS/UUID	FRU	Unique system ID	Derived from host MAC address. Used for PXE boot and licensing.
/SYS/ACPI	State sensor	Advanced Configuration and Power Interface	<i>(hidden)</i> 01h-ACPI_ON_WORKING 20h-ACPI_SOFT_OFF
/SYS/VPS	Threshold sensor	Virtual power sensor	Watts
/SYS/VPS_CPUS	Threshold sensor	Virtual power sensor (CPUs)	Watts
/SYS/VPS_MEMORY	Threshold sensor	Virtual power sensor (Memory)	Watts
/SYS/VPS_FANS	Threshold sensor	Virtual power sensor (Fans)	Watts
/SYS/T_AMB	Threshold sensor	Ambient temperature on system motherboard	Degrees Celsius
/SYS/TEMP_FAULT	Indicator	Temperature Fault LED	Color: Amber Location: Front panel Off: Normal On: Chassis overtemp fault
/SYS/OK	Indicator	System OK LED	Color: Green Location: Front and back panels

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
			Off: Power is off. Standby blink: Standby power is on; Oracle ILOM SP is running. Slow blink: Startup sequence initiated on host. On: Host is booting OS or running the OS.
/SYS/SERVICE	Indicator	Fault-Service Required LED	Color: Amber Location: Front and back panels Off: Normal On: Server requires service.
/SYS/LOCATE	Indicator	Locate Button/LED	Color: White Location: Front and back panels Off: Normal Fast blink: Locate function is activated; self-extinguishes after 30 minutes.
/SYS/PS_FAULT	Indicator	Rear Power Supply Fault LED	Color: Amber Location: Front panel Off: Normal On: General power supply fault
/SYS/FAN_FAULT	Indicator	Top Fan Fault LED	Color: Amber Location: Front panel Off: Normal On: General fan fault
/SYS/DO_NOT_SERVICE	Indicator	Do Not Service LED	Color: White Location: Front panel Off: Normal On: Do not service

Related Information

- [“Cooling Unit Components” on page 289](#)
- [“Disk Backplane Components” on page 290](#)

- [“Memory Device Components” on page 291](#)
- [“Power Unit Components” on page 291](#)
- [“Processor Components” on page 293](#)
- [“System Motherboard Components” on page 293](#)
- [“System Firmware Components” on page 295](#)
- [“Hard Disk Drive Components” on page 295](#)

Cooling Unit Components

The system has four 40-mm fan modules with two fans in each module. The following table lists the system cooling unit components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/FM[0-3]	FRU	Fan module FRU	
/SYS/MB/FM[0-3]/F[0-x]	FRU	Individual fan	
/SYS/MB/FM[0-3]/PRSNT	Discrete sensor	Fan module is present.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/FM[0-3]/F[0-x]/TACH	Threshold sensor	Fan module fan speed	RPM
/SYS/MB/FM[0-3]/SERVICE	Indicator	Fan Fault-Service Required LED	Color: Amber Location: Motherboard Off: Normal On: Fan module was diagnosed as faulty.

Related Information

- [“System Chassis Components” on page 287](#)
- [“Disk Backplane Components” on page 290](#)
- [“Memory Device Components” on page 291](#)
- [“Power Unit Components” on page 291](#)
- [“Processor Components” on page 293](#)
- [“System Motherboard Components” on page 293](#)
- [“System Firmware Components” on page 295](#)
- [“Hard Disk Drive Components” on page 295](#)

Disk Backplane Components

The following table lists the disk backplane (DBP) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/DBP	FRU	Disk backplane FRU	
/SYS/DBP/PRSNT	Discrete sensor	Disk backplane presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]	Pseudo	Hard disk drives (HDD)	
/SYS/DBP/HDD[0-x]/PRSNT	Discrete sensor	Hard disk drive presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]/STATE	State sensor	Hard disk drive state	01h-FAULT_STATUS 02h-IDENTITY 04h-INSTALLED 20h-SLOT_POWER_OFF
/SYS/DBP/HDD[0-x]/SERVICE	Indicator	Fault-Service Required LED	Color: Amber Location: HDD Off: Normal On: HDD was diagnosed as failed
/SYS/DBP/HDD[0-x]/OK2RM	Indicator	Hard disk drive OK to remove	Color: Blue Location: HDD Off: Normal On: HDD is OK to remove
/SYS/DBP/HDD[0-x]/NVME	FRU	NVMe drive FRU	
/SYS/DBP/HDD[0-x]/NVME/PRSNT	Discrete sensor	NVMe device presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT

Related Information

- [“System Chassis Components” on page 287](#)
- [“Cooling Unit Components” on page 289](#)
- [“Memory Device Components” on page 291](#)
- [“Power Unit Components” on page 291](#)

- [“Processor Components” on page 293](#)
- [“System Motherboard Components” on page 293](#)
- [“System Firmware Components” on page 295](#)
- [“Hard Disk Drive Components” on page 295](#)

Memory Device Components

The following table lists the memory device components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/P[0-x]/D[0-11]	FRU	Host CPU DIMM FRU	
/SYS/MB/P[0-x]/D[0-11]/PRSNT	Discrete sensor	Host CPU DIMM is present.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/P[0-x]/D[0-11]/SERVICE	Indicator	Host CPU DIMM Fault-Service Required LED	Color: Amber Location: Motherboard Off: Normal On: DIMM was diagnosed as faulty.

Related Information

- [“System Chassis Components” on page 287](#)
- [“Cooling Unit Components” on page 289](#)
- [“Disk Backplane Components” on page 290](#)
- [“Power Unit Components” on page 291](#)
- [“Processor Components” on page 293](#)
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Power Unit Components

The following table lists the power unit components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/PS[0-1]	FRU	Power supply FRU	
/SYS/PS[0-1]/PRSNT	Discrete sensor	Power supply is present.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/PS[0-1]/STATE	Discrete sensor	Multistate, power supply sensor type, per IPMI	Presence detected Failure detected Predictive failure Power supply input lost Power supply input lost or out-of-range Power supply input out-of-range Configuration error
/SYS/PS[0-1]/P_IN	Power sensor	Input power draw	Watts
/SYS/PS[0-1]/P_OUT	Power sensor	Output power	Watts
/SYS/PS[0-1]/V_IN	Voltage sensor	Input voltage	Volts
/SYS/PS[0-1]/V_12V	Voltage sensor	12V output voltage	Volts
/SYS/PS[0-1]/V_12V_STBY	Voltage sensor	12V standby output voltage	Volts
/SYS/PS[0-1]/T_IN	Temperature sensor	PSU input temperature	Degrees Celsius
/SYS/PS[0-1]/T_OUT	Temperature sensor	PSU output temperature	Degrees Celsius

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Processor Components

The following table lists the processor (CPU) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/P[0-x]	FRU	Host CPU FRU	
/SYS/MB/P[0-x]/PRSNT	Discrete sensor	Host CPU is present.	01h-ENTITY_PRESENT 02h-ENTITY_ABSENT
/SYS/MB/P[0-x]/SERVICE	Indicator	Host CPU Fault-Service Required LED	Color: Amber Location: Motherboard Off: Normal On: Processor was diagnosed as faulty.

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System Motherboard Components

The following table lists the system motherboard components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB	FRU	General host system motherboard FRU	

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/CPLD	FRU	Motherboard CPLD/FPGA firmware version	
/SYS/MB/NET[0-x]	FRU	Host Ethernet FRU	
/SYS/MB/RISER[1-x]/PCIE[1-x]	FRU	PCIe slot	
/SYS/MB/RISER[1-x]/PCIE[1-x]/PRSNT	Discrete sensor	PCIe slot is occupied.	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/T_OUT_SLOT[1-3]	Threshold sensor	Cooling zone chassis exhaust temperature, located behind the specified PCIe slots <ul style="list-style-type: none"> ■ Slot 1 – PCIe slot 1 ■ Slot 2 – PCIe slot 2 ■ Slot 3 – PCIe slot 3 	Degrees Celsius
/SYS/MB/T_IN_SLOT[1-3]	Threshold sensor	Cooling zone chassis inlet temperature, located in front of the specified PCIe slots <ul style="list-style-type: none"> ■ Slot 1 – PCIe slot 1 ■ Slot 2 – PCIe slot 2 ■ Slot 3 – PCIe slot 3 	Degrees Celsius
/SYS/SP	FRU	Service processor FRU	
/SYS/SP/OK	Indicator	SP OK LED	Color: Green Location: Front panel On: SP is operating. Off: SP requires service.
/SYS/SP/NET[0-1]	FRU	SP Ethernet FRU	
/SYS/MB/RISER3	FRU	M.2 SSD riser	
/SYS/MB/RISER3/PRSNT	Discrete sensor	M.2 riser presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/RISER3/SSD[0-1]	FRU	Internal M.2 SSD drives	
/SYS/MB/RISER3/SSD[0-1]/PRSNT	Discrete sensor	M.2 SSD drive presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/MB/RISER3/SSD[0-1]/STATE	State sensor	M.2 SSD drive state sensor	04h-INSTALLED 20h-SLOT_POWER_OFF

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System Firmware Components

The following table lists the system firmware components.

Component Name (Oracle ILOM CLI Target)	IPMI Type	Description
/SYS/MB/BIOS	FRU	BIOS FRU
/SYS/MB/CPLD	FRU	Motherboard CPLD/FPGA firmware

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Hard Disk Drive Components

The following table lists the hard disk drive (HDD) components.

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/DBP/HDD[0-x]	FRU	Hard disk drive FRU	From host

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/DBP/HDD[0-x]/PRSNT	Discrete sensor	Hard disk drive presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]/STATE	Discrete sensor	Writable multistate, slot/connector sensor type, per IPMI	01h-FAULT_STATUS 02h-IDENTITY 04h-INSTALLED 20h-SLOT_POWER_OFF
/SYS/DBP/HDD[0-x]/SERVICE	Indicator	Hard disk drive Fault-Service Required LED	Color: Amber Location: HDD Off: Normal On: Hard disk drive was diagnosed as faulty.
/SYS/DBP/HDD[0-x]/OK2RM	Indicator	Hard disk drive OK to Remove LED	Color: Blue Location: HDD Off: Normal On: Drive is ready to remove.
/SYS/DBP/HDD[0-x]/NVME	FRU	NVMe drive FRU	
/SYS/DBP/HDD[0-x]/NVME/PRSNT	Discrete sensor	NVMe device presence	01h-ENTITY_ABSENT 02h-ENTITY_PRESENT

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Identifying SNMP Trap Messages

It is possible to configure Oracle ILOM to generate Simple Network Management Protocol (SNMP) traps when hardware problems occur. For information about how to configure SNMP alert rule destinations to start receiving these traps, refer to the Oracle Integrated Lights Out Manager (ILOM) 5.0 Documentation Library at:

<https://www.oracle.com/goto/ilom/docs>

The tables in these sections list the set of SNMP traps that are generated from Oracle ILOM.

- “Environmental Events” on page 297
- “Hard Disk Drive Events” on page 299
- “Power Events” on page 299
- “Fan Events” on page 304
- “Memory Events” on page 305
- “Entity Presence Events” on page 306

Environmental Events

The following table lists environmental events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapTempFatalThresholdExceeded	/SYS/PS[0-1]/T_OUT
Oracle ILOM Event Message: Lower fatal threshold exceeded	/SYS/PS[0-1]/T_IN
Severity and Description: Critical; A temperature sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting.	/SYS/MB/T_IN_SLOT[1-3] /SYS/MB/T_OUT_SLOT[1-3]
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapTempFatalThresholdDeasserted	/SYS/PS[0-1]/T_OUT
Oracle ILOM Event Message: Lower fatal threshold no longer exceeded	/SYS/PS[0-1]/T_IN
Severity and Description: Informational; A temperature sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting.	/SYS/MB/T_IN_SLOT[1-3] /SYS/MB/T_OUT_SLOT[1-3]
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	

Messages and Descriptions	Component Name
<p>SNMP Trap: sunHwTrapTempCritThresholdExceeded</p> <p>Oracle ILOM Event Message: Upper critical threshold exceeded</p> <p>Severity and Description: Critical; A temperature sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	<p>/SYS/PS[0-1]/T_OUT</p> <p>/SYS/PS[0-1]/T_IN</p> <p>/SYS/MB/T_IN_SLOT[1-3]</p> <p>/SYS/MB/T_OUT_SLOT[1-3]</p>
<p>SNMP Trap: sunHwTrapTempCritThresholdDeasserted</p> <p>Oracle ILOM Event Message: Upper critical threshold no longer exceeded</p> <p>Severity and Description: Informational; A temperature sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	<p>/SYS/PS[0-1]/T_OUT</p> <p>/SYS/PS[0-1]/T_IN</p> <p>/SYS/MB/T_IN_SLOT[1-3]</p> <p>/SYS/MB/T_OUT_SLOT[1-3]</p>
<p>SNMP Trap: sunHwTrapTempFatalThresholdExceeded</p> <p>Oracle ILOM Event Message: Lower fatal threshold exceeded</p> <p>Severity and Description: Critical; A temperature sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	<p>/SYS/T_AMB</p>
<p>SNMP Trap: sunHwTrapTempFatalThresholdDeasserted</p> <p>Oracle ILOM Event Message: Lower fatal threshold no longer exceeded</p> <p>Severity and Description: Informational; A temperature sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	<p>/SYS/T_AMB</p>

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Hard Disk Drive Events

The following table lists hard disk drive events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapSlotOrConnectorError Oracle ILOM Event Message: Assert Severity and Description: Major; A sensor associated with a slot or connector has detected an error.	/SYS/DBP/HDD[0-x]/STATE
SNMP Trap: sunHwTrapSlotOrConnectorOk Oracle ILOM Event Message: Deassert Severity and Description: Informational; A sensor associated with a slot or connector has returned to its normal state.	/SYS/DBP/HDD[0-x]/STATE

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Power Events

The following table lists power events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapPowerSupplyError Oracle ILOM Event Message: PS_PRESENCE ASSERT Severity and Description: Major; A power supply sensor has detected an error.	/SYS/PS[0-1]/STATE
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE

Power Events

Messages and Descriptions	Component Name
Oracle ILOM Event Message: PS_PRESENCE DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_FAILURE ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_FAILURE DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_PREDICTIVE_FAILURE ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_PREDICTIVE_FAILURE DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_LOST ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_LOST DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_ERROR ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_ERROR DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_RANGE_ERROR ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_INPUT_RANGE_ERROR DEASSERT	

Messages and Descriptions	Component Name
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyError	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_CONFIG_ERROR ASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapPowerSupplyOk	/SYS/PS[0-1]/STATE
Oracle ILOM Event Message: PS_CONFIG_ERROR DEASSERT	
Severity and Description: Major; A power supply sensor has detected an error.	
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded	/SYS/VPS
Oracle ILOM Event Message: Upper noncritical threshold exceeded	
Severity and Description: Minor; A sensor has reported that its value has gone above an upper non critical threshold setting or below a lower non critical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorThresholdOk	/SYS/VPS
Oracle ILOM Event Message: Upper noncritical threshold no longer exceeded	
Severity and Description: Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded	/SYS/VPS_FANS
Oracle ILOM Event Message: Upper noncritical threshold exceeded	/SYS/PS[0-1]/P_IN
Severity and Description: Minor; A sensor has reported that its value has gone above an upper noncritical threshold setting or below a lower noncritical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	/SYS/PS[0-1]/P_OUT
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorThresholdOk	/SYS/VPS_FANS
Oracle ILOM Event Message: Upper noncritical threshold no longer exceeded	/SYS/PS[0-1]/P_IN
Severity and Description: Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	/SYS/PS[0-1]/P_OUT
SNMP Trap: sunHwTrapSensorFatalThresholdExceeded	/SYS/PS[0-1]/P_IN
Oracle ILOM Event Message: Lower fatal threshold exceeded	/SYS/PS[0-1]/P_OUT
Severity and Description: Critical; A power supply sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting.	

Power Events

Messages and Descriptions	Component Name
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorFatalThresholdDeasserted	/SYS/PS[0-1]/P_IN
Oracle ILOM Event Message: Lower fatal threshold no longer exceeded	/SYS/PS[0-1]/P_OUT
Severity and Description: Informational; A power supply sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting.	
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorCritThresholdExceeded	/SYS/PS[0-1]/P_IN
Oracle ILOM Event Message: Lower critical threshold exceeded	/SYS/PS[0-1]/P_OUT
Severity and Description: Major; A power supply sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting.	
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorCritThresholdDeasserted	/SYS/PS[0-1]/P_IN
Oracle ILOM Event Message: Lower critical threshold no longer exceeded	/SYS/PS[0-1]/P_OUT
Severity and Description: Informational; A power supply sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting.	
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageFatalThresholdExceeded	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Lower fatal threshold exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Critical; A voltage sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting.	/SYS/PS[0-1]/V_IN
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageFatalThresholdDeasserted	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Lower fatal threshold no longer exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Informational; A voltage sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting.	/SYS/PS[0-1]/V_IN
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageCritThresholdExceeded	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Upper critical threshold exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Critical; A voltage sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting.	/SYS/PS[0-1]/V_IN

Messages and Descriptions	Component Name
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageCritThresholdDeasserted	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Upper critical threshold no longer exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Informational; A voltage sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting.	/SYS/PS[0-1]/V_IN
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageNonCritThresholdExceeded	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Upper noncritical threshold exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Minor; A voltage sensor has reported that its value has gone above an upper noncritical threshold setting or below a lower noncritical threshold setting.	/SYS/PS[0-1]/V_IN
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapVoltageOk	/SYS/PS[0-1]/V_12V
Oracle ILOM Event Message: Upper noncritical threshold no longer exceeded	/SYS/PS[0-1]/V_12V_STBY
Severity and Description: Informational; A voltage sensor has reported that its value is in the normal operating range.	/SYS/PS[0-1]/V_IN
SNMP Trap: sunHwTrapSensorNonCritThresholdExceeded	/SYS/VPS_CPUS
Oracle ILOM Event Message: Upper noncritical threshold exceeded	/SYS/VPS_MEMORY
Severity and Description: Minor; A sensor has reported that its value has gone above an upper noncritical threshold setting or below a lower noncritical threshold setting. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	
The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.	
SNMP Trap: sunHwTrapSensorThresholdOk	/SYS/VPS_CPUS
Oracle ILOM Event Message: Upper noncritical threshold no longer exceeded	/SYS/VPS_MEMORY
Severity and Description: Informational; A sensor has reported that its value is in the normal operating range. This generic 'sensor' trap is generated when the SNMP agent does not recognize the component type.	

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Fan Events

The following table lists fan events.

Messages and Descriptions	Component Name
<p>SNMP Trap: sunHwTrapFanSpeedCritThresholdExceeded</p> <p>Oracle ILOM Event Message: Lower critical threshold exceeded</p> <p>Severity and Description: Major; A fan speed sensor has reported that its value has gone above an upper critical threshold setting or below a lower critical threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	/SYS/MB/FM[0-3]/F[0-x]/TACH
<p>SNMP Trap: sunHwTrapFanSpeedCritThresholdDeasserted</p> <p>Oracle ILOM Event Message: Lower critical threshold no longer exceeded</p> <p>Severity and Description: Informational; A fan speed sensor has reported that its value has gone below an upper critical threshold setting or above a lower critical threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	/SYS/MB/FM[0-3]/F[0-x]/TACH
<p>SNMP Trap: sunHwTrapFanSpeedFatalThresholdExceeded</p> <p>Oracle ILOM Event Message: Lower fatal threshold exceeded</p> <p>Severity and Description: Critical; A fan speed sensor has reported that its value has gone above an upper fatal threshold setting or below a lower fatal threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	/SYS/MB/FM[0-3]/F[0-x]/TACH
<p>SNMP Trap: sunHwTrapFanSpeedFatalThresholdDeasserted</p> <p>Oracle ILOM Event Message: Lower fatal threshold no longer exceeded</p> <p>Severity and Description: Informational; A fan speed sensor has reported that its value has gone below an upper fatal threshold setting or above a lower fatal threshold setting.</p> <p>The sunHwTrapThresholdType object indicates whether the threshold was an upper or lower threshold.</p>	/SYS/MB/FM[0-3]/F[0-x]/TACH

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Memory Events

The following table lists memory events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapMemoryFault Oracle ILOM Event Message: event fault.cpu.intel.quickpath.link_slow "The Quickpath Interconnect (QPI) link is operating below normal speed." Severity and Description: Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared Oracle ILOM Event Message: event fault.cpu.intel.quickpath.link_slow "The Quickpath Interconnect (QPI) link is operating below normal speed." Severity and Description: Informational; A memory component fault has been cleared.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFault Oracle ILOM Event Message: event fault.cpu.intel.quickpath.unknown-errcode "An unknown error code from the Quickpath Interconnect (QPI) reference code has been detected." Severity and Description: Major; A memory component is suspected of causing a fault.	/SYS/MB
SNMP Trap: sunHwTrapMemoryFaultCleared Oracle ILOM Event Message: event fault.cpu.intel.quickpath.unknown-errcode "An unknown error code from the Quickpath Interconnect (QPI) reference code has been detected." Severity and Description: Informational; A memory component fault has been cleared.	/SYS/MB

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Entity Presence Events

The following table lists entity presence events.

Messages and Descriptions	Component Name
SNMP Trap: sunHwTrapProcessorError	/SYS/MB/P[0-x]/PRSNT
Oracle ILOM Event Message: ENTITY_PRESENT ASSERT	
Severity and Description: Major; A processor sensor has detected an error. Device absent.	
SNMP Trap: sunHwTrapProcessorOk	/SYS/MB/P[0-x]/PRSNT
Oracle ILOM Event Message: ENTITY_PRESENT DEASSERT	
Severity and Description: Major; A processor sensor has returned to its normal state. Device present.	
SNMP Trap: sunHwTrapProcessorError	/SYS/MB/P[0-x]/PRSNT
Oracle ILOM Event Message: ENTITY_DISABLED ASSERT	
Severity and Description: Major; A processor sensor has detected an error. Device disabled.	
SNMP Trap: sunHwTrapProcessorOk	/SYS/MB/P[0-x]/PRSNT
Oracle ILOM Event Message: ENTITY_DISABLED DEASSERT	
Severity and Description: Major; A processor sensor has returned to its normal state. Device enabled.	

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- [“System Chassis Components” on page 287](#)

- [“Cooling Unit Components” on page 289](#)
- [“Disk Backplane Components” on page 290](#)
- [“Memory Device Components” on page 291](#)
- [“Power Unit Components” on page 291](#)
- [“Processor Components” on page 293](#)
- [“System Motherboard Components” on page 293](#)
- [“Hard Disk Drive Components” on page 295](#)

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