

# Oracle Communications Server E6-2L

## Service Manual



Release 1.0  
G55399-02  
April 2026



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# Contents

- 1 [About Oracle Communications Server E6-2L](#)
- 2 [Troubleshoot and Diagnose Issues](#)
- 3 [Prepare to Service](#)
- 4 [Replace Storage Drives](#)
- 5 [Replace Power Supplies](#)
- 6 [Replace Fan Modules](#)
- 7 [Replace Internal M.2 Flash SSDs](#)
- 8 [Replace the Air Baffle](#)
- 9 [Replace DIMMs](#)
- 10 [Replace the Battery](#)
- 11 [Replace PCIe Cards](#)

12 Replace the Motherboard Assembly

13 Replace Processors

14 Replace the Disk Backplane

15 Replace the Front LED Indicator Module

16 Replace SAS Cables

17 Return the Server to Operation

18 Set Up BIOS Configuration Parameters

19 Known Issues

Part I Appendix

# 1

## About Oracle Communications Server E6-2L

### Product Description

The system supports these components and configurations.

Oracle Communications Server E6-2L is an enterprise-class, two rack unit (2U) server that supports multiple configurations. Each configuration uses the same server but is provisioned differently. Some supported features are specific to individual configurations, while other features are common across configurations. Front and back panel configurations can include Oracle Communications Server E6-2L provisioned with:

- NVMe storage drives: 4-Drive bay front panel, either 9-slot PCIe card back panel or Full Height PCIe card capable back panel
- SAS storage drives: 12-Drive bay front panel, 9-slot PCIe card back panel

Oracle Communications Server E6-2L supports the following components:

**Table 1-1 System Components**

Feature	System Components
System chassis	2U chassis
Processor	One or two processors with twelve memory channels per processor, 12 DIMMs per processor. Up to two AMD Turin SP5 Classic processors (P0 and P1) with the following capabilities are supported (factory installed): <ul style="list-style-type: none"><li>• AMD Turin, 96-core, 2.8GHz, 400W processors, 384 MB L3 cache</li><li>• AMD Turin, 32-core, 3.4GHz, 210W processors, 128 MB L3 cache</li></ul>
Memory	Server memory configurations can include the following: Dual-processor systems support up to twenty-four DDR5 128-GB, 96-GB, 64-GB, and 32-GB RDIMMs, for a maximum of twelve per processor, with speeds up to 6400MT/sec. Total supported memory is up to 3 TB. <ul style="list-style-type: none"><li>• 24 DDR5 128-GB RDIMMs 6400 MT/sec 3.0 TB</li><li>• 24 DDR5 96-GB RDIMMs 6400 MT/sec 2.3 TB</li><li>• 24 DDR5 64-GB RDIMMs 6400 MT/sec 1.5 TB</li><li>• 24 DDR5 32-GB RDIMMs 6400 MT/sec 512 G</li></ul> Single-processor systems support up to twelve DDR5 128-GB, 96-GB, 64-GB, and 32-GB RDIMMs with speeds up to 6400 MT/sec. Total supported memory is up to 1.5 TB. <ul style="list-style-type: none"><li>• 12 DDR5 128-GB RDIMMs 6400 MT/sec 1.5 TB</li><li>• 12 DDR5 96-GB RDIMMs 6400 MT/sec 1.15 TB</li><li>• 12 DDR5 64-GB RDIMMs 6400 MT/sec 768 G</li><li>• 12 DDR5 32-GB RDIMMs 6400 MT/sec 384 G</li></ul>
Storage Drives	Storage drive configuration can comprise either solid state drives (SSDs) or hard disk drives (HDDs). Oracle Communications Server E6-2L front panel storage drive bays can be provisioned with: <ul style="list-style-type: none"><li>• Up to four 2.5-inch hot-pluggable PCIe Gen5 NVMe SSDs:<ul style="list-style-type: none"><li>– Oracle 6.8 TB (7.68 TB Max) 2.5-inch NVMe PCIe 5.0 SSD</li><li>– Oracle 3.84TB 2.5-inch NVMe PCIe 5.0 SSD</li></ul></li><li>• SAS storage drives:<ul style="list-style-type: none"><li>– Up to twelve 3.5-inch hot-pluggable SAS-3 hard disk drives (HDDs)</li></ul></li><li>• Two hot-pluggable internal M.2 Gen3 480 GB or 960 GB NVMe SSDs</li></ul>

**Table 1-1 (Cont.) System Components**

Feature	System Components
PCI Express (PCIe) slots	<p>Oracle Communications Server E6-2L 4-Drive backplane configuration:</p> <ul style="list-style-type: none"> <li>9-slot PCIe card back panel configurations support up to nine half height PCIe cards</li> <li>Full-height PCIe card capable back panel configurations support half height PCIe cards or full-height PCIe cards.</li> </ul> <p>Oracle Communications Server E6-2L 12-Drive backplane configuration: 9-slot PCIe card back panel configurations support up to nine half height PCIe cards.</p>
9-slot PCIe Configuration	<p>9-slot PCIe Configuration</p> <p>9-slot PCIe card back panel: Oracle Communications Server E6-2L supports up to nine half-height PCIe cards. Up to nine PCIe Gen5 vertical card slots are supported when the low profile Add In Card (AIC) chassis is utilized.</p> <p>Up to nine PCIe card Gen5 slots are supported in dual-processor systems.</p> <ol style="list-style-type: none"> <li>Slot 1 - PCIe5 x16 electrical interface</li> <li>Slot 2 - PCIe5 x16 electrical interface</li> <li>Slot 3 - PCIe5 x8 electrical interface</li> <li>Slot 4 - PCIe5 x8 electrical interface</li> <li>Slot 5 - PCIe5 x16 electrical interface</li> <li>Slot 6 - PCIe5 x8 electrical interface, x16 electrical interface with motherboard PCIe Flyover cable attached</li> <li>Slot 7 - PCIe5 x8 electrical interface with motherboard PCIe cable attached (Note: If slot 6 is PCIe5 x16 electrical interface, slot 7 is not functional.)</li> <li>Slot 8 - PCIe5 x8 electrical interface</li> <li>Slot 9 - PCIe5 x8 electrical interface, x16 connector</li> </ol>
Full Height PCIe Configuration	<p>Full Height PCIe Configuration</p> <p>Two Riser back panel: Up to two vertical PCIe Gen5 slots and up to four horizontal PCIe Gen 3 and PCIe Gen 4 cards are supported.</p> <ol style="list-style-type: none"> <li>Slot 1 - PCIe5 x16 electrical interface</li> <li>Slot 2 - PCIe4 x16 electrical interface full-height PCIe card</li> <li>Slot 3 - PCIe4 not used</li> <li>Slot 4 - PCIe3 x1 electrical interface, full-height PCIe card</li> <li>Slot 5 - PCIe5 x16 electrical interface</li> <li>Slot 6 - PCIe4 x8 electrical interface, x16 electrical interface with motherboard PCIe Flyover cable installed, full-height PCIe card</li> <li>Slot 7 - PCIe4 not used</li> <li>Slot 8 - PCIe3 x1 electrical interface, full-height PCIe card</li> </ol>
PCIe Riser	Two CEM Risers: Supports a single-wide PCIe CEM compliant PCIe card.

**Table 1-1 (Cont.) System Components**

Feature	System Components
PCIe cards	<ul style="list-style-type: none"> <li>• Up to eight Oracle Flash Accelerator F680 PCIe Cards: 6.8 TB, NVMe PCIe 5.0</li> <li>• Up to three Oracle Dual Port CX6-LX 2x25Gb NICs (LP ADAPTER, DUAL SFP28 25GBE,CX6 LX,PCIE4 0x8) <ul style="list-style-type: none"> <li>– Up to six Oracle Dual Port CX6-LX 2x25Gb NICs are supported in the ZS11-2 configuration</li> </ul> </li> <li>• Up to three Oracle Dual Port CX6-DX 2x100Gb NICs (LP ADAPTER, DUAL QSFP56 200GBE,CX-6 DX,PCIE4.0x16)</li> <li>• Up to three Oracle Dual Port CX7 2x200Gb NICs (Connect X-7 2x200Gbit/Sec PAM4 PCIe Gen5 X16, Ethernet NIC) <ul style="list-style-type: none"> <li>– Up to four Oracle Dual Port CX7 2x200Gb NICs with PCIe slot 9 populated in the ZS11-2 configuration</li> </ul> </li> <li>• Up to seven Oracle Quad Port 4x10Gb NICs</li> <li>• Up to two HBAs, BROADCOM 9500-8e, 12GB SAS PCIe, 8 PORT, EXTERNAL</li> <li>• Up to two HBAs, BROADCOM 9500-16i, 12GB SAS PCIe, 16 PORT, INTERNAL</li> <li>• Up to four HBAs, BROADCOM 9500-16e,12GB SAS PCIe, 16-PORT, EXTERNAL</li> <li>• Up to six HBAs, DUAL PORT 32GB FC LP PCIe (Narvi-Q)</li> <li>• One Oracle Dual Port 100 Gb RoCE Adapter</li> <li>• Up to four GPUs, Nvidia L4</li> </ul>
Root-of-Trust card	One Root-of-Trust (RoT) card back panel slot
Power supplies	Two hot-swappable and highly-redundant 1400W power supplies (PS0 and PS1)
Cooling fans	Six hot-swappable fan modules (FM0-5), each containing a 60mm x 56mm counter-rotating dual motor fan for chassis cooling.
I/O ports	<p>NET 0: One 1GbE 100/1000BASE-T RJ-45 Gigabit Ethernet (GbE) port, labeled NET 0</p> <p>NET MGT: One 1GbE 100/1000BASE-T RJ-45 Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management Ethernet port</p> <p>SER MGT: One RJ-45 serial management Ethernet port</p>
USB port	One USB 3.1 port
Service processor (SP)	One server integrated service processor (SP) provides local or remote management capabilities with Oracle Integrated Lights Out Manager (ILOM), primarily for fan control and thermal monitoring. The service processor (SP) is based on the ASPEED AST2600 chip.
Management software	<p>Oracle Integrated Lights Out Manager (ILOM) on the service processor (SP). Refer to <a href="#">Oracle ILOM Documentation</a>.</p> <p>Oracle Hardware Management Pack available as a standalone product for supported operating systems. Refer to Oracle Hardware Management Pack documentation at <a href="#">Servers Documentation - Systems Management</a>.</p> <p>BIOS Setup Utility Menu Options The server supports the Unified Extensible Firmware Interface (UEFI). UEFI provides an interface between system firmware and all supported operating systems. With UEFI BIOS Setup Utility, you can configure platform-specific information, and some of the run-time and boot-time characteristics of your system using a simple graphical interface.</p> <p>If you are managing multiple servers, you can use Oracle Enterprise Manager Ops Center. For information about Ops Center, refer to <a href="#">Oracle Enterprise Manager Ops Center 12c Release 3</a>.</p>

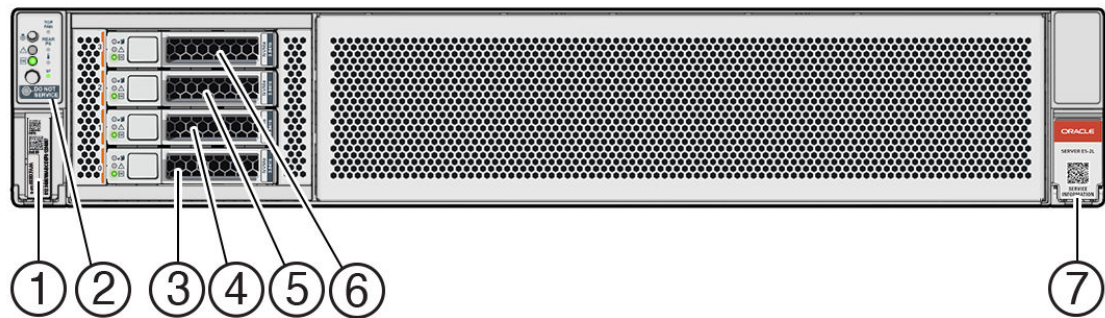
See System Specifications

## Front Panel Components

The NVMe Storage Drive Configuration supports up to four NVMe storage drives. The SAS Storage Drive Configuration supports up to twelve SAS storage drives.

### NVMe Storage Drive Configuration

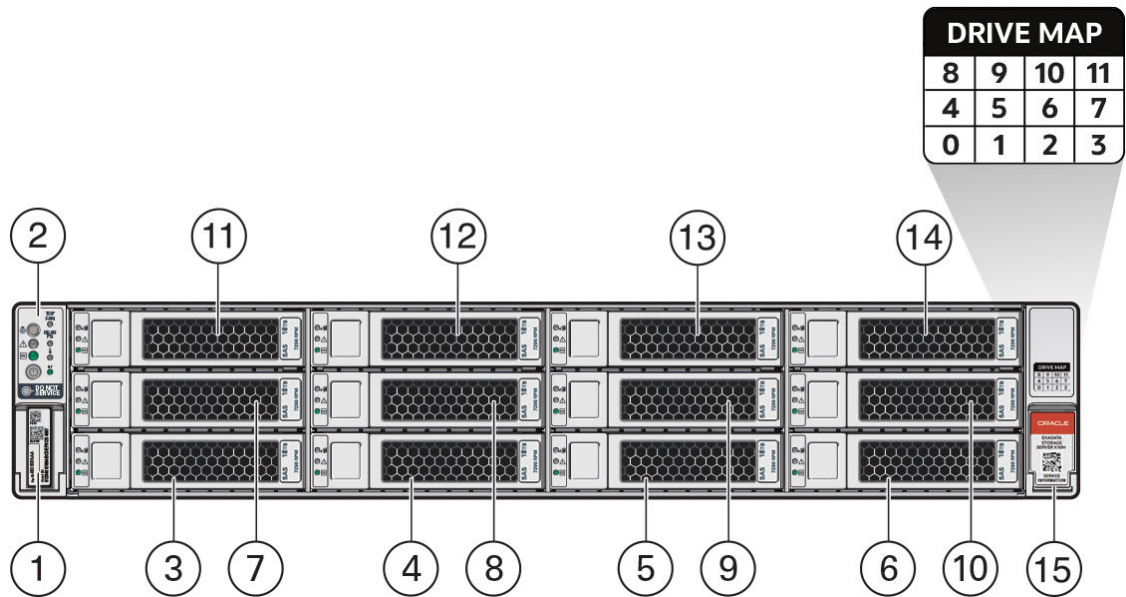
Oracle Communications Server E6-2L supports up to four 2.5-inch hot-pluggable PCIe Gen5 NVM-Express (NVMe) solid-state drives (SSDs) on the front panel.



Callout	Description
1	Product Serial Number (PSN) label and Radio Frequency Identification (RFID) tag
2	Front LED Indicator Module (FIM)
3	Storage drive 0 NVMe
4	Storage drive 1 NVMe
5	Storage drive 2 NVMe
6	Storage drive 3 NVMe
7	Service Information QR Code

### SAS Storage Drive Configuration

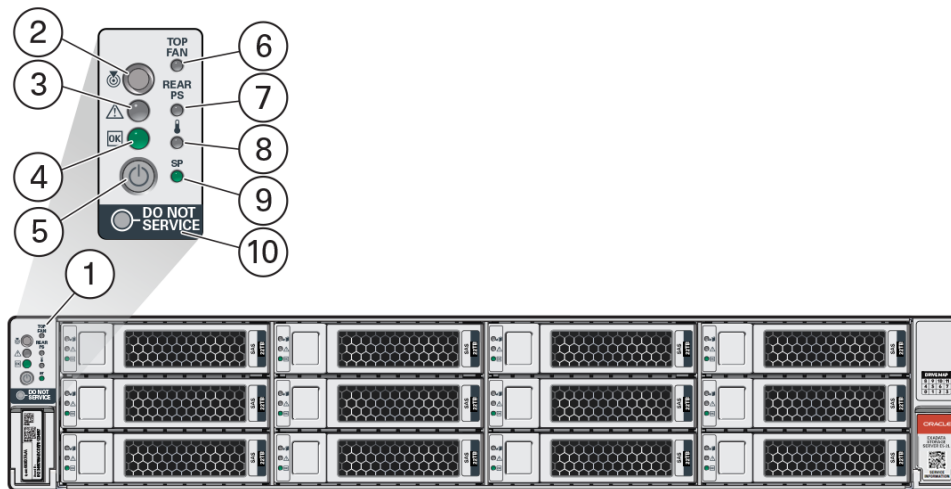
Oracle Communications Server E6-2L supports up to twelve 3.5-inch hot-pluggable SAS-3 hard disk drives (HDDs) on the front panel.



Callout	Description
1	Product Serial Number (PSN) label and Radio Frequency Identification (RFID) tag
2	Front LED Indicator Module (FIM)
3	Storage drive 0 SAS HDD
4	Storage drive 1 SAS HDD
5	Storage drive 2 SAS HDD
6	Storage drive 3 SAS HDD
7	Storage drive 4 SAS HDD
8	Storage drive 5 SAS HDD
9	Storage drive 6 SAS HDD
10	Storage drive 7 SAS HDD
11	Storage drive 8 SAS HDD
12	Storage drive 9 SAS HDD
13	Storage drive 10 SAS HDD
14	Storage drive 11 SAS HDD
15	Service Information QR Code

### Front LED Indicator Module

Oracle Communications Server E6-2L NVMe Storage Drive and SAS Storage Drive configurations support a Front LED status indicator module (FIM) on the front panel.



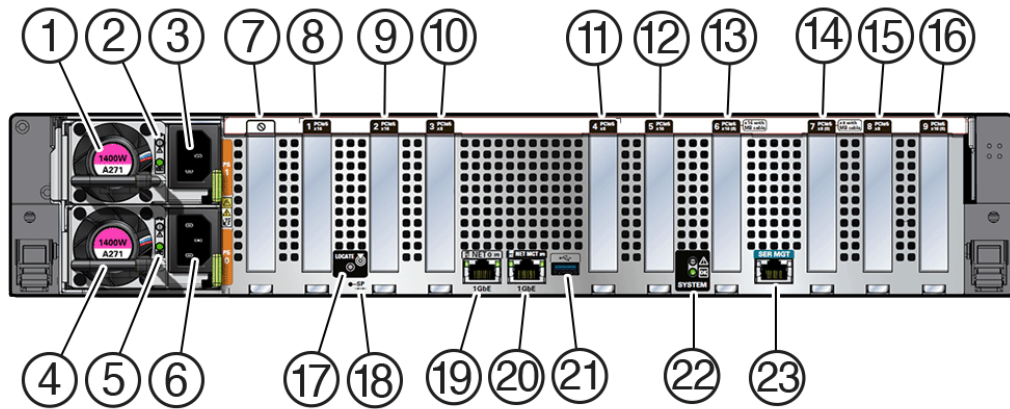
Callout	Description
1	Front LED Indicator Module (FIM)
2	Locate Button/LED: white
3	Fault-Service Action Required LED: amber
4	System OK LED: green
5	On/Standby button
6	TOP FAN Fault-Service Required LED for internal access Fan Modules: amber
7	REAR PS Fault-Service Required LED for back panel Power Supplies: amber
8	Overtemp Fault-Service Required LED: System Over Temperature Warning: amber
9	SP Service Processor OK LED: green
10	DO NOT SERVICE LED: white

## Back Panel Components

The 9-slot PCIe half height card configuration supports up to nine half height PCIe cards. Using PCIe risers, the full height PCIe configuration supports up to four full height and two half height PCIe cards.

## Nine-slot PCIe Card Configuration

Oracle Communications Server E6-2L, in 9-slot PCIe card back panel half height PCIe configuration, supports up to nine vertically mounted half height PCIe cards.



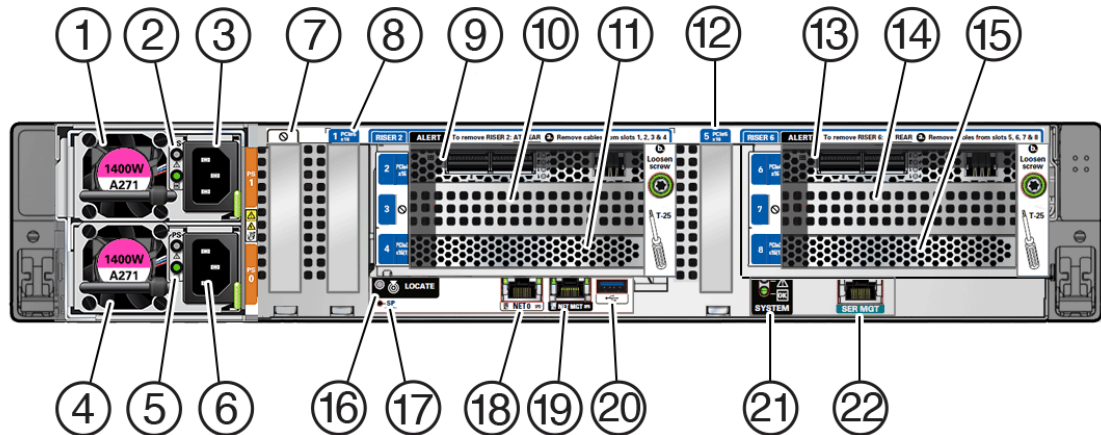
Callout	Description
1	Power supply (PS1)
2	Power Supply 1 (PS1) status indicators: Fault-Service Required LED: amber; AC OK LED: green
3	Power Supply 1 (PS1) AC Power Inlet (AC1)
4	Power supply (PS0)
5	Power Supply (PS0) status indicators: Fault-Service Required LED: amber; AC OK LED: green
6	Power Supply (PS0) AC Power Inlet (AC0)
7	(Oracle internal use only) Dedicated Root-of-Trust (RoT) card slot
8	PCIe slot 1 (PCIe5, x16 electrical interface)
9	PCIe slot 2 (PCIe5, x16 electrical interface)
10	PCIe slot 3 (PCIe5, x8 electrical interface)
11	PCIe slot 4 (PCIe5, x8 electrical interface)
12	PCIe slot 5 (x16 electrical interface)
13	PCIe slot 6 (PCIe5, x8 electrical interface, x16 electrical interface with MB PCIe Flyover cable)
14	PCIe slot 7 (PCIe5, x8 electrical interface with PCIe Flyover cable)
15	PCIe slot 8 (PCIe5, x8 electrical interface)
16	PCIe slot 9 (PCIe5, x8 electrical interface, x16 electrical connector)
17	LOCATE: Server Locate Button/LED
18	SP: Reset service processor (SP)
19	NET 0: Network (NET) 1GbE 100/1000BASE-T RJ-45 Gigabit Ethernet (GbE) port
20	NET MGT: Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management (NET MGT) 1GbE RJ-45 100/1000BASE-T port
21	USB 3.1 connector
22	SYSTEM: Fault-Service Required: amber; System OK: green.
23	SER MGT: Serial management (SER MGT) RJ-45 serial port

### Note

Single-processor systems: PCIe slots 1-4 are nonfunctional in single-processor systems.

## Full Height PCIe Configuration

Oracle Communications Server E6-2L, in full-height PCIe card capable back panel configuration, supports four full-height, full-width PCIe cards horizontally mounted in two PCIe risers, and two half-height, half-width PCIe cards vertically mounted in slots 1 and 5.



Callout	Description
1	Power Supply (PS1)
2	Power Supply 1 (PS1) status indicators: Fault-Service Required LED: amber; AC OK LED: green
3	Power Supply 1 (PS1) AC Power Inlet (AC1)
4	Power Supply (PS0)
5	Power Supply 0 (PS0) status indicators: Fault-Service Required LED: amber; AC OK LED: green
6	Power Supply 0 (PS0) AC Power Inlet (AC0)
7	(Oracle internal use only) Dedicated Root-of-Trust (RoT) card slot
8	PCIe slot 1 (PCIe 5, x16 electrical interface)
9	PCIe slot 2 (PCIe 4, x16 electrical interface) Riser 2
10	PCIe slot 3 (Blank), Riser 2
11	PCIe slot 4 (PCIe 3, x16 electrical interface(1)) Riser 2 x16 connector, x1 Electrical Gen3, Riser 2
12	PCIe slot 5 (PCIe 5, x16 electrical interface)
13	PCIe slot 6 (PCIe 4, x16 electrical interface) Riser 6 x16 connector, x1 Electrical Gen3, Riser 6
14	PCIe slot 7 (Blank), Riser 6
15	PCIe slot 8 (PCIe 3, x16 electrical interface (1)) Riser 6
16	LOCATE: Server Locate Button/LED
17	SP: Reset service processor (SP)
18	NET 0: Network (NET) 1GbE 100/1000BASE-T RJ-45 Gigabit Ethernet (GbE) port
19	NET MGT: Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management (NET MGT) 1GbE RJ-45 100/1000BASE-T port
20	USB 3.1 connector
21	SYSTEM: Fault-Service Required: amber; System OK: green
22	SER MGT: Serial management (SER MGT) RJ-45 serial port

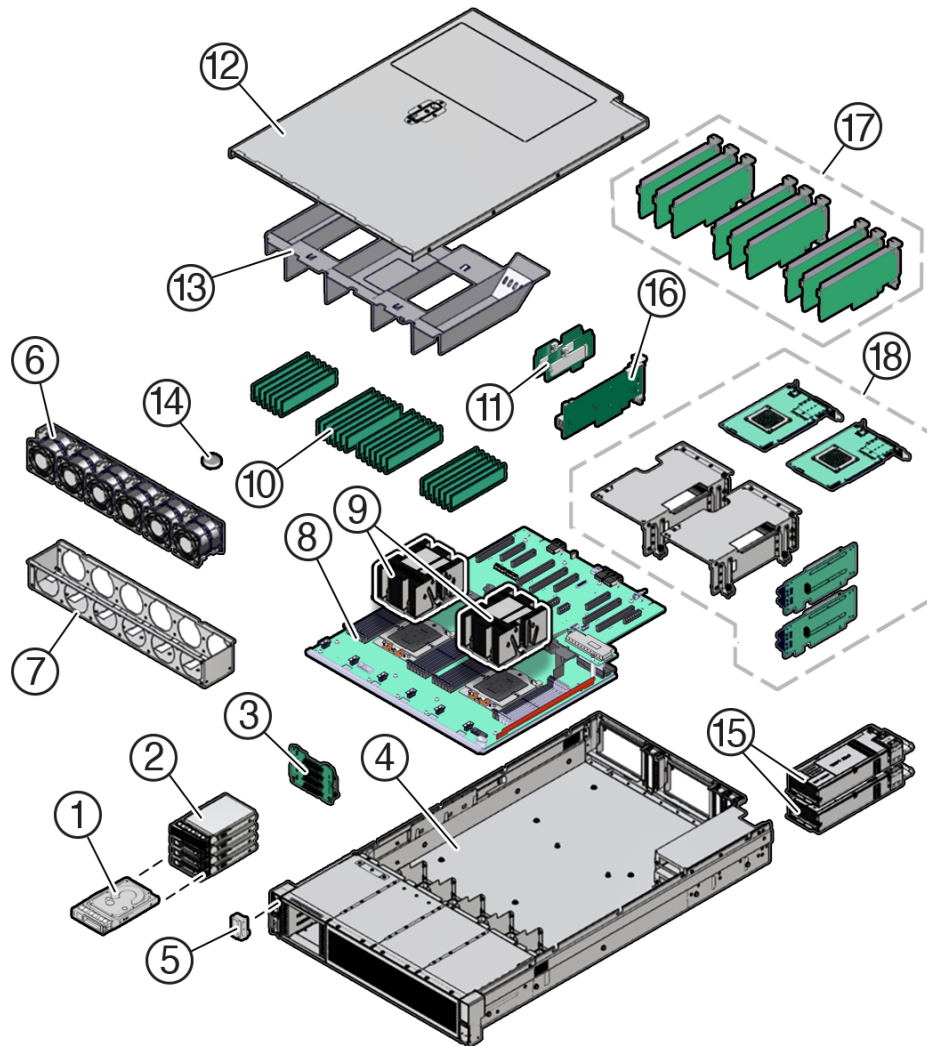
See Server Status Indicator LEDs. Single-processor systems: PCIe slots 1-4 are nonfunctional in single-processor systems.

### Illustrated Parts Breakdown

Identify major components of Oracle Communications Server E6-2L with 4-Drive Backplane and Oracle Communications Server E6-2L with 12-Drive Backplane.

#### Oracle Communications Server E6-2L with 4-Drive Backplane

The following figure identifies Oracle Communications Server E6-2L major components with 4-Drive backplane.

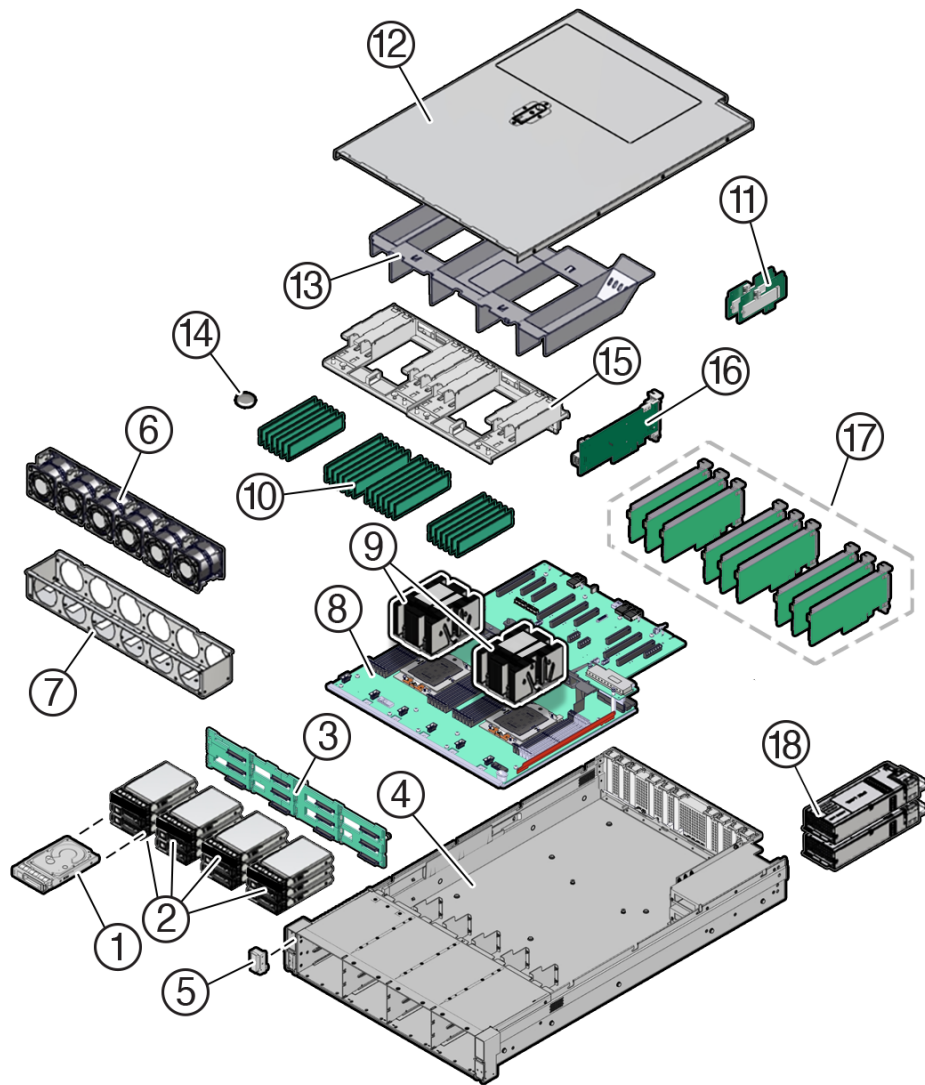


Callout	Description
1	Storage drives, up to four 2.5-inch hot-pluggable PCIe-based NVMe SFF SSDs in 4-Drive backplane
2	Storage drive bay cage
3	4-Drive backplane (DBP)
4	System chassis

Callout	Description
5	Front LED indicator module (FIM)
6	Six fan modules (FM0-5)
7	Fan tray
8	Motherboard assembly (MB)
9	Processors (P0, P1) and heatsinks (Single-processor systems contain only a single processor in socket P0; socket P1 contains a cap to protect processor socket pins.)
10	24 DIMMs (Twelve DIMMs are supported in single-processor systems and the DIMMs must be installed in P0 DIMM sockets.)
11	Internal M.2 SSD memory with two internal M.2 Risers
12	Top cover
13	Air baffle
14	System RTC battery
15	Two power supplies (PS0, PS1)
16	(Optional) Oracle RoT card
17	(Optional) Nine HHHL PCIe cards PCIe slots 1 through 4 are nonfunctional in single-processor systems.
18	(Optional) Two PCIe Risers (2 and 6) for FHFL PCIe cards CEM compliant riser configurations

### Oracle Communications Server E6-2L with 12-Drive Backplane

The following figure identifies Oracle Communications Server E6-2L major components with 12-Drive backplane.



Callout	Description
1	Storage drives, up to twelve 3.5-inch hot-pluggable SAS-3 LFF HDDs in 12-Drive backplane
2	Four storage drive bay cages
3	12-Drive backplane (DBP)
4	System chassis
5	Front LED indicator module and temperature sensor (FIM)
6	Six fan modules (FM0-5)
7	Fan tray
8	Motherboard assembly (MB)
9	Processors (P0, P1) and heatsinks (Single-processor systems contain only a single processor in socket P0; socket P1 contains a cover to protect processor socket pins.)
10	24 DIMMs (Twelve DIMMs are supported in single-processor systems and the DIMMs must be installed in P0 DIMM sockets.)
11	Internal M.2 SSD memory with two internal M.2 Risers
12	Top cover
13	Air baffle

Callout	Description
14	System RTC battery
15	PCIe card shroud (9-slot PCIe card back panel)
16	(Optional) Oracle RoT card
17	Nine HHHL PCIe cards PCIe slots 1 through 4 are nonfunctional in single-processor systems.
18	Two power supplies (PS0, PS1)

## Replaceable Components

This table lists server replaceable components and provides associated links to service replacement instructions.

**Table 1-2 Components**

Component	Service Instructions	Description	Service Level
Storage drives		Storage drive configurations can be comprised of NVMe solid state drives (SSDs) or SAS-3 hard disk drives (HDDs). Configurations may include up to four 2.5-inch hot-pluggable PCIe-based NVMe SSDs or up to twelve 3.5-inch hot-pluggable SAS-3 HDDs.	Hot service
Power supplies		Two fully redundant AC-powered power supplies. PS0, PS1	Hot service
Fan modules		Six fan modules FM0-5 cool server components.	Hot service
Fan Tray		One Fan Tray. See Fan modules	Cold service
M.2 flash SSDs		Up to two hot-pluggable internal M.2 NVMe SSDs in up to two SSD Risers.	Hot service
DIMMs		Add or replace memory modules in the system.	Cold service
Battery		Lithium coin-cell battery that powers CMOS BIOS and RTC real-time clock.	Cold service
PCIe cards		Optional PCIe Add-in cards (AIC) that can expand server functionality. (Note: Oracle Flash Accelerator F680 PCIe Card: 6.8 TB, NVMe PCIe 5.0 in Exadata Database Server X11M, Exadata Storage Server X11M, and Exadata Control Plane Server X11M)	Cold service Hot service
PCIe risers		Two optional PCIe Risers to accommodate Full Height PCIe Cards labeled Riser 2 and Riser 6.	Cold service
Air baffle		Directs cool air towards the system components.	Cold service
Motherboard assembly		Motherboard (MB) Provides connectors for the DIMMs, processors, PCIe risers, and other components.	Cold service
Processor		Processor with heatsink that carries out the instructions of the system.	Cold service
Disk backplane		4 or 12 disk backplane (DBP) provides power and communications connectors for 4 NVMe SFF or 12 SAS-3 LFF storage drives.	Cold service
Front LED indicator module		FIM contains the push-button circuitry and LEDs that are displayed on the front panel.	Cold service
SAS cables		Provides SAS-3 signals between card located in PCIe slots and the disk backplane.	Cold service

# 2

## Troubleshoot and Diagnose Issues

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

This section includes information about diagnosing and troubleshooting hardware component faults for Oracle Communications Server E6-2L. For more information about server diagnostics and troubleshooting, refer to [Oracle x86 Servers Diagnostics and Troubleshooting Guide](#) at [Oracle x86 Servers Administration, Diagnostics, and Applications Documentation](#).

### Diagnose Server Component Hardware Faults

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

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 choose. When you become aware of a hardware fault, address it immediately. For details, refer to [Oracle ILOM Documentation](#).

Use the following process to address a hardware fault.

1. Identify the server subsystem containing the fault. See Server Status Indicator LEDs. You can use Oracle ILOM to identify a failed component. See Access Oracle ILOM.
  - To collect system-level information or to verify the system health status from the CLI, type `show /System`. To access subsystem and component health details from the CLI, type `show /System/subsystem-name`.
    - PROCESSORS
    - MEMORY
    - POWER
    - COOLING
    - STORAGE
    - NETWORKING
    - PCI\_DEVICES
    - FIRMWARE
  - See Monitor Component Health and Faults Using Oracle ILOM to identify a failed component.
  - For a step-by-step diagnostic procedure, see Troubleshoot Hardware Faults Using Oracle ILOM Web Interface.
  - 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 [Oracle x86 Servers Diagnostics and Troubleshooting Guide](#) at [Oracle ILOM Documentation](#).
1. Review Oracle Communications Server E6-2L Product Information and Known Issues for any late-breaking information about the server. Refer to Oracle AMD-Based Cloud Servers

Product Notes. Review up-to-date information about the server, including hardware-related known issues.

2. 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. See Access Oracle ILOM. See Prepare to Service.
3. Prepare the service workspace. Before servicing the server, prepare the workspace, ensuring Electrostatic Discharge Safety (ESD) protection for the server and components. See Prepare to Service.
4. Service the components. To service Replaceable Components, see the removal, installation, and replacement procedures in this document.
5. Server components 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. For details, refer to Oracle Integrated Lights Out Manager (ILOM) documentation at [Oracle ILOM Documentation](#).

### Troubleshoot Hardware Faults Using Oracle ILOM CLI

This procedure uses the basic troubleshooting steps described in Diagnose Server Component Hardware Faults.

Use this procedure to troubleshoot hardware faults using the Oracle ILOM command-line interface (CLI) and, if necessary, prepare the server for service.

1. Open a terminal and using a secure method, such as a secure shell, log into the SP using the user name (with administrator privileges) and SP IP address or hostname. For example: `ssh username@hostname`
2. When prompted, enter the password.
3. At the Oracle ILOM prompt (`->`), enter the command to show any faults. For example: `-> show faulty Target | Property | Value -----+-----`  
`+----- /SP/faultmgmt/0 | fru | /SYS/MB/P0 /SP/faultmgmt/0/faults/0 | class |`  
`fault.cpu.cache.uncorrectable.error` In the above example, the displayed fault shows that Processor 0 encountered an uncorrectable cache error.
4. To get more information, enter the command to view Open Problems: `-> show System/ Open_Problems`  
Open Problems (1) Date/Time Subsystems Component

Wed May 16 18:00:39 2023 Processor, Last Level Cache, P0(CPU 0) A non-recoverable cache failure was detected by the device while performing a command. (Probability:100, UUID:f9c9d6d6-5c42-6f7d-c2c0-857962de2ce5, Resource:/SYS/MB/P0, Part Number:N/A, Serial Number:N/A, Reference Document:http://support.oracle.com/msg/ISTOR-1234-5H) The Open Problems listing 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 KnowledgeBase article that includes possible problem resolution steps. 5. Before accessing the physical server, review Known Issues for information related to the issue or the component. The Oracle AMD-Based Cloud Server Product Notes contain up-to-date information about the server, including hardware-related issues. In addition to checking the product notes, the customer should follow the link to the Oracle KnowledgeBase article. 6. To prepare the server for service, see Preparing for Service. 7. Service the component. After servicing the component, you might need to clear the fault in Oracle ILOM. For more information, refer the service procedures for the component. See Monitor Component Health and Faults Using Oracle ILOM and [Oracle ILOM Documentation](#).

## Troubleshoot Hardware Faults Using Oracle ILOM Web Interface

Use this procedure to troubleshoot hardware faults using the Oracle ILOM web interface and, if necessary, prepare the server for service. This procedure uses the basic troubleshooting steps described in Diagnose Server Component Hardware Faults.

This procedure provides one basic approach to troubleshooting hardware faults. It uses the Oracle ILOM web interface. However, you can perform the procedure using the Oracle ILOM command-line interface (CLI). For more information about the Oracle ILOM web interface and CLI, refer to [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. On the Login screen, enter a user name (with administrator privileges) and password. 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
  - PCI\_Devices
  - Firmware
2. In the Status section of the Oracle ILOM Summary Information page, identify the server subsystem that requires service.

The screenshot shows the Oracle ILOM web interface. The top navigation bar includes 'ORACLE Integrated Lights Out Manager v5.1.0.0', 'About', 'Refresh', and 'Logout'. The user is logged in as 'root' with the role 'auro'. The main content area is titled 'Summary Information' and contains a 'General Information' table, an 'Actions' panel, and a 'Status' section.

General Information	
System Type	Rack Mount
Model	ORACLE SERVER E5-2i
QPart ID	Q14536
Part Number	E52L999
Serial Number	2210CK001L
RFID Serial Number	341A583DE58000000004
System Identifier	-
System Firmware Version	5.1.0.0
Primary Operating System	Not Available
Host Primary MAC Address	
ILOM Address	
ILOM MAC Address	

**Actions**

Power State:  OFF

Locator Indicator:  OFF

System Firmware Update:

Remote Console:

**Status**

Overall Status: Service Required Total Problem Count: 2

Subsystem	Status	Details	Inventory
Processors	OK	Processor Architecture: x86 64-bit Processor Summary: Two AMD EPYC 9004 Series	Processors: 2 / 2 (installed / Maximum)

For example, if a hardware component in the subsystem is in a fault state, the Status column notes the status as Service Required.

3. To identify the faulty component, click the component in the Status section. The Oracle ILOM page showing the faulty component appears.
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.

5. Before going to the server, review Product Information and Known Issues for any late-breaking information about the server and for information related to the issue or the component. Review up-to-date information about server hardware-related known issues. Refer to Oracle AMD-Based Cloud Servers Product Notes.
6. Prepare the server for service. 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. For details, refer to Oracle Integrated Lights Out Manager (ILOM) documentation at [Oracle ILOM Documentation](#).
7. Service the component. To service Replaceable Components, see the removal, installation, and replacement procedures in this document.
8. Return the server to operation. See Monitor Component Health and Faults Using Oracle ILOM.

### Troubleshoot Power Issues

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

#### Server Power Issues

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 operate at a particular voltage and within an acceptable range of voltage fluctuations. Refer to Electrical Requirements.	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. 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 indicate 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 Issue	Description	Action	Prevention
Power Supplies (PS)	<p>The server power supplies (PS0, PS1) 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.</p> <p><b>Note:</b> 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 minimize the risk of accidental disconnection.</p>	<p>Verify that the AC cables are connected to both power supplies. Verify that the power supplies are operational (the PS 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 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.</p>	<p>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. Redundancy allows the server to continue to operate if one of the power supplies fails. However, when a server is being powered by a single power supply, the redundancy no longer exists, and the risk for downtime or an unexpected shutdown increases.</p>
Top Cover	<p>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.</p>	<p>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 60 seconds. See <a href="#">Replace Fan Modules and Install the Server Top Cover</a>.</p>	<p>Be careful to avoid bending or otherwise warping the top cover.</p>

## Troubleshoot 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, you need to address overtemperature 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.

### Server Cooling Issues

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. 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. 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.	Inspect the server interior to ensure that the air baffle is properly installed. Ensure that all external-facing 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.	When servicing the server, ensure that the air baffle is installed correctly and that the server has no unoccupied external-facing slots. Never operate the server without the top cover installed.

Cooling Issue	Description	Action	Prevention
Hardware Component Failure	Components, such as power supplies and fan modules, are an integral part of the server cooling system. When one of these components fails, the server internal temperature can rise. This rise in temperature can cause other components to enter into an over-temperature state. 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.	Investigate the cause of the overtemperature event, and replace failed components immediately . See Diagnose Server Component Hardware Faults.	Component redundancy is provided to allow for component failure in critical subsystems, such as the cooling subsystem. However, once a component in a redundant system fails, the redundancy no longer exists, and the risk for server shutdown and component failures increases. Therefore, it is important to maintain redundant systems and replace failed components immediately .

### Troubleshoot 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. 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 Selection

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
Oracle ILOM Oracle Documentation	SP firmware Integrated Lights Out Manager (ILOM) management software	Oracle ILOM event Log. Monitors environmental condition and component functionality sensors, generates alerts, performs fault isolation, and provides remote access.	Can function in either Standby power mode or Main power mode and is not OS dependent. Local Oracle ILOM command-line access using a serial connection Support for Ethernet access to the SP through a dedicated management port (NET MGT) and optionally through the host NET0 Ethernet port (sideband management)	Remote and local access. IPMI 2.0-compliant remote management capabilities Support for remote KVMS (keyboard, video, mouse, and storage) over IP
Hardware-based LED indicator Server Status Indicator LEDs	System indicators and sensors 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) Oracle x86 Servers Administration, Diagnostics, and Applications Documentation	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 Oracle x86 Servers Diagnostics and Troubleshooting Guide	SP firmware	Tests and detects problems on all processors, memory, disk drives, and network ports.	Use either the Oracle ILOM web interface or the command-line interface (CLI) to run UEFI diagnostics.	Remote access through Oracle ILOM Remote System Console Plus.

Diagnostic Tool	Type	What It Does	Accessibility	Remote Capability
Oracle ILOM SP/Diag shell Oracle x86 Servers Diagnostics and Troubleshooting Guide	SP firmware	Allows you to run HWdiag commands to check the status of a system and its components, and access HWdiag logs.	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 Linux commands	Operating system software	Displays system information.	Requires operating system.	Local, and over network.

### Attach Devices to the Server

Attach devices to the server so you can access diagnostic tools when troubleshooting and servicing the server.

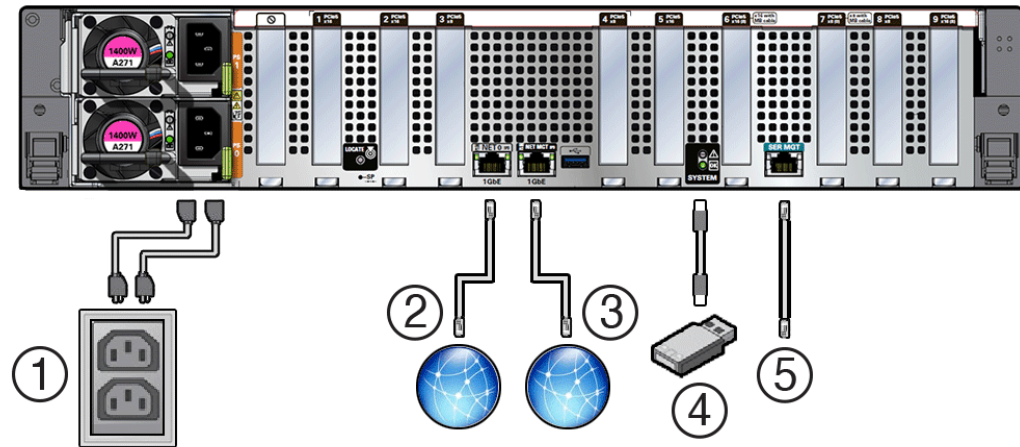
#### Attach Devices

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

1. Attach local Oracle ILOM command-line access using a serial connection. To access the Oracle ILOM service processor 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. Note: The serial management port does not support network connections.
2. Attach Ethernet access to the SP through a dedicated management port (NET MGT). To connect to the Oracle ILOM service processor over the network remotely, connect an Ethernet cable to the Ethernet port labeled NET MGT.
3. Attach Ethernet access optionally through the host NET0 Ethernet port (sideband management). Connect an Ethernet cable to the 1GbE Gigabit Ethernet port connector labeled NET 0 as needed for remote OS support. Refer to [Oracle ILOM Documentation](#).

#### 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.



Callout	Cable Port	Description
1	Power supply 0 Power supply 1 input power	The server has two power supply connectors AC0 and AC1, one for each power supply. 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. Note: Oracle ILOM signals a fault on any installed power supply that is not connected to an AC power source, as it might indicate a loss of redundancy.
2	Ethernet port (NET 0)	The Ethernet port enables you to connect the system to the network. The Gigabit Ethernet port uses an RJ-45 cable for a 1GbE 100/1000BASE-T connection.
3	Network management port (NET MGT)	The service processor NET MGT port is the optional connection to the Oracle ILOM service processor. The service processor NET MGT port uses an RJ-45 cable for a 1GbE 100/1000BASE-T connection.
4	USB port	One USB 3.1 port on Oracle Communications Server E6-2L back panel. 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)	Local Oracle ILOM command-line access using a serial connection: 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. Refer to Oracle ILOM Documentation. Note: The serial management port does not support network connections.

### Configure 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.

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:

Oracle ILOM CLI interface

1. Open an SSH session, and at the command line, log in to the SP Oracle ILOM CLI. Log in as a user with root or administrator privileges. For example: `ssh root@ ipaddress` Where `ipaddress` is the IP address of the server SP. The Oracle ILOM CLI prompt (`->`) appears.
2. To set the serial port owner, type: `-> set /SP/serial/portsharing owner=host` Note: The serial port sharing value, by default, is `owner=SP`.
3. Connect a serial host to the server.

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.
2. On the Summary Information page, select `ILOM Administration` → `Connectivity` from the navigation menu on the left side of the screen.
3. Select the Serial Port tab. Note: The serial port sharing setting, by default, is `Service Processor`.
4. On 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.

For details, refer to [Oracle ILOM Documentation](#).

### Ethernet Device Naming

This topic contains information about the device naming for the 1GbE 100/1000BASE-T Gigabit Ethernet (GbE) port (labeled NET 0) on the back panel of the server. See Back Panel Connector Locations and Ethernet Port Status Indicators.

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. The device naming convention might vary, depending on the conventions of your operating system and which devices are installed in the server.

Naming used by the interfaces might be different from the names in the following table, depending on which devices are installed in the system.

### Ethernet Device Naming

Ethernet Port	Oracle Linux 8 and 9	Oracle Solaris	Windows (example default name, see note below)
Net 0	eno1	igb0	Ethernet

For Windows, a port name such as Ethernet is 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.

### MAC Address Mapping to Ethernet Ports

A system serial label that displays the MAC ID (and the associated barcode) for the server is attached to the top, front left side of the Oracle Communications Server E6-2L server disk cage bezel.

This MAC ID (and barcode) corresponds to a hexadecimal (base 16) MAC address for a sequence of six consecutive MAC addresses. These six MAC addresses correspond to the server network ports, as shown in the following table.

### Ethernet Port MAC Address Map

Base MAC Address	Corresponding Ethernet Port
"base" + 0	NET 0
"base" + 1	Unassigned
"base" + 2	Unassigned
"base" + 3	Unassigned
"base" + 4	SP (NET MGT)
"base" + 5	Used only when Network Controller-Sideband Interface (NC-SI) sideband management is configured.

### Net 0 Gigabit Ethernet Port

The server has one auto-negotiating 100/1000BASE-T Gigabit Ethernet (GbE) system domain port labeled NET 0 that uses a standard RJ-45 connector.

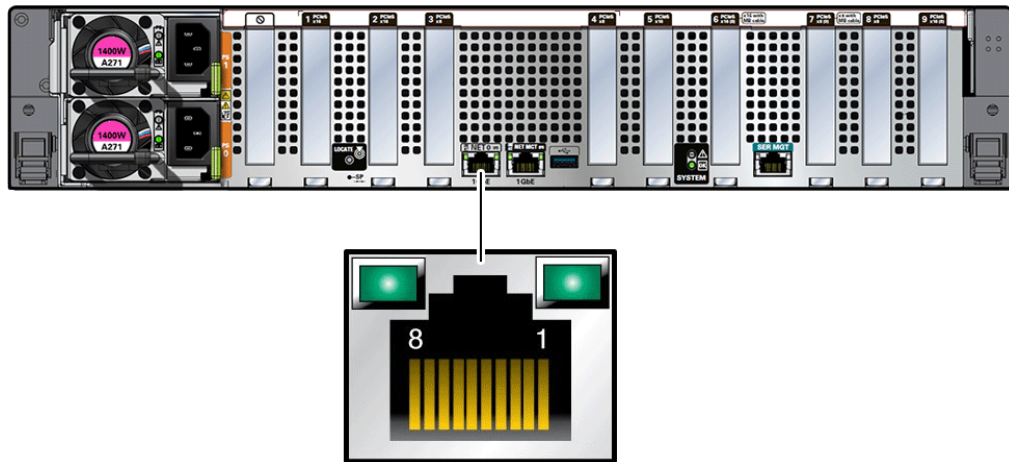
NET 0 GbE Ethernet port transfer rates are shown in the following table.

### Ethernet Port Transfer Rates

Connection Type	IEEE Terminology	Transfer Rate
Fast Ethernet	100BASE-T	100 Mbps
Gigabit Ethernet	1000BASE-T	1,000 Mbps

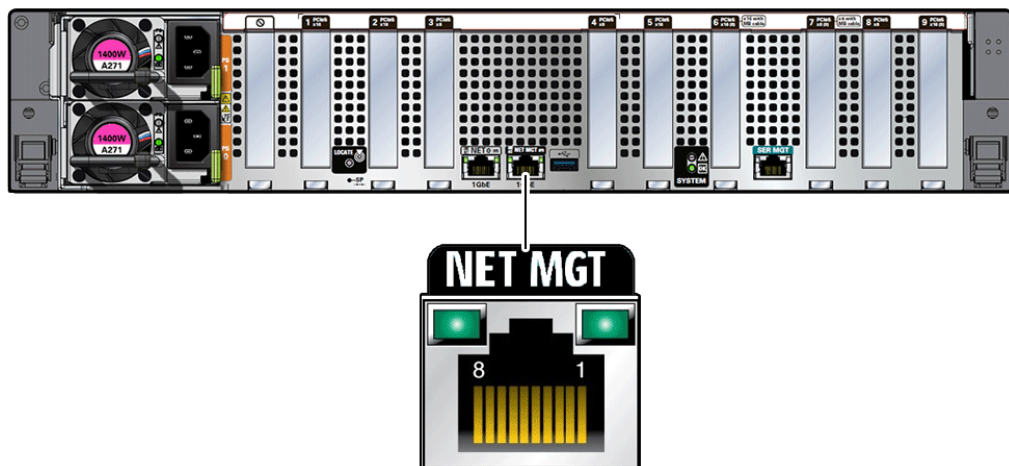
### Network Management Port

The server has one 100/1000BASE-T RJ-45 Oracle Integrated Lights Out Manager (ILOM) service processor (SP) network management.



Ethernet port labeled NET MGT. The auto-negotiating 100/1000BASE-T Ethernet management domain interface port is configured by default to use Dynamic Host Configuration Protocol (DHCP).

SPs with Oracle Integrated Lights Out Manager (ILOM) include support for Ethernet access to the SP through a dedicated Network Management port (NET MGT). Access to the SP is available through a rear panel RJ-45 100/1000BASE-T port labeled NET MGT. The NET MGT port is connected to a system rack switch and can be used for accessing the SP remotely over an Ethernet connection. See [Access Oracle ILOM](#).

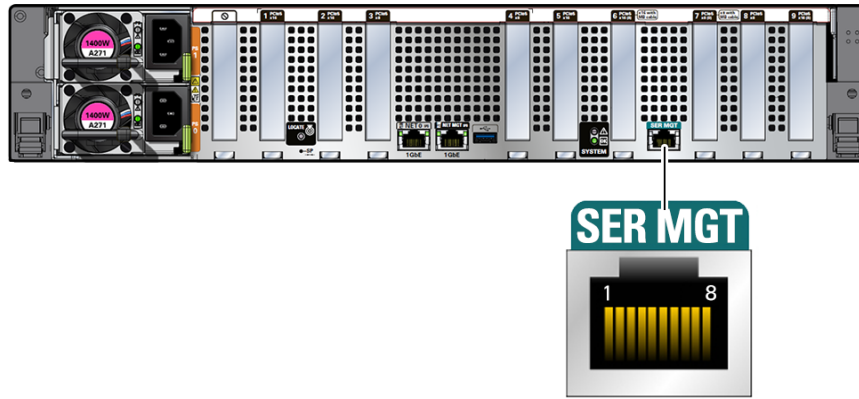


See Network Management Port Status Indicators. For information on configuring this port for managing the server with Oracle ILOM, refer to [Oracle ILOM Documentation](#).

### 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 only the SER MGT port for server management. Refer to [Oracle ILOM Documentation](#).

The following figure and table describe the SER MGT port pin signals.



### 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

### Default Serial Connections for Serial Port

Parameter	Setting
Connector	SER MGT
Rate	115200 baud
Parity	None
Stop bits	1
Data bits	8

If you need to connect to the SER MGT port using a cable with either a DB-9 or a DB-25 connector, use the pin descriptions in the following tables to create a crossover adapter appropriate for your serial connection.

### RJ-45 to DB-9 Adapter Crossovers Wiring Reference

Serial Port (RJ-45 Connector) Pin	Serial Port (RJ-45 Connector) Signal Description	DB-25 Adapter Pin	DB-25 Adapter 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

### RJ-45 to DB-25 Adapter Crossovers Wiring Reference

Serial Port (RJ-45 Connector) Pin	Serial Port (RJ-45 Connector) Signal Description	DB-25 Adapter Pin	DB-25 Adapter 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

### USB Port

The server has a single USB port located on the server back panel for attaching supported USB 3.1-compliant devices.

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.

The USB port is for service operation only and should not be connected 24x7. Enable the USB port in BIOS, as required.

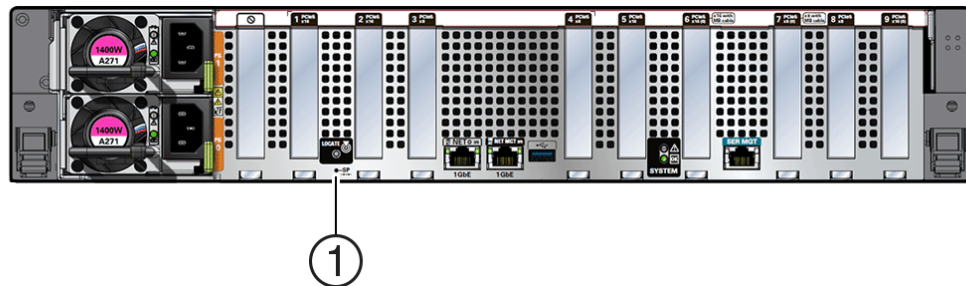
### Manually Reset a Server's Service Processor

You need a non-conductive stylus no more than 1.5 mm in diameter.

This section shows the location of the service processor (SP) reset button on the front panel of the server. The button is recessed to prevent accidental pressing. If the service processor becomes inaccessible, you can use a non-conductive stylus to press the SP reset button.

If the Oracle ILOM SP stops running and you cannot reset it using the Oracle ILOM web interface or the Oracle ILOM CLI, use the following procedure to reset the SP from the server back panel.

1. Locate the SP reset pinhole button on the server back panel.



2. Insert a non-conductive stylus straight into the SP reset pinhole no more than 6.5 mm (the distance to reach and depress the reset button). Care should be taken to not insert the stylus at an angle, to over penetrate, or accidentally touch the sensitive electrical components near the button. The stylus must be non-conductive with a diameter no more than 1.5 mm. To depress the pinhole button, the stylus must reach 6.5 mm into the chassis.

3. After initiating the SP reset, the OK LED will fast blink while the SP is rebooting. This can take a few minutes. The host will still operate normally. Any Oracle ILOM user sessions running on the SP will be terminated during SP reset. Once the SP has rebooted successfully, you will be able to log into Oracle ILOM.
4. After the SP successfully boots, the LED will remain steady on. You can confirm that the SP is working by logging into Oracle ILOM for that system. For details, refer to [Oracle ILOM Documentation](#).

### Access Oracle ILOM

You can connect to Oracle ILOM using one of these methods:

- Serial remote host console – Access the host console remotely
- Serial connection to SER MGT port (CLI only) – Oracle ILOM command-line interface (CLI) locally using the RJ-45 serial management port (SER MGT)
- Dedicated remote network management connection – Oracle ILOM CLI or Oracle ILOM web interface remotely using a network port on the server (NET MGT)
- Sideband network management connection – Refer to "Sideband Network Management Connection" in Oracle ILOM Administrator's Guide for Configuration and Maintenance.
- Host-to-ILOM interconnect – Refer to "Dedicated Interconnect SP Management" in Oracle ILOM Administrator's Guide for Configuration and Maintenance.

#### [Oracle ILOM Documentation](#)

Prerequisites: You need to know the IP address or host name of the service processor (SP) to log in to Oracle ILOM CLI or web interface remotely using one of the network ports on the server.

To enable first time login and access to Oracle ILOM, a default Administrator account and its password are provided with the system. To build a secure environment, change the default password (`changeme`) for the default Administrator account (`root`) after your initial login. If this default Administrator account has since been changed, contact your system administrator for an Oracle ILOM user account with Administrator privileges.

To prevent unauthorized access to Oracle ILOM, create user accounts for each user. For procedures to change the root password and create user accounts, refer to [Oracle ILOM Documentation](#).

If you do not know the IP address of the SP, reset the Oracle ILOM SP. See [Manually Reset a Server's Service Processor](#). Two issues might occur on the Oracle ILOM service processor (SP):

- You need to reset the Oracle ILOM SP to complete an upgrade or to clear an error. Resetting the server SP automatically disconnects any current Oracle ILOM sessions and renders the SP unmanageable until the reset process is complete.
- As the system administrator, you forgot the `root` account password and need to recover it.

### Access Serial Remote Host Console

To access the host console remotely.

1. Configure serial host console properties in Oracle ILOM as required. Before you access the host console, you can configure properties in Oracle ILOM to make the serial host console easier to view and to enable logging. Refer to the Oracle ILOM Administrator's Guide for Configuration and Maintenance and [Configure Serial Port Sharing](#).

2. Establish a connection to the Oracle ILOM CLI. Log in to the Oracle ILOM CLI using an account with Administrator privileges.
3. Ensure that the server is cabled for a local serial connection to Oracle ILOM. See Back Panel Connector Locations.
4. Press Enter on the terminal device that is connected to the server.
5. At the Oracle ILOM login prompt, type your user name, and press Enter.
6. At the password prompt, type the password associated with your user name, and press Enter. Oracle ILOM displays a default command prompt (->), indicating that you successfully logged in.
7. At the Oracle ILOM command prompt (->), type: `start /HOST/console` The serial console output appears on the screen. If the serial console is in use, stop and restart it using the `stop /HOST/console` command followed by the `start /HOST/console` command.
8. To return to the Oracle ILOM console, press Esc and then press Shift 9 to enter the open parenthesis ( character.

### Oracle ILOM command-line interface (CLI)

To establish a connection to the Oracle ILOM CLI locally using the RJ-45 serial management port (SER MGT):

1. Ensure that the server is cabled for a local serial connection to Oracle ILOM. See Back Panel Connector Locations.
2. Press Enter on the terminal device that is connected to the server.
3. At the Oracle ILOM login prompt, type your user name, and press Enter.
4. At the password prompt, type the password associated with your user name, and press Enter. Oracle ILOM displays a default command prompt (->), indicating that you successfully logged in.

### Oracle ILOM CLI remotely using a server network port

To establish a connection to the Oracle ILOM CLI:

1. Ensure that the server is cabled for a remote network management connection to Oracle ILOM.
2. From the command line, initiate a secure shell session, type: `ssh username@hostname` Where username is the user name of an Oracle ILOM account with Administrator privileges, and hostname is either the IP address or hostname (when using DNS) of the server SP. The Oracle ILOM password prompt appears. `Password:`
3. At the Oracle ILOM password prompt, type your password and press Enter. For example: `Password: changeme` Oracle ILOM displays the default command prompt ->, indicating that you successfully logged in to the Oracle ILOM CLI.

### Oracle ILOM web interface remotely using a server network port

To establish a connection to the Oracle ILOM web interface:

1. Type the IP address of the server in the address field of your web browser and press Enter.
2. On the Oracle ILOM login screen, type your user name and password, and click Log In. The Summary Information page appears, indicating that you successfully logged in to the Oracle ILOM web interface.

## Service Processor Connection and Login

This procedure describes how to cable the server to access its Root-of-Trust circuitry and service processor (SP).

1. For dedicated access to the server Root-of-Trust circuitry, connect an RJ-45 Ethernet cable to the TOR/NET port on the card located on the server back panel. Attach the other end of the cable or connector to your end point. This provides command-line interface (CLI) access over the network. This port is for service use only.
2. For access to the server Oracle ILOM service processor, do one of the following:
  - For dedicated network access to Oracle ILOM, connect an RJ-45 Ethernet cable to the 10/100/1000 Ethernet management port (labeled NET MGT) on the card located on the server back panel. Attach the other end of the RJ-45 Ethernet cable to your switch. This provides command-line interface (CLI) access over the network.
  - For access to either Oracle ILOM or the RoT circuitry, connect an RJ-45 serial console cable to the RJ-45 serial port (labeled TOR/SER) on the card located on the server back panel. Attach the other end of the RJ-45 serial console cable or connector to your end point. This provides CLI access over a local serial connection or terminal server.
1. Ensure that AC power is plugged into the server power supplies. Standby power is required for SP access, Main power and a running host is not required.
2. Access Oracle ILOM. If this is the first time you are connecting to Oracle ILOM, do one of the following:
  - Access Oracle ILOM using a local serial connection to the command-line interface:
    1. From the terminal device connected to the server's SER MGT port, press Enter to obtain a prompt.
    2. At the Oracle ILOM login prompt, type `root` as the username, and then press Enter.
    3. At the Oracle ILOM password prompt, enter the default password. Type:  
`password: changeme` Oracle ILOM displays the default command prompt (->), indicating that you successfully logged in to the Oracle ILOM CLI.
  - Access Oracle ILOM using an Ethernet connection to the command-line interface: From a terminal device with network access to the server's NET MGT port, initiate a Secure Shell session and log into the Oracle ILOM root account. Type: `# ssh root@hostname` Where `hostname` is either the IP address or host name (when using DNS) of the server SP. By default, Oracle ILOM is configured for DHCP. The DHCP server should list the IP address for your Oracle ILOM host name or SP MAC address.
    1. At the Oracle ILOM password prompt, enter the default password. Type:  
`password: changeme` Oracle ILOM displays the default command prompt (->), indicating that you successfully logged in to the Oracle ILOM CLI.
    2. Once logged in, change default the root password for security.
    3. To enable first-time login and access to Oracle ILOM, a default Administrator account (`root`) and its password are provided with the system. To build a secure environment and enforce user authentication and authorization in Oracle ILOM, you must change the default password (`changeme`) for the default Administrator account (`root`) after your initial login to Oracle ILOM. If this default Administrator account has since been changed, contact your system administrator for an Oracle ILOM user account with Administrator privileges. For more information on changing account information, refer to [Oracle ILOM Documentation](#).

## Test the IPv4 or IPv6 Network Configuration

1. Use either the Oracle ILOM CLI or web interface to test the IPv4 or IPv6 network configuration.
  - From the Oracle ILOM CLI:
    1. At the CLI prompt, type the show command to view the network test targets and properties. For example, the following output shows the test target properties: ->  
show /SP/network/test Targets: Properties: ping = (Cannot show property)  
ping6 = (Cannot show property) Commands: cd set show
    2. Use the set ping or ping6 command to send a network test from the device to a network destination specified in the following table. | Property | Set Property Value | Description | | :- | :- | :- | | ping | set ping=<IPv4\_address> | Type the set ping=command at the command prompt followed by the IPv4 test destination IPv4 address. For example:-> set ping=192.168.10.106Ping of 192.168.10.106 succeeded | | ping | set ping6=<IPv6\_address> | Type the set ping6=command at the command prompt followed by the IPv6 test destination IPv6 address. For example:-> set ping6=2001::db8:5dff:febe:5000Ping of 2001::db8:5dff:febe:5000 succeeded |
  - From the Oracle ILOM web interface:
    1. Click ILOM Administration → Connectivity → Network.
    2. On the Connectivity page, click the Tools button. The Network Tools dialog box appears.

The screenshot displays the Oracle Integrated Lights Out Manager v5.0.2.20 interface. The left sidebar shows a navigation menu with 'Connectivity' selected. The main content area is titled 'Connectivity' and has tabs for 'Network', 'DNS', and 'Serial Port'. The 'Network' tab is active, showing instructions to view MAC addresses and configure network settings. Below this are sections for 'General Settings' (MAC Address, Out of Band MAC Address, Sideband MAC Address, Management Port, Link State, 802.1Q Tagging), 'IPv6' (State, Autoconfig, DHCPv6 Autoconfig, Link-Local IP Address, Static IP Address, Static Gateway, Gateway), 'Dynamic Addresses' (a table with columns for Number and IP Address), 'Local Host Interconnect' (Local Network Connection, Status), and 'Network Tools' (Access tools to test the network configuration). A 'Tools' button is highlighted with a red box. A 'Network Tools' dialog box is open, showing a 'Test Type' dropdown set to 'Ping' and a 'Destination' field.

3. In the Network Tools dialog box, in the Test Type list box, select `Ping` (for an IPv4 configuration) or `Ping6` (for an IPv6 network configuration). If the test was successful, the message `Ping of ip_address succeeded` message appears below the Destination field in the Network Configuration Test screen.
4. Type the IPv4 or IPv6 test destination address in the Destination field and click `Test`.

### Set the Mouse Mode

In Oracle ILOM, you can set the Mouse Mode property to optimize mouse movement in the Oracle ILOM Remote System Console Plus. The mouse mode can be set to either Absolute or Relative and must be set according to the requirements of the operating system that you are using to connect to Oracle ILOM.

Read the following guidelines to determine the appropriate mouse mode for your system.

### Mouse Mode Properties

Operating Systems	Mouse Mode
Oracle Linux	Absolute
Oracle VM	Not applicable
VMware ESXi Software	Not applicable
Windows Server	Absolute

For more information about selecting a mouse mode, refer to Oracle ILOM Administrator's Guide for Configuration and Maintenance in [Oracle ILOM Documentation](#).

To set the mouse mode, perform the following steps:

1. Log in to the Oracle ILOM web interface.
2. Navigate to the Remote Control → KVMS page, and then select a mouse mode from the Mouse Mode drop-down list.
3. Click Save.

### Reset the Server Using Oracle ILOM

For more details, see [Oracle ILOM Documentation](#).

1. Log in to the Oracle ILOM web interface or command-line interface (CLI) using an account with admin (a) role privileges.
2. Reset the server:
  - From Oracle ILOM CLI, type: `-> reset /System`. When prompted, type `y` to confirm: Are you sure you want to reset /System (y/n)? `y` Performing hard reset on /System
  - From Oracle ILOM web interface, select `Host Management` → `Power Control`, and in the `Select Action` list box, select `Graceful Reset, Reset, Or Power On`. Click `Save`, and then click `OK`.
  - From the local server, press the `On/Standby` button on the front panel of the server for approximately 1 second to power off the server, and then press the `On/Standby` button again to power on the server. The power-on self-test (POST) sequence begins.

### Log Out of Oracle ILOM

See the following procedure to log out of Oracle ILOM CLI or web interface.

1. To end an Oracle ILOM session:
  - From the Oracle ILOM CLI – Type `exit` at the CLI prompt.
  - Oracle ILOM web interface – Click the `Log Out` button in the top-right corner of the screen.

### Monitor Component Health and Faults Using Oracle ILOM

Oracle ILOM interfaces provide easy-to-view information about the health status of system components. From the Oracle ILOM command-line interface (CLI) or web interface, 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 automatically does the following:

- Identify the faulted component in the Open Problems table. Open problems detected on a host server or system chassis are viewable from either the `/System/Open_problems` CLI target or Open Problems web page. To view server open problems, type `show /System/`

Open\_Problems. Refer to View Open Problems Detected on a Managed Device in the Oracle ILOM User's Guide for System Monitoring and Diagnostics.

- 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.
  - For the event log, type: `show /SP/Logs/event/list`
  - For the system log, type: `show /System/Log/list`
  - For the audit log, type: `show /SP/Logs/audit/list` To scroll through a list, press any key except the q key.
- Illuminate the Fault-Service Required LED status indicator on the server front and back panels. See Server Status Indicator LEDs. See Server Components for status and fault messages.

To collect system-level information or to verify the system health status from the CLI, type `show /System`. To access subsystem and component health details from the CLI, type `show /System/subsystem-name`.

- PROCESSORS
- MEMORY
- POWER
- COOLING
- STORAGE
- NETWORKING
- PCI\_DEVICES
- FIRMWARE

For further information about administering open problems that are detected and reported by Oracle ILOM, refer to Administering Open Problems in the Oracle ILOM Administrator's Guide for Configuration and Maintenance Firmware. Refer to [Oracle ILOM Documentation](#).

### Get Help

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

### Contact Support

#### [My Oracle Support](#)

If the troubleshooting procedures in this chapter do not solve your problem, use the following table to collect information that you might need to communicate to Oracle Support.

### System Configuration Information

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	

System Configuration Information Needed	Your Information
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	

### Locate 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 Panel Components](#).
- 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 available at no additional cost to customers with Oracle Premier Support. 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 at [My Oracle Support](#). 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 diagnostics 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.

# 3

## Prepare to Service

This chapter describes safety considerations and provides prerequisite procedures and information about replacing components in the server.

Before replacing server components, perform the procedures in the following sections.

### 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 Safety and Compliance Guide and Important Safety Information for Oracle's Hardware Systems.
- Ensure that the voltage and frequency of your power source match the voltage and frequency that appear on the equipment electrical rating label.
- Follow the electrostatic discharge safety practices as described in Electrostatic Discharge Safety.
- Disconnect both power supply cords (if necessary) before servicing components.

Power cords must be disconnected when servicing components that require cold service.

### Safety Symbols

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

 **Caution**

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

 **Caution**

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

 **Caution**

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

### Electrostatic Discharge Safety

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

**⚠ Caution**

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

Do the following when handling ESD-sensitive components:

- Use an antistatic wrist strap.

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

An antistatic wrist strap is not included in the Accessory 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 board (PCB) cards on an antistatic mat. The following items can be used as an antistatic mat:

- Antistatic bag used to wrap an Oracle replacement part
- Oracle ESD mat (orderable item)
- Disposable ESD mat (shipped with some replacement parts or optional system components)

**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.

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

**Required Service Tools**

The server can be serviced with the following tools:

- Antistatic wrist strap
- Antistatic mat(s)
- No. 2 Phillips screwdriver
- Torx (6 lobe) T10, T15, T25, and T30 drivers
- Torque driver 12 in-lbf with T20 Torx bit (processor and heatsink installation)

### Prepare the Server for Component Replacement

When you are replace the storage drives or power supplies, not all of the procedures in this section are necessary. For more information, see the replacement procedures for those components.

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

#### Power Down the Server

Gracefully shut down the server host to prevent data from being corrupted. Performing a graceful shutdown ensures that the system is ready for restart. If the server is not responding, or you must shut down the server quickly, perform an immediate shutdown.

Some server components, such as storage drives, power supplies, fan modules, and M.2 flash SSDs are hot-pluggable. Components that are hot-pluggable do not require the server to be powered down when performing service procedures.

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

#### Power Down the Server Gracefully Using 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. Refer to [Oracle ILOM Documentation](#).
2. Notify affected users that the server will be powered down.
3. Save any open files, and quit all running applications. Refer to your application documentation for specific information about these processes.
4. Log in to the Oracle ILOM command-line interface (CLI) using an Administrator account. See Access Oracle ILOM.
5. At the Oracle ILOM prompt, shut down the operating system: stop command-> stop / System
  - a. 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 Oracle ILOM CLI.

If the system is running 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 System-Level Status Indicators.

1. Disconnect the power and cables from the server. See Disconnect Cables From the Server.

 **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.

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

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

1. Log in to the server as superuser or equivalent. Depending on the nature of the problem, you might want to view the system status or the log files or run diagnostics before you shut down the system. Refer to [Oracle ILOM Documentation](#).
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. See Access Oracle ILOM.
5. In the left pane, click Host Management → Power Control, and click Graceful Shutdown and Power Off from the Select Action list.
6. Click Save, and then click OK. The host server performs an orderly power shutdown to Standby power mode, and the System OK LED on the front panel begins blinking. See System-Level Status Indicators.
7. Disconnect the power cords and data cables from the server. See Disconnect Cables From the Server.

 **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.

**Power Down the Server Gracefully Using the On/Standby Button**

Power down the server using the On/Standby button. Performing a graceful shutdown ensures that all of your data is saved and the system is ready for restart.

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 System-Level Status Indicators.

1. Disconnect the power cords and data cables from the server. See Disconnect Cables From the Server.

**⚠ 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.

**Power Down the Server for Immediate Shutdown Using 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. See Access Oracle ILOM.

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

1. At the CLI prompt, type the following command: -> stop -f /System

The server powers down immediately to Standby power mode.

1. Disconnect the power and data cables from the server. See Disconnect Cables From the Server.

**⚠ 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.

**Power Down the Server for Immediate Shutdown Using 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. See Access Oracle ILOM.

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

1. In the left pane, click Host Management → Power Control, and click Immediate Power Off in the Select Action list.
2. Click Save, and then click OK. 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](#).

 **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.

### 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 the Main power is off, the System OK LED on the front panel begins blinking, indicating that the server is in Standby power mode. See [System-Level Status Indicators](#).
2. Disconnect the power cords and data cables from the server. See [Disconnect Cables From the Server](#).

 **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.

### Disconnect Cables From the Server

 **Caution**

The system supplies Standby power to the circuit boards even when the system is powered off.

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

## Extend the Server to the Maintenance Position

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

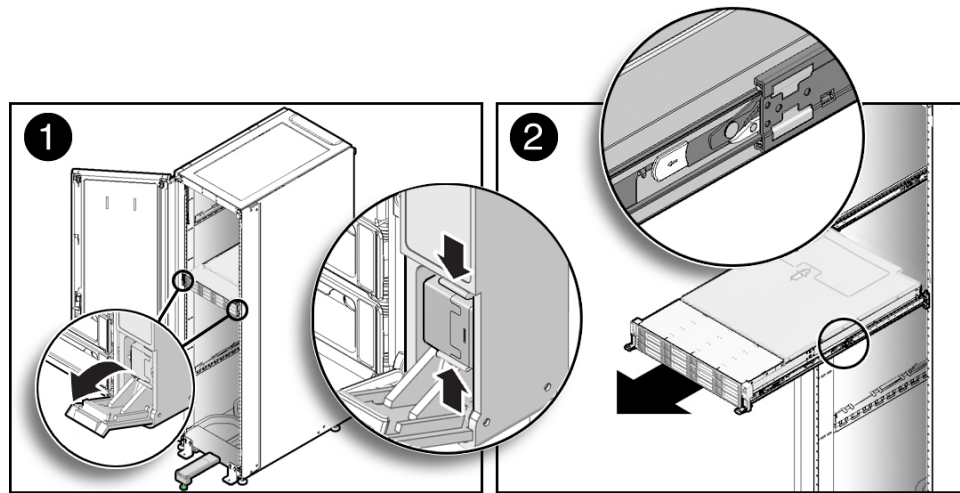
- Fan modules
- Storage drives
- DDR5 DIMMs
- Processors
- M.2 Flash drives and risers
- System battery
- Motherboard
- PCIe cards and cables
- Disk backplane
- SAS cables
- Front indicator module

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. See *Stabilize the Rack*. Also refer to the Oracle Rack Cabinet 1242 User's Guide at [Oracle Rack Cabinet 1242 Documentation Library](#).
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, ensure that all cables and cords are capable of extending.
3. From the front of the server, open and hold the left and right release latch covers in the open position. When in an open position, the release latch covers engage the slide-rail release latches [1].

### **Caution**

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



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

#### Remove the Server From the Rack

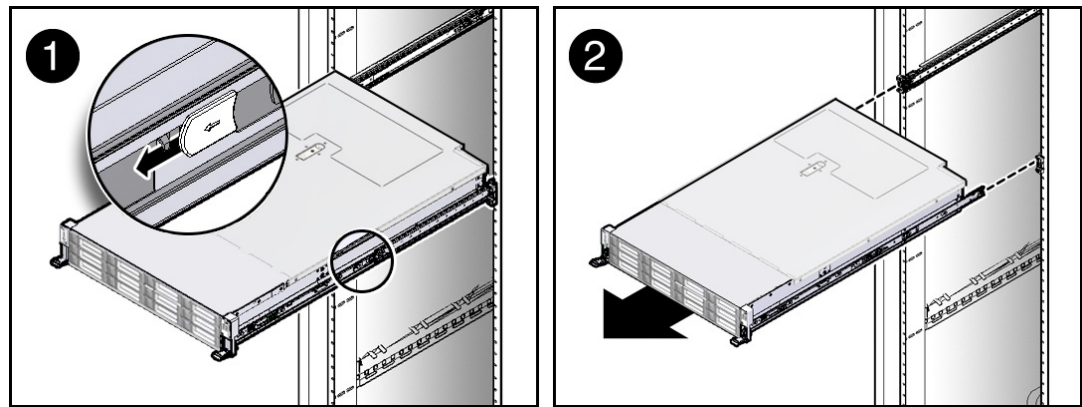
##### **Caution**

The server weighs approximately 76 lbs (34 kg). A mechanical lift or two people are required to remove the server from the rack and carry the chassis.

Use a mechanical lift or two people to remove and transport the chassis.

1. Disconnect all the cables and power cords from the server.
2. Remove the cable management arm (CMA). See Remove the Cable Management Arm.
3. Extend the server to the maintenance position. See Extend the Server to the Maintenance Position.
4. From the front of the server on both sides, pull the gray slide-rail release tabs toward the front of the server, and pull the server out of the rack until it is free of the rack rails [1 and 2]. Use a mechanical lift or two people to remove the chassis from the rack and transport it. A slide-rail release tab is located on each slide-rail.

To pull the gray 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, ESD safe work surface.

#### Take Antistatic Measures

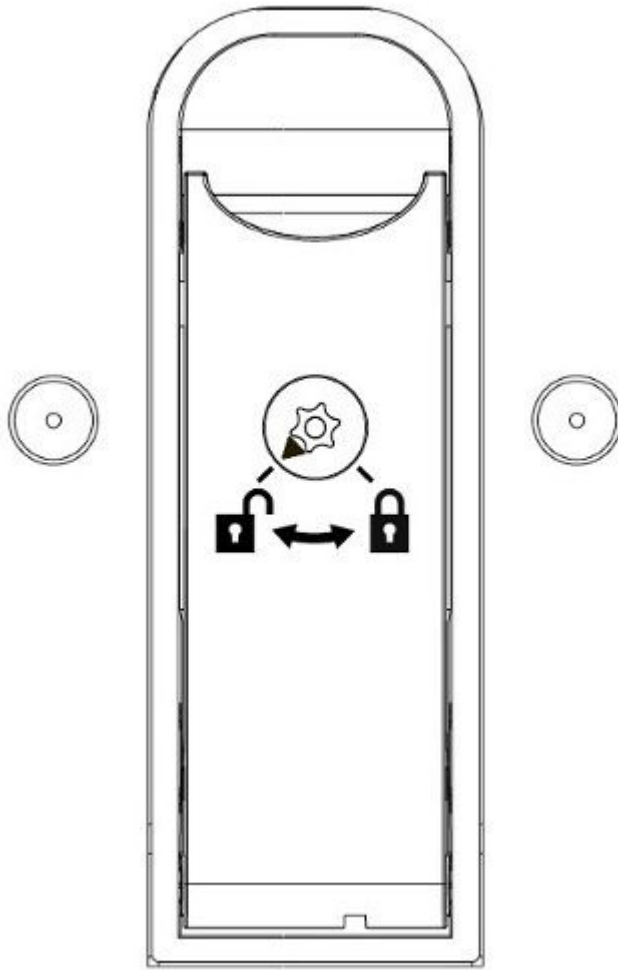
1. Prepare an antistatic surface on which to set parts during removal and installation. Place electrostatic discharge ESD-sensitive components such as the printed circuit boards on an antistatic mat. You can use the following items as an antistatic mat:
  - Antistatic bag used to wrap a replacement part
  - Oracle ESD mat (orderable item)
  - Disposable ESD mat (shipped with some replacement parts or optional system components)
2. Attach an antistatic wrist strap. When servicing or removing server components, attach an antistatic strap to your wrist and then to a metal area on the chassis. Then perform procedures for servicing the server.

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

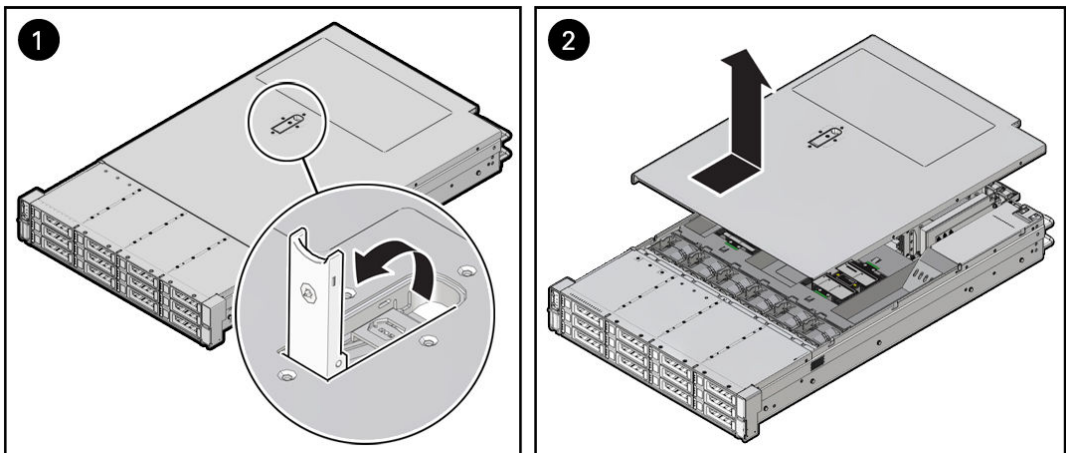
#### Remove the Server Top Cover

Servicing some components requires that the top cover be removed.

1. Ensure that AC power cords are disconnected from the server power supplies. Fan modules and M.2 flash SSDs 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 slides the server cover toward the rear of the chassis for easy removal.



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

# 4

## Replace Storage Drives

This chapter describes how to service storage drives.

Storage drives are replaceable components that do not require you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

The procedures and illustrations in this chapter apply to both NVMe and SAS storage drives, except where noted.

The following sections describe how to remove and replace hard-disk drives (HDDs) and NVMe solid-state drives (SSD) storage drives.

### Storage Drive Hot-Plug Conditions

The SAS hard-disk drives (HDDs) or NVMe solid-state drives (SSDs) that are installed in the server are in most cases hot-pluggable. The hot-plug 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 *Power Down the Server*.

Replacing a drive does not require extending or removing the server from a rack.

### Storage Drive Failure and RAID

A single storage drive failure does not cause a data failure if you configured the storage drives 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 you configured the replaced storage drive as a hot-spare, the new HDD is automatically configured as a new hot-spare.

See *Configure NVMe RAID Using BRU* for server instructions.

### Remove

1. Prepare the system for the drive removal. Refer to *Take Antistatic Measures*.
2. Identify the location of the drive that you want to remove. For storage drive locations, see either *NVMe Storage Drive Configuration* or *SAS Storage Drive Configuration*.

If NVMe storage drives are installed in the server front panel, they are labeled NVMe0 through NVMe3. Server operating systems may assign these storage drives different names.

The following table shows sample corresponding names assigned by the operating systems. Example drive names provided in the table assume that the NVMe cabling between the motherboard and the NVMe disk backplane is correct.

Storage Drive Labels	Example Names Assigned by Server Operating Systems
NVMe0	PCIe Slot 100
NVMe1	PCIe Slot 101
NVMe2	PCIe Slot 102
NVMe3	PCIe Slot 103

**1.** Remove the storage drive.

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

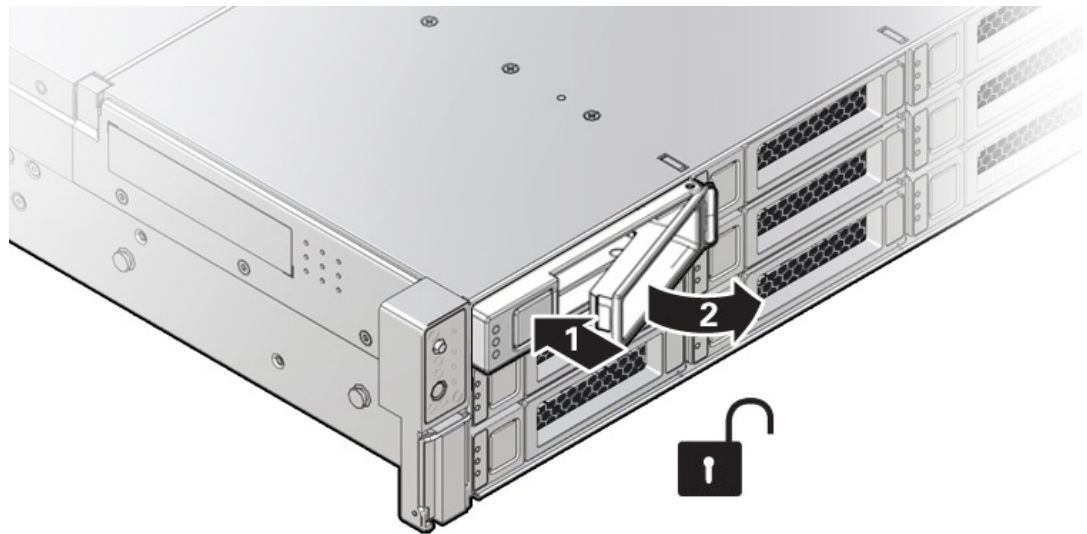
The exact commands required depend on the configuration of your drives. Unmount file systems or issue RAID commands, as needed.

- 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](#).
- If you are removing an NVMe storage drive, see the procedures for your operating system.

NVMe storage drives are supported only on servers that are running Oracle Linux and Oracle Solaris.

- [Remove and Replace an NVMe Storage Drive Using Oracle Solaris](#)
- [Remove and Replace an NVMe Storage Drive Using Oracle Linux](#)

**2.** Push the latch release button to open the drive latch [1, 2].

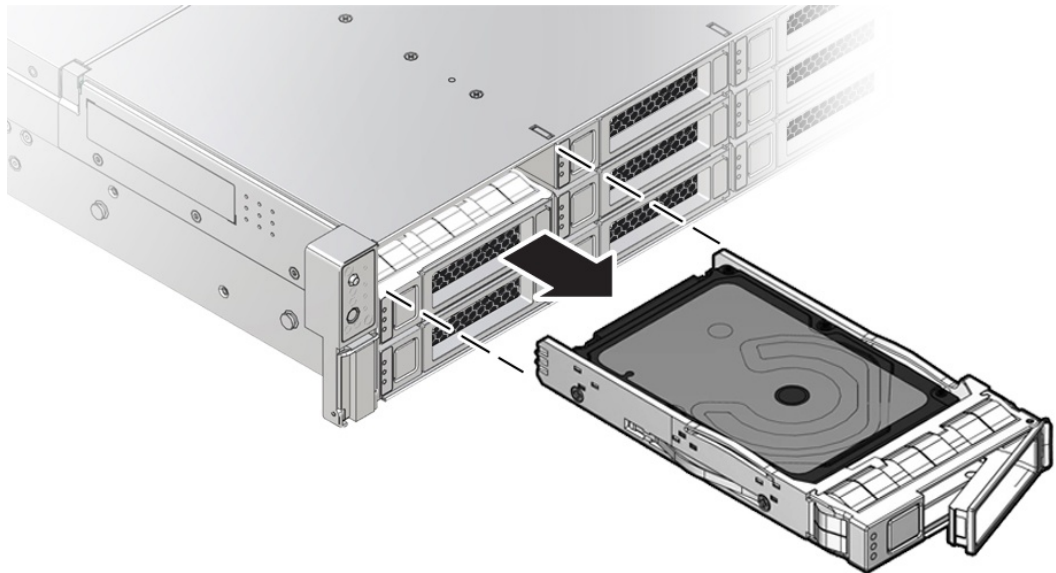


Callout	Description
1	Pressing the latch release button.
2	Opening the latch.

**⚠ Caution**

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

1. Grasp the latch and pull the drive out of the drive slot.



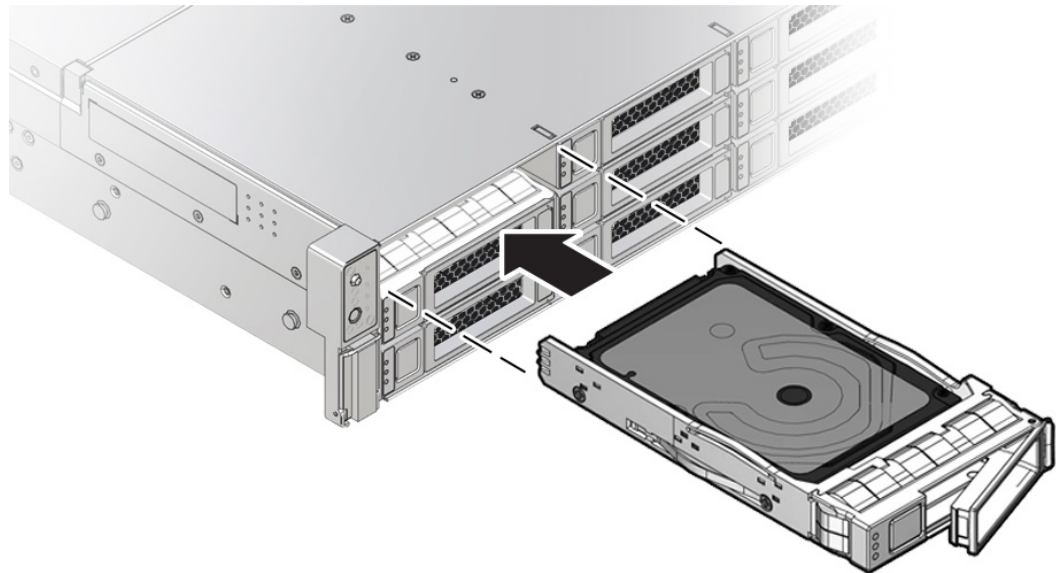
2. Consider your next steps:
  - If you are replacing the drive, continue to [Install a Storage Drive](#).
  - If you are not replacing the drive, install a filler in the empty drive slot to maintain proper airflow and perform administrative tasks to configure the server to operate without the drive. See [Remove and Install Filler Panels](#).
    - a. Locate the vacant storage drive module slot in the server, and then ensure that the release lever on the filler panel is fully opened.
    - b. Slide the filler panel into the vacant slot by pressing the middle of the filler panel faceplate with your thumb or finger.

The release lever will 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.

- a. Using your thumb or finger, press on the middle of the filler panel faceplate until the release lever engages with the chassis.
- b. Close the release lever until it clicks into place and is flush with the front of the server

## Install

1. Remove the replacement drive from its packaging, and place the drive on an antistatic mat.
2. If necessary, remove the drive filler panel.
  - a. Locate the storage drive filler panel to be removed from the server.
  - b. To unlatch the storage drive filler panel, pull the release lever, and tilt the lever out into a fully opened position.
  - c. To remove the filler panel from the slot, hold the opened release lever, and gently slide the filler panel toward you. See [Remove and Install Filler Panels](#).
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 you removed.
4. Slide the drive into the slot until the drive is fully seated.



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

## Remove and Replace Storage Drives Using an OS

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

## Remove and Replace 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

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\*'

```

This command returns output similar to the following example, with the PCIe addresses in bold text:

```
/sys/devices/
pci0000:d7/0000:d7:02.0/0000:e3:00.0/0000:e4:07.0/0000:e8:00.0/nvme/
nvme10
  /sys/devices/
pci0000:d7/0000:d7:02.0/0000:e3:00.0/0000:e4:07.0/0000:e8:00.0/nvme/
nvme10/uevent
  /sys/devices/
pci0000:d7/0000:d7:02.0/0000:e3:00.0/0000:e4:07.0/0000:e8:00.0/nvme/
nvme10/cntlid

```

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

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

```

This command returns output similar to the following example, with the bus addresses for the corresponding NVMe instances in bold text.

- i. In the following 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 NVMe Storage Drives](#).

```
/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)

```

- c. Disconnect all users from 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 the device.
      - 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 2.b above.

Note: If there are any NVMe devices working in x4x4 mode, all devices need to be powered off.

1. 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 [NVMe Storage Drive Configuration](#).
2. Verify that the OK to Remove indicator (LED) on the NVMe drive is lit.
3. On the NVMe drive you plan to remove, push the latch release button to open the drive latch. See [Remove a Storage Drive](#).
4. Grasp the latch and pull the drive out of the drive slot.
5. Consider your next steps:
  - If you are replacing the drive, continue to [Verify Removal of an NVMe Storage Drive](#), and then [Install an NVMe Storage Drive](#).
  - 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](#).

### Verify Removal of an NVMe Storage Drive

1. To check the NVMe drive enumeration to verify that 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 command 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 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 you removed.
4. Slide the drive into the slot until the drive is fully seated. See *Install a Storage Drive*.
5. Close the drive latch to lock the drive in place.

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

1. 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

1. 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*`

### Remove and Replace 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

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
-----
/SYS/DBP/HDD0/NVME  ENABLED       PCIe-Native   /pci@0,0/pci1022,14ab@1,1
/SYS/DBP/HDD1/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,2
/SYS/DBP/HDD2/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,3
/SYS/DBP/HDD3/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,4
/SYS/MB/SSDR0/SSD0  EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,1
/SYS/MB/SSDR1/SSD0  EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,2
Slot0               EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,3
```

1. 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 /SYS/DBP/HDD0/NVME

# hotplug list -lc
```

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

```
#
# hotplug list -lc
Connection          State          Description    Path
-----
/SYS/DBP/HDD0/NVME  PRESENT       PCIe-Native   /pci@0,0/pci1022,14ab@1,1
/SYS/DBP/HDD1/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,2
/SYS/DBP/HDD2/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,3
/SYS/DBP/HDD3/NVME  EMPTY        PCIe-Native   /pci@0,0/pci1022,14ab@1,4
/SYS/MB/SSDR0/SSD0  EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,1
/SYS/MB/SSDR1/SSD0  EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,2
Slot0               EMPTY        PCIe-Native   /pci@0,0/pci1022,14aa@5,3
```

1. 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 NVMe Storage Drive Configuration.
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. See Remove a Storage Drive.
4. Grasp the latch and pull the drive out of the drive slot.
5. Consider your next steps:
  - If you are replacing the drive, continue to Verify Removal of an NVMe Storage Drive, and then Install an NVMe Storage Drive.
  - 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.

### Verify Removal of an NVMe Storage Drive

1. 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
-----
/SYS/DBP/HDD0/NVME  EMPTY         PCIe-Native  /pci@0,0/pci1022,14ab@1,1
/SYS/DBP/HDD1/NVME  EMPTY         PCIe-Native  /pci@0,0/pci1022,14ab@1,2
/SYS/DBP/HDD2/NVME  EMPTY         PCIe-Native  /pci@0,0/pci1022,14ab@1,3
/SYS/DBP/HDD3/NVME  EMPTY         PCIe-Native  /pci@0,0/pci1022,14ab@1,4
/SYS/MB/SSDR0/SSD0  EMPTY         PCIe-Native  /pci@0,0/pci1022,14aa@5,1
/SYS/MB/SSDR1/SSD0  EMPTY         PCIe-Native  /pci@0,0/pci1022,14aa@5,2
Slot0               EMPTY         PCIe-Native  /pci@0,0/pci1022,14aa@5,3
```

### 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](#).
5. Close the drive latch to lock the drive in place.

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

1. Type:

```
# hotplug enable /SYS/DBP/HDD0/NVME
```

2. Type:

```
# hotplug list -lc
```

The following status is displayed for the NVMe storage drive.

```
# hotplug enable /SYS/DBP/HDD0/NVME
# hotplug list -lc
Connection          State          Description Path
-----
/SYS/DBP/HDD0/NVME  ENABLED        PCIe-Native  /pci@0,0/
pci1022,14ab@1,1
/SYS/DBP/HDD1/NVME  EMPTY         PCIe-Native  /pci@0,0/
pci1022,14ab@1,2
/SYS/DBP/HDD2/NVME  EMPTY         PCIe-Native  /pci@0,0/
```

```
pci1022,14ab@1,3
/SYS/DBP/HDD3/NVME   EMPTY           PCIe-Native /pci@0,0/
pci1022,14ab@1,4
/SYS/MB/SSDR0/SSD0  EMPTY           PCIe-Native /pci@0,0/
pci1022,14aa@5,1
/SYS/MB/SSDR1/SSD0  EMPTY           PCIe-Native /pci@0,0/
pci1022,14aa@5,2
Slot0                EMPTY           PCIe-Native /pci@0,0/pci1022,14aa@5,3
```

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 --help
```

# 5

## Replace Power Supplies

This section describes how to service power supplies.

Power supplies are replaceable components that do not require you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

The power supplies are located at the back of the server.

### Power Supply Overview

The redundant power supply in the server supports concurrent maintenance, which enables you to remove and replace a power supply without shutting down the server, if the other power supply is online and working.

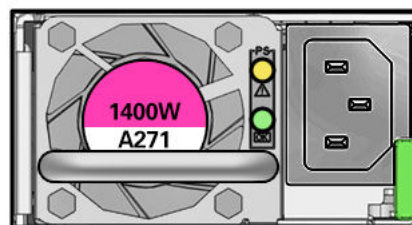
The server supports model A271 and A271a (1400 watt) power supplies. The power supply (PS) provides conversion from the AC lines to the system, accepting 220 volts AC (VAC) only. The PSUs are hot-pluggable, and in most cases provide fully redundant “1+1” power, allowing the system to suffer the loss of a PS 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 power supply. Power supplies provide an over-subscription mode (always enabled), which allows the system to operate with fault-tolerance, even with modest excursions beyond the rated capacity of a single PS. This over-subscription support is accomplished using hardware signaling between the PS and motherboard circuitry, which can force the system to throttle processor (CPU) and memory power in the event that a power supply is lost. The resulting power savings is enough to allow the system to continue to run (in a lower-performance state) until the power problem is resolved.

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.

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

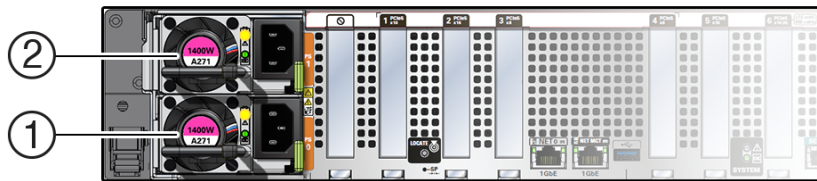
- Front and back panel Fault-Service Required LEDs
- Rear Power Supply Fault-Service Required LED located on the server front panel
- Amber Fault-Service Required LED on the faulty power supply



For more information, see *Power Supply Status Indicators*.

## Remove

1. Prepare the system for power supply removal. See Take Antistatic Measures.



2. Identify which power supply requires replacement.

Callout	Description
2 PS1	Power supply 1
1 PS0	Power supply 0

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

To list all known faults in the server, log in to the Oracle ILOM Fault Management Shell from the Oracle ILOM service processor and issue the `fmadm faulty` command. Alternatively, log in to Oracle Solaris and issue the `fmadm faulty` command (Solaris root privileges required). 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 at [Oracle ILOM Documentation](#).

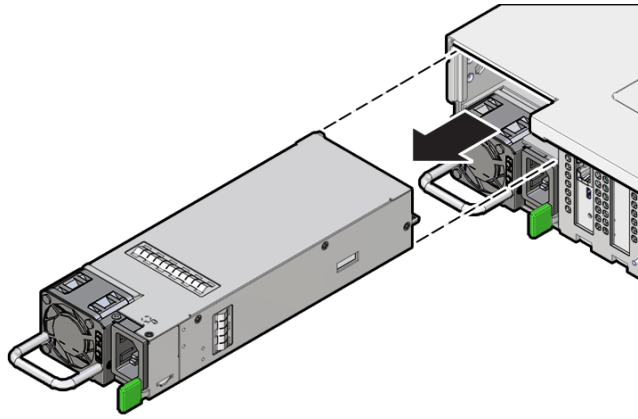
The fans of a failed power supply still might be spinning when the system is powered on. You can remove a power supply while the fans are still spinning.

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. See Remove the Cable Management Arm for additional CMA information.

### Caution

When disconnecting the CMA left-side connectors, be sure to use your arm to support the CMA so that it does not hang down under its own weight and stress the right-side connectors. Otherwise, the CMA might be damaged. You must continue to support the CMA until you reconnect both 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. Open the power supply handle if the handle is folded flush. Open the velcro straps if present.



7. Pull the power supply out of the chassis.

**⚠ Caution**

When you remove a power supply, be sure to replace it with another power supply within 60 seconds; otherwise, the server might overheat due to improper airflow.

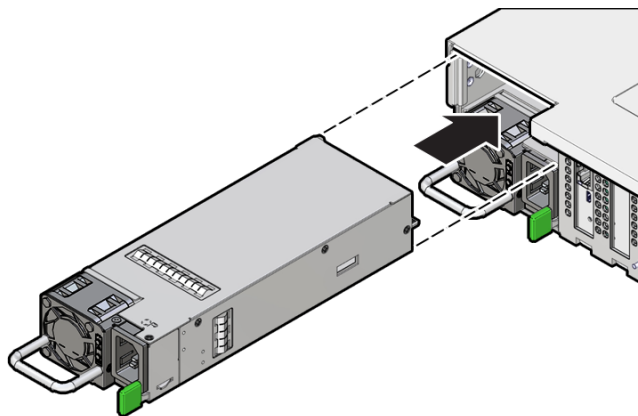
8. Continue to Install a Power Supply.

### Install

**⚠ Caution**

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

1. Remove the replacement power supply from its packaging, and place it on an antistatic mat.
2. Align and orient the replacement power supply with the empty power supply slot.
3. Slide the power supply into the slot until it is fully seated. You will hear an audible click when the power supply fully seats.



4. Reconnect the power cord to the power supply.

5. Verify that the amber Fault-Service Required LED on the replaced power supply and the Fault-Service Required LEDs are not lit on the front and back panels. After you replace 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) Configuration and Maintenance Guide at [Oracle ILOM Documentation](#). Power Supply 1 does not contain KIP data, and therefore does not require an SP reset after replacement.

1. If you disconnected the two CMA left-side connectors, reconnect the connectors or straps. See [Install the Cable Management Arm \(Optional\)](#).

# 6

## Replace Fan Modules

This section describes how to service fan modules and the fan tray.

Fan modules are replaceable components that do not require you to power off the server before servicing. For more information about replaceable components, see "Illustrated Parts Breakdown" and "Replaceable Components" in this guide.

Fan modules are located in the front of the server.

### Fan Module

#### Remove

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

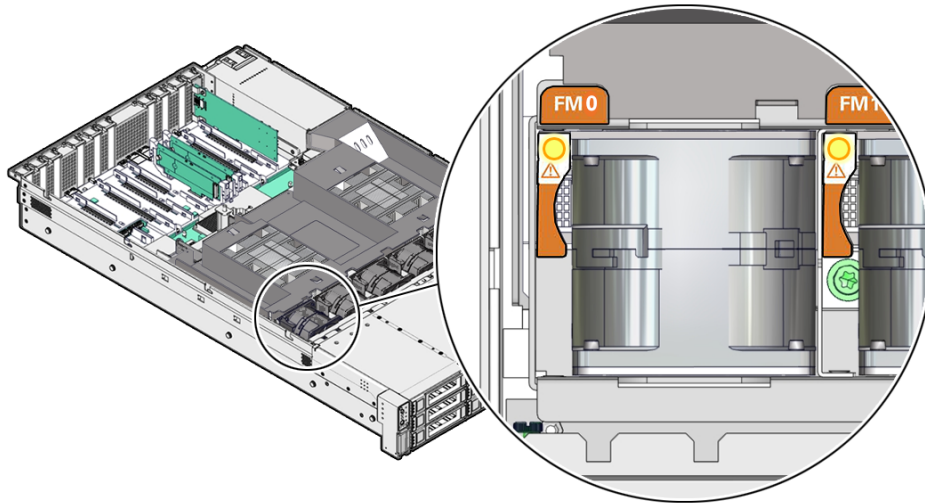
**Caution**When removing and replacing a fan module in the Oracle Communications Server E6-2L, you must complete the entire procedure within 60 seconds to maintain adequate cooling in the system.

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 one fan, with two fan motors per fan. The two fan motors provide separate tachometer signals so that the fan module reports two tach signals to Oracle ILOM. Even if only one fan motor is faulted within the fan module, the Oracle ILOM service processor detects that two fan motors have failed to spin while the fan module is removed. If the fan module is not replaced within 60 seconds of removal, Oracle ILOM will take the protective action to shut down the system to prevent thermal damage to the system.

If the cover is not installed within 60 seconds, the system may shutdown due to over-temperature or a PCIe card may overheat, potentially damaging it.

1. Extend the server to the maintenance position. See [Extend the Server to the Maintenance Position](#).
2. To access the fan modules, remove the server top cover. See [Remove the Server Top Cover](#).
3. Identify the faulty fan module. Each fan module has a fan service action required 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.



---

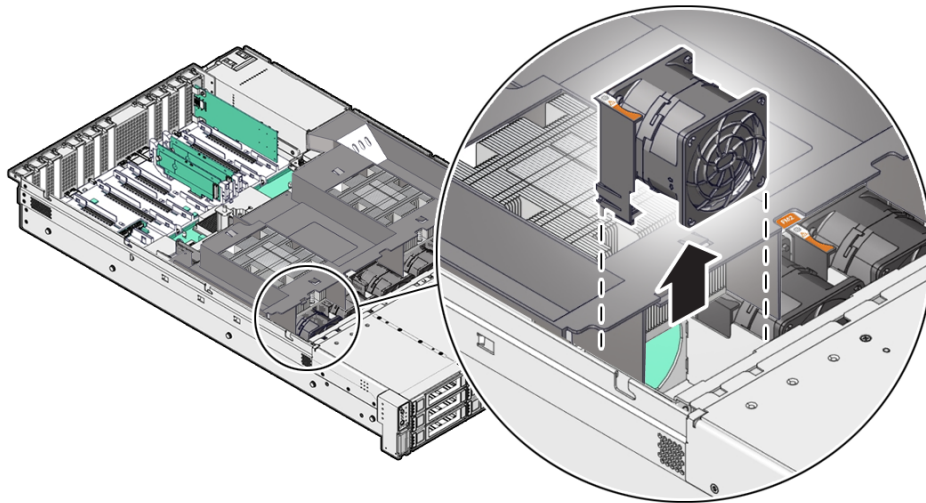
**LED Color and State Meaning**

---

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.

---

1. Using your forefinger and thumb, lift the fan module straight up and out of the chassis and set it aside on an antistatic mat.

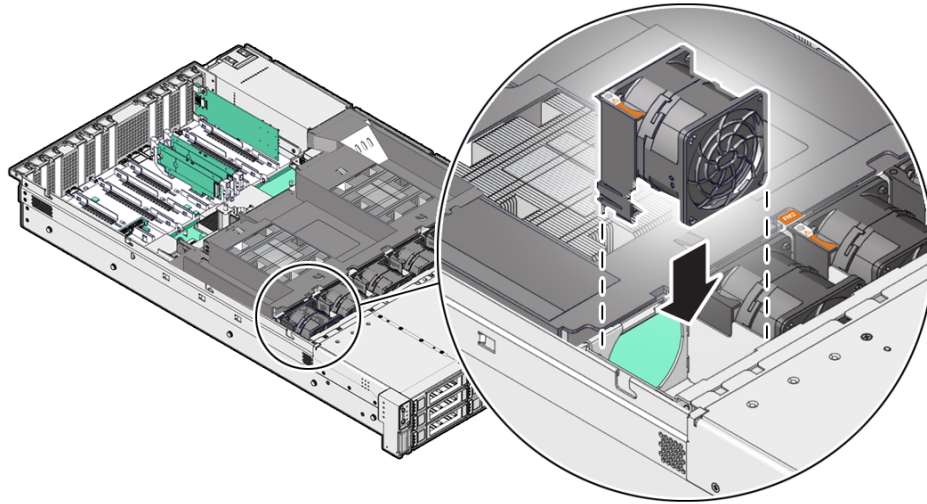


2. Consider your next step:
  - If you removed the fan assembly as part of another procedure, return to that procedure.
  - Otherwise, continue to Install a Fan Module.

**Install**

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

2. With the server top cover removed, install the replacement fan module into the server. The fan modules are keyed to ensure that they are installed in the correct orientation.



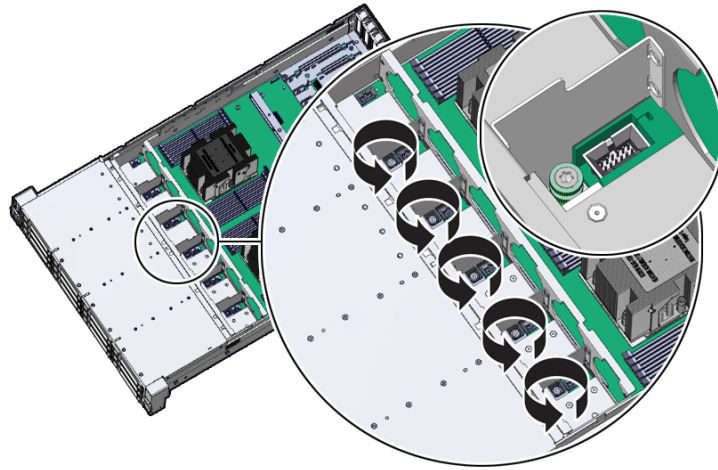
3. Press down on the fan module to fully seat the fan module.
4. Verify that the fan module status indicator (LED) for the replacement fan module is not illuminated.
5. Install the server top cover. See [Install the Server Top Cover](#).
6. Verify that the Top Fan Fault LED on the front of the server and the Fault-Service Required LEDs on the front and back of the server are not illuminated. See [System-Level Status Indicators](#) for more information about identifying and interpreting system status 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 .

## Fan Tray

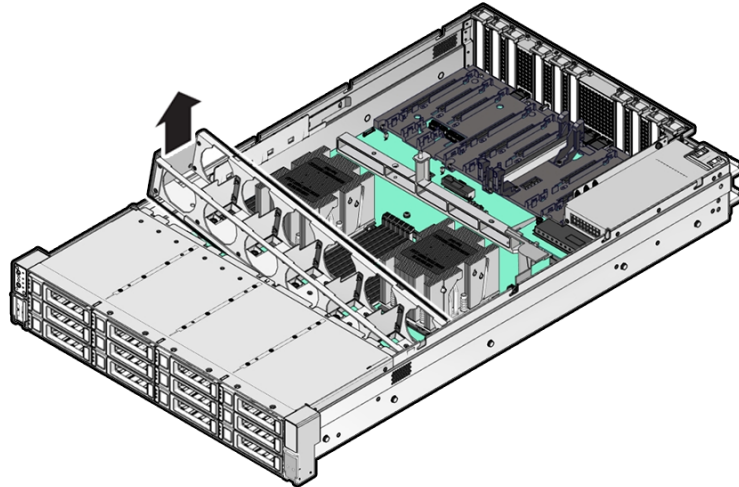
### Remove

Perform this procedure only when servicing Disk backplane, SAS cables, and Motherboard assembly replaceable components.

1. Remove all fan modules from the fan tray. See ["Remove a Fan Module"](#) in this guide.
2. Remove the air baffle. See ["Remove the Air Baffle"](#) in this guide.
3. Using a Torx T25 screwdriver, loosen the five spring-mounted screws that secure the fan tray to the server chassis.

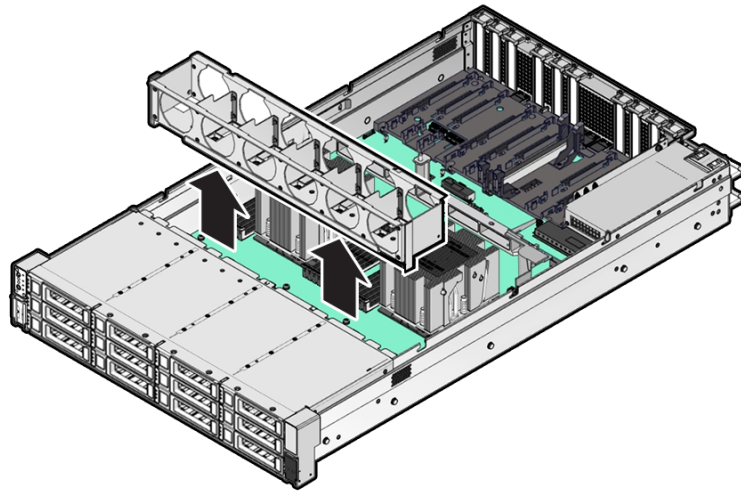


4. When removing the fan tray, slightly tilt the fan tray to the left to decompress the cables, before the operation.



Ensure all motherboard cables are clear of the fan tray and fan tray gasket.

5. Lift the fan tray from the server.

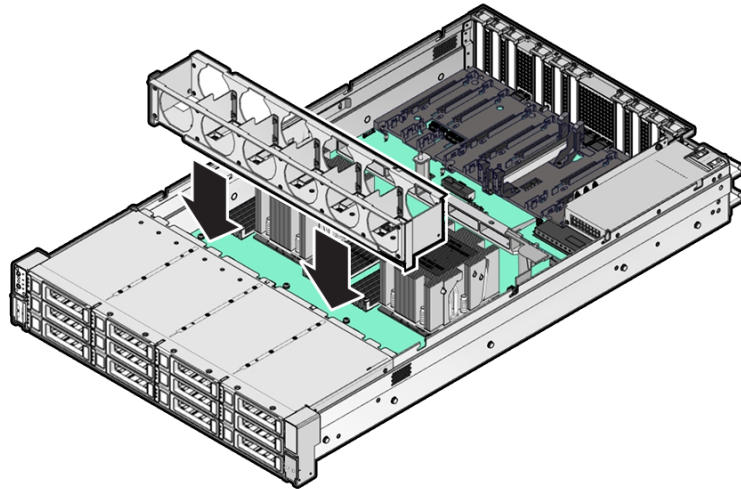


6. Continue with the next step in the service procedure.

### Install

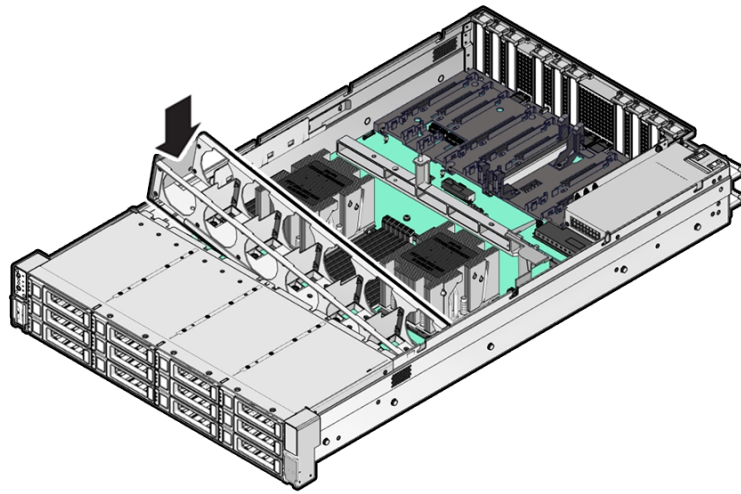
Perform this procedure only when servicing Disk backplane, SAS cables, and Motherboard assembly replaceable components:

1. Lower the fan tray into the server.



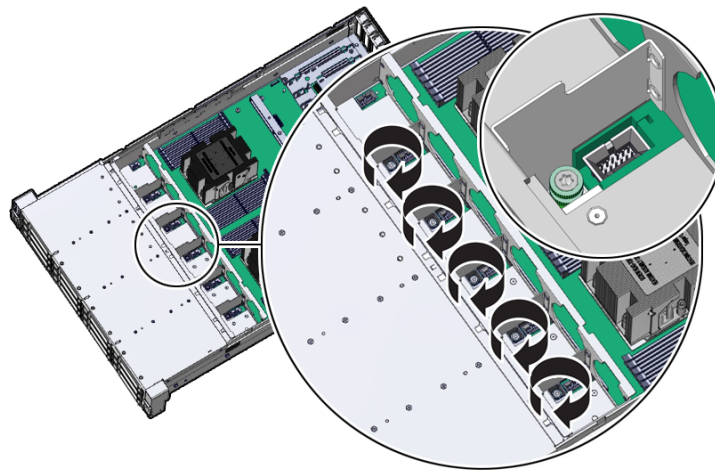
Ensure all motherboard cables are clear of the fan tray and fan tray gasket.

2. When installing the fan tray, the fan tray should first be slightly tilted to the left to compress the cables, before the operation.



Ensure all motherboard cables are clear of the fan tray and fan tray gasket.

3. Using a Torx T25 screwdriver, tighten the five spring-mounted screws that secure the fan tray to the server chassis.



4. Install the fan modules into the fan tray. See "Install a Fan Module" in this guide.
5. Install the air baffle. See "Install the Air Baffle" in this guide.
6. Continue with the next step in the service procedure.

# 7

## Replace Internal M.2 Flash SSDs

This section describes how to service M.2 flash solid-state drives (SSDs).

M.2 flash SSDs are replaceable components that do not require you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

### **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*.

### **Caution**

Unless the two M.2 risers are running in a software RAID configuration, removing one riser might result in a system crash and possible data corruption.

### **Caution**

The lever is not an ejector. Do not open the lever too far. Doing so can damage the lever.

### Flash Riser Board

#### Remove

The server can contain up to two hot-pluggable flash riser boards (SSDR0, SSDR1). Each flash riser board can contain one M.2 flash SSD.

1. Prepare the server for service.
  - a. Extend the server into maintenance position. See *Extend the Server to the Maintenance Position*.
  - b. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See *Take Antistatic Measures*.
  - c. Remove the server top cover. See *Remove the Server Top Cover*.

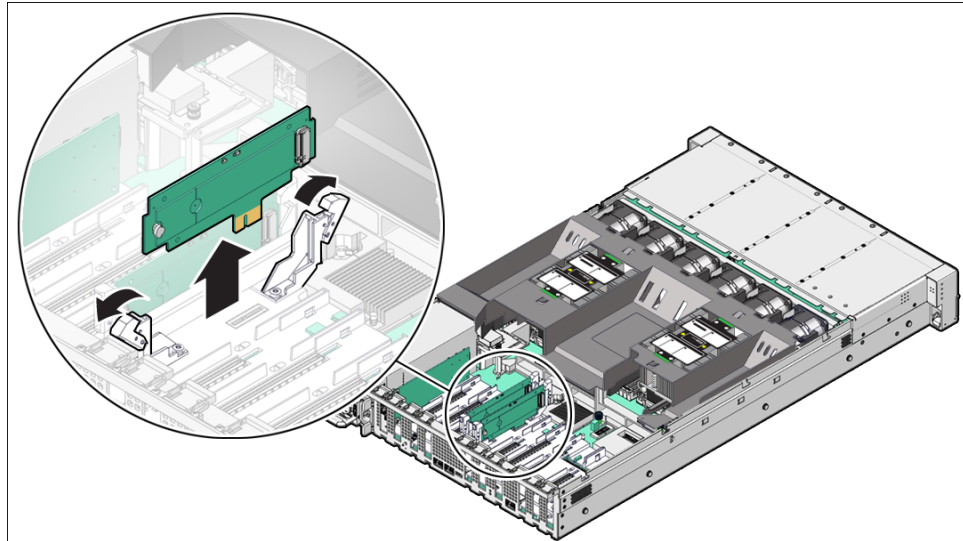
Hot service requires component replacement within 60 seconds.

1. To remove the flash riser board, do the following:
  - a. Rotate both riser board socket levers outward as far as they go.

**Note**

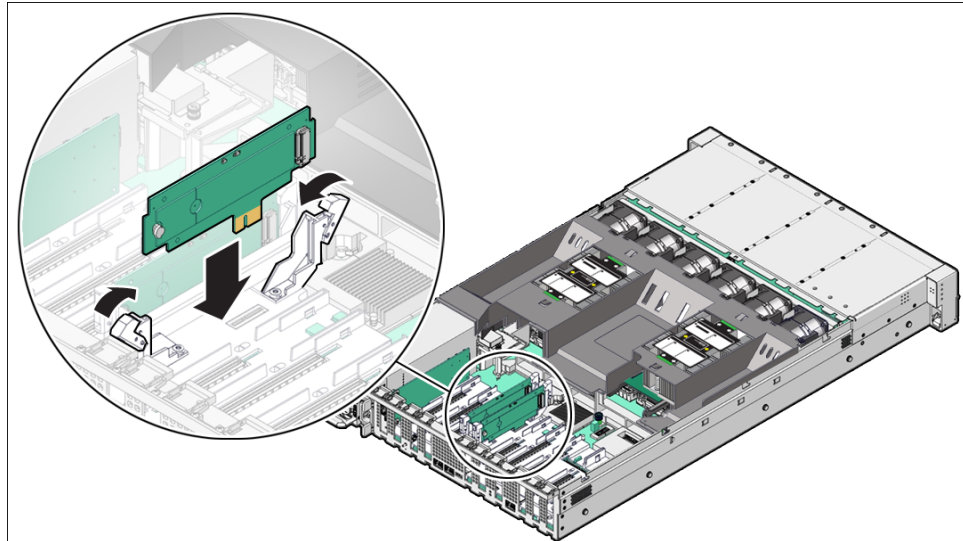
The green Power LED indicator located on the riser board is extinguished when you open the socket levers.

- b. Carefully lift the riser board straight up to remove it from the sockets. Place the riser board on an antistatic mat. If required, perform the procedures for removing the M.2 flash SSD from the flash riser board. See "Identify and Remove an M.2 Flash SSD".

**Install**

The system motherboard provides two slots (labeled SSDR 0 and SSDR 1) for flash riser boards. When installing flash riser boards, install the first riser board into slot SSDR 0 and then into SSDR 1.

1. Unpack the replacement flash riser board and place it on an antistatic mat. If required, ensure that you have installed an M.2 flash SSD onto the riser board before installing the riser board into the server. See "Install an M.2 Flash SSD".
2. Install the flash riser board.
  - a. Ensure that the riser board socket levers are in the open position.
  - b. Align the notch in the replacement riser board with the connector key in the connector socket. The notch ensures that the riser board is oriented correctly.
  - c. Push the riser board into the connector socket until the riser board is securely seated in the socket.



### **Caution**

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

1.
  - a. Rotate the riser board socket levers inward until the riser board is secured in place.
2. (Optional) Repeat Step 2 to install a second flash riser board into the server.
3. Return the server to operation.
  - a. Install the server top cover. See [Install the Server Top Cover](#).
  - b. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).

## M.2 Flash SSD

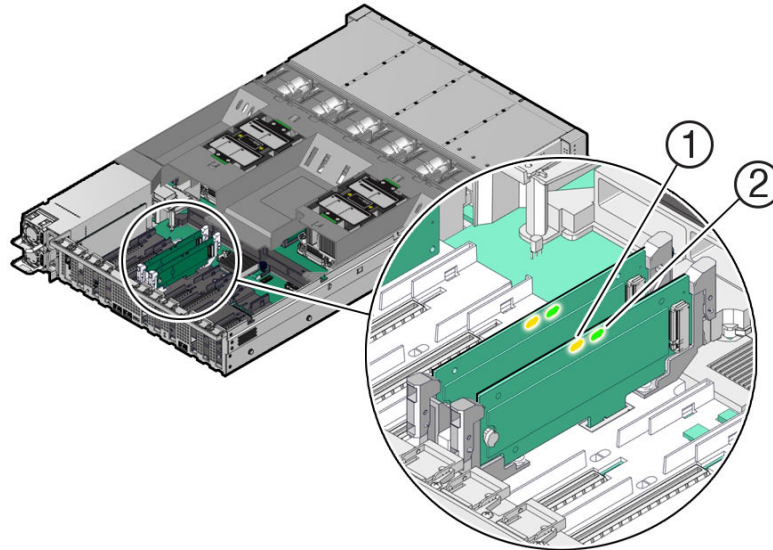
### Identify and Remove

In the standard Oracle Communications Server E6-2L configuration, the flash riser board contains an M.2 flash SSD in a socket.

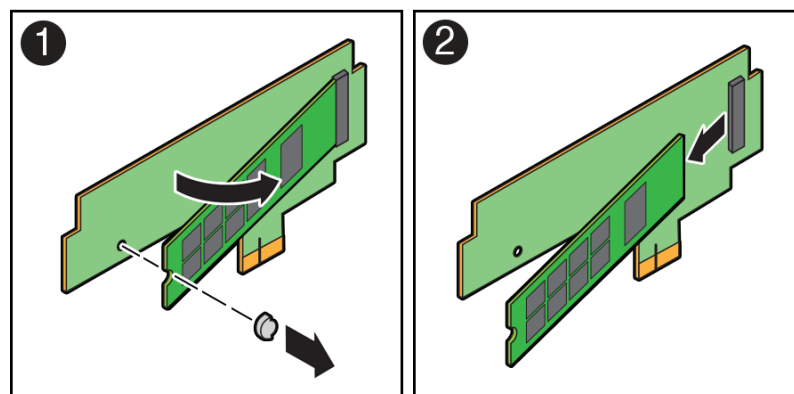
1. Prepare the server for service.
  - a. Extend the server into maintenance position. See [Extend the Server to the Maintenance Position](#).
  - b. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See [Take Antistatic Measures](#).
  - c. Remove the server top cover. See [Remove the Server Top Cover](#).
2. Identify and note the location of the failed M.2 flash SSD.
  - a. Identify the location of the failed M.2 flash SSD. Failed SSDs are identified with a corresponding amber LED that is lit on the flash riser board.
    - If the SSD fault LED is off, then the SSD is operating properly.

- If the SSD fault LED is on (amber), then the SSD is failed and must be replaced.

The amber SSD fault LED indicator [1] and green Power LED indicator [2] are illuminated only when power is applied to the system. The green Power LED indicator is extinguished when you open the riser board socket levers.



- b. Note the location of the failed M.2 flash SSD. Note the faulty SSD location, before replacing the cover, if removing system power for cold service.
3. Remove a flash riser board from the server.
4. Place the riser board on an antistatic mat.
5. Remove the M.2 flash SSD in socket SSD from the riser board.
  - a. Using your fingers, push the plastic retainer clip through the flash riser board to release the M.2 flash SSD from the riser board [1].



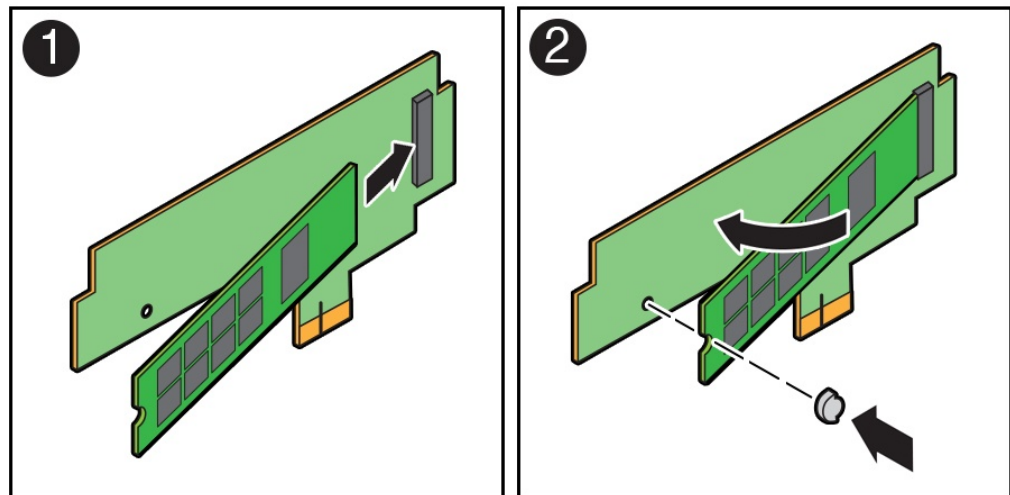
- b. Remove the plastic retainer clip from the M.2 flash SSD [1].
- c. Lift up on the end of the M.2 flash SSD where the plastic retainer clip was removed by one-half to one inch [2].
- d. Gently slide the M.2 flash SSD card back and out of the connector to disengage the SSD contacts from the riser board socket [2].

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

### Install

In the standard Oracle Communications Server E6-2L configuration, the flash riser board contains an M.2 flash SSD in a socket.

1. Unpack the replacement M.2 flash SSD and place it on an antistatic mat.
2. Install the M.2 flash SSD into socket SSD on the flash riser board.
  - a. Align and then insert the plastic retainer clip into the slot on the M.2 flash SSD [1].
  - 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 riser board, and the other end is adjacent to the riser SSD socket [1].



- c. Gently slide the M.2 flash SSD forward and into the connector to engage the flash SSD contacts with the riser board 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 riser board [2]. You hear an audible click when the M.2 flash SSD is secured to the flash riser board.
3. Perform the steps to install the M.2 flash riser board with the replacement flash SSD into the server. See "Install a Flash Riser Board".
4. Return the server to operation.
  - a. Install the server top cover. See "Install the Server Top Cover".
  - b. Return the server to the normal rack position. See "Return the Server to the Normal Rack Position".

# 8

## Replace the Air Baffle

This section describes how to service the air baffle.

You must power off the server before servicing the air baffle. The air baffle must be in place during system operation. Remove the air baffle to lift the Motherboard and access the motherboard handle. For more information about replaceable components, see Illustrated Parts Breakdown and Replaceable Components.

### **Caution**

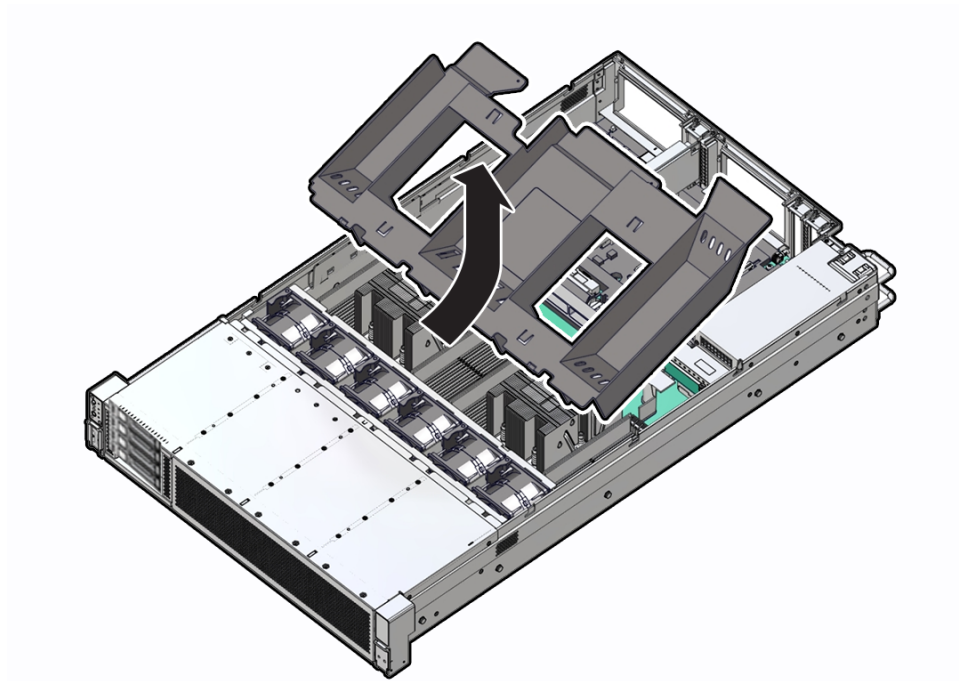
To prevent the system from overheating, ensure that the air baffle is correctly installed before powering on the system.

### **Caution**

You must disconnect all power cables from the system before performing these procedures.

### Remove

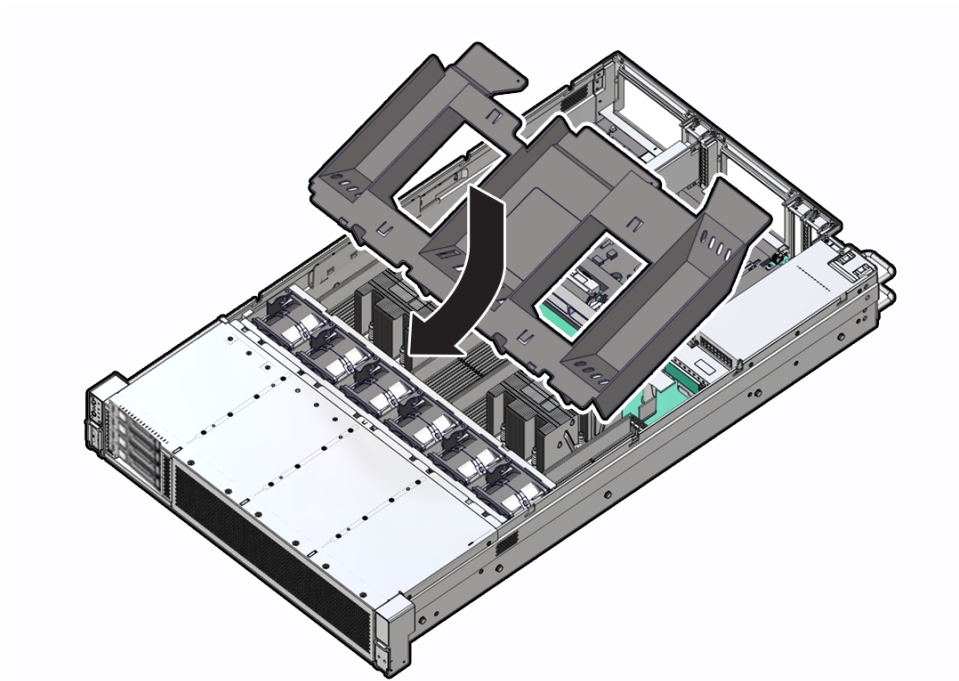
1. Prepare the server for service.
  - a. Power off the server. See "Power Down the Server".
  - b. Disconnect the power cords from the power supplies. See "Disconnect Cables From the Server".
  - c. Extend the server into the maintenance position. See "Extend the Server to the Maintenance Position".
  - d. Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis. See "Take Antistatic Measures".
  - e. Remove the server top cover. See "Remove the Server Top Cover".
2. Remove the air baffle by lifting the baffle up and out of the server. Lift up the air baffle in the rear at a 50 degree angle, and slide slightly rearward to clear the air baffle tabs that prevent the front of the baffle from lifting up.



3. Set aside the air baffle.
4. Consider your next step:
  - If you removed the air baffle as part of another procedure, return to that procedure.
  - Otherwise, continue to Install the Air Baffle.

### Install

1. Install the air baffle by placing it into the server and lowering it to its inserted position. To install the air baffle, the baffle must fit around the processor heatsinks, then lifted up about 50 degrees. Locate the tabs on the air baffle so that one tab on each side is under the lip of the fan tray, and the others are on top of the fan tray.



2. Consider your next step:
  - If you removed the air baffle as part of another procedure, return to that procedure.
  - Otherwise, continue to with this procedure.
3. Return the server to operation:
  - a. Install the server top cover. See [Install the Server Top Cover](#).
  - b. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
  - c. Reconnect the power cords and data cables to the server. See [Reconnect Power and Data Cables](#).
  - d. Power on the server. See [Power On the Server](#).
  - e. Verify that the power supply AC OK LED is lit.

# 9

## Replace DIMMs

This section describes how to service dual in-line memory modules (DIMMs).

DIMMs are replaceable components that require you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*. The topics and procedures in this section provide information to assist you when replacing a DIMM or upgrading DIMMs.

### **Caution**

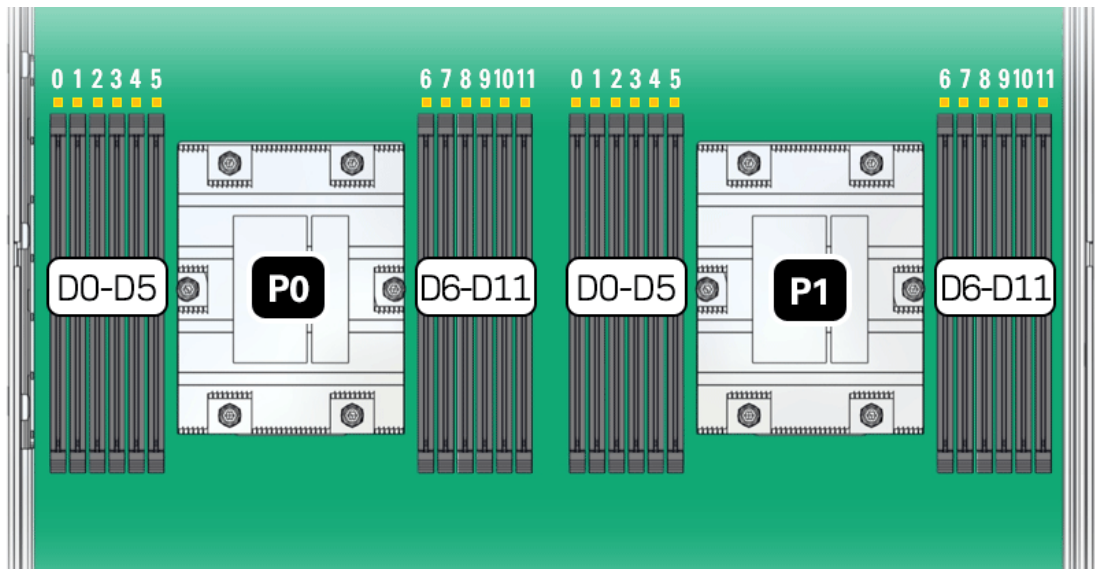
These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in *Electrostatic Discharge Safety*.

### **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.

### 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 (D0-D11), six on each processor side. Each DIMM slot supports a single memory channel, for total of twelve DDR5 memory channels per processor (0-11).

**Table 9-1 Memory Channels and DIMM Slots for P0 and P1**

Memory Channel	DIMM Slot
0	D3
1	D1
2	D0
3	D5
4	D4
5	D2
6	D8
7	D10
8	D11
9	D6
10	D7
11	D9

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

### 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, and 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, do not change the DIMM configuration.

- You purchased new DIMMs and want to use them to upgrade the server memory.

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

### DIMM Population Rules

The population rules for adding DIMMs to Oracle Communications Server E6-2L are as follows:

- The server supports:
  - Up to 24 DDR5 DIMMs, 12 per processor socket.
  - 32 GB, 64 GB, 96 GB, and 128 GB dual-rank (DR) Registered DIMMs (RDIMMS).
  - Up to 3 TB memory when populating the 24 DIMM slots with 128-GB DIMMs.
  - 1 DIMM per channel (1DPC). Each DIMM channel is composed of a black slot.
  - A maximum supported memory speed of 6400 MT/s.

However, the maximum attainable memory speed could be limited by the maximum speed supported by a specific processor or DIMM. All memory installed in the system operates at the same speed, or frequency.

- Populate all 12 memory DIMMs per processor to achieve the highest system performance. If populating 12 memory DIMMs per processor is not feasible, populate each processor with 1, 2, 4, 6, 8, or 10 DIMMs.
- Populate each memory channel with the same capacity and number of banks.
- Populate processor 0 (P0) and processor 1 (P1) using the same DIMM configuration. Failure to do so will result in lower system performance.
- The server operates properly with a minimum of one DIMM installed per processor. Install one DIMM in slot D5 on each processor.
- Each DIMM is shipped with a label identifying its rank classification (dual or quad). The following identifies the label corresponding to the supported DIMM rank classification:  
Dual-rank RDIMM 2Rx4
- Do not mix DIMM sizes in a server even if they are the same type. For example, you cannot mix 96 GB RDIMMs with 64 GB RDIMMs on the same server.
- Do not mix DIMM types in a server. Load-Reduced (LRDIMMs) are not supported.
- Do not mix DIMM module types within a memory channel. All DIMM module types must be RDIMM module types, with the same ECC configuration.
- Do not mix x4 and x8 DIMMs within a memory channel.
- The server does not support lockstep memory mode, which is also known as double device data correction, or Extended ECC.
- Populate the DIMM slots in the order described in the following sections, which provide an example of how to populate the DIMM slots to achieve optimal system performance.

**Populate 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:

- Populate DIMMs of the same size in multiples of twelve (six for each processor).
- The DIMM population for each processor (P0 and P1) must be identical.
- DIMM channels per processor are arranged from left to right (as you face the front of the system) in the following order: Copy

F E D C B A G H I J K L

**Table 9-2 Table 9-2 DIMM Memory Slot Population Requirements**

DIMMs per CPU	Channel Population Order	DIMM Memory Slots CPU-0/1
	Memory Channel:	F E D C B A G H I J K L
12 DIMMs per CPU	Number Installed	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 X X X X X X X X X X X X

**Table 9-2 (Cont.) Table 9-2 DIMM Memory Slot Population Requirements**

DIMMs per CPU	Channel Population Order	DIMM Memory Slots CPU-0/1
10 DIMMs per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E X X X X X X X X X X E
8 DIMMs per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E X E X X X X X X E X E
6 DIMMs per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E E E X X X X X X E E E
4 DIMMs per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E E E X E X X E X E E E
2 DIMMs per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E E E E E X X E E E E E
1 DIMM per CPU	NumberInstalled	D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 E E E E E X E E E E E E

AMD only tests and validates the population ordering documented. Other populations may work but are NOT supported.

#### Dual or single processor requirements:

- Populate DIMMs in Dual-Processor Systems for Optimal System Performance
- Populate DIMMs in Single-Processor Systems for Optimal System Performance

#### Populate DIMMs in Dual-Processor Systems for Optimal System Performance

In dual-processor systems, install DIMMs into DIMM slots starting with processor 0 (P0) D5, alternating between slots associated with processor 0 (P0) and matching slots for processor 1 (P1).

The following list describes the order in which to install DIMMs in a dual-processor system, which correspond to DIMM slot labels D0 through D11.

DIMM population order on dual-processor systems

1. P0/D5
2. P1/D5

3. P0/D6
4. P1/D6
5. P0/D3
6. P1/D3
7. P0/D8
8. P1/D8
9. P0/D4
10. P1/D4
11. P0/D7
12. P1/D7
13. P0/D1
14. P1/D1
15. P0/D10
16. P1/D10
17. P0/D2
18. P1/D2
19. P0/D9
20. P1/D9
21. P0/D0
22. P1/D0
23. P0/D11
24. P1/D11

### **Populate DIMMs in Single-Processor Systems for Optimal System Performance**

In single-processor systems, install DIMMs only into DIMM slots associated with processor 0 (P0).

The following list describes the order in which to populate DIMMs in a single-processor system, which correspond to DIMM slot labels D0 through D11.

DIMM population order on single-processor systems

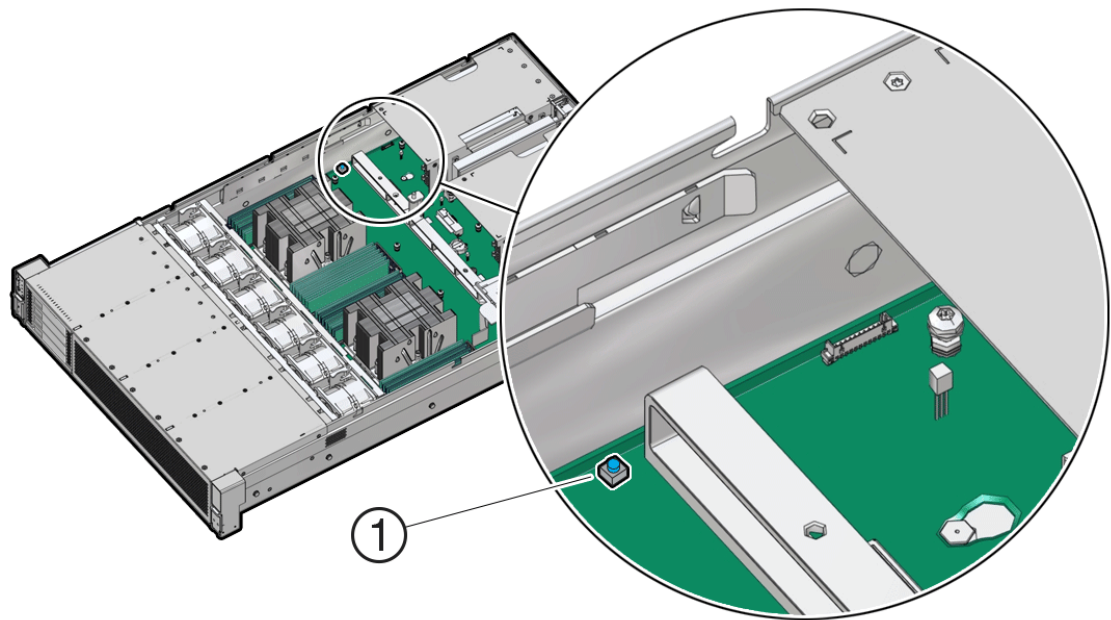
1. P0/D5
2. P0/D6
3. P0/D3
4. P0/D8
5. P0/D4
6. P0/D7
7. P0/D1
8. P0/D10
9. P0/D2

10. P0/D9
11. P0/D0
12. P0/D11

### Use the Server Fault Remind Button

When you press the server Fault Remind button [1], an LED located next to the Fault Remind button lights green which indicates 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 is removed from the server for more than 15 minutes.

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



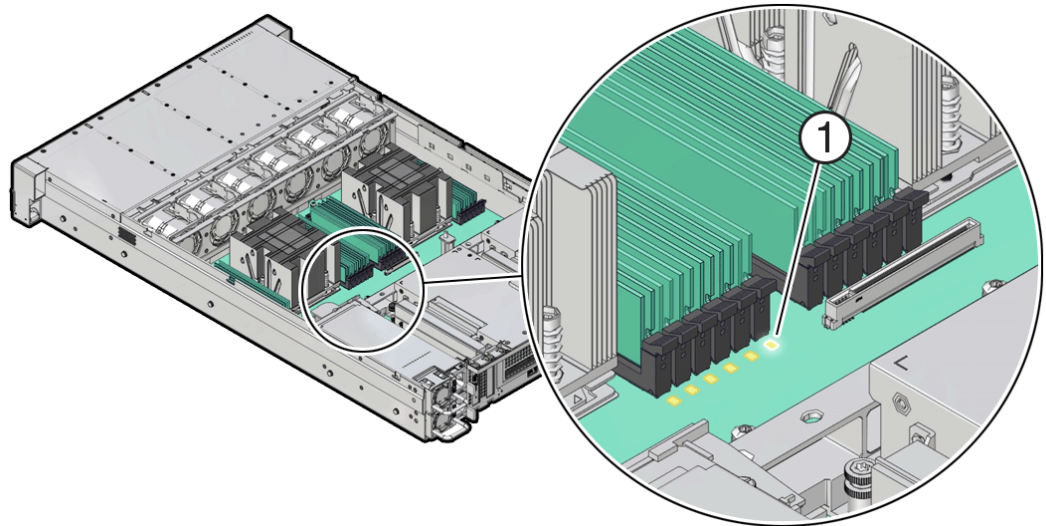
### Replace a DIMM

#### Identify and Remove

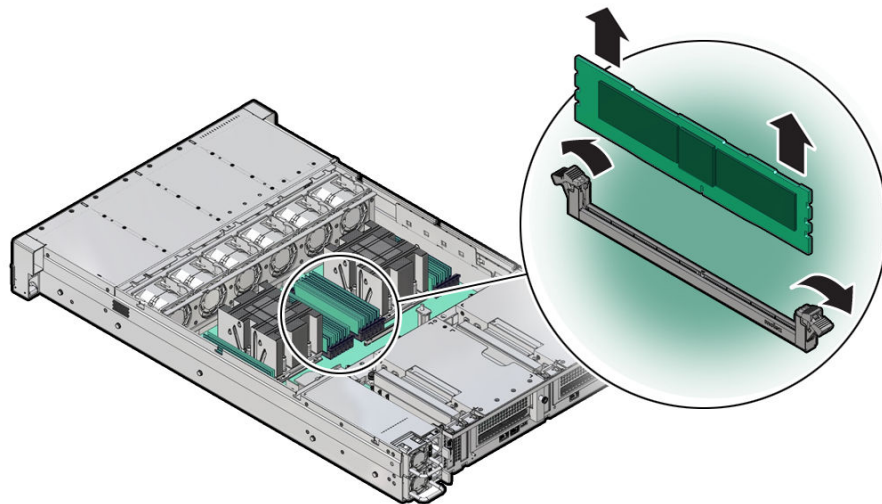
1. Prepare the server for service.
  - a. Power off the server. See "Power Down the Server".
  - b. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
  - c. Extend the server into the maintenance position. See Extend the Server to the Maintenance Position.
  - d. Attach an antistatic wrist strap to your wrist and then to a metal area on the chassis. See Take Antistatic Measures.
  - e. Remove the server top cover. See Remove the Server Top Cover.
  - f. Remove the air baffle. See Remove the Air Baffle.
2. Identify and note the location of the failed DIMM by pressing the Fault Remind button on the motherboard. See Use the Server Fault Remind Button.

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 must be replaced [1].



3. To remove the failed DIMM, do the following:
  - a. Rotate both DIMM slot ejectors outward as far as they go. The DIMM is partially ejected from the slot.
  - b. Carefully lift the DIMM straight up to remove it from the slot.



4. Replace each failed DIMM with either another DIMM of the same rank size (quad-rank or dual-rank) or leave the slot empty. For DIMM replacement instructions, see [Install a DIMM](#).

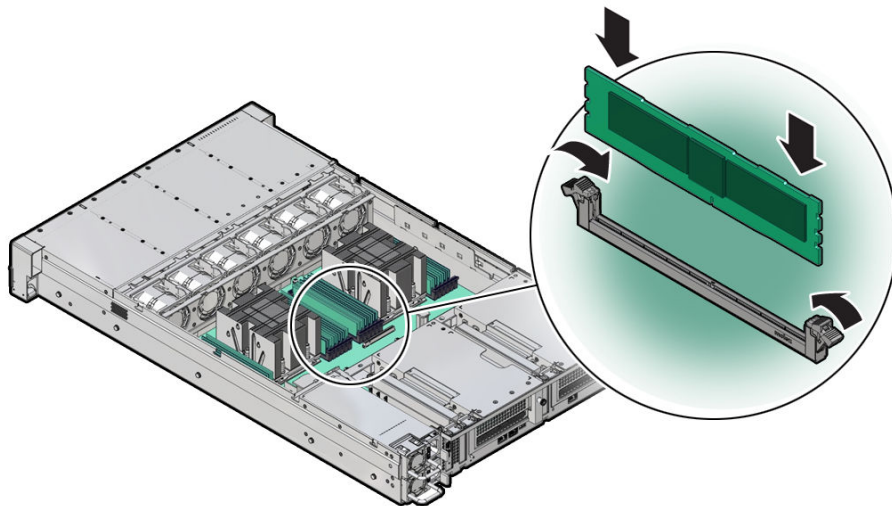
### Install

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

2. Ensure that the replacement DIMM matches the size, type, and rank of the DIMM it is replacing.  
See DIMM Population Rules and Populate DIMMs for Optimal System Performance.
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.

**⚠ Caution**

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 air baffle. See Install the Air Baffle.
  - b. Install the server top cover. See Install the Server Top Cover.
  - c. Return the server to the normal rack position. See Return the Server to the Normal Rack Position.
  - d. Reconnect the power cords and data cables to the server. See Reconnect Power and Data Cables.
  - e. Power on the server. See Power On the Server.
  - f. 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 [Oracle ILOM Documentation](#).

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 in the current slot location, causing a false DIMM fault condition.

# 10

## Replace the Battery

This section describes how to service the system battery.

The system battery is a replaceable component that requires you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

The real-time clock (RTC) battery maintains system time when the server is powered off and a time server is unavailable. If the server does not maintain the correct 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*.

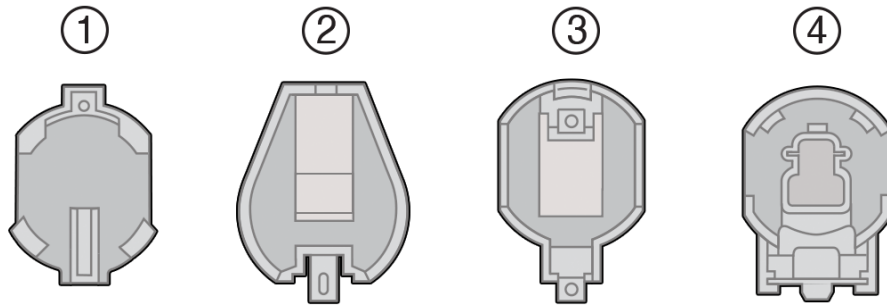
### **Caution**

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.

### **Remove**

Battery holder types may vary.

1. Prepare the server for service.
  - a. Power off the server. See *Power Down the Server*.
  - b. Disconnect the power cords from the power supplies. See *Disconnect Cables From the Server*.
  - c. Extend the server into the maintenance position. See *Extend the Server to the Maintenance Position*.
  - d. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See *Take Antistatic Measures*.
  - e. Remove the server top cover. See *Remove the Server Top Cover*.
2. Locate the battery and RTC battery retainer on the server motherboard. Coin battery retainer types that are mounted in the RTC battery motherboard location may be different.
3. Remove the battery from the battery holder. Review the following battery holder (Part number: 8210501) options.



Callout	Description
1	796136-1 Top-Load Battery Connector (TE)
2	1093TR Top-Load Battery Connector
3	1070TR Top-Load Battery Connector
4	S8421 Top-Load Battery Connector

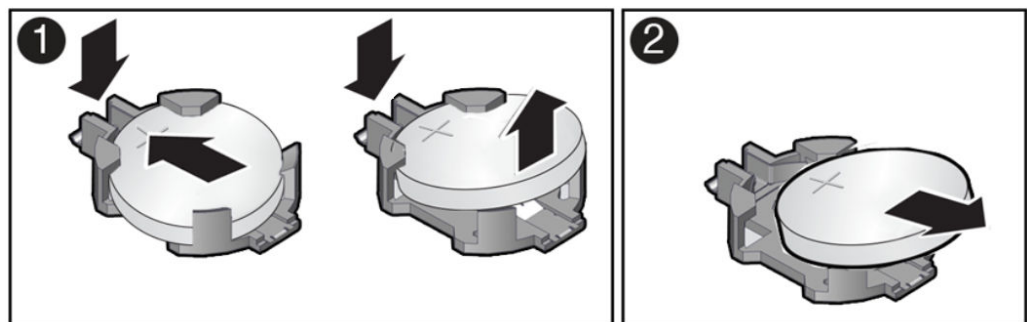
Do one of the following detailed instructions for the type of RTC battery retainer on the server motherboard.

- [1] Remove the battery from the TE Top-Load Battery Connector as follows. Each connector consists of a housing with a positive contact and a negative contact. The floor of the housing is embossed with a + to designate the positive contact. The connector features four lips for positive retention of the battery.
  - Grasp connector. Support the connector by grasping the "positive" end of the connector.

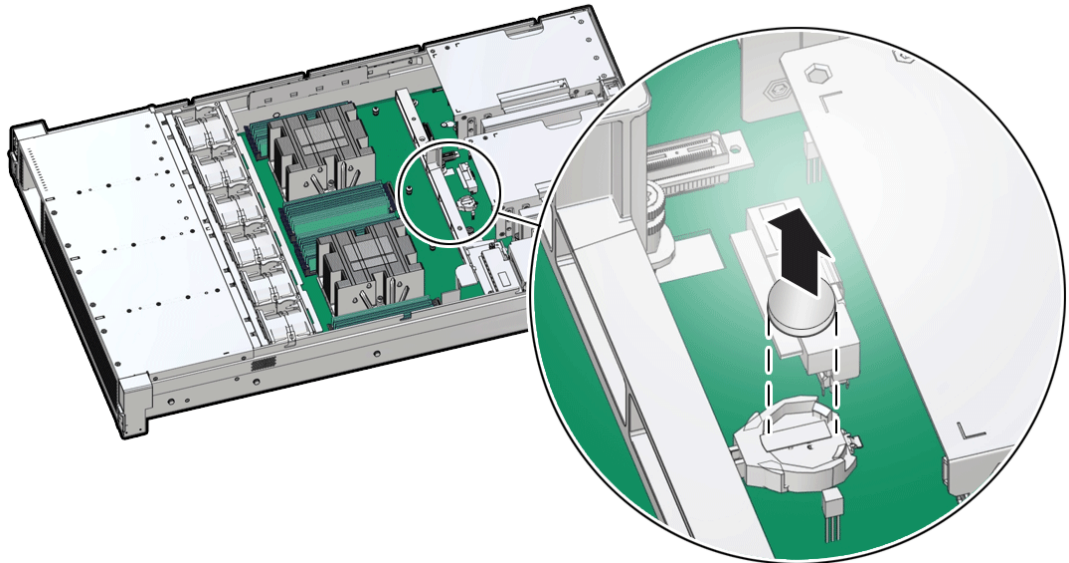
**⚠ Caution**

The connector must be supported, otherwise damage to the soldered contacts could occur.

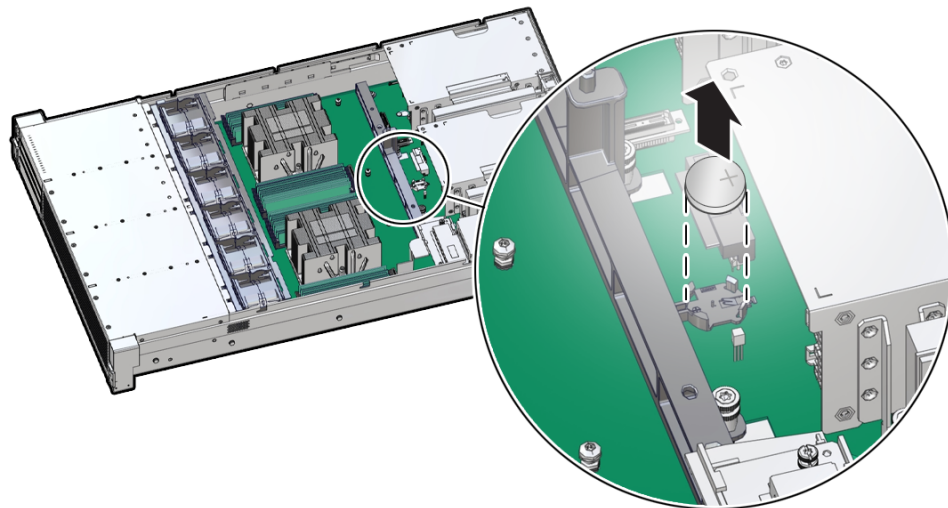
- Slide battery under lips at positive end of connector. While supporting the connector, simultaneously push the battery toward the positive end of the connector, and slightly move the lips at the negative end of the connector away from the battery. Hold in this position, and lift the battery.
- Pull the battery from the connector.



- [2] Remove the battery from the 1093TR battery connector as follows. Push the coin battery towards the negative spring and then lift up the coin battery to dislodge it from its holder.



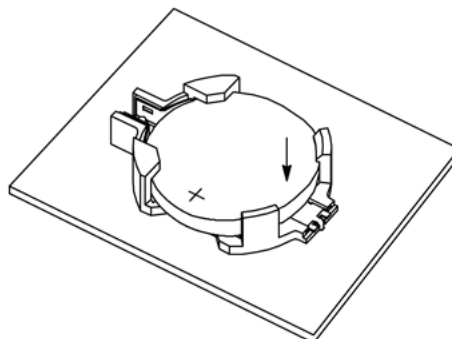
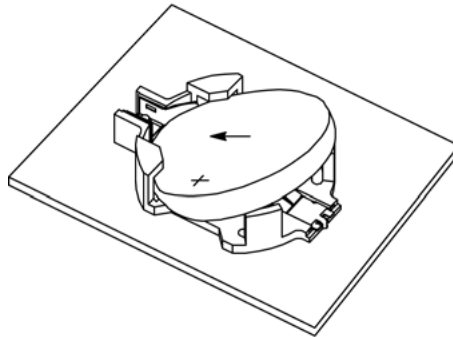
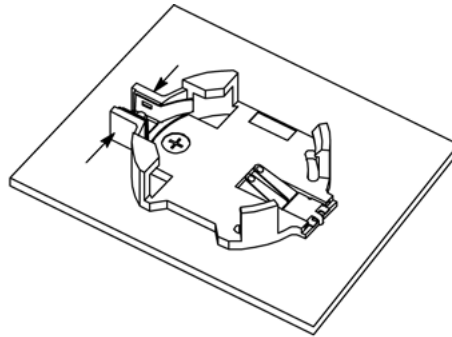
- [3] [4] Remove the battery from other Top-Load Battery Connectors as follows.
  1. To dislodge the battery from the retainer, place your finger under the side of the battery nearest the rear of the server [1].
  2. Gently lift the battery up and out of the retainer [2].



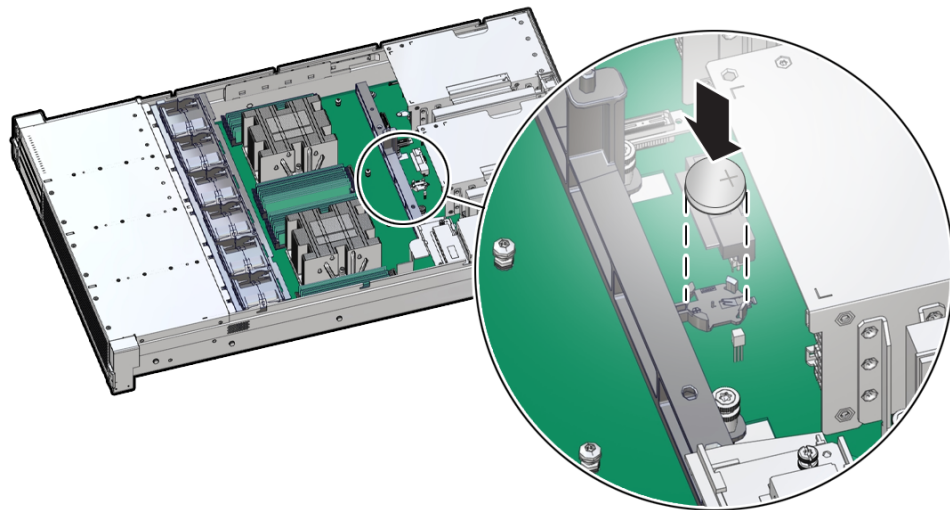
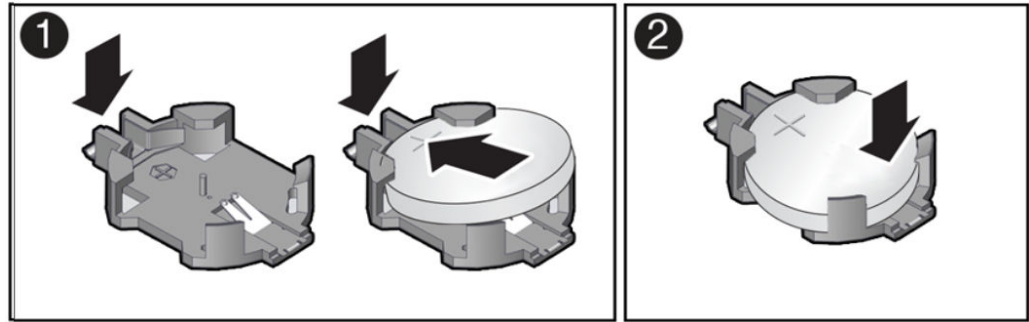
### Install

1. Unpack the replacement RTC battery.
2. Press the new battery into the battery retainer.

- Install the battery into the Top-Load Battery Connector as follows: Each connector consists of a housing with a positive contact and a negative contact. The floor of the housing is embossed with a + to designate the positive contact. The connector features four lips for positive retention of the battery.
  - a. Grasp connector. Support the connector by grasping the positive end of the connector. **Caution**
    - i. The connector must be supported, otherwise damage to the soldered contacts could occur.
  - b. Slide battery under lips at positive end of connector. While supporting the connector, hold the battery at an angle with the positive side facing up, and slide the battery under the lips at the positive end of the connector. Positive side of battery is marked with a '+’.
  - c. Fully seat battery onto housing floor. Gently push the battery onto the floor of the housing until the battery is fully seated. There should be an audible “snap.” Insert the battery so that the positive (+) side is facing up.



- Press the new battery into the battery retainer with the positive side (+) facing up.



3. Return the server to operation.
  - a. Install the server top cover. See [Install the Server Top Cover](#).
  - b. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
  - c. Reconnect the power cords to the server power supplies, and power on the server. See [Reconnect Power and Data Cables and Power On the Server](#).
  - d. Verify that the System OK LED indicator is lit. If the service processor is configured to synchronize with a network time server using the Network Time Protocol (NTP), the Oracle ILOM SP clock is 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, you must do one of the following:
  - Reset the Oracle ILOM clock using Oracle ILOM CLI or web interface. Refer to [Oracle ILOM Documentation](#).
  - Use the BIOS Setup Utility to reprogram the host clock. See [BIOS Setup Utility Menus](#).

# 11

## Replace PCIe Cards

This section describes how to service PCIe cards and PCIe Risers.

PCIe cards and PCIe risers are replaceable components that require you to power off the server before servicing.

For more information about replaceable components, see Illustrated Parts Breakdown and Replaceable Components. For complete software and cabling information about your card, refer to your PCIe card documentation. For a complete list of supported PCIe cards, see [About Oracle Communications Server E6-2L](#).

### **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.

### **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.

### PCIe Slot Locations

The server is designed to support both full height and low profile PCIe cards. Using PCIe risers, the full height PCI slot configuration supports up to 4 full height and 2 half height PCIe cards. The 9-slot PCIe half height configuration supports up to 9 half height PCIe cards. See Back Panel Components for PCIe slot numbering and supported PCIe configurations.

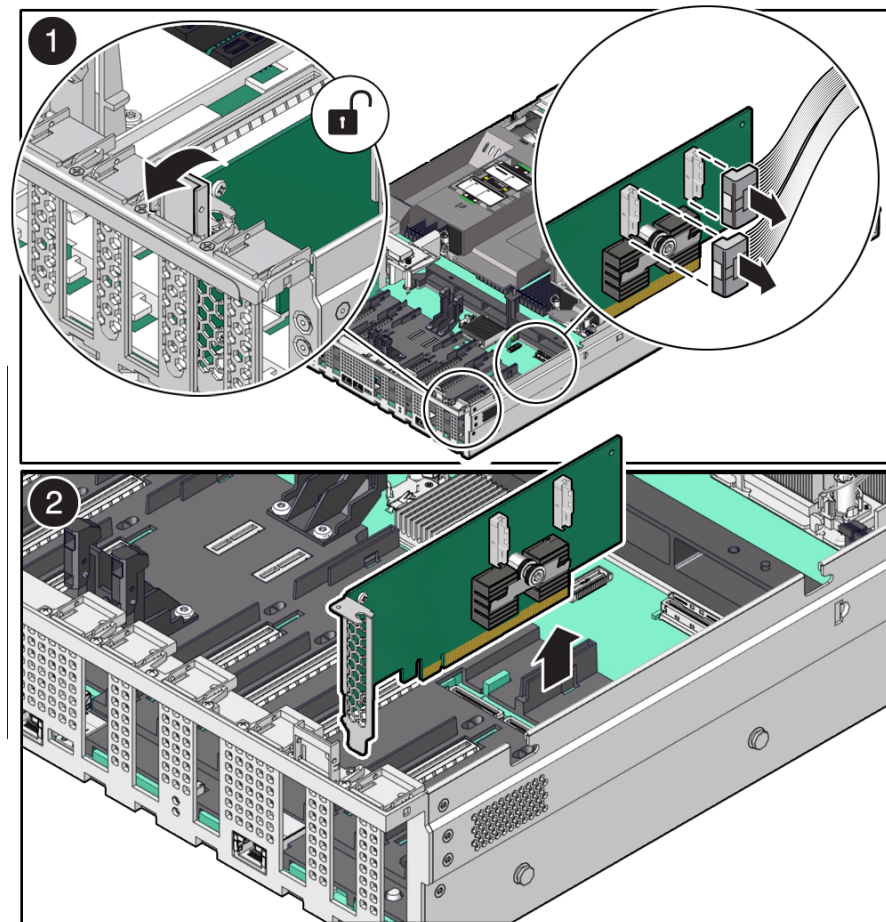
- All card slots support Half Height, Half Length (HHHL) PCIe cards (Low profile short) at PCIe Gen4 or Gen5.
- Four riser card slots support Full Height, Full Length (FHFL) PCIe cards at PCIe Gen5.
- All PCIe card slots are 75W capable slots. All of the PCIe slots comply with the PCI Express 5.0 specification and can accommodate 75 Watt PCIe cards.
- All PCIe card slots support persistent power.
- All Add-in-Card (AIC) slots support Hot-Plug.
- PCIe card slots 1 through 4 are nonfunctional in single-processor systems.
- The Full Height card chassis configuration uses two PCIe riser cards supporting two Full height 10.5 inch double width GPU cards at x16 PCIe Gen4.
- PCIe Gen5 card slots can be up to four x16 PCIe slots, or up to six x8 PCIe slots, depending upon the PCIe card slots 6 and 7 motherboard cabling option.

## Half Height PCIe Card

### Remove

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

1. Prepare the server for service.
  - a. Power off the server. See [Power Down the Server](#).
  - b. Disconnect the power cords from the power supplies. See [Disconnect Cables From the Server](#).
  - c. Extend the server to the maintenance position. See [Extend the Server to the Maintenance Position](#).
  - d. Attach an antistatic wrist strap. See [Take Antistatic Measures](#).
  - e. Remove the server top cover. See [Remove the Server Top Cover](#).
2. Locate the PCIe card that you want to remove. PCIe slots 1 through 4 are nonfunctional in single-processor systems. See [Back Panel Components](#).
3. If necessary, record where the PCIe cards are installed.
4. Unplug all data cables from the PCIe card [1]. Note the cable connections so that it's easier to properly reconnect the cables.  
If it is difficult to disconnect the cables from the PCIe card when the card is inserted into the PCIe slot, consider performing the procedure in [Step 5](#) before completing this step.
5. Rotate the PCIe card locking mechanism in to an upright position [1], and then lift up on the PCIe card to disengage it from the motherboard connectors [2].



6. Place the PCIe card on an antistatic mat.

**⚠ Caution**

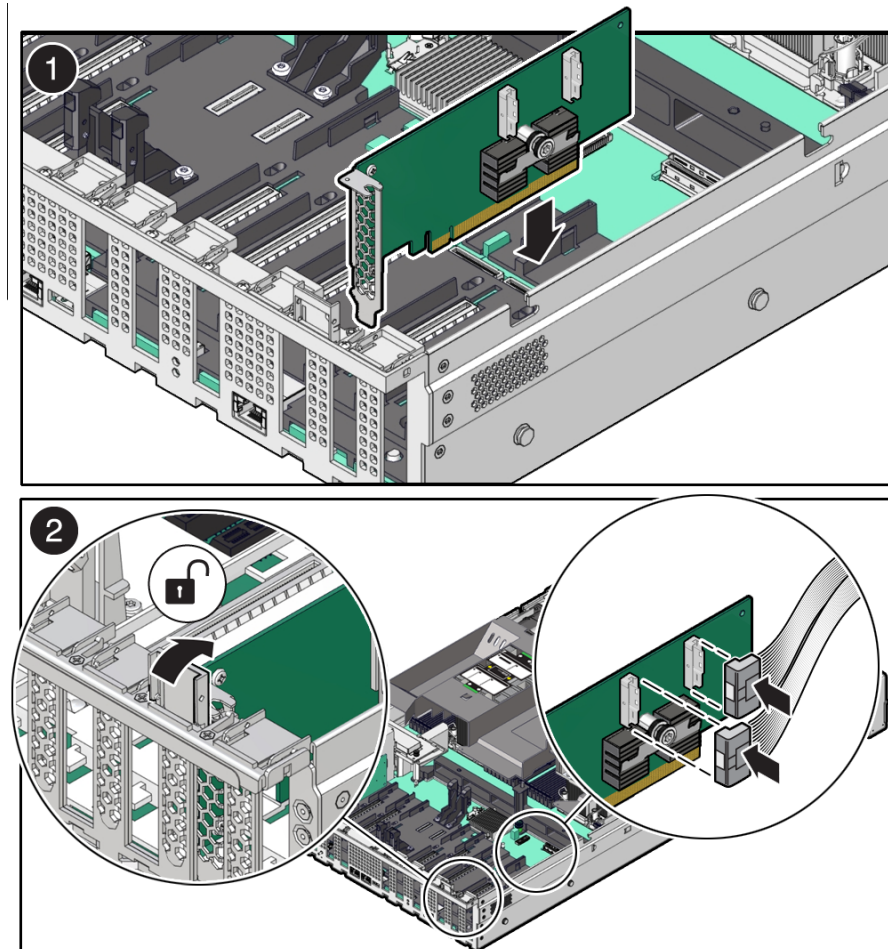
If you are not immediately inserting a replacement PCIe card into the empty slot, insert a PCIe filler panel in the slot to reduce the possibility of radiated electromagnetic interference (EMI). See [Remove and Install Filler Panels](#).

### Install

If you are installing an x16 PCIe card in slot 6, you must install the motherboard PCIe Flyover cable in to slot 6 to enable support for a PCIe x16 electrical interface; otherwise, slot 6 supports only a PCIe x8 electrical interface. If you are installing a PCIe card in slot 7, you must install the motherboard PCIe Flyover cable in slot 7 to support a PCIe x8 electrical interface; otherwise, PCIe slot 7 is non-functional. See [Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces](#).

1. Unpack the replacement PCIe card, and place it on an antistatic mat. Before replacing or installing a PCIe card, refer to the card documentation for specific installation and cabling instructions.
2. Locate the proper PCIe slot for the card you are replacing. PCIe slots 1 through 4 are nonfunctional in single-processor systems. See [Back Panel Components](#).

3. If necessary, remove the PCIe filler panel from the slot.  
Save this filler panel in case you need to remove the PCIe card from the system.
4. Insert the PCIe card into the correct slot [1], and rotate the PCIe locking mechanism downward to secure the PCIe card in place [2]. You hear an audible click when the PCIe card is secured into the slot.  
If it is difficult to reconnect the cables to the PCIe card when the card is inserted into the PCIe slot, consider performing the procedure in Step 5 before completing this step.



5. Reconnect the cables to the PCIe card that you unplugged during the removal procedure [2].  
To ensure proper SAS cable connections to the Broadcom 9500-16i, 12GB SAS PCIe, 16 Port, Internal card, see the SAS cabling reference table in Step 3 in Install SAS Storage Drive Cables.
6. Return the server to operation.
  - a. Install the top cover. See Install the Server Top Cover.
  - b. Return the server to the normal rack position. See Return the Server to the Normal Rack Position.
  - c. Connect any required data cables to the PCIe card.(Optional) Route data cables through the Cable Management Arm (CMA).
  - d. Reconnect the power cords to the power supplies and power on the server. See Reconnect Power and Data Cables and Power On the Server.

- e. Verify that the System OK LED is lit.
7. Use Oracle ILOM to clear any server PCIe card faults. If a PCIe card fault message in Oracle ILOM is not cleared under Open Problems, you must manually clear the fault using Oracle ILOM. Refer to "Clear Faults for Undetected Replaced or Repaired Hardware Components" in the Oracle ILOM User's Guide for System Monitoring and Diagnostics at [Oracle ILOM Documentation](#).
8. To determine whether additional steps are required to complete the installation of the PCIe card, refer to the server product notes for the type of PCIe card you installed.

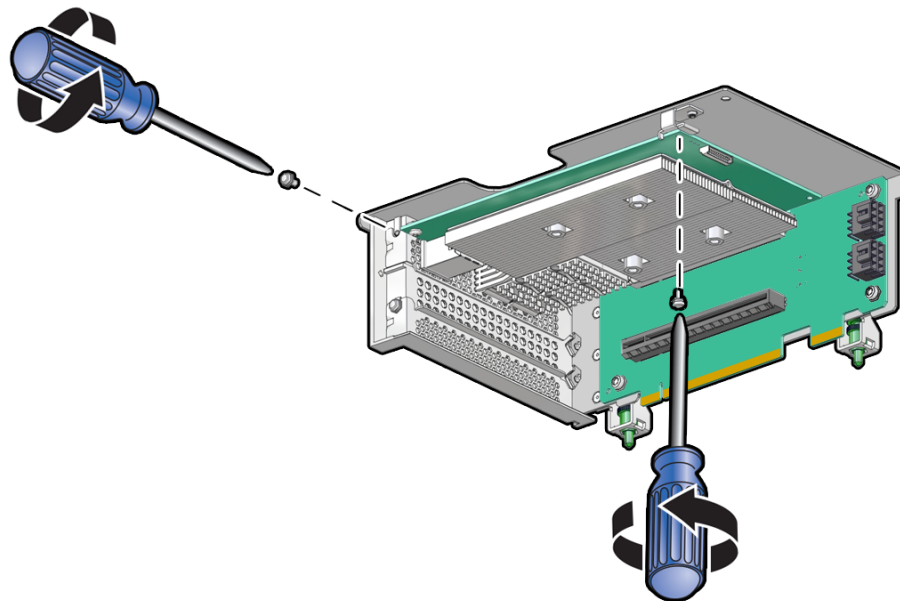
## Full Height PCIe Card

### Remove

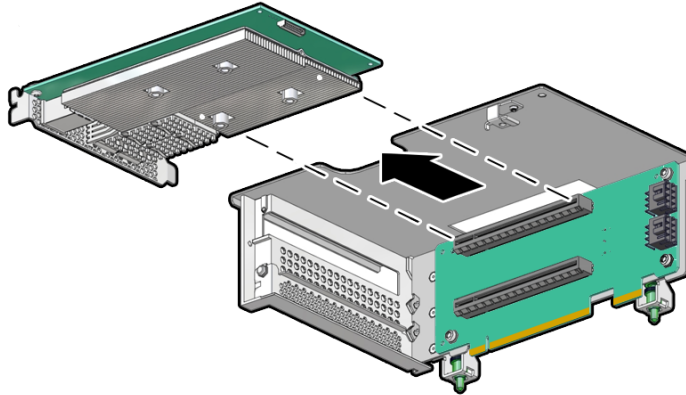
This task also applies to half-height PCIe cards that are being removed from PCIe Risers.

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

1. Locate the PCIe card that you want to remove, and if necessary, record the PCIe slot where the PCIe card is installed.  
PCIe slots 1 through 4 are nonfunctional in single-processor systems. See Back Panel Components.
2. Remove the PCIe Riser that contains the PCIe card you want to remove.  
See Remove a PCIe Riser.
3. Using a Torx (6 lobe) T10 screwdriver, remove the screw that secures the PCIe card bracket to the PCIe riser.



4. While holding the PCIe Riser in one hand, use your other hand to carefully pull the PCIe card connector out of the PCIe Riser slot.



5. If required, unplug any data cables from the PCIe card.  
Note the cable connections so that it's easier to properly reconnect the cables.
6. Place the PCIe card on an antistatic mat.

**⚠ Caution**

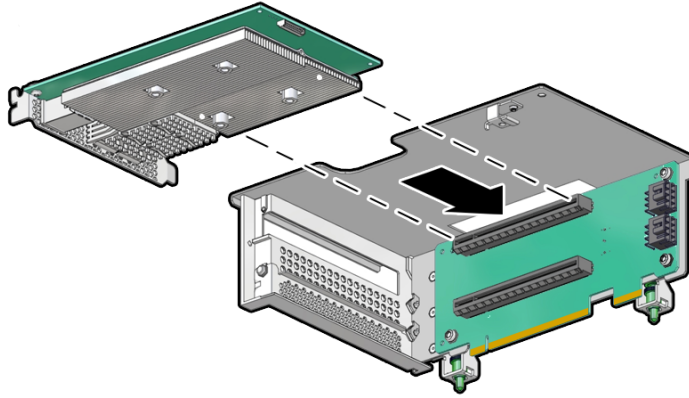
If you are not immediately inserting a replacement PCIe card into the empty slot, insert a PCIe filler panel in the slot to reduce the possibility of radiated electromagnetic interference (EMI). See [Remove and Install Filler Panels](#).

### Install

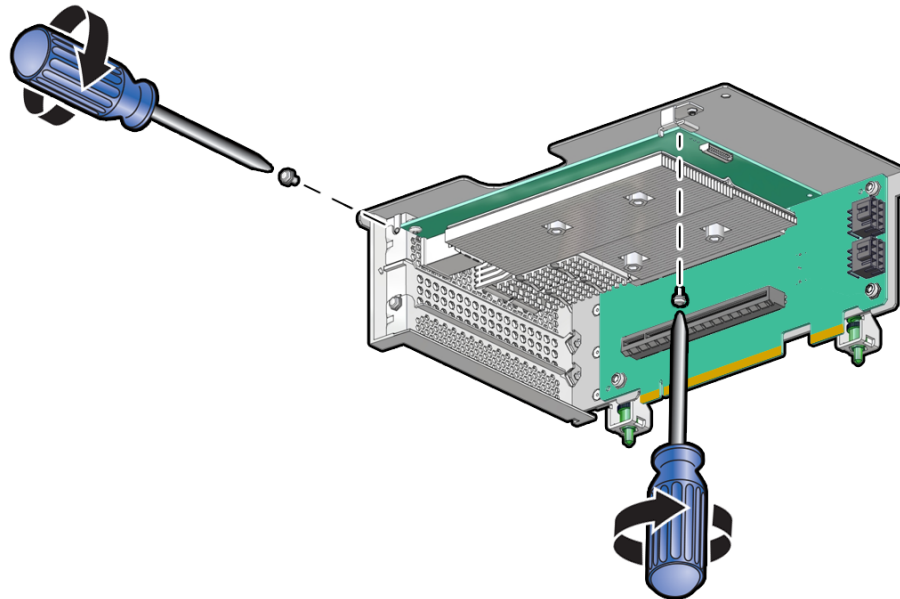
This task also applies to half-height PCIe cards that are being installed in PCIe Risers.

If you are installing a x16 PCIe card in Riser 6, you must install the motherboard PCIe Flyover cable in to slot 6 to enable support for a PCIe x16 electrical interface; otherwise, slot 6 supports only a PCIe x8 electrical interface. See ["Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces"](#).

1. Unpack the replacement PCIe card, and place it on an antistatic mat.
2. Locate the proper PCIe slot for the card you are replacing.  
PCIe slots 1 through 4 are nonfunctional in single-processor systems. See [Back Panel Components](#).
3. If necessary, remove the PCIe filler panel from the PCIe Riser slot.  
Save this filler panel in case you need to remove the PCIe card from the system.
4. While holding the PCIe Riser in one hand, use your other hand to insert the PCIe card into the correct slot on the PCIe Riser. You hear an audible click when the PCIe card is secured into the slot.



5. Using a Torx (6 lobe) T10 screwdriver, install and tighten the screw to 8 in-lb (0.9 Nm/9.2 kg-cm) that secures the PCIe card bracket to the PCIe Riser.



6. Reconnect the cables to the PCIe card that you unplugged during the removal procedure. If it is difficult to reconnect the cables to the PCIe card when the card is secured into the PCIe slot, consider performing this procedure prior to inserting the PCIe card in to the PCIe Riser slot.
7. Install the PCIe riser that contains the PCIe card. See [Install a PCIe Riser](#).

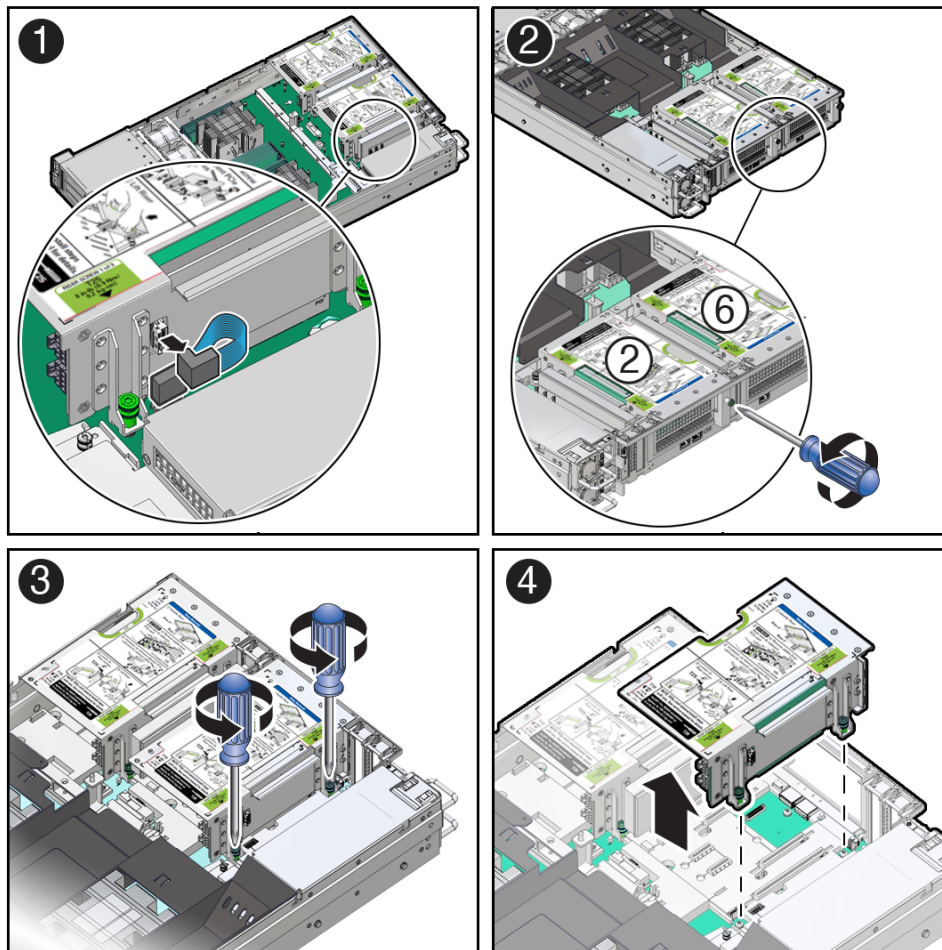
## PCIe Riser

### Remove

This task applies only to the back panel Riser configuration.

1. Prepare the server for service.

- a. Power off the server. See Power Down the Server.
  - b. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
  - c. Remove rear panel cables.  
See Full Height PCIe Configuration in Back Panel Components.
  - d. Using a Torx (6 lobe) T25 screwdriver, loosen the rear panel Riser(s) attaching screw [2].
  - e. Extend the server into the maintenance position. See Extend the Server to the Maintenance Position.
  - f. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis.  
See Take Antistatic Measures.
  - g. Remove the server top cover. See Remove the Server Top Cover.
2. Identify the proper back panel PCIe slot (Riser 2 or Riser 6) for the Riser you are replacing.  
See Full Height PCIe Configuration in Back Panel Components.
  3. Disconnect the data and power cables from the adjacent PCIe card in PCIe slot 1 or 5.  
Then remove the adjacent PCIe card.  
See Remove a Half Height PCIe Card.
  4. Disconnect the PCIe Riser signal cable from the side of the riser you are replacing [1].
  5. Using a Torx (6 lobe) T25 screwdriver, loosen one screw that secures the PCIe riser to the back panel [2].
  6. Using a Torx (6 lobe) T25 screwdriver, loosen the two screws that secure the PCIe riser to the motherboard [3].
  7. Lift the PCIe riser from the slot and place it on an antistatic mat [4].



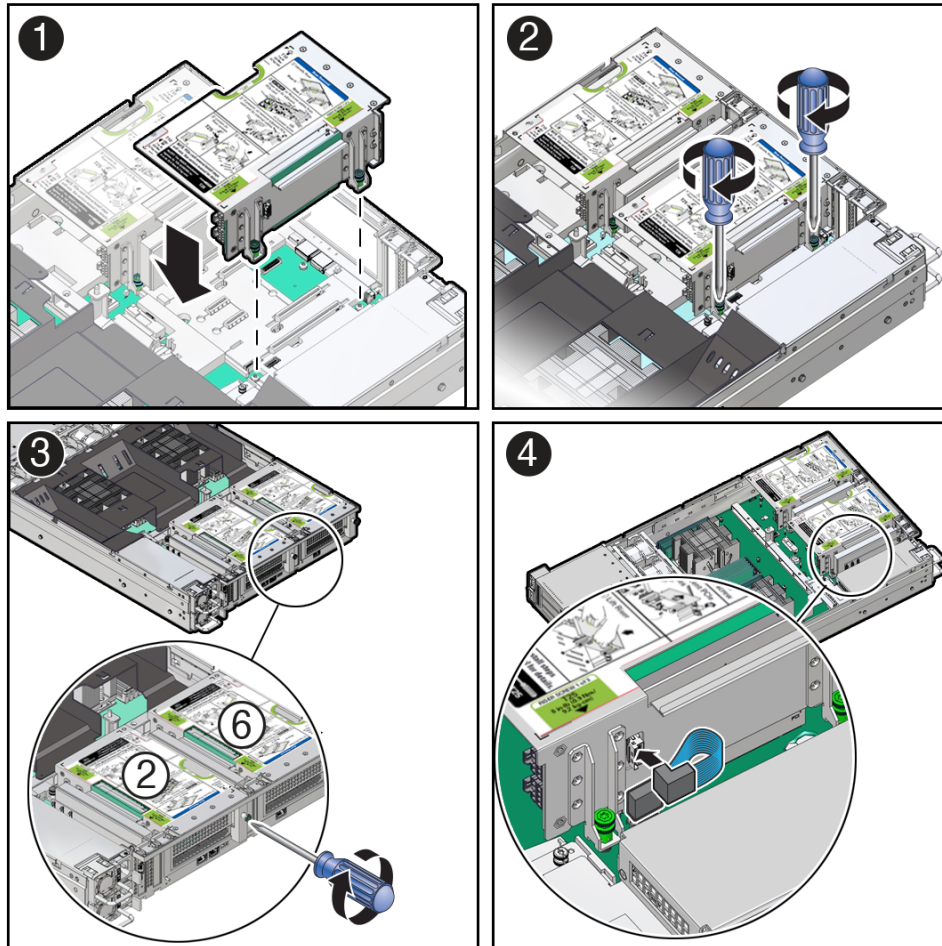
8. If required, remove the installed PCIe card from the Riser PCIe slot. Hold the Riser in one hand and use your other hand to carefully pull the PCIe card connector out of the PCIe riser slot. Leave the PCIe data and power cables attached to the PCIe card and place the PCIe card on an antistatic mat. You will need to install the PCIe card in the replacement PCIe riser.  
See also [Remove a Full Height PCIe Card](#) and [Remove a Half Height PCIe Card](#).

### Install

This task applies only to the back panel Riser configuration.

1. Unpack the replacement PCIe Riser, and place it on an antistatic mat.
2. Locate the proper PCIe slot (Riser 2 or Riser 6) for the Riser you are replacing. See [Back Panel Components](#).
3. If necessary, remove the PCIe filler panel from the PCIe slot on the PCIe riser. Save this filler panel in case you need to remove the PCIe Riser from the system.
4. While holding the PCIe riser, insert supported full height or half height PCIe cards into PCIe slots on the PCIe riser. See [Install a Full Height PCIe Card](#). See [Install a Half Height PCIe Card](#).
5. Reconnect the cables to the PCIe card that you unplugged during the removal procedure. If it is difficult to reconnect the cables to the PCIe card when the card is inserted into the PCIe slot, consider performing this procedure prior to inserting the PCIe card in to the PCIe Riser slot.

6. Using a Torx (6 lobe) T10 screwdriver, install and tighten the screw to 8 in-lb (0.9 Nm/9.2 kg-cm) that secures the PCIe card bracket to the PCIe riser.
7. Lower the PCIe riser in to the proper PCIe slot and press down until the riser is firmly seated in the PCIe connector [1].  
You hear an audible click when the PCIe card is secured into the slot.



8. Using a Torx (6 lobe) T25 screwdriver, tighten two captive screws to 8 in-lb (0.9 Nm/9.2 kg-cm) to secure the PCIe riser to the motherboard [2] and the rear panel of the server [3].
9. Reconnect the PCIe Riser signal cable between the motherboard and PCIe riser [4].
10. If required, reinstall the adjacent half height PCIe card that was removed from PCIe slot 1 or 5.
11. Return the server to operation.
  - a. Install the top cover.
  - b. Return the server to the normal rack position.
  - c. Connect any required data cables to the PCIe card. Route data cables through the Cable Management Arm.
  - d. Reconnect the power cords to the power supplies and power on the server.
  - e. Verify that the System OK LED is lit. See Server Status Indicator LEDs.
12. Use Oracle ILOM to clear any server PCIe card faults.

If a PCIe card fault message in Oracle ILOM is not cleared under Open Problems, you must manually clear the fault using Oracle ILOM. Refer to "Clear Faults for Undetected Replaced or Repaired Hardware Components" in the Oracle ILOM User's Guide for System Monitoring and Diagnostics at Oracle ILOM Documentation.

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

### Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces

Using the PCIe Flyover cable, server PCIe slots 6 and 7 can be configured to support either a PCIe x16 (slot 6) or PCIe x8 (slot 7) electrical interface. PCIe slot 6 supports a PCIe x8 electrical interface and PCIe slot 7 is non-functional when the PCIe Flyover PCIe cable is not installed in the server. Installing the cable in slot 6 configures the slot as a PCIe x16 electrical interface. Installing the cable in slot 7 configures the slot as a PCIe x8 electrical interface.

The PCIe Flyover cable is factory installed in either PCIe slot 6 or slot 7. You must switch the cable to the desired PCIe slot prior to installing a PCIe card or PCIe Riser 6.

1. Determine where you want to install the PCIe card or Riser.  
Rules For Configuring PCIe Slots 6 and 7:
  - If you are installing an x16 PCIe card in slot 6, you must install the PCIe Flyover cable in to slot 6 to enable support for a PCIe x16 electrical interface; otherwise, slot 6 supports only a PCIe x8 electrical interface.
  - If you are installing a PCIe card in slot 7, you must install the PCIe Flyover cable in slot 7 to support a PCIe x8 electrical interface; otherwise, PCIe slot 7 is non-functional.
  - If you are installing Riser 6 and it contains a PCIe x16 card, you must install the PCIe Flyover cable in to slot 6 to enable a PCIe x16 electrical interface for the Riser; otherwise, slot 6 supports only a PCIe x8 electrical interface.
2. Perform one of the following.
  - Connect the PCIe Flyover cable between the motherboard connector and PCIe slot 6.
  - Connect the PCIe Flyover cable between the motherboard connector and PCIe slot 7.
3. Press and hold the button on the connector to disengage the locking mechanism, then gently pull the connector from the motherboard [1].



Callout	Description
1	PCIe Flyover cable
2	PCIe slot 7 electrical interface connector
3	PCIe slot 6 electrical interface connector

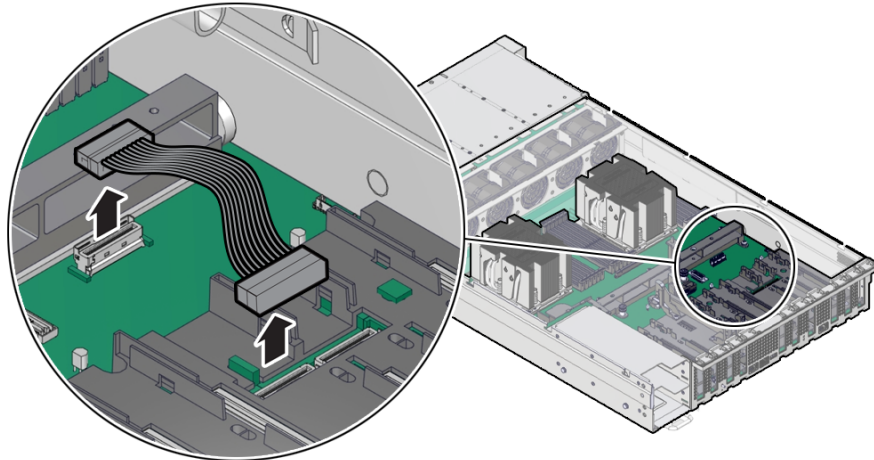
4. Install the connector in the desired slot and press down on the connector until it is fully seated in the slot [2].
5. Continue by installing the PCIe card or Riser 6.

### Remove

Before removing the PCIe Flyover cable, review the rules for configuring the PCIe electrical interfaces. See [Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces](#).

1. Prepare the server for service.
  - a. Power off the server. See [Power Down the Server](#).
  - b. Disconnect the power cords from the power supplies. See [Disconnect Cables From the Server](#).
  - c. Extend the server to the maintenance position. See [Extend the Server to the Maintenance Position](#).
  - d. Attach an antistatic wrist strap. See [Take Antistatic Measures](#).

- e. Remove the server top cover. See Remove the Server Top Cover.
2. Locate the PCIe Flyover cable in the server.  
The PCIe Flyover cable is installed on the rear left side of the system, between the motherboard handle and behind PCIe slots 6 and 7. The PCIe Flyover cable is connected to either the PCIe slot 6 or slot 7 electrical interface connector. Note which PCIe electrical interface is being used.
3. If necessary, remove PCI Riser 6 to ease access to the PCIe Flyover cable. See Remove a PCIe Riser.
4. Disconnect and remove the PCIe Flyover cable.



At each end of the cable, press and hold the metal clip to disengage the locking mechanism, then gently lift the PCIe Flyover cable from the electrical interface connector.

### Install

Before installing the PCIe Flyover cable, review the rules for configuring the PCIe electrical interfaces. See Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces.

1. Unpack the replacement PCIe Flyover cable and place it on an antistatic mat.
2. Connect the PCIe Flyover cable to the motherboard connector and to either the PCIe slot 6 or slot 7 PCIe electrical interface connector. For information on which PCIe slot to connect the PCIe Flyover cable, see Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces.  
Plug each end of the cable into its connector until you hear an audible click.
3. If necessary, reinstall PCI Riser 6. See Install a PCIe Riser.
4. Return the server to operation.
  - a. Install the top cover.
  - b. Return the server to the normal rack position.
  - c. Reconnect the power cords to the power supplies and power on the server.
  - d. Verify that the System OK LED is lit. See Server Status Indicator LEDs.

# 12

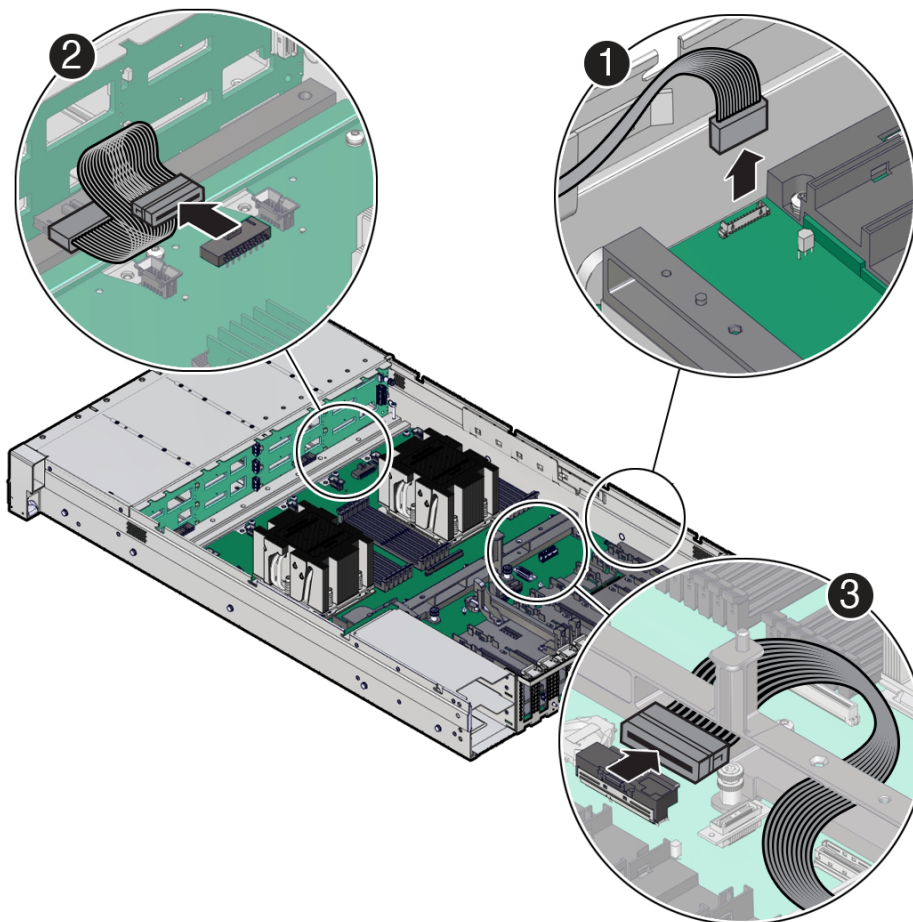
## Replace the Motherboard Assembly

This section describes how to service the motherboard assembly.

The motherboard assembly is a replaceable component that requires you to power off the server before servicing. The motherboard includes a Power Distribution Board (PDB) in the assembly. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

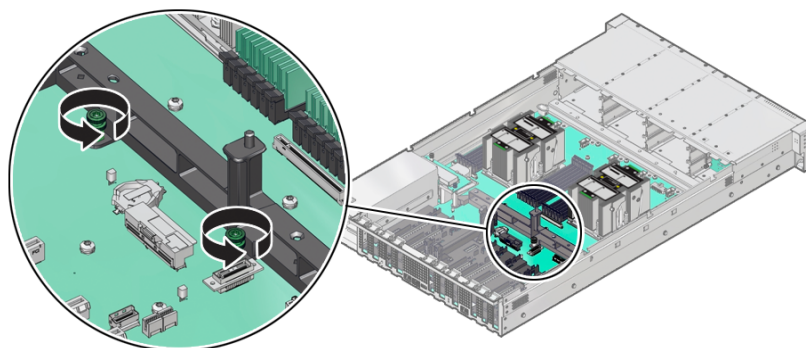
### Remove

1. Prepare the server for service.
2. Power off the server. See *Power Down the Server*.
3. Disconnect the power cords from the power supplies. See *Disconnect Cables From the Server*.
4. Remove rear panel cables. See *Back Panel Components*.
5. Extend the server into the maintenance position. See *Extend the Server to the Maintenance Position*.
6. Attach an antistatic wrist strap to your wrist, and then to a metal area of the chassis. See *Take Antistatic Measures*.
7. Remove the server top cover. Use a Torx T15 screwdriver to unlock. See *Remove the Server Top Cover*.
8. Remove the following reusable components:
  - Air baffle Remove the air baffle (sitting over the two processors) by lifting the baffle up and out of the server. Lift up the air baffle in the rear at a 50 degree angle, and slide slightly rearward to clear the air baffle tabs that prevent the front of the baffle from lifting up. Set aside the air baffle. See *Remove the Air Baffle*.
  - Fan modules See *Remove a Fan Module*.
  - Fan tray See *Remove the Fan Tray*.
  - PCIe cards See *Remove a Half Height PCIe Card*. See *Remove a Full Height PCIe Card*.
  - SAS storage drive cables (if present) See *Remove SAS Storage Drive Cables*.
  - Power supplies See *Remove a Power Supply*.
1. Disconnect the following cables from the motherboard: Label any unlabeled cables to ease reconnecting them after the replacement motherboard is installed.
2. Front LED indicator module (FIM) ribbon cable .See *Replace the Front LED Indicator Module*.
3. Disk backplane auxiliary signal (DBP SIG) cable. See *Replace the Disk Backplane*.
4. Disk backplane power (DBP PWR) cable Disconnect the power cable from the motherboard and the disk backplane connections. Remove the cable guide holding the cables. See *Replace the Disk Backplane*. The NVMe four-disk backplane uses a single power cable; the SAS twelve-disk backplane uses two power cables.

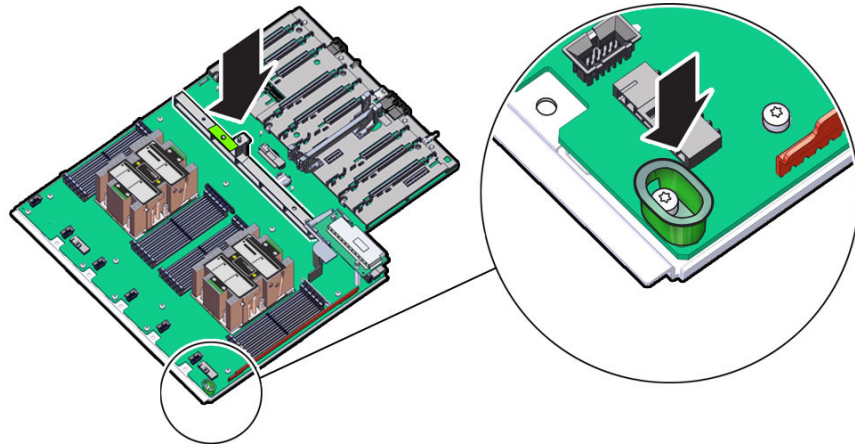


Callout	Description
1	Front LED indicator module (FIM) ribbon cable
2	Disk backplane auxiliary signal (DBP SIG) cable
3	Disk backplane power (DBP PWR) cable

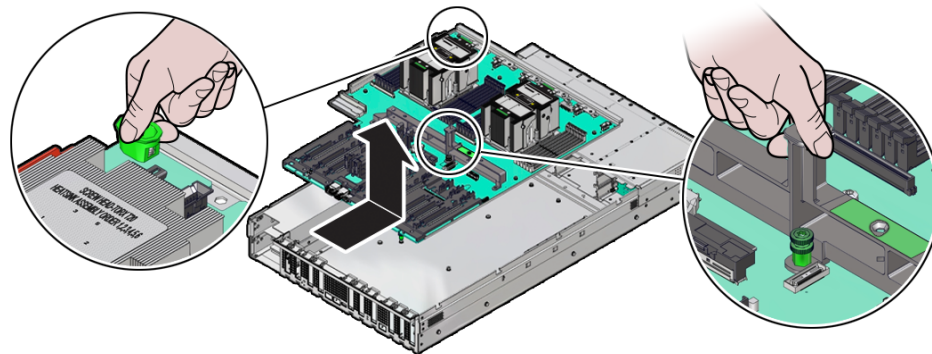
- Using a Torx T25 screwdriver, fully loosen the two captive screws that secure the motherboard mid-wall to the chassis. If you are not able to remove the motherboard, loosen the third screw in the midwall motherboard handle. After removing the motherboard, tighten the same screw.



6. With the server in the extended maintenance position, remove the motherboard from the server with all reusable components that populate the motherboard in place. Move all cables out of the way so they do not interfere with the procedure. Be careful not to damage or break off the rear Locate light pipe LED indicator.
7. Grasp the midwall motherboard handle labeled MB Handle. Hold the motherboard with the midwall motherboard handle and the small plastic motherboard handle.

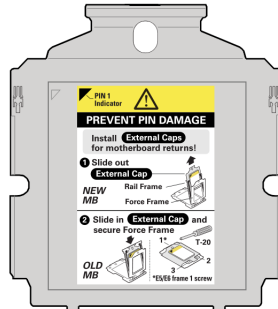


8. Carefully slide the motherboard forward, and while holding the motherboard mid-wall handle and small plastic motherboard handle, lift it out of the chassis.

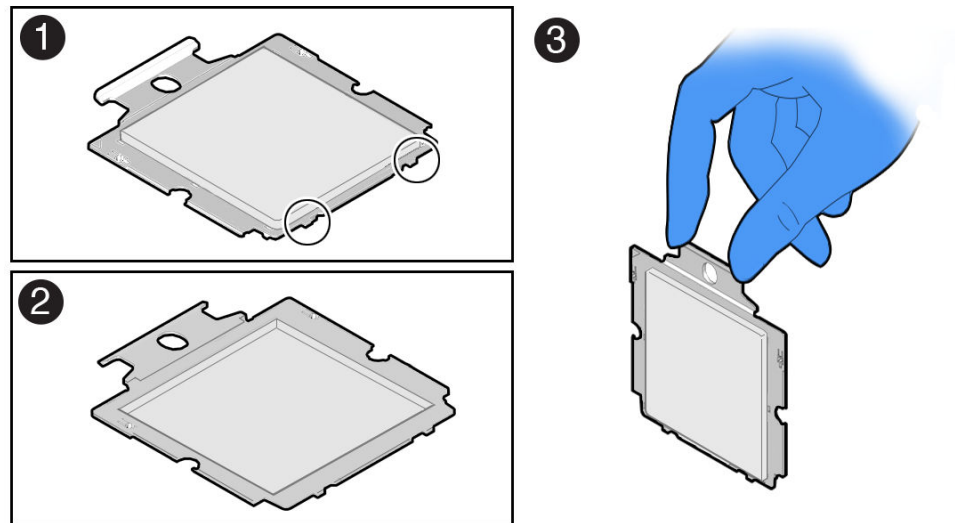


9. Place the motherboard assembly on an antistatic mat, and next to the replacement motherboard.
10. Remove the following reusable components from the old motherboard and install them onto the replacement motherboard.
  - DIMMs See Identify and Remove a DIMM and Install a DIMM. Install the DIMMs only 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.
  - M.2 flash riser SSDs See Remove a Flash Riser Board and Install a Flash Riser Board.
  - Processor/heatsink assemblies Remove all processor/heatsink assemblies from the failed motherboard. See Identify and Remove a Processor.

- Motherboard (Flyover) PCIe cable See Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces.
1. Remove the External Cap from the new replacement motherboard and install the processors. The external cap is used to protect the socket pins if the processor is not installed. The following figure shows the External Cap.



Note the orientation and correct handling of the External Cap.

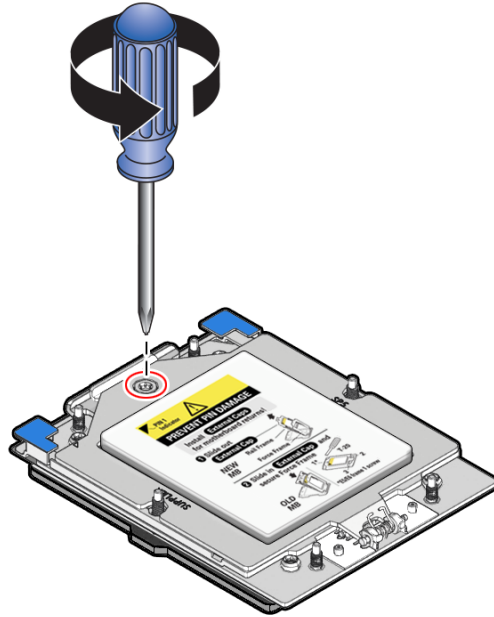


Callout	Description
1	Top of External Cap (insertion tabs are circled)
2	Bottom of External Cap (contacts the socket)
3	Use of the External Cap handle

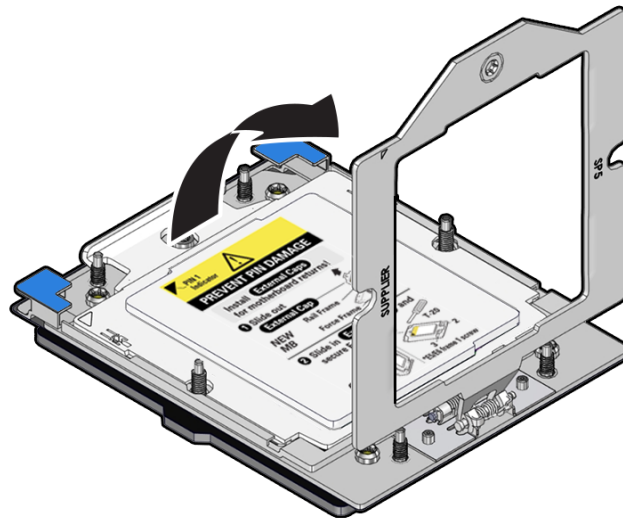
See Processor Overview for processor frame and socket information.

On the new replacement motherboard:

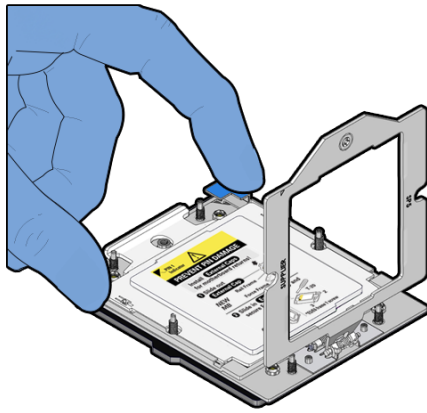
2. Unscrew the socket Force Frame. Using a Torx T20 screwdriver, fully loosen the captive Force Frame Retention Screw that secures the Force Frame to the socket. Apply counter-pressure to the force frame when opening.



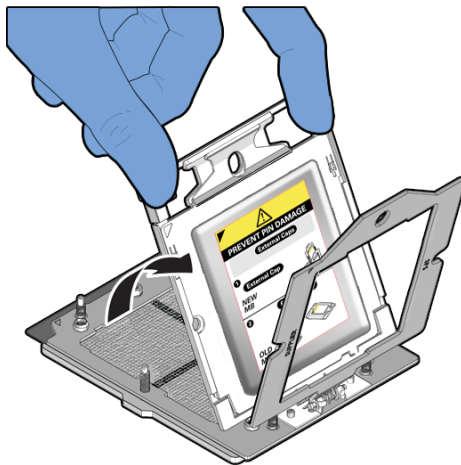
3. Lift the force frame to the open position.



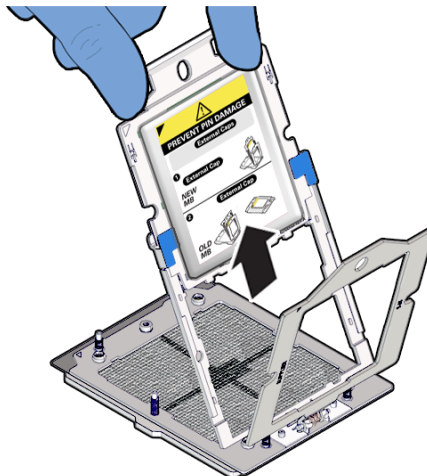
4. On the socket, open the Rail Frame. Squeeze the blue tabs to release the rail frame.



Lift the processor rail frame by holding its lift tabs and rotating the rail frame to its near vertical position. The rail frame is spring-loaded. Hold on to the rail frame as it releases from the socket frame, when rotating it to the vertical position.

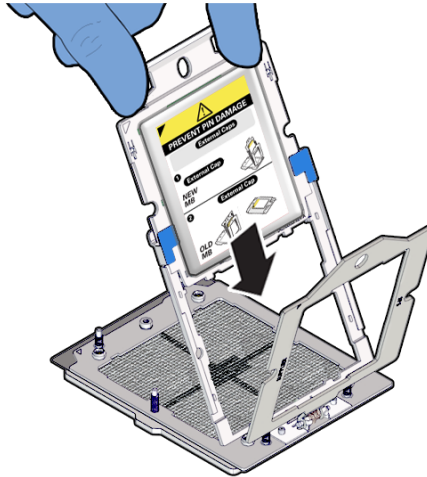


5. Remove the External Cap by its handle. Do not re-install the socket External Cap. Holding the socket cover external cap by its handle, slide the External Cap up and out of the Rail Frame.

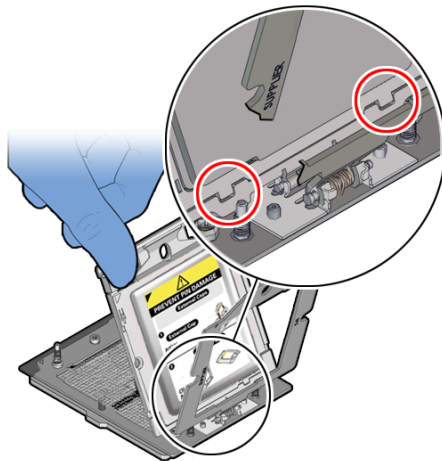


Retain the external cap to be placed on the processor socket (in the Rail Frame) of the motherboard being replaced. This will prevent damage during shipping back to the Service Center for motherboard failure analysis.

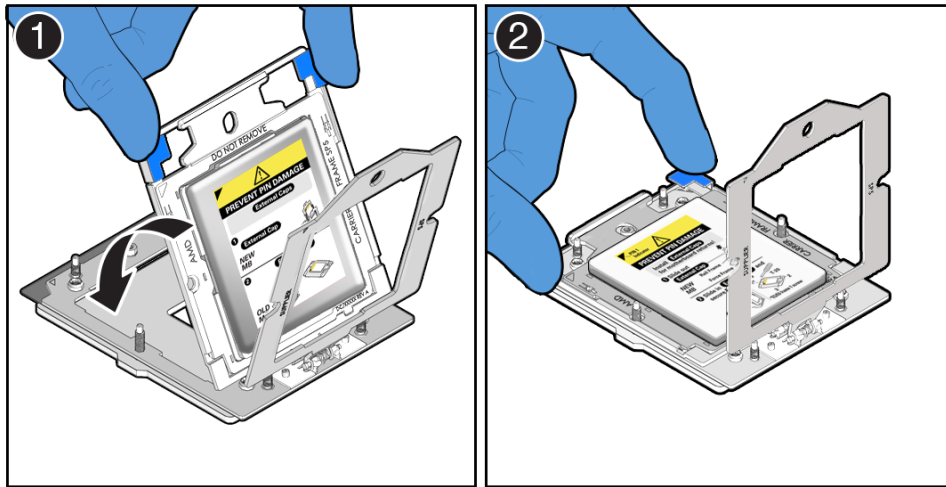
6. Install an External Cap on a Processor 0 or Processor 1 socket for motherboard returns. Install the protective lid by sliding it in the rail frame and pressing down. Holding the External Cap you removed from the new motherboard by its handle, slide it into the processor rail frame on the old motherboard.



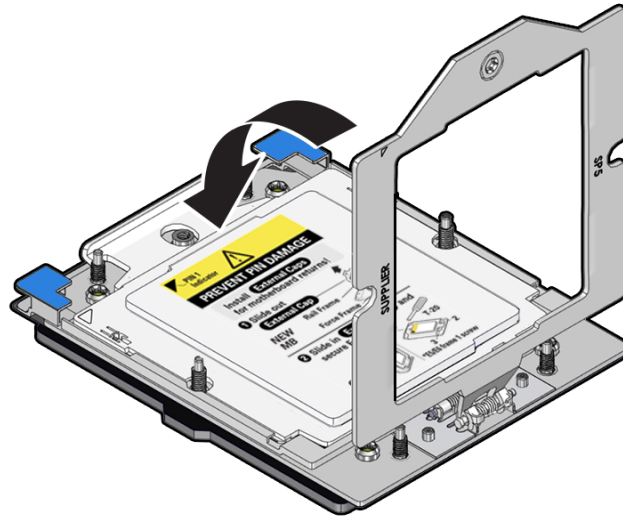
Slide the External Cap until the two insertion tabs at the bottom of the External Cap are inserted into the slots in the rail frame.



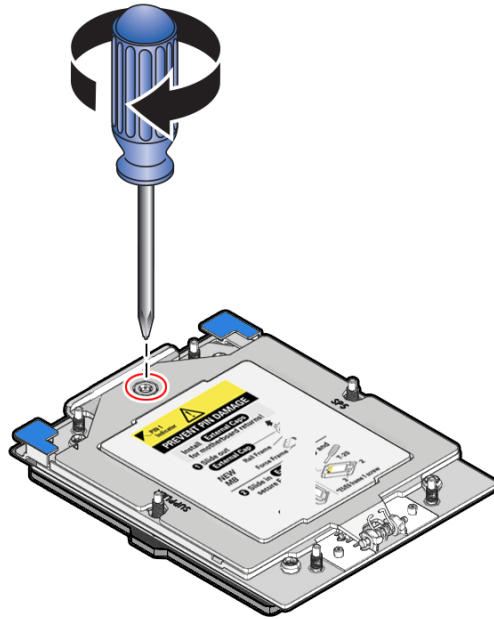
7. Grasping the rail frame edge [1], rotate the rail frame to the closed position [2].



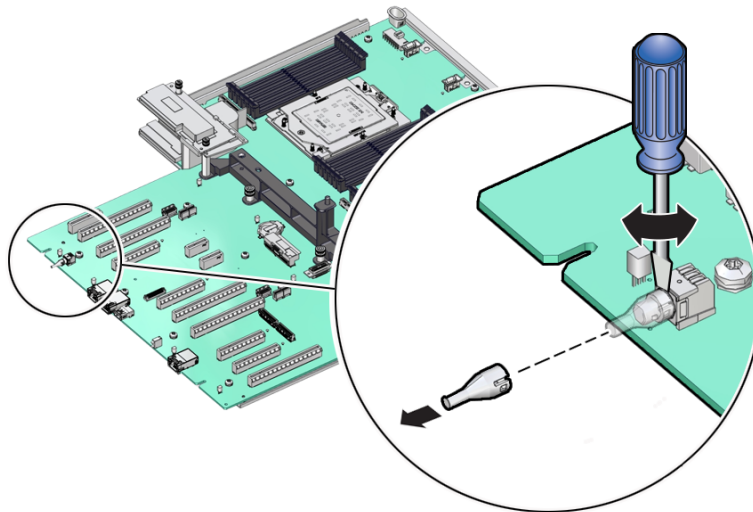
8. Rotate the force frame to its closed position on the socket stiffener frame.



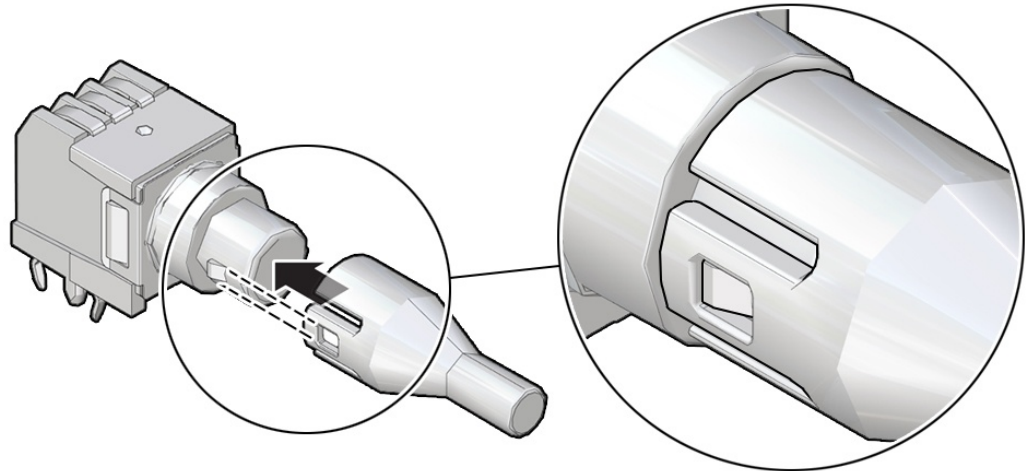
9. Using a 12 in-lb (inch-pound) (1.35 Nm/13.5 kg-cm) driver with a Torx T20 bit, fully tighten the captive screw that secures the force frame to the socket stiffener frame. Use one hand to hold down the spring-loaded force frame until the screw is tightened.



10. Install a processor into the socket on the replacement motherboard. Install a processor into the socket Processor 0 or Processor 1 from which you removed the processor External Cap. See [Install a Processor](#).
11. Repeat steps 7 and 8 to remove the second processor External Cap from the replacement motherboard and install the second processor.
12. 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.
1. Check to see if the replacement motherboard came with a light pipe. A replacement light pipe would be in a separate plastic bag.
  - If you find a replacement light pipe, skip to Step 10.b.
  - If you do not find a replacement light pipe, perform the following steps to remove the light pipe from the faulty motherboard.
1. Insert a flat tool such as a screwdriver or penknife blade between the light pipe housing and the light pipe.



2. Twist the tool back and forth to release the light pipe from the housing.
3. Pull the light pipe away from the housing.
4. Install the light pipe on the replacement motherboard.
5. Match the rectangular holes on the outside of the light pipe with the retaining clips on the housing.

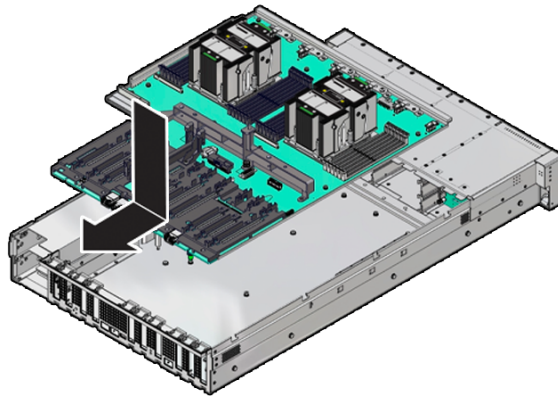


6. Push the light pipe onto the housing until the clips latch in the holes.

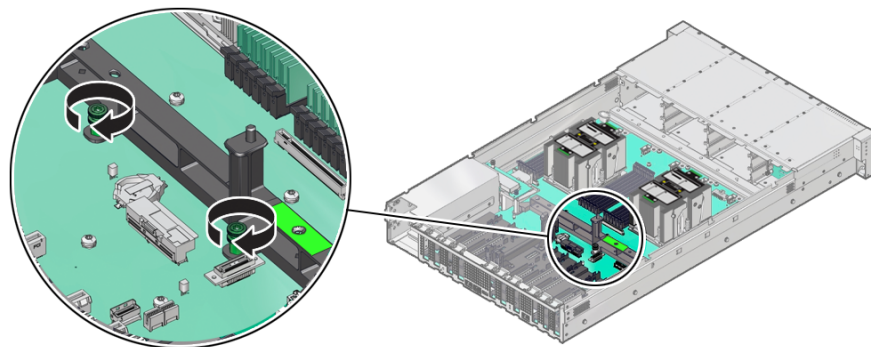
### Install

1. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See *Take Antistatic Measures*.
2. Carefully lift and place the motherboard assembly into the chassis. Use the motherboard handle two holding points to grasp the motherboard. While holding the motherboard mid-wall handle and small plastic motherboard handle, tilt the motherboard to the right side to

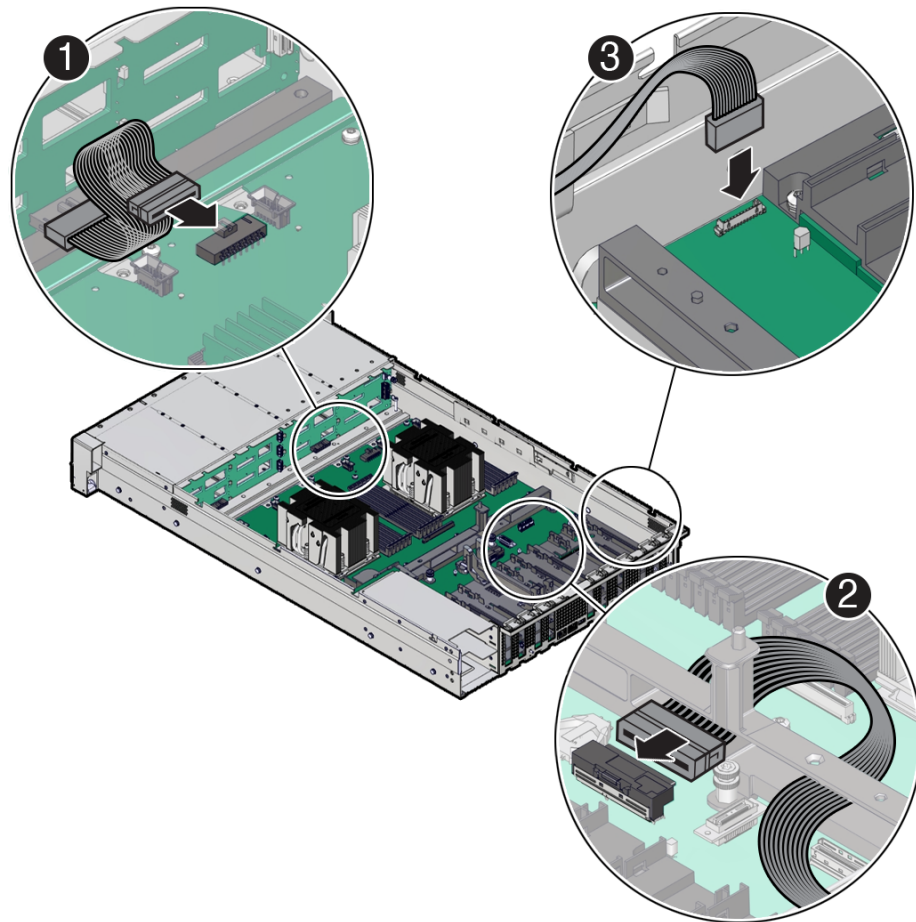
fit it under the power supply assembly, and level the motherboard and place it into the server chassis. Slide the motherboard to the back of the server to engage the raised standoffs.



3. Using a Torx T25 screwdriver, tighten the two captive screws to secure the motherboard mid-wall to the chassis.



4. Reconnect the following cables to the motherboard:
  - a. Disk backplane power (DBP PWR) cable Reconnect the power cable to the motherboard and the disk backplane. Reinstall the cable guide holding the cables NVMe four-disk backplanes use single power cables. SAS twelve-disk backplanes use two power cables. See Replace the Disk Backplane.
  - b. Disk backplane auxiliary signal (DBP SIG) cable. See Replace the Disk Backplane.
  - c. Front LED indicator module (FIM) ribbon cable. See Replace the Front LED Indicator



Callout	Description
1	Disk backplane power (DBP PWR) cable
2	Disk backplane auxiliary signal (DBP SIG) cable
3	Front LED indicator module (FIM) ribbon

5. Reinstall the following components:
  - Power supplies. See [Install a Power Supply](#).
  - PCIe cards and motherboard PCIe cable. See [Use the PCIe Flyover Cable to Configure PCIe Electrical Interfaces](#). See [Install a Half Height PCIe Card](#). See [Install a Full Height PCIe Card](#).
  - SAS storage drive cables (if present). See [Install SAS Storage Drive Cables](#).
  - Fan tray. See [Install the Fan Tray](#).
  - Fan modules. See [Install a Fan Module](#).
  - Air baffle To install the air baffle, the baffle must fit around the processor heatsinks, then lifted up about 50 degrees. Locate the tabs on the air baffle so that one tab on each side is under the lip of the fan tray, and the others are on top of the fan tray. See [Install the Air Baffle](#).
6. Return the server to operation.
  - a. Install the server top cover. See [Install the Server Top Cover](#).

- b. Return the server to the normal rack position. See Return the Server to the Normal Rack Position.
- c. Reconnect the power cords to the power supplies, and power on the server. See Reconnect Power and Data Cables and Power On the Server.
- d. Verify that the power supply AC OK LED is lit.

# 13

## Replace Processors

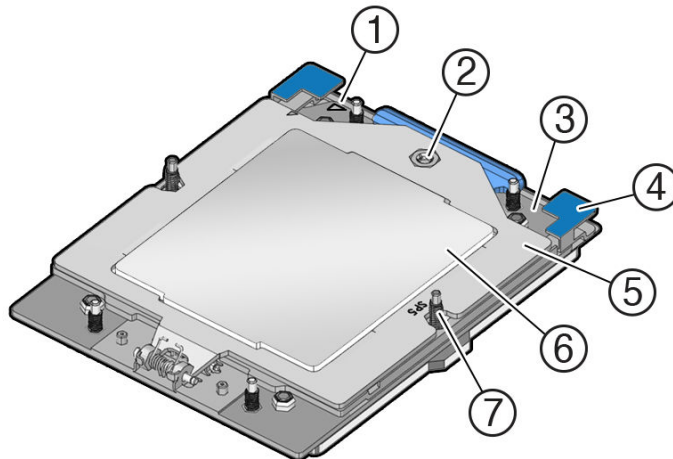
This section describes how to service processors.

Processors are replaceable components that require you to power off the server before servicing. For more information about replaceable components, see Illustrated Parts Breakdown and Replaceable Components.

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

### Processor Overview

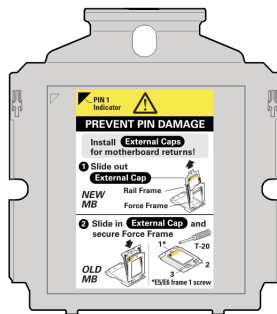
Socket components in the processor assembly have a pin 1 indicator to aid in assembly.



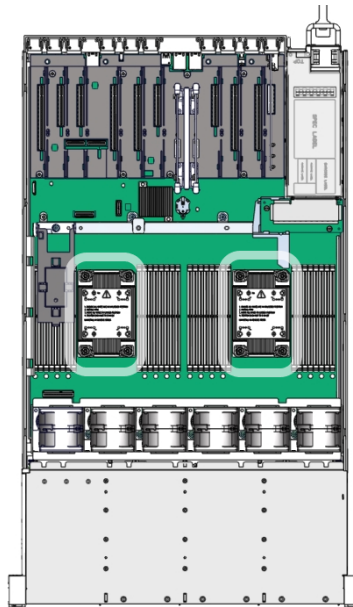
Callout	Description
1	Pin 1 orientation
2	Force Frame Retention Screw (captive)
3	Rail Frame (socket stiffener frame)
4	Release Tabs (2x)
5	Force Frame (retention frame)
6	Processor Package (carrier frame holding preinstalled processor)
7	Heatsink Attachment Studs (6x)

### External Cap

The external cap is used to protect the socket pins if the processor is not installed. The following figure shows the External Cap.

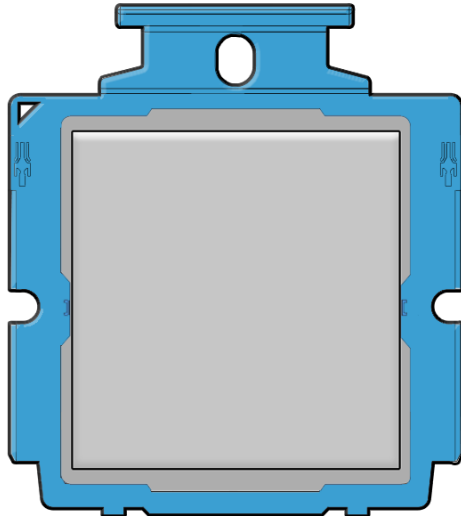


Two processor sockets are located on the server motherboard.

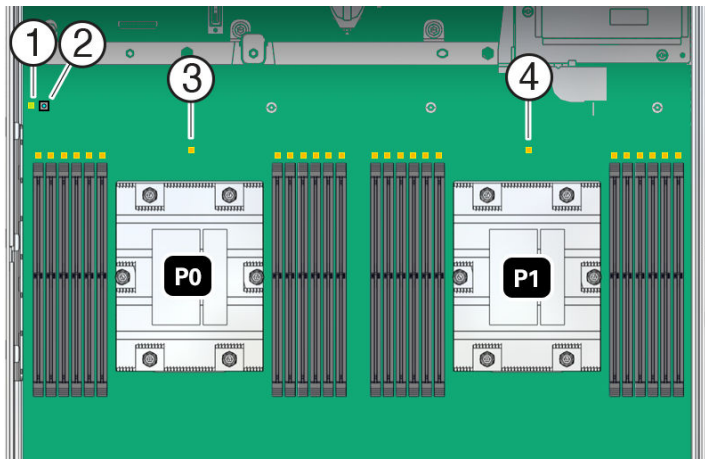


### Identify and Remove

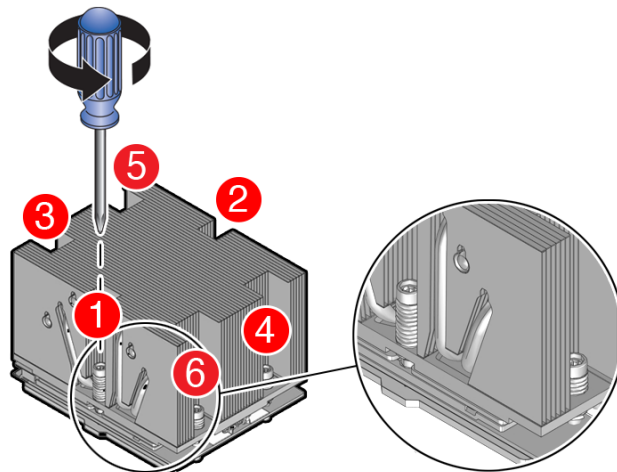
- Use ESD gloves (not latex or vinyl), if possible, when handling the processor.
- Obtain a torque driver set to 12 in-lb (inch-pound) (1.35 Nm/13.5 kg-cm) force with T20 Torx bit for processor and heatsink removal.
- Be careful not to touch the processor socket pins.
- Obtain the materials required to remove the old thermal interface material (TIM).
  - Isopropyl alcohol wipes (included with FRU kit)
  - Techwipes or similar low-lint and low-abrasion wipe
  - Isopropyl alcohol (90% or above recommended)
- Never remove the processor from the carrier. Replacement processors come preinstalled in a carrier package as shown in the following illustration.



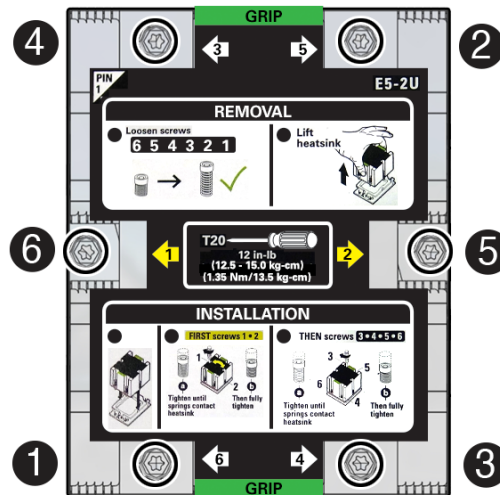
1. Prepare the server for service.
2. Power off the server. See Power Down the Server.
3. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
4. Extend the server to the maintenance position. See Extend the Server to the Maintenance Position.
5. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See Take Antistatic Measures.
6. Remove the server top cover. Use a Torx T15 screwdriver to unlock the release button latch. See Remove the Server Top Cover.
7. Remove the air baffle. Remove the air baffle (sitting over the two processors) by lifting the baffle up and out of the server. Lift up the air baffle in the rear at a 50 degree angle, and slide slightly rearward to clear the air baffle tabs that prevent the front of the baffle from lifting up. Set aside the air baffle. See Remove the Air Baffle.
8. Identify the location of the failed processor by pressing the Fault Remind button on the motherboard. When you press the Fault Remind button, an LED located next to the Fault Remind button illuminates green, indicating that there is sufficient voltage in the fault remind circuit to illuminate any fault LEDs that were illuminated due to a failure. If this LED fails to illuminate 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 illuminated, or if power was removed from the server for more than 15 minutes. The processor fault LED for the failed processor illuminates. The processor fault LEDs are located next to the processors. See Motherboard Status Indicators.
  - If the processor fault LED is off, the processor is operating properly.
  - If the processor fault LED is illuminated (amber), the processor failed and you must replace it.



Callout	Description
1	Fault Remind circuit power LED - green
2	Fault Remind button
3	Processor 0 fault LED - amber
4	Processor 1 fault LED - amber

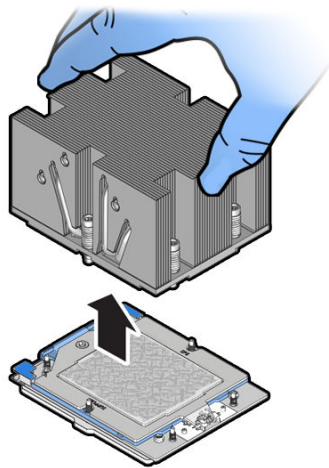


1. Using a Torx T20 screwdriver, loosen the six captive screws that secure the heatsink to the socket. Loosen in reverse order 6-1, then go back and disengage completely.
2. Loosen captive screws 6,5,4,3,2,1 in the order shown in the illustration.
3. Disengage captive screws 6,5,4,3,2,1 in the order shown in the illustration.



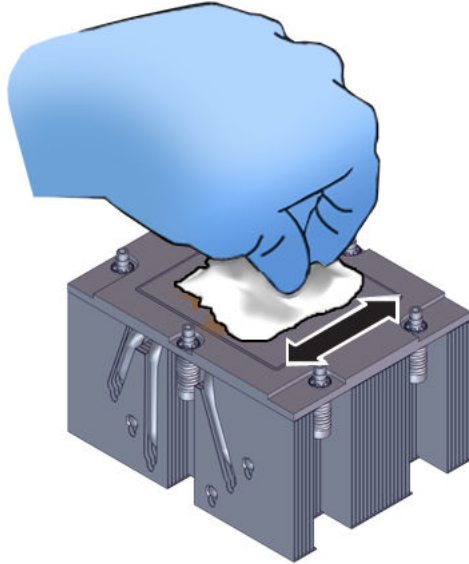
Use a torque driver set to 12 in-lb (inch-pound) (1.35 Nm/13.5 kg-cm) force with T20 Torx bit.

4. Lift the heatsink from the socket. Always grip the heatsink along the axis of the fins to prevent damage.

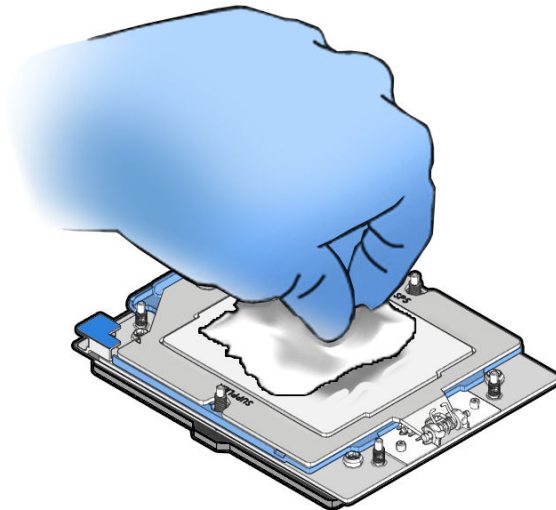


5. Place the heatsink, facing up, on a work surface.
6. Remove Thermal Grease. Clean off the thermal interface material (TIM) using the supplied alcohol wipes. If reusing a processor, do not remove it from the processor carrier. Follow these steps if you plan on reusing either the heatsink or processor.
7. Gather Thermal Grease Removal Materials required.
8. 1. Techwipes or similar low-lint and low-abrasion wipe
9. 2. Isopropyl alcohol (90% or above recommended)
10. 3. Torx T20 screwdriver
11. 4. SP5 socket protective lid Some thermal greases may be classified as hazardous waste and should be disposed of in proper hazardous waste collection bins.

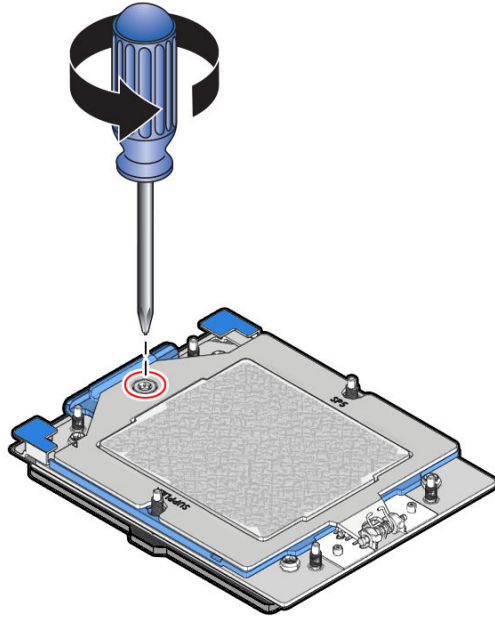
12. Wipe the heatsink with a dry wipe to remove most of the thermal grease. Then add a small amount of isopropyl alcohol to a wipe and rub until there is no grease remaining.



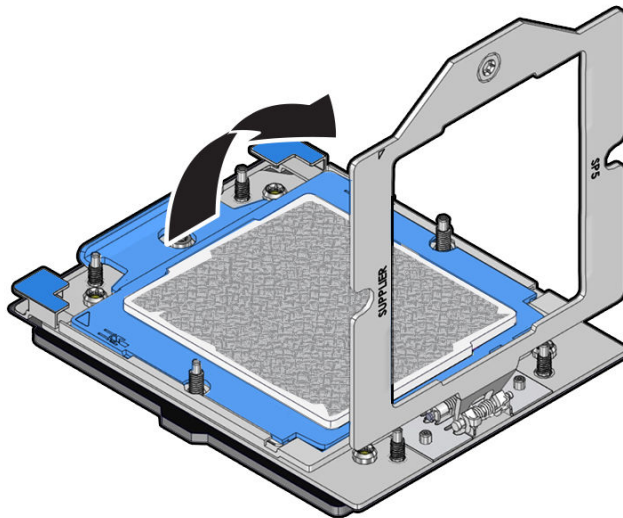
13. Wipe the processor lid with a dry wipe to remove most of the thermal grease. Processor 1 fault LED - amber



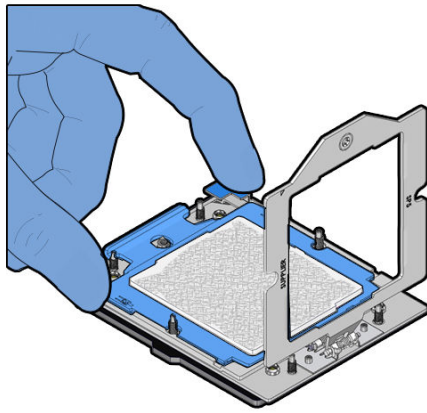
14. Using a Torx T20 screwdriver, loosen the captive Force Frame Retention Screw that secures the Force Frame to the socket. The Force Frame is spring loaded, apply counter-pressure to prevent the Force Frame from flying open unrestricted.



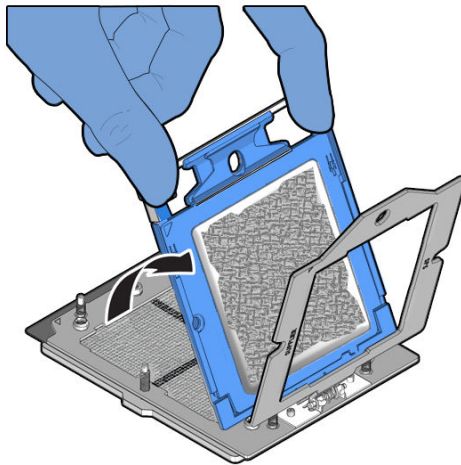
15. Lift the Force Frame to the open position.



16. Open the Rail Frame. Squeeze the blue tabs to release the Rail Frame.

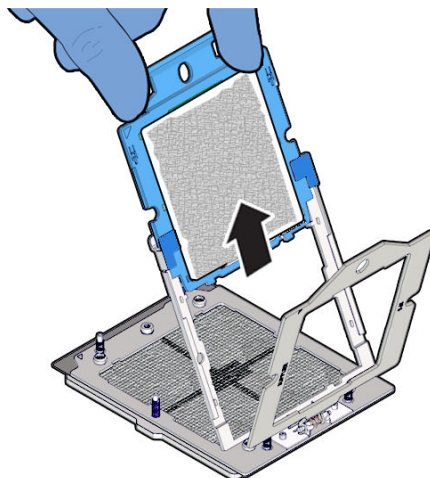


17. Lift the Rail Frame and slide out the carrier frame package. Lift the Rail Frame by holding its lift tabs and rotating the Rail Frame to its near vertical position.

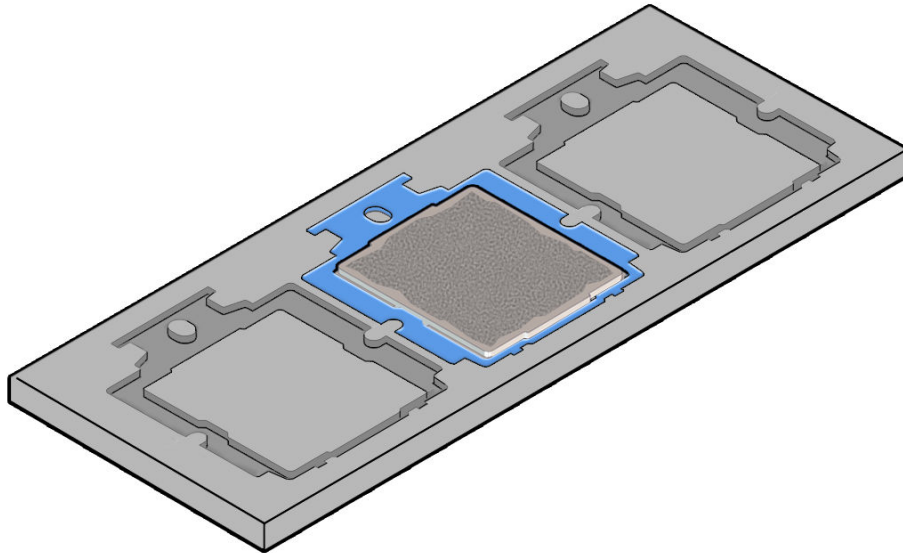


The Rail Frame is spring-loaded. Hold on to the Rail Frame as it releases from the socket frame, when rotating it to the vertical position.

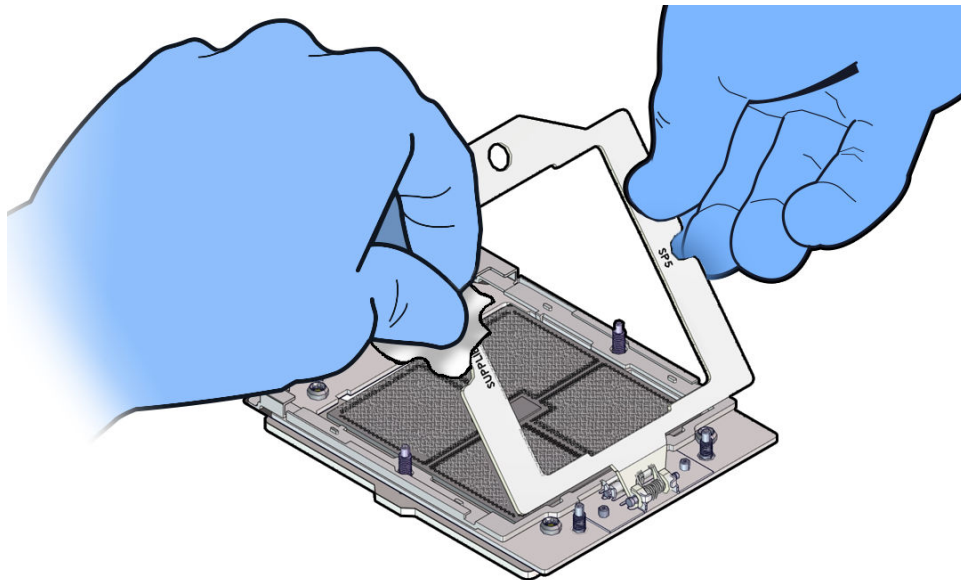
18. Holding the processor carrier by its handle, slide the carrier out of the Rail Frame.



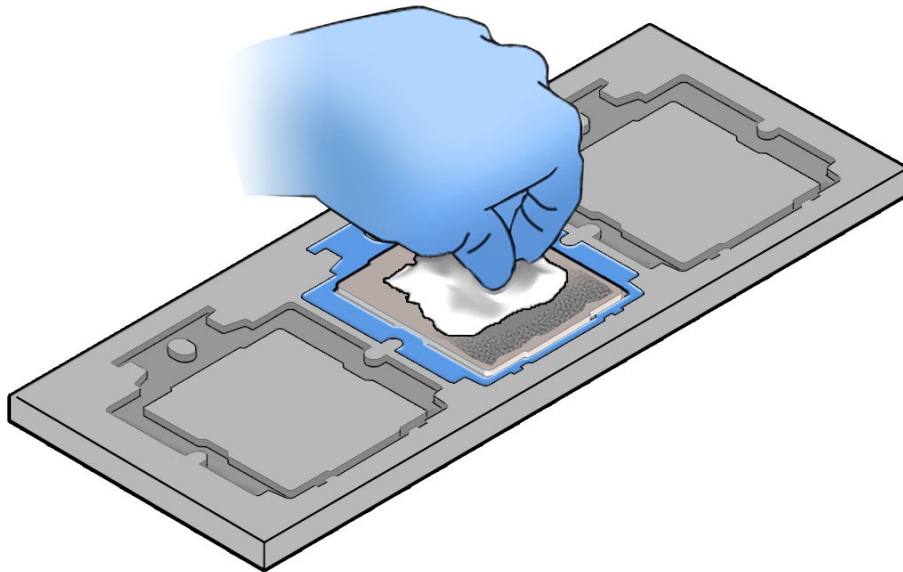
19. Place the carrier frame package in an appropriate tray.



20. Wipe the Force Frame (retention frame) with a dry wipe followed by a wipe with a small amount of isopropyl alcohol. Clean off the thermal interface material (TIM) as needed, wipe the outside and inside of the Force Frame with a dry wipe followed by a wipe with a small amount of isopropyl alcohol.

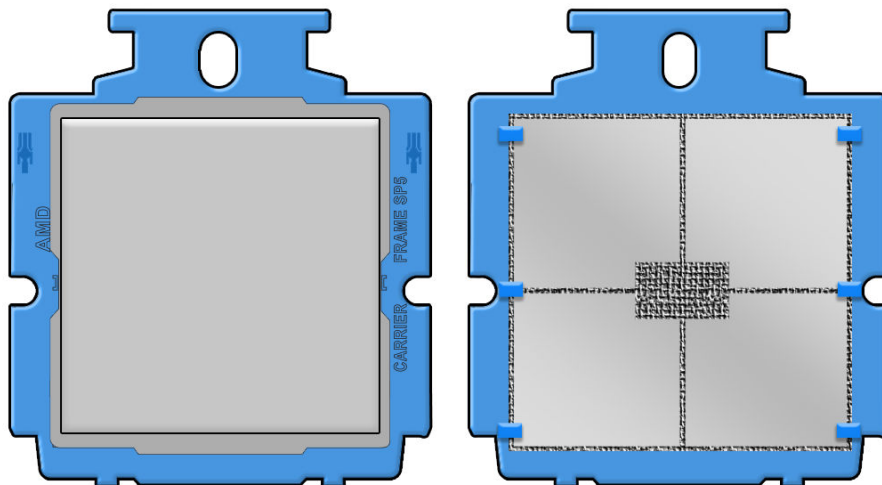


21. Wipe the processor lid and carrier frame with a dry wipe followed by a wipe with a small amount of isopropyl alcohol. Clean off the thermal interface material (TIM) from the processor using the supplied alcohol wipes.

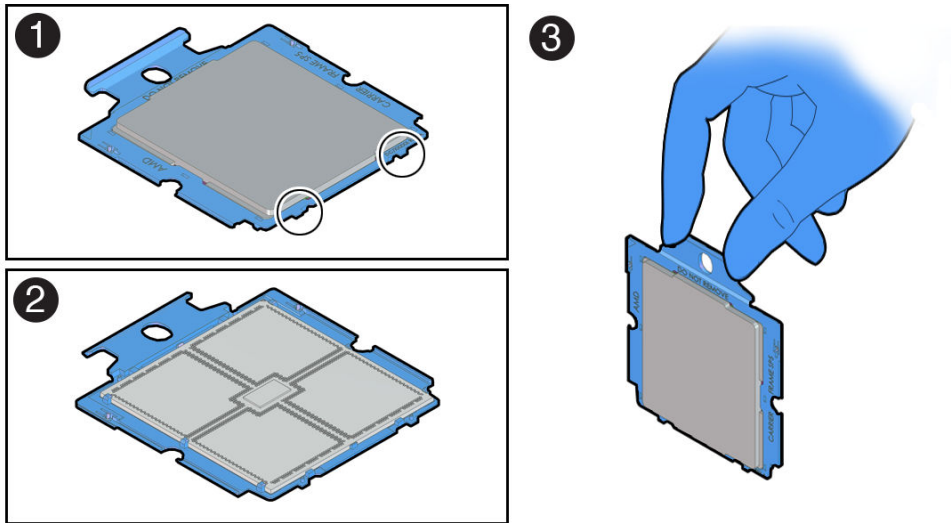


### Install

- Use ESD gloves (not latex or vinyl), if possible, when handling the processor.
  - Obtain a torque driver set to 12 in-lb (inch-pound) (1.35 Nm/13.5 kg-cm) force with T20 Torx bit for processor and heatsink installation.
  - Be careful not to touch the processor socket pins.
  - If you are replacing a processor, ensure that the replacement processor is identical to the processor that was removed. For a list of supported processors, see Product Description.
1. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See Take Antistatic Measures.
  2. Open the new processor package. Ensure that the replacement processor is identical to the processor that was removed. The processor is preinstalled on the processor carrier.

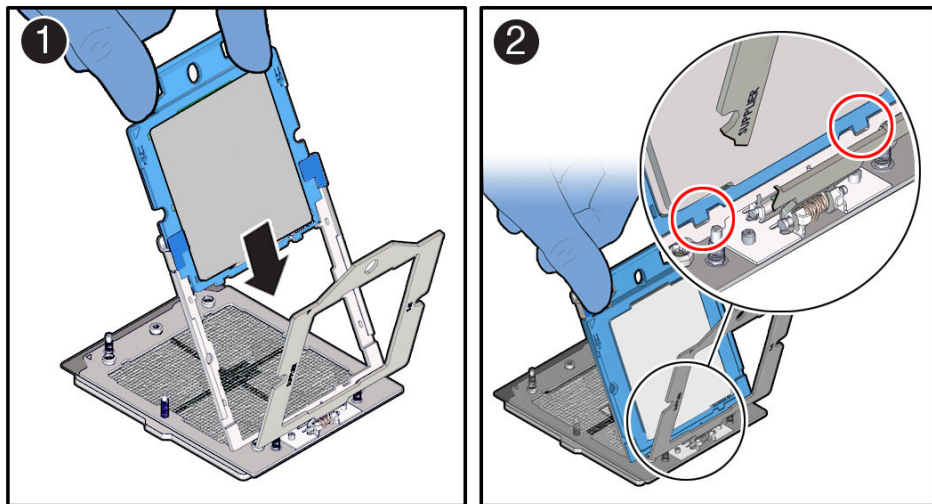


Note the orientation and correct handling of the processor package.

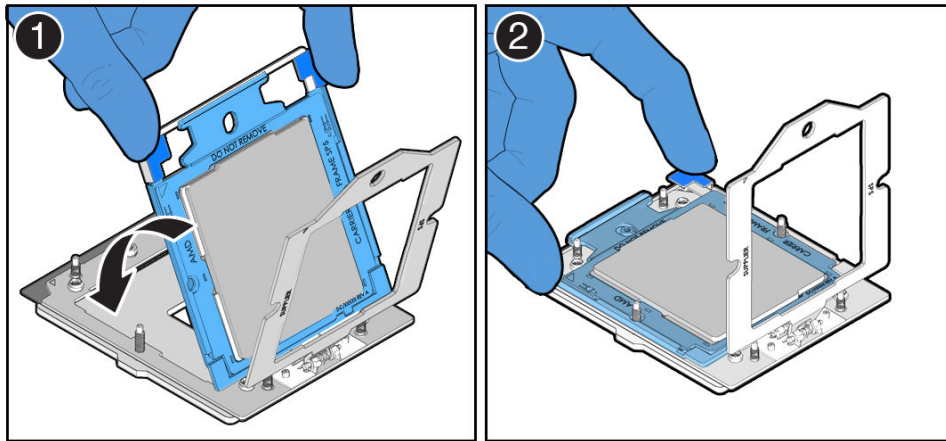


Callout	Description
1	Top of processor carrier (insertion tabs are circled)
2	Bottom of processor carrier (contacts the socket)
3	Use of the processor carrier handle

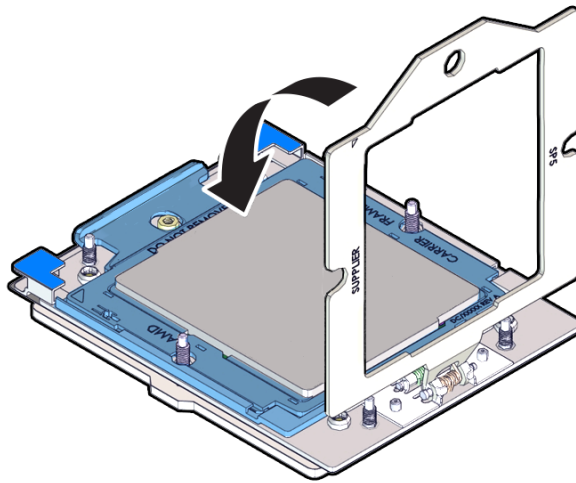
3. Holding the processor carrier by its handle [1], slide it into the Rail Frame. Ensure the two insertion tabs at the bottom of the processor carrier are inserted into the slots in the Rail Frame [2].



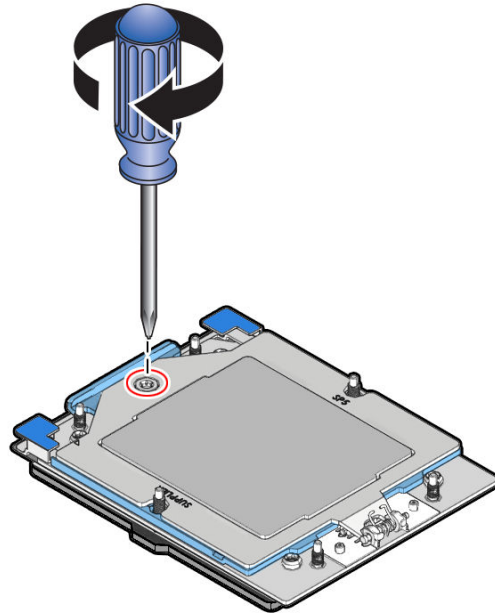
4. Grasping the Rail Frame edge [1], rotate the Rail Frame to the closed position [2].



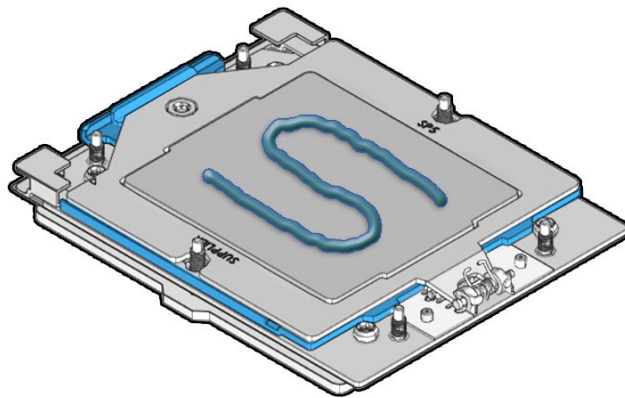
5. Rotate the Force Frame to its closed position on the socket stiffener frame.



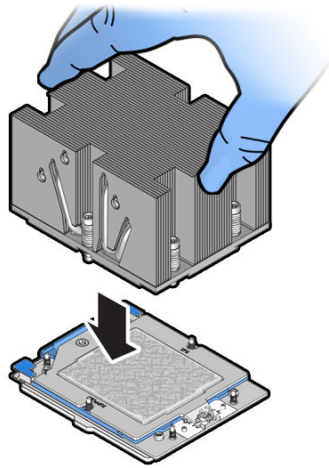
6. Using a 12 in-lb (inch-pound) (1.35 Nm/13.5 kg-cm) driver with a Torx T20 bit, fully tighten the captive screw that secures the Force Frame to the socket stiffener frame. Use one hand to hold down the spring-loaded Force Frame until the screw is tightened.



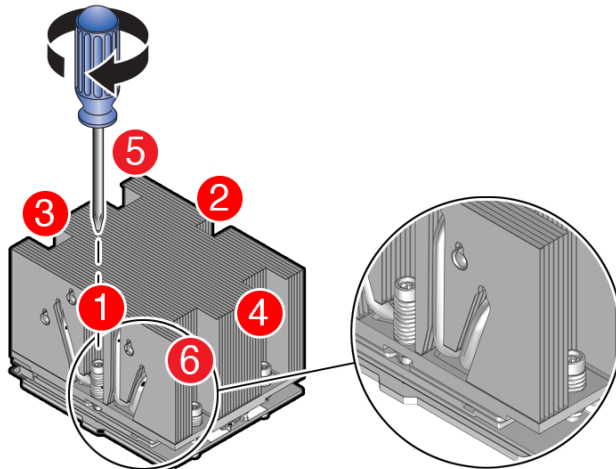
7. Apply Thermal Grease. Using the supplied syringe, evenly apply all of thermal interface material (TIM) in an "S" pattern centered on the top of the processor. Keep the "S" pattern inside a half inch of the processor edge so the grease doesn't overflow and contaminate other parts of the processor housing. Do not distribute the TIM. The pressure of the heatsink will do so for you when you install the heatsink.



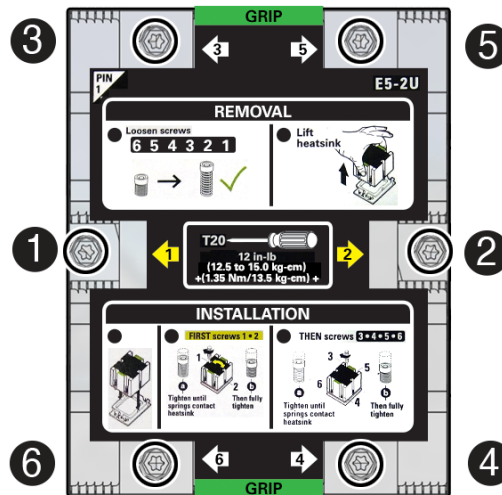
8. Lower the heatsink (see the following note) on to the six socket heatsink attachment studs. Screws 1 and 2 are slightly longer than screws 3, 4, 5, and 6. Carefully lower the module. The heatsink is keyed to go on only one way. The captive screws that attach to the pin 1 end of the socket stiffener frame are closer together than the captive screws that attach at the opposite end of the stiffener frame.



9. Tighten captive screws 1, 2, 3, 4, 5 and 6 in the order shown. Using a 12 in-lbf (1.35 Nm/ 13.5 kg-cm) torque driver with a Torx T20 bit, tighten the heatsink module to the socket, as shown in the following illustration.



10. Engage captive screws 1, 2, 3, 4, 5 and 6 in the order shown in the illustration.
11. Tighten captive screws 1, 2, 3, 4, 5 and 6 in the order shown in the illustration from 12 in-lbf (13.5 kg-cm) to 13.02 in-lbf (15.0 kg-cm).



12. Return the server to operation.
13. Install the air baffle. See [Install the Air Baffle](#).
14. Install the server top cover. See [Install the Server Top Cover](#).
15. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
16. Reconnect the power cords to the power supplies, and power on the server. See [Reconnect Power and Data Cables and Power On the Server](#).
17. Verify that the power supply AC OK LED is lit.
18. Use Oracle ILOM to clear server processor faults.
19. 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: Copy `-> show /SP/faultmgmt Targets: shell 0 (/SYS/MB/P0) Properties: Commands: cd show` Alternatively, 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 at [Oracle ILOM Documentation](#).
20. To clear the fault identified in previous step, type the following command: `set command -> set /SYS/MB/P0 clear_fault_action=true` For example: Copy `-> 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 ILOM service processor from the Oracle ILOM Fault Management Shell and issue the `fmadm repair` command.

# Replace the Disk Backplane

This section describes how to service the 4-Drive backplane and 12-Drive backplane.

The disk backplane (DBP) is a replaceable component that requires you to power off the server before servicing. Perform the 4-Drive backplane or 12-Drive backplane procedures. For more information about replaceable components, see Illustrated Parts Breakdown and Replaceable Components.

## **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**

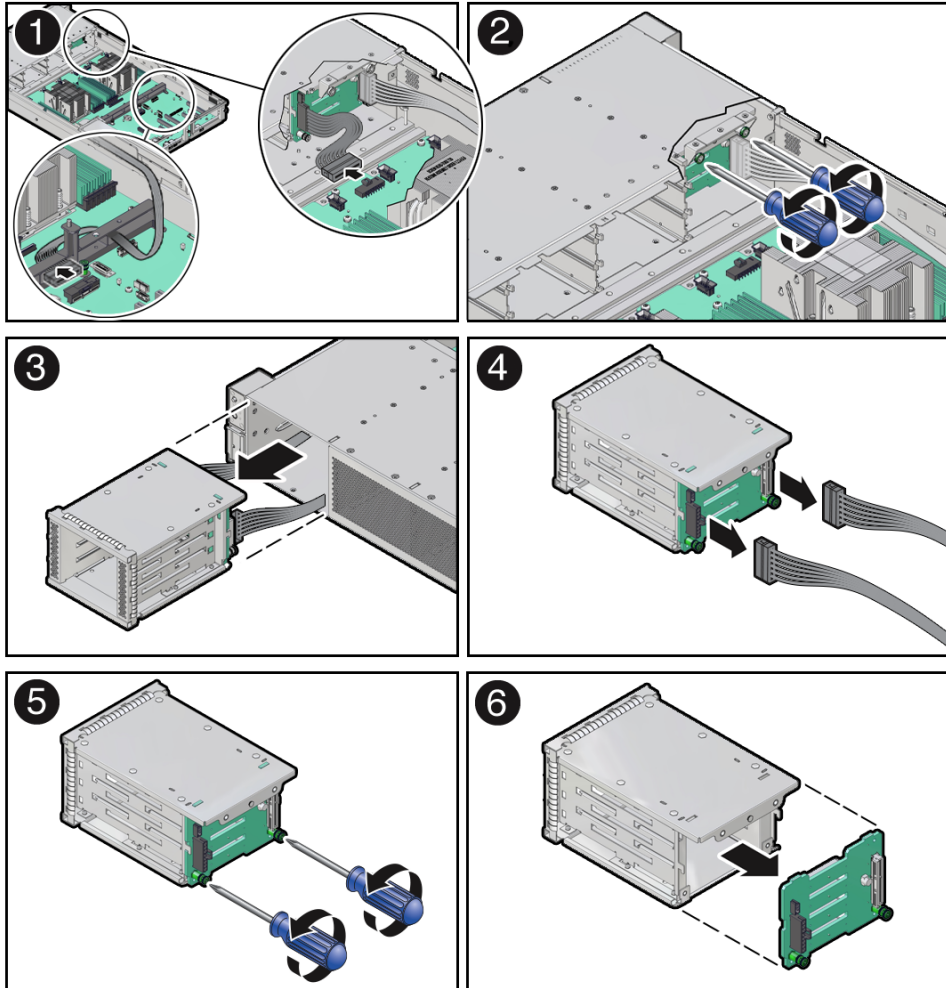
These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See Electrostatic Discharge Safety.

## 4-Drive Backplane

### Remove

To remove the storage drive cage and 4-Drive disk backplane (DBP):

1. Prepare the server for service.
2. Power off the server. See Power Down the Server.
3. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
4. Extend the server into the maintenance position. See Extend the Server to the Maintenance Position.
5. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See Take Antistatic Measures.
6. Remove the server top cover. See Remove the Server Top Cover.
7. Remove the air baffle. See Remove the Air Baffle.
8. Remove the fan modules from the server. See Remove a Fan Module.
9. Remove the fan tray from the server. See Remove the Fan Tray.
10. Remove all NVMe storage drives from the server front panel and set them aside on an antistatic mat. See Remove a Storage Drive. Make a note of each storage drive location so that you can reinstall each storage drive in the same location.
11. Remove the storage drive cage from the chassis.

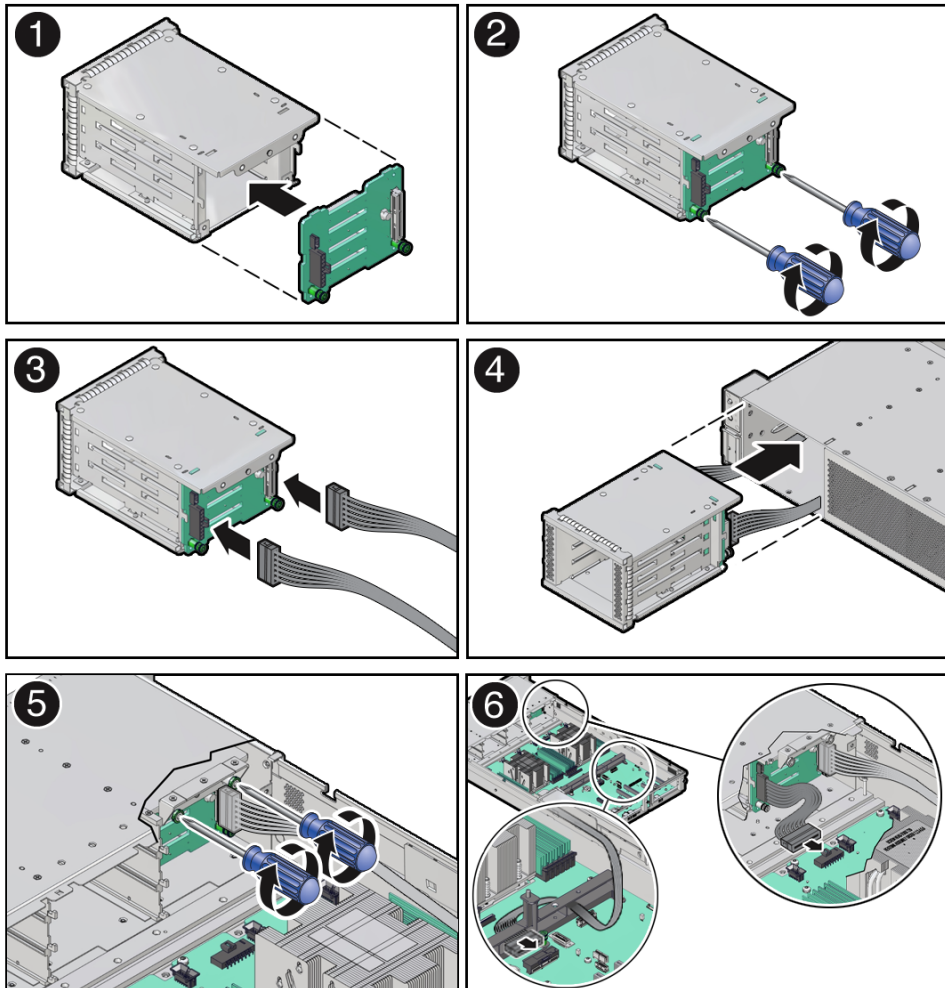


12. Disconnect the DBP power cable and the DBP auxiliary signal cable from the motherboard connectors, and remove the DBP auxiliary signal cable from the left-side cable trough [1]. Do not disconnect the DBP power cable and DBP auxiliary signal cable from the disk backplane at this time.
13. Using a Torx T15 screwdriver, loosen the two spring-mounted screws that secure the storage drive cage in to the chassis [2].
14. Ensure that the DBP power cable and DBP auxiliary signal cable are free from snagging motherboard components and gently pull the storage drive cage with cables attached through the front panel of the chassis [3]. See also [Remove the Disk Backplane Signal Cable](#).
15. Remove the 4-Drive disk backplane from the storage drive cage.
16. Disconnect the DBP power cable and the DBP auxiliary signal cable from the disk backplane and set them aside [4]. Press and hold the button on the connector to disengage the locking mechanism, then gently pull the connector from the disk backplane.
17. Using a Torx T15 screwdriver, loosen the two spring-mounted screws that secure the disk backplane to the storage drive cage [5].
18. Gently remove the disk backplane from the storage drive cage [6].
19. Place the disk backplane on an antistatic mat.

## Install

To install the 4-Drive disk backplane (DBP) and storage drive cage:

1. Install the 4-Drive disk backplane on to the storage drive cage.
2. Align the replacement disk backplane with the rear of the storage drive cage. Using a Torx T15 screwdriver, tighten the two spring-mounted screws to secure the disk backplane to the storage drive cage [1, 2].



3. Reconnect the DBP power cable and the DBP auxiliary signal cable to the disk backplane [3].
4. Install the storage drive cage in to the chassis.
5. Align the storage drive cage with the opening in the front panel of the server. Pull the attached DBP power cable and DBP auxiliary signal cable through the opening while gently pushing the storage drive cage in to the chassis until it is fully seated in the chassis [4].
6. Using a Torx T15 screwdriver, tighten the two spring-mounted screws to secure the storage drive cage to the chassis [5].

7. Gently insert the DBP auxiliary signal cable in to the left-side cable trough. Reconnect the DBP auxiliary signal cable and DBP power cable to the motherboard connectors [6]. See also Install the Disk Backplane Signal Cable.
8. Reinstall the storage drives in to the front
9. Reinstall all NVMe storage drives into the server front panel storage drive cage. See Install a Storage Drive.
10. Return the server to operation.
11. Install the fan tray. See Install the Fan Tray.
12. Install the fan modules. See Install a Fan Module.
13. Install the air baffle. See Install the Air Baffle.
14. Install the server top cover. See Install the Server Top Cover.
15. Return the server to the normal rack position. See Return the Server to the Normal Rack Position.
16. Reconnect the power cords to the power supplies, and power on the server. See Reconnect Power and Data Cables and Power On the Server.
17. Verify that the power supply AC OK LED is lit. **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 removed other quorum member components, you might need to manually program the product serial number (PSN) into the new backplane. For more information, see FRU Key Identity Properties (KIP) Automated UpdateAutomatedUpdate).

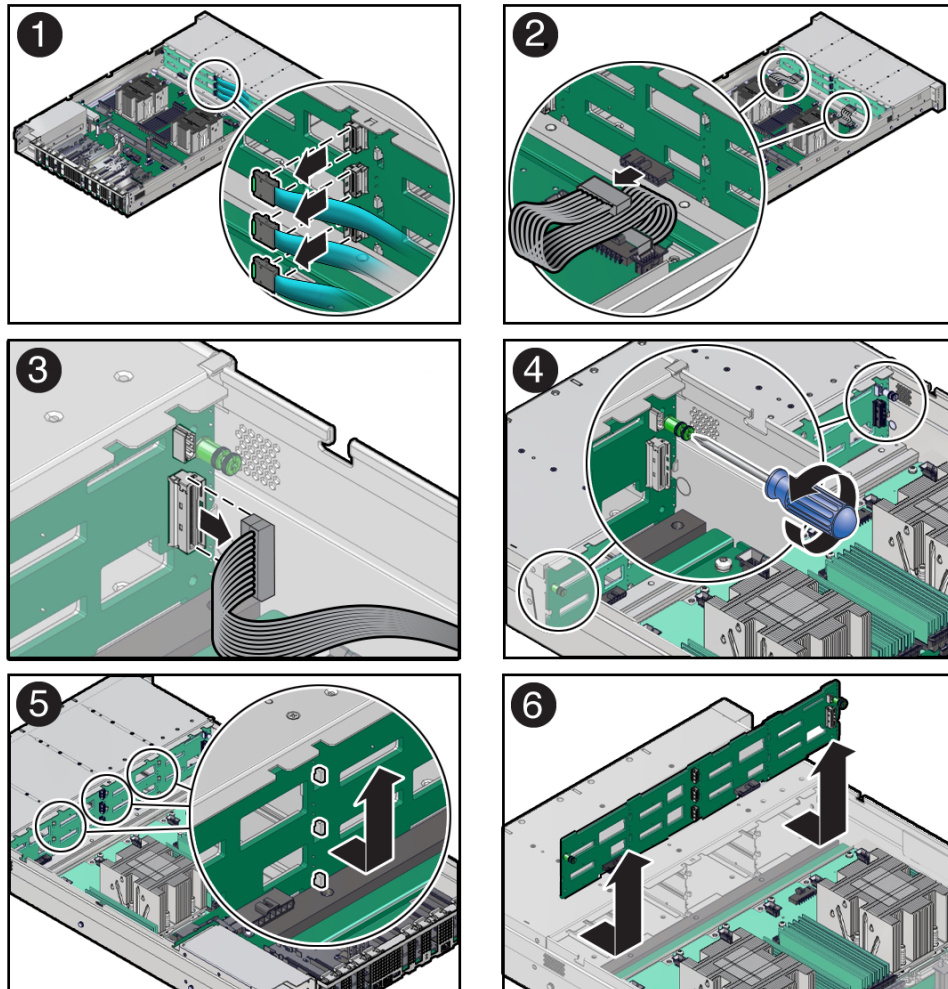
## 12-Drive Backplane

### Remove

To remove the 12-Drive backplane (DBP):

1. Prepare the server for service.
2. Power off the server. See Power Down the Server.
3. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
4. Extend the server into the maintenance position. See Extend the Server to the Maintenance Position.
5. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See Take Antistatic Measures.
6. Remove the server top cover. See Remove the Server Top Cover.
7. Remove the air baffle. See Remove the Air Baffle.
8. Remove the fan modules from the server. See Remove a Fan Module.
9. Remove the fan tray from the server. See Remove the Fan Tray.
10. Pull each storage drive out far enough to disengage it from the backplane. See Remove a Storage Drive. It is not necessary to completely remove the storage drives from the server; simply pull them out far enough to disengage them from the backplane. If you do remove the storage drives from the server, make a note of their locations so that you can reinstall them in the same locations.
11. Disconnect the cables from the disk backplane. Ensure all cables are moved out of the way so they do not interfere with the disk backplane removal procedure.

12. Disconnect the three SAS cables from the 12-Drive backplane [1]. See also Remove SAS Storage Drive Cables.
13. Disconnect the two power cables from the 12-Drive backplane [2]. Press and hold the button on the connector to disengage the locking mechanism, then gently pull the connector from the disk backplane. Note the cable connections in order to ease proper reconnection of the cables.

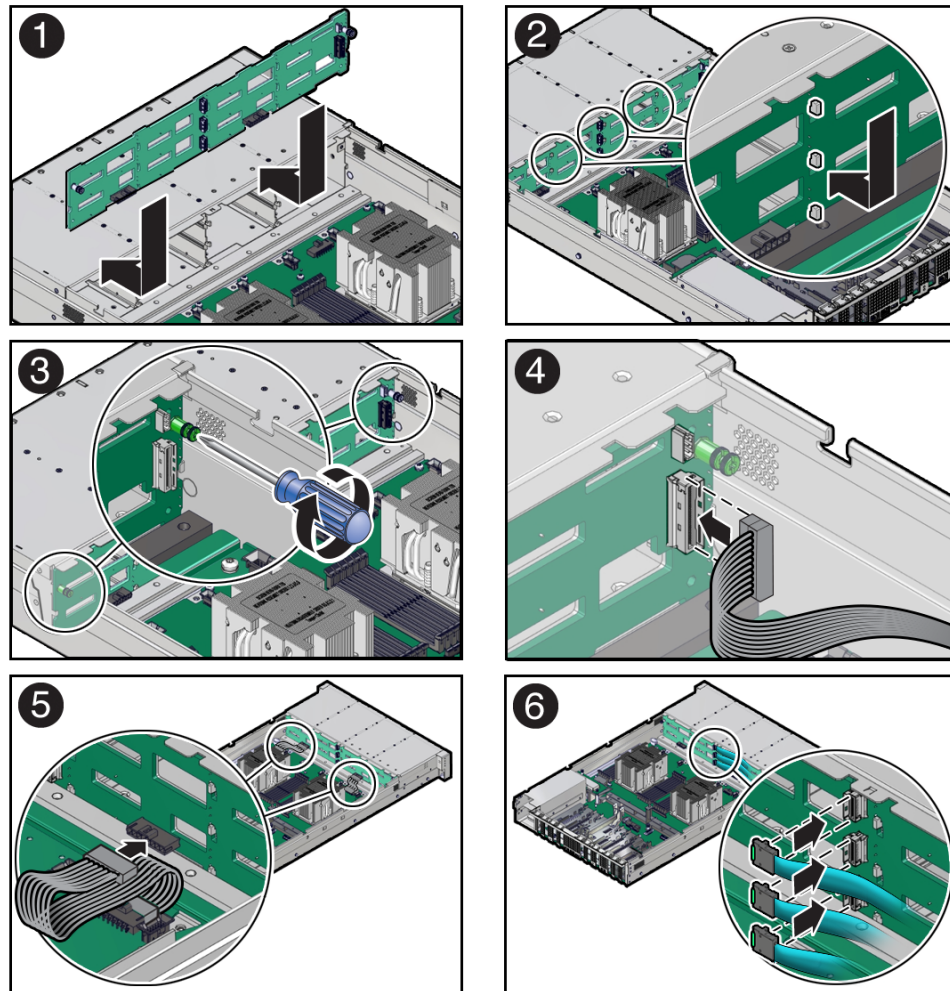


14. Disconnect the DBP auxiliary signal cable from the 12-Drive backplane [3]. See also Remove the Disk Backplane Signal Cable.
15. Using a Torx T15 screwdriver, loosen the right-side and left-side spring-mounted screws that secure the 12-Drive backplane to the chassis [4].
16. Lift the 12-Drive backplane up to release it from the standoff hooks and out of the chassis [5 and 6].
17. Place the 12-Drive backplane on an antistatic mat.

### Install

To install the 12-Drive backplane (DBP):

1. Lower the 12-Drive backplane into the server, and position it to engage the standoff hooks [1 and 2].



2. Using a Torx T15 screwdriver, tighten the right-side and left-side spring-mounted screws to secure the 12-Drive backplane to the chassis [3].
3. Reconnect the cables to the disk backplane.
4. Reconnect the DBP auxiliary signal cable to the 12-Drive backplane [4]. See also Install the Disk Backplane Signal Cable.
5. Reconnect the two power cables to the disk backplane [5].
6. Reconnect the three SAS cables to the 12-Drive backplane [6]. To ensure proper SAS cable connections, see the SAS cabling reference table in Step 3 in Install SAS Storage Drive Cables.
7. Return the server to operation.
8. Install the fan tray. See Install the Fan Tray.
9. Install the fan modules. See Install a Fan Module.
10. Install the air baffle. See Install the Air Baffle.
11. Install the server top cover. See Install the Server Top Cover.
12. Install all storage drives into the storage drive cage. When reinstalling storage drives, start with the top row and go from left to right. See Install a Storage Drive.

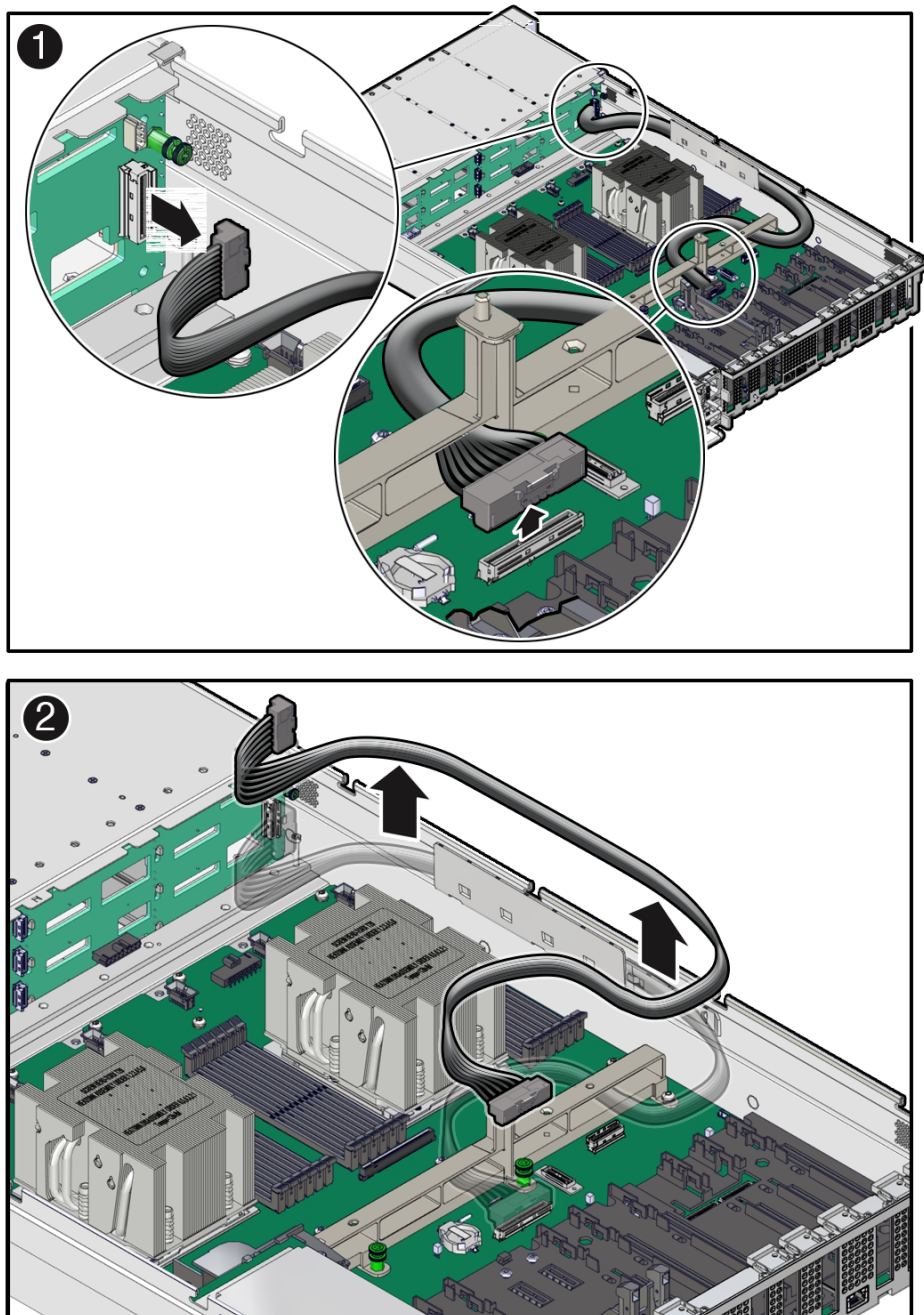
13. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
14. Reconnect the power cords to the power supplies, and power on the server. See [Reconnect Power and Data Cables and Power On the Server](#).
15. Verify that the power supply AC OK LED is lit. **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 removed other quorum member components, you might need to manually program the product serial number (PSN) into the new backplane. For more information, see [FRU Key Identity Properties \(KIP\) Automated UpdateAutomatedUpdate](#).

## Disk Backplane Signal Cable

### Remove

Before removing the disk backplane signal cable, review the procedures for removing the 4 or 12 disk backplane from the server. See [Remove the 4-Drive Backplane](#) and [Remove the 12-Drive Backplane](#).

1. Prepare the server for service.
2. Power off the server. See [Power Down the Server](#).
3. Disconnect the power cords from the power supplies. See [Disconnect Cables From the Server](#).
4. Extend the server to the maintenance position. See [Extend the Server to the Maintenance Position](#).
5. Attach an antistatic wrist strap. See [Take Antistatic Measures](#).
6. Remove the server top cover. See [Remove the Server Top Cover](#).
7. Remove the air baffle. See [Remove the Air Baffle](#).
8. Remove the fan modules from the server. See [Remove a Fan Module](#).
9. Remove the fan tray from the server. See [Remove the Fan Tray](#).
10. Locate the disk backplane signal cable. The disk backplane signal cable is connected between the 4 or 12 disk backplane and the motherboard connector, which is located between PCIe slot 4 and the motherboard handle. The signal cable is routed from the disk backplane, through the left-side cable trough, and then through the motherboard handle before connecting to the motherboard [1, 2].

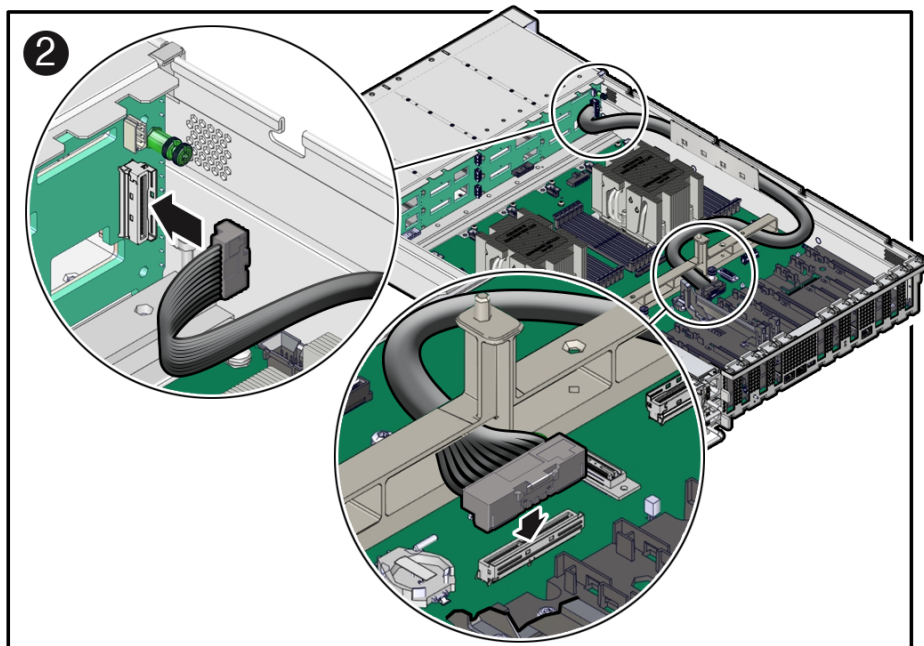
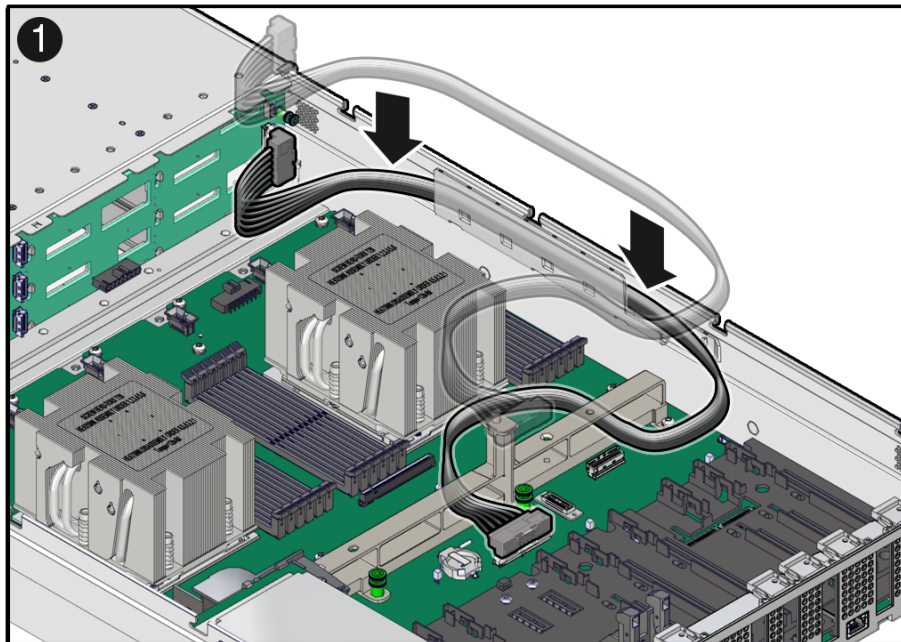


11. Disconnect and remove the disk backplane signal cable from the server.
12. Disconnect the signal cable from the disk backplane and the motherboard [1]. At each end of the signal cable, press and hold the connector to disengage the locking mechanism, then gently lift the connector from the disk backplane and motherboard.
13. For information on disconnecting the disk backplane signal cable from the 4-disk backplane, see [Remove the 4-Drive Backplane](#).
14. Remove the cable from the server. Gently direct the cable through the motherboard handle and then lift the cable from the left-side cable trough [2]. Ensure that the disk backplane signal cable is free from snagging motherboard components and other cables in the server. You might need to remove the SAS cables from the left-side cable trough before removing the disk backplane signal cable. See [Remove SAS Storage Drive Cables](#).

## Install

Before installing the disk backplane signal cable, review the procedures for installing the 4 or 12 disk backplane in the server. See [Install the 4-Drive Backplane](#) and [Install the 12-Drive Backplane](#).

1. Unpack the replacement disk backplane signal cable and place it on an antistatic mat.
2. Install the disk backplane signal cable between the disk backplane and motherboard connectors [1]. Route the signal cable through the left-side cable trough and then through the motherboard handle.



Ensure that the disk backplane signal cable is free from snagging motherboard components and other cables in the server. You might need to remove the SAS cables from the left-side cable trough before installing the disk backplane signal cable. See [Remove SAS Storage Drive Cables](#).

3. Reconnect the disk backplane signal cable to the disk backplane and the motherboard. Plug each end of the cable into its connector until you hear an audible click [2]. For information on reconnecting the disk backplane signal cable to the 4-disk backplane, see [Install the 4-Drive Backplane](#).
4. If necessary, reinstall SAS cables in the left-side cable trough. See [Install SAS Storage Drive Cables](#).
5. Return the server to operation.
6. Install the fan tray. See [Install the Fan Tray](#).
7. Install the fan modules. See [Install a Fan Module](#).
8. Install the air baffle. See [Install the Air Baffle](#).
9. Install the server top cover. See [Install the Server Top Cover](#).
10. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
11. Reconnect the power cords to the power supplies, and power on the server. See [Reconnect Power and Data Cables and Power On the Server](#).

# Replace the Front LED Indicator Module

This section describes how to service the front LED indicator module.

The front LED indicator module is a replaceable component that requires you to power off the server before servicing. For more information about replaceable components, see *Illustrated Parts Breakdown and Replaceable Components*.

 **Caution**

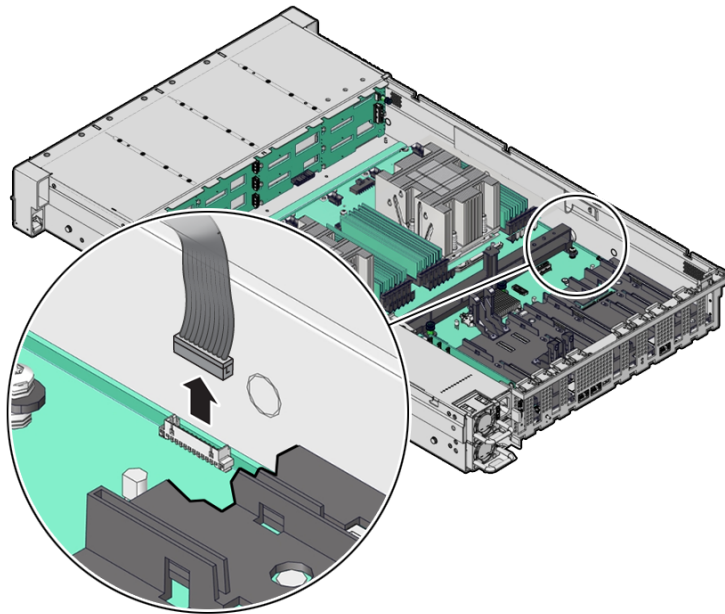
Ensure that all power is removed from the server before removing or installing the disk backplane. You must disconnect the power cables before performing this procedure.

 **Caution**

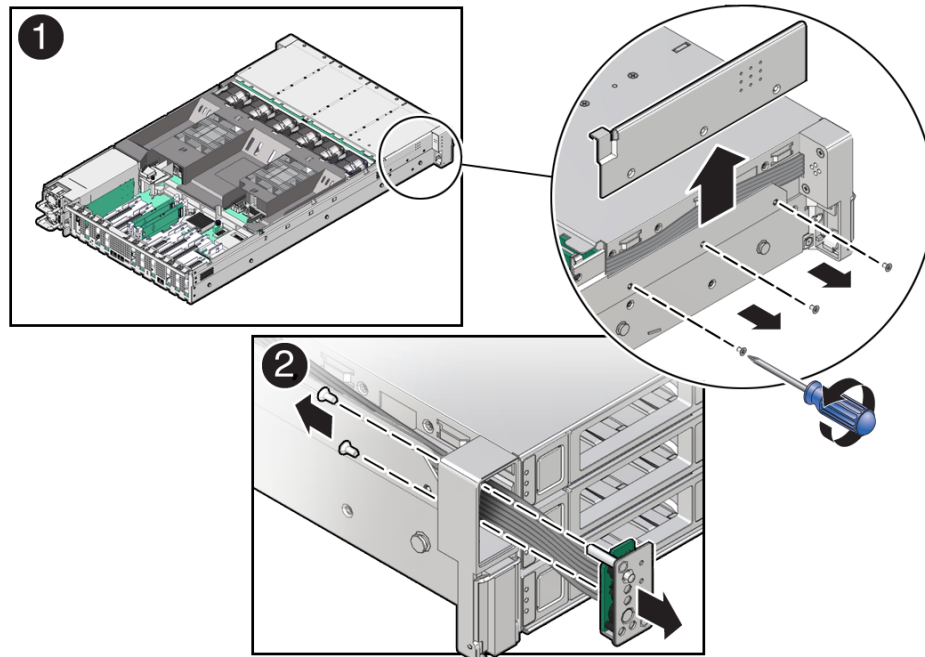
These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the component to fail. To avoid damage, ensure that you follow electrostatic discharge safety measures and antistatic practices. See *Electrostatic Discharge Safety*.

## Remove

1. Prepare the server for service.
2. Power off the server. See *Power Down the Server*.
3. Disconnect the power cords from the power supplies. See *Disconnect Cables From the Server*.
4. Extend the server into the maintenance position. See *Extend the Server to the Maintenance Position*.
5. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See *Take Antistatic Measures*.
6. Remove the server top cover. See *Remove the Server Top Cover*.
7. Disconnect the LED indicator module cable from the motherboard. To ease removal of the LED indicator module cable, you might need to lift the disk backplane auxiliary signal cable and SAS cable (if present) from the left-side cable trough.



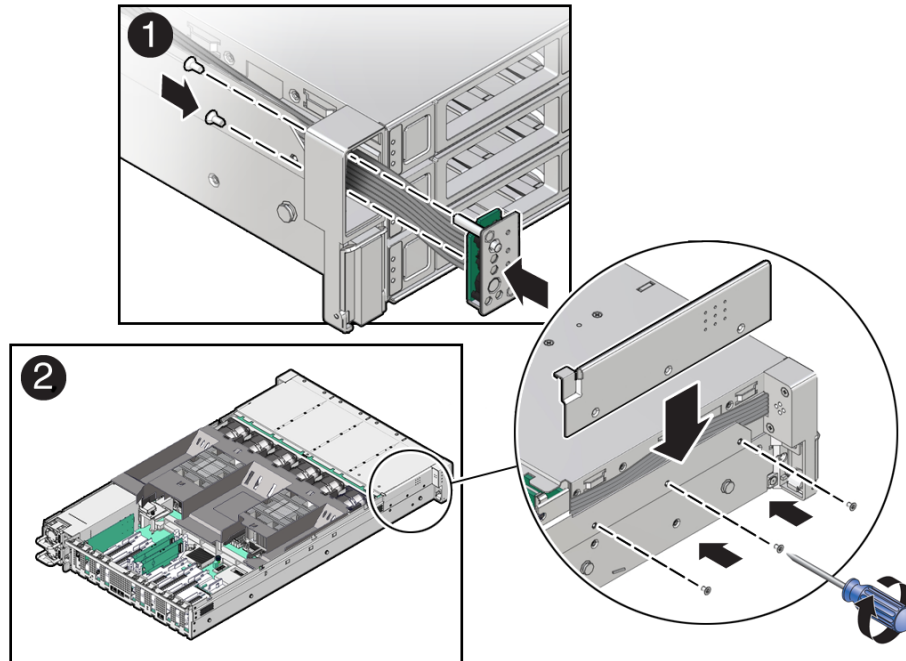
8. Remove the three No. 2 Phillips screws that secure the FIM cable cover to the chassis [1].



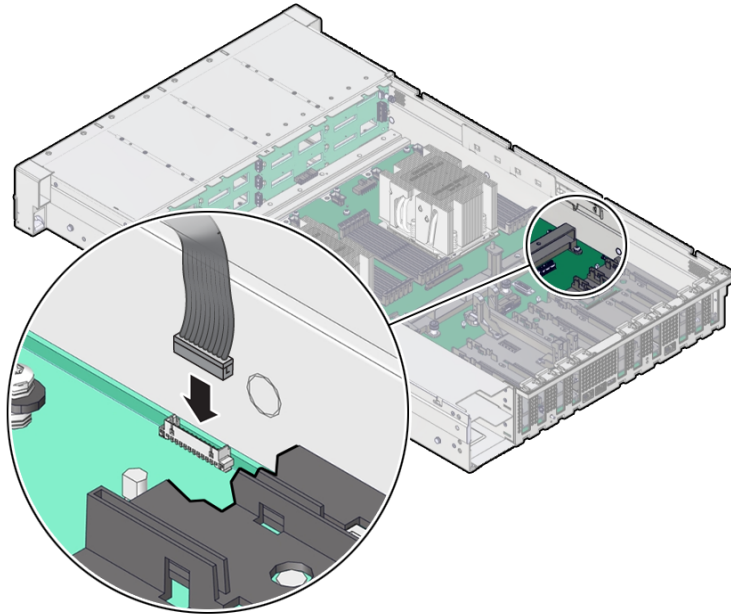
9. Lift up and remove the FIM cable cover from the FIM cable cover slot [1]. Set aside the FIM cable cover.
10. Remove the front LED indicator module [2].
11. Remove the two No. 2 Phillips screws that secure the LED indicator module to the server front panel.
12. Remove the LED indicator module and cable from the server front panel. Remove the LED indicator module cable by carefully pulling the cable through the left-side cable trough.

## Install

1. Install the front LED indicator module.
2. Push the LED indicator module and cable through the LED housing on the server front panel [1].



3. Install the LED indicator module cable by carefully pulling the cable through the left-side cable trough. To ease installation of the LED indicator module cable, you might need to lift the disk backplane auxiliary signal cable and SAS cable (if present) from the left-side cable trough.
4. Insert and tighten the two No. 2 Phillips screws to secure the LED indicator module to the server front panel [1].
5. Install the FIM cable cover to the chassis by inserting it into the FIM cable cover slot [2].
6. Install the three No. 2 Phillips screws to secure the FIM cable cover to the chassis [2].
7. Reconnect the LED indicator module cable to the motherboard.



8. Return the server to operation.
9. Install the server top cover. See [Install the Server Top Cover](#).
10. Return the server to the normal rack position. See [Return the Server to the Normal Rack Position](#).
11. Reconnect the power cords to the power supplies, and power on the server. See [Reconnect Power and Data Cables and Power On the Server](#).

# 16

## Replace SAS Cables

This section describes how to service SAS cables.

SAS interface cables are replaceable components that require you to power off the server before servicing. For more information about replaceable components, see Illustrated Parts Breakdown and Replaceable Components.

### **Caution**

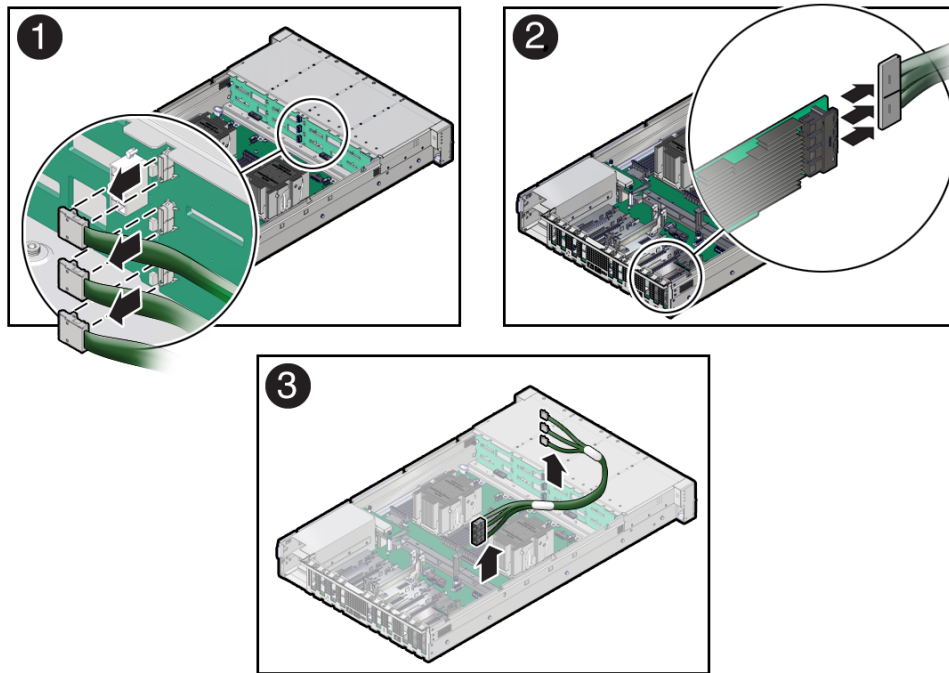
The system supplies power to the cables even when the server is powered off. To avoid personal injury or damage to the server, you must disconnect power cords before servicing the cables.

### **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.

### Remove

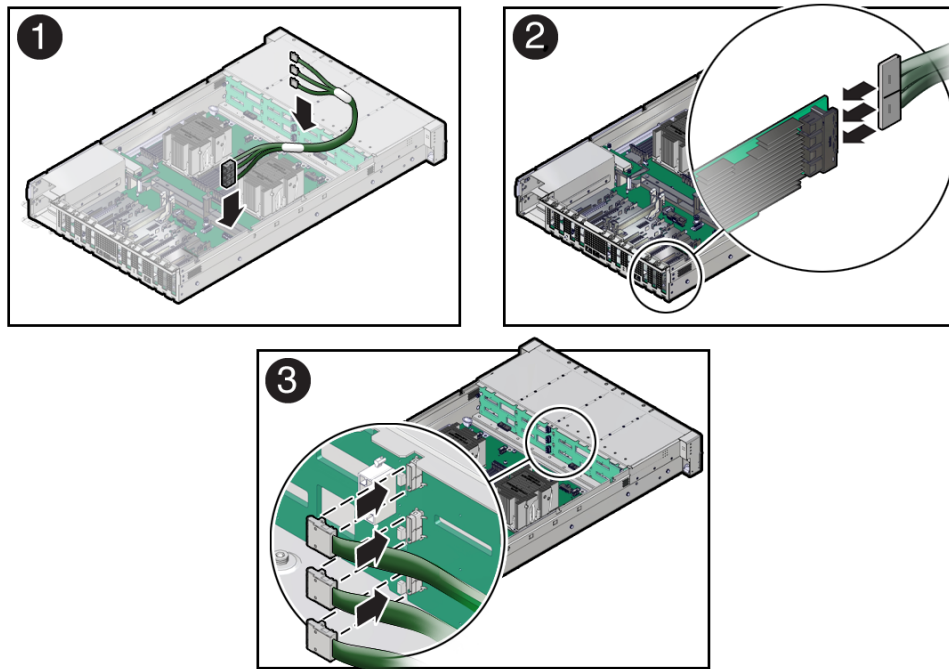
1. Prepare the server for service.
  - a. Power off the server. See Power Down the Server.
  - b. Disconnect the power cords from the power supplies. See Disconnect Cables From the Server.
  - c. Extend the server to the maintenance position. See Extend the Server to the Maintenance Position.
  - d. Attach an antistatic wrist strap to your wrist, and then to a metal area on the chassis. See Take Antistatic Measures.
  - e. Remove the server top cover. See Remove the Server Top Cover.
  - f. Remove the air baffle. See Remove the Air Baffle.
  - g. Remove fan modules. See Remove a Fan Module.
  - h. Remove the fan tray from the server. See Remove the Fan Tray.
2. Disconnect the SAS cables from the disk backplane [1]. Press and hold the button on the connector to disengage the locking mechanism, then gently pull the connector from the disk backplane.



3. Disconnect the SAS cables from the Broadcom 9500-16i, 12GB SAS PCIe, 16 Port, Internal card in PCIe slot 9 [2]. Press each latch, and then pull out to disengage the cable from each connector.
4. Remove the SAS cables from the server [3]. Carefully remove the SAS cable bundles from the server. Be careful not to snag the cables on the server components.

### Install

1. Install the SAS cables between the disk backplane and the rear PCIe slots [1]. Route the SAS cable bundle through the left-side cable trough.



2. Reconnect the SAS cables to the Broadcom 9500-16i, 12GB SAS PCIe, 16 Port, Internal card in PCIe slot 9 [2]. Plug each cable into its SAS connector until you hear an audible click. To ensure proper SAS cable connections, see the SAS cable connections table in Step 3.

SAS cable assembly, part number 8211223 [F] is required to connect the HBA card to the disk backplane.

1. Reconnect the SAS cables to the disk backplane [3]. Plug each cable into its SAS connector until you hear an audible click.

When attaching SAS cables, ensure that you match the numbers on the SAS cables with the SAS connectors on the disk backplane and on the HBA card. Use the following table to ensure proper SAS connections between the disk backplane and the HBA card. Use PCIe slot 9.

HBA Connector	Disk Backplane Connector	SAS Storage Drives
C0 - 1	1	0, 1, 2, 3
C0 - 2	2	4, 5, 6, 7
C1 - 3	3	8, 9, 10, 11

1. Return the server to operation.
  - a. Install the fan tray. See Install the Fan Tray.
  - b. Install the fan modules. See Install a Fan Module.
  - c. Install the air baffle. See Install the Air Baffle.
  - d. Install the server top cover. See Install the Server Top Cover.
  - e. Return the server to the normal rack position. See Return the Server to the Normal Rack Position.
  - f. Reconnect the power cords to the power supplies, and power on the server. See Reconnect Power and Data Cables and Power On the Server.
  - g. Verify that the power supply AC OK LED is lit.

# Return the Server to Operation

This section describes safety considerations and provides procedures and information after replacing components in the server.

After replacing components inside of the server, perform the procedures in the following sections.

## 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

Perform the following procedures as required to remove and install server filler panels for storage drives and PCIe cards.

Note: In single-processor systems, PCIe slots 1 through 4 are nonfunctional. Therefore, you do not need to remove the filler panels for these slots.

1. Remove the Storage drive filler panel.
  - a. Locate the storage drive filler panel to be removed from the server.
  - b. To unlatch the storage drive filler panel, pull the release lever, and tilt the lever out into a fully opened position.
  - c. To remove the filler panel from the slot, hold the opened release lever, and gently slide the filler panel toward you.
2. Install the Storage drive filler panel.
  - a. Locate the vacant storage drive module slot in the server, and then ensure that the release lever on the filler panel is fully opened.
  - b. Slide the filler panel into the vacant slot by pressing the middle of the filler panel faceplate with your thumb or finger.

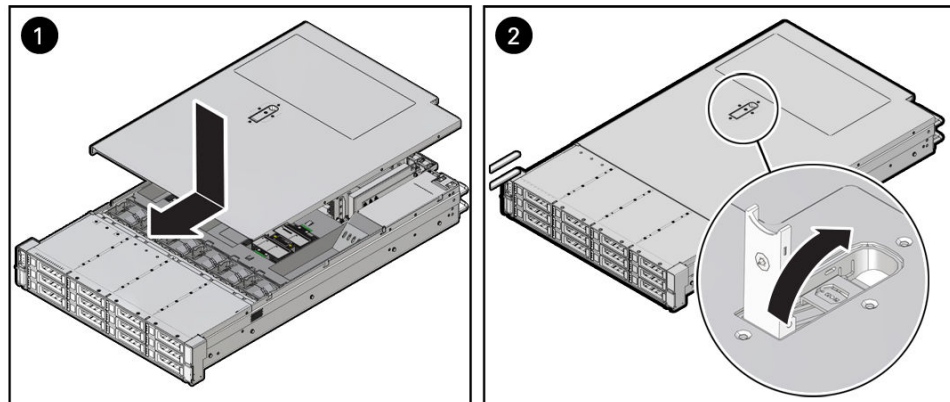
The release lever will close as it makes contact with the chassis. Do not slide the filler panel in all the way. Leave the filler panel out approximately 0.25 to 0.50 inch (6 to 12 mm) from the opening.

1.
  - a. Using your thumb or finger, press on the middle of the filler panel faceplate until the release lever engages with the chassis.
  - b. Close the release lever until it clicks into place and is flush with the front of the server
2. Remove the PCIe slot filler panel.
  - a. Remove the server top cover.

- b. To remove the PCIe slot filler panel, rotate the PCIe locking mechanism in to an upright position, and lift and remove the PCIe slot filler panel where you want to install the PCIe card.
3. Install the PCIe slot filler panel.
  - a. Remove the server top cover.
  - b. Press the PCIe filler panel into the vacant PCIe slot, and rotate the PCIe locking mechanism downward to secure the PCIe slot filler panel. You hear an audible click when the PCIe filler panel is secured into the slot.

### 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.

### Remove Antistatic Measures

1. Remove any antistatic straps or conductors from the server chassis.

### 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 76 lbs (34 kg). Two people are required to carry the chassis and install it in the rack.

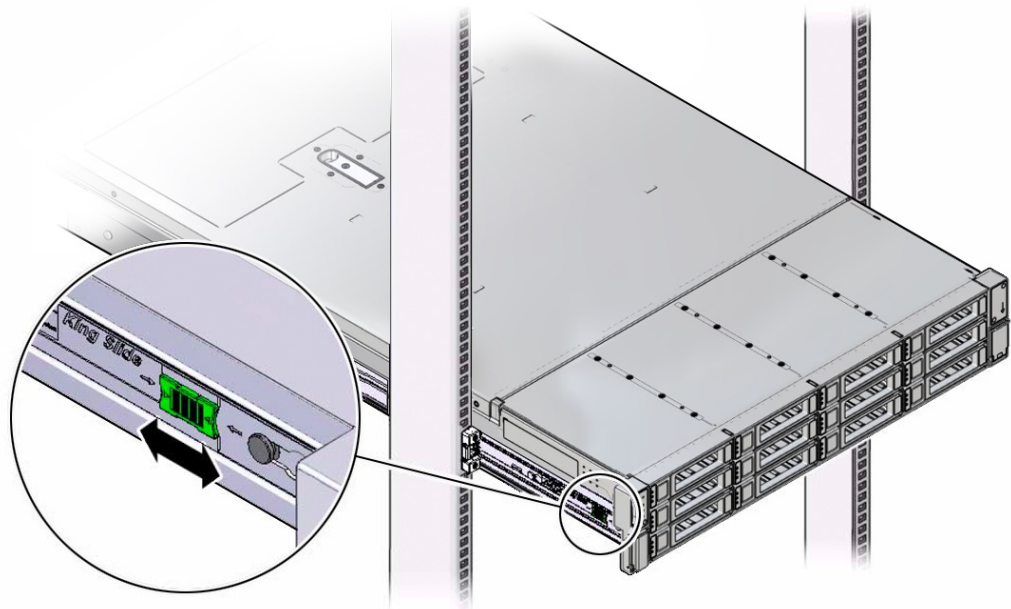
Use a mechanical lift or two people to transport the chassis and install it in the rack.

1. Lift the server from the antistatic mat, and reinstall the server into the rack. See Rackmount the Server.
2. If the cable management arm (CMA) is not installed, because you removed the server completely out of the rack, install the CMA. See Install the Cable Management Arm (Optional).
3. If the cables are disconnected from the back of the server, 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 Power and Data Cables.
  - To identify the location of cable connectors on the back of the server, refer to Back Panel Connector Locations.

**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. Verify that the cable management arm (CMA) retracts without binding. To pull the green release tab, place your finger in the center of the tab, not on the end, and apply pressure as you pull the tab toward the front of the server.





# Set Up BIOS Configuration Parameters

This section provides an overview of BIOS configuration management, UEFI BIOS, and the BIOS Setup Utility.

BIOS configuration parameters on an Oracle x86 server are manageable from the BIOS Setup Utility and Oracle Integrated Lights Out Manager (ILOM). Refer to [Oracle ILOM Documentation](#).

## Access the BIOS Setup Utility

The BIOS Setup Utility allows you to view product information, and to configure, enable, and disable, or manage system components.

## BIOS Setup Utility Menus

The following table provides descriptions for the top-level BIOS Setup Utility menus.

Menu	Description
Main	View general BIOS information, including version, build date and time, memory, and system date and time.
Advanced	Configure APMB, trusted computing, PSP firmware, AMD CBS, serial port console redirection, PCI subsystem, NVMe, network stack, CPU, and disk freeze lock.
IO	Configure internal I/O devices, add-in cards, and PCIe connectors.
Security	Configure secure boot.
Boot	Configure the retry boot list, network boot retry, persistent boot support, and boot option priorities.
Save & Exit	Save changes and exit, discard changes and exit, discard changes, or restore the default BIOS settings.

## BIOS Key Mappings

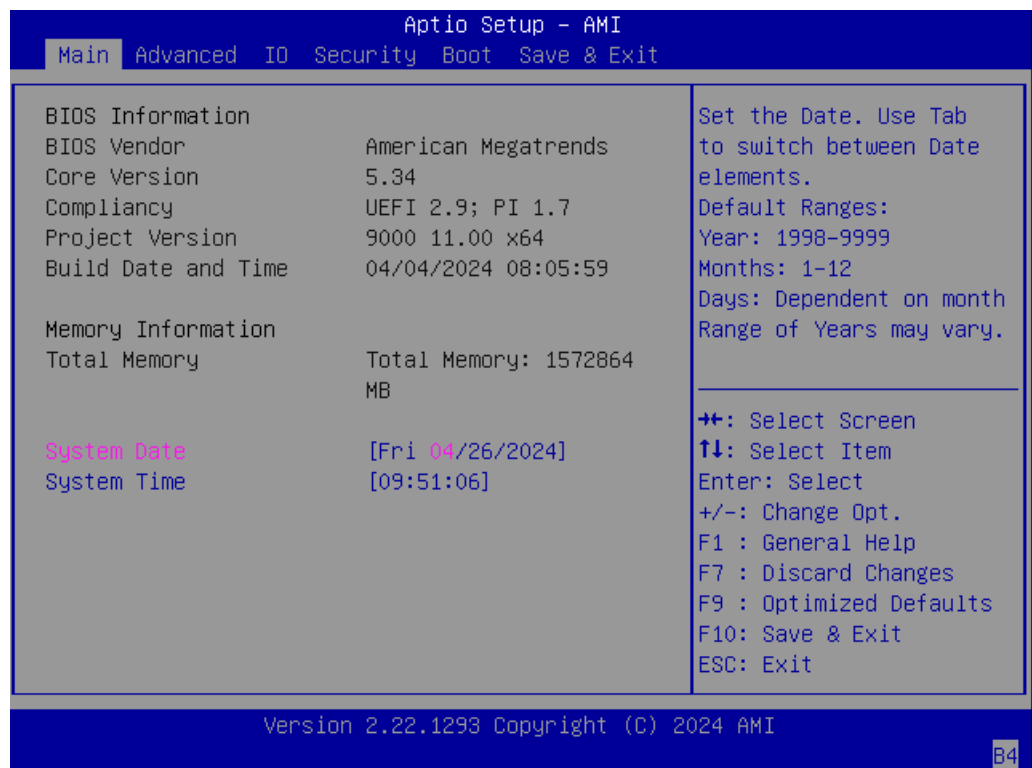
When viewing the BIOS output from a terminal using the serial console redirection feature, some terminals do not support function keys. BIOS supports the mapping of function keys to Control key sequences when serial redirection is enabled. The following table provides a description of the function key 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.

## 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.
    - Oracle ILOM CLI: type `reset /System`
    - Oracle ILOM web interface: click Host Management → Power Control and select Reset from the Select Action list. Click Save and click OK.
  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.



### Navigate BIOS Setup Utility Menus

1. In the BIOS Setup Utility, press the left and right arrow keys to select the menu options. As you select a menu option, the top-level menu for that menu option appears.
2. To navigate options in a top-level menu, press the up and down arrow keys. Options that you can modify appear highlighted in the menu. User instructions for a selected menu option appear on the upper right side of the screen.
3. Modify an option by pressing the + or - (plus or minus) keys, or by pressing Enter and selecting the option from the menu. The navigation keys appear on the lower right side of the BIOS screen.

4. Press the Esc key to return from a sub-menu to the previous menu. Pressing Esc from a top-level menu is equivalent to selecting the Discard Changes and Exit option in the Save menu.
5. Modify the parameters, as needed.
6. Press the F10 key to save your changes and exit the BIOS Setup Utility. Alternatively, you can select the Save menu, and select Save Changes and Exit to save your changes and exit the BIOS Setup Utility.

After modifying any BIOS settings, the subsequent reboot might take longer than a typical reboot where you did not change any settings. The delay occurs because the changes to the BIOS settings are synchronized with Oracle ILOM.

### Use UEFI BIOS

The Oracle server has 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.

### 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
- Back up or restore the BIOS configuration
- Enable UEFI diagnostics to run at system boot

See [Oracle ILOM Documentation](#).

### UEFI Secure Boot

The Oracle server 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.

### 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.

## 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.

1. Ensure that a console connection is established to the server.
2. 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.
  - Oracle ILOM CLI: type `reset /System`
  - Oracle ILOM web interface: click Host Management → Power Control and select Reset from the Select Action list. Click Save and click OK.
3. After the server resets and begins the initialization process, when prompted, press the F2 key to access the BIOS Setup Utility.
4. To ensure that the factory defaults are set, do the following:
  - a. Press the F9 key to automatically load the optimal factory default settings.
  - b. To confirm, highlight OK, and press Enter.
5. Press the F10 key to save the changes and exit the BIOS Setup Utility.

## Select a 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.
  - Oracle ILOM CLI: type `reset /System`
  - Oracle ILOM web interface: click Host Management → Power Control and select Reset from the Select Action list. Click Save and click OK
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.
3. In the Please Select Boot Device dialog box, select the boot device according to the operating system you are running, and press Enter. The boot device you select is in effect only for the current system boot. The permanent boot device specified using the F2 key is in effect after booting from the temporary boot device.
4. Follow the onscreen instructions to install the operating system or boot from the selected boot device.

## Configure TPM Support

The Trusted Platform Module (TPM) feature set is enabled by default. If you want to disable it, or to enable it after it has been disabled, perform the procedure in this section.

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.

If you intend to use the TPM, configure the server to support TPM, which is enabled by default on the Oracle server.

1. Access the BIOS Setup Utility menus.
2. On the Advanced screen, select Trusted Computing 2.0.
3. 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.
4. On the updated Trusted Computing 2.0 Configuration screen, press the F10 key to save the changes and exit the BIOS Setup Utility.

### Configure UEFI Driver Settings

1. Access the BIOS Setup Utility menus.
2. In the BIOS Setup Utility menus, navigate to the IO menu.
3. On the IO 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.

### Configure Slot PCIe Connector

Configure the UEFI BIOS for 2x4 bifurcation on Oracle F640 Flash Card v3.

1. Access the BIOS Setup Utility menus.
2. In the BIOS Setup Utility menus, navigate to the IO menu.
3. On the IO screen, select PCIe Connector Special Configuration, and press Enter to display the PCIe Connector Configuration Settings slots.
4. Specify the connector to control PCIe bifurcation and hotplug. On the PCIe Connector Special Configuration screen, select the Slot 1-9 PCIe Connector Configuration you want to configure and press Enter. Special configure this slot's connector PCIe SLOT Connector Configuration
5. On the `Menu to Control PCIE connector Bifurcation and Hotplug` pop-up screen for that slot, select one of the following and press Enter.
  - Select `No Special connector configuration` for this slot's PCIe connector.
  - Select `x16 Bifurcation` to enable x16 bifurcation special configuration in this slot's PCIe connector.
  - Select `x8x8 Bifurcation` to enable x8x8 bifurcation special configuration in this slot's PCIe connector.

- Select `x4x4x4x4 Bifurcation` to enable x4x4x4x4 bifurcation special configuration in this slot's PCIe connector.
  - Select `Hotplug\_Enabled` to enable PCIe card hotplug in this slot's PCIe connector.
  - Select `Hotplug\_Disabled` to disable PCIe card hotplug in this slot's PCIe connector.
  - Select `x4x4 HP ENABLED Aura-9` to enable x4x4 HP ENABLED Oracle Flash Accelerator F640 PCIe Card v3 special configure this slot's PCIe connector.
  - Select `x4x4x4x4 HP ENABLED Aura-9` to enable x4x4x4x4 HP ENABLED Oracle Flash Accelerator F640 PCIe Card v3 special configure this slot's connector.
6. Press the F10 key to save the changes and exit the BIOS Setup Utility.

#### **Configure UEFI Secure Boot**

1. Access the BIOS Setup Utility menus.
2. On the Main 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 ...

# 19

## Known Issues

This chapter describes important operating notes and known service issues for Oracle Communications Server E6-2L.

You can find detailed information about Oracle Communications Server E6-2L supported hardware in Product Description. For the most updated information about supported firmware and operating systems, important operating notes, and known issues, refer to Oracle AMD-Based Cloud Servers Product Notes.

Information about the latest firmware and Software Release, including tools, drivers, component firmware versions, and bug fixes is available in the ReadMe file for each Software Release. Some product features are enabled only when the latest versions of patches or firmware are installed. You must install the latest software version for optimal performance, security, and stability.

- 37627428 - 37469025 - set /SP/powermgmt/budgets/cpus activation\_state=enabled failed after factory defaults

Oracle Communications Server E6-2L failed after factory defaults or flash to sw3.8.0 ILOM without preserving sp config. The user can't set power capping activation\_state=enabled after flashing ILOM to sw380 build01, reports "set: This operation is not allowed in the current state."

```
set /SP/powermgmt/budgets/cpus activation_state=enabled
```

See 37469025: set /SP/powermgmt/budgets/cpus activation\_state=enabled failed after factory defaults.

# Appendix





## Server Status Indicators LEDs





These sections describe Oracle Communications Server E6-2L status indicators (LEDs) located on the front and back panels, including indicators located on components and ports.

## System-Level Status Indicators

System-level status indicators (LEDs) are located on both the server front panel and the back panel. For the location of the status indicators, see Front Panel Components and Back Panel Components. The following table describes these indicators.

**Table A-1 System-Level Status Indicators**



Status Indicator Name	Icon	Color	State and Meaning
Locate Button/LED		White	Indicates the location of the server. 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.
	Front and back panel		
ServiceFault-Service Required		Amber	Indicates the fault state of the server. OFF – The server is operating normally. STEADY ON – A fault is present on the server. This LED indicator lights whenever a fault indicator lights for a replaceable component on the server. Note: When this LED indicator is lit, a system console message might appear that includes a recommended service action.
	Front and back panel		
OK System OK		Green	Indicates the operational state of the chassis. 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 are running on the server host system, or the host is transitioning from the powered-on state to the standby state on shutdown. STEADY ON – The server is powered on, and all host POST code checkpoint tests are complete. The server is in one of the following states: the server host is booting the operating system (OS), or the server host is running the OS.
	Front and back panel		
SP OK		Green	Indicates the state of the service processor. OFF – Service processor (SP) is not running. SLOW BLINK – SP is booting. STEADY ON – SP is fully operational.
	Front panel		

Status Indicator Name	Icon	Color	State and Meaning
Top Fan		Amber	Indicates that one or more of the internal fan modules failed. OFF – Indicates steady state; no service is required. STEADY ON – Indicates service required.
	Front panel		
Rear Power Supply Fault		Amber	Indicates that one of the server power supplies failed. PS0 and PS1 are located on the server back panel. OFF – Indicates steady state; no service is required. STEADY ON – Indicates service required; service the power supply.
	Front panel		
Temp-Fault System Over Temperature Warning		Amber	Indicates a warning for an overtemperature condition. OFF – Normal operation; no service is required. STEADY ON – The system is experiencing an overtemperature warning condition. Note: This is a warning indication, not a fatal overtemperature. Failure to correct this might result in the system overheating and shutting down unexpectedly.
	Front panel		
DO NOT SERVICE		White	Indicates that the system is not ready to service. OFF – Normal operation. STEADY ON – The system is not ready for service. Note: The DO NOT SERVICE indicator is application specific. This indicator is only illuminated on demand by the Host application.
	Front panel		

### Power Supply Status Indicators

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


**Table A-2 Power Supply Status Indicators**

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

### Fan Module Status Indicators

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




**Table A-3 Fan Module Status Indicators**

Status Indicator Name	Icon	Color	State and Meaning
Fan Module Fault		Amber	OFF – The fan module is correctly installed and operating within specification. STEADY ON – 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.

**Table A-4 Storage Drive Status Indicators**

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

### Network Management Port Status Indicators

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

**Table A-5 Network Management Port Status Indicators**

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

### Ethernet Port Status Indicators

The server has one Ethernet port labeled 1GbE (NET 0). Two NET 0 status indicators (LEDs) are visible from the back of the server.

See 100/1000BASE-T Gigabit Ethernet port.

**Table A-6 Ethernet Port Status Indicators**

Status Indicator Name	Location	Color	State and Meaning
Activity Link	Bottom left	Green	ON – Link up. OFF – No activity. BLINKING – Packet activity.
speed	Bottom right	Bi-colored: Amber/Green	OFF – 100BASE-T link (if link up). Green ON – 1000BASE-T link.

### Motherboard Status Indicators

The motherboard contains the following status indicators (LEDs).

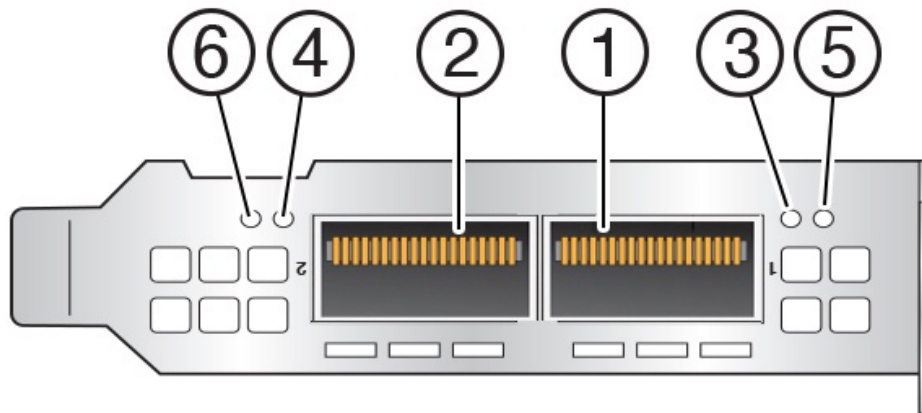
**Table A-7 Motherboard Status Indicators**

Status Indicator	Description
DIMM Fault Status Indicators	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. See Replace DIMMs.
Processor Fault Status Indicators	The motherboard includes a fault status indicator (LED) adjacent to each of the two processor sockets. These LEDs indicate when a processor fails. Pressing the Fault Remind button on the motherboard I/O card signals the service processor to light the fault status indicators associated with the failed processors. See Replace Processors.
Fault Remind Status Indicator	This status indicator (LED) is located next to the Fault Remind button and is powered from the super capacitor that powers the fault LEDs on the motherboard. This LED lights to indicate that the fault remind circuitry is working properly in cases where no components failed and, as a result, none of the component fault LEDs illuminate. See Use the Server Fault Remind Button.

Status Indicator	Description
STBY PWRGD Status Indicator	This green status indicator (LED) is labeled STBY PWRGD and is located on the motherboard near the back of the server. STBY PWRGD LED lights to inform a service technician that the motherboard is receiving Standby power from at least one of the power supplies. This LED helps prevent service actions on the server internal components while the AC power cords are installed and power is being supplied to the server.

### Mellanox ConnectX-6 Dx SmartNIC Status Indicators

The Mellanox ConnectX-6 Dx Dual Port RoCE SmartNIC status indicators are defined as follows:



Callout	Description
1	Port 1
2	Port 2
3	Port 1 status indicator: OFF = Link has not been established SOLID GREEN = Valid link has been established BLINKING GREEN = Link activity BLINKING AMBER = 1 Hz blink indicates a beacon command is being run to locate the adapter card; 4 Hz blink indicates a problem with the physical link
4	Port 2 status indicator: OFF = Link has not been established SOLID GREEN = Valid link has been established BLINKING GREEN = Link activity BLINKING AMBER = 1 Hz blink indicates a beacon command is being run to locate the adapter card; 4 Hz blink indicates a problem with the physical link
5 & 6	Not used.

### 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.

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.

## System Specifications

These sections describe specifications for Oracle Communications Server E6-2L.

### Server Physical Specifications

The following table lists physical specifications for Oracle Communications Server E6-2L.

**Table B-1 Physical Specifications**

Dimension	Server Specification	Measurements
Height	2-rack unit (2U) nominal	86.9 mm (3.42 inches)
Width	Server chassis	445 mm (17.52 inches)
Depth	Maximum overall	756 mm (29.76 inches)
Weight	Fully populated server	34 kg (76 lbs)

Dimensions do not include PSU handles.

### Electrical Requirements

The server uses high-line AC power. The server can operate effectively over a range of voltages and frequencies.

The following table contains the power supply specifications for Oracle Communications Server E6-2L.

The power dissipation numbers listed in the following table are the maximum rated power numbers for the power supply used in the server. The numbers are not a rating of the actual power consumption of the server. For up-to-date information about server power consumption, go to [Oracle Power Calculator](#).

**Table B-2 Electrical Requirements**

Parameter	Specification
Electrical ratings	200-240V~, 10A, 50/60Hz (x2)
Voltage (nominal)	200-240 VAC
Input current (maximum)	10.0A at 200-240 VAC
Frequency (nominal)	50/60 Hz (47-63 Hz range)
Maximum power consumption	1400W at AC 200V-240V

Parameter	Specification
Maximum heat output	11,600 BTU/Hr

**Table B-3 Power Supply Specifications**

Parameter	Power Supply Specification
Oracle Communications Server E6-2L	Two hot-swappable and highly-redundant 1400W A271 or A271A power supplies (PS0 and PS1)Note: The A271 and A271A power supplies are functionally identical. Either are supported in the system.
A271 Power Supply	A271 - Delta Electronics, Model AWF2DC1400W, Input rated 200 - 240 V~, 10A Max, 50/60 Hz. Output: V1 rated 12.1 Vdc, 116A Max., Vsb rated 12.1 Vdc, 3A Max, 1400W maximum
A271A Power Supply	A271A - Flextronics, Model SUN-S-1400ADU00, Input rated 200 - 240 V~, 10A Max, 50/60 Hz. Output: V1 rated 12.1 Vdc, 116A Max., Vsb rated 12.1 Vdc, 3A Max, 1400W maximum

To protect your server from such disturbances, use a dedicated power distribution system, power-conditioning equipment, and lightning arresters or power cables for protection from electrical storms.

See the following additional power specifications.

### Facility Power Guidelines

Electrical work and installations must comply with applicable local, state, or national electrical codes. To determine the type of power that is supplied to the building, contact your facilities manager or qualified electrician.

To prevent failures:

- Design the input power sources to ensure adequate power is provided to the power distribution units (PDUs).
- Use dedicated AC breaker panels for all power circuits that supply power to the PDU.
- When planning for power distribution requirements, balance the power load between available AC supply branch circuits.
- In the United States and Canada, ensure that the current load of the overall system AC input does not exceed 80 percent of the branch circuit AC current rating.

PDU power cords for Oracle racks are 4 meters (13.12 feet) long, and 1 to 1.5 meters (3.3 to 4.9 feet) of the cord might be routed in the rack cabinet. The installation site AC power receptacle must be within 2 meters (6.6 feet) of the rack.

### Grounding Guidelines

Use the following guidelines for grounding the server:

- The rack must use grounding type power cords. For example, Oracle Communications Server E6-2L uses three-wire, grounding-type power cords.
- Always connect the grounding-type power cords to grounded power outlets.
- Because different grounding methods are used, depending on location, verify the grounding type. For the correct grounding method, refer to local electrical codes.

- Ensure that a facility administrator or qualified electrical engineer verifies the grounding method for the building and performs the grounding work.

### Circuit Breaker and UPS Guidelines

To prevent failures:

- Ensure that the design of your power system provides adequate power to the server.
- Use dedicated AC breaker panels for all power circuits that supply power to the server.
- Ensure that electrical work and installations comply with applicable local, state, or national electrical codes.
- Ensure that the electrical circuits are grounded to Earth.
- Provide a stable power source, such as an uninterruptable power supply (UPS) to reduce the possibility of component failures. If computer equipment is subjected to repeated power interruptions and fluctuations, then it is susceptible to a higher rate of component failure.

### Environmental Requirements

The following table describes environmental specifications for Oracle Communications Server E6-2L.

**Table B-4 Environmental Requirements**

Specification	Operating	Nonoperating
Ambient temperature (does not apply to removable media)	Maximum range: 5°C to 35°C (41°F to 95°F) up to 900 meters (2,953 feet) Optimal: 21°C to 23°C (69.8°F to 73.4°F) Maximum ambient operating temperature is derated by 1 degree C per 300 meters of elevation above 900 meters, to a maximum altitude of 3,000 meters.	–40°C to 68°C (–40°F to 154°F)
Relative humidity	10% to 90% noncondensing, short term –5°C to 55°C (23°F to 113°F) 5% to 90% noncondensing, with a maximum of 0.024 kg of water per kg of dry air (0.053 lbs water/2.205 lbs dry air)	Maximum wet bulb of 93% noncondensing 35°C (95°F)
Altitude	Up to 3,000 meters (9,840 feet) In China markets, regulations might limit installations to a maximum altitude of 2,000 meters (6,562 feet).	Maximum 12,000 meters (39,370 feet)
Acoustic noise	Fan speed % Pulse Width Modulation (PWM) Acoustic noise emission declaration based on the measured Sound Power LWAd (1Bel = 10 dB) 4-Drive Sound Power (Bels) 50% PWM: 8.4, 60% PWM: 8.8, 70% PWM: 9.1, 80% PWM: 9.6, 90% PWM: 9.8 100% PWM: 10.1 12-drive Sound Power (Bels) 40% PWM: 7.9, 50% PWM: 8.58, 60% PWM: 8.96, 70% PWM: 9.3, 80% PWM: 9.5	Not applicable
Vibration	0.15 G (z-axis) 0.10 G (x-, y-axes), 5-500Hz swept sine IEC 60068-2-6 Test FC	0.5 G (z-axis), 0.25 G (x-, y-axes), 5-500Hz swept sine IEC 60068-2-6 Test FC

Specification	Operating	Nonoperating
Shock	3.5 G, 11 ms half-sine IEC 60068-2-27 Test Ea	Roll-off: 1.25-inch roll-off free fall, front to back rolling directions Threshold: 13-mm threshold height at 0.65 m/s impact velocity ETE-1010-02 Rev A

### Humidity Guidelines

The server ambient relative humidity range of 45 to 50 percent is acceptable for safe data processing operations and is the recommended optimal range. Foot 1 An ambient relative humidity optimal range of 45 to 50 percent can:

- Help protect computer systems from corrosion problems associated with high humidity levels.
- Provide the greatest operating time buffer in the event of air conditioner control failure.
- Help to avoid failures or temporary malfunctions caused by intermittent interference from static discharges that might occur when relative humidity is too low. Electrostatic discharge (ESD) is easily generated and not easily dissipated in areas where the relative humidity level is below 35 percent. ESD risk becomes critical when relative humidity levels drop below 30 percent.

### Temperature Guidelines

An ambient temperature range of 21° to 23° Celsius (70° to 74° Fahrenheit) is optimal for server reliability and operator comfort. Most computer equipment can operate in a wide temperature range, but approximately 22° Celsius (72° Fahrenheit) is recommended because it is easier to maintain safe humidity levels. Operating in this temperature range provides a safety buffer in the event that the air conditioning system is not running for a period of time.

### Ventilation and Cooling Requirements

Always provide adequate space in front of and behind the rack to allow for proper ventilation of rackmounted servers. Do not obstruct the front or back of the rack with equipment or objects that might prevent air from flowing through the rack. Rackmountable servers and equipment, including Oracle Communications Server E6-2L, draw cool air in through the front of the rack and release warm air out the back of the rack. There is no airflow requirement for the left and right sides due to front-to-back cooling.

If the rack is not completely filled with components, then cover the empty sections with filler panels. Gaps between components can adversely affect airflow and cooling in the rack.

The servers function while installed in a natural convection airflow. Follow these environmental specifications for optimal ventilation:

- Ensure that air intake is in the front of the system, and the air outlet is in the back. Take care to prevent recirculation of exhaust air in a rack or cabinet.
- Allow a minimum clearance of 123.2 cm (48.5 inches) in the front of the system, and 91.4 cm (36 inches) in the back.

- Ensure that airflow is unobstructed through the chassis. Oracle Communications Server E6-2L uses internal fans that can achieve between 130 CFM to 160 CFM (depending on configuration), within the specified range of operating conditions.
- Ensure that ventilation openings, such as cabinet doors for both the inlet and exhaust of the server, are unobstructed. For example, Oracle Rack Cabinet 1242 is optimized for cooling. Both the front and back doors have 80 percent perforations that provide a high level of airflow through the rack.
- Ensure that the front and back clearances between the cabinet doors is a minimum of 2.5 cm (1 inch) at the front of the server and 8 cm (3.15 inches) at the back of the server when mounted. To improve cooling performance, these clearance values are based on the inlet and exhaust impedance (available open area) and assume a uniform distribution of the open area across the inlet and exhaust areas. The combination of inlet and exhaust restrictions, such as cabinet doors and the distance of the server from the doors, can affect the cooling performance of the server. You must evaluate these restrictions. Server placement is particularly important for high-temperature environments
- Manage cables to minimize interference with the server exhaust vent.

### Agency Compliance

Oracle Communications Server E6-2L complies with the following specifications.

**Table B-5 Agency Compliance**

Category	Relevant Standards
Regulations	Product Safety: UL/CSA 60950-1, EN 60950-1, IEC 60950-1 CB Scheme with all country differences Product Safety: UL/CSA 62368-1, EN 62368-1, IEC 62368-1 CB Scheme with all country differences EMC/EMC: Emissions: FCC 47 CFR 15, ICES-003, EN55022, EN55032, KN32, EN61000-3-2, EN61000-3-3 Immunity: EN 55024, KN35
Certifications	North America Safety (NRTL)(CE) European Union International CB Scheme BIS (India) BSMI (Taiwan) CCC (PRC) EAC (EAEU including Russia) KC (Korea) RCM (Australia) VCCI (Japan) UKCA (United Kingdom)
European Union Directives	2014/35/EU Low Voltage Directive 2014/30/EU EMC Directive 2011/65/EU RoHS Directive 2012/19/EU WEEE Directive 2009/125/EC Ecodesign Energy Related Products Directive

#### Footnote 2

All standards and certifications referenced are to the latest official version. For additional detail, contact your sales representative.

#### Footnote 3

Other country regulations/certifications may apply.

#### Footnote 4

Regulatory and certification compliance were obtained for the shelf-level systems only.

Refer to safety information in [Oracle Server Safety and Compliance Guide](#) and in Important Safety Information for Oracle's Hardware Systems.

### 960GB NVMe M.2 Solid State Drive Specification

This section provides the specification for 960GB NVMe M.2 Solid State Drives.

The following tables list 960GB NVMe M.2 Solid State Drive specifications for Oracle Server E6-2L.

- 960GB, M.2, NVMe Solid State Drive 8212586 Specification
- 960GB, M.2, NVMe Solid State Drive 8213400 Specification

### 960GB M.2, NVMe Solid State Drive 8212586 Specification

NVMe Storage Drive 8212586 specifications are listed in the following table.

**Table B-6 960GB, M.2, NVMe Solid State Drive 8212586 Specification**

Specification	Value
Device name	Product Identifier SAMSUNG MZ1L2960HCJR-00A07Oracle Part Number raw: 8213397 generic: 8212582 assy: 8221518Device Identification:PCIe Vendor ID : 0x144dPCIe Device ID : 0xa80aPCIe Subsystem VID 0x144dPCIe Subsystem ID: 0xaa89
Manufacturing name	Samsung PM9A3 960 GB NVMe Solid-State Drive
Form factors	M.2 22110
PCIe interface	PCIe Gen4 Interface, Single port x4 lanes
NAND	Samsung V6 128L TLC V-NANDdie size: 32GiB4 ODP packages2 planesPage Size: 16KBNumber of dies 32 NAND dies (32 * 32GiB = 1024 GiB)
Flash Controller	Samsung Elpis controller8 NAND ChannelsDRAM DDR4 – up to 3200MbpsNAND channel Toggle 4.0 - 1200Mbps
Features	TCG-OPAL 2.0
Product Compliance	NVM Express Specification Rev. 1.4PCI Express Base Specification Rev. 4Enterprise SSD Form Factor Version 1.0aNVMe-MI Rev 1.1 (excluding VPD data)
Certifications and declarations	cUL-us, CE, TUV, CB, BSMI, KC, VCCI RCM, FCC, IC

**Table B-7 Drive Usage Information**

Usage	Description
Operating temperature (composite device temperature reported via SMART)	0 to 70 degrees Celsius
Non-Operating temperature	-40 to 85 degrees Celsius
Maximum temperature (SMART trip)	Warning at 77 degrees Celsius (composite), thermal throttling when approaching critical 85 degrees Celsius. Thermal Shutdown at 93 degrees Celsius
Other environmental factors	Conforms to IEC standards
Error rates	Uncorrectable Bit Error Rate (UBER): 1 sector per 10 <sup>17</sup> bits read
Data retention	3 months powered off at 40 degrees Celsius at end of rated endurance
Endurance	Drive Writes Per Day (DWPD) for 5 years: 1 (@ 960 GB)1 PBW (at 4KB Random Write) 1.75 PWB

**Table B-8 Drive Reliability**

Attribute	Value
Component Design Life (Useful life)	5 years
MTBF	2,000,000 hours

Attribute	Value
Expected AFR (Annualized Failure Rate)	0.44% for normal 24x7 operating conditions

**Table B-9 Drive Capacity and Performance**

Attribute	Value
Capacity, formatted	960 GB Capacity format : 960197124096 bytesSector Size (LBA size): 512 bytes per sectorTotal Addressable LBAs : 1,875,385,008Max User Capacity is 960 GB
Capacity, raw NAND	1024 GiB
Random 4 KB Read	IOPs - QD32, 4 thread - 550k IOPSLatency - QD=1 , 1 thread, 75us (typ)
Random 4 KB Write	IOPS - QD32, 4 thread - 60k IOPSLatency - QD=1 , 1 thread, 30us (typ)
Sequential Read	128KB, QD 32, 1 Thread : 3.5 GB/s
Sequential Write	128KB, QD 32, 1 Thread : 1.4 GB/s
Interface data transfer rate	Interface Data Rate: PCIe Gen4Data Transfer Rate 16 GT/secInterface drivers/receivers M.2: 1x4 lanes

**Table B-10 Drive Electrical Specifications**

Attribute	Value
Power On to Ready (no rebuild, no pending sanitize action)	5 seconds (CSTS.Ready =1 ; may not be ready for IO)
Supply Voltage / Tolerance	3.3 V +5%/-5%DC – 100Khz 300 mVp-p max100Khz-20Mhz 50 mVp-p maxmin Off time 10 ms
Inrush Current	3.3 V, 1.0 A
Power Consumption	< 8.2 WActive Read: 7.5 WActive Write: 6.5 WIdle < 5 W (in power-saving idle mode which is activated in case of no host command for 10seconds)
Power Requirements	Refer to vendor product specification.

**Table B-11 Drive Physical Characteristics**

Attribute	Value
Height	3.80 mm +/-0.18 mm
Width	22.00 mm +/-0.15 mm
Length	110.00 +/- 0.15 mm Max
Mass	Up to 20 g

**Table B-12 Solid-State Drive Characteristics**

Attribute	Value
NAND Technology	Samsung V6 128L TLC V-NAND
Over Provisioning	13% (to raw) at 960GB
Number of NAND Channels	8
NAND Die Count	128
NAND Transfer Rate	Toggle 4.0 - 1200 Mbps
Sectors per page	32

Attribute	Value
Page size	16 KB + 2048 B
Pages per Erase Block	3096 Pages/Blocks
Number of Blocks per Plane	340
Number of Planes per die	2
Erase Block Size	48 MB
TREAD (typ)	41 us
TPROG (typ)	0.7 ms
Program/Erase Cycles	7K

**Table B-13 Drive Characteristics**

Attribute	Value
Minimum operating system versions	Refer to the server product notes for minimum operating system versions, hardware, firmware, and software compatibility.
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs. SSD supports the standard method defined by NVMe for Solid State Drive to report NAND wear through the “Get Log” command SMART/Health Information Percentage Used field. The units are whole percentage of wear. Percentage Used: Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer’s prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 are represented as 255. This value is updated once per power-on hour (when the controller is not in a sleep state). Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
End-to-End data path protection	Device does not support Metadata formats – only supports 512B and 4KB LBA formats
Enhanced power-loss data protection	Energy storage components complete buffered writes to the persistent flash storage in case of a sudden power loss.
Power loss protection capacitor self-test	Supports testing of the power loss capacitor. Power is monitored using SMART (Self-Monitoring, Analysis, and Reporting Technology) attribute critical warning.
Out-of-Band Management (SMBUS)	Managed through the SMBUS. Provides out-of-band management by means of SMBUS interface. SMBUS access includes temperature sensor via MI basic but excludes the VPD page which is blank at FFs as the device does not support a VPD write protection scheme.
Hot-plug Support	Device advanced power loss protection provides robust data integrity. During IOs, the storage drive integrated monitoring enables the integrity of already committed data on the media and commits acknowledged writes to the media.

**960GB M.2, NVMe Solid State Drive 8213400 Specification**

NVMe Storage Drive 8213400 specifications are listed in the following table.

**Table B-14 960GB, M.2, NVMe Solid State Drive 8213400 Specification**

Specification	Value
Device name	Product Identifier Micron_7450_MTFDKBG960TFROracle Part Number raw: 8213398 generic: 8212582 assy: 8221518Device Identification:PCIe Vendor ID : 0x1344PCIe Device ID : 0x51C3PCIe Subsystem VID 0x1344PCIe Subsystem ID: 0x2100
Manufacturing name	Micron 7450 PRO 960GB NVMe Solid-State Drive
Form factors	M.2 22x110 M key
PCIe interface	PCIe Gen4 Interface, Single port x4 lanes
NAND	Micron 5th Gen 176L 3DNAND TLC (2ndnode RG)die size: 64GiB4 QDP packages4 planes Page Size: 16KBNumber of dies 16 NAND dies (16 * 64GiB = 1024 GiB)
Flash Controller	Micron Tomcat controller8 NAND Channels DRAM DDR4 – up to 3200MbpsNAND channel ONFI 4.2
Features	Supports UEFI boot
Product Compliance	NVM Express Specification Rev. 1.4bPCI Express Base Specification Rev. 4Enterprise SSD Form Factor Version 1.0aNVM-MI Rev 1.1b
Certifications and declarations	cUL-us, CE, TUV, CB, BSMI, KC, VCCI RCM, FCC, IC

**Table B-15 Drive Usage Information**

Usage	Description
Operating temperature (composite device temperature reported via SMART)	0 to 70 degrees Celsius
Non-Operating temperature	-40 to 85 degrees Celsius
Maximum temperature (SMART trip)	Warning at 77 degrees Celsius (composite), thermal throttling when approaching critical 85 degrees Celsius.Thermal Shutdown at 93 degrees Celsius
Other environmental factors	Conforms to IEC standards
Error rates	Uncorrectable Bit Error Rate (UBER): 1 sector per 10 <sup>17</sup> bits read
Data retention	3 months powered off at 40 degrees Celsius at end of rated endurance
Endurance	Drive Writes Per Day (DWPD) for 5 years: 1 (@ 960 GB)PBW (at 4KB RW) 1.7 PWB

**Table B-16 Drive Reliability**

Attribute	Value
Component Design Life (Useful life)	5 years
MTBF	2,000,000 hours
Expected AFR (Annualized Failure Rate)	0.44% for normal 24x7 operating conditions

**Table B-17 Drive Capacity and Performance**

Attribute	Value
Capacity, formatted	960GB Capacity format : 960197124096 bytes Sector Size (LBA size): 512 bytes per sector Total Addressable LBAs : 1,875,385,008Max User Capacity is 960GB
Capacity, raw NAND	1024 GiB

Attribute	Value
Random 4 KB Read	IOPs - 4k, 256 OIO - 520k IOPSLatency - QD=1 , 1 thread, 80us (typ)
Random 4 KB Write	IOPS - 4k, 128 OIO - 82k IOPSLatency - QD=1 , 1 thread, 15us (typ)
Sequential Read	128KB, QD 32, 1 Thread : 5.0 GB/s
Sequential Write	128KB, QD 32, 1 Thread : 1.4 GB/s
Interface data transfer rate	Interface Data Rate: PCIe Gen4Data Transfer Rate 16 GT/sec Interface drivers/receivers M.2: 1x4 lanes

**Table B-18 Drive Electrical Specifications**

Attribute	Value
Power On to Ready	20 seconds (CSTS.Ready =1 ; may not be ready for IO)
Supply Voltage / Tolerance	3.3 V +5%/-5%DC – 100Khz 300 mVp-p max100Khz-20Mhz 50 mVp-p maxmin Off time 1s
Inrush Current	3.3 V, 2.5 A
Power Consumption	< 8.2 WActive Read: 7 WActive Write: 5.7 WIdle < 2.9 W
Power Requirements	Refer to vendor product specification.

**Table B-19 Drive Physical Characteristics**

Attribute	Value
Height	3.80 mm +/-0.18 mm
Width	22.00 mm +/-0.15 mm
Length	110.00 +/- 0.15 mm Max
Mass	Up to 14 g

**Table B-20 Solid-State Drive Characteristics**

Attribute	Value
NAND Technology	Micron 5th Gen 176L 3DNAND TLC (2ndnode RG)
Over Provisioning	13% (to raw) at 960GB
Number of NAND Channels	8
NAND Die Count	16
NAND Transfer Rate	ONFI 4.2
Sectors per page	32
Page size	16 KB + 2048 B
Pages per Erase Block	2112 Pages/Blocks
Number of Blocks per Plane	552
Number of Planes per die	4
Erase Block Size	33 MB
TREAD (typ)	TBA us
TPROG (typ)	TBA ms
Program/Erase Cycles	10K

**Table B-21 Drive Characteristics**

Attribute	Value
Minimum operating system versions	Refer to the server product notes for minimum operating system versions, hardware, firmware, and software compatibility.
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs. SSD supports the standard method defined by NVMe for Solid State Drive to report NAND wear through the "Get Log" command SMART/Health Information Percentage Used field. The units are whole percentage of wear. Percentage Used: Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer's prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 are represented as 255. This value is updated once per power-on hour (when the controller is not in a sleep state). Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
End-to-End data path protection	Device does not support Metadata formats – only supports 512B and 4KB LBA formats.
Enhanced power-loss data protection	Energy storage components complete buffered writes to the persistent flash storage in case of a sudden power loss.
Power loss protection capacitor self-test	Supports testing of the power loss capacitor. Power is monitored using SMART (Self-Monitoring, Analysis, and Reporting Technology) attribute critical warning.
Out-of-Band Management (SMBUS)	Managed through the SMBUS. Provides out-of-band management by means of SMBUS interface. SMBUS access includes temperature sensor via MI basic.
Hot-plug Support	Device advanced power loss protection provides robust data integrity. During IOs, the storage drive integrated monitoring enables the integrity of already committed data on the media and commits acknowledged writes to the media. M.2 FF does not support hot-plug.

## 480GB NVMe M.2 Solid State Drive Specification

This section provides the specification for 480GB NVMe M.2 Solid State Drives.

The following tables list 480GB NVMe M.2 Solid State Drive specifications for Oracle Server E6-2L.

- 480GB, M.2, NVMe Solid State Drive 8214990 Specification
- 480GB, M.2, NVMe Solid State Drive 8214991 Specification

### 480GB M.2, NVMe Solid State Drive 8214990 Specification

NVMe Storage Drive 8214990 specifications are listed in the following table.

**Table B-22 480GB, M.2, NVMe Solid State Drive 8214990 Specification**

Specification	Value
Device name	Product Identifier: MICRON_7450_MTFDKBA480TFOracle Part Number: 8214990Device Identification:PCIe Vendor ID: 0x1344PCIe Device ID: 0x51C3Subsystem PCIe Vendor ID: 0x1344Subsystem ID 0x1100
Manufacturing name	Micron 7450 480GB M.2 NVMe Solid State Drive
Form factors	M.2 2280 M key

Specification	Value
PCIe interface	PCIe Gen4 Interface, single port, x4 lanes
Features	NVMe PCIe Gen4 Interface NVMe-MI (MCTP) VPD per NVMe-MI Ver 1.0a specification
Product Compliance	NVM Express Specification Rev. 1.4.b PCI Express Base Specification Rev. 4.0 Enterprise SSD Form Factor Version 1.0a NVMe-MI Rev 1.1b
Product ecological compliance	RoHS
Certifications and declarations	cUL-us, CE, TUV-GS, CB, CE, BSMI, KCC, Morocco, VCCI, RCM, FCC, IC

**Table B-23 Drive Usage Information**

Usage	Description
Operating temperature (composite device temperature reported via SMART)	0 to 70 degrees Celsius
Non-Operating temperature	-40 to 85 degrees Celsius
Maximum temperature (SMART trip)	Warning at 77 degrees Celsius (composite), thermal throttling when approaching critical 85 degrees Celsius. Thermal Shutdown at 93 degrees Celsius
Error rates	Uncorrectable Bit Error Rate (UBER): 1 sector per 10 <sup>17</sup> bits read
Data retention	3 months powered off at 40 degrees Celsius at end of rated endurance
Endurance	Drive Writes Per Day (DWPD) for 5 years: 1 PBW (at 4KB Random Write) 0.8 PBW Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.

**Table B-24 Drive Reliability**

Attribute	Value
Component Design Life (Useful life)	5 years
MTBF	2,000,000 hours
Expected AFR (Annualized Failure Rate)	0.44% for normal 24x7 operating conditions

**Table B-25 Drive Capacity and Performance**

Attribute	Value
Capacity, formatted	Default Formatted Capacity: 480,103,981,056 bytes Sector Size (LBA size): 512 bytes per sector
Capacity, unformatted	Unformatted Capacity (Total User Addressable LBA): 937,703,088 (max 480 GB)
Capacity, raw NAND	512 GiB
Random 4 KB Read	Random 4KB Read - 280k IOPs Typical 4 KB Random Read QD=1, Worker=1: 80us
Random 4 KB Write	Random 4 KB Write 40K IOPs Typical 4 KB Random Write QD=1, Worker=1: 15us
Sequential Read	128 KB, QD 128, Worker=1: 5.0 GB/s
Sequential Write	128 KB, QD 128, Worker=1: 0.7 GB/s

Attribute	Value
Interface data transfer rate	Interface Data Rate: PCIe Gen 4Data Transfer Rate 16 GT/secInterface drivers/receivers SFF: 1x4 lanes

**Table B-26 Drive Electrical Specifications**

Attribute	Value
Power On to Ready	20 seconds (CSTS.Ready=1 ; may not be ready for IO)
Supply Voltage / Tolerance	3.3 V +5%/-5%
Inrush Current	3.3 V, 2.5 A
Power Consumption	Active Read: 7 WActive Write: 5.7 WIdle < 2.9 W
Power Requirements	Refer to vendor product specification.

**Table B-27 Drive Physical Characteristics**

Attribute	Value
Height	3.80 mm +/-0.18 mm
Width	22.00 mm +/-0.15 mm
Length	80.00 mm +/- 0.15 mm
Mass	Up to 11 g

**Table B-28 Drive Characteristics**

Attribute	Value
Minimum operating system versions	Refer to the server product notes for minimum operating system versions, hardware, firmware, and software compatibility.
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs. SSD supports the standard method defined by NVMe for Solid State Drive to report NAND wear through the “Get Log” command SMART/Health Information Percentage Used field. The units are whole percentage of wear. Percentage Used: Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer’s prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 are represented as 255. This value is updated once per power-on hour (when the controller is not in a sleep state).Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
Enhanced power-loss data protection	Energy storage components complete buffered writes to the persistent flash storage in case of a sudden power loss.
Power loss protection capacitor self-test	Supports testing of the power loss capacitor. Power is monitored using SMART (Self-Monitoring, Analysis, and Reporting Technology) attribute critical warning.
Out-of-Band Management (SMBUS)	Managed through the SMBUS. Provides out-of-band management by means of SMBUS interface. SMBUS access includes NVMe-MI, the VPD page and temperature sensor.

Attribute	Value
Management utilities	For more information about management utilities, refer to the server documentation.

#### 480GB M.2, NVMe Solid State Drive 8214991 Specification

NVMe Storage Drive 8214991 specifications are listed in the following table.

**Table B-29 480GB, M.2, NVMe Solid State Drive 8214991 Specification**

Specification	Value
Device name	Product Identifier: SAMSUNG MZVL2480HBJD-00A07Oracle Part Number: 8214991Device Identification:PCIe Vendor ID: 0x144DPCIe Device ID: 0xA80ASubsystem PCIe Vendor ID: 0x144DSubsystem ID 0xA81C
Manufacturing name	Samsung PM9A3 480GB M.2 NVMe Solid-State Drive
Form factors	M.2 2280 M key
PCIe interface	PCIe Gen4 Interface, Single port x4 lanes
Features	NVMe PCIe Gen4 InterfaceNVMe-MIVPD is blank "FFs" as supplied TCG Opal 2.0 compliant
Product Compliance	NVM Express Specification Rev. 1.4PCI Express Base Specification Rev. 4.0Enterprise SSD Form Factor Version 1.0aNVMe-MI Rev 1.1 (excluding VPD data)
Product ecological compliance	RoHS
Certifications and declarations	cUL, CE, TUV-GS, CB, BSMI, KC, VCCI, Morocco, RCM, FCC, IC

**Table B-30 Drive Usage Information**

Attribute	Value
Operating temperature (Composite, as reported via SMART)	0 to 70 degrees Celsius
Non-Operating temperature	-40 to 85 degrees Celsius
Maximum temperature (SMART trip)	Warning at 77 degrees Celsius (composite). Thermal throttling in stages until critical 85 degrees Celsius. Thermal Shutdown at 99 degrees Celsius.
Error rates	Uncorrectable Bit Error Rate (UBER): 1 sector per 10 <sup>17</sup> bits read
Data retention	3 months powered off at 40 degrees Celsius at end of rated endurance
Endurance	Drive Writes Per Day (DWPD) for 5 years: 1PBW (at 4KB Random Write): 0.8 PBRefer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.

**Table B-31 Drive Reliability**

Attribute	Value
Component Design Life (Useful life)	5 years
MTBF	2,000,000 hours
Expected AFR (Annualized Failure Rate)	0.44% for normal 24x7 operating conditions

**Table B-32 Drive Capacity and Performance**

Attribute	Value
Capacity, formatted	Default Formatted Capacity: 480,103,981,056 bytes Sector Size (LBA size): 512 bytes per sector
Capacity, unformatted	Unformatted Capacity (Total User Addressable LBA): 937,703,088 (max 480 GB)
Capacity, raw NAND	512 GiB
Random 4 KB Read	4 KB Random Read - 130K IOPS (up to) Latency - QD=1, 1 thread, 75us (Typical)
Random 4 KB Write	4 KB Random Write - 20K IOPS (up to) Latency - QD=1, 1 thread, 50us (Typical)
Sequential Read	128 KB, QD 64, 1 thread: 1.5 GB/s (up to)
Sequential Write	128 KB, QD 64, 1 thread: 400 MB/s (up to)
Interface data transfer rate	Interface Data Rate: PCIe Gen 4 Data Transfer Rate 16 GT/sec Interface drivers/receivers SFF: 1x4 lanes

**Table B-33 Drive Electrical Specifications**

Attribute	Value
Power On to Ready	5 seconds (CSTS. Ready =1; may not be ready for IO)
Supply Voltage / Tolerance	3.3 V +5%/-5%
Inrush Current	3.3 V, 1.0 A
Power Consumption	< 8.2 W Active Read: 3.6 W Active Write: 3.4 W Idle < 2.5 W
Power Requirements	Refer to vendor product specification.

**Table B-34 Drive Physical Characteristics**

Attribute	Value
Height	3.80 mm +/-0.18 mm
Width	22.00 mm +/-0.15 mm
Length	80.00 mm +/-0.15 mm
Mass	15 g Max

**Table B-35 Drive Characteristics**

Attribute	Value
Minimum operating system versions	Refer to the server product notes for minimum operating system versions, hardware, firmware, and software compatibility.

Attribute	Value
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs. SSD supports the standard method defined by NVMe for Solid State Drive to report NAND wear through the "Get Log" command SMART/Health Information Percentage Used field. The units are whole percentage of wear. Percentage Used: Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer's prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 are represented as 255. This value is updated once per power-on hour (when the controller is not in a sleep state). Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
Enhanced power-loss data protection	Energy storage components complete buffered writes to the persistent flash storage in case of a sudden power loss.
Power loss protection capacitor self-test	Supports testing of the power loss capacitor. Power is monitored using SMART (Self-Monitoring, Analysis, and Reporting Technology) attribute critical warning.
Out-of-Band Management (SMBUS)	Managed through the SMBUS. Provides out-of-band management by means of SMBUS interface. SMBUS access includes NVMe-MI, the VPD page and temperature sensor. On this device the VPD is supplied as blank "FFs".
Management utilities	For more information about management utilities, refer to the server documentation.

## 22TB Hard Disk Drive Specification

This section provides the specification for 22TB Hard Disk Drives.

The following tables list 22TB Hard Disk Drive (HDD) specifications.

**Table B-36 22TB HDD Power Requirements**

Condition	+5 VDC (+/-5%)	+12 VDC (+/-5%)
Motor start (Surge current 20 sec) Amp. peak	0.94 A	2.00 A
Idle power (Average)	0.41 A	0.33 A
Maximum peak operational power	1.09 A	2.00 A (10.0 W max workload)

**Table B-37 22TB HDD Drive Physical Characteristics**

Attribute	Value
Height	26.1 mm, 1.03 in.
Width	101.6 +/-0.25 mm, 4.00 +/-0.006 in.
Depth	147 mm, 5.787 +/-0.006 in.
Weight	Up to 0.670 kg, 23.6336 oz

**Table B-38 22TB HDD Drive Usage**

Usage	Description
Useful life	5 years Minimum
Expected annualized failure rate (AFR) for normal 24/7 operating conditions	0.35%
Operating temperature (Case)	0 to 50 degrees Celsius Note - Derating of AFR applies above 40 degrees Celsius.
Maximum temperature	60 degrees Celsius (maximum sustained temperature)Note - Drive may be rendered unusable above 65 degrees Celsius.
Other environmental factors	Conforms to IEC standards

**Table B-39 22TB HDD Drive Capacity and Performance**

Attribute	Value
Capacity, formatted	22,000,969,973,760 bytes (512 bytes per sector)
Average latency	4.16 msec (7,200 rpm)
Seek times (read/write)	Typical
Single track seek	0.25/0.35 msec
Average seek	6.79/7.82 msec
Maximum seek	13.63/14.68 msec
Random 2 KB reads per sec	Typical
Queue=1, 100% Volume (RR)	87 IOPS
Queue=32, 100% Volume (RR)	210 IOPS
HDA data transfer rate	Typical
Sustained sequential read	257 MiB/s (OD) / 151 MiB/s (ID)
Interface data transfer rate	12 Gbps/6 Gbps/3 Gbps/1.5 Gbps (auto negotiation, dual port, full duplex) SAS-3
Maximum instantaneous data transfer rate	1200 Mbytes per sec (12 Gbps mode)
Power On to Ready	25 sec (typical)
Spin down	30 sec (typical)

Note - Most computer equipment can operate in a wide range (20 to 80 percent).

## Server Installation Information

### Receiving and Unpacking Requirements

When the server is unloaded at your site:

- Leave the server in its shipping carton until it arrives at its installation location.
- Use a separate area to remove the packaging material to reduce particle contamination before the server is taken to the data center.
- Ensure that there is enough clearance and clear pathways to move the server from the unpacking area to the installation location.
- Ensure that the entire access route to the installation location is free of raised-pattern flooring that causes vibration.

## Maintenance Space Requirements

The maintenance area for the rackmounted Oracle Communications Server E6-2L must have the required access space. The following table lists the maintenance access requirements for the server when it is installed in a rack.

**Table C-1 Maintenance Space Requirements**

Location	Maintenance Access Requirement
Back of the server	91.4 cm (36 inches)
Area above the rack	91.4 cm (36 inches)
Front of the server	123.2 cm (48.5 inches)

## Rack Space Requirements

Oracle Communications Server E6-2L is a 2U server. For physical dimensions, see Server Physical Specifications.

You can install the server into a four-post rack cabinet that conforms to ANSI/EIA 310-D-1992 or IEC 60297 standards, such as Oracle Rack Cabinet 1242. See Rack Compatibility.

The minimum ceiling height for the cabinet is 230 cm (90 inches), measured from the true floor or raised floor, whichever is higher. An additional 91.4 cm (36 inches) of ceiling height is required for top clearance. The space above the cabinet and its surroundings must not restrict the movement of cool air between the air conditioner and the cabinet, or the movement of hot air coming out of the top of the cabinet.

## Rack Compatibility

The rack into which you install Oracle Communications Server E6-2L must meet the requirements listed in the following table. Oracle Rack Cabinet 1242 and Sun Rack II are compatible with Oracle Server E6-2L. For information about the racks, see Rackmount the Server.

**Table C-2 Rack Compatibility**

Item	Requirement
Structure	Four-post rack: (mounting at both front and back) Supported rack types: square hole (9.5 mm) and round hole (M6 or 1/4-20 threaded only). Two-post racks are not compatible.
Rack horizontal opening and unit vertical pitch	Conforms to ANSI/EIA 310-D-1992 or IEC 60297 standards.
Distance between front and back mounting planes	Minimum 61 cm and maximum 91.5 cm (24 inches to 36 inches).
Clearance depth in front of front mounting plane	Distance to front cabinet door is at least 2.54 cm (1 inch).
Clearance depth behind front mounting plane	Distance to back cabinet door is at least 90 cm (35.43 inches) with the cable management arm, or 80 cm (31.5 inches) without the cable management arm.
Clearance width between front and back mounting planes	Distance between structural supports and cable troughs is at least 45.6 cm (18 inches).

Item	Requirement
Minimum clearance for service access	Clearance, front of server: 123.2 cm (48.5 inches) Clearance, back of server: 91.4 cm (36 inches)

The following table contains Oracle Rack Cabinet 1242 rack specifications:

**Table C-3 Oracle Rack Cabinet 1242 Rack Specifications**

Requirement	Specification
Usable rack units	42
Height	199.9 cm (78.74 inches)
Width (with side panels)	60 cm (23.62 inches)
Maximum dynamic load	1005 kg (2215 lbs)

The following table contains Sun Rack II Model 1242 and Sun Rack II Model 1042 rack specifications:

**Table C-4 Sun Rack II Model 1242 and Sun Rack II Model 1042 Rack Specifications**

Requirement	Specification
Usable rack units	42
Height	199.8 cm (78.66 inches)
Width (with side panels)	60 cm (23.62 inches)
Depth Model 1242	120 cm (47.24 inches)
Depth Model 1042	105.8 cm (41.66 inches)
Weight Model 1242	150.6 kg (332 lbs)
Weight Model 1042	123.4 kg (272 lbs)
Maximum dynamic load	1005 kg (2215 lbs)

Depth is measured from front door handle to back door handle.

### Installation Procedure

This topic provides an overview of the Oracle Communications Server E6-2L installation procedure. Review the entire installation procedure and find links to more information about each step.

The following list summarizes the tasks that you must perform to properly install Oracle Server E6-2L.

1. Review Known Issues for any late-breaking information about the server. Refer to Oracle AMD-Based Cloud Servers Product Notes.
2. Confirm Installation Prerequisites. Prepare to install the server.
3. Install the server into a rack. Rackmount the Server. To rackmount the server, secure the rack to the floor, stabilize the rack, and install the mounting brackets and slide rails. Install the server hardware.
4. Connect to the system. Attach cables and power cords to the server.
5. Power on the server.
6. Connect to Oracle Integrated Lights Out Manager (ILOM).

7. Install the operating system.

### Installation Prerequisites

Prepare to install the server. Before you start the Rackmount Procedures or Reinstall the Server Into the Rack, ensure that the following tasks are complete.

1. Review the server:
  - Features
  - Components
  - Specifications
  - Site Planning Checklists
  - Management
1. Confirm that your site meets the required electrical and environmental requirements. See Site Planning Checklists.
2. Familiarize yourself with safety precautions and electrostatic discharge (ESD).
3. Before installing the server, read the safety information in Oracle Server Safety and Compliance Guide and in Important Safety Information for Oracle's Hardware Systems.
4. Assemble the required tools and equipment for installation.
5. Confirm that you received all the items you ordered. See Shipping Inventory.
6. Install any separately shipped optional components.

### Safety Precautions

This section describes safety precautions you must follow when installing the server into a rack.



**Communicate instructions:** When performing a two-person procedure, communicate your intentions clearly to the other person before, during, and after each step to minimize confusion.

**Elevated operating ambient temperature:** If you install the server in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment might be higher than the room ambient temperature. Install the equipment in an environment compatible with the maximum ambient temperature (T<sub>ma</sub>) specified for the server. For server environmental requirements, see Environmental Requirements.

**Reduced airflow:** Install the equipment in a rack so that it does not compromise the amount of airflow required for safe operation of the equipment.

**Mechanical loading:** Mount the equipment in the rack so that it does not cause a hazardous condition due to uneven mechanical loading.

**Circuit overloading:** Consider the connection of the equipment to the supply circuit and the effect that overloading the circuits might have on over-current protection and supply wiring. Also consider the equipment nameplate power ratings used when you address this concern.

**Reliable earthing:** Maintain reliable earthing of rackmounted equipment. Pay attention to supply connections other than direct connections to the branch circuit (for example, use of power strips).

**Mounted equipment:** Do not use slide-rail-mounted equipment as a shelf or a workspace.

### ESD Precautions

Electronic equipment is susceptible to damage by static electricity. To prevent electrostatic discharge (ESD) when you install or service the server:

- Use a grounded antistatic wrist strap, foot strap, or equivalent safety equipment.
- Place components on an antistatic surface, such as an antistatic discharge mat or an antistatic bag.
- Wear an antistatic grounding wrist strap connected to a metal surface on the chassis when you work on system components.

Before installing the server, read the safety information in [Oracle Server Safety and Compliance Guide](#) and in Important Safety Information for Oracle's Hardware Systems.

### Tools and Equipment For Installation

To install and maintain the server, you must have the following service tools:

- Phillips (+) No. 1, No. 2
- Torx (6 Lobe) T15, T20, T25, T30
- Antistatic wrist strap
- Antistatic mat

You must provide a system console device, such as a laptop (running terminal emulation software), workstation, or terminal server.

### Shipping Inventory

Inspect the shipping cartons for evidence of physical damage. If a shipping carton appears damaged, request that the carrier agent be present when the carton is opened. Keep all contents and packing material for the agent inspection.

The carton contains these components:

- Power cords, packaged separately with the country kit
- Rackmount kit, containing rack rails, mounting brackets, screws, and the Rackmounting Template
- Legal and safety documents

### Rackmount the Server

To rackmount the server, secure the rack to the floor, stabilize the rack, and install the mounting brackets and slide rails. Then, install the server into the rack.

#### Rack Mount Instructions

A) Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T<sub>ma</sub>) specified by the manufacturer.

B) Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

C) Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

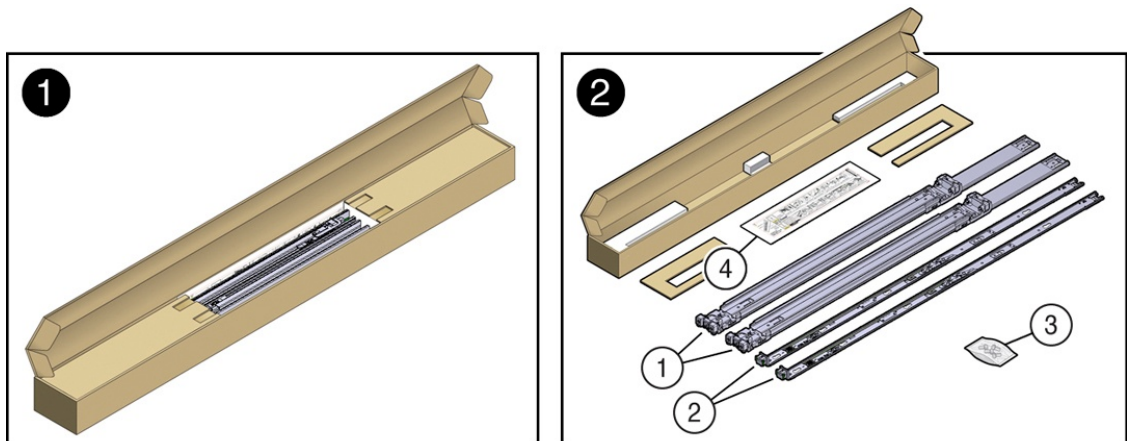
D) Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

E) Reliable Earthing - Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Equipment is intended for installation in Restricted Access Area

### Rackmount Kit Contents

The following figure shows the Rackmount Kit contents. For additional instructions on how to install your server in a four-post rack using the slide-rail and cable management arm options, refer to the Rackmounting Template.



Call Out	Description
1	Slide-rails
2	Mounting brackets
3	Four M4 x 5 fine-pitch mounting bracket securing screws (optional)
4	Rackmounting Template

### Stabilize the Rack

Refer to your rack documentation for detailed instructions for the following steps.

1. Open and remove the front and back doors from the rack cabinet, only if they impinge on the mounting bay.
2. To prevent the rack cabinet from tipping during the installation, fully extend the rack cabinet anti-tilt bar, which is located at the bottom front of the rack cabinet.
3. If the rack includes leveling feet beneath the rack cabinet to prevent the rack from rolling, extend these leveling feet fully downward and lock to the floor.

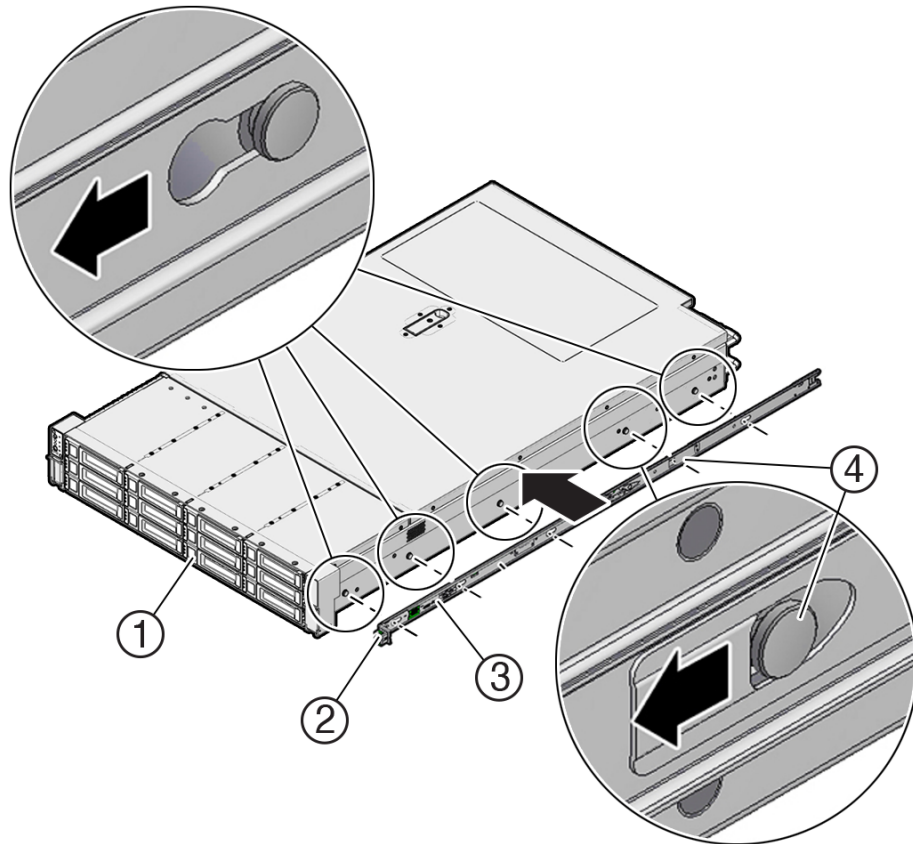
## Related Rack Documentation

- [Oracle Rack Cabinet 1242 Documentation](#)
- [Oracle Sun Rack II 1242 Documentation](#)
- [Oracle Sun Rack II 1042 Documentation](#)

## Install Mounting Brackets on the Server

To install the mounting brackets on the sides of the server:

1. Position a mounting bracket against the chassis so that the slide-rail lock is at the server front, and the five keyhole openings on the mounting bracket are aligned with the five locating pins on the side of the chassis.



Call Out	Description
1	Chassis front
2	Slide-rail lock
3	Mounting bracket
4	Mounting bracket clip

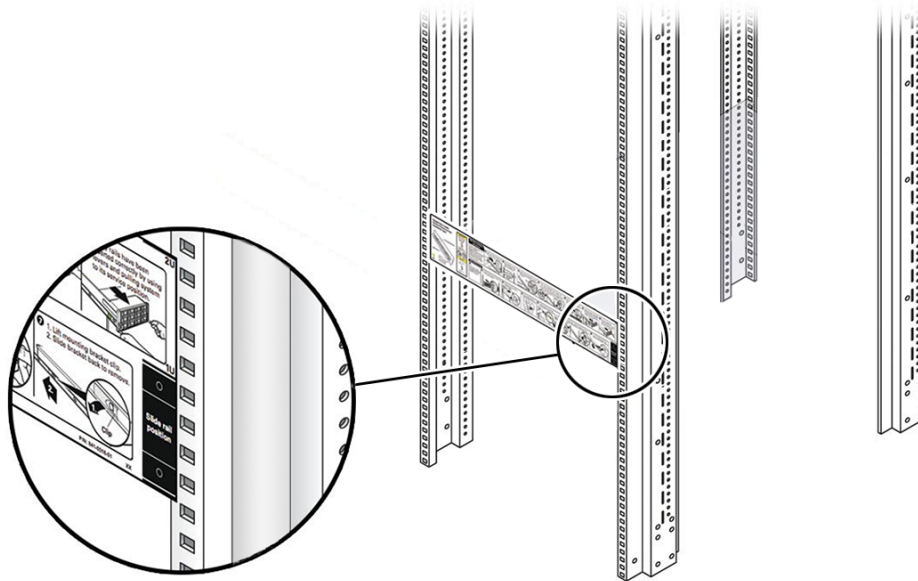
2. When the heads of the five chassis locating pins protrude through the five keyhole openings in the mounting bracket, pull the mounting bracket toward the front of the chassis until the mounting bracket clip locks into place with an audible click.
3. Verify that the back locating pin is engaged with the mounting bracket clip.

- Repeat Step 1 through Step 3 to install the other mounting bracket on the other side of the server.

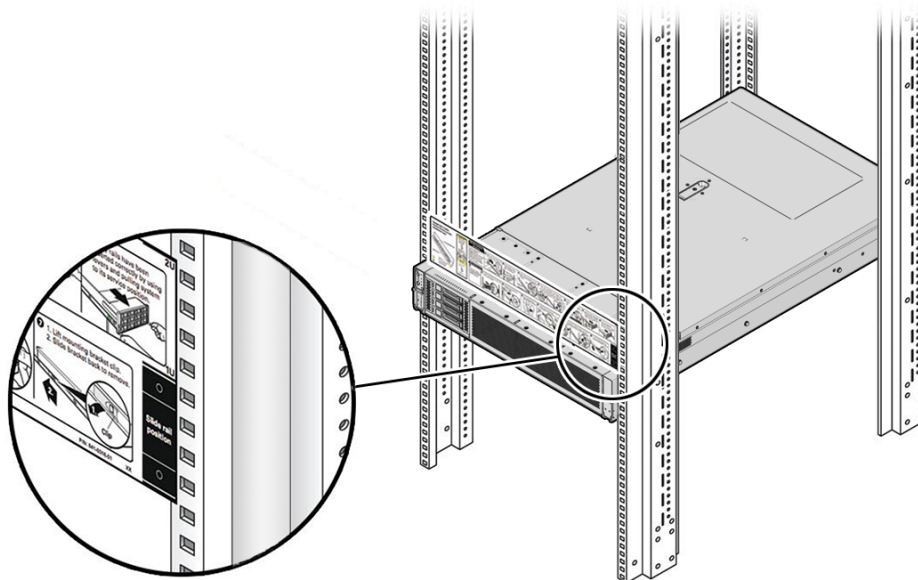
### Mark the Rackmount Location

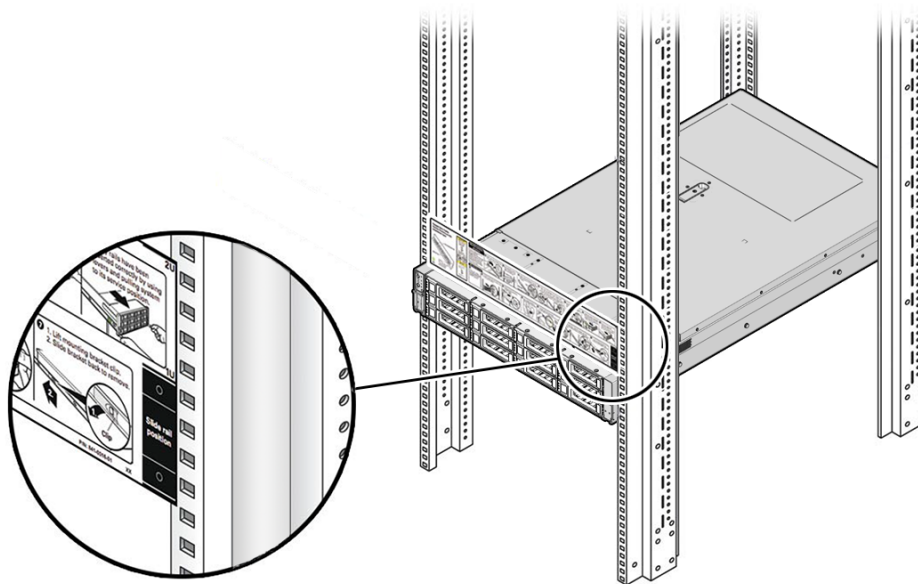
Identify the location in the rack where you want to place the server. Oracle Server E6-2L requires two rack units (2U). Use the Rackmounting Template to identify the correct mounting holes for the slide-rails.

- Ensure that there is at least two rack units (2U) of vertical space in the rack cabinet to install the server. See Rack Compatibility.
- Place the Rackmounting Template against the front rails, and measure up from the bottom of the Rackmounting Template. The bottom edge of the Rackmounting Template card corresponds to the bottom edge of the server.



- Mark the mounting holes for the front slide-rails.

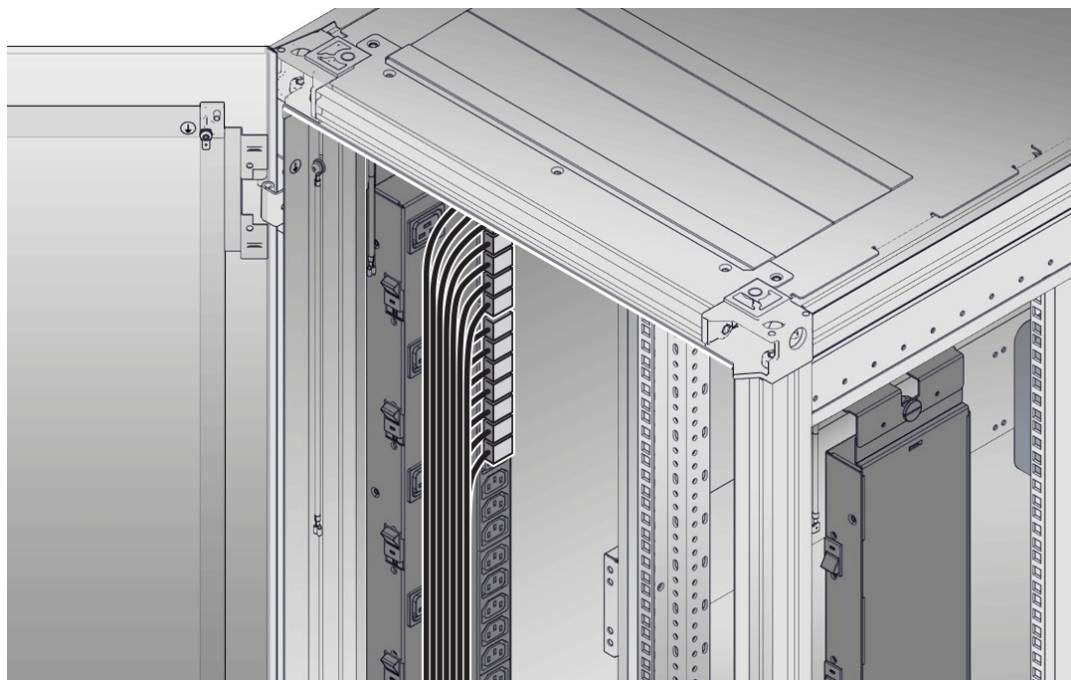




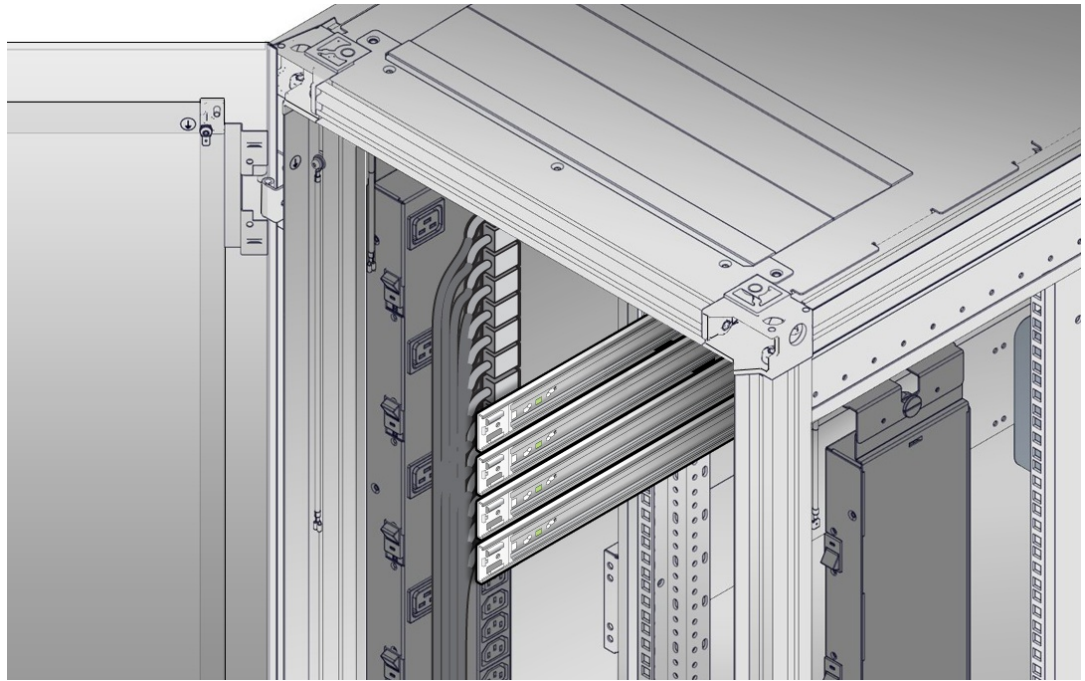
4. Mark the mounting holes for the back slide-rails.

#### Install AC Power Cables and Slide-Rails

1. Before you install the slide-rails into the rack, install server right-angle AC power cables into the left-side and right-side PDU electrical sockets. Use part number 7079727 - Pwrcord, Jmpr, Bulk, SR2, 2m, C14RA, 10A, C13, 2-meter, right-angle AC power cable for this procedure.



2. Install the slide-rails into the rack. See Attach the Slide-Rails.

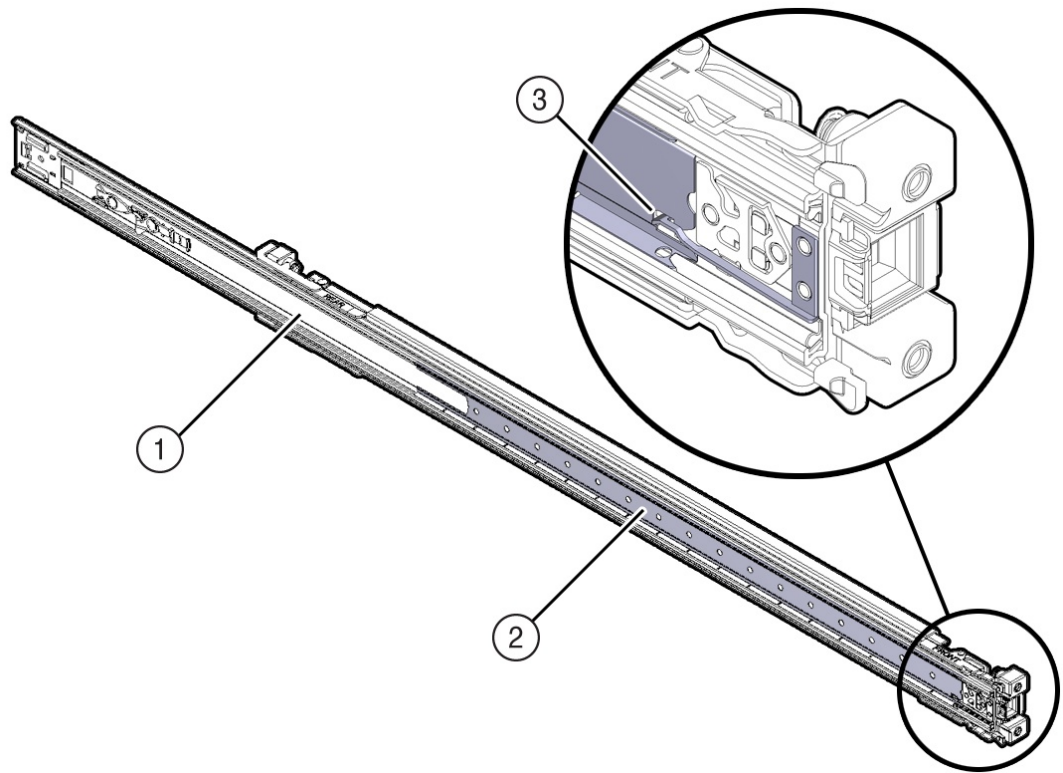


### **Attach the Slide-Rails**

Use this procedure to attach slide-rail assemblies to the rack.

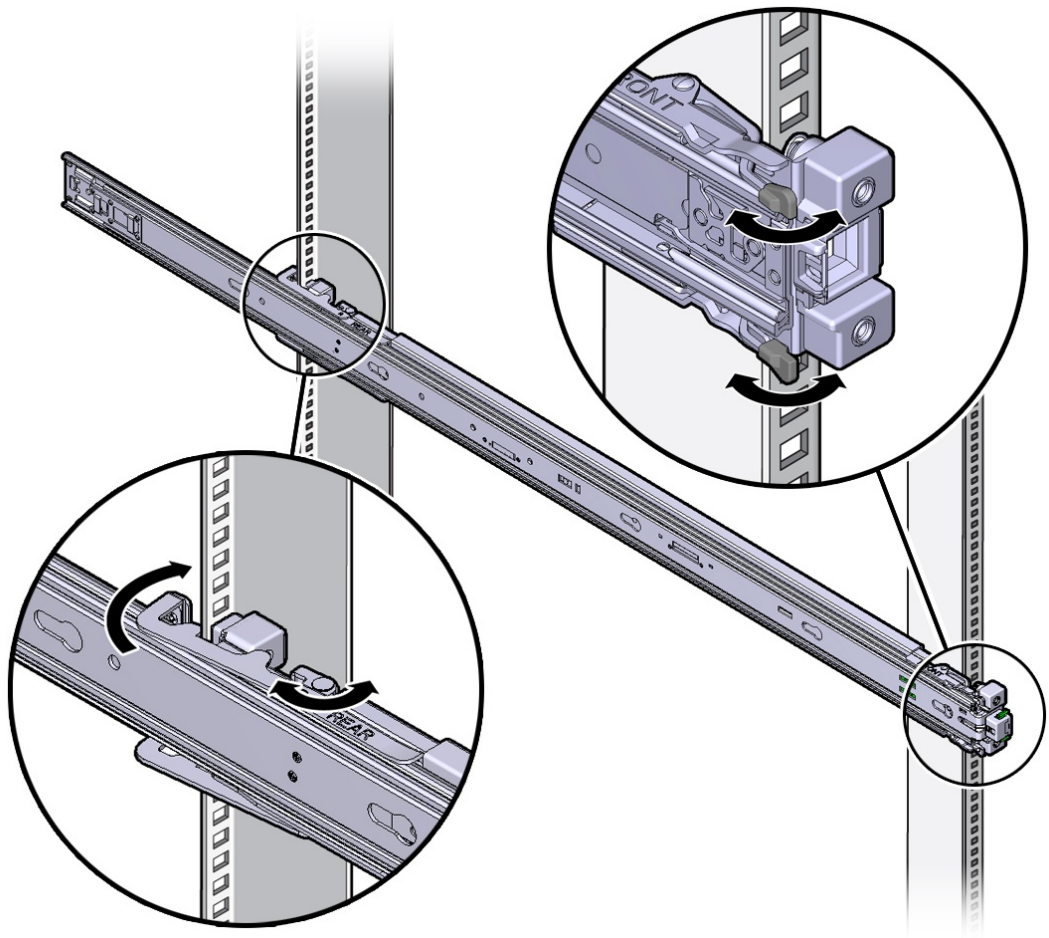
Before you install the slide-rails, be sure to install the server right-angle AC power cables (part number 7079727 - Pwrcord, Jmpr, Bulk, SR2, 2m, C14RA, 10A, C13). In the 1000 mm rack, the standard rail kit slide-rails obstruct access to the front of the 15kVA, 22kVA, and 24kVA Power Distribution Unit (PDU) electrical sockets. If you use the standard AC power cables, first plug them in, and then install the slide-rails into the rack. After you install the slide-rails, you cannot disconnect or remove the standard AC power cables from the PDU but you can remove them from the system.

1. Orient the slide-rail assembly so that the ball-bearing track is forward and locked in place.



Call Out	Description
1	Slide-rail
2	Ball-bearing track
3	Ball-bearing locking mechanism

2. Starting with either the left or right side of the rack, align the back of the slide-rail assembly against the inside of the back rack rail, and push until the assembly locks into place with an audible click.



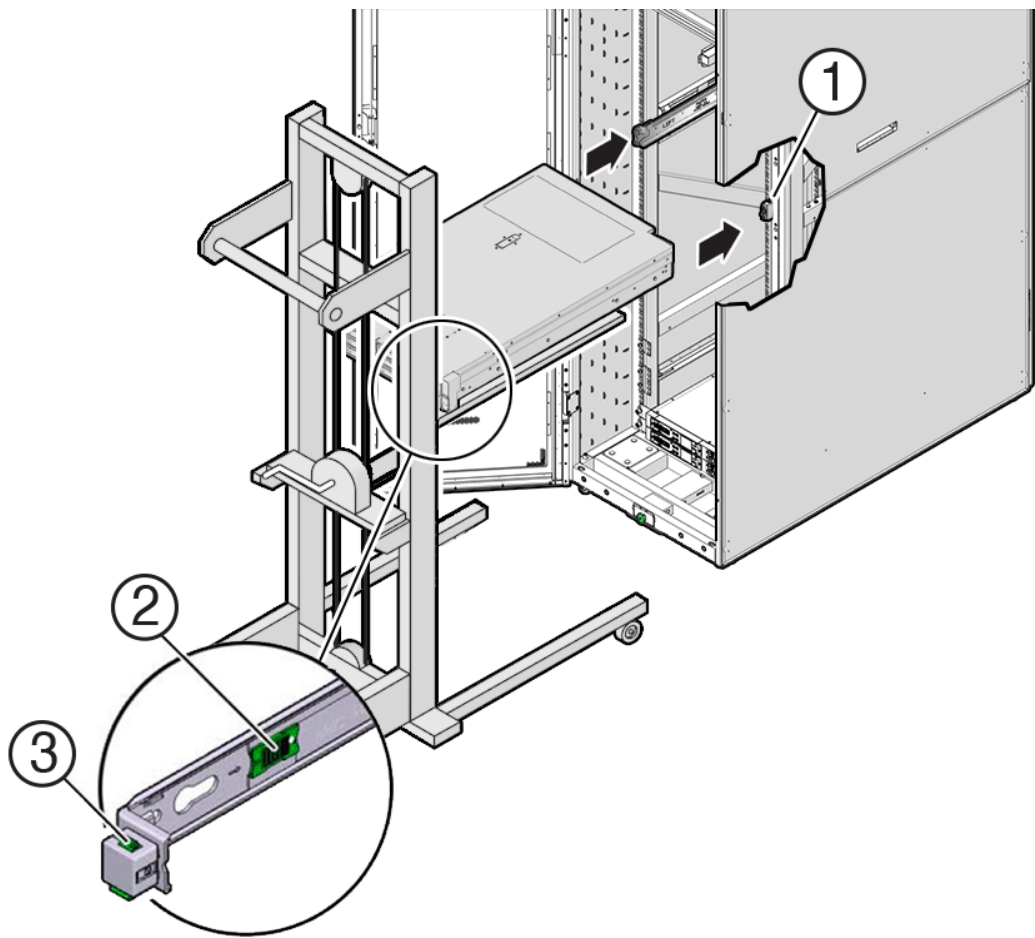
3. Align the front of the slide-rail assembly against the outside of the front rack rail, and push until the assembly locks into place with an audible click.
4. Repeat Step 1 through Step 3 to attach the slide-rail assembly to the other side of the rack.

#### **Install the Server Into the Slide-Rail Assemblies**

Use this procedure to install the server chassis with mounting brackets into the slide-rail assemblies that are mounted to the rack.

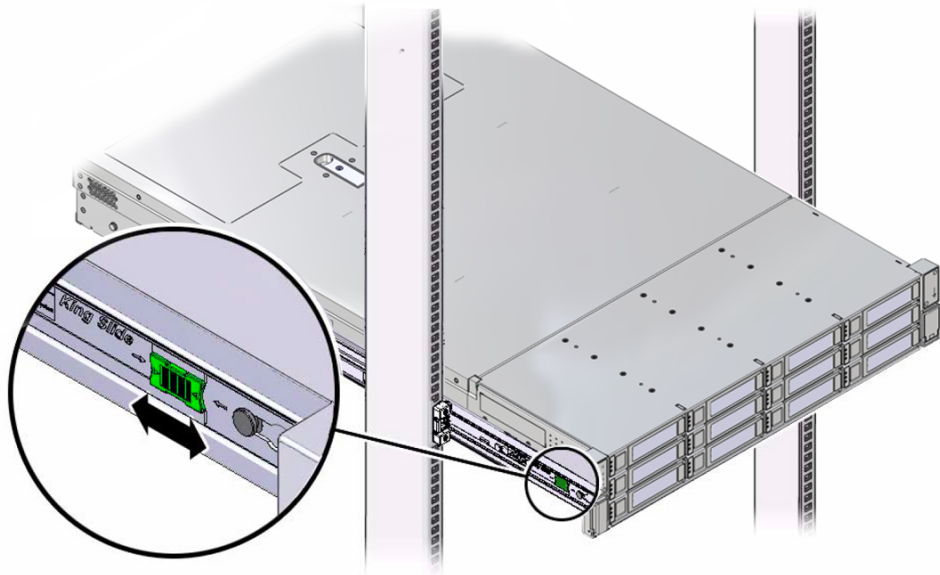
Always load equipment into a rack from the bottom up so that the rack does not become top-heavy and tip over. Extend the rack anti-tilt bar to prevent the rack from tipping during equipment installation.

1. Push the slide-rails as far as possible into the slide-rail assemblies in the rack.
2. Position the server so that the back ends of the mounting brackets are aligned with the slide-rail assemblies that are mounted in the rack.
3. Insert the mounting brackets into the slide-rails, and then push the server into the rack until the mounting brackets are flush with the slide-rail stops (approximately 30 cm or 12 inches).



Call Outs	Description
1	Inserting mounting bracket into slide-rail
2	Slide-rail release button
3	Slide-rail lock

4. Simultaneously push and hold the green slide-rail release buttons on each mounting bracket while you push the server into the rack. Continue pushing the server into the rack until the slide-rail locks (on the front of the mounting brackets) engage the slide-rail assemblies with an audible click.



**⚠ Caution**

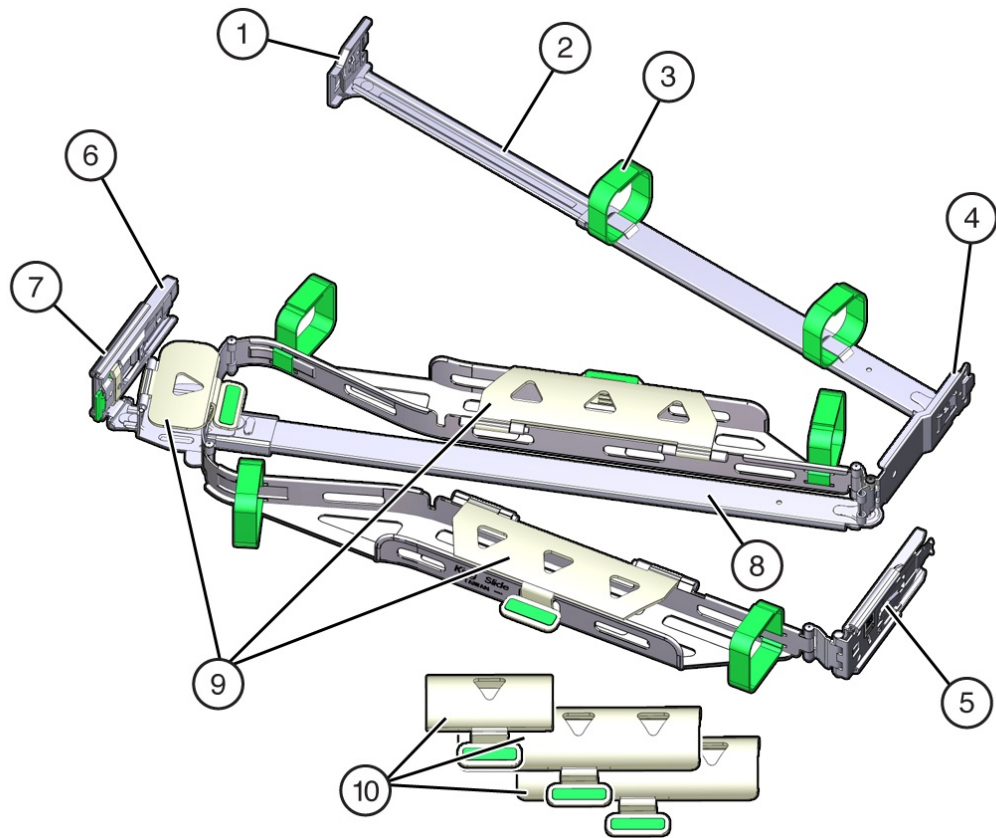
Before you install the optional cable management arm verify that the server is securely mounted in the rack and that the slide-rail locks are engaged with the mounting brackets.

**Install the Cable Management Arm (Optional)**

Follow this procedure to install the cable management arm (CMA), which you can use to manage cables connected to the back of the server.

Before you install the CMA, ensure that the right-angle AC power cables are long enough to connect to the rackmounted servers when routed through the CMA.

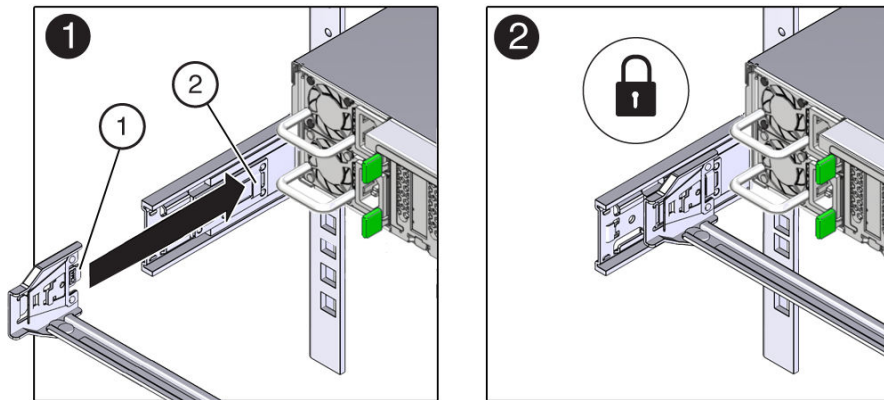
1. Unpack the CMA, which contains the following components.



Call Out	Description
1	Connector A
2	Front slide bar
3	Velcro straps (6)
4	Connector B
5	Connector C
6	Connector D
7	Slide-rail latching bracket (used with connector D)
8	Back slide bar
9	Server flat cable covers
10	Server round cable covers (optional)

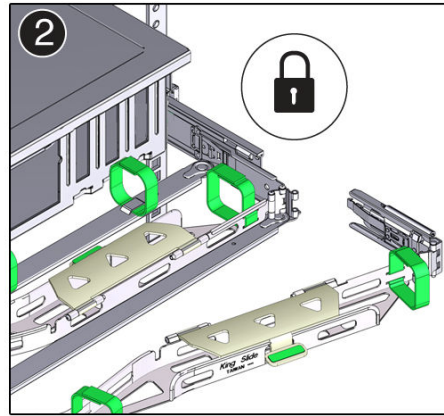
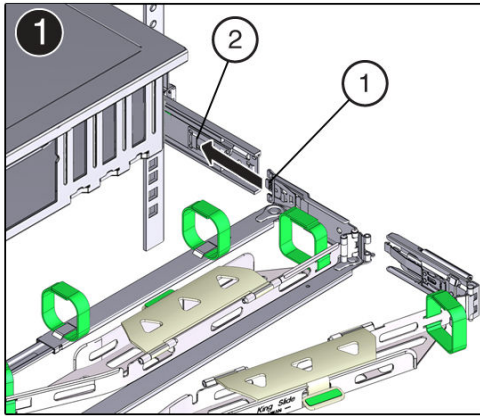
2. Prepare the CMA for installation.
3. Ensure that you install the flat cable covers for your server on the CMA.
4. Ensure that the six Velcro straps are threaded into the CMA. Ensure that the two Velcro straps located on the front slide bar are threaded through the opening in the top of the slide bar, as shown in the illustration in Step 1. This prevents the Velcro straps from interfering with the expansion and contraction of the slide bar when the server is extended out of the rack and returned to the rack.

5. To make it easier to install the CMA, extend the server approximately 13 cm (5 inches) out of the front of the rack.
6. Take the CMA to the back of the equipment rack, and ensure that you have adequate room to work at the back of the server. References to "left" or "right" in this procedure assume that you are facing the back of the equipment rack. Throughout this installation procedure, support the CMA and do not allow it to hang under its own weight until it is secured at all four attachment points
7. To install CMA connector A into the left slide-rail:
8. Insert CMA connector A into the front slot on the left slide-rail until it locks into place with an audible click [1 and 2]. The connector A tab (callout 1) goes into the slide-rail front slot (callout 2).
9. Gently tug on the left side of the front slide bar to verify that connector A is properly seated.



Call Out	Description
1	Connector A tab
2	Left slide-rail front slot

10. To install CMA connector B into the right slide-rail:
11. Insert CMA connector B into the front slot on the right slide-rail until it locks into place with an audible click [1 and 2]. The connector B tab (callout 1) goes into the slide-rail front slot (callout 2).
12. Gently tug on the right side of the front slide bar to verify that connector B is properly seated.



**Call Out**

**Description**

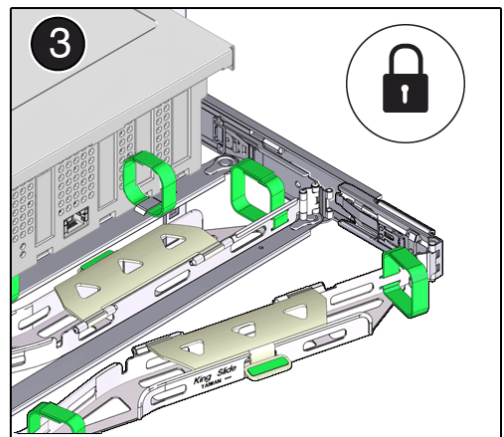
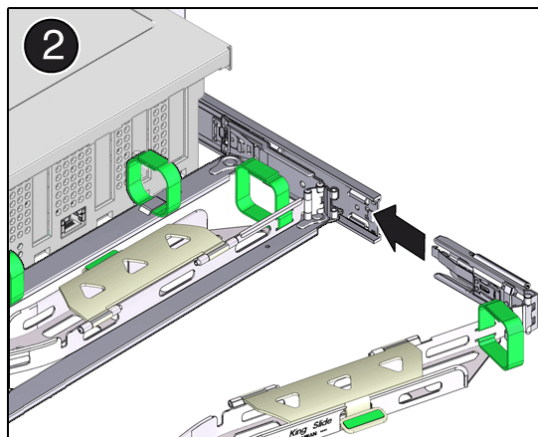
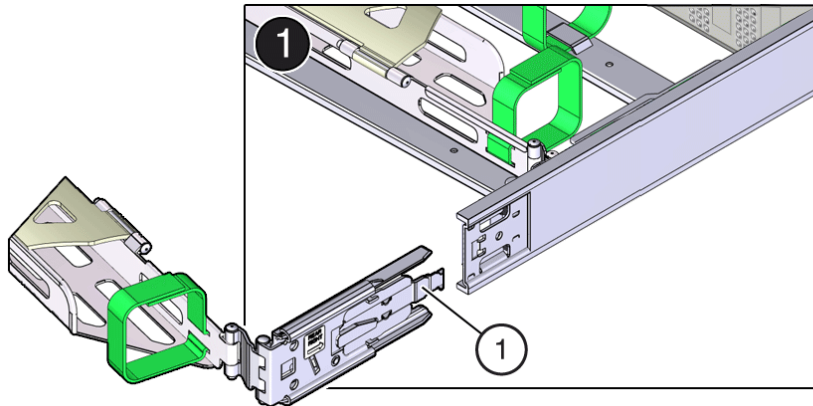
1

Connector B tab

2

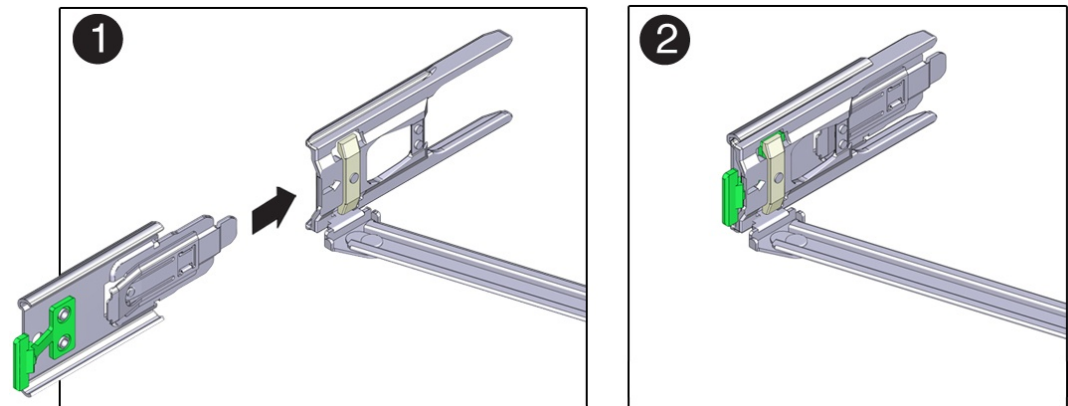
Right slide-rail front slot

- 13. To install CMA connector C into the right slide-rail:
- 14. Align connector C with the slide-rail so that the locking spring (callout 1) is positioned inside (server side) of the right slide-rail [1].

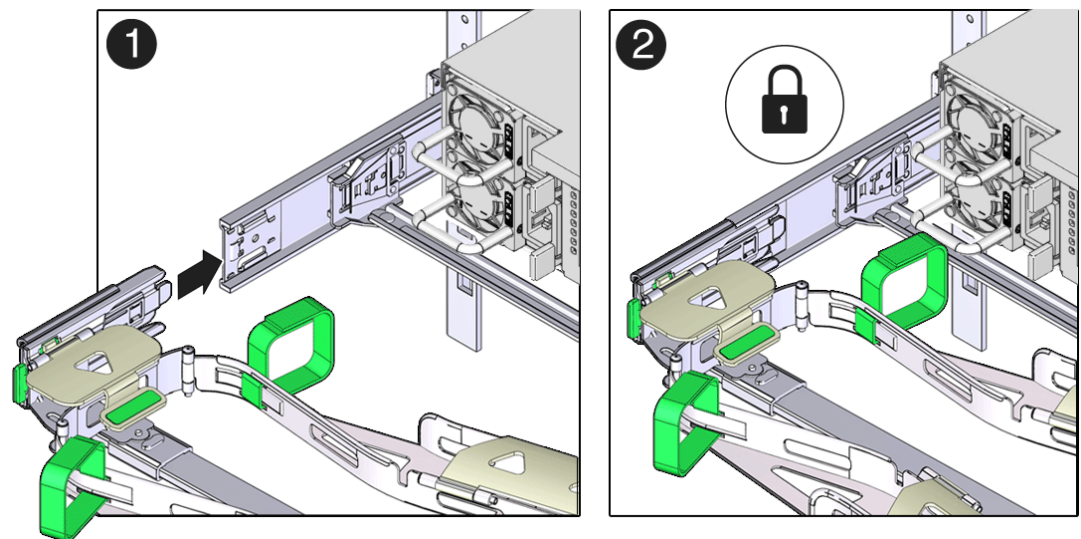


Call Out	Description
1	Connector C locking spring

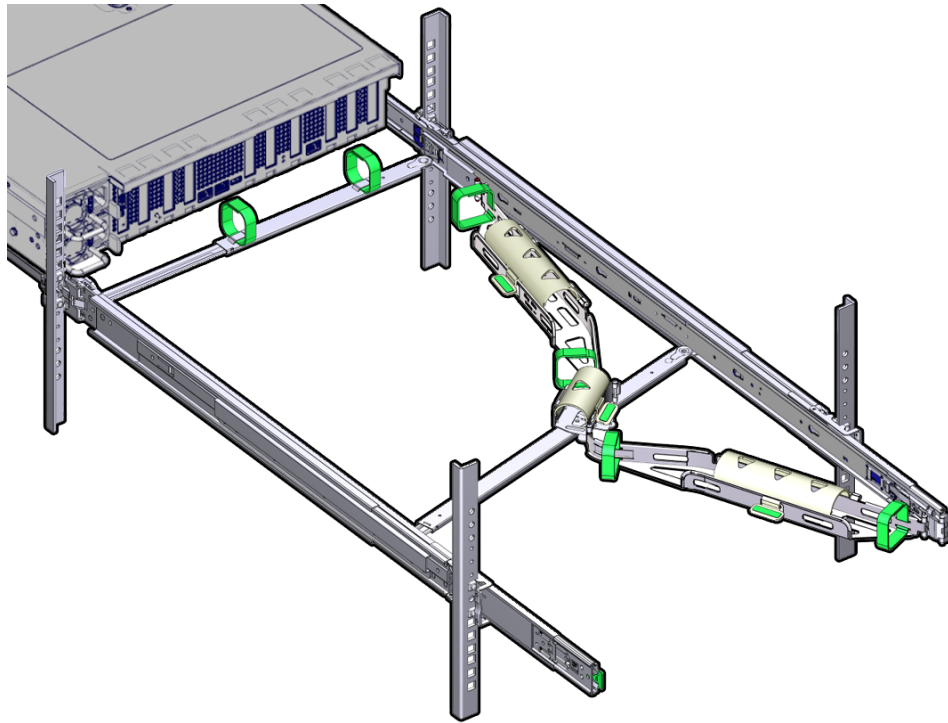
15. Insert connector C into the right slide-rail until it locks into place with an audible click [2 and 3].
16. Gently tug on the right side of the CMA back slide bar to verify that connector C is properly seated.
17. To prepare CMA connector D for installation, remove the tape that secures the slide-rail latching bracket to connector D, and ensure that the latching bracket is properly aligned with connector D [1 and 2]. The CMA is shipped with the slide-rail latching bracket taped to connector D. You must remove the tape before you install this connector.



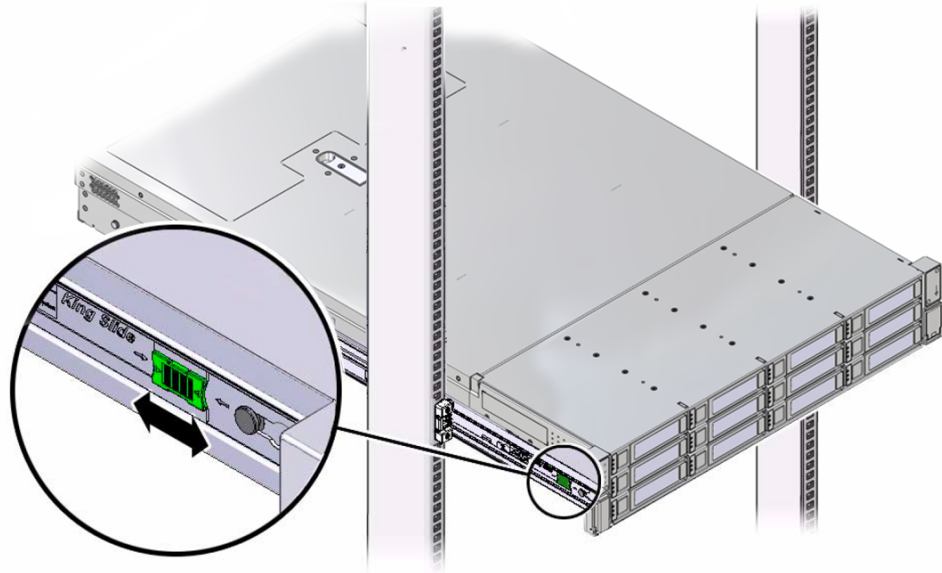
18. To install CMA connector D into the left slide-rail:
19. While holding the slide-rail latching bracket in place, insert connector D and its associated slide-rail latching bracket into the left slide-rail until connector D locks into place with an audible click [1 and 2]. When inserting connector D into the slide-rail, the preferred and easier method is to install connector D and the latching bracket as one assembly into the slide-rail.
20. Gently tug on the left side of the CMA back slide bar to verify that connector D is properly seated. The slide-rail latching bracket has a green release tab. Use the tab to release and remove the latching bracket so that you can remove connector D.



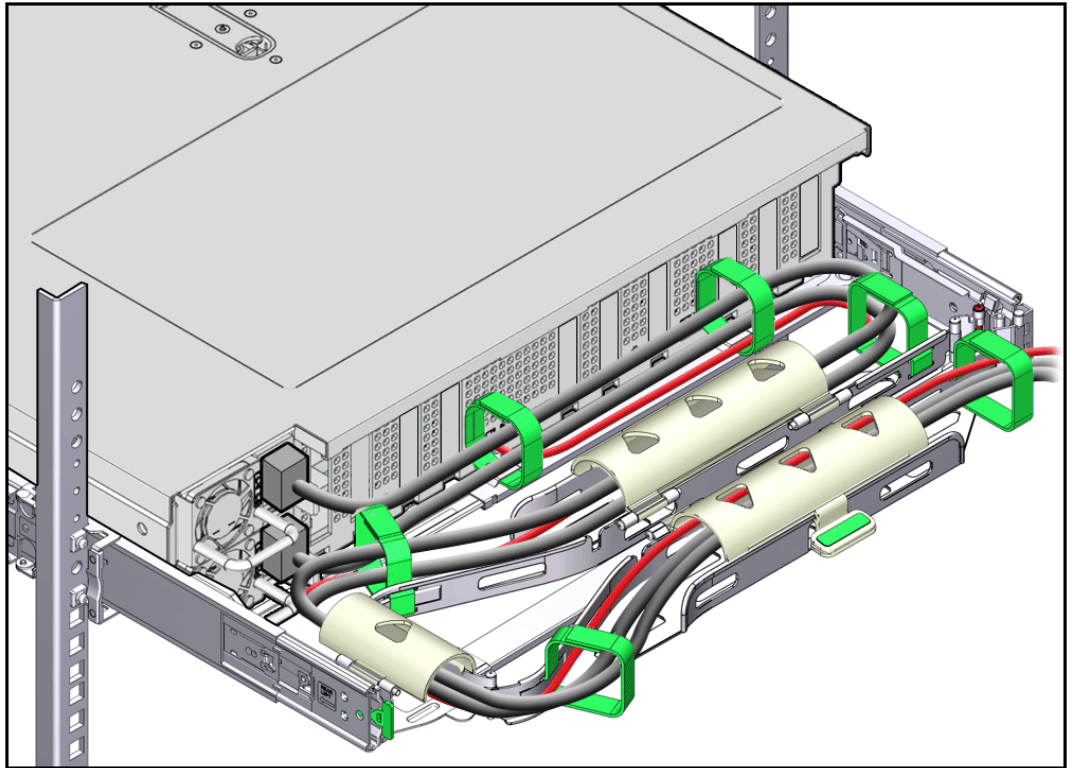
21. Gently tug on the four CMA connection points to ensure that the CMA connectors are fully seated before you allow the CMA to hang by its own weight.
22. To verify that the slide-rails and the CMA are operating properly before routing cables through the CMA:
23. Ensure that the rack anti-tilt bar is extended to prevent the rack from tipping forward when the server is extended. For instructions to stabilize the rack, see *Stabilize the Rack*.
24. Slowly pull the server out of the rack until the slide-rails reach their stops.
25. Inspect the attached cables for any binding or kinks.
26. Verify that the CMA extends fully with the slide-rails.



27. To return the server to the rack:
28. Simultaneously pull and hold the two green release tabs (one on each side of 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 CMA retracts without binding.
29. To pull the green release tabs, place your finger in the center of each tab, not on the end, and apply pressure as you pull the tab toward the front of the server.



30. Continue pushing the server into the rack until the slide-rail locks (on the front of the server) engage the slide-rail assemblies. You hear a click when the server is in the normal rack position.
31. Connect cables to the server, as required. See Reconnect Power and Data Cables.
32. Open the CMA cable covers, route the server cables through the CMA cable troughs (in the order specified in the following steps), close the cable covers, and secure the cables with the six Velcro straps.
33. First through the front-most cable trough.
34. Then through the small cable trough.
35. Then through the back-most cable trough.



36. Ensure that the secured cables do not extend above the top or below the bottom of the server to which they are attached. Otherwise, the cables might snag on other equipment installed in the rack when the server is extended from the rack or returned to the rack.
37. If necessary, bundle the cables with additional Velcro straps to ensure that they stay clear of other equipment. If you need to install additional Velcro straps, wrap the straps around the cables only, not around any of the CMA components. Otherwise, expansion and contraction of the CMA slide bars might be hindered when the server is extended from the rack and returned to the rack.

### **Remove the Cable Management Arm**

Follow this procedure to remove the cable management arm (CMA).

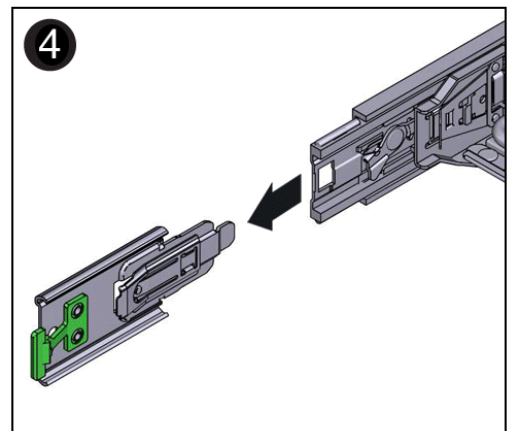
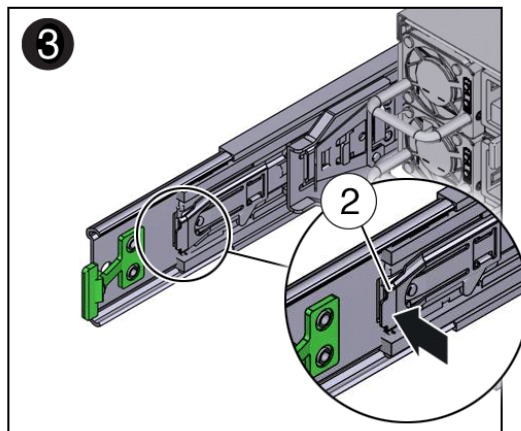
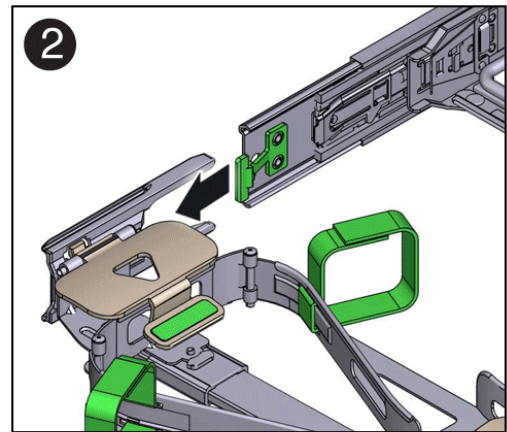
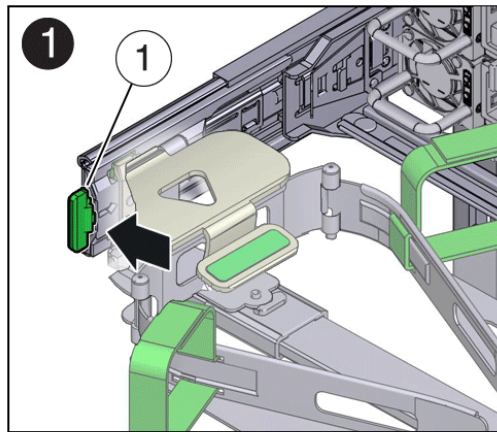
Before you begin this procedure, refer to the illustration provided in Step 1 in the procedure *Install the Cable Management Arm* to identify CMA connectors A, B, C, and D. Disconnect the CMA connectors in the reverse order in which you installed them, that is, disconnect connector D first, followed by C, B, and A.

Throughout this procedure, after you disconnect any of the CMA four connectors, do not allow the CMA to hang under its own weight.

References to “left” or “right” in this procedure assume that you are facing the back of the equipment rack.

1. To prevent the rack from tipping forward when the server is extended, ensure that the rack anti-tilt bar is extended. For instructions to stabilize the rack, see *Stabilize the Rack*.
2. To make it easier to remove the CMA, extend the server approximately 13 cm (5 inches) out of the front of the rack.
3. To remove the cables from the CMA:
4. Disconnect all cables from the back of the server.

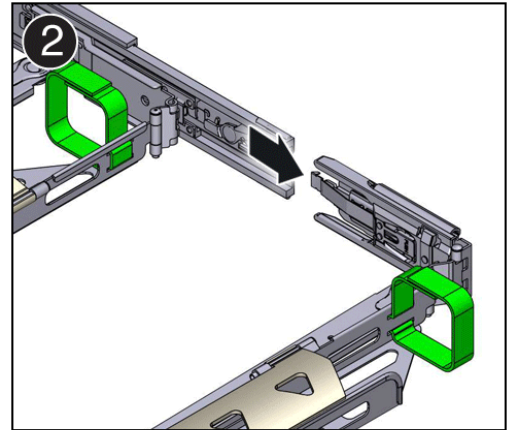
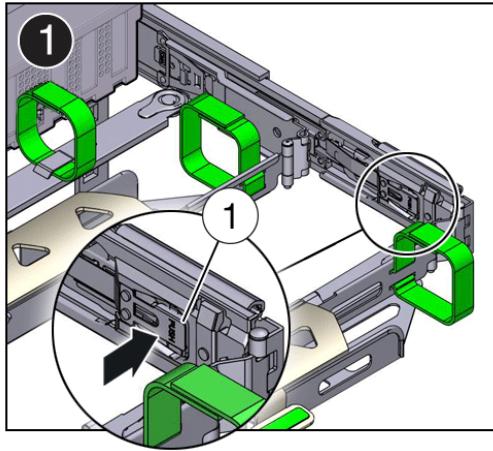
5. If applicable, remove any additional Velcro straps that were installed to bundle the cables.
6. Unwrap the six Velcro straps that are securing the cables.
7. Open the three cable covers to the fully opened position.
8. Remove the cables from the CMA and set them aside.
9. To disconnect connector D:
10. Press the green release tab (callout 1) on the slide-rail latching bracket toward the left and slide the connector D out of the left slide-rail [1 and 2]. When you slide connector D out of the left slide-rail, the slide-rail latching bracket portion of the connector remains in place. You disconnect connector D in the next step. After you disconnect connector D, do not allow the CMA to hang under its own weight. Throughout the remainder of this procedure, the CMA must be supported until all the remaining connectors are disconnected and the CMA can be placed on a flat surface.



Call Out	Description
1	Connector D release tab (green)
2	Slide-rail latching bracket release tab (labeled PUSH)

11. Use your right hand to support the CMA and use your left thumb to push in (toward the left) on the slide-rail latching bracket release tab labeled PUSH (callout 2), and pull the latching bracket out of the left slide-rail and put it aside [3 and 4].
12. To disconnect connector C:

13. Place your left arm under the CMA to support it.
14. Use your right thumb to push in (toward the right) on the connector C release tab labeled PUSH (callout 1), and pull connector C out of the right slide-rail [1 and 2].



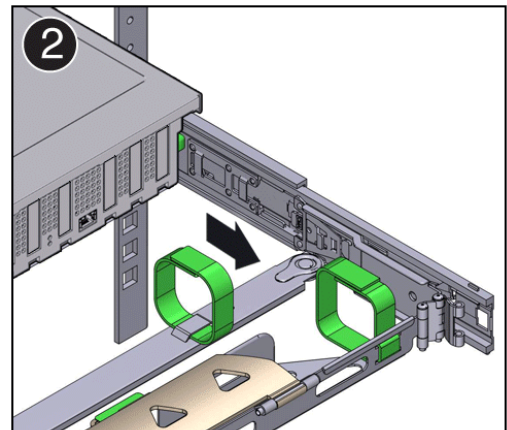
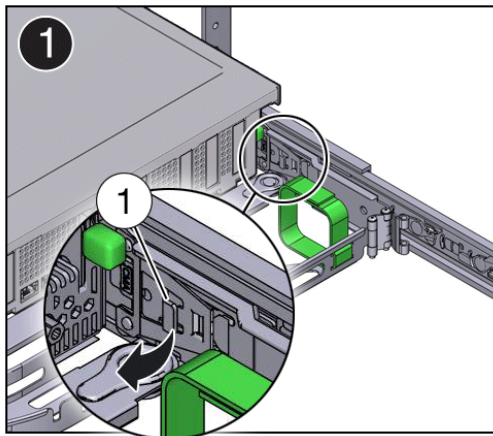
**Call Out**

**Description**

1

Connector C release tab (labeled PUSH)

15. To disconnect connector B:
16. Place your right arm under the CMA to support it and grasp the back end of connector B with your right hand.
17. Use your left thumb to pull the connector B release lever to the left, away from the right slide-rail (callout 1), and use your right hand to pull the connector out of the slide-rail [1 and 2].



**Call Out**

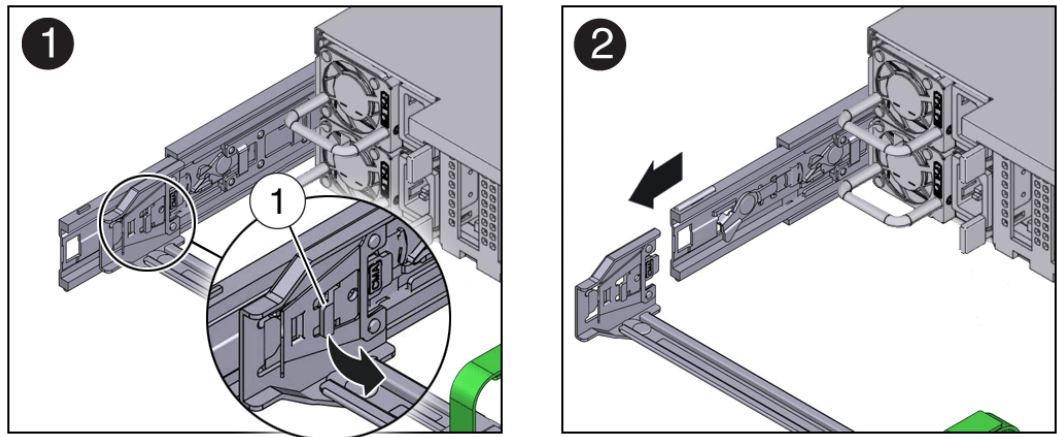
**Description**

1

Connector B release lever

18. To disconnect connector A:
19. Place your left arm under the CMA to support it and grasp the back end of connector A with your left hand.

20. Use your right thumb to pull the connector A release lever to the right, away from the left slide-rail (callout 1), and use your left hand to pull the connector out of the slide-rail [1 and 2].



Call Out	Description
1	Connector A release lever

21. Remove the CMA from the rack and place it on a flat surface.
22. Go to the front of the server and push it back into the rack.

### Operating System Installation Process

Each operating system has specific steps to follow to complete the installation. Refer to the OS documentation. The general process for all operating system installations is as follows.

1. Review the server Known Issues.
2. Confirm the server supported operating system version.
3. Install the server hardware.
4. Connect to the system.
5. Select the installation method.
6. Select the installation target.
7. Install the operating system.
8. Configure the operating system.

### Configure NVMe RAID Using BRU

#### BRU on Oracle AMD Platforms

On Oracle Communications Server E6-2L, BRU is employed in "Native" mode, which is based on Linux RAID metadata version 1.2. Oracle AMD platforms do not support IMSM (Intel® Matrix Storage Manager) containers and metadata, which are Intel VROC features.

#### Enable/Disable BRU

By default, BRU is disabled in UEFI. There is no BRU enable/disable switch in the UEFI menus. BRU is enabled by modifying the UEFI configuration in Oracle ILOM 'expert mode'. You must stop the system to perform this procedure.

BRU (Boot RAID on UEFI) enables Oracle Communications Server E6-2L to boot from NVMe RAID1 devices. BRU replaces the boot device discovery functionality provided by Intel© VROC (Virtual RAID on CPU). Note that BRU is not a feature-for-feature replacement of VROC. BRU does not provide RAID device configuration and management capability. The RAID1 boot devices used by BRU are created with Linux mdadm utility. The underlying RAID functionality is managed with Linux mdadm utility and md driver.

The Configure NVMe RAID1 Boot Devices procedure configures a RAID1 volume so that you can install Oracle Linux. Boot RAID on UEFI (BRU), implements a UEFI driver that identifies a bootable NVMe M.2 RAID1 volume in the UEFI environment. On Oracle Communications Server E6-2L, BRU uses native Linux RAID1 metadata (version 1.2) and is fully compatible with mdadm utilities in Linux.

Please note that Windows© and VMware© do not support booting from BRU devices. This procedure applies only to Oracle Communications Server E6-2L with Oracle Linux and installed NVMe M.2 SSD boot devices.

Microsoft Windows, VMware ESXi, and Oracle Solaris do not support BRU on Oracle Server E6-2L.

1. Access the host console locally or through Oracle ILOM. For instructions, see Access Oracle ILOM.
2. Create a RAID1 with Oracle Linux mdadm. Assuming the system has two NVMe M.2 drives containing namespace of the same size (for information about creating NVMe namespaces, see "man -s 1 nvme").

a. Type: # nvme list

```

      Node          SN          Model          Namespace
Usage          Format  FW Rev
-----
/dev/nvme0n1  S435NF0KA01142  SAMSUNG MZ1LB960HAJQ-00007  1
960.20GB/960.20GB 512B+0B EDA7202Q
/dev/nvme0n1  S435NF0KA01137  SAMSUNG MZ1LB960HAJQ-00007  1
960.20GB/960.20GB 512B+0B EDA7202Q
#

```

- b. Create a RAID1 from the namespaces, specifying metadata version 1.2 # mdadm --create /dev/md0 --level=1 --raid-devices 2 /dev/nvme0n1 /dev/nvme1n1 --metadata=1.2
  - c. Shutdown the Oracle Linux OS. Use the recommended Oracle Linux OS shutdown command. # /etc/shutdown
  - d. Stop the system. -> stop /SYS Are you sure you want to stop /SYS (y/n)? y  
Stopping /SYS ->
  - e. Enable BRU. See "Enabling BRU" steps.
3. Enable expert\_mode in the SP Shell: -> set /System/BIOS/Config expert\_mode=enabled Set 'expert\_mode' to 'enabled' ->
  4. Dump uefi configuration file to remote system: -> dump -destination scp://username@remote\_host.us.foo.com/var/tmp/ueficfg.xml /System/BIOS/Config Enter remote user password: \*\*\*\*\* Dump successful. ->
  5. On the remote host, use a text editor to modify ueficfg.xml; find the 'Block RAID in UEFI' heading, change the Block\_RAID\_in\_UEFI value from 'Disable' to 'Enable'.

- Change this `<Block_RAID_in_UEFI> <Block_RAID_in_UEFI>Disable</Block_RAID_in_UEFI> </Block_RAID_in_UEFI>` To this: `<Block_RAID_in_UEFI> <Block_RAID_in_UEFI>Enable</Block_RAID_in_UEFI> </Block_RAID_in_UEFI>`
  - Save the file.
6. From the SP, reload the modified UEFI configuration file: `-> load -source scp://username@remote_host.us.foo.com/var/tmp/ueficfg.xml /System/BIOS/Config` Enter remote user password: `*****` Load successful. `->`
  7. Disable ILOM expert mode. `-> set /System/BIOS/Config expert_mode=disabled` Set 'expert\_mode' to 'disabled' `->`
  8. Restart the system `-> start /SYS` Are you sure you want to start /SYS (y/n)? `y`  
Starting /SYS `->` The power-on self-test (POST) sequence begins.
  9. This completes the RAID configuration. You can now install an operating system on the volume that you created.

## nvme list

## Site Planning Checklists

This topic provides checklists for site preparation.

Review the server site requirements, specifications, and components. Complete the following checklists to ensure that your site meets the physical, electrical, and environmental requirements of Oracle Communications Server E6-2L before you receive the server.

Review the following facility requirements before you install the server.

**Table D-1 Data Center Room Considerations**

Data Center Room Considerations	Yes	No	N/A	Comment
Has the access route been checked for clearances of the packaged equipment?				
Do all the doors and entryways conform to the width and height requirements for transportation, including the width of the unpacked unit?				
Are there any ramps, stairs, or thresholds that are in the moving path for the new hardware?				
Have you confirmed that the access route is free of any obstacles that would expose the device to shock?				
If there are stairs, then is a loading elevator accessible for moving the equipment?				
Has the rack location been allocated?				
Is there a vacant space in the rack for the new server?				
Does the floor layout meet the equipment maintenance access requirements?				
Have cabinet stabilization measures been implemented?				
Will the hardware location require any non-standard cable lengths?				
Is the floor to ceiling height a minimum of 2914 mm or 2.9 m (9.6 feet)?				

Complete the following checklist to ensure that the data center environment requirements are met for the server.

**Table D-2 Data Center Environment Checklist**

<b>Data Center Environmental Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Does the computer room air handling meet temperature and humidity requirements?				
Does the installation floor layout satisfy the ventilation requirements?				
Will the equipment be positioned so that the exhaust air of one rack does not enter the air intake of another rack?				
Are the perforated floor tiles each rated at 400 CFM or greater?				
Do the data center air conditioners provide sufficient front to back airflow?				
Is airflow adequate to prevent hot spots?				
Can the data center continuously satisfy environmental requirements?				
Can more vented floor tiles be obtained if required?				

Complete the following checklist to ensure that the facility power requirements are met for the data center where the server is installed.

**Table D-3 Facility Power Checklist**

<b>Facility Power Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Do you know the required operating voltage and electric current level of the server and peripherals?				
Are enough power outlets provided within 2 meters (6.5 feet) for each rack?				
Do the power outlets have appropriate socket receptacles?				
Will optional ground cables be attached to the rack?				
Are the circuit breakers for the equipment suitable for voltage and current-carrying capacities?				
Does the power frequency meet the equipment specifications?				
Will system power be delivered from two separate power grids?				
Is there a UPS to power the equipment?				
Do you have the minimum required power sources to support the power load for the new hardware? Use kilowatt (kW)/kilovolt (kVA) to express power load.				

Complete the following checklist before you install the server into a rack.

**Table D-4 Rackmount Checklist**

<b>Rackmount Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Is the distance between the front and back mounting planes between a minimum of 610 mm and a maximum 915 mm (24 inches to 36 inches)?				

<b>Rackmount Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Is the minimum clearance for service: Front of server: 123.2 cm (48.5 inches) Back of server: 91.4 cm (36 inches)				
Is the rack a four-post rack (mounting at both front and back)? Two-post racks are not compatible.				
Do the horizontal opening and unit vertical pitch of the rack conform to ANSI/EIA 310-D-1992 or IEC 60297 standards?				
Does the rack have RETMA rail support?				
Does the rack support Oracle cable management arms (CMAs)?				
Does the rack support installation of Oracle vented and solid filler panels?				
Is there sufficient space for cable harnesses and the power distribution units (PDUs) in the rack, if required?				
Can a label with the server serial number be printed and attached to the target rack?				
Did you label the network cables that will connect to the server?				
Does the rack support installation of standard Oracle PDUs? If not, then complete this checklist.				
Can the customer provide an equivalent pair of PDUs?				
Can the customer provide two PDUs with capacity of 110kVA per PDU?				
Can the customer provide a single PDU and its circuits to support the power requirements in case a PDU fails?				
Can the customer ensure that power loads are evenly distributed across all circuits of a single PDU?				

Complete the following checklist to ensure that the safety requirements are met for the data center where the server will be installed.

**Table D-5 Safety Checklist Considerations**

<b>Safety Checklist Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Is there a fire protection system in the data center room?				
Is the computer room adequately equipped to extinguish a fire?				
Is antistatic flooring installed?				
Is the floor below the raised floor free of obstacles and blockage?				

Complete the following checklist if you are planning to use Oracle Auto Service Request with the server.

**Table D-6 Auto Service Request Considerations**

<b>Auto Service Request Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
Do you have a My Oracle Support Online Account to register Auto Service Request?				

<b>Auto Service Request Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
<p>Do you have your My Oracle Support Customer Support Identifier (CSI) number?</p> <p>Do you have the host name and IP address for the server that will have Auto Service Request Manager?</p> <p>Will the system need a proxy server? If so, what is the host name and IP address for the proxy server?</p> <p>Do you have the Technical Contact information for Auto Service Request? This information must include the first name, last name, and e-mail address of the contact.</p>				

Complete the following checklist to ensure that the logistics requirements are met for the data center where the server will be installed.

**Table D-7 Logistics Checklist Considerations**

<b>Logistics Checklist Considerations</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>Comment</b>
<p>Do you have contact information for the data center personnel?</p> <p>Is there security or access control for the data center?</p> <p>Are there any security background checks or security clearances required for vendor personnel to access the data center? If yes, then do you have a recommended agency?</p> <p>Are there any additional security access issues?</p> <p>Is computer room access available for installation personnel?</p> <p>Are laptops, cell phones, and cameras allowed in the data center?</p> <p>Does the building have a delivery dock?</p> <p>Is there a delivery/unpacking/staging area, and is it protected from environmental elements?</p> <p>Is the unpacking area air-conditioned to avoid thermal shock for various hardware components?</p> <p>Will sufficient moving personnel be available to install the hardware?</p> <p>Are you prepared for uncrating and trash removal?</p> <p>Are there any restrictions on delivery truck length, width, or height?</p> <p>Are cardboard boxes and other packing material allowed in the computer room?</p> <p>Is there a time constraint on dock access? If yes, then provide time constraints.</p> <p>Is a tail lift required of the delivery carrier to unload the equipment at the delivery dock?</p> <p>Will any of the following items be required to place equipment in the computer room? Stair walkers Lifters Ramps Steel plates Floor covers</p> <p>Does the delivery carrier require any special equipment, such as non-floor damaging rollers, transport dollies, pallet jacks, or fork lifts?</p>				

## Server Components

These sections describe Oracle Communications Server E6-2L component names, status, and indicator states. The tables in this section identify the system components and describe the naming conventions applied to the components of Oracle Communications Server E6-2L. Each section corresponds to an IPMI entity ID and lists sensors, indicators, and replaceable units 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 replaceable unit. 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 replaceable unit represented.
- **Description** – Describes the particular component name reference.
- **Values** – Defines the states of the sensor, indicator, or replaceable unit entity, and any specific units or values that are expected, if applicable.

## System Chassis Components

The following table lists the system chassis components.

**Table E-1 System Chassis Components**

<b>Component Name (Oracle ILOM CLI Targets)</b>	<b>IPMI Type</b>	<b>Description</b>	<b>Values (if applicable)</b>
/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	01h-ACPI_ON_WORKING20h-ACPI_SOFT_OFF
/SYS/VPS	Threshold sensor	Virtual power consumption sensor	Watts
/SYS/VPS_CPUS	Threshold sensor	Virtual power sensor - CPU power consumption	Watts
/SYS/VPS_MEMORY	Threshold sensor	Virtual power sensor - memory power consumption	Watts
/SYS/VPS_FANS	Threshold sensor	Virtual power sensor - fan power consumption	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

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/OK	Indicator	System OK LED	Color: Green Location: Front and back panels Off: Power is off. Standby blink: Host is off, awaiting Power On. 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 this cell	

## Power Unit Components

The following table lists the power unit components.

**Table E-2 Power Unit Components**

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/PDB	FRU	Power distribution board FRU	
/SYS/PS[0-1]	FRU	Power supply FRU	
/SYS/PS[0-1]/PRSNT	Discrete sensor	Power supply is present. (Hidden)	01h- ENTITY_ABSENT02h- ENTITY_PRESENT

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/PS[0-1]/STATE	State sensor	Power supply state 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	Threshold sensor	Input power draw	Watts
/SYS/PS[0-1]/P_OUT	Threshold sensor	Output power	Watts
/SYS/PS[0-1]/V_IN	Threshold sensor	Power supply input voltage	Volts
/SYS/PS[0-1]/V_12V	Threshold sensor	Power supply 12V output voltage	Volts
/SYS/PS[0-1]/V_12V_STBY	Threshold sensor	Power supply 12V standby output voltage	Volts
/SYS/PS[0-1]/T_IN	Threshold sensor	PSU input temperature	Degrees Celsius
/SYS/PS[0-1]/T_OUT	Threshold sensor	PSU output temperature	Degrees Celsius

### Cooling Unit Components

The system has six 60-mm fan modules with two fans in each module. The following table lists the system cooling unit components.

**Table E-3 Cooling Unit Components**

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB/FM[0-5]	FRU	Fan module FRU	
/SYS/MB/FM[0-5]/F[0-x]	FRU	Individual fan	
/SYS/MB/FM[0-5] / PRSNT	Discrete sensor	Fan module is present.	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/FM[0-5] /F[0-x]/TACH	Threshold sensor	Fan module fan speed	RPM
/SYS/MB/FM[0-5] / SERVICE	Indicator	Fan Fault-Service Required LED	Color: Amber Location: Motherboard Off: Normal On: Fan module was diagnosed as faulty.

### Disk Backplane Components

The following table lists the disk backplane (DBP) components.

**Table E-4 Disk Backplane 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 (Hidden)	01h-ENTITY_ABSENT02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]	FRU	Hard disk drives (HDD)	
/SYS/DBP/HDD[0-x]/PRSNT	Discrete sensor	Hard disk drive presence(Hidden)	01h-ENTITY_ABSENT02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]/STATE	State sensor	Hard disk drive state	01h-FAULT_STATUS02h-IDENTITY04h-INSTALLED20h-SLOT_POWER_OFF
/SYS/DBP/HDD[0-x]/SERVICE	Indicator	Fault-Service Required LED	Color: AmberLocation: HDDOff: NormalOn: HDD was diagnosed as failed
/SYS/DBP/HDD[0-x]/OK2RM	Indicator	Hard disk drive OK to remove	Color: BlueLocation: HDDOff: NormalOn: 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_ABSENT02h-ENTITY_PRESENT
/SYS/VREG_DBP_ERR	Discrete sensor	Disk backplane voltage regulator-down (VRD) error (Hidden)	01h-DEASSERTED02h-ASSERTED
/SYS/VREG_USB_ERR	Discrete sensor	Universal Serial Bus (USB) VRD error (Hidden)	01h-DEASSERTED02h-ASSERTED

## Drive Components

The following table lists the hard disk drive (HDD) and solid state drive (SSD) components.

**Table E-5 Drive 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
/SYS/DBP/HDD[0-x]/PRSNT	Discrete sensor	Hard disk drive presence	01h-ENTITY_ABSENT02h-ENTITY_PRESENT
/SYS/DBP/HDD[0-x]/STATE	Discrete sensor	Writable multistate, slot/connector sensor type, per IPMI	01h-FAULT_STATUS02h-IDENTITY04h-INSTALLED20h-SLOT_POWER_OFF

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/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[0-3]/ NVME	FRU	NVMe drive FRU	
/SYS/DBP/HDD[0-3]/ NVME/PRSNT	Discrete sensor	NVMe device presence	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/SSDR[0-1]	FRU	Internal M.2 SSD riser (2) FRU	
/SYS/MB/SSDR[0-1]/ PRSNT	Discrete sensor	Solid-state drive (SSD) riser presence (2 risers)	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/SSDR[0-1]/ SSD[0-1]	FRU	Internal SSD drive FRU	
/SYS/MB/SSDR[0-1]/ SSD[0-1]/PRSNT	Discrete sensor	SSD drive presence (1 SSD per riser on 2U) (Hidden)	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/SSDR[0-1]/ SSD[0-1]/STATE	State sensor	SSD drive state	04h-INSTALLED20h- SLOT POWER OFF
/SYS/MB/SSDR[0-1]/ SSD[0-1]/NVME	FRU	Internal SSD that is NVM Express FRU	
/SYS/MB/SSDR[0-1]/ SSD[0-1]/NVME/PRSNT	Discrete sensor	Indicates the SSD is PCIe (NVMeExpress)	01h- ENTITY_ABSENT02h- ENTITY_PRESENT

### Processor Components

The following table lists the processor (CPU) components.

**Table E-6 Processor 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[0-1]/PRSNT	Discrete sensor	Host CPU is present.	01h- ENTITY_PRESENT02h- 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.

### Memory Device Components

The following table lists the memory device components.

**Table E-7 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[0-1]/D[0-11]/ PRSNT	Discrete sensor	Host CPU DIMM is present.	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/P[0-x]/D[0-1]/ SERVICE	Indicator	Host CPU DIMM Fault- Service Required LED	Color: Amber Location: Motherboard Off: Normal On: DIMM was diagnosed as faulty.
/SYS/MB/P[0-1]/D[0-11]/ TEMP	Discrete sensor	Host CPU DIMM temperature sensor (Hidden)	

**System Motherboard Components**

The following table lists the system motherboard components.

**Table E-8 System Motherboard Components**

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS/MB	FRU	General host system motherboard FRU	
/SYS/MB/NET[0]	FRU	Host Ethernet FRU	
/SYS/MB/PCIE[1-9]	FRU	PCIe slot	
/SYS/MB/PCIE[1-9]/ PRSNT	Discrete Sensor	PCIe slot is occupied.	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/PCIE[1-9]/ P_ENABLE_STATE	Indicator	PCIe slot power indicator	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/RISER[2-6]	FRU	PCIe Riser card FRU at Slot 2 and Slot 6 (Database Full Height card configuration)	
/SYS/MB/RISER[2-6]/ PRSNT	Discrete Sensor	PCIe Riser Card at Slot 2 or Slot 6 is present	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/RISER2/ PCIE[2, 6]	FRU	PCIE Slot on RISER2Slot 2 - x16 CEM slotSlot 4 - x1 CEM slot for SMART NIC	
/SYS//SYS/MB/RISER2/ PCIE[2,4]/PRSNT	Discrete Sensor	Option card inserted into PCIe Slots on Riser 2	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS//SYS/MB/RISER2/ PCIE[2,4]/ P_ENABLE_STATE	State Sensor	PCIe slots on Riser 2 Power Enable State	02h-SLOT POWER ENABLED01h-SLOT POWER DISABLED
/SYS//SYS/MB/RISER6/ PCIE[6,8]/PRSNT	Discrete Sensor	Option card inserted into PCIe Slots on Riser 6	01h- ENTITY_ABSENT02h- ENTITY_PRESENT

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description	Values (if applicable)
/SYS//SYS/MB/RISER6/ PCIE[6,8]/ P_ENABLE_STATE	State Sensor	PCIe slots on Riser 6 Power Enable State	02h-SLOT POWER ENABLED01h-SLOT POWER DISABLED
/SYS/MB/ROT	FRU	Root of Trust FRUOptional card is present in slot 1 (only supported slot)	
/SYS//SYS/MB/ROT/ PRSNT	Discrete Sensor	Root of Trust is Present	01h- ENTITY_ABSENT02h- ENTITY_PRESENT
/SYS/MB/ T_IN_ZONE[0-3]	Threshold sensor	Cooling zone input temperature sensor	Degrees Celsius
/SYS/MB/ T_OUT_ZONE[0-3]	Threshold sensor	Cooling zone output temperature sensor	Degrees Celsius
/SYS/SP	FRU	Service processor FRU	
/SYS/SP/OK	Indicator		SP OK LEDColor: GreenLocation: Front panelOn: SP is operating.Off: SP requires service.
/SYS/SP/NET[0-1]	FRU	SP Ethernet FRU	

## System Firmware Components

The following table lists the system firmware components.

**Table E-9 System Firmware Components**

Component Name (Oracle ILOM CLI Targets)	IPMI Type	Description
/SYS/MB/BIOS	FRU	BIOS FRU
/SYS/MB/CPLD	FRU	Motherboard complex programmable logic device (CPLD)/field programmable gate array (FPGA) firmware version

## BIOS Setup Utility Menu Options

### Main Menu

Main Menu Option	Description
BIOS Information	
BIOS Vendor	American Megatrends
Core Version	Core version number for a specific release. Format is XX.YY, where: XX - Core major release. YY - Core minor release. Example: 5.27
Compliance	Compliance version number for a specific release. Format is UEFI version number and Platform Initialization (PI) version number. Example: UEFI 2.8; PI 1.7

Main Menu Option	Description
Project Version	BIOS project version number for a specific release. Example: 8400 17.00 x64
Build Date and Time	The date and time the build for the BIOS version was created.
Memory Information	
Total Memory	Total amount of memory in megabytes. Example: 65536 MB
System Date	Allows you to change the current system date. Example: Tue 11/08/2022
System Time	Allows you to change the current system time. Example: 13:38:27

### Advanced Menu

This section includes screens of the Advanced menu in the BIOS Setup Utility for Oracle Server E6-2L.

### Force APCB Update

Force APCB Update Option	Description
Force APCB Update	Allows you to force an APCB update. By default, the option is disabled.

### Trusted Computing 2.0 Options

The Trusted Computing 2.0 options are available only when you enable the Security TPM Device Support option.

Setup Option	Description
TPM 2.0 Device Found	
Firmware Version	Displays the firmware version for the TPM (Trusted Platform Module) device.
Vendor	Displays the firmware vendor for the TPM device.
Security TPM Device Support	Enable (default) or disable Trusted Platform Module (TPM) support. If disabled, the OS will not show TPM. Reset of the platform is required.
Active PCR banks	Displays active Platform Configuration Register (PCR) banks.
Available PCR banks	Displays available Platform PCR banks.
SHA256 Bank	Displays if the SHA256 PCR bank is enabled (default) or disabled.
Pending Operation	Schedule an operation for the security device. Note: Your computer reboots during restart to change the state of a security device. None (default), TPM Clear
Platform Hierarchy	Enable (default) or disable platform hierarchy.
Storage Hierarchy	Enable (default) or disable storage hierarchy.
Endorsement Hierarchy	Enable (default) or disable endorsement hierarchy.

## PSP Firmware Versions

<b>PSP Firmware Versions Option</b>	<b>Description</b>
ABL Version	Displays the AMD Boot Loader (ABL) version number.
PSP Bootloader Version	Displays the Platform Security Processor (PSP) bootloader version.
PSP Bootloader 2 Version	Displays the PSP bootloader 2 version.
PSP TEE Version	Displays the PSP TEE version.
SMU FW Version	Displays the AMD System Management Unit firmware version (SMU FW). The SMU is a microcontroller in the AMD EPYC processor that handles real-time events such as power management.
SEV FW Version	Displays the AMD Secure Encrypted Virtualization firmware version (SEV FW).
PHY FW Version	Displays the physical layer firmware (PHY FW) version.
MPIO FW Version	Displays the mass production I/O firmware (MPIO FW) version.
TF MPDMA FW Version	Displays the TF Microprocessor Direct Memory Access (MPDMA) firmware (FW) version.
PM MPDMA FW Version	Displays the PM MPDMA firmware (FW) version.
GMI FW Version	Displays the Global Memory Interconnect (GMI) firmware (FW) version.
RIB FW Version	Displays the RIB firmware (FW) version.
SEC FW Version	Displays the SEC firmware (FW) version.
PMU FW Version	Displays the PMU firmware (FW) version.
EMCR FW Version	Displays the EMCR firmware (FW) version.

## AMD CBS

<b>AMD CBS Option</b>	<b>Description</b>
AMD CBS Revision Number	Displays the AMD CBS revision number.
CPU Common Options	
Performance	
OC Mode	With Force APCB Update enabled, allows you to customize overclock mode with Normal Operation or Customized settings.
CCD/Core/Thread Enablement	
CCD Control	With Force APCB Update enabled, allows you to select the number of active charge couple devices (CCDs). After you use this option to remove any CCDs, run a power cycle so that the settings you select in the future take effect. Default is Auto.
Core Control	With Force APCB Update enabled, allows you to select the number of cores you want to use. After you use this option to remove any cores, run a power cycle so that the settings you select in the future take effect. Default is Auto.
SMT Control	With Force APCB Update enabled, you can disable symmetric multithreading (SMT). To re-enable SMT, select Enable and run a power cycle. Select Auto, based on the BIOS PCD (PcdAmdSmtMode) default setting. S3 is not supported on systems where SMT is disabled.
Prefetcher Settings	
L1 Stream HW Prefetcher	With Force APCB Update enabled, allows you to enable (default) or disable the L1 Stream HW Prefetcher. Default is Auto.
L2 Stream HW Prefetcher	With Force APCB Update enabled, allows you to enable (default) or disable the L2 Stream HW Prefetcher. Default is Auto.

AMD CBS Option	Description
Platform First Error Handling	With Force AP CB Update enabled, allows you to enable (default) or disable platform first error handling, cloak individual banks, and mask deferred error interrupts from each bank.
Core Performance Boost	With Force AP CB Update enabled, allows you to disable core performance boost. Default is Auto.
Global C-State Control	With Force AP CB Update enabled, allows you to enable or disable the IO based C-state generation and DF c-states. Default is Auto.
SEV-ES ASID Space Limit	With Force AP CB Update enabled, allows you to set space limits for Secure Encrypted Virtualization-Encrypted State address space identifier (SEV-ES ASID). SEV-ES and AMD Secure Nested Paging (SNP) guests must use ASIDs in the range 1 through 1086. For all ASIDs to support SEV-ES or SNP guests, set the value to 1007. The default is 1 which sets the space limits for all SEV guests and no SEV-ES or SNP guests.
SEV Control	With Force AP CB Update enabled, allows you to enable (default) or disable SEV. To re-enable SEV, after you select Enable, run a power cycle.
SNP Memory (RMP Table) Coverage	With Force AP CB Update enabled, allows you to enable, disable, or customize the entire system memory. Default is Auto.
SMEE	With Force AP CB Update enabled, allows you to enable or disable secure memory encryption enable (SMEE). Enabling both SMEE and Multi-Key Secure Memory Encryption (SME-MK) is not supported. Default is Auto.
Enhanced REP MOVSB/STOSB (ESRM)	With Force AP CB Update enabled, allows you to enable (default) or disable memory security for Enterprise Security Management (ESRM). Default is 1. You can set the option to zero for analysis purposes, providing that the OS supports the option.
DF Common Options	
Memory Addressing	
NUMA Nodes Per Socket	With Force AP CB Update enabled, allows you to specify the number of non-uniform memory access (NUMA) nodes per socket. Default is Auto. NPS1 specified one NUMA node per socket. NPS0 specified one NUMA node per system and attempts to interleave the two sockets together.
Memory Interleaving	With Force AP CB Update enabled, allows you to disable or enable memory interleaving. NUMA nodes per socket are recognized regardless of this setting. Default is Auto.
1TB Remap	With Force AP CB Update enabled, allows you to reamap DRAM out of the space below the 1TB bounday. Remapping depends on the DRAM configuration, NUMA node per socket (NPS), and interleaving selection, and might not always be possible. Default is Auto.
DRAM Map Intervention	With Force AP CB Update enabled, allows you to invert the map so that the highest memory channels are assigned to the lowest addresses in the system. Default is Auto.
Location of Private Memory Regions	With Force AP CB Update enabled, allows you to control whether the private memory regions (PSP, SMU and CC6) are at the top of DRAM, at the top of the 1st DRAM pair, or distributed. The Distributed option requires memory on all dies. The location of the private memory regions is always at the top of DRAM if some dies do not have memory, regardless of the setting. The Consolidate option for the first DRAM pair is only valid for non-interleaved memory. Default is Auto.
Link	With Force AP CB Update enabled, allows you to specify the maximum frequency for the inter-chip global memory interconnect (XGMI) PState in a 4-link or 3-link topology. Default is Auto.

AMD CBS Option	Description
UMC Common Options	
DDR Controller Configuration	
DDR Power Options	
Sub Urgent Refresh Lower Bound	With Force APCB Update enabled, allows you to specify the stored refresh limit required to enter sub-urgent refresh mode. The minimum limit is 1 and the maximum limit is 6. Default is 1.
Urgent Refresh Limit	With Force APCB Update enabled, allows you to specify the stored refresh limit required to enter urgent refresh mode. The minimum limit is 1 and the maximum limit is 6. Default is 4.
DRAM Refresh Rate	With Force APCB Update enabled, allows you to specify the DRAM refresh rate to 3.9 usec (default) or 1.95 usec.
Self-Refresh Exit Staggering	With Force APCB Update enabled, allows you to specify the amount to stagger the self-refresh exit. $Tcksr_x += (Trfc/n * (UMC\_Number \% 3))$ To disable staggering, select $n=1$ . Default is $n=9$ .
Double Data Rate Self-Testing Memory Built-in Self Test (DDR MBIST) Options	
DDR Healing BIST Options	With Force APCB Update enabled, allows you to enable or disable (default) running a full memory content test and is separate and distinct from the MBIST test of Interface and Data Eye. The PMU Mem BIST option uses PMU firmware to test the memory on all channels simultaneously. Failing memory is repaired using soft or hard PPR, depending on the PPR configuration. The Self-Healing Mem BIST option runs the JEDEC DRAM self healing test, if the device and DIMM support the self-healing. The DRAM does a hard repair for any failing memory. The Power Management Unit (PMU) and Self-Healing Mem BIST option runs the PMU Mem BIST and then the Self-Healing Mem BIST tests sequentially.
DDR Healing BIST Execution Mode	With Force APCB Update enabled, enables a memory content test.
PMU Mem BIST Algorithm	With Force APCB Update enabled, allows you to select PMU Mem BIST algorithms.
DDR Healing BIST Repair Type	With Force APCB Update enabled, for DRAM errors found in the BIOS memory BIST, select the repair type: Soft, Hard, or Test only. Do not attempt to repair.
Double Data Rate Row Address Strobe (DDR RAS)	
Disable Memory Error Injection	With Force APCB Update enabled, allows you to specify the Unified Management Console (UMC) error injection configuration where writes are disabled. Default is Auto.
DDR Security	
TSME	With Force APCB Update enabled, allows you to enable or disable transparent SME. Default is Auto.
SME-MK	With Force APCB Update enabled, allows you to enable or disable (default) SME-MK encryption mode. Enabling both SMEE and SME-MK is not supported.
Non-blocking Input Output (NBIO) Options	
IOMMU	With Force APCB Update enabled, allows you to enable or disable I/O Memory Management Unit (IOMMU). Default is Auto.
ACS Enable	With Force APCB Update enabled, allows you to enable or disable Access Control Services (ACS). You must enable Advanced Error Reporting (AER) for ACS to work. Default is Auto.

<b>AMD CBS Option</b>	<b>Description</b>
PCIe ARI Support	With Force APCB Update enabled, allows you to enable (default) or disable Alternative Routing-ID Interpretation (ARI).
System Management Unit (SMU) Common Options	
Thermal Design Power (TDP) Control	With Force APCB Update enabled, allows you to use the fused Thermal Design Power TDP (Auto) or set customized TDP (Manual). Default is Manual.
TDP	With Force APCB Update enabled, allows you to set TDP in decimal format. The minimum value is 0 and the maximum value is 4294967295. Default is 400.
Package Power Tracking (PPT) Control	With Force APCB Update enabled, allows you to use the fused PPT (Auto) or set customized PPT (Manual). Default is Manual.
PPT	With Force APCB Update enabled, allows you to set PPT in decimal format. The minimum value is 0 and the maximum value is 4294967295. Default is 400.
Determinism Control	With Force APCB Update enabled, allows you to use the default performance determinism settings (Auto) or set custom performance determinism settings (Manual). Default is Manual.
Determinism Enable	With Force APCB Update enabled, allows you to specify Power (default) or Performance for determinism control.
xGMI Link Width Control	With Force APCB Update enabled, allows you to use the default xGMI link width controller settings (Auto) or set custom xGMI link width controller settings (Manual). Default is Manual.
xGMI Force Link Width Control	With Force APCB Update enabled, you can specify not forcing the xGMI to a fixed width (Unforce) or force the xGMI link to a specified width. Default is Force.
xGMI Force Link Width	With Force APCB Update enabled, you can set the xGMI force link width at 2 (x16), 1 (x8), or 0 (x4). Default is 2.
xGMI Max Link Width Control	With Force APCB Update enabled, you can use the default xGMI maximum supported link width (Auto) or set a custom xGMI maximum link width (Manual). Default is Manual.
xGMI Max Link Width	With Force APCB Update enabled, you can select 0 to set the maximum xGMI link width to x8 or select 1 (default) to set the maximum xGMI link width to x16.
Algorithm Performance Boost Disable (APBDIS)	With Force APCB Update enabled, you can select 0 to set mission mode and not use APBDIS or select 1 (default) to use APBDIS.
DfPstate	With Force APCB Update enabled, when you use APBDIS, you can set the Data Fabric P-State (DfPstate) index from 0-4. Default is 0.
NBIO RAS Common Options	
PCI AER Reporting Mechanism	With Force APCB Update enabled, allows you to select the method of reporting AER errors from PCI Express. Firmware First allows BIOS to handle errors first through the generation of a system management interrupt (SMI). Otherwise OS First (default) allows the OS to handle the errors first through the generation of a system control interrupt (SCI).
Enable AER Cap	With Force APCB Update enabled, enable or disable Advanced Error Reporting capability. Default is Auto.
SEV-SNP Support	With Force APCB Update enabled, enable or disable (default) support for Secure Encrypted Virtualization and Secure Nested Paging.
SoC Miscellaneous Control	
ABL Console Out Control	With Force APCB Update enabled, enable or disable the ConsoleOut Function for ABL. Default is Auto.

AMD CBS Option	Description
ABL Basic Console Out Control	With Force APCB Update enabled, enable or disable the Basic ConsoleOut Function for ABL. Default is Auto.
ABL PMU Message Control	With Force APCB Update enabled, enable or disable PMU message for ABL. Default is Auto.

### Serial Port Console Redirection

Serial Port Console Redirection Option	Description
COM0 Console Redirection Settings	
Console Redirection EMS	Enable or disable (default) console redirection EMS.
Console Redirection Terminal Type	Enable (default) or disable console redirection. VT100, VT100Plus (default), VT-UFT8, ANSI
Bits Per Second	9600, 19200, 38400, 57600, 115200 (default)
Data Bits	7, 8 (default)
Parity	None (default), Even, Odd, Mark, Space
Stop Bits	1 (default), 2
Flow Control	None (default), Hardware, Request to Send or Clear to Send (RTS/CTS)

### PCI Subsystem Settings

PCI Subsystem Settings	Description
PCI Driver Version	Version number of the PCI driver. Example: A5.01.28
PCI Devices Common Settings	Caution: If you change the PCI devices common settings, there might be unwanted results, such as the system might freeze.
PCI Latency Timer	Specify a PCI Bus Clock value (32 (default) 64, 96, 128, 160, 192, 224, 248) to use for the PCI Latency Timer Register.
PCI-X Latency Timer	Specify a PCI Bus Clock value (32, 64 (default), 96, 128, 160, 192, 224, 248) to use for the PCI-X Latency Timer Register.
VGA Palette Snoop	Enable or disable (default) the PCI cards to snoop on the video card palettes and register snooping.
PERR# Generation	Enable or disable (default) the PCI device to generate PERR#.
SERR# Generation	Enable or disable (default) the PCI device to generate SERR#.
Above 4G Decoding	Enable (default) above 4G decoding only if the system supports 64 bit PCI decoding or disable the option.
SR-IOV Support	Enable (default) 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 on 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.
BME DMA Mitigation	Enable or disable (default) Bus Master Attribute (BME) Direct Memory Access (DMA) that is disabled after PCI enumeration for PCI bridges, after SMM is locked.
PCI Express Settings	
PCI Express Device Register Settings	
Relaxed Ordering	Enable (default) or disable PCI Express device relaxed ordering.

<b>PCI Subsystem Settings</b>	<b>Description</b>
Extended Tag	Enable to allow device to use the 8-bit tag field as a requester or disable (default) the option.
No Snoop	Enable (default) the PCI Express device no snoop option or disable the option.
Maximum Payload	Select the maximum payload for a PCI Express device or select Auto (default) to allow BIOS to select the value.
Maximum Read Request	Select the maximum read request size for a PCI Express device or select Auto (default) to allow BIOS to select the value.
PCI Express Link Register Settings	
ASPM Support	By default, the Active State Power Management (ASPM) option is disabled. Select Auto to allow BIOS to configure ASPM. Select Force L0s to force all links to the L0s state. Warning: Enabling ASPM might cause some PCIe devices to fail.
Extended Synch	By the default, the option is disabled. Enabling Extended Synch allows the generation of extended synchronization patterns.
Link Training Retry	Specifies the number of retry attempts (2, 3, or 5) that the software makes to retrain the link, if a previous attempt was unsuccessful. Default is 5.
Link Training Retry Timeout	Specifies the number of microseconds the software waits before polling the Link Training bit in the Link Status register. The values are 10-10000 uS. Default is 1000.
Unpopulated Links	To save power, the software disables the unpopulated PCIe links if you select Disable Link. Default is Keep Link ON.
PCI Express GEN 2 Settings	
PCI Express GEN 2 Device Register Settings	
Completion Timeout	In device functions that support completion timeout, allows the system software to change the Completion Timeout value. Default is 50 us to 50 ms. You can select Shorter or Longer to change the timeout length of time or disable the timeout.
ARI Forwarding	If Alternative Routing ID Interpretation (ARI) Forwarding is supported by the hardware and enabled, the Downstream Port disables its Device Number field of 0 enforcement, when turning a Type1 Configuration Request into a Type0 Configuration Request. Enabling ARI Forwarding allows access to Extended Functions in an ARI Device immediately below the port. Default is Disabled.
AtomicOp Requester Enable	If supported by hardware and enabled, Atomic Operation (AtomicOp) Requester initiates AtomicOp Requests only if the Bus Master Enable bit is in the Command Register Set. Default is Disabled.
AtomicOp Egress Blocking	If supported by hardware and enabled, outbound AtomicOp Requests through the Egress Ports are blocked. Default is Disabled.
IDO Request Enable	If supported by hardware and enabled, allows you to set the number of ID-Based Ordering (IDO) bit (Attribute 2) requests to be initiated. Default is Disabled.
IDO Completion Enable	If supported by hardware and enabled, allows you to enable ID-Based Ordering (IDO) Completion bit. Default is Disabled.
LTR Mechanism Enable	If supported by hardware and enabled, allows you to enable the Latency Tolerance Reporting (LTR) Mechanism. Default is Disabled.
End-End TLP Prefix Blocking	If supported by hardware and enabled, allows you to block forwarding of Traffic Light Protocols (TLPs) that contain End-End TLP Prefixes. Default is Disabled.

PCI Subsystem Settings	Description
PCI Express GEN2 Link Register Settings	
Target Link Speed	If supported by hardware and you select Force to X.X (2.5, 5.0, 9.0, 16.0, or 32.0) GT/s for downstream ports, you set an upper limit on the link operational speed by restricting the values advertised by the upstream component in its training sequences. Auto (default) uses hardware initialized data.
Clock Power Management	If supported by hardware and enabled, the device uses the CLKREQ# signal for power management of the link clock, with the protocol defined in the form factor specification. Default is Disabled.
Compliance SOS	If supported by hardware and enabled, forces Link Training and Status State Machine (LTSSM) to send Sealed Key Protection (SKP) Ordered Sets between sequences when sending Compliance Pattern or Modified Compliance Pattern. Default is Disabled.
Hardware Autonomous Width	If supported by hardware and disabled, the hardware cannot change the link width except for width size reduction to correct an unstable link operation. Default is Disabled.
Hardware Autonomous Speed	If supported by hardware and disabled, the hardware cannot change the link speed except for speed rate reduction to correct an unstable link operation. Default is Disabled.
PCI Hot-Plug Settings	
BIOS Hot-Plug Support	Allows BIOS build in Hot-Plug support, if the operating system does not support PCI Express and Standard Hot-Plug Controller (SHPC) hot-plug natively. Default is Enabled.
PCI Buses Padding	Pads the PCI buses behind the bridge for hot-plug. Select 1-5. Default is 1.
I/O Resources Padding	Pads the I/O resources behind the bridge for hot-plug. Select 4 K, 8 K, 16 K, or 32 K. Default is 4K.
MMIO 32 Bit Resources Padding	Pads the PCI Memory-Mapped IO (MMIO) 32-bit resources behind the bridge for hot-plug. Default is 16 M.
PFMMIO 32 Bit Resources Padding	Pads the PFMMIO 32-bit prefetchable resources behind the bridge for hot-plug. Default is 16 M.
PFMMIO 64 Bit Resources Padding	Pads the PFMMIO 64-bit prefetchable resources behind the bridge for hot-plug. Default is disabled.

## NVMe Configuration

NVMe Configuration Option	Description
NVMe Configuration	Displays the model number, size, vendor ID, device ID, and namespace for the NVMe controller.
Self Test Option	Allows you to change the type of self test, Short (default) or Extended, change the self test action, Controller Only Test (default) or Controller and Namespace, and run a self test based on the option and action you selected.

## Network Stack Configuration

Network Stack Option	Description
Network Stack	Enables (default) the UEFI network stack and prevents users from performing single-user network boots and network installations. If disabled, the host does not use the network interface.

<b>Network Stack Option</b>	<b>Description</b>
IPv4 PXE Support	Enables (default) IPv4 PXE Boot support. If disabled, the IPv4 PXE Boot Option is not supported.
IPv4 HTTP Support	Enables IPv4 HTTP Boot support. If disabled (default), the IPv4 HTTP Boot Option is not supported.
IPv6 PXE Support	Enables IPv6 PXE Boot support. If disabled (default), the IPv6 PXE Boot Option is not supported.
IPv6 HTTP Support	Enables IPv6 HTTP Boot support. If disabled (default), the IPv6 HTTP Boot Option is not supported.
PXE Boot Wait Time	Specifies the wait time to press the ESC key to abort the PXE boot. Default is 0.
Media Detect Count	Specifies the number of times the presence of physical storage devices are verified on a system reset or power cycle. Default is 1.

### **SATA Configuration**

<b>SATA Configuration Option</b>	<b>Description</b>
SATA Controller	Displays the SATA controller BUS device and function, and installed media devices.

### **CPU Configuration**

<b>CPU Configuration Option</b>	<b>Description</b>
SVM Mode	Enable (default) or disable CPU virtualization.
Node Information	Displays the information for each node in the CPU.
AMD	Displays the CPU ID. Example: 100-000000894-04
Cores	Displays the number of cores. Example: 96
Threads	Displays the number of threads. Example: 192
Processor Family	Displays the processor family for the CPU. Example: 19h
Processor Model	Displays the processor model for the CPU. Example: 10h-1Fh
Microcode Patch Level	Displays the microcode patch level. Example: A101010
Cache Per Core	Displays the amount of cache per core for the L1 Instruction Cache, L1 Data Cache, L2 Cache, and L3 Cache Per Socket.

### **Disk Freeze Lock Settings**

<b>Disk Freeze Lock Settings Option</b>	<b>Description</b>
Disk Freeze Lock Settings	
Disk Freeze Lock	Enables or disables (default) disk freeze lock, which prevents disks from being sanitized. Disk types include NVMe and M.2.

## USB Ports

USB Ports Option	Description
External USB Port	Enables or disables (default) the external USB port.

## IO Menu

This section includes screens of the IO menu in the BIOS Setup Utility for Oracle Server E6-2L.

## Internal Devices

Internal Devices Option	Description
NET0	Displays and provides options to change the internal device settings.
PCI-E UEFI Driver Enable	Enable (default) 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.

## Add-in Cards

Add-in Cards Option	Description
Slot 1-9	Displays and provides options to change the settings of the devices in PCIe slots.
PCIe UEFI Driver Enable	Enable (default) 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 100-103	Displays and provides options to change the settings of the devices in NVMe slots.

## PCIe Connector Special Configuration

PCIe Connector	Description
Slot 1-9 PCIe Connector Configuration	Specify the connector to control PCIe bifurcation and hotplug.

## Security Menu

Security Menu Option	Description
System Mode	Secure Boot is activated when Platform Key (PK) is enrolled, System mode is User (default) or Deployed, and the Compatibility Support Module (CSM) function is disabled.
Attempt Secure Boot	When enabled (default), Secure Boot is activated when Platform Key (PK) is enrolled, System mode is User or Deployed, and the Compatibility Support Module (CSM) function is disabled.
Secure Boot Mode	Specifies Standard or Custom (default) Secure Boot mode. In Custom mode, you can configure secure boot policy variables by a physically present user without full authentication.

<b>Security Menu Option</b>	<b>Description</b>
Restore Factory Keys	Forces system to User mode. Installs factory default Secure Boot key databases.
Reset to Setup Mode	Removes all secure boot key databases from NVRAM.
Enter Audit Mode	Resets the system to Audit Mode workflow and erases the PK variable.
Enter Deployed Mode	Transitions between Deployment and User modes.
Key Management	Allows expert users to change Secure Boot Policy variables without variable authentication.
Factory Key Provision	Enables (default) provisioning factory default Secure Boot keys after the platform reset and while the system is in Setup Mode.
Restore Factory Keys	Forces the system to User mode. Installs factory default Secure Boot key databases.
Enroll EFI Image	Enrolls an EFI image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database.
Export Secure Boot Variables	Select a file system to copy the NVRAM content of Secure Boot variables to files in a root folder on a file system device.
Secure Boot Variable   Size   Keys   Key Source	Displays the size, platform keys, key exchange keys, and signatures.

## Boot Menu

<b>Boot Menu Option</b>	<b>Description</b>
Boot EFI Shell	Disable (default) or enable to add the EFI Shell to the Boot Priority List.
Retry Boot List	Disable or enable (default) automatic retries of the Boot List when all devices fail.
Network Boot Retry	If enabled (default), 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, fails over to the main Boot Options Priority list.
Persistent Boot Support	Disable (default) reverts to the default boot handing for the next boot.
Boot Option Priorities	Displays and sets the system boot order.

## Exit Menu

<b>Save and Exit Option</b>	<b>Description</b>
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.