Dell PowerEdge R930

Owner's Manual

Regulatory Model: E37S Series
Regulatory Type: E37S001
August 2020
Rev. A08

Notes, cautions, and warnings

NOTE: A NOTE indicates important information that helps you make better use of your product.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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1

About the PowerEdge R930

The Dell PowerEdge R930 is a rack server that supports up to four processors based on the Intel E7-8800/4800 v3 or v4 product family, eight memory risers with a capacity of 12 DIMMs per riser, and up to 24 hard drives/SSDs.

Topics:

- Supported configurations for the PowerEdge R930 system
- Front panel
- Back panel features
- Diagnostic indicators
- Locating service tag of your system

Supported configurations for the PowerEdge R930 system

The Dell PowerEdge R930 system supports the following configurations:

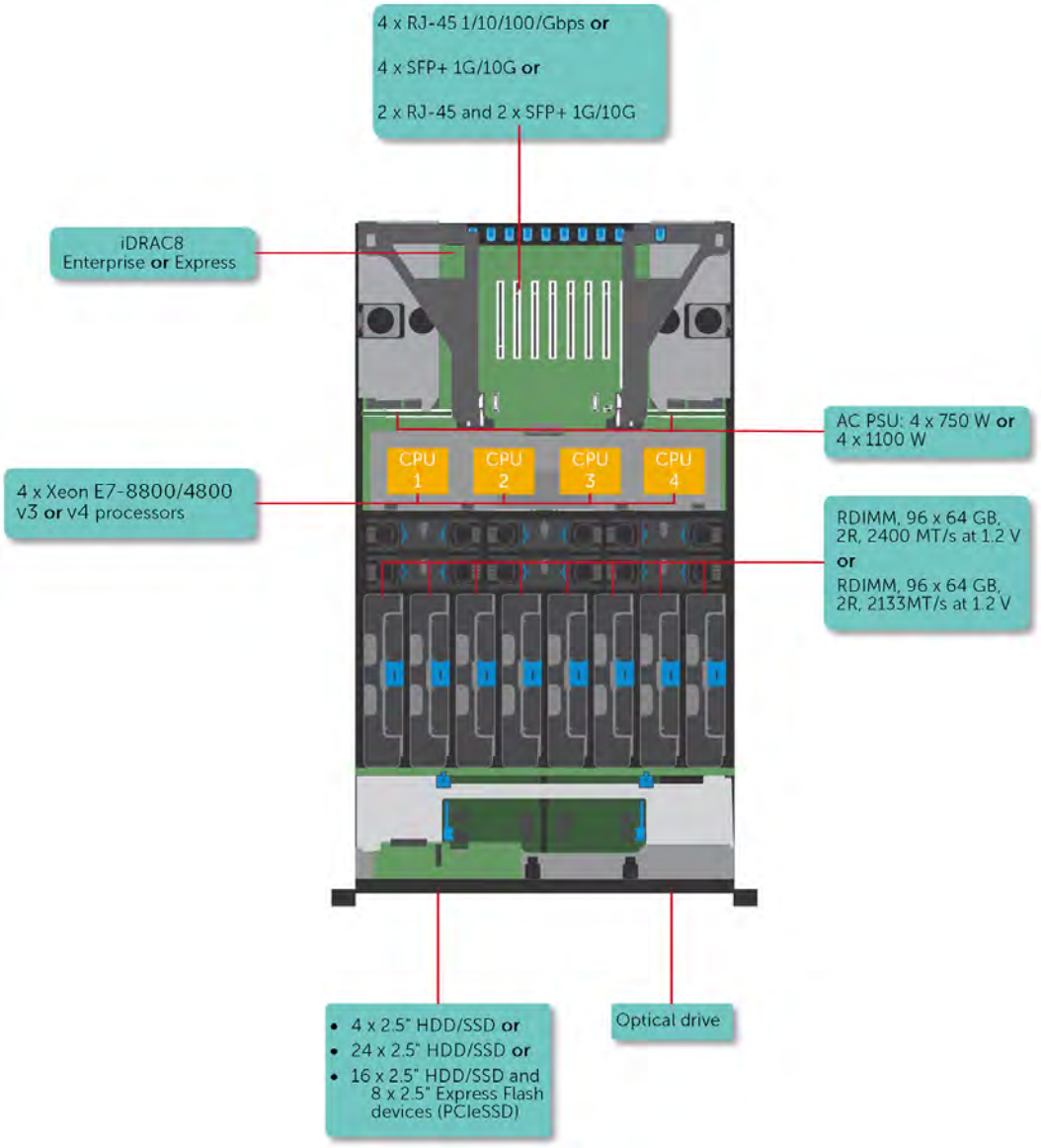

Figure 1. Supported configurations for the PowerEdge R930 system

Front panel

The front panel provides access to the features available on the front of the server, such as the power button, NMI button, system identification tag, system identification button, and USB and VGA ports. The diagnostic LEDs or the LCD panel is prominently located on the front panel. The hot swappable hard drives are accessible from the front panel.

Front panel features of the PowerEdge R930 system

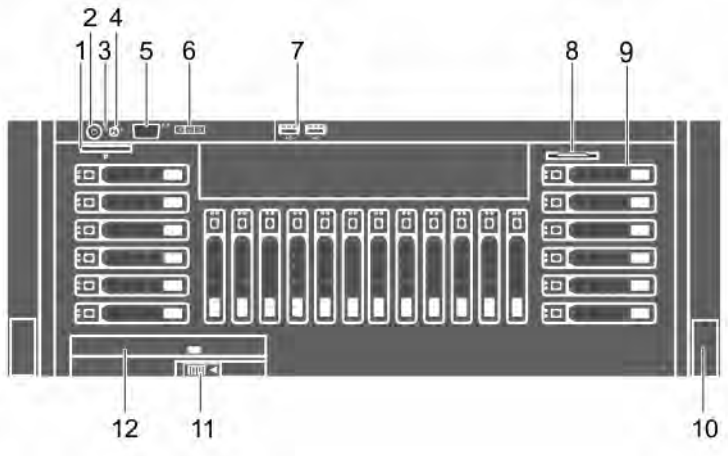

Figure 2. Front panel features of the PowerEdge R930 system

1. vFlash media card slot
2. Power button
3. NMI button
4. System identification button
5. Video connector
6. LCD menu buttons
7. USB port (2)
8. Information tag
9. Hard drives
10. Rack ears
11. Slide lock
12. Optical drive

Table 1. Front panel features of the PowerEdge R930 system.

Item	Indicator, Button, or Connector	Icon	Description
1	vFlash media card slot		The SD vFlash media card slot provides persistent on-demand local storage and a custom deployment environment that enables automation of system configuration, scripts, and imaging.
2	Power button		Indicates if the system is powered on or off. Press the power button to manually power on or off the system. **NOTE:** Press the power button to gracefully shut down an ACPI-compliant operating system.
3	NMI button		Press the Non-Maskable Interrupt (NMI) button to troubleshoot software application and device driver errors when running certain operating systems. Use the end of a paper clip to press the NMI button. **NOTE:** Use the NMI button only if directed to do so by qualified support personnel or by the operating system documentation.

Table 1. Front panel features of the PowerEdge R930 system.

Item	Indicator, Button, or Connector	Icon	Description
4	System identification button		**NOTE:** If the server stops responding during POST, press and hold the **System ID** button for more than five seconds to enter the BIOS progress mode. **NOTE:** To reset the iDRAC (if not disabled on the iDRAC setup page by pressing F2 during system boot), press and hold the **System ID** button for more than 15 seconds.
5	Video connector		Enables you to connect a display device to the system. For more information, see the Technical specifications section.
6	LCD menu buttons		The LCD menu buttons enable you to perform actions similar to GUI, RACADM, and the WS-Man interfaces.
7	USB port (2)		The USB ports are 4-pin, 2.0-compliant. These ports enable you to connect USB devices to the system.
8	Information tag		The Information tag is a slide-out label panel that contains system information such as Service Tag, NIC, MAC address, and so on. If you have opted for the secure default access to iDRAC, the Information tag also contains the iDRAC secure default password.
9	Hard drives		Up to twenty four 2.5-inch hard drives **NOTE:** On the backplane supported Flash devices, there are 3 bays in total. The first two bays are for PCIe Flash devices with two sets of drives labelled 0 through 3. The bay 3 is for SAS drives labelled 0 through 15. Enable you to install drives that are supported on your system. For more information about drives, see the Technical specifications section.
10	Rack ears		Enables you to pull the system out of the rack.
11	Optical drive lock		A lock that opens out the ejector handle for the optical drive.
12	Optical drive (optional)		One optional SATA DVD-ROM drive or DVD+/- RW drive. Enables you to retrieve and store data on optical discs such as compact discs (CD) and digital versatile discs (DVD). For more information, see the Technical specifications section.

Related references

Technical specifications on page 23

LCD panel

The LCD panel of your system provides system information, status, and error messages to indicate if the system is functioning correctly or if the system needs attention. For more information about error messages, see the *Dell Event and Error Messages Reference Guide* at **Dell.com/openmanagemanuals** >**OpenManage software**.

- The LCD backlight turns blue during normal operating conditions.
- When the system needs attention, the LCD turns amber, and displays an error code followed by descriptive text.
  NOTE: If the system is connected to a power source and an error is detected, the LCD turns amber regardless of whether the system is turned on or off.
- The LCD backlight is turned off when the system is in standby mode and can be turned on by pressing either the Select, Left, or Right button on the LCD panel.
- The LCD backlight remains off if LCD messaging is turned off using the iDRAC utility, the LCD panel, or other tools.

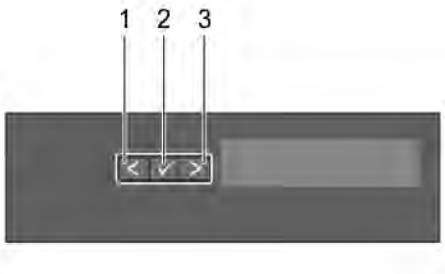

Figure 3. LCD panel features

Table 2. LCD panel features

Item	Button	Description
1	Left	Moves the cursor back in one-step increments.
2	Select	Selects the menu item highlighted by the cursor.
3	Right	Moves the cursor forward in one-step increments. During message scrolling: • Press and hold the button to increase scrolling speed. • Release the button to stop. **NOTE:** The display stops scrolling when the button is released. After 45 seconds of inactivity, the display starts scrolling.

Related references

Setup menu on page 12
View menu on page 13

Related tasks

Viewing Home screen on page 12

Viewing Home screen

The **Home** screen displays user-configurable information about the system. This screen is displayed during normal system operation when there are no status messages or errors. When the system turns off and there are no errors, LCD enters the standby mode after five minutes of inactivity. Press any button on the LCD to turn it on.

1. To view the **Home** screen, press one of the three navigation buttons (Select, Left, or Right).
2. To navigate to the **Home** screen from another menu, complete the following steps:
   a. Press and hold the navigation button till the up arrow is displayed.
   b. Navigate to the using the up arrow
   c. Select the **Home** icon.
   d. On the **Home** screen, press the **Select** button to enter the main menu.

Related references

LCD panel on page 11
Setup menu on page 12
View menu on page 13

Setup menu

NOTE: When you select an option in the Setup menu, you must confirm the option before proceeding to the next action.

Option	Description
iDRAC	Select **DHCP** or **Static IP** to configure the network mode. If **Static IP** is selected, the available fields are **IP**, **Subnet (Sub)**, and **Gateway (Gtw)**. Select **Setup DNS** to enable DNS and to view domain addresses. Two separate DNS entries are available.
Set error	Select **SEL** to view LCD error messages in a format that matches the IPMI description in the SEL. This enables you to match an LCD message with an SEL entry. Select **Simple** to view LCD error messages in a simplified user-friendly description. For more information about error messages, see the *Dell Event and Error Messages Reference Guide* at **Dell.com/openmanagemanuals** > **OpenManage software**.
Set home	Select the default information to be displayed on the **Home** screen. See View menu section for the options and option items that can be set as the default on the **Home** screen.

Related references

LCD panel on page 11
View menu on page 13

Related tasks

Viewing Home screen on page 12

View menu

NOTE: When you select an option in the View menu, you must confirm the option before proceeding to the next action.

Option	Description
iDRAC IP	Displays the **IPv4** or **IPv6** addresses for iDRAC8. Addresses include **DNS** (**Primary** and **Secondary**), **Gateway**, **IP**, and **Subnet** (IPv6 does not have Subnet).
MAC	Displays the MAC addresses for **iDRAC**, **iSCSI**, or **Network** devices.
Name	Displays the name of the **Host**, **Model**, or **User String** for the system.
Number	Displays the **Asset tag** or the **Service tag** for the system.
Power	Displays the power output of the system in BTU/hr or Watts. The display format can be configured in the **Set home** submenu of the **Setup** menu.
Temperature	Displays the temperature of the system in Celsius or Fahrenheit. The display format can be configured in the **Set home** submenu of the **Setup** menu.

Related references

LCD panel on page 11
Setup menu on page 12

Related tasks

Viewing Home screen on page 12

Back panel features

The back panel provides access to the features available on the back of the server, such as the system identification button, power supply sockets, cable management arm connectors, iDRAC storage media, NIC ports, and USB and VGA ports. A majority of the expansion card ports can be accessed from the back panel. The hot swappable and cabled power supply units are accessible from the back panel.

Back panel features of the PowerEdge R930 system

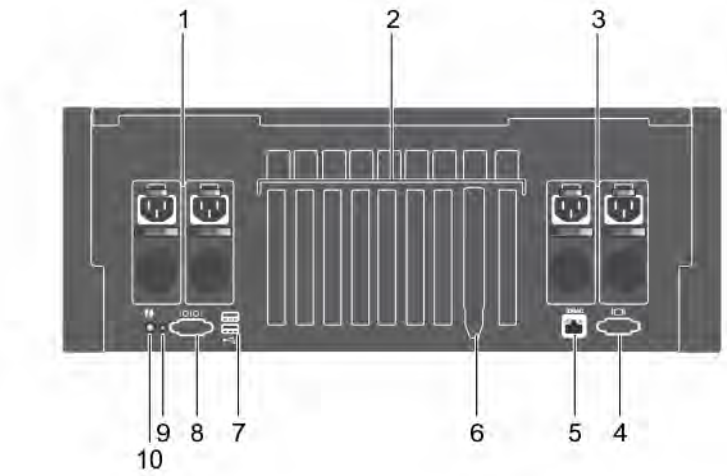

Figure 4. Back panel features of the PowerEdge R930 system

1. Power supply unit (PSU 3 and 4)
2. PCIe expansion card slots
3. Power supply unit (PSU 1 and 2)
4. Video connector
5. iDRAC Enterprise port
6. Ethernet port (4)
7. USB port (2)
8. Serial connector
9. System identification connector
10. System identification button

Table 3. Back panel features of the PowerEdge R930 system (continued)

Item	Indicator, Button, or Connector	Icon	Description
1	Power supply unit (PSU 3 and 4)		Up to two redundant AC power supplies with a rating of 750 W or 1100 W
2	PCIe expansion card slots (8 or 10 depending on the I/O risers installed)		Enables you to connect PCI Express expansion cards.
3	Power Supply Unit (PSU 1 and 2)		Up to two redundant AC power supplies with a rating of 750 W or 1100 W
4	Video connector		Enables you to connect a display device to the system. For more information, see the Technical specifications section.
5	iDRAC Enterprise port		Enables you to remotely access iDRAC. For more information, see the iDRAC User's Guide at www.dell.com/poweredgemanuals. **NOTE:** The port is available for use only if the iDRAC8 Enterprise license is installed on your system.
6	Ethernet port (4)		Four integrated 10/100/1000 Mbps NIC connectors or Four integrated connectors that include: • Two 10/100/1000 Mbps NIC connectors

Table 3. Back panel features of the PowerEdge R930 system

Item	Indicator, Button, or Connector	Icon	Description
			• Two 100 Mbps/1 Gbps/10 Gbps and two SFP+/10 GbE T connectors • Four SFP+/10 GbE T connectors
7	USB port (2)		The USB ports are 4-pin, 2.0-compliant. These ports enable you to connect USB devices to the system.
8	Serial port		Enables you to connect a serial device to the system. For more information, see the Technical specifications section.
9	System identification port		The System identification port connects the optional system status indicator assembly to the system through the optional cable management arm.
10	System identification button		**NOTE:** To reset the iDRAC (if not disabled in System Setup), press and hold the button for more than 15 seconds.

Diagnostic indicators

The diagnostic indicators on the system indicate operation and error status.

Hard drive indicator codes

Each hard drive carrier has an activity indicator and a status indicator. The indicators provide information about the current status of the hard drive. The activity LED indicates whether hard drive is currently in use or not. The status LED indicates the power condition of the hard drive.

Figure 5. Hard drive indicators

1. Hard drive activity indicator
2. Hard drive status indicator
3. Hard drive

NOTE: If the hard drive is in the Advanced Host Controller Interface (AHCI) mode, the status indicator (on the right side) does not turn on.

Table 4. Hard drive indicator codes

Drive-status indicator pattern	Condition
Flashes green twice per second	Identifying drive or preparing for removal.
Off	Drive ready for insertion or removal. **NOTE:** The drive status indicator remains off until all hard drives are initialized after the system is turned on. Drives are not ready for insertion or removal during this time.
Flashes green, amber, and then turns off	Predicted drive failure
Flashes amber four times per second	Drive failed
Flashes green slowly	Drive rebuilding
Steady green	Drive online
Flashes green for three seconds, amber for three seconds, and then turns off after six seconds	Rebuild stopped

SSD LED indicator pattern

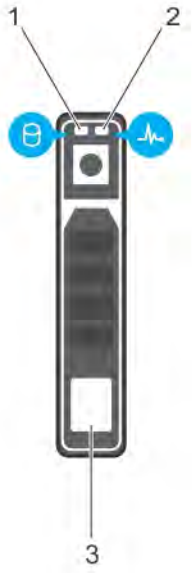

Figure 6. SSD LED indicator pattern

1. SSD activity indicator
2. SSD status indicator
3. SSD

While the operating system is running, the status indicator provides the current status of the device. The following table lists the device states along with the associated LED indicator codes.

Table 5. SSD LED indicator pattern

State Name	Slot/Device State	Status LED (Green)	Status LED (Amber)
Device status off	The system or device is not powered up.	Off	Off
Device online	The device is powered up.	On	Off

Table 5. SSD LED indicator pattern

State Name	Slot/Device State	Status LED (Green)	Status LED (Amber)
Device identify (blink)	The device is identifying the slot location or is indicating that the device has received a `Prepare for Removal` command from the host operating system.	On for 250 msec Off for 250 msec	Off
Device failed	The host operating system no longer has access to the device because the device is not responding or has encountered a critical error condition.	Off	On for 250 msec Off for 250 msec

NIC indicator codes

The NIC on the back panel has an indicator that provides information about the network activity and link status. The activity LED indicates whether the NIC is currently connected or not. The link LED indicates the speed of the connected network.

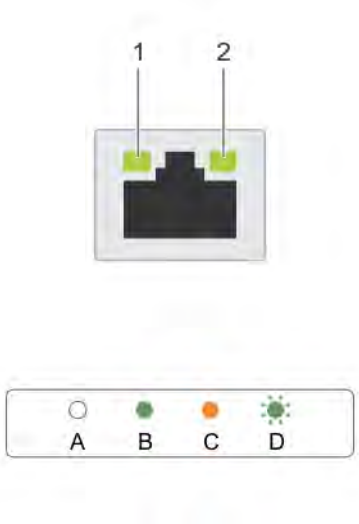

Figure 7. NIC Indicator Codes

1. link indicator
2. activity indicator

Table 6. NIC indicators

Convention	Status	Condition
A	Link and activity indicators are off.	The NIC is not connected to the network.
B	Link indicator is green.	The NIC is connected to a valid network at its maximum port speed (1 Gbps or 10 Gbps).
C	Link indicator is amber	The NIC is connected to a valid network at less than its maximum port speed.
D	Activity indicator is flashing. green	Network data is being sent or received.

Indicator codes for redundant power supply unit

Each AC power supply unit (PSU) has an illuminated translucent handle that indicates whether power is present or whether a power fault has occurred.

Figure 8. AC PSU status indicator

1. AC PSU status indicator or handle

Table 7. Redundant AC PSU status indicator

Convention	Power Indicator Pattern	Condition
A	Green	A valid power source is connected to the PSU and the PSU is operational.
B	Flashing green	When the PSU firmware is being updated, the PSU handle flashes green. **CAUTION: Do not disconnect the power cord or unplug the PSU when updating firmware. If firmware update is interrupted, the PSUs will not function. You must roll back the PSU firmware by using Dell Lifecycle Controller. For more information, see Dell Lifecycle Controller User's Guide at Dell.com/idracmanuals.**
C	Flashing green and turns off	When hot-adding a PSU, the PSU handle flashes green five times at 4 Hz rate and turns off. This indicates that there is a PSU mismatch with respect to efficiency, feature set, health status, and supported voltage. **CAUTION: For AC PSUs, use only PSUs with the Extended Power Performance (EPP) label on the back.** **NOTE:** Ensure that both the PSUs are of the same capacity. **NOTE:** Mixing PSUs from previous generations of Dell PowerEdge servers can result in a PSU mismatch condition or failure to turn the system on.
D	Flashing amber	Indicates a problem in the PSU. **CAUTION: When correcting a PSU mismatch, replace only the PSU with the flashing indicator. Swapping the other PSU to make a matched pair can result in an error condition and unexpected system shutdown. To change from a High Output configuration to a Low Output configuration or vice versa, you must turn off the system.** **CAUTION: AC PSUs support both 220 V and 110 V input voltages with the exception of Titanium PSUs, which support only 220 V. When two identical PSUs receive different input voltages, they can output different wattages, and trigger a mismatch.** **CAUTION: If two PSUs are used, they must be of the same type and have the same maximum output power.** **CAUTION: Combining AC and DC PSUs is not supported and triggers a mismatch.**

Table 7. Redundant AC PSU status indicator

Convention	Power Indicator Pattern	Condition
E	Not lit	Power is not connected.

Internal dual SD module indicator codes

The Internal Dual SD module (IDSDM) provides you with a redundant SD card solution. You can configure the IDSDM for storage or as the OS boot partition. The IDSDM card offers the following features:

- Dual card operation — maintains a mirrored configuration by using SD cards in both the slots and provides redundancy.
  NOTE: When the Redundancy option is set to Mirror Mode in the Integrated Devices screen of System Setup, the information is replicated from one SD card to another.
- Single card operation — single card operation is supported, but without redundancy.

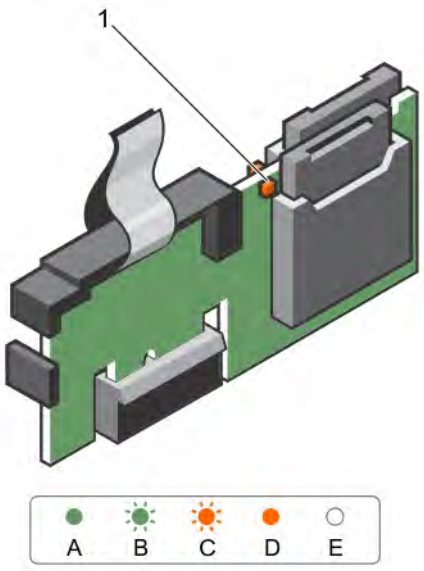

Figure 9. Internal dual SD module (IDSDM)

1. LED status indicator (2)

The following table describes the IDSDM indicator codes:

Table 8. IDSDM indicator codes

Convention	IDSDM indicator code	Description
A	Green	Indicates that the card is online.
B	Flashing green	Indicates rebuild or activity.
C	Flashing amber	Indicates card mismatch or that the card has failed.
D	Amber	Indicates that the card is offline, has failed, or is write-protected.
E	Not lit	Indicates that the card is missing or is booting.

Locating service tag of your system

Your system is identified by a unique Express Service Code and Service Tag number. The Express Service Code is and Service Tag are found on the front of the system by pulling out the information tag. Alternatively, the information may be on a sticker on the chassis of the system. This information is used by Dell to route support calls to the appropriate personnel.

2

Documentation resources

This section provides information about the documentation resources for your system.

To view the document that is listed in the documentation resources table:

- From the Dell EMC support site:
  1. Click the documentation link that is provided in the Location column in the table.
  2. Click the required product or product version.

     NOTE: To locate the product name and model, see the front of your system.
  3. On the Product Support page, click **Manuals & documents**.
- Using search engines:
  - Type the name and version of the document in the search box.

Table 9. Additional documentation resources for your system (continued)

Task	Document	Location
Setting up your system	For more information about installing and securing the system into a rack, see the Rail Installation Guide included with your rack solution. For information about setting up your system, see the *Getting Started Guide* document that is shipped with your system.	www.dell.com/poweredgemanuals
Configuring your system	For information about the iDRAC features, configuring and logging in to iDRAC, and managing your system remotely, see the Integrated Dell Remote Access Controller User's Guide. For information about understanding Remote Access Controller Admin (RACADM) subcommands and supported RACADM interfaces, see the RACADM CLI Guide for iDRAC. For information about Redfish and its protocol, supported schema, and Redfish Eventing are implemented in iDRAC, see the Redfish API Guide. For information about iDRAC property database group and object descriptions, see the Attribute Registry Guide.	www.dell.com/poweredgemanuals
	For information about earlier versions of the iDRAC documents, see the iDRAC documentation. To identify the version of iDRAC available on your system, on the	www.dell.com/idracmanuals

Table 9. Additional documentation resources for your system (continued)

Task	Document	Location	
	iDRAC web interface, click **?** > **About**.		
	For information about installing the operating system, see the operating system documentation.	www.dell.com/operatingsystemmanuals	
	For information about updating drivers and firmware, see the Methods to download firmware and drivers section in this document.	www.dell.com/support/drivers	
Managing your system	For information about systems management software offered by Dell, see the Dell OpenManage Systems Management Overview Guide.	www.dell.com/poweredgemanuals	
	For information about setting up, using, and troubleshooting OpenManage, see the Dell OpenManage Server Administrator User's Guide.	www.dell.com/openmanagemanuals > OpenManage Server Administrator	
	For information about installing, using, and troubleshooting Dell OpenManage Essentials, see the Dell OpenManage Essentials User's Guide.	www.dell.com/openmanagemanuals > OpenManage Essentials	
	For information about installing, using, and troubleshooting Dell OpenManage Enterprise, see the Dell OpenManage Enterprise User's Guide.	www.dell.com/openmanagemanuals > OpenManage Enterprise	
	For information about installing and using Dell SupportAssist, see the Dell EMC SupportAssist Enterprise User's Guide.	https://www.dell.com/serviceabilitytools	
	For information about partner programs enterprise systems management, see the OpenManage Connections Enterprise Systems Management documents.	www.dell.com/openmanagemanuals	
	Working with the Dell PowerEdge RAID controllers	For information about understanding the features of the Dell PowerEdge RAID controllers (PERC), Software RAID controllers, or BOSS card and deploying the cards, see the Storage controller documentation.	www.dell.com/storagecontrollermanuals
Understanding event and error messages	For information about the event and error messages that are generated by the system firmware and agents that monitor system components, see the Error Code Lookup.	www.dell.com/qrl	

Table 9. Additional documentation resources for your system

Task	Document	Location
Troubleshooting your system	For information about identifying and troubleshooting the PowerEdge server issues, see the Server Troubleshooting Guide.	www.dell.com/poweredgemanuals

3

Technical specifications

The technical and environmental specifications of your system are outlined in this section.

Topics:

- Chassis dimensions
- Chassis weight
- Processor specifications
- PSU specifications
- System battery specifications
- Expansion bus specifications
- Memory specifications
- Drive specifications
- Ports and connectors specifications
- Video specifications
- Environmental specifications

Chassis dimensions

This section describes the physical dimensions of the system.

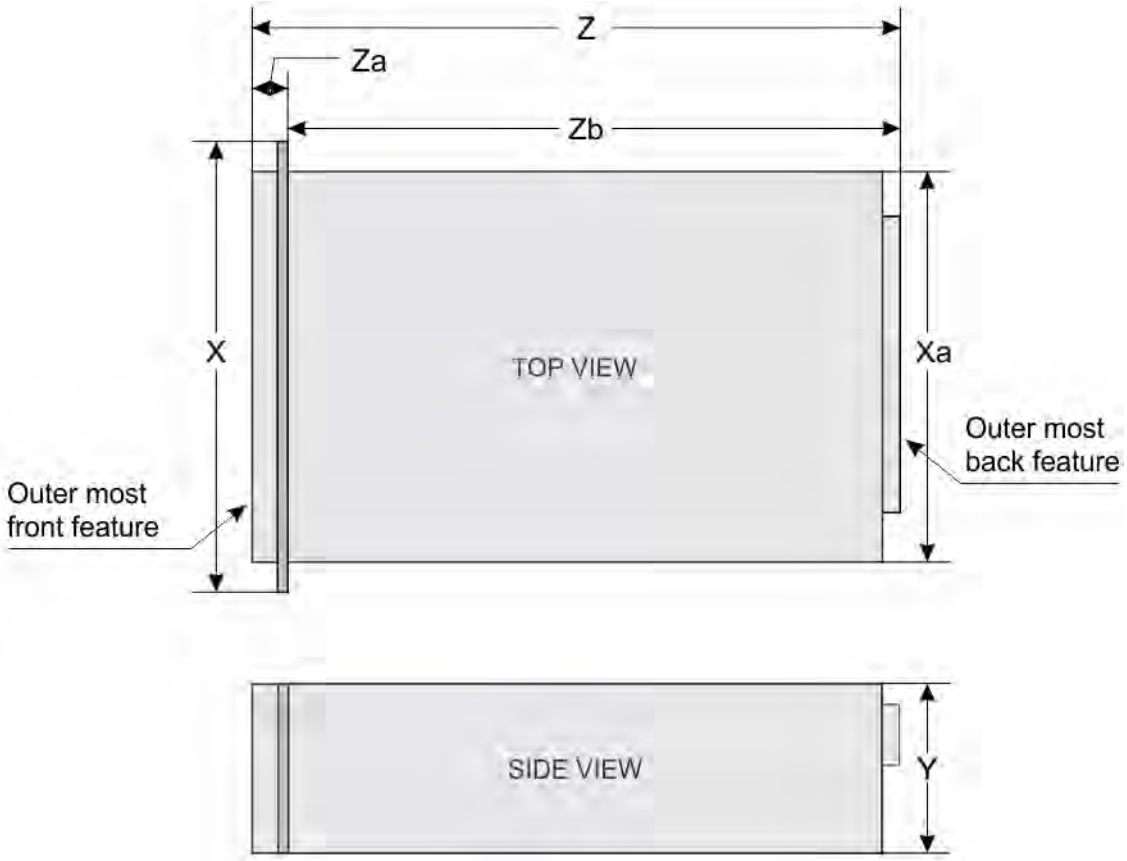

Figure 10. Chassis dimensions of the PowerEdge R930 system

Table 10. Dimensions of the Dell PowerEdge R930 system

X	Xa	Y	Z (with bezel)	Za (without bezel)	Z (without bezel)	Za (without bezel)	Zb
482.4 mm (18.99 inches)	422 mm (16.61 inches)	172.6 mm (6.8 inches)	802.3 mm (31.58 inches)	35 mm (1.37 inches)	787.7 mm (31.01 inches)	20.4mm (0.80 inch)	767.3 mm (30.20 inches)

Chassis weight

This section describes the weight of the system.

Table 11. Chassis weight

System	Maximum weight (with all hard drives/SSDs)
PowerEdge R930	59 kg (130.07 lb)

Processor specifications

The PowerEdge R930 system supports two or four Intel E7-8800/4800 v3 or Intel E7-8800/4800 v4 product family processors.

PSU specifications

The PowerEdge R930 system supports up to four AC redundant power supply units (PSUs).

Table 12. PSU specifications

PSU	Class	Heat dissipation (maximum)	Frequency	Voltage
750 W AC	Platinum	2891 BTU/hr	50/60 Hz	100–240 V AC, autoranging
1100 W AC	Platinum+	4100 BTU/hr	50/60 Hz	100–240 V AC, autoranging

NOTE: Heat dissipation is calculated using the PSU wattage rating.

NOTE: This system is also designed to connect to the IT power systems with a phase-to-phase voltage not exceeding 230 V.

System battery specifications

The PowerEdge R930 system supports 3 V CR2032 Lithium coin cell system battery.

Expansion bus specifications

The PowerEdge R930 system supports PCI express (PCIe) Generation 3 expansion cards, which need to be installed on the system board using expansion card risers. This system supports three types of expansion card risers. The following table provides the expansion card riser specifications:

Table 13. Expansion card riser specifications

Expansion card riser	PCIe slots on the riser	Height	Length	Link
Riser 1 (NDC riser default)	Slot 2	full-height	half-length	x8 link

Table 13. Expansion card riser specifications

Expansion card riser	PCIe slots on the riser	Height	Length	Link
Riser 2 (optional)	Slot 1/1	full-height	full-length	x4
	Slot 2/2	full-height	half-length	x4
	Slot 3	full-height	half-length	x8
	Slot 4	full-height	full-length	x16
	Slot 5	full-height	half-length	x16
	Slot 6	full-height	half-length	x16
	Slot 7	full-height	half-length	x16
	Slot 8	full-height	half-length	x16
Riser 3 (optional)	Slot 1/9	full-height	full-length	x8
	Slot 2/10	half-height	half-length	x8

NOTE: To use slots 6 through 10, all four processors must be installed.

NOTE: Do not install a full-height expansion card on PCIe slot 2/10.

Memory specifications

The PowerEdge R930 system supports DDR4 registered DIMMs (RDIMMs) and load-reduced DIMMs (LRDIMMs). Supported memory bus frequencies are 1866 MT/s, 2133MT/s, or 2400 MT/s.

Table 14. Memory specifications

Memory module sockets	Memory capacity	Minimum RAM	Maximum RAM
Ninety-six 240-pin sockets	• 64 GB quad rank (LRDIMMs) • 4 GB or 8GB single rank (RDIMMs) • 8 GB, 16 GB, or 32 GB dual rank (RDIMMs)	• 192 GB with dual processor with 4 memory risers • 384 GB with quad processor with 8 memory risers	• 3.07 TB with dual processor with 4 memory risers • 6.14 TB with quad processor with 8 memory risers

NOTE:
- Each memory riser supports 12 memory module slots.
- Each processor supports two memory risers.

Drive specifications

Hard drives

The PowerEdge R930 system supports SAS and SATA hard drives and Solid State Drives (SSDs).

Table 15. Supported hard drive and SSD options for the PowerEdge R930 system

Hard drive system	Description
Four hard drive systems	Up to four 2.5 inch, internal, hot-swappable SAS hard drives in hard drive slots 0 through 3. This configuration supports:

Table 15. Supported hard drive and SSD options for the PowerEdge R930 system (continued)

Hard drive system	Description
	• 6 Gbps and 12 Gbps I/O operations on SAS drives. • 6 Gbps on SATA drives.
Twenty four hard drive systems (SAS/SATA)	Up to twenty four 2.5 inch, internal, hot-swappable SAS/SATA hard drives. This configuration supports: • 6 Gbps and 12 Gbps I/O operations on SAS drives. • 6 Gbps on SATA drives. **NOTE:** With a single *Unified mode* daughter card and PERC 9 card the hard drives are located in hard drive slots 0 through 24 (bay 1). **NOTE:** With two *Performance mode* daughter cards and two PERC 9 cards the hard drives are located in hard drive slots 0 through 11 (bay 1) and 0 through 11 (bay 2)
Twenty four or sixteen plus eight hard drive systems	Up to sixteen 2.5 inch, internal, hot-swappable SAS drives and up to eight Dell PowerEdge Express Flash devices (PCIe SSDs) hard drives in hard drive slots 0 through 4 (bay 1), 0 through 4 (bay 2), and 0 through 15 (bay 3) for SAS/SATA with 2 PCIe Extender Cards, one Unified Mode Daughter Card, and one PERC 9 Card. **NOTE:** Performance mode daughter cards (hard drive slots 0 through 7 on SAS/SATA) are not supported.
Twenty four hard drive systems (SAS-3 (12 Gbps)) Performance Mode (split-capable)	Up to twenty four 2.5 inch, internal, hot-swappable SAS hard drives. **NOTE:** When the backplane is NOT in the split mode with single internal PERC, the maximum number of SATA/SSDs are 12 in the right bay (hard drives slots 12 through 23).
Twenty four or sixteen plus eight hard drive systems (SATA SSD)	Up to sixteen 2.5 inch, internal, hot-swappable SATA drives and up to eight Dell PowerEdge Express Flash devices (PCIe SSDs) hard drives in hard drive slots 0 through 4 (bay 1), 0 through 4 (bay 2), and 8 through 15 (bay 3) for SAS/SATA. **NOTE:** Initial status LED of PCIe SSDs may vary based on the actual drive status and server components populated.

Optical drive

The PowerEdge R930 system supports one optional SATA DVD-ROM drive or DVD+/-RW drive.

Ports and connectors specifications

USB ports

The PowerEdge R930 system supports:
- USB 2.0-compliant ports on the front panel
- USB 2.0-compliant ports on the back panel
- USB 2.0-compliant internal port

The following table provides more information about the USB specifications:

Table 16. USB specifications

System	Front panel	Back panel	Internal
PowerEdge R930	Two 4-pin, USB 2.0-compliant port	Two 4-pin, USB 2.0-compliant port	One 4-pin, USB 2.0-compliant port

NIC ports

The PowerEdge R930 system supports four 10/100/1000 Mbps Network Interface Controller (NIC) ports on the back panel.

Serial connector

The serial connector connects a serial device to the system. The PowerEdge R930 system supports one serial connector on the back panel, which is a 9-pin connector, Data Terminal Equipment (DTE), 16550-compliant.

VGA ports

The Video Graphic Array (VGA) port enables you to connect the system to a VGA display. The PowerEdge R930 system supports two 15-pin VGA ports one each on the front and back panels.

Internal Dual SD Module

The PowerEdge R930 system supports two optional flash memory card slots with an internal dual SD module.

NOTE: One card slot is dedicated for redundancy.

Video specifications

The PowerEdge R930 system supports Matrox G200 graphics card with 16 MB capacity.

Table 17. Supported video resolution options

Resolution	Refresh rate (Hz)	Color depth (bits)
640 x 480	60, 70	8, 16, 32
800 x 600	60, 75, 85	8, 16, 32
1024 x 768	60, 75, 85	8, 16, 32
1152 x 864	60, 75, 85	8, 16, 32
1280 x 1024	60, 75	8, 16, 32
1440 x 900	60	8, 16, 32

Environmental specifications

NOTE: For additional information about environmental measurements for specific system configurations, see **Dell.com/environmental_datasheets**.

Table 18. Temperature specifications

Temperature	Specifications
Storage	–40°C to 65°C (–40°F to 149°F)
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Maximum temperature gradient (operating and storage)	20°C/h (68°F/h)

Table 19. Relative humidity specifications

Table 19. Relative humidity specifications

Relative humidity	Specifications
Storage	5% to 95% RH with 33°C (91°F) maximum dew point. Atmosphere must be non-condensing at all times.
Operating	10% to 80% relative humidity with 26°C (78.8°F) maximum dew point.

Table 20. Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.26 G_{rms} at 5 Hz to 350 Hz (all operation orientations).
Storage	1.87 G_{rms} at 10 Hz to 500 Hz for 15 min (all six sides tested).

Table 21. Maximum shock specifications

Maximum shock	Specifications
Operating	Six consecutively executed shock pulses in the positive and negative x, y, and z axes of 6 G for up to 11 ms.
Storage	Six consecutively executed shock pulses in the positive and negative x, y, and z axes (one pulse on each side of the system) of 71 G for up to 2 ms.

Table 22. Maximum altitude specifications

Maximum altitude	Specifications
Operating	3048 m (10,000 ft)
Storage	12,000 m (39,370 ft)

Table 23. Operating temperature de-rating specifications

Operating temperature de-rating	Specifications
Up to 35°C (95°F)	Maximum temperature is reduced by 1°C/300 m (1°F/547 ft) above 950 m (3,117 ft).
35°C to 40°C (95°F to 104°F)	Maximum temperature is reduced by 1°C/175 m (1°F/319 ft) above 950 m (3,117 ft).
40°C to 45°C (104°F to 113°F)	Maximum temperature is reduced by 1°C/125 m (1°F/228 ft) above 950 m (3,117 ft).

Particulate and gaseous contamination specifications

The following table defines the limitations that help avoid any equipment damage or failure from particulates and gaseous contamination. If the levels of particulates or gaseous pollution exceed the specified limitations and result in equipment damage or failure, you may need to rectify the environmental conditions. Re-mediation of environmental conditions is the responsibility of the customer.

Table 24. Particulate contamination specifications

Particulate contamination	Specifications
Air filtration	Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit. **NOTE:** This condition applies to data center environments only. Air filtration requirements do not apply to IT equipment designed to be used outside a data center, in environments such as an office or factory floor.

Table 24. Particulate contamination specifications (continued)

Particulate contamination	Specifications
	NOTE: Air entering the data center must have MERV11 or MERV13 filtration.
Conductive dust	Air must be free of conductive dust, zinc whiskers, or other conductive particles. **NOTE:** This condition applies to data center and non-data center environments.
Corrosive dust	• Air must be free of corrosive dust. • Residual dust present in the air must have a deliquescent point less than 60% relative humidity. **NOTE:** This condition applies to data center and non-data center environments.

Table 25. Gaseous contamination specifications

Gaseous contamination	Specifications
Copper coupon corrosion rate	<300 Å/month per Class G1 as defined by ANSI/ISA71.04-1985.
Silver coupon corrosion rate	<200 Å/month as defined by AHSRAE TC9.9.

NOTE: Maximum corrosive contaminant levels measured at ≤50% relative humidity.

Standard operating temperature

Table 26. Standard operating temperature specifications

Standard operating temperature	Specifications
Continuous operation (for altitude less than 950 m or 3117 ft)	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment.
Humidity percentage range	10% to 80% Relative Humidity with 26°C (78.8°F) maximum dew point.

Expanded operating temperature

Table 27. Expanded operating temperature specifications

Expanded operating temperature	Specifications
Less than or equal to 10% of annual operating hours	5°C to 40°C at 5% to 85% RH with 29°C dew point. **NOTE:** Outside the standard operating temperature (10°C to 35°C), the system can operate continuously in temperatures as low as 5°C and as high as 40°C. For temperatures between 35°C and 40°C, de-rate maximum allowable dry bulb temperature by 1°C per 175 m above 950 m (1°F per 319 ft).
Less than or equal to 1% of annual operating hours	–5°C to 45°C at 5% to 90% RH with 29°C dew point. **NOTE:** Outside the standard operating temperature (10°C to 35°C), the system can operate down to –5°C or up to 45°C for a maximum of 1% of its annual operating hours. For temperatures between 40°C and 45°C, de-rate maximum allowable temperature by 1°C per 125 m above 950 m (1°F per 228 ft).

NOTE: When operating in the expanded temperature range, system performance may be impacted.

NOTE: When operating in the expanded temperature range, ambient temperature warnings maybe reported on the LCD panel and in the System Event Log.

Expanded operating temperature restrictions

In systems that have do not have Class 2, Near Line SAS hard drives installed the restrictions listed here need to be followed:

- x4 passive backplane only
- Requires 4 PSUs (redundant)
- No PCIe SSD
- No Class 2, Near Line SAS, hard drives

In systems that have Enterprise, Near Line SAS hard drives installed the restrictions listed here need to be followed:

- x4 Backplane with any combination of CPU configuration
- x24 Backplane supports a maximum of 140W CPUs
- No PCIe SSD
- Fans speeds are limited to 90% of full speed

4

Initial system setup and configuration

Topics:

- Setting up your system
- iDRAC configuration
- Options to install the operating system

Setting up your system

Complete the following steps to set up your system:

1. Unpack the system.
2. Install the system into the rack. For more information about installing the system into the rack, see your system *Rack Installation Placemat* at **Dell.com/poweredgemanuals**.
3. Connect the peripherals to the system.
4. Connect the system to its electrical outlet.
5. Turn the system on by pressing the power button or by using iDRAC.
6. Turn on the attached peripherals.

iDRAC configuration

The Integrated Dell Remote Access Controller (iDRAC) is designed to make system administrators more productive and improve the overall availability of Dell EMC systems. iDRAC alerts administrators to system issues, helps them perform remote system management, and reduces the need for physical access to the system.

Options to set up iDRAC IP address

You must configure the initial network settings based on your network infrastructure to enable the communication to and from iDRAC. You can set up the IP address by using one of the following interfaces:

Interfaces	Document/Section
iDRAC Settings utility	See *Dell Integrated Dell Remote Access Controller User's Guide* at **Dell.com/idracmanuals**
Dell Deployment Toolkit	See *Dell Deployment Toolkit User's Guide* at **Dell.com/openmanagemanuals**
Dell Lifecycle Controller	See *Dell Lifecycle Controller User's Guide* at **Dell.com/idracmanuals**
Chassis or Server LCD panel	See the LCD panel section

You must use the default iDRAC IP address 192.168.0.120 to configure the initial network settings, including setting up DHCP or a static IP for iDRAC.

NOTE: To access iDRAC, ensure that you install the iDRAC port card or connect the network cable to the Ethernet connector 1 on the system board.

NOTE: Ensure that you change the default user name and password after setting up the iDRAC IP address.

Log in to iDRAC

You can log in to iDRAC as:

- iDRAC user
- Microsoft Active Directory user
- Lightweight Directory Access Protocol (LDAP) user

The default user name and password are `root` and `calvin`. You can also log in by using Single Sign-On or Smart Card.

NOTE: You must have iDRAC credentials to log in to iDRAC.

For more information about logging in to iDRAC and iDRAC licenses, see the latest Integrated Dell Remote Access Controller User's Guide at **Dell.com/idracmanuals**.

Options to install the operating system

If the system is shipped without an operating system, install the supported operating system by using one of the following resources:

Table 28. Resources to install the operating system

Resources	Location
Dell Systems Management Tools and Documentation media	https://www.dell.com/operatingsystemmanuals
Dell Lifecycle Controller	https://www.dell.com/idracmanuals
Dell OpenManage Deployment Toolkit	https://www.dell.com/openmanagemanuals
Dell certified VMware ESXi	https://www.dell.com/virtualizationsolutions
Supported operating systems on Dell PowerEdge systems	www.dell.com/ossupport
Installation and How-to videos for supported operating systems on Dell PowerEdge systems	https://www.youtube.com/playlist?list=PLe5xhhyFjDPfTCaDRFfIB_VsoLpL8x84G

Methods to download firmware and drivers

You can download the firmware and drivers by using any of the following methods:

Table 29. Firmware and drivers

Methods	Location
From the Dell Support site	Global Technical Support
Using Dell Remote Access Controller Lifecycle Controller (iDRAC with LC)	Dell.com/idracmanuals
Using Dell Repository Manager (DRM)	Dell.com/openmanagemanuals > OpenManage Deployment Toolkit
Using Dell OpenManage Essentials (OME)	Dell.com/openmanagemanuals > OpenManage Deployment Toolkit
Using Dell Server Update Utility (SUU)	Dell.com/openmanagemanuals > OpenManage Deployment Toolkit
Using Dell OpenManage Deployment Toolkit (DTK)	Dell.com/openmanagemanuals > OpenManage Deployment Toolkit

Downloading the drivers and firmware

Dell EMC recommends that you download and install the latest BIOS, drivers, and systems management firmware on your system.

Ensure that you clear the web browser cache before downloading the drivers and firmware.

1. Go to Dell.com/support/drivers.
2. In the **Drivers & Downloads** section, type the Service Tag of your system in the **Service Tag or Express Service Code** box, and then click **Submit**.

   NOTE: If you do not have the Service Tag, select **Detect My Product** to allow the system to automatically detect your Service Tag, or in **General support**, navigate to your product.

3. Click **Drivers & Downloads**.
   The drivers that are applicable to your selection are displayed.
4. Download the drivers to a USB drive, CD, or DVD.

5

Pre-operating system management applications

You can manage basic settings and features of a system without booting to the operating system by using the system firmware.

Topics:

- Options to manage the pre-operating system applications
- System Setup
- Dell Lifecycle Controller
- Boot Manager
- PXE boot

Options to manage the pre-operating system applications

Your system has the following options to manage the pre-operating system applications:

- System Setup
- Boot Manager
- Dell Lifecycle Controller
- Preboot Execution Environment (PXE)

Related concepts

System Setup on page 34
Boot Manager on page 58
Dell Lifecycle Controller on page 58
PXE boot on page 59

System Setup

By using the **System Setup** screen, you can configure the BIOS settings, iDRAC settings, and device settings of your system.

NOTE: Help text for the selected field is displayed in the graphical browser by default. To view the help text in the text browser, press F1.

You can access system setup by using two methods:

- Standard graphical browser — The browser is enabled by default.
- Text browser — The browser is enabled by using Console Redirection.

Related references

System Setup details on page 35

Related tasks

Viewing System Setup on page 35

Viewing System Setup

To view the **System Setup** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

Related concepts

System Setup on page 34

Related references

System Setup details on page 35

System Setup details

The **System Setup Main Menu** screen details are explained as follows:

Option	Description
System BIOS	Enables you to configure BIOS settings.
iDRAC Settings	Enables you to configure iDRAC settings. The iDRAC settings utility is an interface to set up and configure the iDRAC parameters by using UEFI (Unified Extensible Firmware Interface). You can enable or disable various iDRAC parameters by using the iDRAC settings utility. For more information about this utility, see *Integrated Dell Remote Access Controller User's Guide* at **Dell.com/idracmanuals**.
Device Settings	Enables you to configure device settings.

Related concepts

System Setup on page 34

Related tasks

Viewing System Setup on page 35

System BIOS

You can use the **System BIOS** screen to edit specific functions such as boot order, system password, setup password, set the RAID mode, and enable or disable USB ports.

Related references

System BIOS Settings details on page 36
Boot Settings on page 37
Network Settings on page 39
System Information on page 45
Memory Settings on page 46
Processor Settings on page 47
SATA Settings on page 49
Integrated Devices on page 51
Serial Communication on page 52

System Profile Settings on page 54
Miscellaneous Settings on page 55
iDRAC Settings utility on page 57
Device Settings on page 57

Related tasks

Viewing System BIOS on page 36

Viewing System BIOS

To view the **System BIOS** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.

Related references

System BIOS on page 35
System BIOS Settings details on page 36

System BIOS Settings details

The **System BIOS Settings** screen details are explained as follows:

Option	Description
System Information	Specifies information about the system such as the system model name, BIOS version, and Service Tag.
Memory Settings	Specifies information and options related to the installed memory.
Processor Settings	Specifies information and options related to the processor such as speed and cache size.
SATA Settings	Specifies options to enable or disable the integrated SATA controller and ports.
Boot Settings	Specifies options to specify the boot mode (BIOS or UEFI). Enables you to modify UEFI and BIOS boot settings.
Network Settings	Specifies options to change the network settings.
Integrated Devices	Specifies options to manage integrated device controllers and ports and specify related features and options.
Serial Communication	Specifies options to manage the serial ports and specify related features and options.
System Profile Settings	Specifies options to change the processor power management settings, memory frequency, and so on.
System Security	Specifies options to configure the system security settings, such as system password, setup password, Trusted Platform Module (TPM) security. It also manages the power and NMI buttons on the system.
Miscellaneous Settings	Specifies options to change the system date, time, and so on.

Related references

System BIOS on page 35

Related tasks

Viewing System BIOS on page 36

Boot Settings

You can use the **Boot Settings** screen to set the boot mode to either **BIOS** or **UEFI**. It also enables you to specify the boot order.

Related references

System BIOS on page 35
Choosing the system boot mode on page 38

Related tasks

Boot Settings details on page 37
Viewing Boot Settings on page 37
Changing the boot order on page 39

Viewing Boot Settings

To view the **Boot Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Boot Settings**.

Related references

Boot Settings on page 37
Choosing the system boot mode on page 38

Related tasks

Boot Settings details on page 37
Changing the boot order on page 39

Boot Settings details

The **Boot Settings** screen details are explained as follows:

Option	Description
Boot Mode	Enables you to set the boot mode of the system. **CAUTION: Switching the boot mode may prevent the system from booting if the operating system is not installed in the same boot mode.** If the operating system supports UEFI, you can set this option to **UEFI**. Setting this field to **BIOS** allows compatibility with non-UEFI operating systems. This option is set to **BIOS** by default. **NOTE:** Setting this field to **UEFI** disables the **BIOS Boot Settings** menu. Setting this field to **BIOS** disables the **UEFI Boot Settings** menu.

Option	Description
Boot Sequence Retry	Enables or disables the Boot Sequence Retry feature. If this option is set to **Enabled** and the system fails to boot, the system reattempts the boot sequence after 30 seconds. This option is set to **Enabled** by default.
Hard-Disk Failover	Specifies the hard drive that is booted in the event of a hard drive failure. The devices are selected in the **Hard-Disk Drive Sequence** on the **Boot Option Setting** menu. When this option is set to **Disabled**, only the first hard drive in the list is attempted to boot. When this option is set to **Enabled**, all hard drives are attempted to boot in the order selected in the **Hard-Disk Drive Sequence**. This option is not enabled for UEFI Boot Mode.
Boot Option Settings	Configures the boot sequence and the boot devices.
BIOS Boot Settings	Enables or disables BIOS boot options. **NOTE:** This option is enabled only if the boot mode is BIOS.
UEFI Boot Settings	Enables or disables UEFI Boot options. The Boot options include **IPv4 PXE** and **IPv6 PXE**. This option is set to **IPv4** by default. **NOTE:** This option is enabled only if the boot mode is UEFI.

Related references

Boot Settings on page 37
Choosing the system boot mode on page 38

Related tasks

Viewing Boot Settings on page 37
Changing the boot order on page 39

Choosing the system boot mode

System Setup enables you to specify one of the following boot modes for installing your operating system:

- BIOS boot mode (the default) is the standard BIOS-level boot interface.
- Unified Extensible Firmware Interface (UEFI) (the default) boot mode is an enhanced 64-bit boot interface. If you have configured your system to boot to UEFI mode, it replaces the system BIOS.

1. From the **System Setup Main Menu**, click **Boot Settings**, and select **Boot Mode**.
2. Select the boot mode you want the system to boot into.
   CAUTION: Switching the boot mode may prevent the system from booting if the operating system is not installed in the same boot mode.
3. After the system boots in the specified boot mode, proceed to install your operating system from that mode.

NOTE:

- Operating systems must be UEFI-compatible to be installed from the UEFI boot mode. DOS and 32-bit operating systems do not support UEFI and can only be installed from the BIOS boot mode.
- For the latest information about supported operating systems, go to Dell.com/ossupport.

Related references

Boot Settings on page 37

Related tasks

Boot Settings details on page 37
Viewing Boot Settings on page 37

Changing the boot order

You may have to change the boot order if you want to boot from a USB key or an optical drive. The following instructions may vary if you have selected **BIOS** for **Boot Mode**.

1. On the **System Setup Main Menu** screen, click **System BIOS** > **Boot Settings**.
2. Click **Boot Option Settings** > **Boot Sequence**.
3. Use the arrow keys to select a boot device, and use the plus (+) and minus (-) sign keys to move the device down or up in the order.
4. Click **Exit**, and then click **Yes** to save the settings on exit.

Related references

Boot Settings on page 37

Related tasks

Boot Settings details on page 37
Viewing Boot Settings on page 37

Network Settings

You can use the **Network Settings** screen to modify PXE device settings. The network settings option is available only in the UEFI mode.

NOTE: The BIOS does not control network settings in the BIOS mode. For the BIOS boot mode, the optional Boot ROM of the network controllers handles the network settings.

Related concepts

UEFI iSCSI Settings on page 40

Related references

Network Settings screen details on page 40
UEFI iSCSI Settings details on page 40
System BIOS on page 35

Related tasks

Viewing Network Settings on page 39
Viewing UEFI iSCSI Settings on page 40

Viewing Network Settings

To view the **Network Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Network Settings**.

Related references

Network Settings on page 39
Network Settings screen details on page 40

Network Settings screen details

The **Network Settings** screen details are explained as follows:

Option	Description
PXE Device n (n = 1 to 4)	Enables or disables the device. When enabled, a UEFI boot option is created for the device.
PXE Device n Settings(n = 1 to 4)	Enables you to control the configuration of the PXE device.

Related references

Network Settings on page 39

Related tasks

Viewing Network Settings on page 39

UEFI iSCSI Settings

You can use the iSCSI Settings screen to modify iSCSI device settings. The iSCSI Settings option is available only in the UEFI boot mode. BIOS does not control network settings in the BIOS boot mode. For the BIOS boot mode, the option ROM of the network controller handles the network settings.

Related references

UEFI iSCSI Settings details on page 40

Related tasks

Viewing UEFI iSCSI Settings on page 40

Viewing UEFI iSCSI Settings

To view the **UEFI iSCSI Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Network Settings**.
5. On the **Network Settings** screen, click **UEFI iSCSI Settings**.

Related references

UEFI iSCSI Settings on page 40

UEFI iSCSI Settings details

The **UEFI ISCSI Settings** screen details are explained as follows:

Option	Description
ISCSI Initiator Name	Specifies the name of the iSCSI initiator (iqn format).

Option	Description
ISCSI Device n (n = 1 to 4)	Enables or disables the iSCSI device. When disabled, a UEFI boot option is created for the iSCSI device automatically.

System Security

You can use the **System Security** screen to perform specific functions such as setting the system password, setup password and disabling the power button.

Related references

Operating with a setup password enabled on page 44
System BIOS on page 35

Related tasks

System Security Settings details on page 41
Viewing System Security on page 41
Creating a system and setup password on page 43
Using your system password to secure your system on page 43
Deleting or changing system and setup password on page 44

Viewing System Security

To view the **System Security** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **System Security**.

Related references

System Security on page 41

Related tasks

System Security Settings details on page 41

System Security Settings details

The **System Security Settings** screen details are explained as follows:

Option	Description
Intel AES-NI	Improves the speed of applications by performing encryption and decryption by using the Advanced Encryption Standard Instruction Set (AES-NI). This option is set to **Enabled** by default.
System Password	Sets the system password. This option is set to **Enabled** by default and is read-only if the password jumper is not installed in the system.
Setup Password	Sets the setup password. This option is read-only if the password jumper is not installed in the system.
Password Status	Locks the system password. This option is set to **Unlocked** by default.

Option	Description
TPM Security	**NOTE:** The TPM menu is available only when the TPM module is installed. Enables you to control the reporting mode of the TPM. The **TPM Security** option is set to **Off** by default. You can only modify the TPM Status, TPM Activation, and Intel TXT fields if the **TPM Status** field is set to either **On with Pre-boot Measurements** or **On without Pre-boot Measurements**.
TPM Information	Changes the operational state of the TPM. This option is set to **No Change** by default.
TPM Status	Specifies the TPM status.
TPM Command	**CAUTION: Clearing the TPM results in the loss of all keys in the TPM. The loss of TPM keys may affect booting to the operating system.** Clears all the contents of the TPM. The **TPM Clear** option is set to **No** by default.
Intel TXT	Enables or disables the Intel Trusted Execution Technology (TXT) option. To enable the **Intel TXT** option, virtualization technology and TPM Security must be enabled with Pre-boot measurements. This option is set to **Off** by default.
Power Button	Enables or disables the power button on the front of the system. This option is set to **Enabled** by default.
NMI Button	Enables or disables the NMI button on the front of the system. This option is set to **Disabled** by default.
AC Power Recovery	Sets how the system behaves after AC power is restored to the system. This option is set to **Last** by default.
AC Power Recovery Delay	Sets the time delay for the system to power up after AC power is restored to the system. This option is set to **Immediate** by default.
User Defined Delay (60s to 240s)	Sets the **User Defined Delay** option when the **User Defined** option for **AC Power Recovery Delay** is selected.
UEFI Variable Access	Provides varying degrees of securing UEFI variables. When set to **Standard** (the default), UEFI variables are accessible in the operating system per the UEFI specification. When set to **Controlled**, selected UEFI variables are protected in the environment and new UEFI boot entries are forced to be at the end of the current boot order.
Secure Boot Policy	When Secure Boot policy is set to **Standard**, the BIOS uses the system manufacturer's key and certificates to authenticate pre-boot images. When Secure Boot policy is set to **Custom**, the BIOS uses the user-defined key and certificates. Secure Boot policy is set to **Standard** by default.
Secure Boot Policy Summary	Specifies the list of certificates and hashes that secure boot uses to authenticate images.

Related references

System Security on page 41

Related tasks

Viewing System Security on page 41

Secure Boot Custom Policy Settings

Secure Boot Custom Policy Settings is displayed only when **Secure Boot Policy** is set to **Custom**.

Viewing Secure Boot Custom Policy Settings

To view the **Secure Boot Custom Policy Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **System Security**.
5. On the **System Security** screen, click **Secure Boot Custom Policy Settings**.

Secure Boot Custom Policy Settings details

The **Secure Boot Custom Policy Settings** screen details are explained as follows:

Option	Description
Platform Key	Imports, exports, deletes, or restores the platform key (PK).
Key Exchange Key Database	Enables you to import, export, delete, or restore entries in the Key Exchange Key (KEK) Database.
Authorized Signature Database	Imports, exports, deletes, or restores entries in the Authorized Signature Database (db).
Forbidden Signature Database	Imports, exports, deletes, or restores entries in the Forbidden Signature Database (dbx).

Creating a system and setup password

Ensure that the password jumper is enabled. The password jumper enables or disables the system password and setup password features. For more information, see the System board jumper settings section.

NOTE: If the password jumper setting is disabled, the existing system password and setup password are deleted and you need not provide the system password to boot the system.

1. To enter System Setup, press F2 immediately after turning on or rebooting your system.
2. On the **System Setup Main Menu** screen, click **System BIOS** > **System Security**.
3. On the **System Security** screen, verify that **Password Status** is set to **Unlocked**.
4. In the **System Password** field, type your system password, and press Enter or Tab.

   Use the following guidelines to assign the system password:
   - A password can have up to 32 characters.
   - The password can contain the numbers 0 through 9.
   - Only the following special characters are allowed: space, (”), (+), (,), (-), (.), (/), (;), ([), (\), (]), (`).

   A message prompts you to reenter the system password.
5. Reenter the system password, and click **OK**.
6. In the **Setup Password** field, type your setup password and press Enter or Tab.
   A message prompts you to reenter the setup password.
7. Reenter the setup password, and click **OK**.
8. Press Esc to return to the System BIOS screen. Press Esc again.

   A message prompts you to save the changes.

   NOTE: Password protection does not take effect until the system reboots.

Related references

System Security on page 41

Using your system password to secure your system

If you have assigned a setup password, the system accepts your setup password as an alternate system password.

1. Turn on or reboot your system.
2. Type the system password and press Enter.

When **Password Status** is set to **Locked**, type the system password and press Enter when prompted at reboot.

NOTE: If an incorrect system password is typed, the system displays a message and prompts you to reenter your password. You have three attempts to type the correct password. After the third unsuccessful attempt, the system displays an error message that the system has stopped functioning and must be turned off. Even after you turn off and restart the system, the error message is displayed until the correct password is entered.

Related references

System Security on page 41

Deleting or changing system and setup password

NOTE: You cannot delete or change an existing system or setup password if the **Password Status** is set to **Locked**.

1. To enter System Setup, press F2 immediately after turning on or restarting your system.
2. On the **System Setup Main Menu** screen, click **System BIOS** > **System Security**.
3. On the **System Security** screen, ensure that **Password Status** is set to **Unlocked**.
4. In the **System Password** field, alter or delete the existing system password, and then press Enter or Tab.
5. In the **Setup Password** field, alter or delete the existing setup password, and then press Enter or Tab.

   If you change the system and setup password, a message prompts you to reenter the new password. If you delete the system and setup password, a message prompts you to confirm the deletion.
6. Press Esc to return to the **System BIOS** screen. Press Esc again, and a message prompts you to save the changes.

Related references

System Security on page 41

Operating with a setup password enabled

If **Setup Password** is set to **Enabled**, type the correct setup password before modifying the system setup options.

If you do not type the correct password in three attempts, the system displays the following message:

```
Invalid Password! Number of unsuccessful password attempts: <x> System Halted! Must
power down.
```

Even after you turn off and restart the system, the error message is displayed until the correct password is typed. The following options are exceptions:

- If **System Password** is not set to **Enabled** and is not locked through the **Password Status** option, you can assign a system password. For more information, see the System Security Settings screen section.
- You cannot disable or change an existing system password.

NOTE: You can use the password status option with the setup password option to protect the system password from unauthorized changes.

Related references

System Security on page 41

System Information

You can use the **System Information** screen to view system properties such as Service Tag, system model name, and the BIOS version.

Related references

System Information details on page 45
System BIOS on page 35

Related tasks

Viewing System Information on page 45

Viewing System Information

To view the **System Information** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **System Information**.

Related references

System Information on page 45

System Information details

The **System Information** screen details are explained as follows:

Option	Description
System Model Name	Specifies the system model name.
System BIOS Version	Specifies the BIOS version installed on the system.
System Management Engine Version	Specifies the current version of the Management Engine firmware.
System Service Tag	Specifies the system Service Tag.
System Manufacturer	Specifies the name of the system manufacturer.
System Manufacturer Contact Information	Specifies the contact information of the system manufacturer.
System CPLD Version	Specifies the current version of the system complex programmable logic device (CPLD) firmware.
UEFI Compliance Version	Specifies the UEFI compliance level of the system firmware.

Related references

System Information on page 45
System Information details on page 45

Related tasks

Viewing System Information on page 45

Memory Settings

You can use the **Memory Settings** screen to view all the memory settings and enable or disable specific memory functions, such as memory testing and node interleaving.

Related references

Memory Settings details on page 46
System BIOS on page 35

Related tasks

Viewing Memory Settings on page 46

Viewing Memory Settings

To view the **Memory Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Memory Settings**.

Related references

Memory Settings on page 46
Memory Settings details on page 46

Memory Settings details

The **Memory Settings** screen details are explained as follows:

Option	Description
System Memory Size	Specifies the memory size in the system.
System Memory Type	Specifies the type of memory installed in the system.
System Memory Speed	Specifies the memory speed.
System Memory Voltage	Specifies the memory voltage.
Video Memory	Specifies the amount of video memory.

Option	Description
System Memory Testing	Specifies whether the memory tests are run during system boot. Options are **Enabled** and **Disabled**. This option is set to **Disabled** by default.
Memory Operating Mode	Specifies the memory operating mode. The options available are **Optimizer Mode**, **Advanced ECC Mode**, **Mirror Mode**, **Spare Mode**, **Spare with Advanced ECC Mode**, **Dell Fault Resilient Mode** and **Dell NUMA Fault Resilient Mode**. This option is set to **Optimizer Mode** by default. **NOTE:** The **Memory Operating Mode** option can have different default and available options based on the memory configuration of your system. **NOTE:** The **Dell Fault Resilient Mode** option establishes an area of memory that is fault resilient. This mode can be used by an operating system that supports the feature to load critical applications or enables the operating system kernel to maximize system availability.
Node Interleaving	Specifies if the Non-Uniform Memory Architecture (NUMA) is supported. If this field is set to **Enabled**, memory interleaving is supported if a symmetric memory configuration is installed. If the field is set to **Disabled**, the system supports NUMA (asymmetric) memory configurations. This option is set to **Disabled** by default.
Snoop Mode	Specifies the Snoop Mode options. The Snoop Mode options available are **Home Snoop**, **Early Snoop**, and **Cluster on Die**. This option is set to **Early Snoop** by default. This field is available only when the **Node Interleaving** is set to **Disabled**. **NOTE:** Snoop Mode is only available if the system is installed with four E7 v4 processors.

Related references

Memory Settings on page 46

Related tasks

Viewing Memory Settings on page 46

Processor Settings

You can use the **Processor Settings** screen to view the processor settings, and perform specific functions such as enabling virtualization technology, hardware prefetcher, and logical processor idling.

Related references

Processor Settings details on page 48
System BIOS on page 35

Related tasks

Viewing Processor Settings on page 47

Viewing Processor Settings

To view the **Processor Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Processor Settings**.

Related references

Processor Settings on page 47
Processor Settings details on page 48

Processor Settings details

The **Processor Settings** screen details are explained as follows:

Option	Description
Logical Processor	Enables or disables the logical processors and displays the number of logical processors. If this option is set to **Enabled**, the BIOS displays all the logical processors. If this option is set to **Disabled**, the BIOS displays only one logical processor per core. This option is set to **Enabled** by default.
QPI Speed	Enables you to control QuickPath Interconnect data rate settings.
Virtualization Technology	Enables or disables the additional hardware capabilities provided for virtualization. This option is set to **Enabled** by default.
Address Translation Service (ATS)	Defines the Address Translation Cache (ATC) for devices to cache the DMA transactions. This option provides an interface between CPU and DMA Memory Management to a chipset's Address Translation and Protection Table to translate DMA addresses to host addresses. This option is set to **Enabled** by default.
Adjacent Cache Line Prefetch	Optimizes the system for applications that need high utilization of sequential memory access. This option is set to **Enabled** by default. You can disable this option for applications that need high utilization of random memory access.
Hardware Prefetcher	Enables or disables the hardware prefetcher. This option is set to **Enabled** by default.
DCU Streamer Prefetcher	Enables or disables the Data Cache Unit (DCU) streamer prefetcher. This option is set to **Enabled** by default.
DCU IP Prefetcher	Enables or disables the Data Cache Unit (DCU) IP prefetcher. This option is set to **Enabled** by default.
Logical Processor Idling	Enables you to improve the energy efficiency of a system. It uses the operating system core parking algorithm and parks some of the logical processors in the system which in turn allows the corresponding processor cores to transition into a lower power idle state. This option can only be enabled if the operating system supports it. It is set to **Disabled** by default.
Configurable TDP	Enables you to reconfigure the processor Thermal Design Power (TDP) levels during POST based on the power and thermal delivery capabilities of the system. TDP verifies the maximum heat the cooling system is needed to dissipate. This option is set to **Nominal** by default. **NOTE:** This option is only available on certain stock keeping units (SKUs) of the processors.
X2Apic Mode	Enables or disables the X2Apic mode.
Number of Cores per Processor	Controls the number of enabled cores in each processor. This option is set to **All** by default.
Processor 64-bit Support	Specifies if the processor(s) support 64-bit extensions.
Processor Core Speed	Specifies the maximum core frequency of the processor.
Processor 1	**NOTE:** Depending on the number of CPUs, there may be up to four processors listed. The following settings are displayed for each processor installed in the system:

Option	Description
Family-Model-Stepping	Specifies the family, model, and stepping of the processor as defined by Intel.
Brand	Specifies the brand name.

Option	Description

Option	Description
Level 2 Cache	Specifies the total L2 cache.
Level 3 Cache	Specifies the total L3 cache.
Number of Cores	Specifies the number of cores per processor.

Related references

Processor Settings on page 47

Related tasks

Viewing Processor Settings on page 47

SATA Settings

You can use the **SATA Settings** screen to view the SATA settings of SATA devices and enable RAID on your system.

Related references

System BIOS on page 35

Related tasks

SATA Settings details on page 49
Viewing SATA Settings on page 49

Viewing SATA Settings

To view the **SATA Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **SATA Settings**.

Related references

SATA Settings on page 49

Related tasks

SATA Settings details on page 49

SATA Settings details

The **SATA Settings** screen details are explained as follows:

Option	Description
Embedded SATA	Enables the embedded SATA option to be set to **Off**, **ATA**, **AHCI**, or **RAID** modes. This option is set to **AHCI** by default.

Option	Description
Security Freeze Lock	Sends Security Freeze Lock command to the Embedded SATA drives during POST. This option is applicable only for ATA and AHCI modes.
Write Cache	Enables or disables the command for Embedded SATA drives during POST.
Port A	Sets the drive type of the selected device. For **Embedded SATA settings** in **ATA** mode, set this field to **Auto** to enable BIOS support. Set it to **OFF** to turn off BIOS support. For **AHCI** or **RAID** mode, BIOS support is always enabled.

Option	Description
Model	Specifies the drive model of the selected device.
Drive Type	Specifies the type of drive attached to the SATA port.
Capacity	Specifies the total capacity of the hard drive. This field is undefined for removable media devices such as optical drives.

Port B	Sets the drive type of the selected device. For **Embedded SATA settings** in **ATA** mode, set this field to **Auto** to enable BIOS support. Set it to **OFF** to turn off BIOS support. For **AHCI** or **RAID** mode, BIOS support is always enabled.

Option	Description
Model	Specifies the drive model of the selected device.
Drive Type	Specifies the type of drive attached to the SATA port.
Capacity	Specifies the total capacity of the hard drive. This field is undefined for removable media devices such as optical drives.

Port C	Sets the drive type of the selected device. For **Embedded SATA settings** in **ATA** mode, set this field to **Auto** to enable BIOS support. Set it to **OFF** to turn off BIOS support. For **AHCI** or **RAID** mode, BIOS support is always enabled.

Option	Description
Model	Specifies the drive model of the selected device.
Drive Type	Specifies the type of drive attached to the SATA port.
Capacity	Specifies the total capacity of the hard drive. This field is undefined for removable media devices such as optical drives.

Port D	Sets the drive type of the selected device. For **Embedded SATA settings** in **ATA** mode, set this field to **Auto** to enable BIOS support. Set it to **OFF** to turn off BIOS support. For **AHCI** or **RAID** mode, BIOS support is always enabled.

Option	Description
Model	Specifies the drive model of the selected device.
Drive Type	Specifies the type of drive attached to the SATA port.
Capacity	Specifies the total capacity of the hard drive. This field is undefined for removable media devices such as optical drives.

Related references

SATA Settings on page 49

Related tasks

Viewing SATA Settings on page 49

Integrated Devices

You can use the **Integrated Devices** screen to view and configure the settings of all integrated devices including the video controller, integrated RAID controller, and the USB ports.

Related references

System BIOS on page 35

Related tasks

Integrated Devices details on page 51
Viewing Integrated Devices on page 51

Viewing Integrated Devices

To view the **Integrated Devices** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Integrated Devices**.

Related references

Integrated Devices on page 51

Related tasks

Integrated Devices details on page 51

Integrated Devices details

The **Integrated Devices** screen details are explained as follows:

Option	Description
User Accessible USB Ports	Enables or disables the USB ports. Selecting **Only Back Ports On** disables the front USB ports, selecting **All Ports Off** disables all USB ports. The USB keyboard and mouse operate during boot process in certain operating systems. After the boot process is complete, the USB keyboard and mouse do not work if the ports are disabled. **NOTE:** Selecting **Only Back Ports On** and **All Ports Off** disables the USB management port and also restricts access to iDRAC features.
Internal USB Port	Enables or disables the internal USB port. This option is set to **Enabled** by default.
Integrated RAID Controller	Enables or disables the integrated RAID controller. This option is set to **Enabled** by default.
Integrated Network Card 1	Enables or disables the integrated network card.
Embedded NIC1 and NIC2	**NOTE:** The Embedded NIC1 and NIC2 options are only available on systems that do not have **Integrated Network Card 1**. Enables or disables the Embedded NIC1 and NIC2 options. If set to **Disabled**, the NIC may still be available for shared network access by the embedded management controller. The embedded NIC1 and NIC2 options are only available on systems that do not have Network Daughter Cards (NDCs).

Option	Description
	The Embedded NIC1 and NIC2 option is mutually exclusive with the Integrated Network Card 1 option. Configure the Embedded NIC1 and NIC2 option by using the NIC management utilities of the system.
I/OAT DMA Engine	Enables or disables the I/OAT option. Enable only if the hardware and software support the feature.
I/O Snoop Holdoff Response	Selects the number of cycles PCI I/O can withhold snoop requests from the CPU, to allow time to complete its own write to LLC. This setting can help improve performance on workloads where throughput and latency are critical.
Embedded Video Controller	Enables or disables the **Embedded Video Controller** option. This option is set to **Enabled** by default.
Current State of Embedded Video Controller	Displays the current state of the embedded video controller. The **Current State of Embedded Video Controller** option is a read-only field. If the Embedded Video Controller is the only display capability in the system (that is, no add-in graphics card is installed), then the Embedded Video Controller is automatically used as the primary display even if the **Embedded Video Controller** setting is set to **Disabled**.
SR-IOV Global Enable	Enables or disables the BIOS configuration of Single Root I/O Virtualization (SR-IOV) devices. This option is set to **Disabled** by default.
OS Watchdog Timer	If your system stops responding, this watchdog timer aids in the recovery of your operating system. When this option is set to **Enabled**, the operating system initializes the timer. When this option is set to **Disabled** (the default), the timer does not have any effect on the system.
Memory Mapped I/O above 4 GB	Enables or disables the support for PCIe devices that need large amounts of memory. This option is set to **Enabled** by default.
Slot Disablement	Enables or disables the available PCIe slots on your system. The slot disablement feature controls the configuration of PCIe cards installed in the specified slot. Slots must be disabled only when the installed peripheral card prevents booting into the operating system or causes delays in system startup. If the slot is disabled, both the Option ROM and UEFI drivers are disabled.

Related references

Integrated Devices on page 51

Related tasks

Viewing Integrated Devices on page 51

Serial Communication

You can use the **Serial Communication** screen to view the properties of the serial communication port.

Related references

System BIOS on page 35

Related tasks

Serial Communication details on page 53
Viewing Serial Communication on page 52

Viewing Serial Communication

To view the **Serial Communication** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Serial Communication**.

Related references

Serial Communication on page 52

Related tasks

Serial Communication details on page 53

Serial Communication details

The **Serial Communication** screen details are explained as follows:

Option	Description
Serial Communication	Selects serial communication devices (Serial Device 1 and Serial Device 2) in BIOS. BIOS console redirection can also be enabled and the port address can be specified. This option is set to **Auto** by default.
Serial Port Address	Enables you to set the port address for serial devices. This option is set to **Serial Device 1=COM2, Serial Device 2=COM1** by default. **NOTE:** You can use only Serial Device 2 for the Serial Over LAN (SOL) feature. To use console redirection by SOL, configure the same port address for console redirection and the serial device. **NOTE:** Every time the system boots, the BIOS syncs the serial MUX setting saved in iDRAC. The serial MUX setting can independently be changed in iDRAC. Loading the BIOS default settings from within the BIOS setup utility may not always revert the serial MUX setting to the default setting of Serial Device 1.
External Serial Connector	Enables you to associate the External Serial Connector to Serial Device 1, Serial Device 2, or the Remote Access Device by using this option. **NOTE:** Only Serial Device 2 can be used for Serial Over LAN (SOL). To use console redirection by SOL, configure the same port address for console redirection and the serial device. **NOTE:** Every time the system boots, the BIOS syncs the serial MUX setting saved in iDRAC. The serial MUX setting can independently be changed in iDRAC. Loading the BIOS default settings from within the BIOS setup utility may not always revert this setting to the default setting of Serial Device 1.
Failsafe Baud Rate	Specifies the failsafe baud rate for console redirection. The BIOS attempts to determine the baud rate automatically. This failsafe baud rate is used only if the attempt fails, and the value must not be changed. This option is set to **115200** by default.
Remote Terminal Type	Sets the remote console terminal type. This option is set to **VT 100/VT 220** by default.
Redirection After Boot	Enables or disables the BIOS console redirection when the operating system is loaded. This option is set to **Enabled** by default.

Related references

Serial Communication on page 52

Related tasks

Viewing Serial Communication on page 52

System Profile Settings

You can use the **System Profile Settings** screen to enable specific system performance settings such as power management.

Related references

System BIOS on page 35

Related tasks

System Profile Settings details on page 54
Viewing System Profile Settings on page 54

Viewing System Profile Settings

To view the **System Profile Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **System Profile Settings**.

Related references

System Profile Settings on page 54

Related tasks

System Profile Settings details on page 54

System Profile Settings details

The **System Profile Settings** screen details are explained as follows:

Option	Description
System Profile	Sets the system profile. If you set the **System Profile** option to a mode other than **Custom**, the BIOS automatically sets the rest of the options. You can only change the rest of the options if the mode is set to **Custom**. This option is set to **Performance Per Watt Optimized (DAPC)** by default. DAPC is Dell Active Power Controller. **NOTE:** All the parameters on the system profile setting screen are available only when the **System Profile** option is set to **Custom**.
CPU Power Management	Sets the CPU power management. This option is set to **System DBPM (DAPC)** by default.
Memory Frequency	Sets the speed of the memory. You can select **Maximum Performance**, **Maximum Reliability**, or a specific speed.
Turbo Boost	Enables or disables the processor to operate in the turbo boost mode. This option is set to **Enabled** by default.
Energy Efficient Turbo	Enables or disables the **Energy Efficient Turbo** option. Energy Efficient Turbo (EET) is a mode of operation where a processor's core frequency is adjusted to be within the turbo range based on workload.

Option	Description
C1E	Enables or disables the processor to switch to a minimum performance state when it is idle. This option is set to **Enabled** by default.
C States	Enables or disables the processor to operate in all available power states. This option is set to **Enabled** by default.
Collaborative CPU Performance Control	Enables or disables the CPU power management option. When set to **Enabled**, the CPU power management is controlled by the OS DBPM and the System DBPM (DAPC). This option is set to **Disabled** by default.
Memory Patrol Scrub	Sets the memory patrol scrub frequency. This option is set to **Standard** by default.
Memory Refresh Rate	Sets the memory refresh rate to either 1x or 2x. This option is set to **1x** by default.
Uncore Frequency	Enables you to select the **Processor Uncore Frequency** option. Dynamic mode enables the processor to optimize power resources across the cores and uncore during runtime. The optimization of the uncore frequency to either save power or optimize performance is influenced by the setting of the **Energy Efficiency Policy** option.
Energy Efficient Policy	Enables you to select the **Energy Efficient Policy** option. The CPU uses the setting to manipulate the internal behavior of the processor and determines whether to target higher performance or better power savings.
Number of Turbo Boot Enabled Cores for Processor 1	**NOTE:** If there are two processors installed in the system, you see an entry for **Number of Turbo Boost Enabled Cores for Processor 2**. Controls the number of turbo boost enabled cores for processor 1. The maximum number of cores is enabled by default.
Monitor/Mwait	Enables the Monitor/Mwait instructions in the processor. This option is set to **Enabled** for all system profiles, except **Custom** by default. **NOTE:** This option can be disabled only if the **C States** option in the **Custom** mode is set to **disabled**. **NOTE:** When **C States** is set to **Enabled** in the **Custom** mode, changing the Monitor/Mwait setting does not impact the system power or performance.

Related references

System Profile Settings on page 54

Related tasks

Viewing System Profile Settings on page 54

Miscellaneous Settings

You can use the **Miscellaneous Settings** screen to perform specific functions such as updating the asset tag and changing the system date and time.

Related references

System BIOS on page 35

Related tasks

Miscellaneous Settings details on page 56
Viewing Miscellaneous Settings on page 56

Viewing Miscellaneous Settings

To view the **Miscellaneous Settings** screen, perform the following steps:

1. Turn on, or restart your system.
2. Press F2 immediately after you see the following message:

```
F2 = System Setup
```

NOTE: If your operating system begins to load before you press F2, wait for the system to finish booting, and then restart your system and try again.

3. On the **System Setup Main Menu** screen, click **System BIOS**.
4. On the **System BIOS** screen, click **Miscellaneous Settings**.

Related references

Miscellaneous Settings on page 55

Related tasks

Miscellaneous Settings details on page 56

Miscellaneous Settings details

The **Miscellaneous Settings** screen details are explained as follows:

Option	Description
System Time	Enables you to set the time on the system.
System Date	Enables you to set the date on the system.
Asset Tag	Specifies the asset tag and enables you to modify it for security and tracking purposes.
Keyboard NumLock	Enables you to set whether the system boots with the NumLock enabled or disabled. This option is set to **On** by default. **NOTE:** This option does not apply to 84-key keyboards.
F1/F2 Prompt on Error	Enables or disables the F1/F2 prompt on error. This option is set to **Enabled** by default. The F1/F2 prompt also includes keyboard errors.
Load Legacy Video Option ROM	Enables you to determine whether the system BIOS loads the legacy video (INT 10H) option ROM from the video controller. Selecting **Enabled** in the operating system does not support UEFI video output standards. This field is available only for UEFI boot mode. You cannot set the option to **Enabled** if **UEFI Secure Boot** mode is enabled.
In-System Characterization	Enables or disables **In-System Characterization**. This option is set to **Disabled** by default. The two other options are **Enabled** and **Enabled - No Reboot**. **NOTE:** The default setting for **In-System Characterization** is subject to change in future BIOS releases. When enabled, In-System Characterization (ISC) executes during POST upon detecting relevant changes in system configuration to optimize system power and performance. ISC takes about 20 seconds to execute, and system reset is needed for ISC results to be applied. The **Enabled - No Reboot** option executes ISC and continues without applying ISC results until the next time system reset occurs. The **Enabled** option executes ISC and forces an immediate system reset so that ISC results can be applied. It takes the system longer to be ready due to the forced system reset. When disabled, ISC does not execute.

Related references

Miscellaneous Settings on page 55

Related tasks

Viewing Miscellaneous Settings on page 56

iDRAC Settings utility

The iDRAC settings utility is an interface to set up and configure the iDRAC parameters by using UEFI. You can enable or disable various iDRAC parameters by using the iDRAC settings utility.

NOTE: Accessing some of the features on the iDRAC settings utility needs the iDRAC Enterprise License upgrade.

For more information about using iDRAC, see *Dell Integrated Dell Remote Access Controller User's Guide* at Dell.com/idracmanuals.

Related concepts

Device Settings on page 57

Related references

System BIOS on page 35

Related tasks

Entering the iDRAC Settings utility on page 57
Changing the thermal settings on page 57

Entering the iDRAC Settings utility

1. Turn on or restart the managed system.
2. Press F2 during Power-on Self-test (POST).
3. On the **System Setup Main Menu** page, click **iDRAC Settings**.
   The **iDRAC Settings** screen is displayed.

Related references

iDRAC Settings utility on page 57

Changing the thermal settings

The iDRAC settings utility enables you to select and customize the thermal control settings for your system.

1. Click **iDRAC Settings** > **Thermal**.
2. Under **SYSTEM THERMAL PROFILE** > **Thermal Profile**, select one of the following options:
   - Default Thermal Profile Settings
   - Maximum Performance (Performance Optimized)
   - Minimum Power (Performance per Watt Optimized)
3. Under **USER COOLING OPTIONS**, set the **Fan Speed Offset**, **Minimum Fan Speed**, and **Custom Minimum Fan Speed**.
4. Click **Back** > **Finish** > **Yes**.

Related references

iDRAC Settings utility on page 57

Device Settings

Device Settings enables you to configure device parameters.

Related references

System BIOS on page 35

Dell Lifecycle Controller

Dell Lifecycle Controller (LC) provides advanced embedded system management capabilities including system deployment, configuration, update, maintenance, and diagnosis. LC is delivered as part of the iDRAC out-of-band solution and Dell EMC system embedded Unified Extensible Firmware Interface (UEFI) applications.

Related references

Embedded systems management on page 58

Embedded systems management

The Dell Lifecycle Controller provides advanced embedded systems management throughout the lifecycle of the system. The Dell Lifecycle Controller can be started during the boot sequence and can function independently of the operating system.

NOTE: Certain platform configurations may not support the full set of features provided by the Dell Lifecycle Controller.

For more information about setting up the Dell Lifecycle Controller, configuring hardware and firmware, and deploying the operating system, see the Dell Lifecycle Controller documentation at **Dell.com/idracmanuals**.

Related references

Dell Lifecycle Controller on page 58

Boot Manager

The **Boot Manager** screen enables you to select boot options and diagnostic utilities.

Related references

Boot Manager main menu on page 59
System BIOS on page 35

Related tasks

Viewing Boot Manager on page 58

Viewing Boot Manager

To enter **Boot Manager**:

1. Turn on, or restart your system.
2. Press F11 when you see the following message:

   ```
   F11 = Boot Manager
   ```

   If your operating system begins to load before you press F11, allow the system to complete the booting, and then restart your system and try again.

Related references

Boot Manager on page 58
Boot Manager main menu on page 59

Boot Manager main menu

Menu item	Description
Continue Normal Boot	The system attempts to boot to devices starting with the first item in the boot order. If the boot attempt fails, the system continues with the next item in the boot order until the boot is successful or no more boot options are found.
One-shot Boot Menu	Enables you to access boot menu, where you can select a one-time boot device to boot from.
Launch System Setup	Enables you to access System Setup.
Launch Lifecycle Controller	Exits the Boot Manager and invokes the Dell Lifecycle Controller program.
System Utilities	Enables you to launch System Utilities menu such as System Diagnostics and UEFI shell.

Related references

Boot Manager on page 58

Related tasks

Viewing Boot Manager on page 58

One-shot BIOS boot menu

One-shot BIOS boot menu enables you to select a boot device to boot from.

Related references

Boot Manager on page 58

System Utilities

System Utilities contains the following utilities that can be launched:

- Launch Diagnostics
- BIOS/UEFI Update File Explorer
- Reboot System

NOTE: Depending on the boot mode selected, you might have BIOS or UEFI Update File Explorer.

Related references

Boot Manager on page 58

PXE boot

You can use the Preboot Execution Environment (PXE) option to boot and configure the networked systems, remotely.

NOTE: To access the **PXE boot** option, boot the system and then press F12. The system scans and displays the active networked systems.

6

Installing and removing system components

This section provides information about installing and removing the R930 components.

Topics:

- Safety instructions
- Before working inside your system
- After working inside your system
- Recommended tools
- Front bezel (optional)
- System cover
- Inside the system
- System memory
- Memory riser
- Memory riser and fan cage
- Cooling fans
- Cable management tray
- Hard drives
- Optical drive (optional)
- Internal USB memory key (optional)
- Expansion cards and expansion card risers
- Network Daughter Card riser
- Network daughter card
- Chassis intrusion switch
- SD vFlash card (optional)
- Internal dual SD module (optional)
- Integrated storage controller card
- Processors and heat sinks
- Power supply units
- Power distribution board
- System battery
- Hard drive backplane
- SAS expander daughter card
- Control panel
- System board
- Trusted Platform Module

Safety instructions

NOTE: Whenever you need to lift the system, get others to assist you. To avoid injury, do not attempt to lift the system by yourself.

WARNING: Opening or removing the system cover while the system is powered on may expose you to a risk of electric shock.

CAUTION: Do not operate the system without the cover for a duration exceeding five minutes.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: It is recommended that you always use an antistatic mat and antistatic strap while working on components inside the system.

NOTE: To ensure proper operation and cooling, all bays in the system and system fans must be populated always with either a component or with a blank.

Before working inside your system

Follow the safety guidelines listed in the Safety instructions section.

1. Turn off the system, including any attached peripherals.
2. Disconnect the system from the electrical outlet and disconnect the peripherals.
3. If installed, remove the front bezel.
4. If applicable, remove the system from the rack.
   For more information, see the *Rack Installation* placemat at **Dell.com/poweredgemanuals**.
5. Remove the system cover.

Related references

Safety instructions on page 60

Related tasks

Removing the optional front bezel on page 62
Removing the system cover on page 63

After working inside your system

Follow the safety guidelines listed in the Safety instructions section.

1. Install the system cover.
2. If applicable, install the system into the rack.
   For more information, see the *Rack Installation* placemat at **Dell.com/poweredgemanuals**.
3. If removed, install the front bezel.
4. Reconnect the peripherals and connect the system to the electrical outlet.
5. Turn on the system, including any attached peripherals.

Related references

Safety instructions on page 60

Related tasks

Installing the optional front bezel on page 62

Recommended tools

You need the following tools to perform the removal and installation procedures:

- Key to the bezel lock.

  The key is needed only if your system includes a bezel.

- Phillips #2 screwdriver
- Wrist grounding strap

Front bezel (optional)

The front bezel is attached to the front side of the system and prevents accidents while removing the hard drive or when pressing the reset or power button. The front bezel can also be locked for additional security.

Removing the optional front bezel

Follow the safety guidelines listed in the Safety instructions section.

1. Locate and remove the bezel key.

   NOTE: The bezel key is attached to the back of the bezel.

2. Unlock the bezel by using the key.
3. Slide the release latch up, and pull the left end of the bezel.
4. Unhook the right end, and remove the bezel.

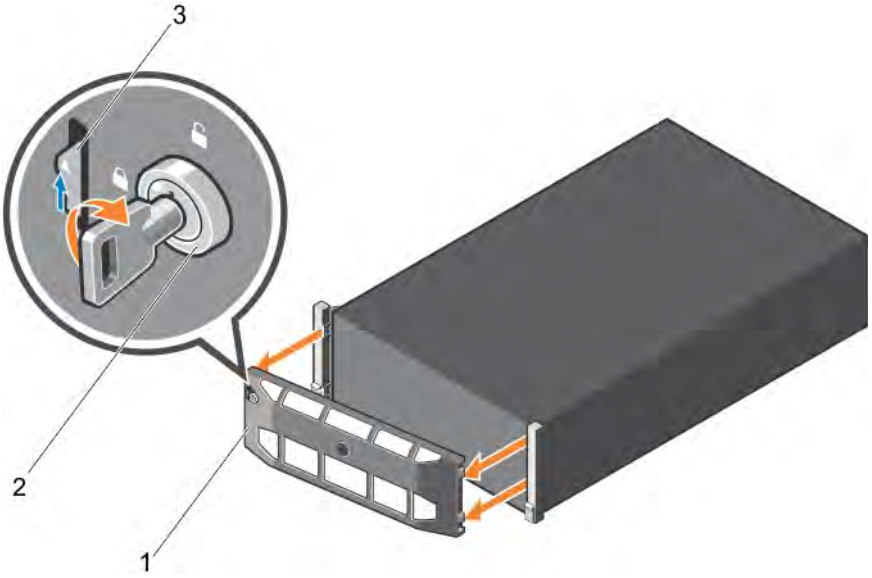

Figure 11. Removing the optional front bezel

a. front bezel
b. bezel lock
c. release latch

Related references

Safety instructions on page 60

Installing the optional front bezel

Follow the safety guidelines listed in the Safety instructions section.

1. Locate and remove the bezel key.

   NOTE: The bezel key is attached to the back of the bezel.

2. Hook the right end of the bezel onto the chassis.
3. Fit the free end of the bezel onto the system.
4. Lock the bezel by using the key.

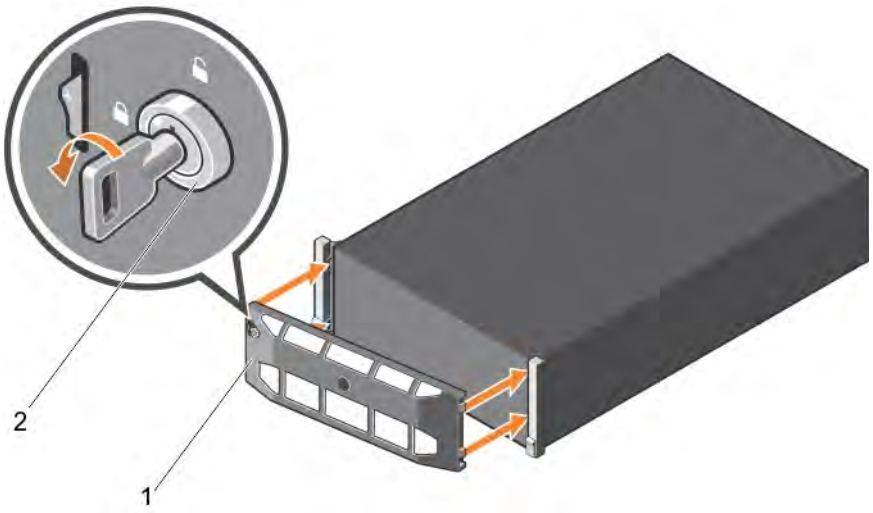

Figure 12. Installing the optional front bezel

a. front bezel
b. bezel lock

Related references

Safety instructions on page 60

System cover

The system cover protects the components inside the system and helps in maintaining air flow inside the system. Removing the system cover activates the intrusion switch.

Removing the system cover

1. Follow the safety guidelines listed in the Safety instructions section.
2. Turn off the system, including any attached peripherals.
3. Disconnect the system from the electrical outlet and disconnect the peripherals.
4. If installed, remove the front bezel.
1. Rotate the latch release lock counter clockwise to the unlocked position.
2. Lift the latch toward the back of the system.

   The system cover slides back and the tabs on the system cover disengage from the slots on the chassis.

   NOTE: The position of the latch may vary depending on the configuration of your system.

3. Hold the cover on both sides, and lift the cover away from the system.

Figure 13. Removing the system cover

a. latch release lock
b. system cover
c. system cover latch

1. Install the system cover.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing the optional front bezel on page 62
Installing the optional front bezel on page 62

Installing the system cover

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Ensure that all internal cables are connected and placed out of the way, and no tools or extra parts are left inside the system.

1. Align the slots on the system cover with the tabs on the chassis.
2. Push the system cover latch down.

   The system cover slides forward and the slots on the system cover engage with the tabs on the chassis. The system cover latch locks into place when the system cover is completely engaged with the tabs on the chassis.
3. Rotate the latch release lock clockwise to the locked position.

Figure 14. Installing the system cover

a. latch release lock
b. system cover
c. latch

1. If removed, install the front bezel.
2. Reconnect the peripherals and connect the system to the electrical outlet.
3. Turn on the system, including any attached peripherals.
4. Follow the procedure listed in the After working inside your system section.

Inside the system

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

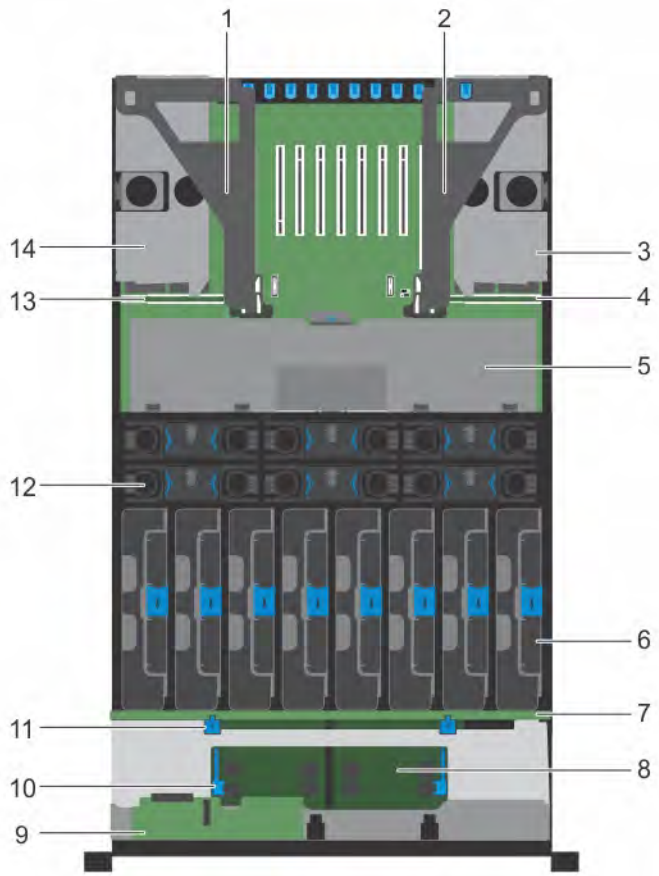

Figure 15. Inside the system

1. left expansion card riser assembly
2. right expansion card riser assembly
3. right power supply bay
4. right power distribution board
5. cable management tray
6. memory riser (8)
7. hard drive backplane
8. SAS expander daughter card (primary)
9. control panel board
10. release tab for SAS expander daughter card (2)
11. release tab for hard drive backplane (2)
12. cooling fan (6)
13. left power distribution board
14. left power supply bay

System memory

Your system supports DDR4 ECC registered DIMMs (RDIMMs) and load reduced DIMMs (LRDIMMs) at DDR4 (1.2 V) voltage specification. It also supports single, dual, and quad rank DIMMs of up to 2400 MHz.

NOTE: MT/s indicates DIMM speed in MegaTransfers per second.

Memory bus operating frequency can be 1333 MT/s, 1600 MT/s, and 1866 MT/s depending on:

- DIMM type (RDIMM and LRDIMM)
- DIMM configuration (number of ranks)
- Maximum frequency of the DIMMs
- Number of DIMMs populated per channel
- System profile selected (for example, Performance Optimized, Custom, or Dense Configuration Optimized)
- Maximum supported DIMM frequency of the processors

The system memory contains 96 memory sockets organized into eight memory risers, split into four sets of two risers per processor. Each memory riser has:

- 12 DIMM sockets arranged into four channels. In each channel, the release levers of the first socket are marked white, the second socket black, and the third socket green.
- Two Scalable Memory Interconnect-2 (SMI-2) ports that help DIMMs to connect with the processor.

- Two Scalable Memory Buffers (SMB) that provide access to the DIMMs.

NOTE: GT/s indicates memory bus speed in GigaTransfers per second.

SMI-2 ports operate in two modes:

- Performance Mode (2:1) up to 3.2 GT/s for higher bandwidth
- Lock Step Mode (1:1) up to 1.87 GT/s for higher DDR4 speeds and better RAS (Reliability, Availability, and Serviceability) features

The maximum memory that is supported on your system varies according to the sizes of memory modules being used. Single, dual, and quad rank DIMMs of capacities 8 GB, 16 GB, and 32 GB are supported for a total of up to 3 TB.

NOTE: DIMMs in memory risers A and B are assigned to processor 1, C and D are assigned to processor 2, E and F are assigned to processor 3 and G and H are assigned to processor 4.

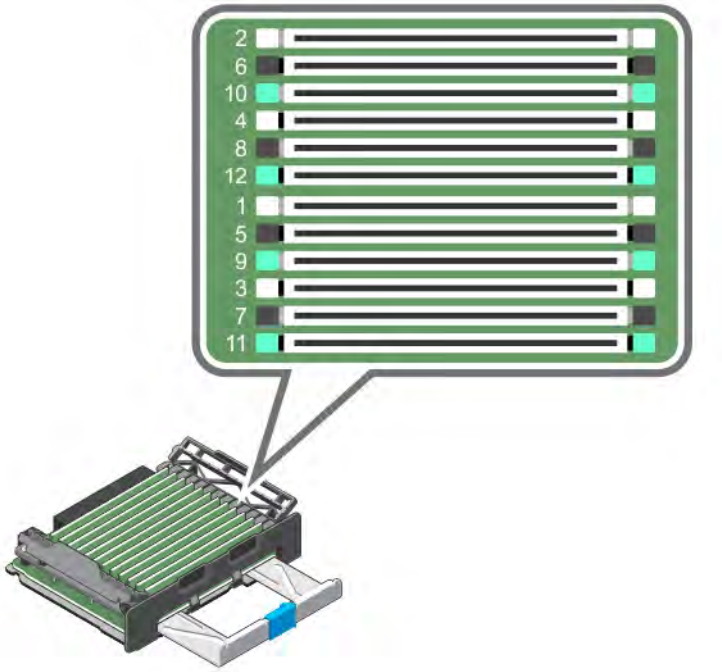

Figure 16. Memory socket locations

Memory channels are organized as follows:

Table 30. Memory channel organization

Processor	Configurations							
Processor 1	channel 0: slots A1, A5, and A9	channel 1: slots A2, A6, and A10	channel 2: slots A3, A7, and A11	channel 3: slots A4, A8, and A12	channel 0: slots B1, B5, and B9	channel 1: slots B2, B6, and B10	channel 2: slots B3, B7, and B11	channel 3: slots B4, B8, and B12
Processor 2	channel 0: slots C1, C5, and C9	channel 1: slots C2, C6, and C10	channel 2: slots C3, C7, and C11	channel 3: slots C4, C8, and C12	channel 0: slots D1, D5, and D9	channel 1: slots D2, D6, and D10	channel 2: slots D3, D7, and D11	channel 3: slots D4, D8, and D12
Processor 3	channel 0: slots E1, E5, and E9	channel 1: slots E2, E6, and E10	channel 2: slots E3, E7, and E11	channel 3: slots E4, E8, and E12	channel 0: slots F1, F5, and F9	channel 1: slots F2, F6, and F10	channel 2: slots F3, F7, and F11	channel 3: slots F4, F8, and F12
Processor 4	channel 0: slots G1, G5, and G9	channel 1: slots G2, G6, and G10	channel 2: slots G3, G7, and G11	channel 3: slots G4, G8, and G12	channel 0: slots H1, H5, and H9	channel 1: slots H2, H6, and H10	channel 2: slots H3, H7, and H11	channel 3: slots H4, H8, and H12

The following table shows the memory populations and operating frequencies for the supported configurations (Performance Mode (2:1)):

Table 31. Memory population

DIMM Type	DIMMs Populated/ Channel (DPC)	DIMM Size	Operating Frequency (in MT/s)	Maximum DIMM Rank/ Channel
			DDR4 2400 MT/s (1.2 V)	
RDIMM	1	32 GB	1600 MT/s	Dual rank
	2	32 GB	1600 MT/s	Dual rank
	3	32 GB	1333 MT/s	Dual rank
LRDIMM	1	64 GB	1600 MT/s	Quad rank
	2	64 GB	1600 MT/s	Quad rank
	3	64 GB	1600 MT/s	Quad rank

The following table shows the memory populations and operating frequencies for the supported configurations (Lock Step Mode (1:1)):

Table 32. Memory population for Lock Step Mode (1:1)

DIMM Type	DIMMs Populated/ Channel (DPC)	DIMM Size	Operating Frequency (in MT/s)	Maximum DIMM Rank/ Channel
			DDR4 2133 MT/s (1.2 V)	
RDIMM	1	32 GB	1866 MT/s	Dual rank
	2	32 GB	1866 MT/s	Dual rank
	3	32 GB	1333 MT/s	Dual rank
LRDIMM	1	64 GB	1866 MT/s	Quad rank
	2	64 GB	1866 MT/s	Quad rank
	3	64 GB	1600 MT/s	Quad rank

General memory module installation guidelines

Your system supports Flexible Memory Configuration, enabling the system to be configured and run in any valid chipset architectural configuration. The following are the recommended guidelines for best performance:

- RDIMMs and LRDIMMs cannot be mixed.
- x4 and x8 DRAM based DIMMs can be mixed. For more information, see Mode-Specific Guidelines.
- Populate up to three dual- or single-rank RDIMMs per channel.
- Up to three quad rank LRDIMMs can be populated per channel.
- Up to three LRDIMMs can be populated regardless of rank count.
- Populate DIMM sockets only if a processor is installed. For dual-processor systems, sockets A1 to A12, B1 to B12 and sockets C1 to C12, D1 to D12 are available. Each processor requires a minimum of 2 DIMMs, which must be identical.
- Populate all sockets with white release lever first, then black, and then green.
- Populate the sockets by highest rank count in the following order — first in sockets with white release levers, then black, and then green. For example, if you want to mix single-rank and dual-rank RDIMMs, populate single-rank RDIMMs in the sockets with white release tabs and dual-rank RDIMMs in the sockets with black release tabs.
- The memory configuration for each processor should be identical. For example, if you populate socket A1 and B1 for processor 1, then populate socket C1 and D1 for processor 2, and so on.
- Memory modules of different sizes can be mixed provided that other memory population rules are followed (for example 8 GB and 16 GB memory modules can be mixed).
- Populate four DIMMs per processor (one DIMM per channel) at a time to maximize performance.
- If memory modules with different speeds are installed, they will operate at the speed of the slowest installed memory module(s) or slower depending on system DIMM configuration.

Mode-specific guidelines

Four memory channels are allocated to each processor. The allowable configurations depend on the memory mode selected.

Advanced Error Correction Code

Advanced Error Correction Code (ECC) mode extends SDDC from x4 DRAM based DIMMs to both x4 and x8 DRAMs. This protects against single DRAM chip failures during normal operation.

The installation guidelines for memory modules are as follows:

- Memory modules must be identical in size, speed, and technology.
- DIMMs installed in memory sockets with white release tabs must be identical and similar rule applies for sockets with black and green release tabs. This ensures that identical DIMMs are installed in matched pairs - for example, A1 with A3, A2 with A4, A5 with A7, and so on.

Memory optimized independent channel mode

This mode supports Single Device Data Correction (SDDC) only for memory modules that use x4 device width. It does not impose any specific slot population requirements.

Memory sparing

NOTE: To use memory sparing, this feature must be enabled in System Setup.

In this mode, one rank per channel is reserved as a spare. If persistent correctable errors are detected on a rank, the data from this rank is copied to the spare rank, and the failed rank is disabled.

With memory sparing enabled, the system memory available to the operating system is reduced by one rank per channel. For example, in a dual-processor configuration with sixteen 4 GB single-rank memory modules, the available system memory is: 3/4 (ranks/channel) × 16 (memory modules) × 4 GB = 48 GB, and not 16 (memory modules) × 4 GB = 64 GB.

NOTE: Memory sparing does not offer protection against a multi-bit uncorrectable error.

NOTE: Both Advanced ECC/Lockstep and Optimizer modes support memory sparing.

Memory mirroring

Memory mirroring offers the strongest memory module reliability mode compared to all other modes, providing improved uncorrectable multi-bit failure protection. In a mirrored configuration, the total available system memory is one half of the total installed physical memory. Half of the installed memory is used to mirror the active memory modules. In the event of an uncorrectable error, the system switches over to the mirrored copy. This ensures SDDC and multi-bit protection.

The installation guidelines for memory modules are as follows:

- Memory modules must be identical in size, speed, and technology.
- Memory modules installed in memory module sockets with white release levers must be identical and the same rule applies for sockets with black and green release tabs. This ensures that identical memory modules are installed in matched pairs—for example, A1 with A2, A3 with A4, A5 with A6, and so on.
- Memory modules installed in memory module sockets with white release levers must be identical and the same rule applies for sockets with black and green release tabs. This ensures that identical memory modules are installed in matched pairs—for example, A1 with A3, A2 with A4, A5 with A7, and so on.

Table 33. Processor configuration

Processor	Configuration	Memory population rules	Memory population information
Single CPU	Memory population order	{1,2}, {3,4}	See Memory mirroring note

Fault Resilient Memory

Fault Resilient Memory (FRM) mode operates with the parts of redundant system memory, leaving the rest of the system memory in non-mirror mode. It reduces the cost of memory mirroring by mirroring just the critical portion of memory versus mirroring the entire memory space. It provides additional flexibility to optimize cost, performance, or RAS by providing high degree of reliability to memory at lower cost than mirroring the entire system memory.

Memory Mirroring is a RAS feature that enables duplicating memory content at a remote DIMM in the partition. This capability enables high data availability from memory subsystem. Fault Resilient Memory enables you to select the segments of system memory that contains the most critical code.

Sample memory configurations

The following table shows sample memory configurations for a single processor that follow the appropriate memory guidelines stated in this section.

NOTE: DIMMs populated must be identical for each riser. In the mirroring mode, only one of the two CPUs is populated.

Table 34. Memory configurations—single riser

Memory Mode	System Capacity (in GB)	DIMM Size (in GB)	Number of DIMMs	DIMM Slot Population for CPU 1 (Riser A)											
				2	6	10	4	8	12	1	5	9	3	7	11
Advanced ECC Lockstep	64	8	8	X			X			X			X		
	96	8	12	X			X			X	X		X	X	
	128	8	16	X	X		X	X		X	X		X	X	
	192	8	24	X	X	X	X	X	X	X	X	X	X	X	X
	64	16	4	X						X					
	96	16	6	X						X			X		
	128	16	8	X			X			X			X		
	128	32	4	X						X					
	192	32	6	X						X			X		
	256	32	8	X			X			X			X		
	384	32	12	X			X			X	X		X	X	
Optimized Population (Independent Channel)	32	8	4	X						X					
	48	8	6	X						X			X		
	64	8	8	X			X			X			X		
	80	8	10	X			X			X	X		X		
	96	16	6	X						X			X		
	128	16	8	X			X			X			X		
	96	16	6	X						X			X		
	128	16	8	X			X			X			X		
	192	32	6	X						X			X		
	256	32	8	X			X			X			X		
	192	32	6	X						X			X		
	256	32	8	X			X			X			X		
	384	32	12	X	X		X			X	X		X		
Mirroring and Partial Mirroring	64	8	8	X			X			X			X		
	128	8	16	X	X		X	X		X	X		X	X	
	192	8	24	X	X	X	X	X	X	X	X	X	X	X	X
	128	16	8	X			X			X			X		

Table 34. Memory configurations—single riser

Memory Mode	System Capacity (in GB)	DIMM Size (in GB)	Number of DIMMs	DIMM Slot Population for CPU 1 (Riser A)											
	256	16	16	X	X		X	X		X	X		X	X	
	384	16	24	X	X	X	X	X	X	X	X	X	X	X	X
	256	32	8	X			X			X			X		
	512	32	16	X	X		X	X		X	X		X	X	
	768	32	24	X	X	X	X	X	X	X	X	X	X	X	X

NOTE: The table displays sample memory population for Riser A, the same rules have to be replicated on Riser B.

Memory riser

Removing a memory riser blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

Holding the slots on the memory riser blank, lift the memory riser blank out of the memory riser and fan cage.

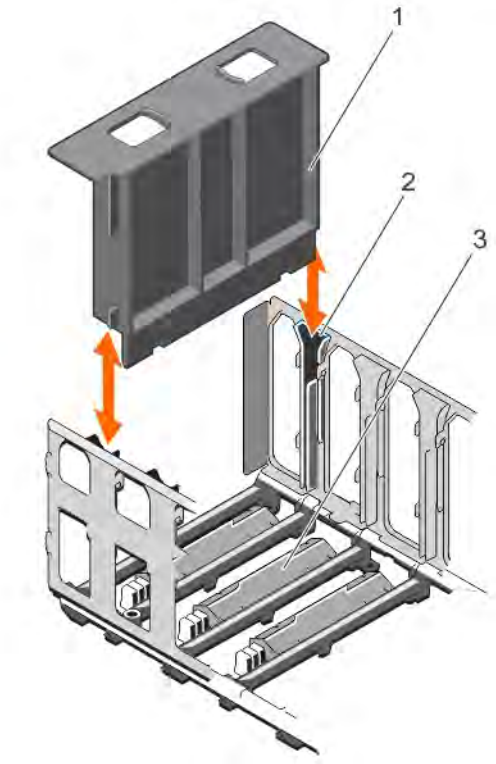

Figure 17. Removing the memory riser blank

a. memory riser blank
b. guide on the memory riser and fan cage (2)

c. connector protective cap

1. Install the memory riser blank or memory riser.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing a memory riser blank on page 72
Installing a memory riser on page 74
After working inside your system on page 61

Installing a memory riser blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the memory riser blank with the guides on the memory riser and fan cage.
2. Insert the memory riser blank into the guides on the memory riser and fan cage until it is firmly seated.

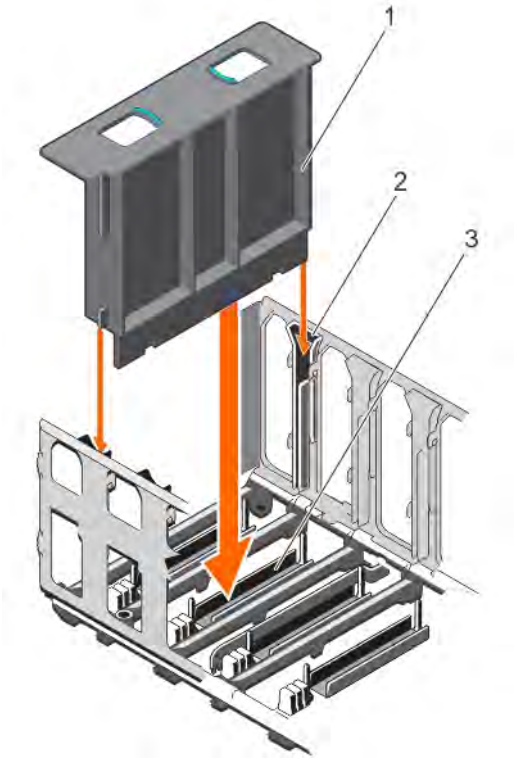

Figure 18. Installing the memory riser blank

a. memory riser blank
b. guide on the memory riser and fan cage (2)
c. connector protective cap

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
After working inside your system on page 61

Removing a memory riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Press the handle lock, and slide it in the direction of the arrow to release the memory riser handle.
2. Hold the memory riser handle and pull the memory riser out of the memory riser and fan cage.

CAUTION: To maintain proper system cooling, all empty memory riser slots must have memory riser blanks installed.

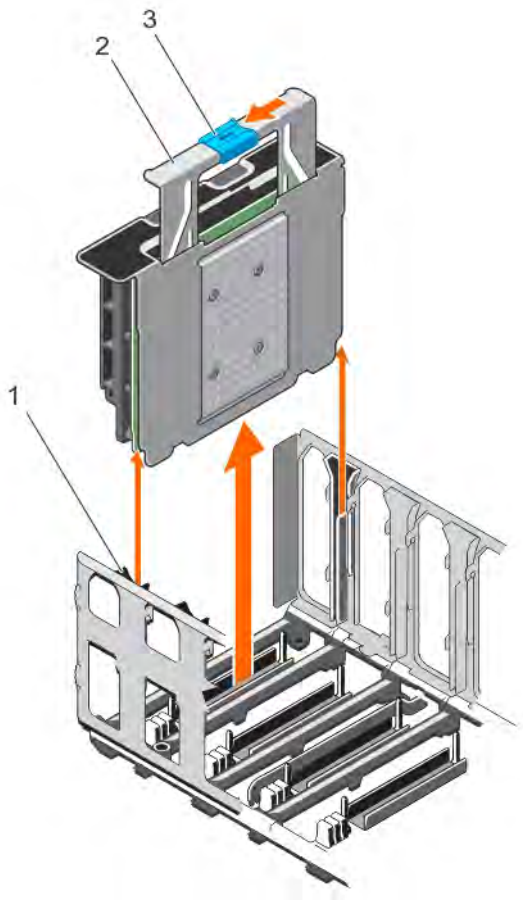

Figure 19. Removing the memory riser

a. memory riser and fan cage
b. memory riser handle
c. handle lock

1. Install a memory riser or a memory riser blank.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing a memory riser on page 74
Installing a memory riser blank on page 72
After working inside your system on page 61

Installing a memory riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: Before installing the memory riser, ensure that the memory module socket ejectors are in the locked position. Also ensure cables from the hard drive backplane are placed in the cable latch and closed.

CAUTION: Use the memory riser handle, while installing and removing the memory risers. Handling the memory riser without using the handle may cause injury.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. If installed, remove the memory riser blank and the protective cap on the memory riser connector.
1. Hold the memory riser handle in the direction of the air flow, and align the memory riser with the guides on the memory riser and fan cage.
2. Insert the memory riser into the guides on the memory riser and fan cage until it is fully seated in the connector on the system board.

   NOTE: If the memory riser is not seated properly, the memory riser handle will not get locked.

3. Press the memory riser handle until the handle lock clicks into place.

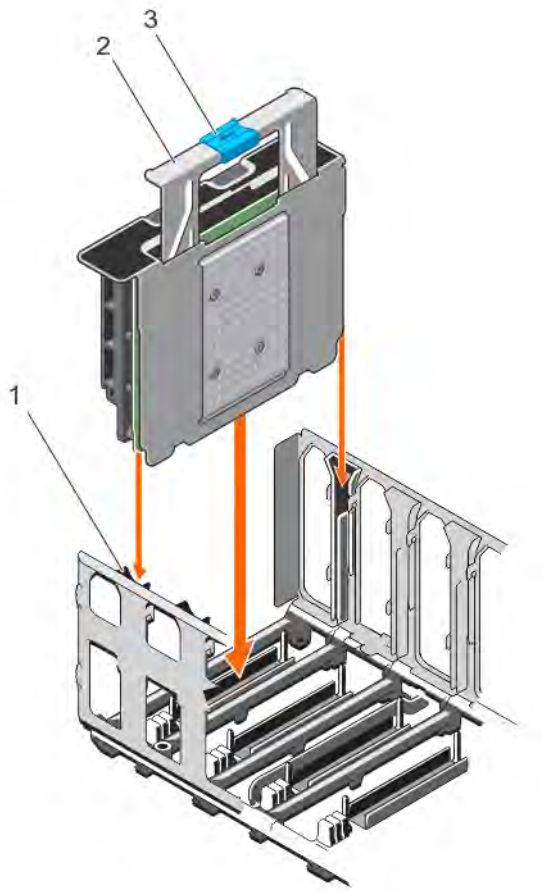

Figure 20. Installing the memory riser

a. memory riser and fan cage
b. memory riser handle
c. handle lock

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser blank on page 71
After working inside your system on page 61

Removing memory modules from the memory riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the memory riser.

WARNING: The memory modules are hot to touch for some time after the system has been powered down. Allow the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components or metallic contacts on the memory module.

CAUTION: To ensure proper system cooling, memory module blanks must be installed in any memory socket that is not occupied. Remove memory module blanks only if you intend to install memory modules in those sockets.

1. To open the memory riser, open the flip out brackets on the memory riser.

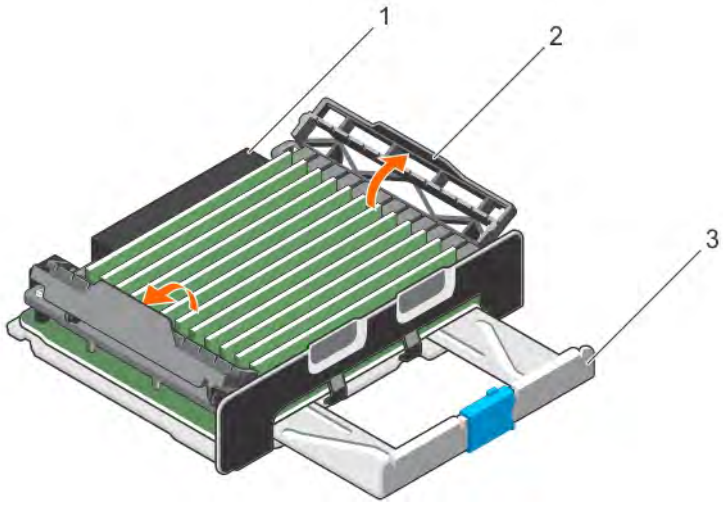

Figure 21. Opening the memory riser

a. memory riser
b. flip out bracket (2)
c. memory riser handle

2. Locate the appropriate memory module socket.
3. To release the memory module from the socket, simultaneously press the ejectors on both ends of the memory module socket.

   NOTE: Handle each memory module only by the card edges, making sure not to touch the middle of the memory module or metallic contacts.

4. Lift the memory module away from the system.

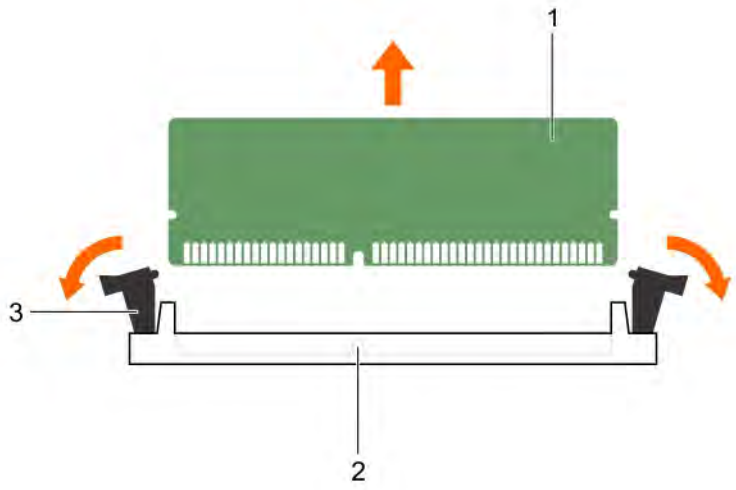

Figure 22. Removing a memory module

a. memory module
b. memory module socket
c. memory module ejector (2)

1. If you are removing a memory module permanently, install a memory module blank.
   NOTE: The procedure for removing and installing a memory module blank is identical to removing and installing a memory module.
2. Install the memory riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser on page 73
Installing memory modules on page 77
Installing a memory riser on page 74
After working inside your system on page 61

Installing memory modules

NOTE: The memory modules are hot to touch for some time after the system has been powered down. Allow the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components or metallic contacts on the memory module.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. To open the memory riser, open the flip out brackets on the memory riser.
2. Locate the appropriate memory module socket.

CAUTION: Handle each memory module only by the card edges, ensuring not to touch the middle of the memory module or metallic contacts.

3. Open the ejectors on the memory module socket outward to allow the memory module to be inserted into the socket.
4. Align the edge connector of the memory module with the alignment key of the memory module socket, and insert the memory module in the socket.

   CAUTION: Do not apply pressure at the center of the memory module; apply pressure at both ends of the memory module evenly.

   NOTE: The memory module socket has an alignment key that enables you to install the memory module in the socket in only one orientation.

5. Press the memory module with your thumbs until the socket levers firmly click into place.

   When the memory module is properly seated in the socket, the levers on the memory module socket align with the levers on the other sockets that have memory modules installed.

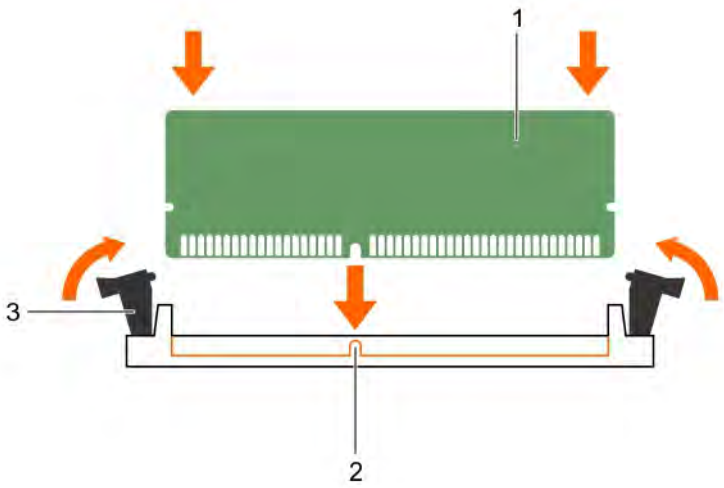

Figure 23. Installing the memory module

a. memory module
b. alignment key
c. memory module socket ejector (2)

6. Repeat step 3 through step 6 of this procedure to install the remaining memory modules.
7. Close the flip out brackets to secure the memory modules in the memory riser.

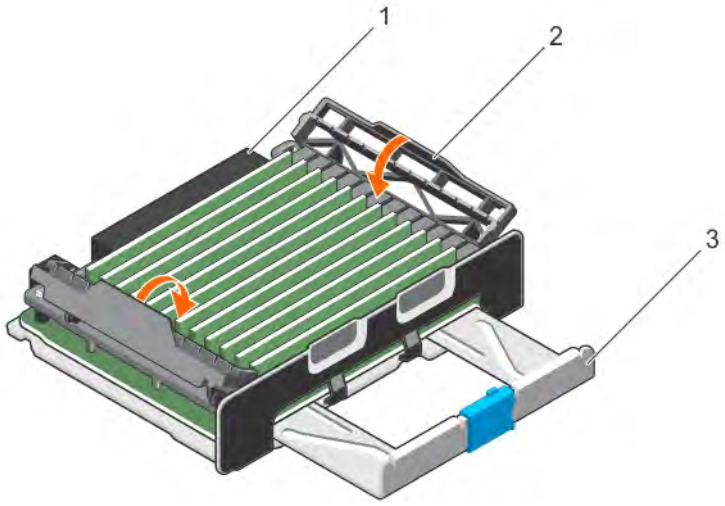

Figure 24. Closing the memory riser

a. memory riser
b. flip out bracket (2)
c. memory riser handle

1. Install the memory riser.
2. Follow the procedure listed in the After working inside your system section.
3. Press F2 to enter System Setup, and check the **System Memory** setting.

   The system should have already changed the value to reflect the installed memory.
4. If the value is incorrect, one or more of the memory modules may not be installed properly. Ensure that the memory module is firmly seated in the memory module socket.
5. Run the system memory test in system diagnostics.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing a memory riser on page 74
After working inside your system on page 61

Memory riser and fan cage

The memory risers and fans are installed and secured in the memory riser and fan cage.

Removing the memory riser and fan cage

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

WARNING: To avoid damage to the memory riser and fan cage, you must remove all the memory risers and cooling fans before removing the memory riser and fan cage.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:

a. Memory risers
b. Cooling fans
c. Memory riser blanks, if installed

1. Slide the cage handle lock in the direction of the arrow.
2. Holding the cage handle in the unlocked position and rear handle, lift the memory riser and fan cage away from the system.

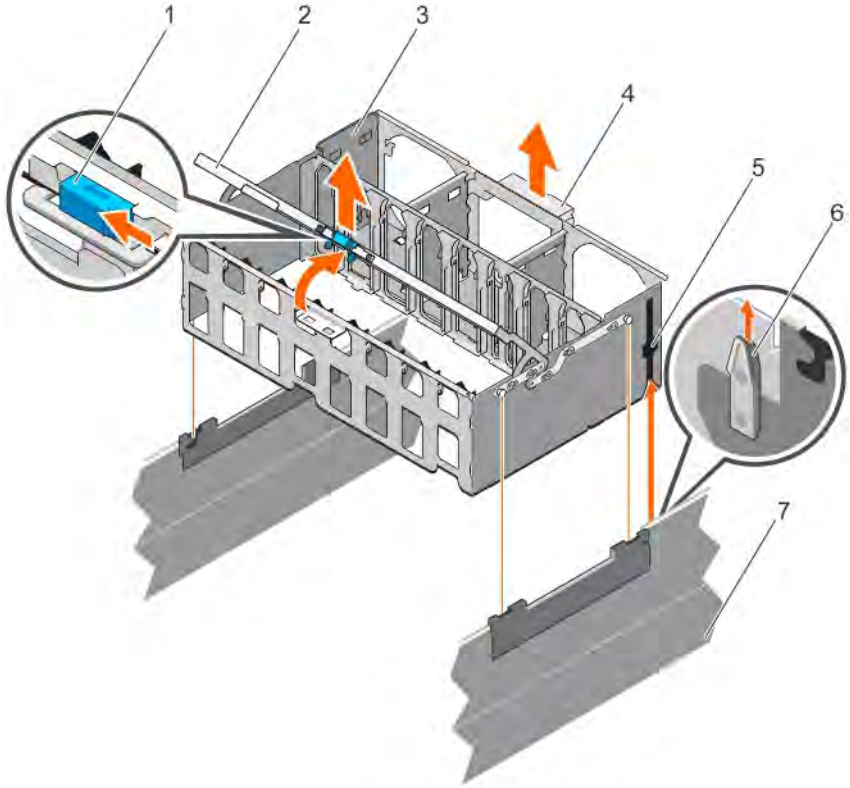

Figure 25. Removing the memory riser and fan cage

1. cage handle lock
2. cage handle
3. memory riser and fan cage
4. rear handle
5. guide rail (2)
6. guide on the chassis (2)
7. chassis

1. Install the memory riser and fan cage.

   NOTE: Before installing the memory riser and fan cage, ensure there are no loose cables from the hard drive backplane. If the cables are not latched, the cage will not seat firmly into the chassis.
2. Install the following:
   a. Memory risers
   b. Cooling fans
   c. Memory riser blanks, if installed
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser blank on page 71
Removing a memory riser on page 73
Removing a cooling fan on page 82
Installing the memory riser and fan cage on page 81

After working inside your system on page 61

Installing the memory riser and fan cage

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: Before installing the memory riser and fan cage, ensure there are no loose cables from the hard drive backplane. If the cables are not latched, the cage will not seat firmly into the chassis.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Lift the memory riser and fan cage by holding the cage handle and back of the cage.
2. Align the guide rails on the memory riser and fan cage with the guides on the chassis.
3. Lower the memory riser and fan cage into the system until it is firmly seated on the system board.
4. Lower the cage handle until the cage handle locks into place.

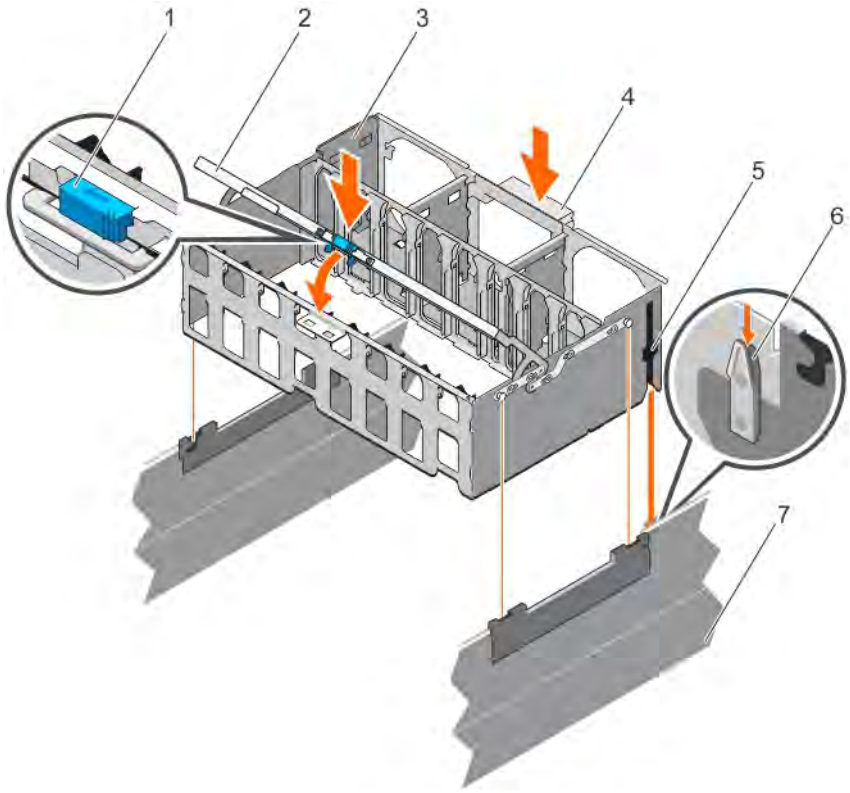

Figure 26. Installing the memory riser and fan cage

1. cage handle lock
2. cage handle
3. memory riser and fan cage
4. rear handle
5. guide rail (2)
6. guide on the chassis (2)
7. chassis

1. Install the following:
   a. Memory risers
   b. Cooling fans
   c. Memory riser blanks, if removed
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing a memory riser on page 74
Installing a cooling fan on page 83
Installing a memory riser blank on page 72
After working inside your system on page 61

Cooling fans

Your system supports six hot-swappable cooling fans that are mounted in a memory riser and fan cage. These fans provide cooling for the processors, expansion cards, and memory modules. Individual fans are connected to the fan tray located below the fan cage. The fan tray is connected through a single 12x2 connector to the system board.

NOTE: In the event of a failure, excessive temperature, or a problem with a particular fan, the fan number is referenced by the Embedded Server Management (ESM), allowing you to easily identify and replace the particular fan by noting the fan numbers on the memory riser and fan cage.

NOTE: Do not place any physical obstructions in the front or rear of the chassis. This may cause a decrease in airflow, resulting in an over-heating condition.

Removing a cooling fan

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: Opening or removing the system cover when the system is on may expose you to a risk of electric shock. Exercise utmost care while removing or installing cooling fans.

NOTE: Do not operate the system without the cooling fans or the system cover for an extended period of time.

WARNING: The cooling fans operate at a high speed. To avoid injury, do not attempt to touch the cooling fan blades while working on cooling fans.

CAUTION: The cooling fans are hot-swappable. To maintain proper cooling while the system is on, replace only one fan at a time.

NOTE: The procedure for removing each fan is identical.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

Press the release tabs and lift the cooling fan out of the memory riser and fan cage.

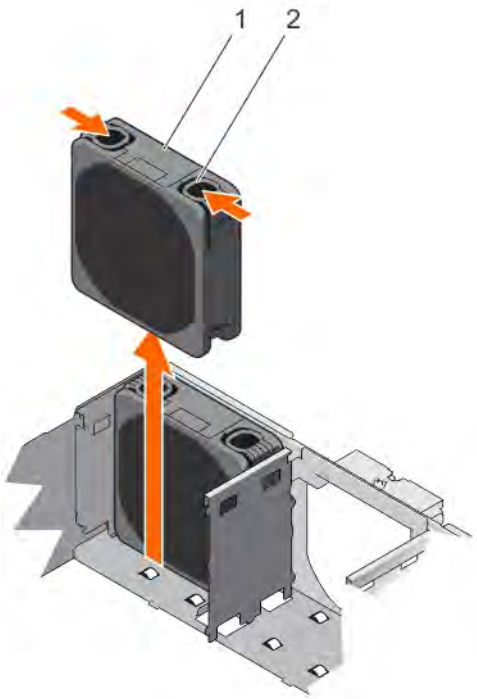

Figure 27. Removing a cooling fan

a. cooling fan
b. release tab (2)

1. Install the cooling fan.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing a cooling fan on page 83
After working inside your system on page 61

Installing a cooling fan

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

WARNING: The cooling fans operate at a high speed. To avoid injury, do not attempt to touch the cooling fan blades while working on cooling fans.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the connector on the cooling fan with the connector on the fan tray.
2. Holding the release tabs, insert the cooling fan into the memory riser and fan cage with the arrow pointing toward the back of the system.
3. Lower the cooling fan until connector on the cooling fan engages with the connector on the fan tray.

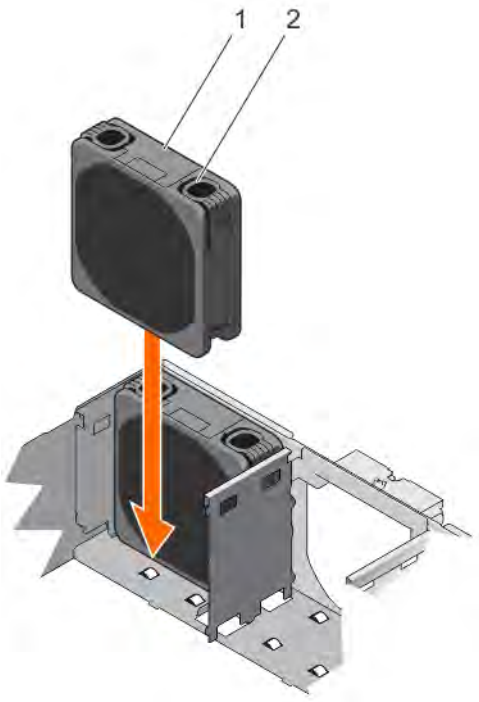

Figure 28. Installing a cooling fan

a. cooling fan
b. release tab (2)

The release tabs click into place when the cooling fan is firmly seated.

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
After working inside your system on page 61

Removing the fan tray

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. Memory risers
   b. Cooling fans
   c. Memory riser blanks, if installed
   d. Memory riser and fan cage
1. Loosen the captive screws in the order of the numbers printed on the fan tray.
2. Hold the fan tray by its edges and lift the fan tray out of the system.

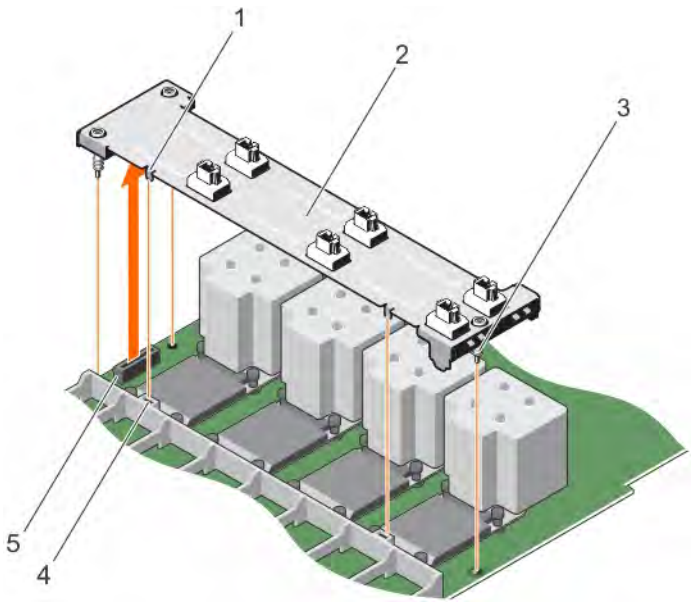

Figure 29. Removing the fan tray

1. tab on the fan tray (2)
2. fan tray
3. captive screw (3)
4. slot on the memory riser guide
5. connector on the system board

1. Install the fan tray.
2. Install the following:
   a. Memory riser and fan cage
   b. Memory risers
   c. Cooling fans
   d. Memory riser blanks, if installed
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser on page 73
Removing a cooling fan on page 82
Removing a memory riser blank on page 71
Installing the fan tray on page 85
Installing the memory riser and fan cage on page 81
Installing a cooling fan on page 83
Installing a memory riser on page 74
Installing a memory riser blank on page 72
After working inside your system on page 61

Installing the fan tray

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the captive screws on the fan tray with the screw holes on the system board while lowering the fan tray into the system.

   NOTE:
   - Ensure that the tabs on the fan tray are seated in the slots on the memory riser guide.
   - Ensure that the connector on the fan tray engages with the connector on the system board.

2. Press the fan tray at the edges to ensure that the fan tray is properly seated.
3. Tighten the captive screws in the order of the numbers printed on the fan tray.

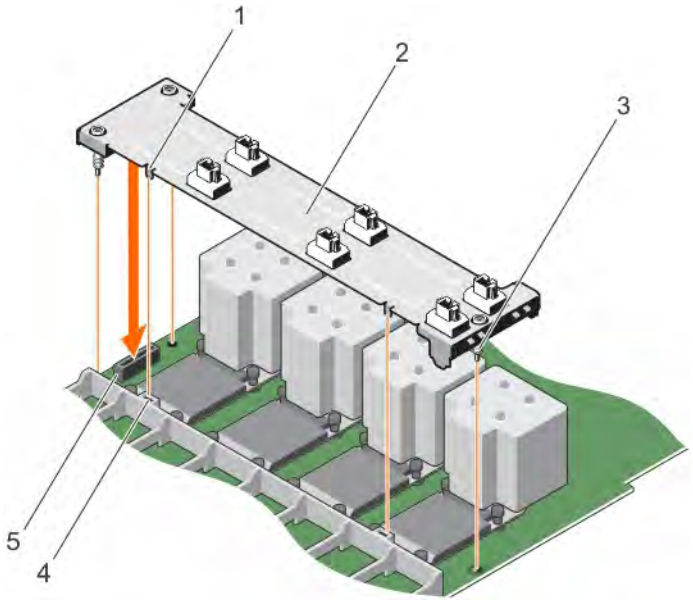

Figure 30. Installing the fan tray

1. tab on the fan tray (2)
2. fan tray
3. captive screw (3)
4. slot on the memory riser guide
5. connector on the system board

1. Install the following:
   a. Memory riser and fan cage
   b. Cooling fans
   c. Memory risers
   d. Memory riser blanks, if removed
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the memory riser and fan cage on page 81
Installing a cooling fan on page 83
Installing a memory riser on page 74
Installing a memory riser blank on page 72
After working inside your system on page 61

Cable management tray

The cable management tray is located above the heat sinks. It is used to route and manage the cables connecting the storage and expansion cards to various connectors on the backplane.

NOTE: Cable management tray also facilitates proper cooling of the system. It helps control airflow to the processors and the expansion cards on the risers, when the risers are installed.

Removing the cable management tray

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. Memory risers
   b. Memory riser blanks, if installed
   c. Cooling fans
   d. Memory riser and fan cage
1. To open the cable management tray, press the release tab.
2. Remove the cables routed through the cable management tray.
3. Press the cable management tray hooks to disengage them from the slots on the side of the chassis.
4. Lift the cable management tray out of the system.

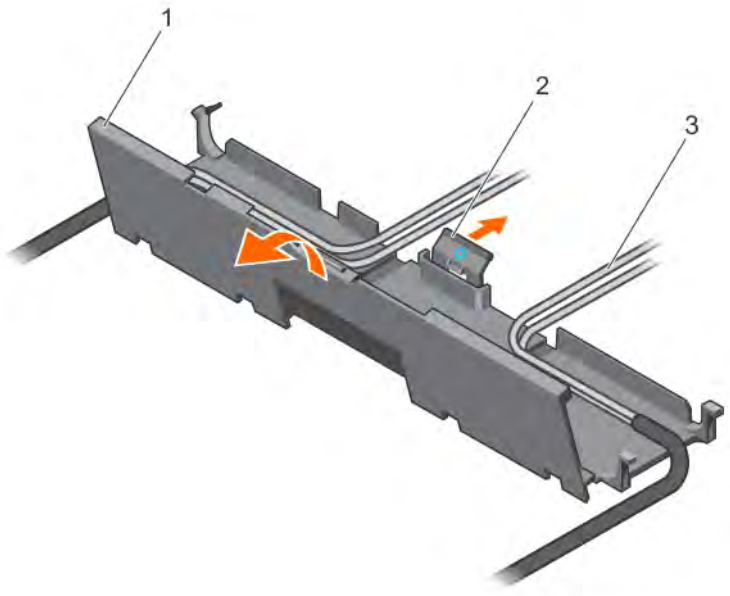

Figure 31. Removing the cables routed through the cable management tray

a. cable management tray
b. release tab
c. cables

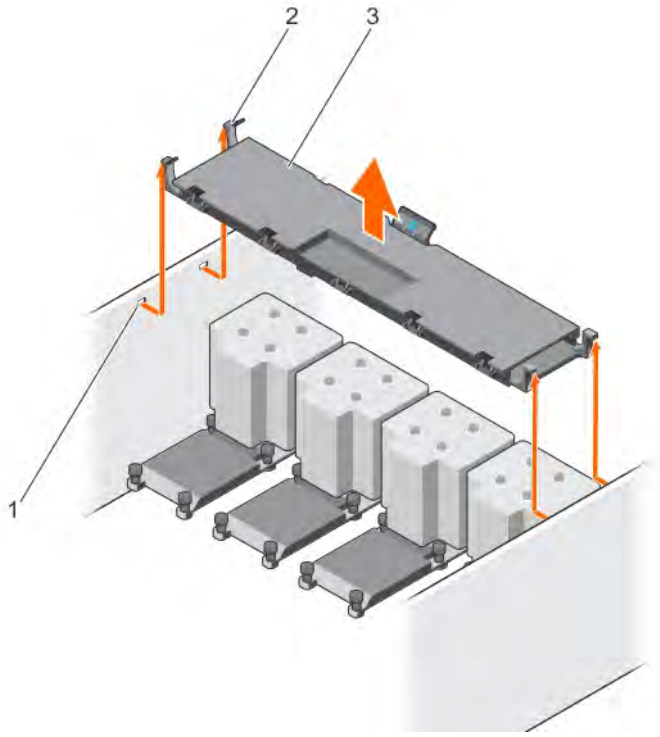

Figure 32. Removing the cable management tray

a. slots on the chassis (4)
b. cable management tray hook (4)
c. cable management tray

1. Install the following:
   a. Memory riser and fan cage
   b. Cooling fans
   c. Memory risers
   d. Memory riser blanks, if removed
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser on page 73
Removing a cooling fan on page 82
Removing the memory riser and fan cage on page 79
Removing a memory riser blank on page 71
Installing the memory riser and fan cage on page 81
Installing a cooling fan on page 83
Installing a memory riser on page 74
Installing a memory riser blank on page 72
Installing the cable management tray on page 88
After working inside your system on page 61

Installing the cable management tray

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. Memory risers
   b. Memory riser blanks, if installed
   c. Cooling fans
   d. Memory riser and fan cage
1. Position the cable management tray above the heat sinks.
2. Lower one end of the cable management tray, and insert the cable management tray hooks into the slots on the side of the chassis.
3. Lower the other end of the cable management tray, and press the cable management tray hooks so that they snap into the slots on the side of the chassis.
4. Open the cable management tray by using the release tab.
5. Route the cables through the cable management tray.
6. Close the cable management tray.

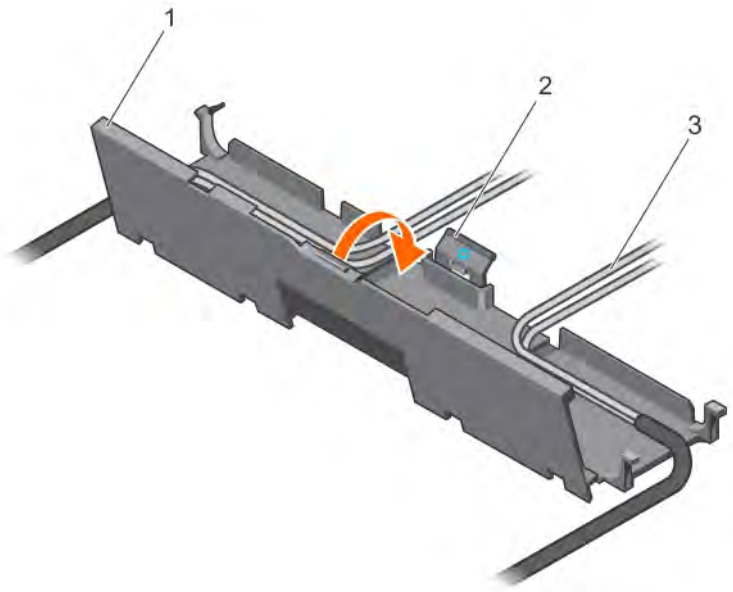

Figure 33. Guiding the cables through the cable management tray

a. cable management tray
b. release tab
c. cables

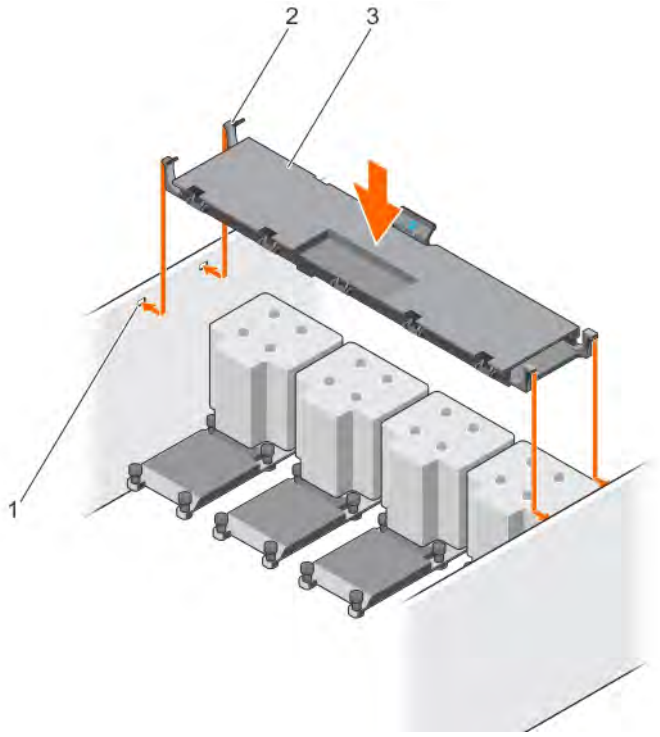

Figure 34. Installing the cable management tray

a. slots on the chassis (4)
b. cable management tray hook (4)
c. cable management tray

1. Install the following:
   a. Memory riser and fan cage
   b. Cooling fans
   c. Memory risers
   d. Memory riser blanks, if removed
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing a memory riser on page 73
Removing a cooling fan on page 82
Removing the memory riser and fan cage on page 79
Removing a memory riser blank on page 71
Installing the memory riser and fan cage on page 81
Installing a cooling fan on page 83
Installing a memory riser on page 74
Installing a memory riser blank on page 72
After working inside your system on page 61

Hard drives

Your system supports Entry Hard Drives and Enterprise Class Hard Drives. Entry Hard Drives are designed for 5x8 operating environment with less workload rating to drives, and Enterprise Class Drives are designed for 24x7 operating environment.

Selecting the correct drive class enables the critical areas of quality, functionality, performance, and reliability to be optimized for the target implementation.

NOTE: Do not mix Enterprise Class Drives with Entry Hard Drives.

Choosing the right drive type depends on the usage pattern. Improper use of Entry Hard Drives (workload rating exceed 55 TB/year) leads to significant risk and increase the drives failure rate.

For more information on these hard drives, see the 512e and 4Kn Disk Formats whitepaper and 4K Sector HDD FAQ document at **Dell.com/poweredgemanuals**.

Depending on the configuration, your system supports one of the following:

Four hard drive systems	Up to four 2.5-inch hot-swappable SAS hard drives, SATA hard drives, or SATA SSD
Twenty four hard drive systems	Up to twenty four 2.5-inch hot-swappable SAS hard drives, SATA hard drives, or SATA SSD
Sixteen hard drive/SSD plus eight PCIe SSD systems	Up to sixteen 2.5-inch hot-swappable SATA hard drives or SATA SSD plus eight 2.5-inch PCIe SSD

Limitations for SATA SSDs backplane configurations:

- Four hard drive systems: No limitations
- x24 hard drive systems with unified backplane (single-PERC configuration): SATA SSDs might be installed in slots 12-23 only.
- x24 hard drive systems with Dual-PERC (performance) configuration: No limitations
- x16+8 PCIE systems: SATA SSDs might only be installed in slots 8-15.

NOTE: SSD/SAS/SATA hard drives cannot be mixed in a system.

The hot-swappable hard drives connect to the system board through the hard drive backplane. Hot-swappable hard drives are supplied in hot-swappable hard drive carriers that fit in the hard drive slots.

CAUTION: Before attempting to remove or install a hot-swappable hard drive while the system is running, see the documentation for the storage controller card to ensure that the host adapter is configured correctly to support hot-swap hard drive removal and insertion.

CAUTION: Do not turn off or reboot your system while the hard drive is being formatted. Doing so can cause a hard drive failure.

NOTE: Use only hard drives that have been tested and approved for use with the hard drive backplane.

When you format a hard drive, allow enough time for the formatting to be completed. High capacity hard drives can take several hours to format.

Removing a 2.5-inch hard drive blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

CAUTION: To maintain proper system cooling, all empty hard drive slots must have hard drive blanks installed.

1. Follow the safety guidelines listed in the Safety instructions section.
2. If installed, remove the front bezel.

Press the release button and slide the hard drive blank out of the hard drive slot.

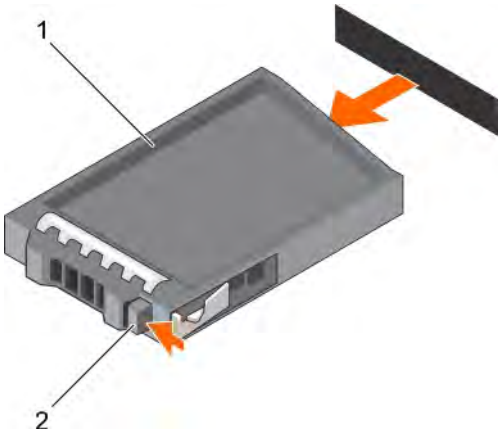

Figure 35. Removing a 2.5-inch hard drive blank

a. hard drive blank
b. release button

If removed, install the front bezel.

Related references

Safety instructions on page 60

Related tasks

Removing the optional front bezel on page 62
Installing the optional front bezel on page 62

Installing a 2.5-inch hard drive blank

1. Follow the safety guidelines listed in the Safety instructions section.
2. If installed, remove the front bezel.

Insert the hard drive blank into the hard drive slot until the release button clicks into place.

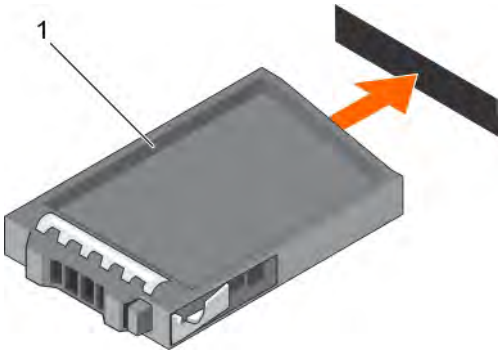

Figure 36. Installing a 2.5-inch hard drive blank

a. hard drive blank

If removed, install the front bezel.

Related references

Safety instructions on page 60

Related tasks

Removing the optional front bezel on page 62
Installing the optional front bezel on page 62

Removing a hot swappable hard drive carrier

1. Follow the safety guidelines listed in the Safety instructions section.
2. If installed, remove the front bezel.
3. Using the management software, prepare the hard drive for removal. For more information, see the documentation for the storage controller.

   If the hard drive is online, the green activity or fault indicator flashes when the hard drive is turned off. You can remove the hard drive when the hard drive indicators turn off.

CAUTION: To prevent data loss, ensure that your operating system supports hot-swap drive installation. See the documentation supplied with your operating system.

NOTE: Hot swappable hard drives are supplied in hot swappable hard drive carriers that fit in the hard drive slots.

1. To open the hard drive carrier release handle, press the release button.
2. Slide the hard drive carrier out of the hard drive slot.

   CAUTION: To maintain proper system cooling, all empty hard drive slots must have hard drive carrier blanks installed.

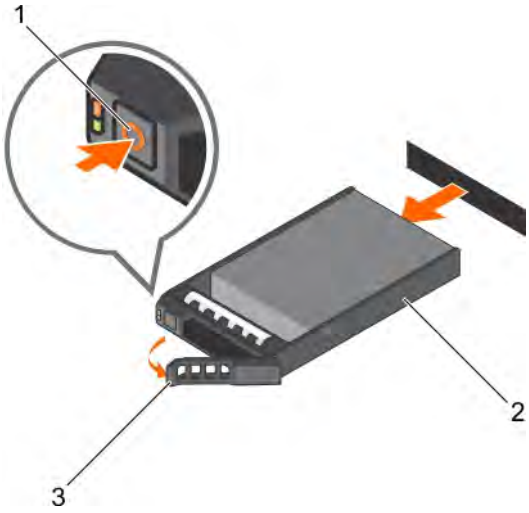

Figure 37. Removing a hot swappable hard drive or SSD

a. release button
b. hard drive carrier
c. hard drive carrier handle

1. If you are not replacing the hard drive immediately, insert a hard drive carrier blank in the empty hard drive slot, or install a hard drive carrier.
2. If removed, install the front bezel.

Related references

Safety instructions on page 60

Related tasks

Removing the optional front bezel on page 62
Installing the optional front bezel on page 62

Installing a hot swappable hard drive carrier

CAUTION: Use only hard drives that have been tested and approved for use with the hard drive backplane.

CAUTION: When installing a hard drive, ensure that the adjacent drives are fully installed. Inserting a hard drive carrier and attempting to lock its handle next to a partially installed carrier can damage the partially installed carrier's shield spring and make it unusable.

CAUTION: To prevent data loss, ensure that your operating system supports hot-swap drive installation. See the documentation supplied with your operating system.

CAUTION: When a replacement hot swappable drive is installed and the system is powered on, the drive automatically begins to rebuild. Ensure that the replacement drive is blank or contains data that you wish to overwrite. Any data on the replacement drive is immediately lost after the drive is installed.

NOTE: Hot swappable hard drives are supplied in hot swappable hard drive carriers that fit in the hard drive slots.

1. If installed, remove the front bezel.
2. If installed, remove the hard drive carrier blank.
3. Install a hot swappable hard drive into the hot swappable hard drive carrier.

1. Press the release button on the front of the hot swappable hard drive carrier and open the hot swappable hard drive carrier handle.
2. Insert the hot swappable hard drive carrier into the hard drive slot, and push the hot swappable hard drive carrier until it comes in contact with the backplane.
3. Close the hot swappable hard drive carrier handle to lock the hot swappable hard drive carrier in place.

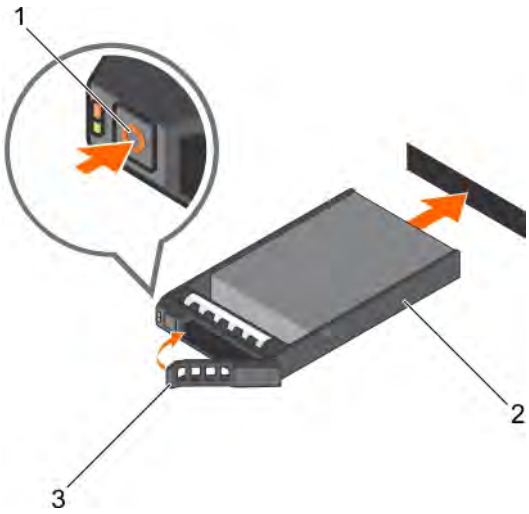

Figure 38. Installing a hot swappable hard drive carrier

a. release button
b. hard drive carrier
c. hard drive carrier handle

If removed, install the front bezel.

Related references

Safety instructions on page 60

Related tasks

Removing a 2.5-inch hard drive blank on page 91
Installing a hot swappable hard drive into a hard drive carrier on page 95
Installing the optional front bezel on page 62
Removing the optional front bezel on page 62

Removing a hot swappable hard drive from a hard drive carrier

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: Hot swappable hard drives are supplied in hot swappable hard drive carriers that fit in the hard drive slots.

1. Keep the Phillips #2 screwdriver ready.
2. Remove the hard drive carrier from the system.
1. Remove the screws from the side rails on the hard drive carrier.
2. Lift the hard drive out of the hard drive carrier.

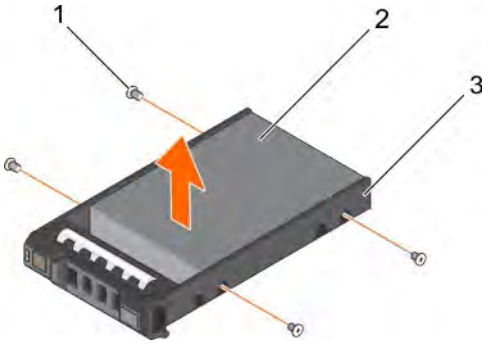

Figure 39. Removing a hot swappable hard drive from a hard drive carrier

a. screw (4)
b. hard drive
c. hard drive carrier

1. Install the hot swappable hard drive into the hard drive carrier.
2. Install the hot swappable hard drive carrier into the system.

Related references

Safety instructions on page 60

Related tasks

Removing a hot swappable hard drive carrier on page 93
Installing a hot swappable hard drive into a hard drive carrier on page 95
Installing a hot swappable hard drive carrier on page 93

Installing a hot swappable hard drive into a hard drive carrier

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

Keep the Phillips #2 screwdriver ready.

1. Insert the hard drive into the hard drive carrier with the connector end of the hard drive facing the back of the hard drive carrier.
2. Align the screw holes on the hard drive with the screw holes on the hard drive carrier.
   When aligned correctly, the back of the hard drive is flush with the back of the hard drive carrier.
3. Install the screws to secure the hard drive to the hard drive carrier.

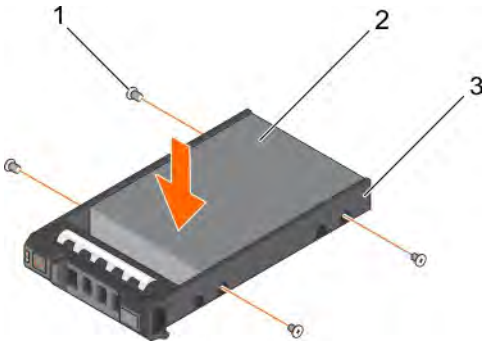

Figure 40. Installing a hard drive into a hard drive carrier

a. screw (4)
b. hard drive
c. hard drive carrier

Optical drive (optional)

Optical drives retrieve and store data on optical discs such as CD and DVD. Optical drives can be categorized into two basic types: optical disc readers and optical disc writers.

Removing the optical drive

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Slide the release latch in the direction of the arrow to release the ejector handle.
2. Hold the ejector handle and pull the optical drive out of the system.
3. To remove the optical drive from the optical drive carrier, pull the tab on the cable to disconnect the cable from the connector on the optical drive .
4. Flex the left side wall of the optical drive carrier to release the optical drive from the carrier.

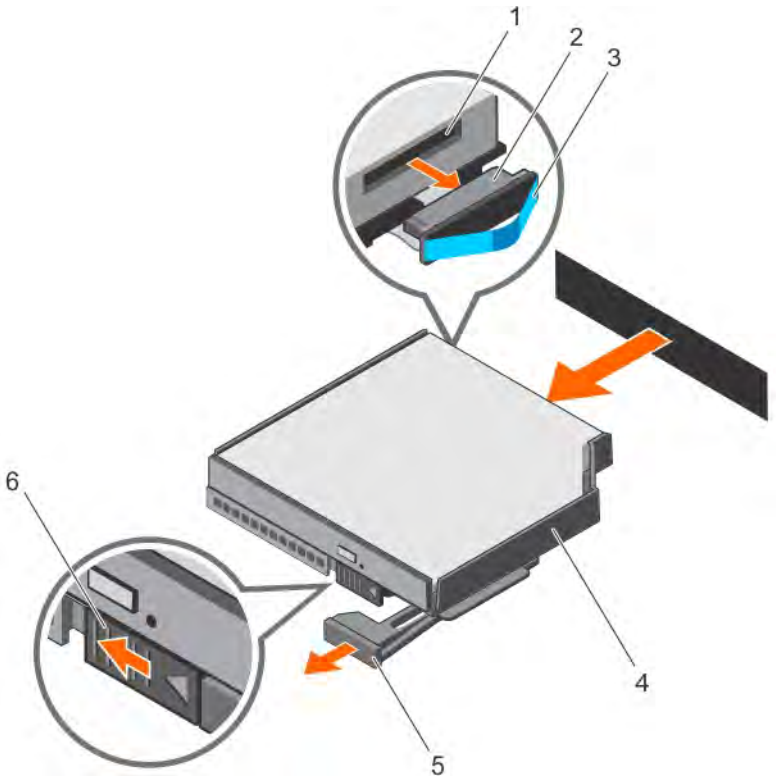

Figure 41. Removing the optical drive

1. optical drive connector
2. cable
3. pull tab
4. optical drive carrier
5. ejector handle
6. release latch

1. Install the optical drive.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the optical drive on page 97
After working inside your system on page 61

Installing the optical drive

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Follow the artwork printed on the optical carrier to insert optical drive into the carrier.
1. Reconnect the cable to the back of the optical drive.
2. Align the optical drive with the optical drive slot in the front of the chassis.
3. Slide the optical drive into the optical drive slot until the optical drive connector engages with SATA connector on the system board.

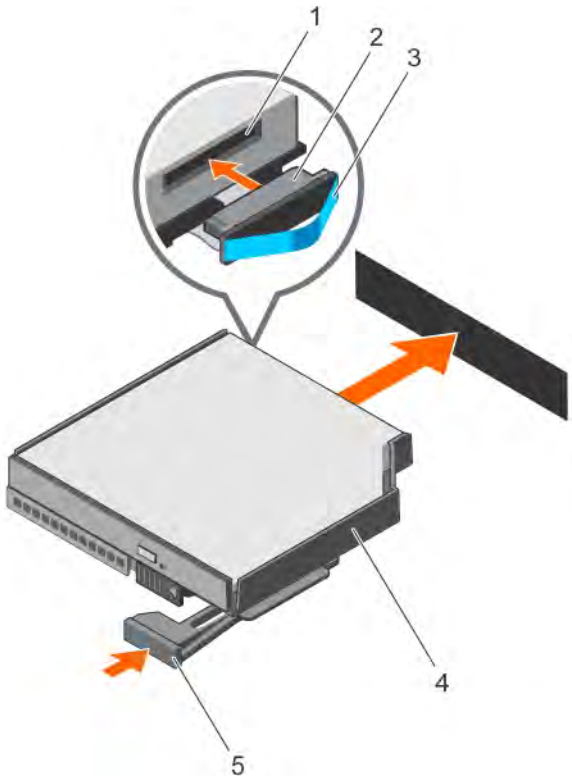

Figure 42. Installing the optical drive

1. optical drive connector
2. cable
3. pull tab
4. optical drive carrier
5. ejector handle

1. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
After working inside your system on page 61

Internal USB memory key (optional)

An optional USB memory key installed inside your system can be used as a boot device, security key, or mass storage device.

To boot from the USB memory key, configure the USB memory key with a boot image and then specify the USB memory key in the boot sequence in System Setup.

The internal USB port must be enabled in **Internal USB Port** option in the **Integrated Devices** screen of **System Setup**.

NOTE: To locate the internal USB port (INT_USB) on the system board, see the System board jumpers and connectors section.

Replacing the optional internal USB memory key

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Locate the USB port or USB memory key on the system board.

To locate the USB port, see the System board jumpers and connectors section.

2. If installed, remove the USB memory key from the USB port.

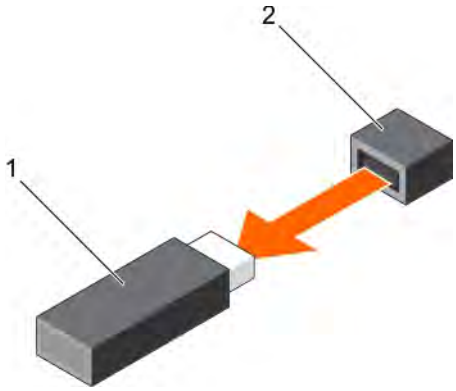

Figure 43. Removing the internal USB memory key

a. USB memory key
b. USB port

3. Insert the replacement USB memory key into the USB port.

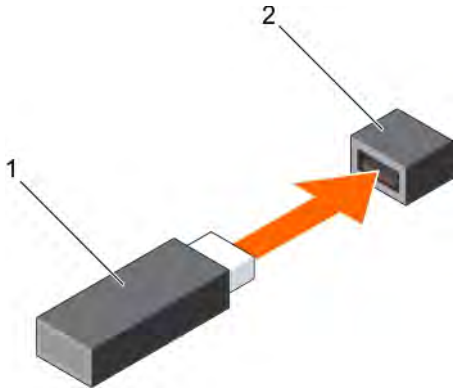

Figure 44. Installing the internal USB memory key

a. USB memory key
b. USB port

1. Follow the procedure listed in the After working inside your system section.
2. While booting, press F2 to enter System Setup and verify that the system detects the USB memory key.

Expansion cards and expansion card risers

Your system supports third Generation 10 PCIe expansion card slots that include one dedicated slot for PERC 9 storage card and one dedicated riser-slot for Network Daughter Card (NDC).

Expansion card installation guidelines

Slot 1 connector functions as an x8 connector and can be extended as two x4 slots when the left I/O riser is installed.

Slot 9 connector functions as an x16 connector and can be extended as two x8 slots when the right I/O riser is installed.

NOTE: A missing or an unsupported expansion card riser logs an SEL event. It does not prevent your system from powering on and no BIOS POST message or F1/F2 pause is displayed.

NOTE: Left and right optional risers support Generation 3 expansion cards.

Table 35. Supported expansion cards

Table 35. Supported expansion cards

Riser	PCIe slot	Processor connection	Height	Length	Link width	Slot width
	1	Processor 1	Full Height	Half Length	x8	x24
2 (optional)	1/1	Processor 1	Full Height	Full Length	x4	x8
NOTE: If the optional riser 2 is installed as the left I/O riser						
1 (NDC riser)	2	Processor 1	Full Height	Half Length	x8	x16 - reversed
	2/2	Processor 1	Full Height	Half Length	x4	x8
	3	Processor 1	Full Height	Half Length	x8	x16
	4	Processor 2	Full Height	Half Length	x16	x16
	5	Processor 2	Full Height	Half Length	x16	x16
	6	Processor 3	Full Height	Half Length	x16	x16
	7	Processor 3	Full Height	Half Length	x16	x16
	8	Processor 4	Full Height	Half Length	x16	x16
	9	Processor 4	Full Height	Half Length	x16	x24
3 (optional)	1/9	Processor 4	Full Height	Full Length	x8	x16
NOTE: If the optional riser 3 is installed as the right I/O riser						
	2/10	Processor 4	Full Height	Half Length	x8	x16

NOTE: Do not install a full-height expansion card on PCIe slot 2/10.

NOTE: The expansion cards are not hot-swappable. Ensure the AC power supply unit is removed before installing the expansion cards.

The following table provides guidelines for installing expansion cards to ensure proper cooling and mechanical fit. The expansion cards with the highest priority should be installed first using the slot priority indicated. All other expansion cards should be installed in card priority and slot priority order.

Table 36. Expansion card installation order

Card priority	Card type	Form factor	Slot priority (Two processors)	Slot priority (Four processors)	Max allowed
1	Internal Storage (Integrated Slot)	Full Height	4	4,7	2
2	External SAS controllers	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (2/10)^, (1/1)*	2
3	40 Gb Ethernet Controllers	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (1/9)^, (2/10)^, (1/1)*, (2/2)*	9
4	Fibre Channel 16 Gb, HBA, Single/Dual Port (Emulex)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (1/9)^, (2/10)^, (1/1)*, (2/2)*	10*
	Fibre Channel 16 Gb, HBA, Single/Dual Port (QLogic)	Full Height	1, 3, 4, 5	1, 3, 4, 5, 6, 7, 8, 9	8
5	Converged Network Adapters 10 Gb, Dual Port (Intel)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	(1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9, (1/1)*, (2/2)*	10

Table 36. Expansion card installation order

Card priority	Card type	Form factor	Slot priority (Two processors)	Slot priority (Four processors)	Max allowed
	Converged Network Adapters 1 Gb, Quad Port (Broadcom)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	(1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9, (1/1)*, (2/2)*	10
	Converged Network Adapters 1 Gb, Dual Port (Broadcom)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	(1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9, (1/1)*, (2/2)*	10
	Converged Network Adapters 10 Gb, Dual Port (Broadcom)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	(1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9, (1/1)*, (2/2)*	10
6	10 Gb Ethernet Controllers Dual Port (Emulex)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (1/9)^, (2/10)^, (1/1)*, (2/2)*	10*
	10 Gb Ethernet Controllers Dual Port (Mellanox)	Full Height	1, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (1/9)^, (2/10)^, (1/1)*, (2/2)*	10
7	Fibre Channel 8 Gb Dual Port (QLogic)	Full Height	1, 3, 4, 5	1, 3, 4, 5, 6, 7, 8, 9	8
	Fibre Channel 8 Gb Dual Port (Emulex)	Full Height	(1/1)*, (2/2)*, 1, 3, 4, 5	(1/1)*, (2/2)*, (1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9	10*
8	Fibre Channel 8 Gb Single Port (QLogic)	Full Height	1, 3, 4, 5	1, 3, 4, 5, 6, 7, 8, 9	8
	Fibre Channel 8 Gb Single Port (Emulex)	Full Height	(1/1)*, (2/2)*, 1, 3, 4, 5	(1/1)*, (2/2)*, (1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9	10*
9	1 Gb NICs Dual Port (Intel)	Full Height	(1/1)*, (2/2)*, 1, 3, 4, 5	(1/1)*, (2/2)*, (1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9	10
	1 Gb NICs Quad Port (Intel)	Full Height	(1/1)*, (2/2)*, 1, 3, 4, 5	(1/1)*, (2/2)*, (1/9)^, (2/10)^, 1, 3, 4, 5, 6, 7, 8, 9	10
10	External Non-RAID Controller	Full Height	1*, 3, 4, 5, (1/1)*, (2/2)*	1, 3, 4, 5, 6, 7, 8, 9, (2/10)^, (1/1)*	2

NOTE:

(*) indicates that "Slot 1" is not available if the optional left PCIe expansion riser is installed.

(^) indicates that "Slot 9" is not available if the optional right PCIe expansion riser is installed.

Removing the left or right expansion card riser blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Slide the blank toward the side wall of the chassis.
2. Tilt the blank away from the chassis.
3. Press and push the release tab on the PCI retention rocker to release the retention rocker.
4. When the release tab opens, press the sides of the PCI retention rocker, and slide the PCI retention rocker assembly out of the chassis

5. Lift the blank away from the system.

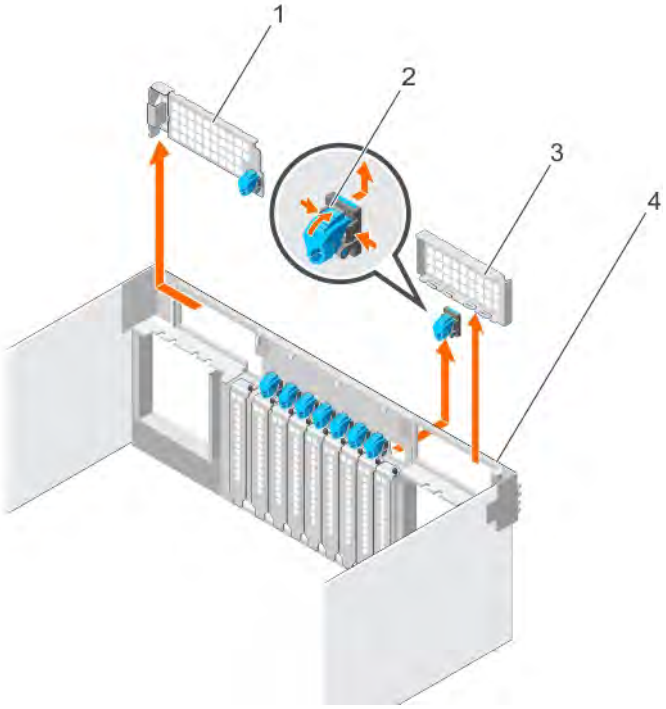

Figure 45. Removing the left or right expansion card riser blank

1. left riser blank
2. release tab on the PCI retention rocker
3. right riser blank
4. chassis

1. Install the left or right expansion card riser.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the left or right expansion card riser blank on page 102
After working inside your system on page 61

Installing the left or right expansion card riser blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the left riser blank with the corresponding slot on the back of the chassis.
2. Press and slide the blank to the right to lock the blank in place.
3. Replace the PCI retention rocker.

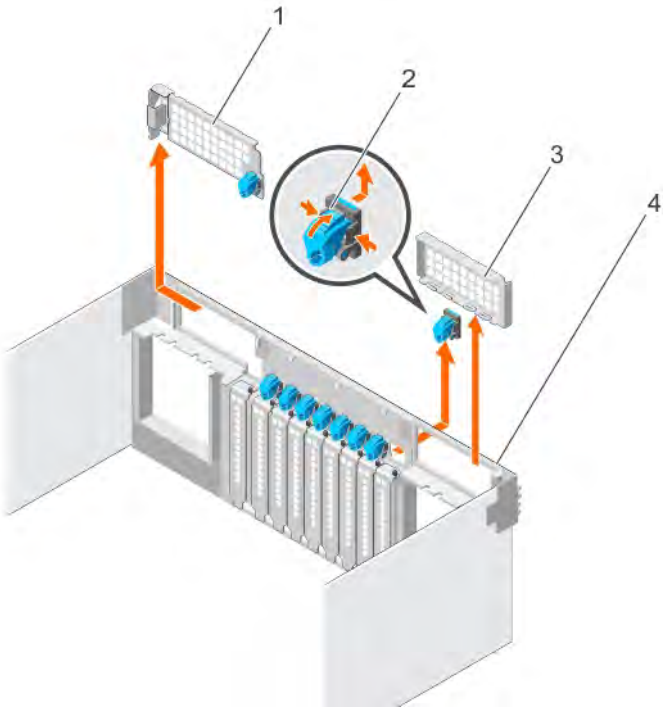

Figure 46. Installing the left or right expansion card riser blank

1. left riser blank
2. release tab on the PCI retention rocker
3. right riser blank
4. chassis

1. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
After working inside your system on page 61

Removing the left or right expansion card riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the left or right expansion card riser blank.
1. Holding the riser handle, pull the expansion card riser in the direction of the arrows on the handle.
2. Lift the expansion card riser away from the system.

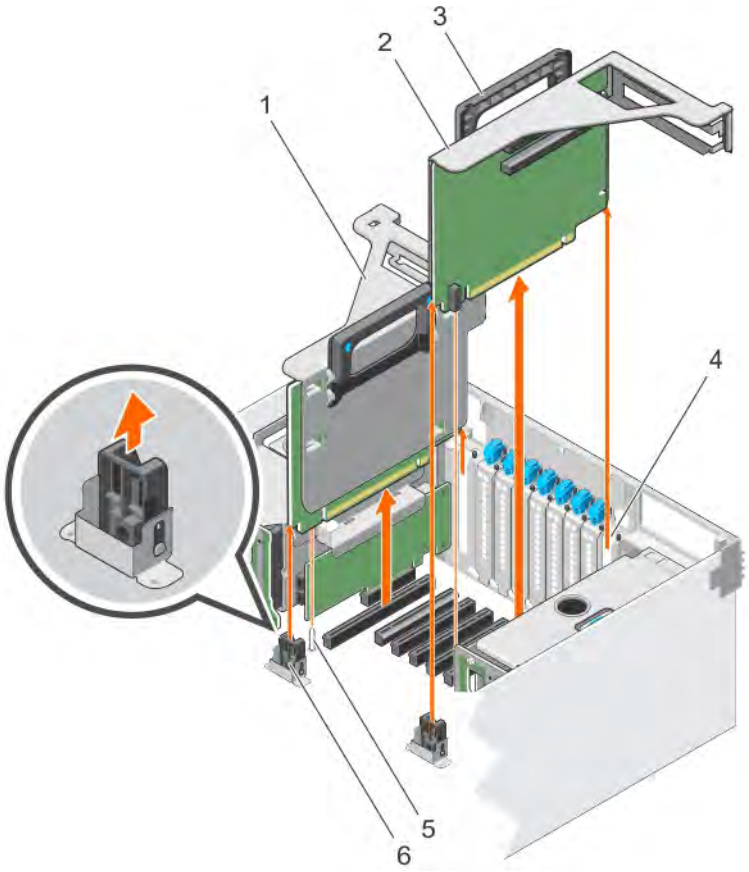

Figure 47. Removing the left or right expansion card riser

1. left expansion card riser
2. right expansion card riser
3. riser handle
4. riser panel
5. guide pin
6. riser guide on VR bracket

1. Install the expansion card into the expansion card riser.
2. Install the left or right expansion card riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the left or right expansion card riser blank on page 101
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Installing the left or right expansion card riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

1. Holding the expansion card riser by its sides, align the riser with the riser panel slot and the connector on the system board.
2. Insert the expansion card riser into the system.

   NOTE: Ensure that the riser edge slides into the riser guide on the system board.

3. Insert the riser edge connector into the PCIe connector on the system board until the riser is fully seated.

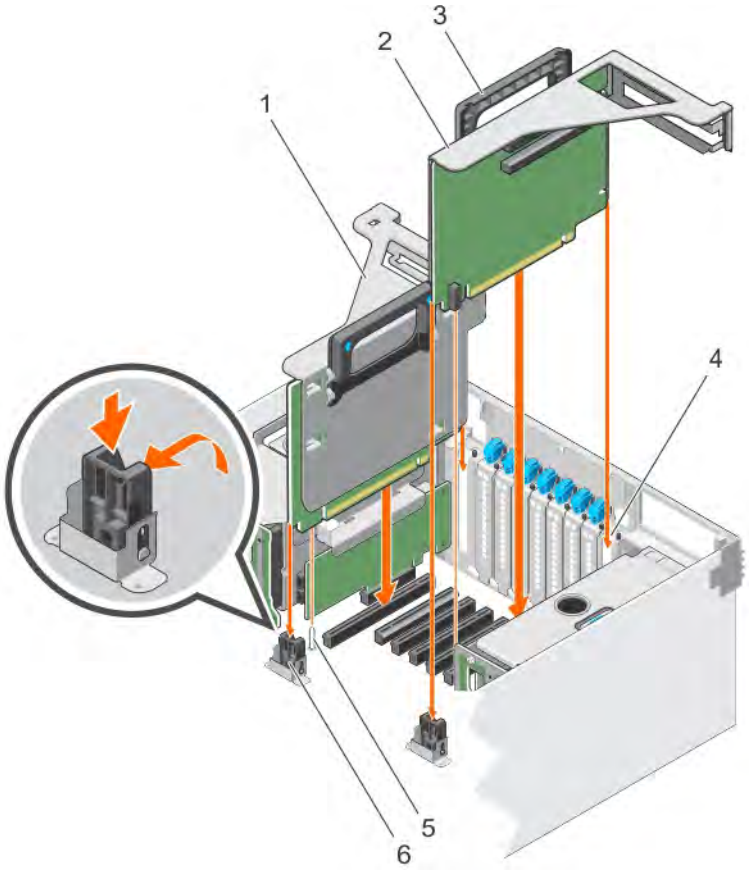

Figure 48. Installing the left or right expansion card riser

1. left expansion card riser
2. right expansion card riser
3. riser handle
4. riser panel
5. guide pin
6. riser guide on VR bracket

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
After working inside your system on page 61

Removing an expansion card from expansion card risers

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.

2. Follow the procedure listed in the Before working inside your system section.
3. Disconnect the cables connected to the expansion card.
4. Remove the expansion card riser.
1. Slide the expansion card latch.
2. Remove the expansion card from the expansion card riser.
3. If you are removing the card permanently, install a metal filler bracket over the empty expansion slot, and insert the expansion card latch.

NOTE: You must install a filler bracket over an empty expansion slot to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aids in proper cooling and airflow inside the system.

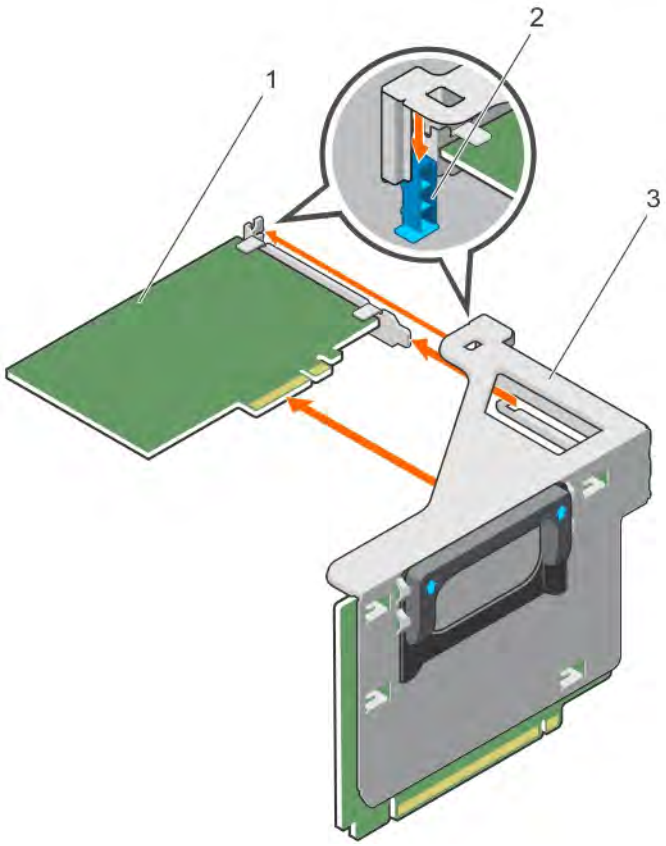

Figure 49. Removing the expansion card (half-length) from the left expansion card riser

a. expansion card (half-length)
b. expansion card latch
c. expansion card riser

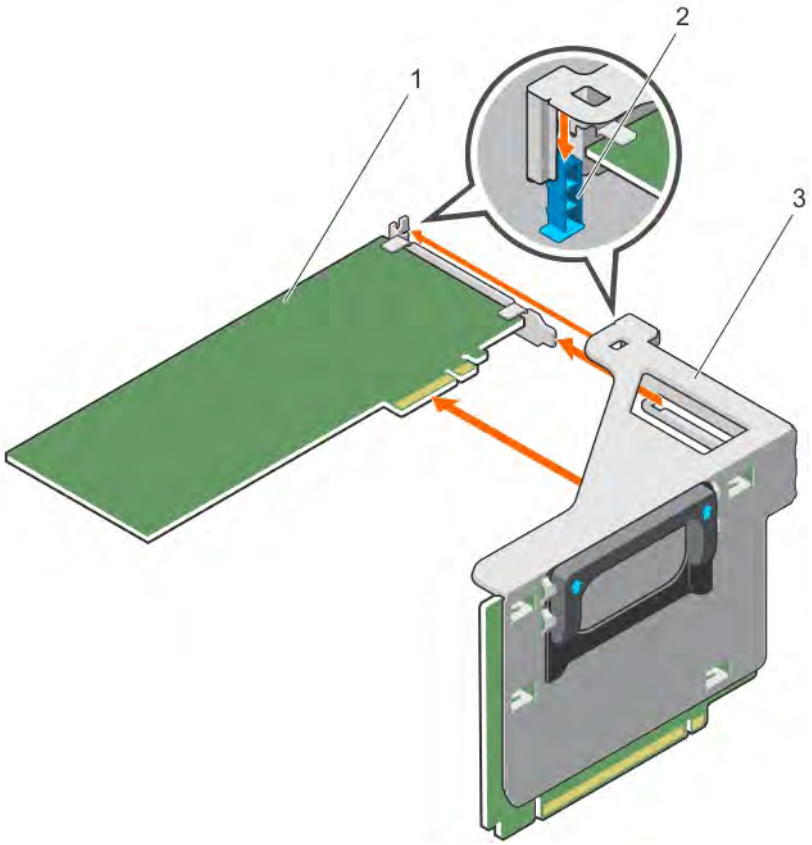

Figure 50. Removing the expansion card (full-length) from the left expansion card riser

a. expansion card (full-length)
b. expansion card latch
c. expansion card riser

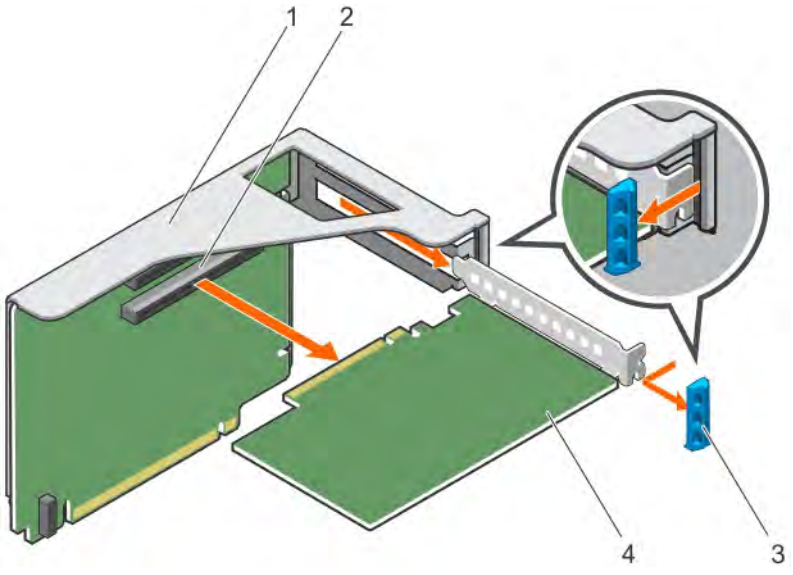

Figure 51. Removing the expansion card from the right expansion card riser

1. expansion card riser
2. expansion card connector on the riser
3. expansion card latch
4. expansion card

1. Install an expansion card into the expansion card riser.
2. Install the expansion card riser.
3. Re-connect the cables to the expansion card.

4. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the left or right expansion card riser on page 103
Installing an expansion card into the expansion card risers on page 108
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Installing an expansion card into the expansion card risers

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Unpack the expansion card and prepare it for installation. For instructions, see the documentation accompanying the card.
1. Slide the expansion card latch.
2. Holding the expansion card by its edges, position the card so that the card edge connector aligns with the expansion card connector on the riser.
3. Insert the card edge connector into the expansion card connector on the riser until the card is fully seated.
4. Insert the expansion card latch.

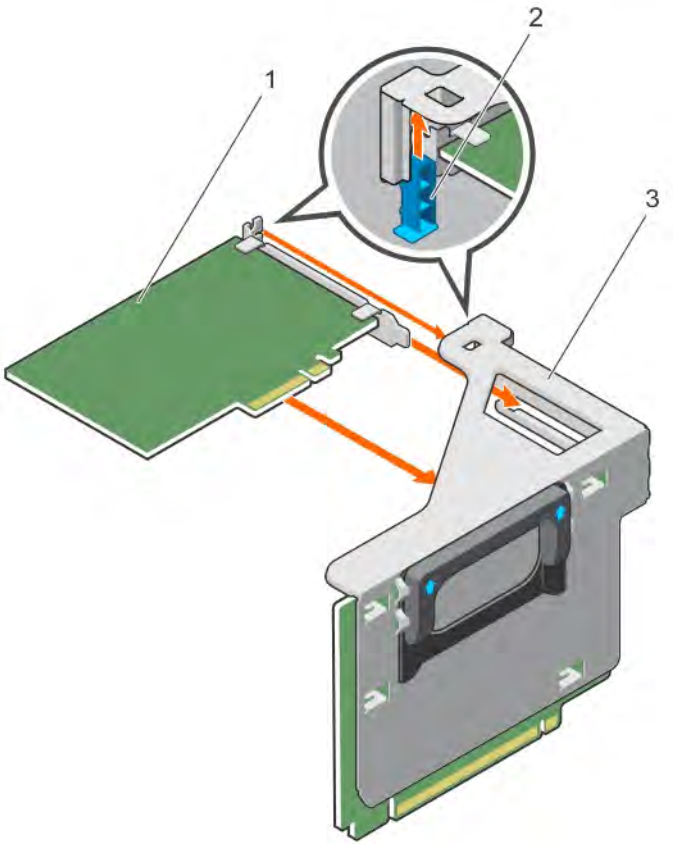

Figure 52. Installing the expansion card (half-length) from the left expansion card riser

a. expansion card (half-length)
b. expansion card latch
c. expansion card riser

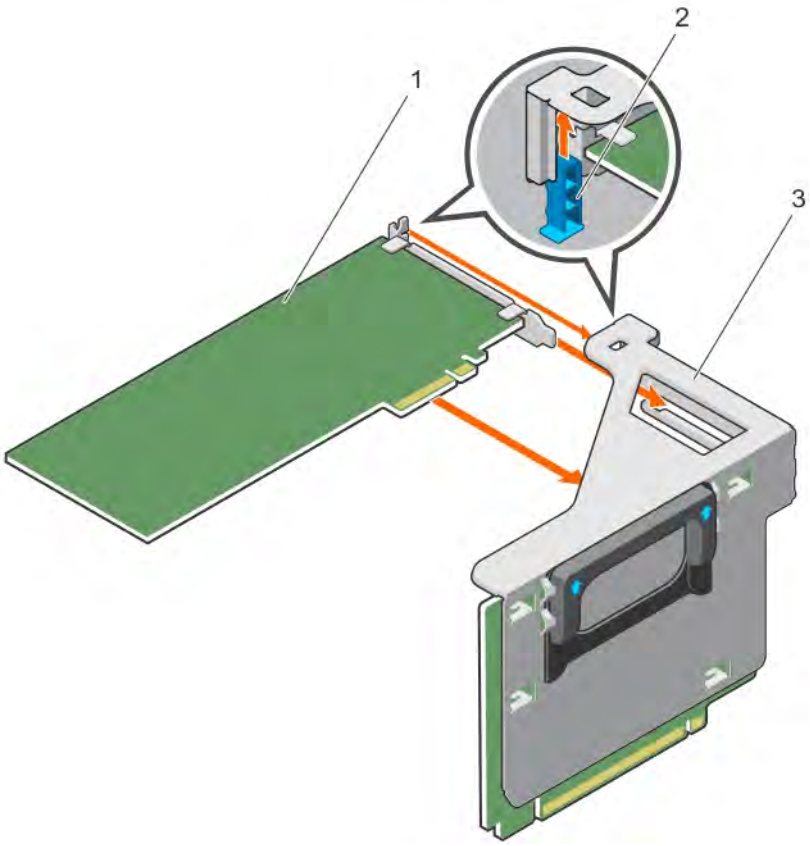

Figure 53. Installing the expansion card (full-length) from the left expansion card riser

a. expansion card (full-length)
b. expansion card latch
c. expansion card riser

To enable the installation of full-length expansion card in expansion card risers, ensure the metal brackets are removed from the back of the memory cage and fan cage. See the illustration below for removing the metal brackets.

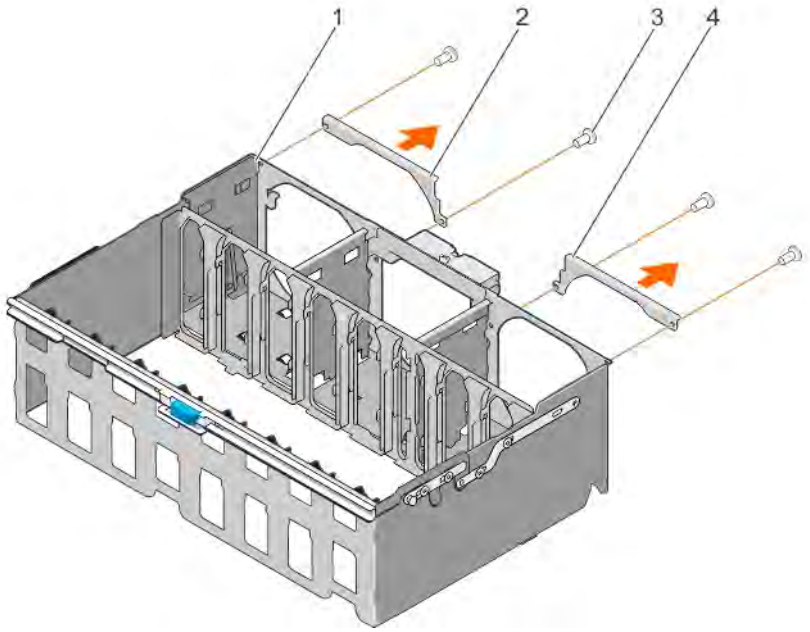

Figure 54. Removing the metal brackets to install the full-length expansion cards

a. memory riser and fan cage
b. left metal bracket

c. right metal bracket

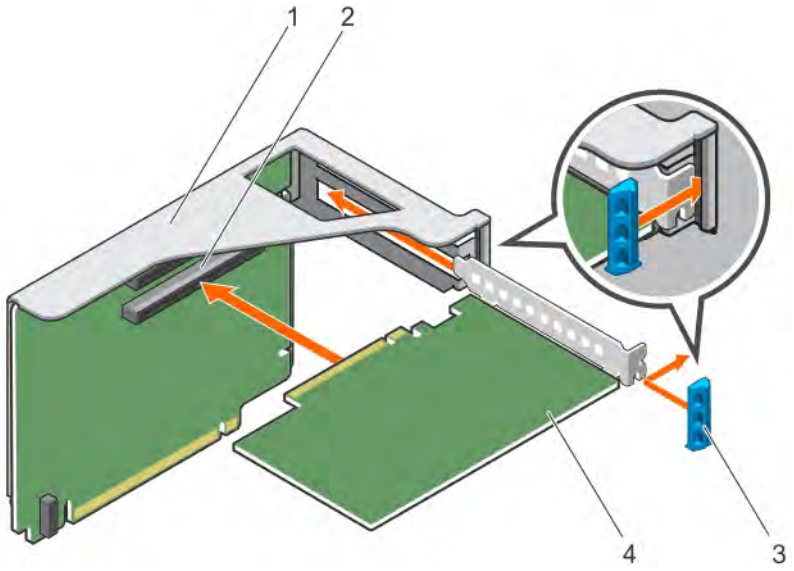

Figure 55. Installing the expansion card from the right expansion card riser

1. expansion card riser
2. expansion card connector on the riser
3. expansion card latch
4. expansion card

1. Install the expansion card riser.
2. Connect the cables to the expansion card.
3. Follow the procedure listed in the After working inside your system section.
4. Install any device drivers required for the card as described in the documentation for the card.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Network Daughter Card riser

The Network Daughter Card (NDC) riser is a half-length, full-height card installed in a dedicated PCIe slot on the system board. It has an x16 PCIe connector (reverse orientation). The NDC riser is also known as I/O riser 1.

The NDC riser supports:

- A standard rNDC connector, which connects one Dell standard Network Daughter Card
- IDSDM connector
- Temperature sensor
- Chassis intrusion switch

Removing the Network Daughter Card riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Disconnect the cables connected to the Network Daughter Card (NDC) riser.
4. If connected, disconnect all the cables connected to the left expansion card riser.
5. If installed, remove the left expansion card riser.
6. Locate the NDC riser (on PCIe slot 2).

1. Release the PCI retention rocker to unlock the NDC riser.
2. Hold the NDC riser by its edges, and pull the NDC riser till the card edge connector disengages from the connector on the system board.
3. Lift the NDC riser away from the system.

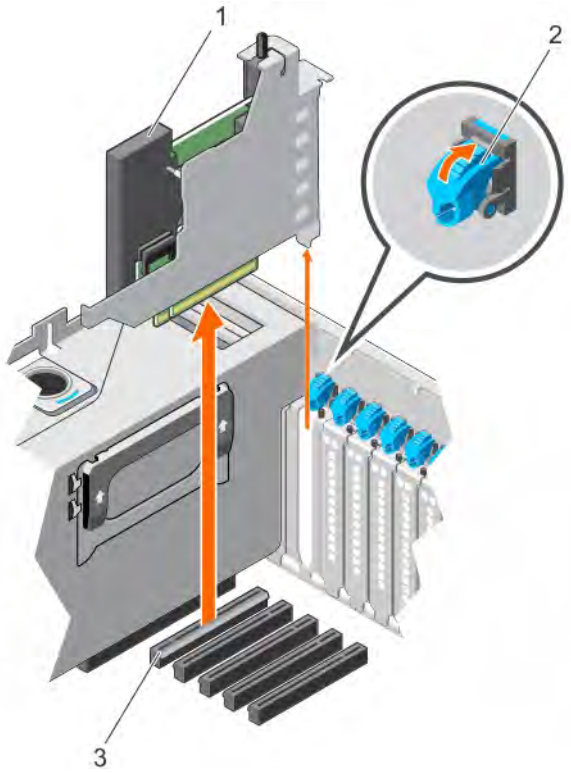

Figure 56. Removing the NDC riser

a. NDC
b. PCI retention rocker
c. connector on the system board

1. Install the NDC riser.
2. If removed, install the left expansion card riser.
3. Re-connect all the disconnected cables
4. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the left or right expansion card riser on page 103
Installing the Network Daughter Card riser on page 113
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Installing the Network Daughter Card riser

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. If connected, disconnect all the cables connected to the left expansion card riser.
4. If installed, remove the left expansion card riser.
5. Locate the Network Daughter Card (NDC) riser connector (on PCIe slot 2).
1. Hold the Network Daughter Card (NDC) riser by its edges and align the connector on the NDC riser with the connector on the system.

   NOTE: The NDC slot on the system board is keyed differently.

2. Insert the NDC riser until the card is fully seated.
3. Close the PCI retention rocker to lock the NDC riser.

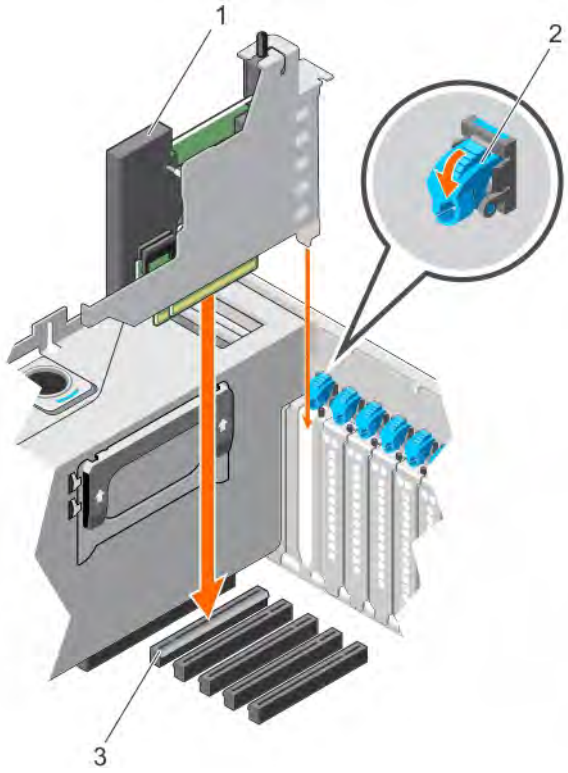

Figure 57. Installing the NDC riser

a. NDC
b. PCI retention rocker
c. connector on the system board

1. If removed, install the left expansion card riser.
2. Re-connect all the disconnected cables
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the left or right expansion card riser on page 103
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Network daughter card

The Network Daughter Card (NDC) contains the complete Network Interface Card (NIC) subsystem, it replaces the traditional LAN-on-Motherboard (LOM) design with the flexible new features, network types, speed and easy to upgrade from 1G to 10G LAN speeds.

NDC riser is installed on a dedicated PCIe slot 2 on the system board. It provides the following interfaces from the system board:

- PCIe x8 Gen3 link
- PCIe x2 Gen2 link
- Network Controller Sideband Interface (NC-SI)
- I-two-C (I2C)
- Power on and grounding
- Miscellaneous control signals

Removing the network daughter card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the Network Daughter Card (NDC) riser.

NOTE: The NDC is on riser 1.

1. Loosen the captive screws that secure NDC to the NDC riser bracket.
2. Hold the NDC by its edges, and pull until the connector on the NDC disengages from the connector on the NDC riser card.
3. Slide the NDC away from the NDC riser bracket until the Network Interface Card (NIC) connectors are clear of the slot.

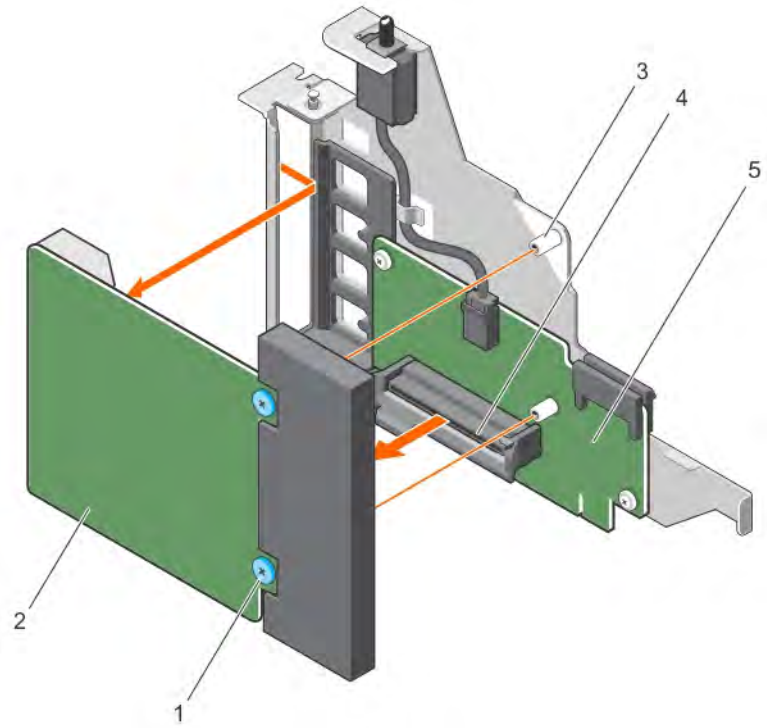

Figure 58. Removing the NDC

1. captive screw (2)
2. NDC
3. screw hole (2)
4. connector on the NDC riser card
5. NDC riser card

1. Install the network daughter card.
2. Install the NDC riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the Network Daughter Card riser on page 111
Installing the network daughter card on page 115
Installing the Network Daughter Card riser on page 113
After working inside your system on page 61

Installing the network daughter card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the following:
   a. Network Interface Card (NIC) connectors with the slot opening on Network Daughter Card (NDC) riser bracket.
   b. Captive screws with the screw holes on the NDC riser card.

2. Press the NDC at its edges to ensure that the connector on the NDC engages with the connector on the NDC riser card.
3. Tighten the captive screws to secure the NDC to the NDC riser card.

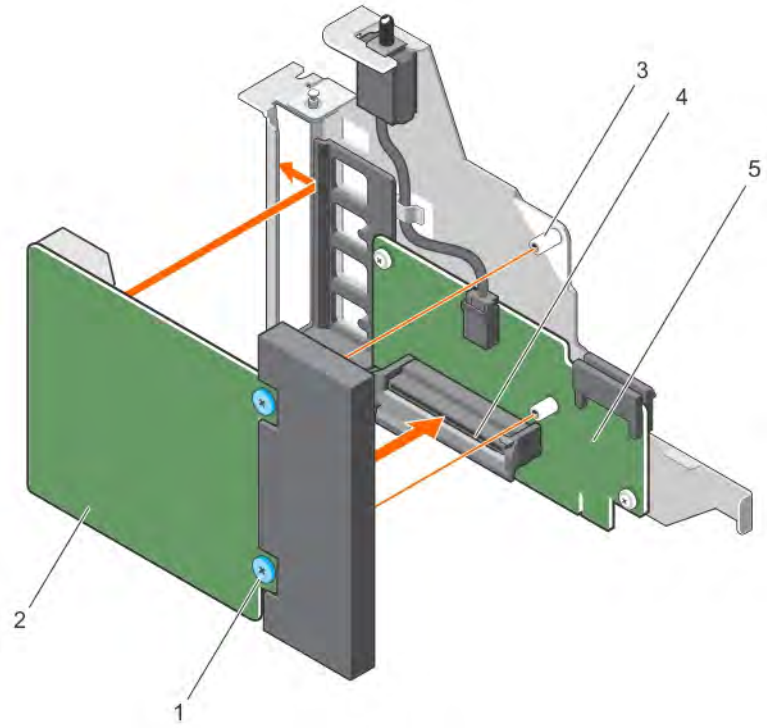

Figure 59. Installing the NDC

1. captive screw (2)
2. NDC
3. screw hole (2)
4. connector on the NDC riser card
5. NDC riser card

1. Install the NDC riser.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the Network Daughter Card riser on page 113
After working inside your system on page 61

Chassis intrusion switch

The Chassis Intrusion Switch detects any intrusion into the interior of your system and provides an indication of the same in the system event logs. This switch is activated as soon as the cover of your system chassis is removed.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

NOTE: If the intrusion cable is missing or not connected, a notification is received in the ESM and intrusion status is not logged in the system event log.

The chassis intrusion switch detects any unauthorized access into the interior of your system and provides an indication of the same. This switch is activated as soon as the system cover is removed and access is made to the interior of your system.

The chassis intrusion switch is located on the Network Daughter Card (NDC) riser, connected to the NDC riser card. It is used to detect unauthorized access to the inside of the system. The intrusion is indicated on the Embedded Server Management (ESM) when the system cover is open.

Removing the chassis intrusion switch

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: The chassis intrusion switch is detachable from the Network Daughter Card (NDC) riser. Ensure that the switch is not removed, so that the chassis intrusions are detected.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the NDC riser.
4. Remove the NDC.

1. Press the intrusion switch and slide it out of the intrusion switch slot.
2. Disconnect the chassis intrusion switch cable connected to the NDC riser card.

NOTE: The chassis intrusion switch cable is routed though a hook on the NDC riser bracket.

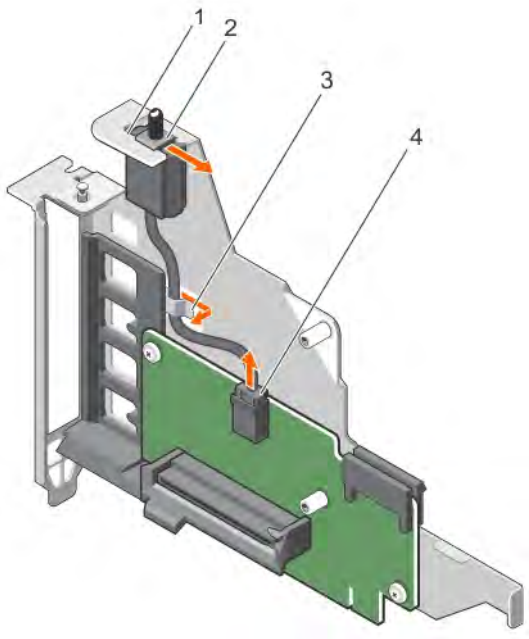

Figure 60. Removing the chassis intrusion switch

1. intrusion switch slot
2. chassis intrusion switch
3. hook on the NDC riser bracket
4. chassis intrusion switch connector

1. Install the chassis intrusion switch
2. Install the NDC.
3. Install the NDC riser.
4. Follow the procedure listed in the After working inside your system section.

.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Removing the Network Daughter Card riser on page 111
Removing the network daughter card on page 114
Installing the chassis intrusion switch on page 118
After working inside your system on page 61

Installing the chassis intrusion switch

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the NDC riser.
4. Remove the NDC.

1. Slide the chassis intrusion switch into the intrusion switch slot.
2. Connect the chassis intrusion switch cable to the connector on the Network Daughter Card (NDC) riser card.
3. Route the cable through the hook on the NDC riser bracket.

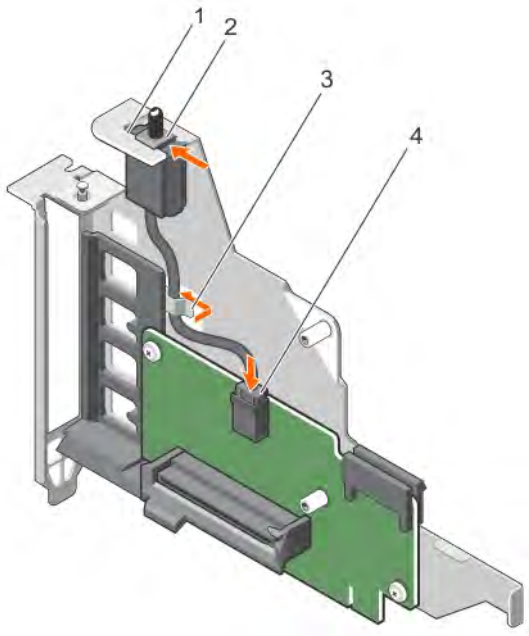

Figure 61. Installing the chassis intrusion switch

1. intrusion switch slot
2. chassis intrusion switch
3. hook on the NDC riser bracket
4. chassis intrusion switch connector

1. Install the NDC.
2. Install the NDC riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the network daughter card on page 115
Installing the Network Daughter Card riser on page 113
After working inside your system on page 61

SD vFlash card (optional)

An SD vFlash card is a Secure Digital (SD) card that plugs into the SD vFlash card slot in the iDRAC port card. It provides persistent on-demand local storage and a custom deployment environment that enables automation of server configuration, scripts, and imaging. It emulates USB device(s). For more information, see the Integrated Dell Remote Access Controller User's Guide at **Dell.com/idracmanuals**.

Removing the optional SD vFlash card

1. Follow the safety guidelines listed in the Safety instructions section.
2. Locate the SD vFlash card slot at the back of the chassis.

To remove the SD vFlash card, push the SD vFlash card inward to release it, and pull the SD vFlash card from the SD vFlash card slot.

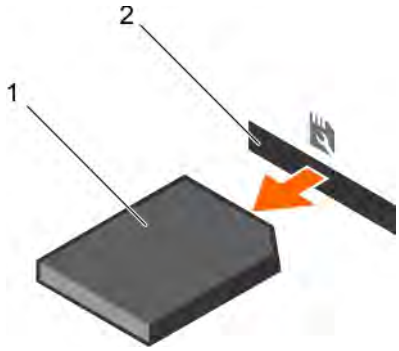

Figure 62. Removing the optional SD vFlash card

a. SD vFlash card
b. SD vFlash card slot

Internal dual SD module (optional)

The Internal Dual SD Module (IDSDM) card provides two SD card slots. This card offers the following features:

- Dual card operation — maintains a mirrored configuration by using SD cards in both the slots and provides redundancy.
  NOTE: When the **Redundancy** option is set to **Mirror Mode** in the **Integrated Devices** screen of System Setup, the information is replicated from one SD card to another.
- Single card operation — single card operation is supported, but without redundancy.

Removing an internal SD card

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: Temporarily label each SD card with its corresponding slot number before removal. Reinstall the SD card(s) into the corresponding slots.

Locate the SD card slot on the internal dual SD module, and press the card to release it from the slot.

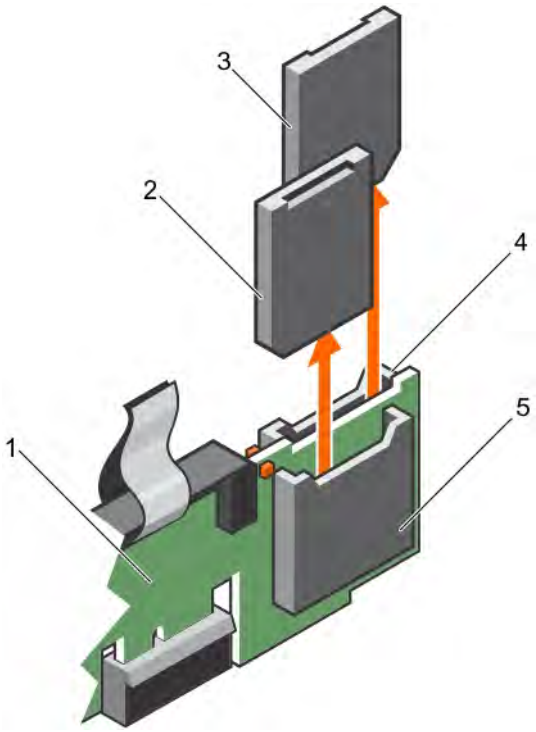

Figure 63. Removing an internal SD card

1. IDSDM
2. SD card 1
3. SD card 2
4. SD card slot 2
5. SD card slot 1

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing an internal SD card on page 120
After working inside your system on page 61

Installing an internal SD card

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: To use an SD card with your system, ensure that the **Internal SD Card Port** is enabled in System Setup.

NOTE: Temporarily label each SD card with its corresponding slot number before removal. Re-install the SD card(s) into the corresponding slots.

1. Locate the SD card connector on the internal dual SD module. Orient the SD card appropriately and insert the contact-pin end of the card into the slot.

   NOTE: The slot is keyed to ensure correct insertion of the card.

2. Press the card into the card slot to lock it into place.

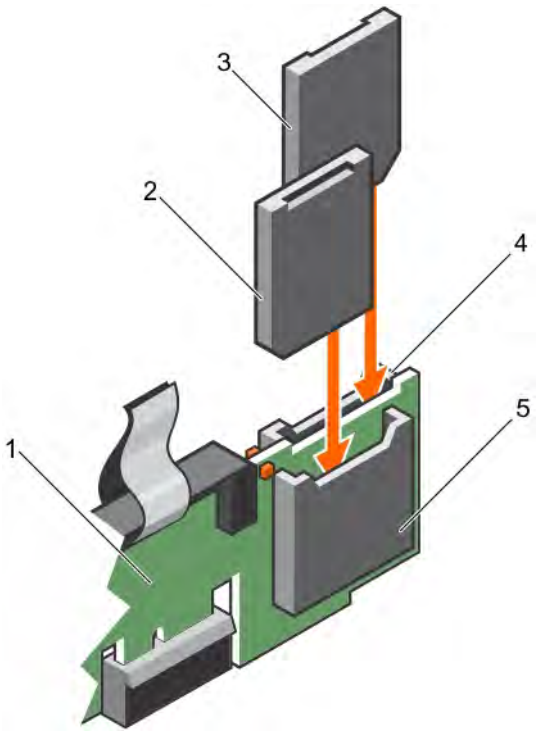

Figure 64. Installing an internal SD card

1. IDSDM
2. SD card 2
3. SD card 1
4. SD card slot 1
5. SD card slot 2

Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

After working inside your system on page 61

Removing the optional internal dual SD module

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

3. If installed, remove the SD cards.

   NOTE: Temporarily label each SD card with its corresponding slot number before removal. Reinstall the SD cards into the corresponding slots.

1. Locate the Internal Dual SD Module (IDSDM) on the Network Daughter Card (NDC) riser card.
2. Holding the pull tab, lift the IDSDM out of the system.

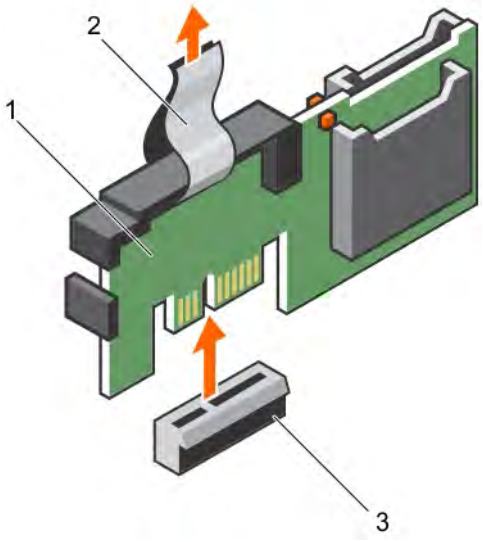

Figure 65. Removing the internal dual SD module (IDSDM)

a. IDSDM
b. pull tab
c. IDSDM connector

1. Install the IDSDM.
2. If removed, install the SD cards.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing an internal SD card on page 119
Installing the optional internal dual SD module on page 122
Installing an internal SD card on page 120
After working inside your system on page 61

Installing the optional internal dual SD module

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.

   NOTE: Temporarily label each SD card with its corresponding slot before removal.

1. Locate the internal dual SD module (IDSDM) connector on the system board. To locate the IDSDM connector, see the System board connectors section.

2. Align the IDSDM with the connector on the system board.
3. Push the IDSDM until it is firmly seated on the system board.

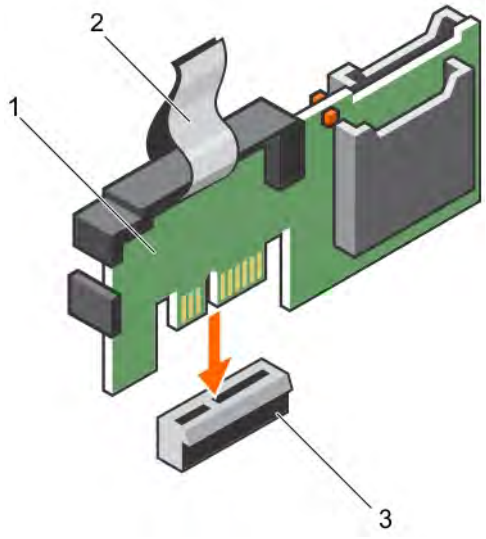

Figure 66. Installing the optional internal dual SD module

a. IDSDM
b. pull tab
c. connector

1. Install the SD cards.

   NOTE: Re-install the SD cards into the same slots based on the labels you had marked on the cards during removal.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61
System board connectors on page 183

Related tasks

Installing an internal SD card on page 120
After working inside your system on page 61

Integrated storage controller card

Your system supports both single and dual storage controller card options. Your system includes a dedicated expansion card slot on the system board for the primary integrated SAS or PERC controller card. The Integrated storage controller card provides the integrated storage subsystem for your system's internal hard drives. Install the secondary storage card must be installed in slot 8. The controller supports SAS and SATA hard drives, and also enables you to set up the hard drives in RAID configurations as supported by the version of the storage controller included with your system.

Removing the integrated storage controller card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: If applicable, remove the other PCIe cards prior to removing the storage controller card.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. If installed, remove the left expansion card riser.
4. Remove the Network Daughter Card (NDC) riser.

NOTE: The storage controller card is located next to the power supply bay, under the clamp.

1. Press and open the clamp.
2. Hold the storage controller card by its edges and lift to remove it from the connector on the system board.
3. To disconnect the SAS cables connected to the card:
   a. Press down and hold the tab on the SAS cable connector.
   b. Pull the SAS cable out of the connector.

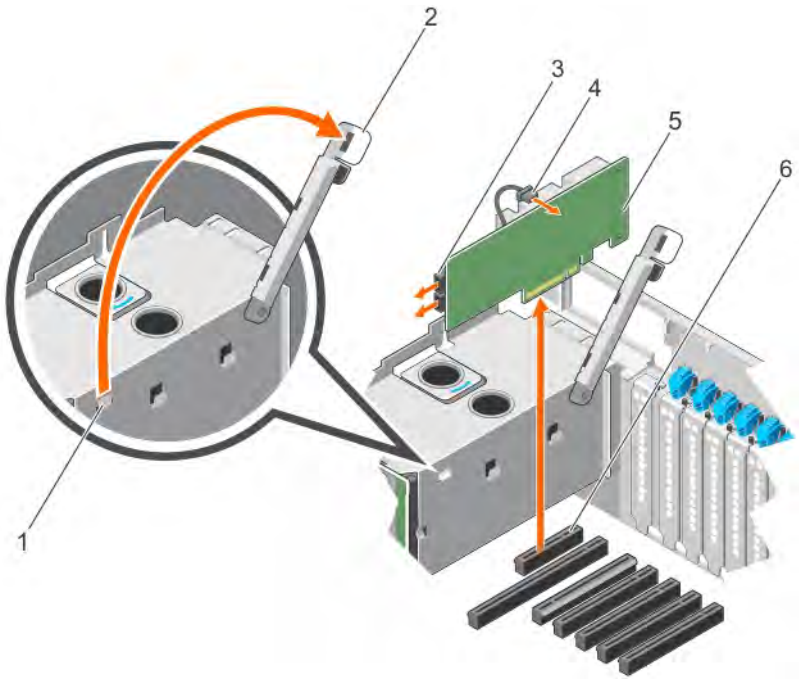

Figure 67. Removing the integrated storage controller card

1. clamp slot on the power supply bay
2. clamp
3. SAS connector
4. storage controller battery connector
5. storage controller card
6. storage controller card connector on the system board

1. Install the NDC riser.
2. If removed, install the left expansion card riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing the left or right expansion card riser on page 103
Removing the Network Daughter Card riser on page 111
Installing the integrated storage controller card on page 125
After working inside your system on page 61

Installing the integrated storage controller card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: Ensure that the storage controller card is installed carefully, so that the components on the card are not damaged.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Reconnect the SAS data cables to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

2. Hold the card by its edges, and align the card edge connector with the connector on the system board.
3. Lower the card into the system until the card is firmly seated.
4. Route the SAS data cable through the channel on the inner side of the chassis.
5. Connect the SAS cables from the storage controller card to the connectors on hard drive backplane or SAS expander card based on the hard drive configuration selected. For more information about cabling images, see the Removing the hard drive backplane section.
6. Close the clamp.

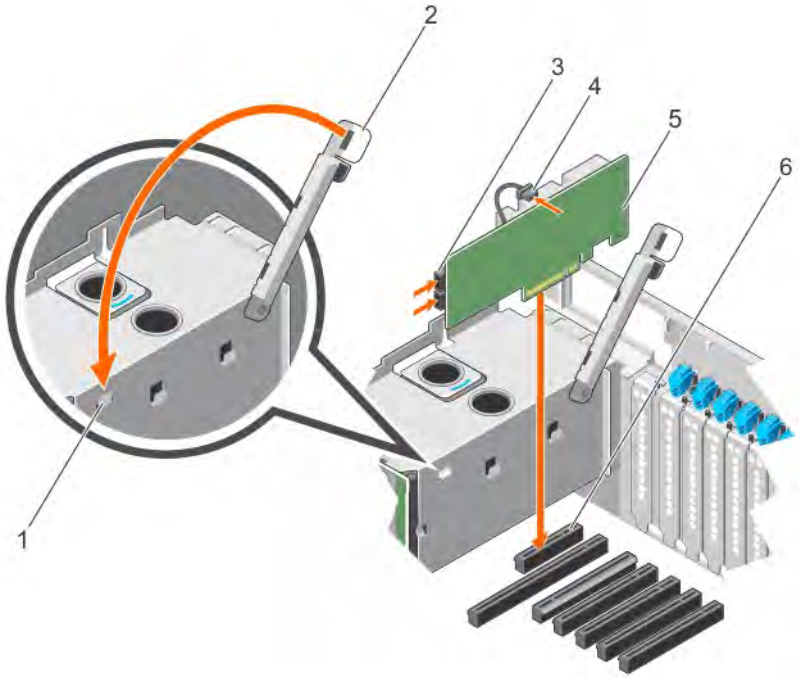

Figure 68. Installing the integrated storage controller card

1. clamp slot on the power supply bay
2. clamp
3. SAS connector
4. storage controller battery connector
5. storage controller card
6. storage controller card connector on the system board

1. Install the NDC riser.
2. If removed, install the left expansion card riser.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Before working inside your system on page 61

Related tasks

Installing the Network Daughter Card riser on page 113
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

Processors and heat sinks

Use the following procedures when:

- Removing and installing a heat sink
- Installing an additional processor
- Replacing a processor

NOTE: To ensure proper cooling, you must install a processor blank in any empty processor socket.

Removing a heat sink

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

CAUTION: Never remove the heat sink from a processor unless you intend to remove the processor. The heat sink is necessary to maintain proper thermal conditions.

NOTE: To ensure proper system cooling, you must install a processor blank and heat sink blank in any empty processor socket.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system.
3. Keep the Phillips #2 screwdriver ready.
4. Remove the following:
   a. Cooling fans
   b. Memory risers
   c. Memory riser and fan cage
   d. Cable management tray
   e. Fan tray

WARNING: The heat sink is hot to touch for some time after the system has been powered down. Allow the heat sink to cool before removing it.

1. Loosen one of the screws that secure the heat sink to the system board.
   Allow some time (approximately 30 seconds) for the heat sink to loosen from the processor.
2. Remove the screw diagonally opposite the screw you first removed.
3. Repeat the procedure for the remaining two screws.

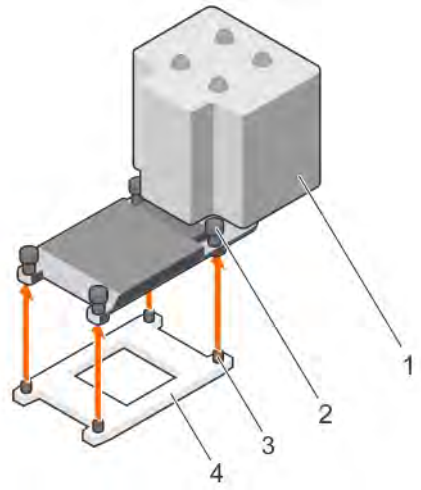

Figure 69. Removing the heat sink

1. heat sink
2. retention screws (4)
3. retention sockets (4)
4. processor shield

1. Install the heat sink.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing a cooling fan on page 82
Removing a memory riser on page 73
Removing the memory riser and fan cage on page 79
Removing the cable management tray on page 87
Removing the fan tray on page 84
Installing a processor on page 129
Installing a heat sink on page 132
After working inside your system on page 61

Removing a processor

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

NOTE: If you are upgrading your system, download the latest system BIOS version from **Dell.com/support** and follow the instructions included in the compressed download file to install the update on your system.

NOTE: You can update the system BIOS by using the Dell Lifecycle Controller.

NOTE: To ensure proper system cooling, you must install a processor blank in any empty processor socket.

1. Follow the safety guidelines listed in the Safety instructions section.

2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready.
4. Remove the heat sink.

WARNING: The processor is hot to touch for some time after the system has been powered down. Allow the processor to cool before removing it.

CAUTION: The processor is held in its socket under strong pressure. Be aware that the release lever can spring up suddenly if not firmly grasped.

1. Release the *open first* socket lever near the unlock icon by pushing the lever down and out from under the tab.
2. Release the *close first* socket release lever near the lock icon by pushing the lever down and out from under the tab. Lift the lever 90 degrees upward.
3. Lower the *open first* socket-release lever to lift the processor shield.
4. Hold the tab on the processor shield and lift the processor shield until the *open first* socket-release lever lifts up.

   CAUTION: The socket pins are fragile and can be permanently damaged. Be careful not to bend the pins in the socket when removing the processor out of the socket.

5. Lift the processor out of the socket and leave the *open first* socket-release lever up.

   NOTE: If you are permanently removing the processor, you must install a socket protective cap in the vacant socket to protect the socket pins and keep the socket free of dust.

   NOTE: After removing the processor, place it in an anti-static container for reuse, return, or temporary storage. Do not touch the bottom of the processor. Touch only the side edges of the processor.

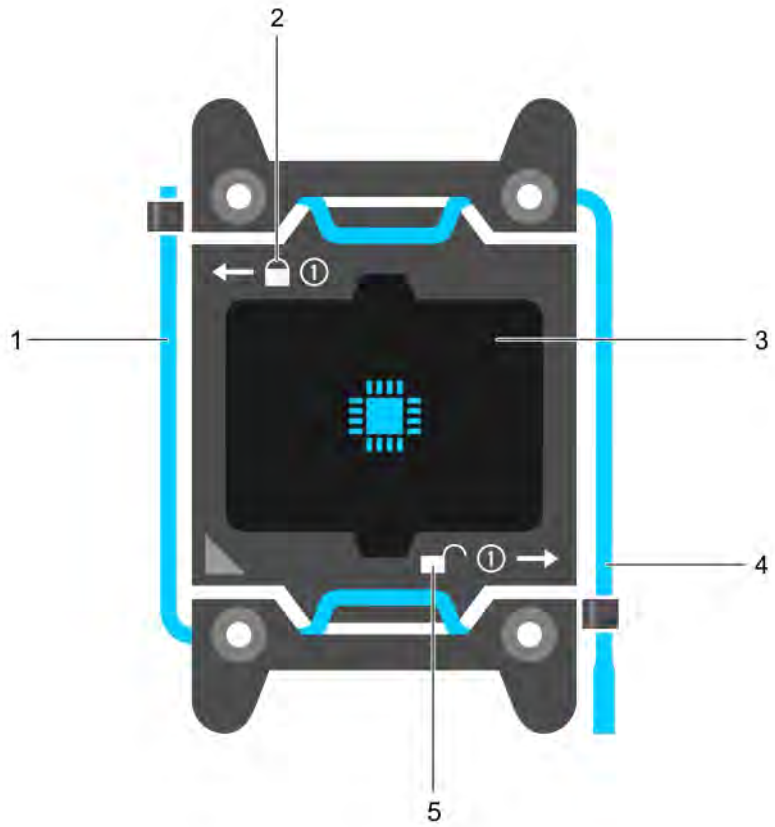

Figure 70. Processor shield

1. *close first* socket release lever
2. lock icon
3. processor
4. *open first* socket release lever

5. unlock icon

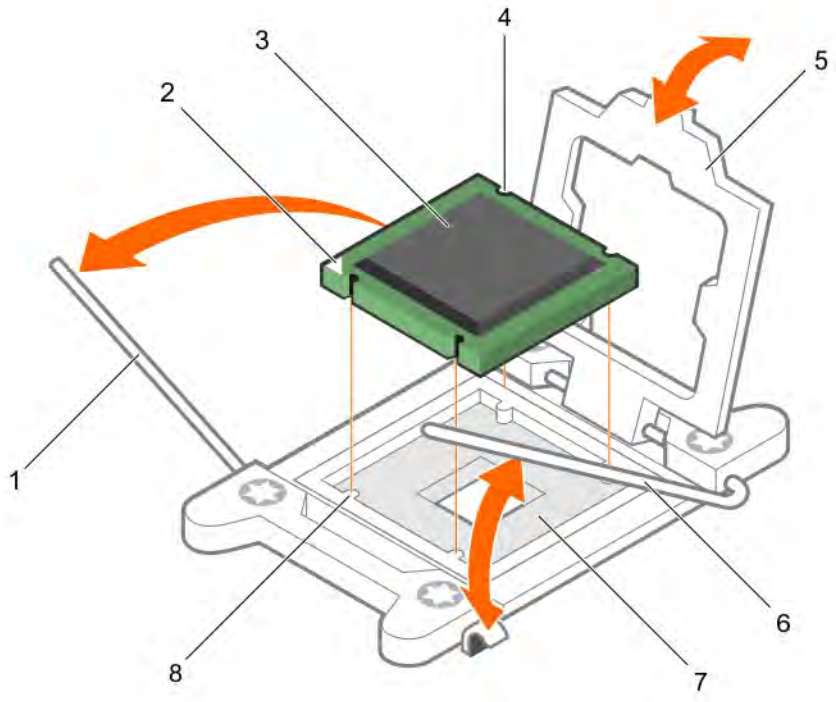

Figure 71. Removing a processor

1. *close first* socket-release lever
2. pin-1 indicator of processor
3. processor
4. slot (4)
5. processor shield
6. *open first* socket-release lever
7. socket
8. socket keys (4)

1. Replace the processor(s).
2. Install the heat sink.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing a processor on page 129
Installing a heat sink on page 132
After working inside your system on page 61

Installing a processor

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready.
4. If you are upgrading your system, download the latest system BIOS version from **Dell.com/support** and follow the instructions included in the compressed download file to install the update on your system.

   NOTE: You can also update the system BIOS by using the Dell Lifecycle Controller.
5. If connected, disconnect the cables from expansion card(s).
6. If installed, remove the expansion card riser.

NOTE: The heat sink and processor are too hot to touch for some time after the system has been powered down. Allow the heat sink and processor to cool down before handling them.

CAUTION: Never remove the heat sink from a processor unless you intend to remove the processor. The heat sink is necessary to maintain proper thermal conditions.

NOTE: If you are installing a single processor, it must be installed in socket CPU1.

1. Unpack the new processor.

   NOTE: If the processor has previously been used in a system, remove any remaining thermal grease from the processor by using a lint-free cloth.
2. Locate the processor socket.
3. If applicable, remove the socket protective cap.
4. Release the *open first* socket-release lever near the unlock icon by pushing the lever down and out from under the tab.
5. Similarly, release the *close first* socket-release lever near the lock icon by pushing the lever down and out from under the tab. Lift the lever 90 degrees upward.
6. Hold the tab near the lock symbol on the processor shield and lift it up and out of the way.

   CAUTION: Positioning the processor incorrectly can permanently damage the system board or the processor. Be careful not to bend the pins in the socket.

   CAUTION: While removing or reinstalling the processor, wipe your hands of any contaminants. Contaminants on the processor pins such as thermal grease or oil can damage the processor.
7. Align the processor with the socket keys.

   CAUTION: Do not use force to seat the processor. When the processor is positioned correctly, it engages easily into the socket.
8. Align the pin-1 indicator of the processor with the triangle on the system board.
9. Place the processor on the socket such that the slots on the processor align with the socket keys.
10. Close the processor shield.
11. Lower the *close first* socket-release lever near the lock icon and push it under the tab to lock it.
12. Similarly, lower the *open first* socket-release lever near the unlock icon and push it under the tab to lock it.

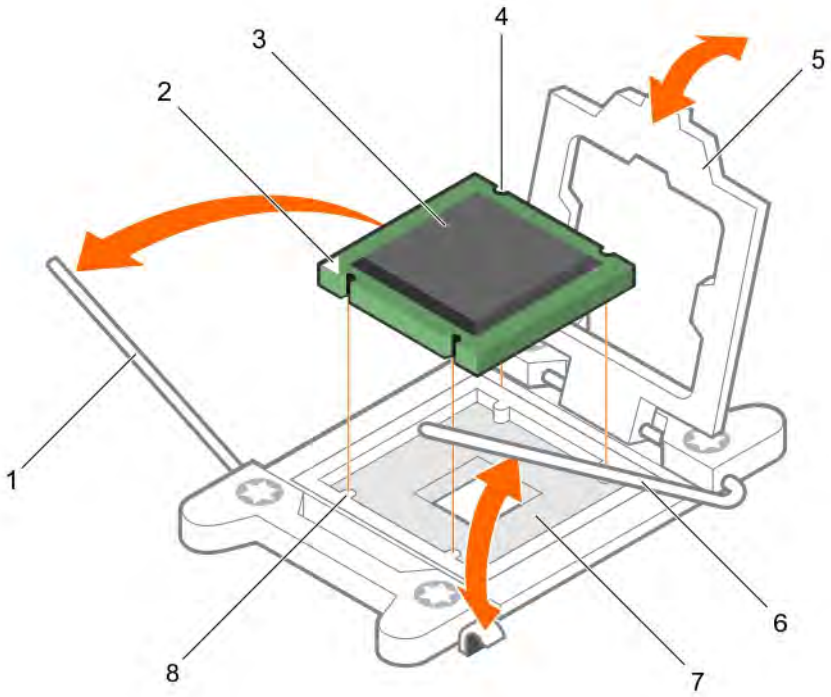

Figure 72. Installing a processor

1. socket-release lever 1
2. pin–1 corner of the processor
3. processor
4. slot (4)
5. processor shield
6. socket-release lever 2
7. processor socket
8. tab (4)

NOTE: Ensure that you install the heat sink after you install the processor. The heat sink is necessary to maintain proper thermal conditions.

1. Install the heat sink.
2. If removed, reinstall the PCIe expansion card riser.
3. If disconnected, reconnect the cables to the expansion card(s).
4. Follow the procedure listed in the After working inside your system.
5. While booting, press F2 to enter System Setup and verify that the processor information matches the new system configuration.
6. Run the system diagnostics to verify that the new processor operates correctly.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing a heat sink on page 132
After working inside your system on page 61

Installing a heat sink

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the cooling shroud.
4. Install the processor.
5. Keep the Phillips #2 screwdriver ready.

1. If you are using an existing heat sink, remove the thermal grease from the heat sink by using a clean lint-free cloth.
2. Use the thermal grease syringe included with your processor kit to apply the grease in a thin spiral on the top of the processor.

   CAUTION: Applying too much thermal grease can result in excess grease coming in contact with and contaminating the processor socket.

   NOTE: The thermal grease syringe is intended for one-time use only. Dispose of the syringe after you use it.

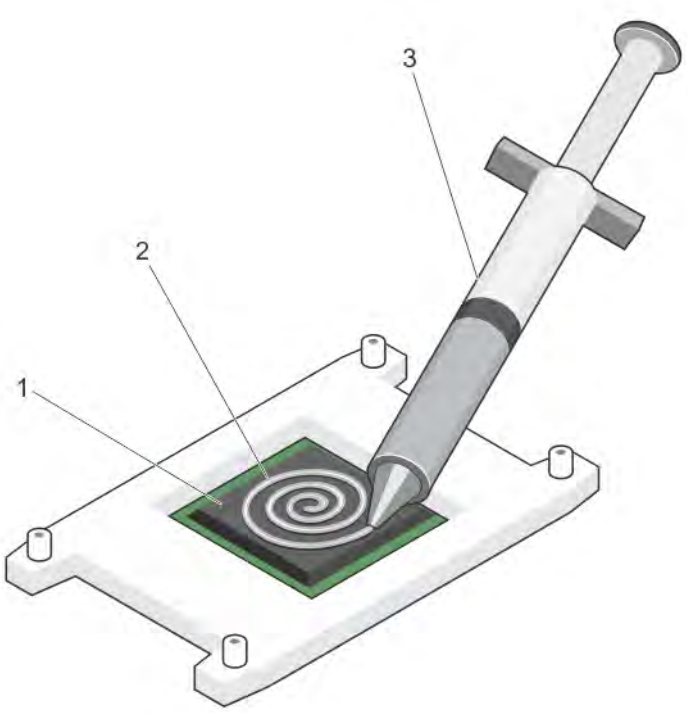

Figure 73. Applying thermal grease on the top of the processor

a. processor
b. thermal grease
c. thermal grease syringe

3. Place the heat sink onto the processor.
4. Tighten one of the four screws to secure the heat sink to the system board.
5. Repeat the procedure for the remaining two screws.

Figure 74. Installing the heat sink

a. heat sink
b. retention screw (4)
c. retention screw slot (4)
d. processor shield

1. Install the following:
   a. Fan tray
   b. Cable management tray
   c. Memory riser and fan cage
   d. Memory riser
   e. Cooling fans
2. Install the cooling shroud.
3. Follow the procedure listed in the After working inside your system section.
4. While booting, press F2 to enter System Setup and verify that the processor information matches the new system configuration.
5. Run the system diagnostics to verify that the new processor operates correctly.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing a processor on page 129
Installing the fan tray on page 85
Installing the cable management tray on page 88
Installing the memory riser and fan cage on page 81
Installing a memory riser on page 74
Installing a cooling fan on page 83
After working inside your system on page 61

Removing a processor and heat sink blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. Memory risers
   b. Cooling fans
   c. Memory riser and fan cage
   d. Cable management tray
   e. Fan tray
1. Press the release tab located at the back of the processor and heat sink blank.
2. Lift the processor and heat sink blank out of the system.

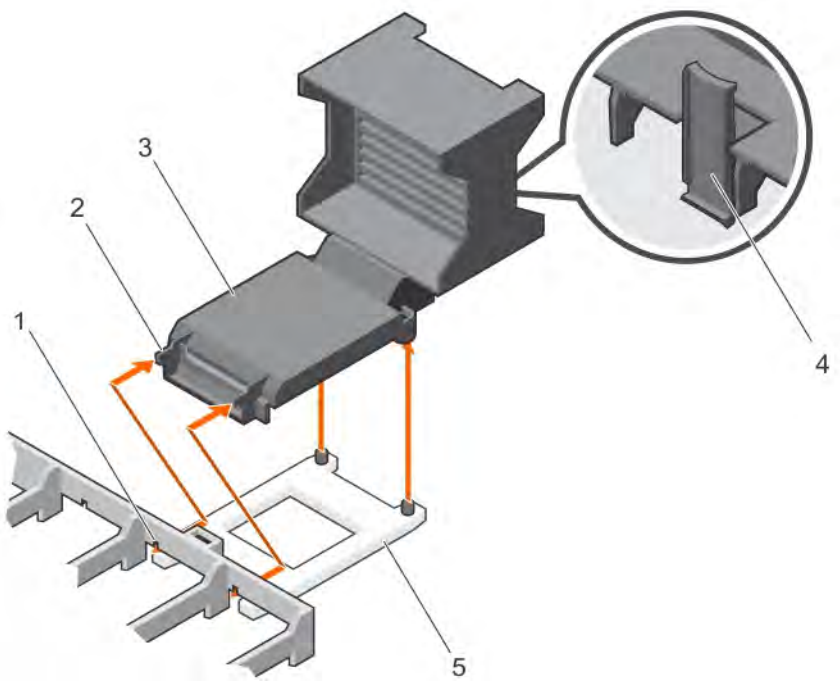

Figure 75. Removing the processor and heat sink blank

1. slot (2)
2. tab (2)
3. processor and heat sink blank
4. release tab
5. processor socket

1. Install the heat sink and processor or the heat sink processor blank
2. Install the following:
   a. Memory risers
   b. Cooling fans
   c. Memory riser and fan cage
   d. Cable management tray
   e. Fan tray
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing a memory riser on page 73
Removing a cooling fan on page 82
Removing the memory riser and fan cage on page 79
Removing the cable management tray on page 87
Removing the fan tray on page 84
Installing a processor on page 129
Installing a heat sink on page 132
Installing a processor and heat sink blank on page 135
After working inside your system on page 61

Installing a processor and heat sink blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Align the tabs on the processor and heat sink blank with the slots on the memory riser guide.
2. Orient the processor and heat sink blank such that the tabs on the processor and heat sink blank engage with the slots on the memory riser guide.
3. Lower the processor and heat sink blank into the system until the release tab clicks into place.

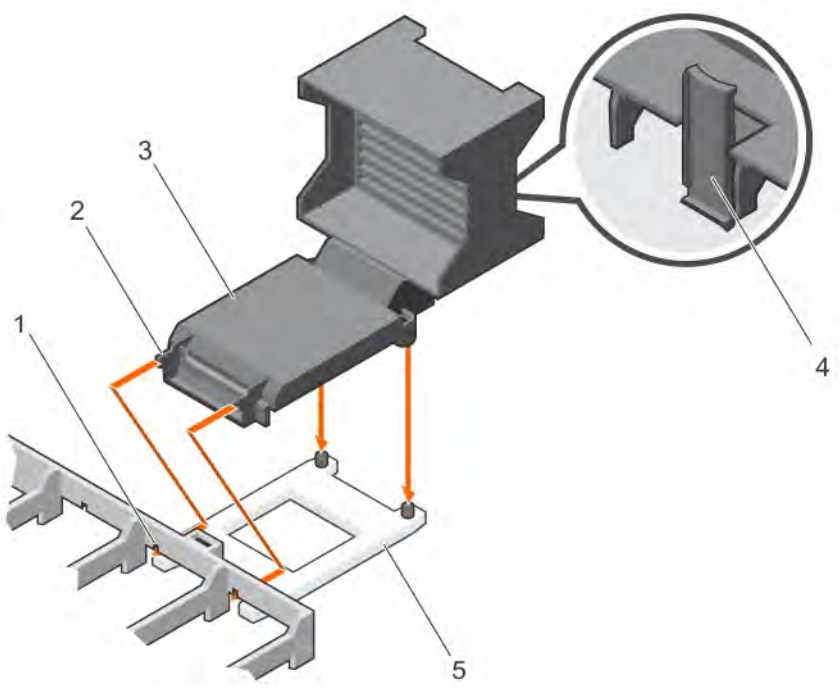

Figure 76. Installing the processor and heat sink blank

1. slot (2)
2. tab (2)
3. processor and heat sink blank
4. release tab
5. processor socket

1. Install the following:
   a. Fan tray
   b. Cable management tray
   c. Memory riser and fan cage
   d. Cooling fans
   e. Memory risers
2. Follow the procedure listen in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the fan tray on page 85

Installing the cable management tray on page 88
Installing the memory riser and fan cage on page 81
Installing a cooling fan on page 83
Installing a memory riser on page 74
After working inside your system on page 61

Power supply units

Your system supports up to four 750 W or four 1100 W AC power supply units (PSUs) that are connected to the system power distribution boards.

NOTE: When two identical PSUs are installed, the PSU configuration can be set to redundant (1 + 1) mode. In redundant mode, power is supplied to the system equally from both PSUs to maximize efficiency.

NOTE: When only one PSU is installed, the PSU configuration is non-redundant (1 + 0). Power is supplied to the system only by the single PSU.

NOTE: When four identical PSUs are installed, the PSU configuration can be set to redundant (2+2 or 3+1) mode. In redundant mode, power is supplied to the system equally from all PSUs to maximize efficiency.

NOTE: If two PSUs are used, they must be of the same type and have the same maximum output power.

NOTE: For AC PSUs, use only PSU with the Extended Power Performance (EPP) label on the back. Mixing PSUs from previous generations of servers can result in a PSU mismatch condition or failure to power on.

Hot spare feature

Your system supports the hot spare feature that significantly reduces the power overhead associated with power supply unit (PSU) redundancy.

When the hot spare feature is enabled, one of the redundant PSUs is switched to the sleep state. The active PSU supports 100 percent of the load, thus operating at higher efficiency. The PSU in the sleep state monitors output voltage of the active PSU. If the output voltage of the active PSU drops, the PSU in the sleep state returns to an active output state.

If having both PSUs active is more efficient than having one PSU in the sleep state, the active PSU can also activate the sleeping PSU.

The default PSU settings are as follows:

- If the load on the active PSU is more than 50 percent, then the redundant PSU is switched to the active state.
- If the load on the active PSU falls below 20 percent, then the redundant PSU is switched to the sleep state.

You can configure the hot spare feature by using the iDRAC settings. For more information about iDRAC settings, see the *Integrated Dell Remote Access Controller User's Guide* available at **Dell.com/idracmanuals**.

Removing an AC power supply unit

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

CAUTION: The system needs one power supply unit (PSU) for normal operation. On power-redundant systems, remove and replace only one PSU at a time in a system that is powered on.

If applicable, unlatch and lift the optional cable management arm if it interferes with the power supply unit (PSU) removal. For information about the cable management arm, see the system's rack documentation.

Follow the safety guidelines listed in the Safety instructions section.

1. Disconnect the power cable from the power source and from the PSU you intend to remove, and then remove the cables from the strap.
2. Press the release latch and slide the PSU out of the chassis by using the PSU handle.

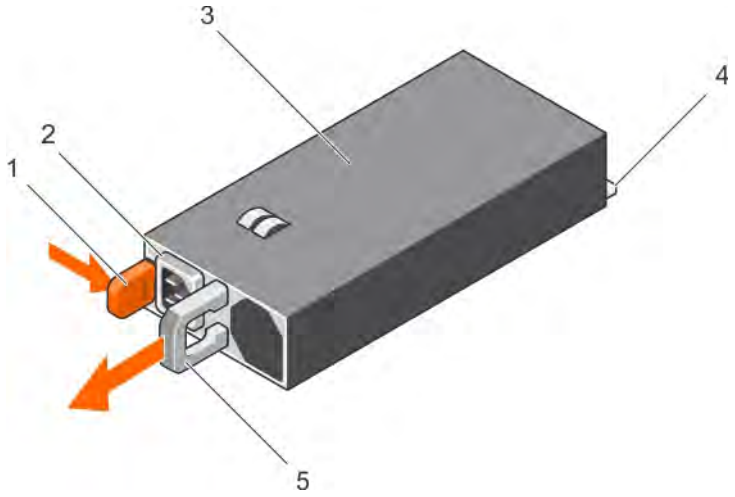

Figure 77. Removing an AC PSU

1. release latch
2. PSU cable connector
3. PSU
4. power connector
5. PSU handle

- If applicable, install the AC PSU.
- If applicable, install the PSU blank.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing an AC power supply unit on page 137
After working inside your system on page 61

Installing an AC power supply unit

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: The maximum output power (shown in watts) is listed on the PSU label.

1. Follow the safety guidelines listed in the Safety instructions section.
2. For systems that support redundant power supply units (PSUs), ensure that both the PSUs are of the same type and have the same maximum output power.
3. If installed, remove the PSU blank.
1. Slide the PSU into the chassis until the PSU is fully seated and the release latch snaps into place.
2. If applicable, relatch the cable management arm.
   For information about the cable management arm, see the rack documentation of your system.
3. Connect the power cable to the PSU, and plug the cable into a power outlet.

CAUTION: When connecting the power cable, secure the cable with the strap.

NOTE: When installing, hot swapping, or hot-adding a new PSU, wait for 15 seconds for the system to recognize the PSU and determine its status. The PSU redundancy may not occur until discovery is complete. Wait until the new PSU is

discovered and enabled before you remove the other PSU. The PSU status indicator turns green to signify that the PSU is functioning properly.

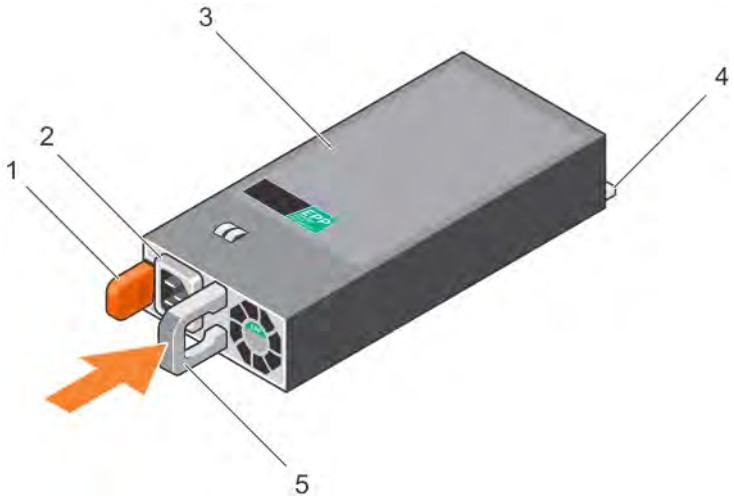

Figure 78. Installing an AC PSU

1. release latch
2. PSU cable connector
3. PSU
4. power connector
5. PSU handle

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

After working inside your system on page 61

Removing the power supply unit blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: To ensure proper system cooling, the power supply unit (PSU) blank must be installed in the second power supply bay in a non-redundant configuration. Remove the power supply blank only if you are installing a second power supply.

Follow the safety guidelines listed in the Safety instructions section.

1. Hold the PSU blank by the sides, and slide it to disengage the tabs on the PSU blank from the slots on the chassis.
2. Remove the PSU blank out of the PSU bay.

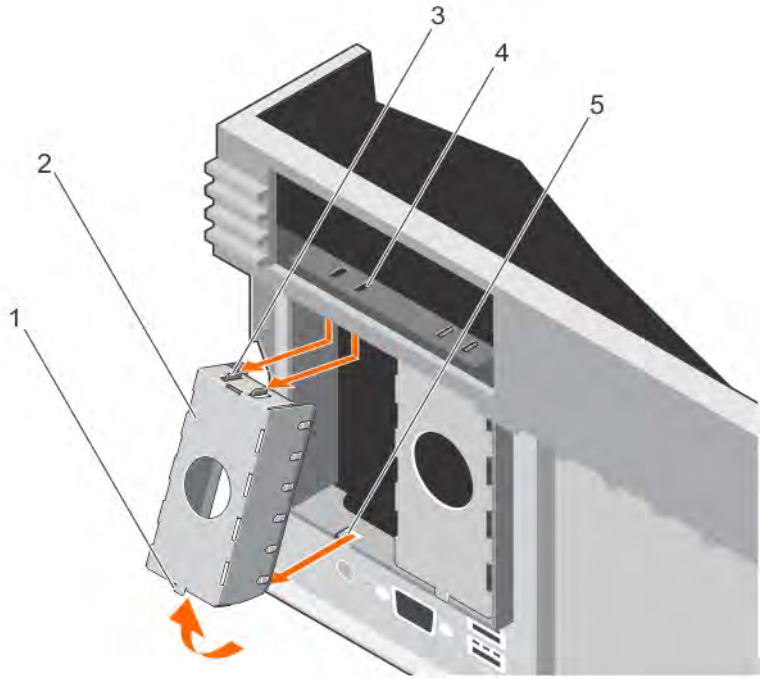

Figure 79. Removing the PSU blank

1. tab at the bottom of PSU blank
2. PSU blank
3. tab on the PSU blank (2)
4. slot on the chassis (2)
5. slot at the bottom of the chassis

Install the PSU or PSU blank.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing an AC power supply unit on page 137
Installing the power supply unit blank on page 139
After working inside your system on page 61

Installing the power supply unit blank

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: Install the power supply unit (PSU) blank only in the second PSU bay.

Follow the safety guidelines listed in the Safety instructions section.

1. Align the tabs on the PSU blank with the slots on the chassis.
2. Insert the top of the PSU blank into the PSU bay first, and then the bottom.
   Ensure that the tabs on the PSU blank engage with the slots on the chassis.

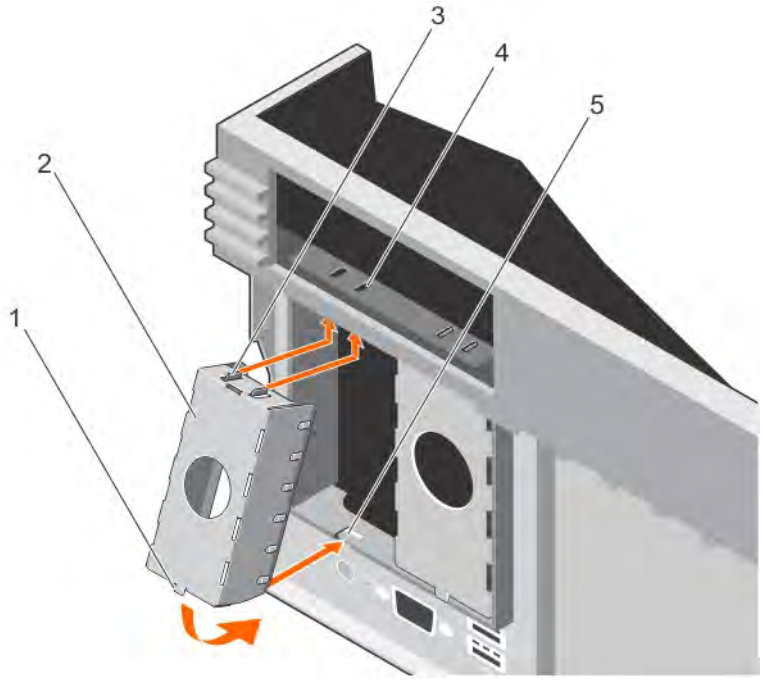

Figure 80. Installing the PSU blank

1. tab at the bottom of PSU blank
2. PSU blank
3. tab on the PSU blank (2)
4. slot on the chassis (2)
5. slot at the bottom of the chassis

Power distribution board

Your system supports two Power Distribution Boards (PDBs) connected to the system board. PDBs are located on the left and right sides of the system and supports AC power supply for your system.

Removing the power supply unit bay

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. AC PSU or power supply unit (PSU) blanks, if installed
   b. Expansion card risers, if installed
   c. Storage controller card for the left PSU bay

1. Using your index finger and thumb press the spring latch on the PSU bay, and pull it until:
   a. The slots on the PSU bay disengage from the tabs on the chassis.
   b. The connector on the Power Distribution Board (PDB) disengages from the connector on the system board.
2. Lift the power supply bay away from the system.

   Follow the same procedure for the removal of other power supply bay in the system.

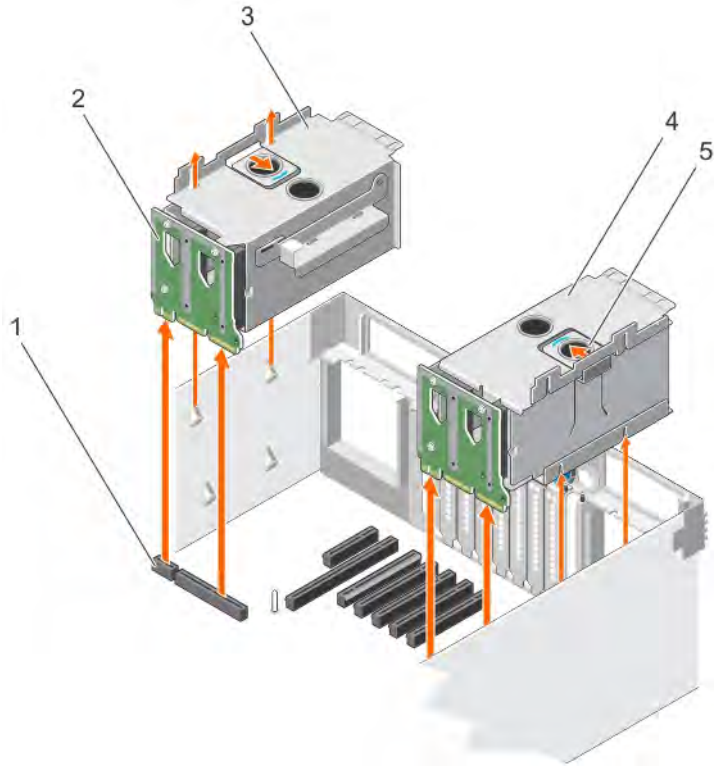

Figure 81. Removing the PSU bay

1. connector on the system board
2. PDB
3. left power supply bay
4. right power supply bay
5. spring latch

1. Install the PSU bay.
2. Install the following:
   a. AC PSU or power supply unit (PSU) blanks, if installed
   b. Expansion card risers, if installed
   c. Storage controller card for the left PSU bay
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing an AC power supply unit on page 136
Removing the power supply unit blank on page 138
Removing the left or right expansion card riser on page 103
Removing the integrated storage controller card on page 123
Installing the power supply unit bay on page 141
After working inside your system on page 61

Installing the power supply unit bay

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Orient the power supply unit (PSU) bay to the side of the chassis.
2. Align the following:
   a. Four slots on the PSU bay with the hooks on the side of the chassis.
   a. Connector on the power distribution board (PDB) with the connector on the system board.
3. Press the PSU bay until it clicks into place.

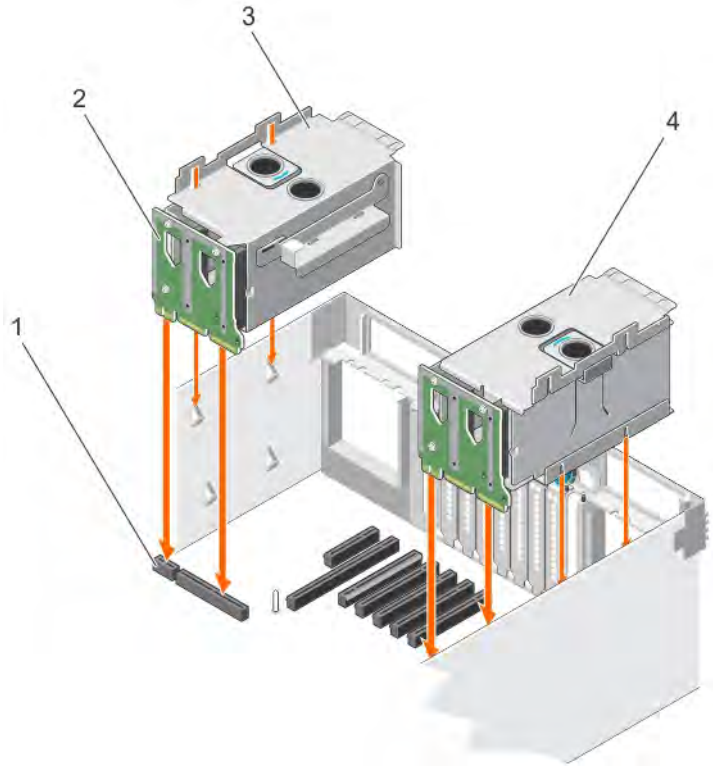

Figure 82. Installing the PSU bay

1. connector on the system board
2. PDB
3. left power supply bay
4. right power supply bay

1. Install the following:
   a. Storage controller card for the left power supply bay
   b. Expansion card risers, if removed
2. Install the AC PSU or PSU blanks.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the integrated storage controller card on page 125
Installing the left or right expansion card riser on page 104
Installing an AC power supply unit on page 137
Installing the power supply unit blank on page 139
After working inside your system on page 61

Removing the power distribution board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready
4. Remove the following:
   a. Expansion card risers, if installed
   b. Storage controller card
   c. AC power supply unit (PSU) or PSU blank, if installed
   d. PSU bay

   NOTE: The Power Distribution Boards (PDBs) are located toward the back of the PSU bay.

1. Remove the screws securing the PDB to the PSU bay.
2. Remove the PDB from the PSU bay.

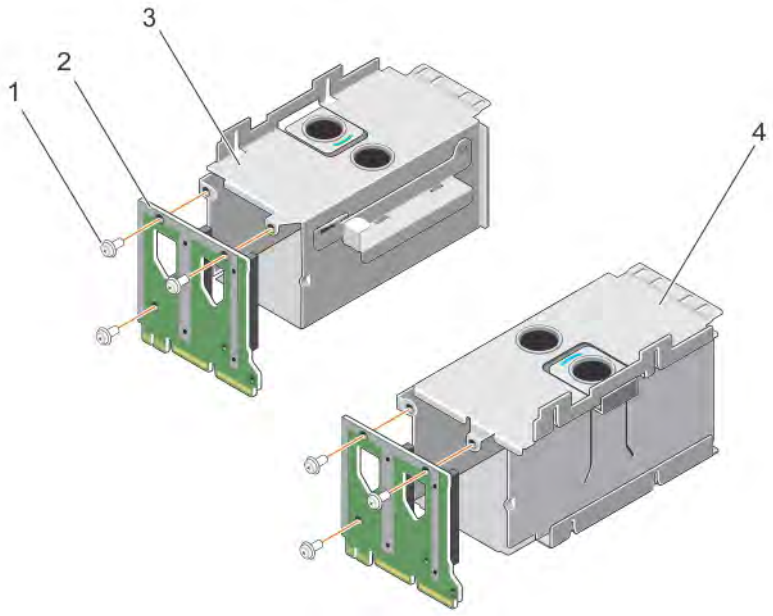

Figure 83. Removing the power distribution board

1. screw (3)
2. PDB
3. left PSU bay
4. right PSU bay

1. Install the PDB.
2. Install the following:
   a. Expansion card risers, if installed
   b. Storage controller card
   c. AC power supply unit (PSU) or PSU blank, if installed
   d. PSU bay
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60

Related tasks

Removing the left or right expansion card riser on page 103
Removing the integrated storage controller card on page 123
Removing an AC power supply unit on page 136
Removing the power supply unit blank on page 138
Removing the power supply unit bay on page 140
Installing the power distribution board on page 144
After working inside your system on page 61

Installing the power distribution board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready.
4. Unpack the replacement power distribution board (PDB).

1. Align the screw holes on the PDB with the holes on the power supply unit (PSU) bay.
2. Tighten the screws to secure the PDB to the PSU bay.

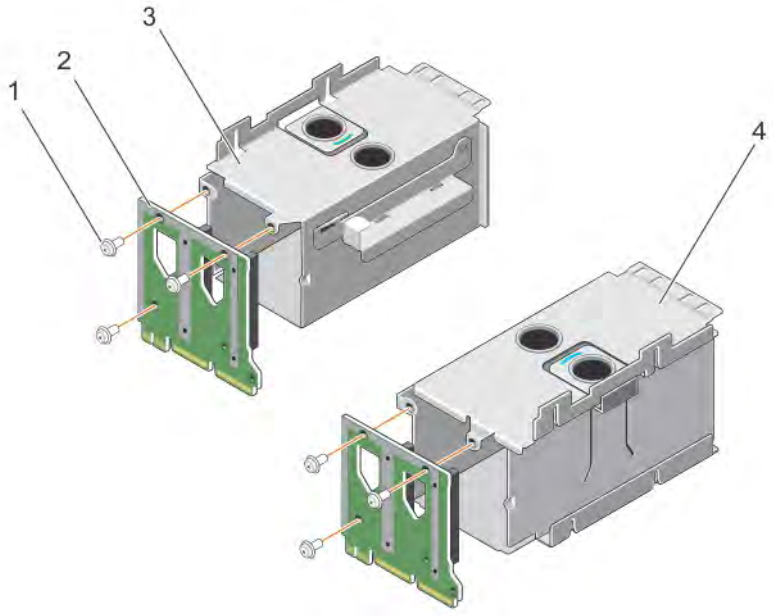

Figure 84. Installing the power distribution board

1. screw (3)
2. PDB
3. left PSU bay
4. right PSU bay

1. Install the following:
   a. PSU bay
   b. AC PSU or PSU blank, if installed
   c. Storage controller card
   d. Expansion card risers, if installed
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the power supply unit bay on page 141
Installing an AC power supply unit on page 137
Installing the power supply unit blank on page 139
Installing the integrated storage controller card on page 125
Installing the left or right expansion card riser on page 104
After working inside your system on page 61

System battery

The system battery is used to power the real-time clock and storing the BIOS settings of the system.

Replacing the system battery

NOTE: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. For more information, see the safety information that shipped with your system.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the cooling shroud.
1. Locate the battery socket. For more information, see the Jumpers and connectors section.

   CAUTION: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

2. Place your finger between the securing tabs at the negative side of the battery connector, and lift the battery out of the socket.

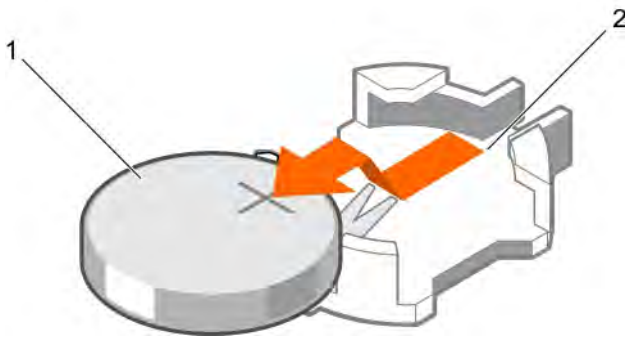

Figure 85. Removing the system battery

a. system battery
b. system battery slot

3. To install a new system battery, hold the battery with the "+" facing up and slide it under the securing tabs.
4. Press the battery into the connector until it snaps into place.

Figure 86. Installing the system battery

a. system battery
b. system battery slot

1. Install the cooling shroud.
2. Follow the procedure listed in the After working inside your system section.
3. While booting, press F2 to enter System Setup and ensure the battery is operating properly.
4. Enter the correct time and date in the System Setup **Time** and **Date** fields.
5. Exit System Setup.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing the power supply unit bay on page 140
Installing the power supply unit bay on page 141
After working inside your system on page 61

Hard drive backplane

Depending on the configuration, your system supports the following backplanes:

- 2.5 inch (x4) SAS/SATA backplane
- 2.5 inch (x24) SAS/SATA backplane
- 2.5 inch (x16) SAS/SATA backplane plus 2.5 inch (x8) Dell PowerEdge Express Flash (PCIe SSD) backplane

Removing the hard drive backplane

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. If installed, remove the front bezel.

   CAUTION: To prevent damage to the drives and backplane, you must remove the hard drives from the system before removing the backplane.

   CAUTION: You must note the number of each hard drive and temporarily label them before removal so that you can replace them in the same locations.
4. Remove the following:
   a. Hard drives
   b. Memory risers

c. Cooling fans
d. Memory riser and fan cage
e. SAS expander daughter card

NOTE: Not applicable for the 2.5 inch (x4) SAS/SATA backplane configuration.

5. Disconnect the SAS/SATA/SSD data, signal, and power cables from the backplane and system board.
1. Push the release tabs in the direction of the arrow.
2. Lift the backplane away from the system until the hooks and slots on the backplane disengage from the hooks and slots on the chassis.

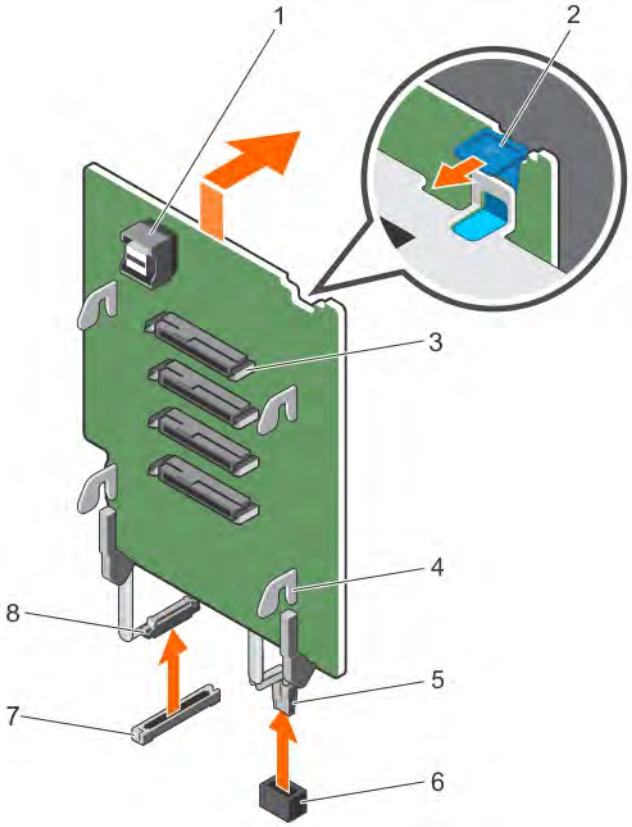

Figure 87. Removing the 2.5 inch (x4) SAS/SATA backplane

1. SAS connector
2. release tab (2)
3. hard drive connector (4)
4. backplane hook (4)
5. guide
6. backplane power cable
7. power connector on the system board
8. memory riser guide

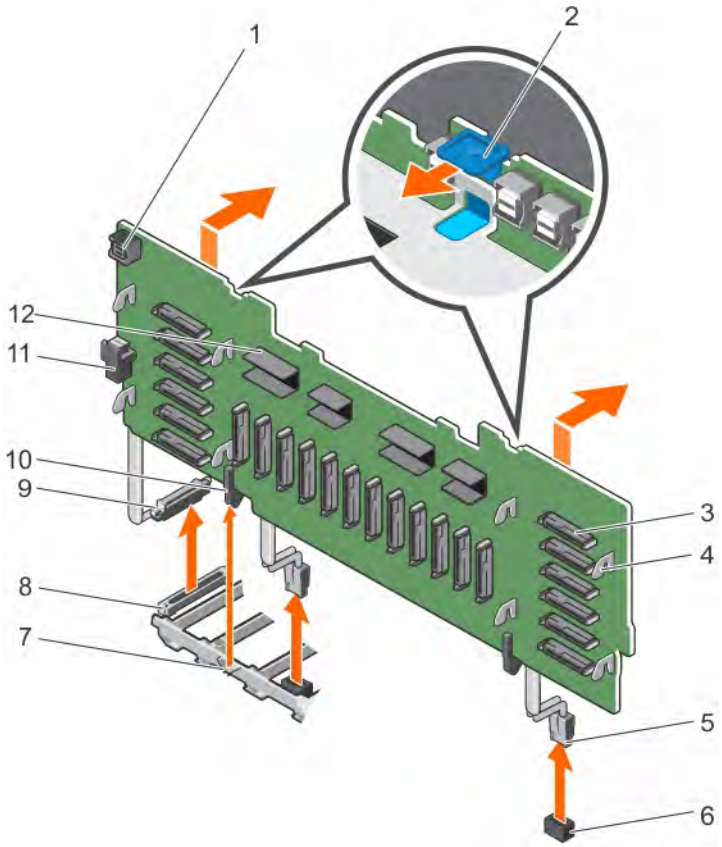

Figure 88. Removing the 2.5 inch (x24) SAS/SATA backplane

1. backplane jumper connector for the expander daughter card
2. release tab (2)
3. hard drive connector (24)
4. backplane hook (8)
5. backplane power cable (2)
6. power connector on the system board (2)
7. memory riser guide
8. miscellaneous signal connector on the system board
9. backplane miscellaneous signal cable
10. guide
11. backplane jumper connector
12. expander connector

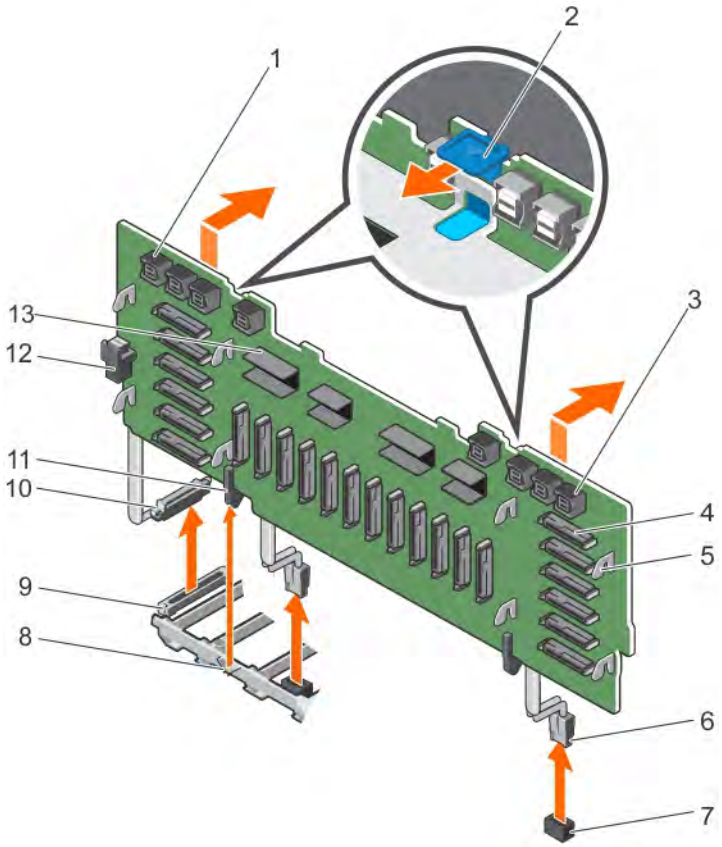

Figure 89. Removing the 2.5 Inch (x24) SAS/SATA plus (x8) PCIe SSD backplane

1. primary PCIe SSD extender mini-SAS HD connector (4)
2. release tab (2)
3. secondary PCIe SSD extender mini-SAS HD connector (4)
4. hard drive connector (24)
5. backplane hook (8)
6. backplane power cable (2)
7. power connector on the system board (2)
8. memory riser guide
9. miscellaneous signal connector on the system board
10. backplane miscellaneous signal cable
11. guide
12. backplane jumper connector
13. expander connector

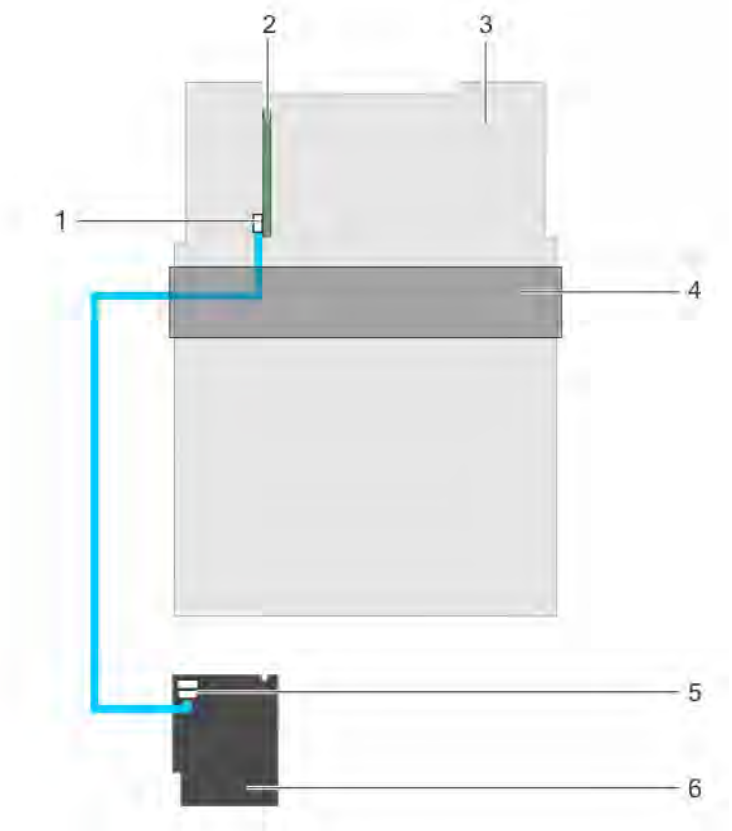

Figure 90. Cabling—2.5 inch (x4) SAS/SATA backplane with PERC 9

1. SAS cable connector on the integrated storage controller card
2. integrated storage controller card (PERC 9)
3. system board
4. cable management tray
5. SAS connector on the backplane
6. x4 hard drive backplane

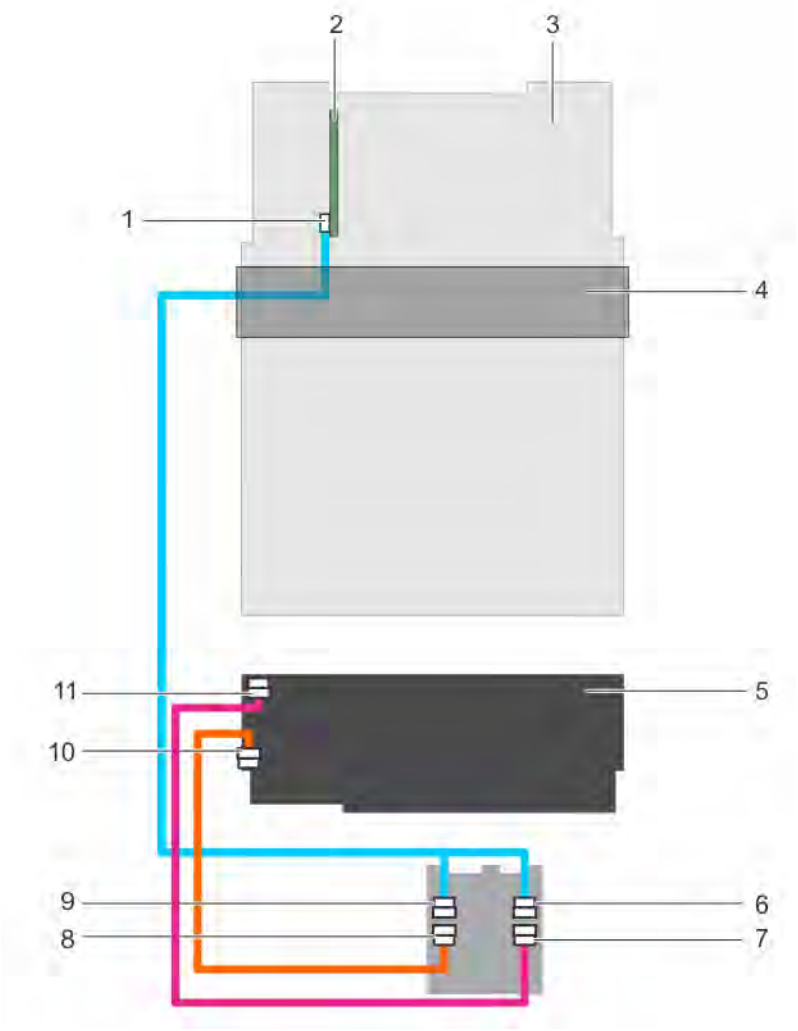

Figure 91. Cabling—2.5 inch (x24) SAS/SATA backplane with PERC 9

1. SAS (A and B) cable connector on the integrated storage controller card
2. integrated storage controller card (PERC 9)
3. system board
4. cable management tray
5. x24 hard drive backplane
6. SAS B cable connector on the expander daughter card
7. backplane jumper cable connector on the expander daughter card
8. SAS jumper cable connector on the expander daughter card
9. SAS A cable connector on the expander daughter card
10. SAS jumper cable connector on the backplane
11. backplane jumper cable connector on the backplane

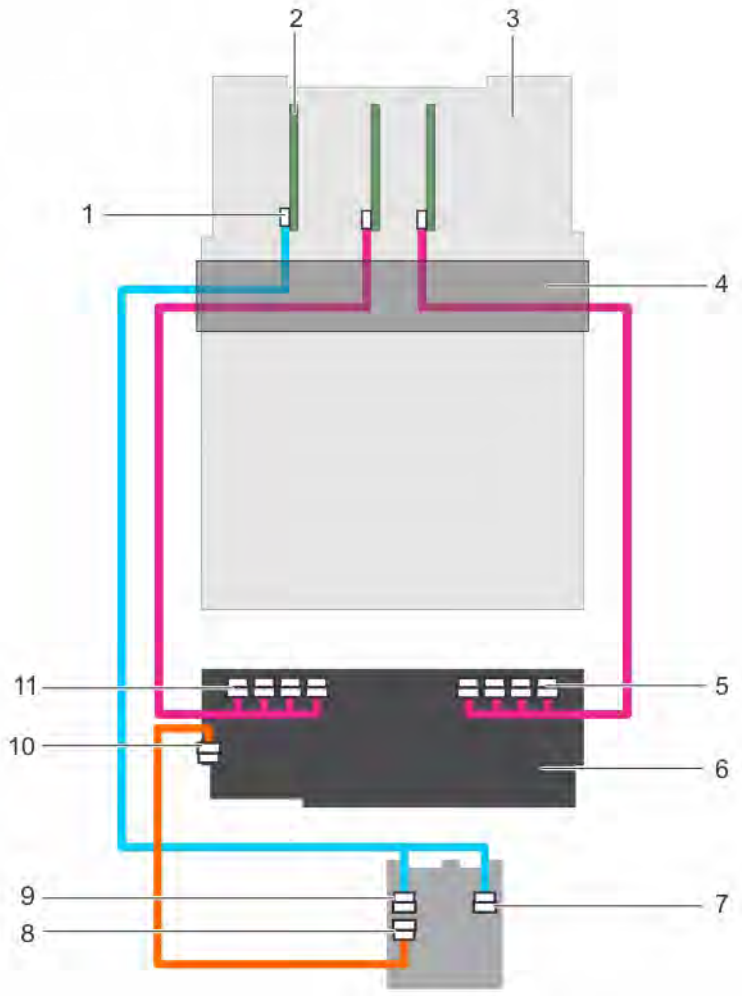

Figure 92. Cabling—2.5 inch (x24) SAS/SATA plus (x8) PCIe SSD backplane (left and right side)

1. SAS (A&B) cable connector on the integrated storage controller card
2. integrated storage controller card (PERC 9)
3. system board
4. cable management tray
5. secondary PCIe SSD extender mini-SAS HD connector (A to D)
6. 2.5 inch (24x) SAS/SATA plus (x8) PCIe SSD backplane
7. SAS B cable connector on the expander daughter card
8. SAS jumper cable connector on the expander daughter card
9. SAS A cable connector on the expander daughter card
10. SAS jumper cable connector on the backplane
11. primary PCIe SSD extender mini-SAS HD connector (A to D)

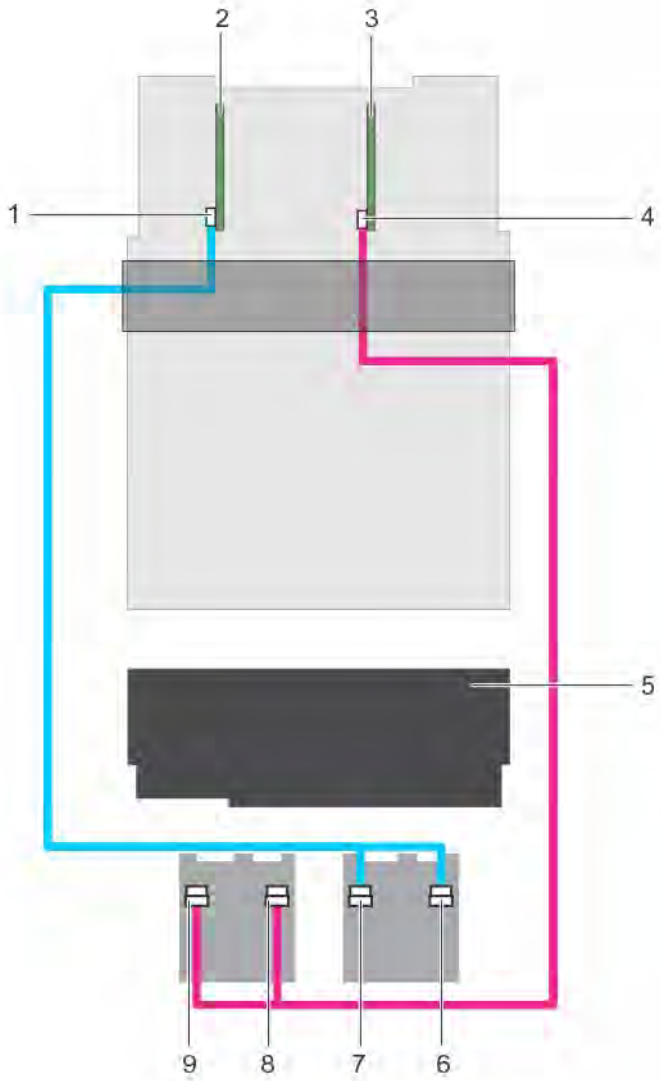

Figure 93. Cabling— x24 backplane with dual PERC and dual SAS expander cards

1. SAS cable connector on the primary integrated storage controller card
2. integrated storage controller card (primary card)
3. integrated storage controller card (secondary card)
4. SAS cable connector on the secondary integrated storage controller card
5. x24 hard drive backplane
6. primary daughter card SAS B connector
7. primary daughter card SAS A connector
8. secondary daughter card SAS B connector
9. secondary daughter card SAS A connector

1. Install the hard drive backplane.
2. If removed, install the front bezel.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing the optional front bezel on page 62
Removing a hot swappable hard drive carrier on page 93

Removing a memory riser on page 73
Removing a cooling fan on page 82
Removing the memory riser and fan cage on page 79
Removing the SAS expander daughter card on page 158
Installing the hard drive backplane on page 154
After working inside your system on page 61

Installing the hard drive backplane

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Remove the following:
   a. Hard drives
   b. Memory risers
   c. Cooling fans
   d. Memory riser and fan cage
   e. SAS expander daughter card

   NOTE: Not applicable for the 2.5 inch (x4) SAS/SATA backplane configuration.

1. Align the following:
   a. Black guide on the hard drive backplane with the memory riser guide.
   b. Hooks and slots on the hard drive backplane with the hooks and slots on the chassis.
2. Lower the backplane into the system until the hooks and slots on the backplane engage with the hooks and slots on the chassis.

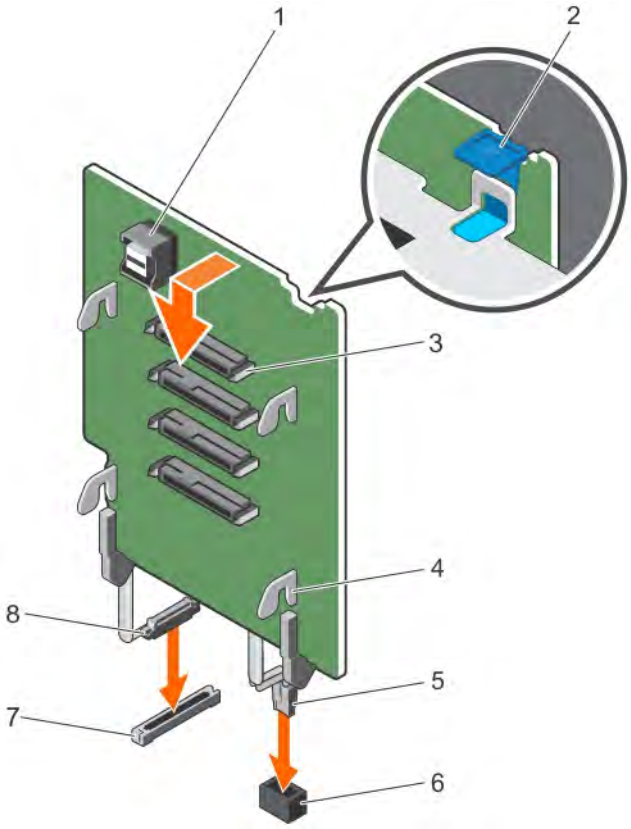

Figure 94. Installing the 2.5 inch (x4) SAS/SATA backplane

1. SAS connector
2. release tab (2)
3. hard drive connector (4)
4. backplane hook (4)
5. guide
6. backplane power cable
7. power connector on the system board
8. memory riser guide

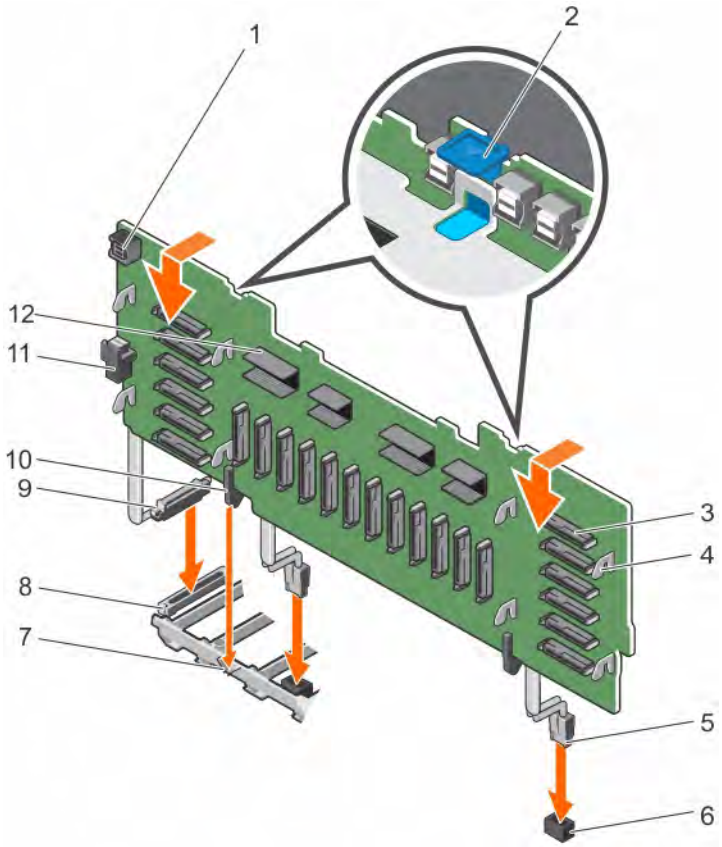

Figure 95. Installing the 2.5 inch (x24) SAS/SATA backplane

1. backplane jumper connector for the expander daughter card
2. release tab (2)
3. hard drive connector (24)
4. backplane hook (8)
5. backplane power cable (2)
6. power connector on the system board (2)
7. memory riser guide
8. miscellaneous signal connector on the system board
9. backplane miscellaneous signal cable
10. guide
11. backplane jumper connector
12. expander connector

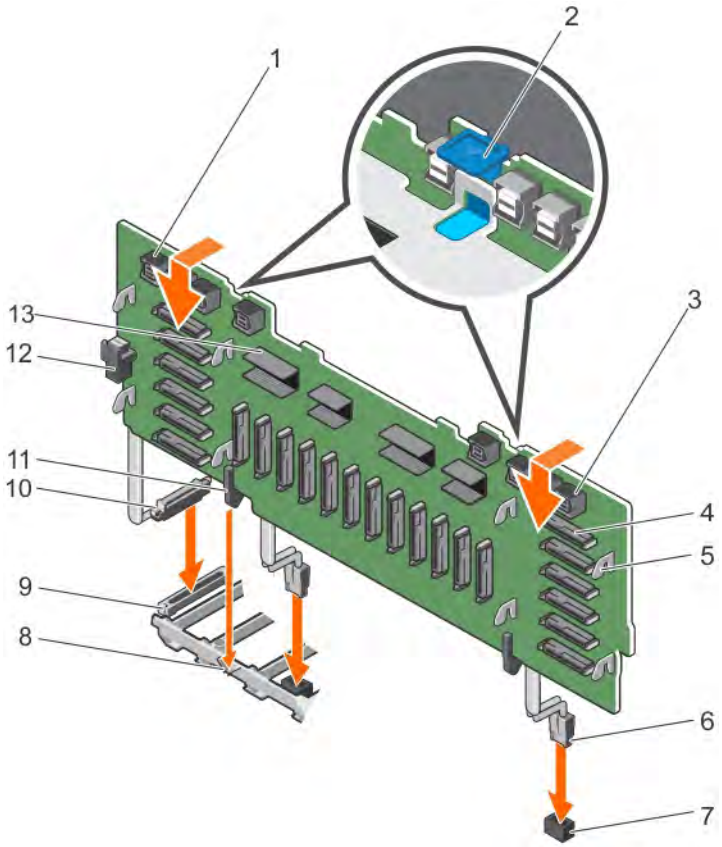

Figure 96. Installing the 2.5 Inch (x24) SAS/SATA plus (x8) PCIe SSD backplane

1. primary PCIe SSD extender mini-SAS HD connector (4)
2. release tab (2)
3. secondary PCIe SSD extender mini-SAS HD connector (4)
4. hard drive connector (24)
5. backplane hook (8)
6. backplane power cable (2)
7. power connector on the system board (2)
8. memory riser guide
9. miscellaneous signal connector on the system board
10. backplane miscellaneous signal cable
11. guide
12. backplane jumper connector
13. expander connector

1. Reconnect the SAS/SATA/PCIe SSD data, signal, and power cables to the backplane and system board.
2. Route the control panel/USB cable, PERC card cable, and PCIe SSD cables along the left side of the chassis wall.
3. Route the PERC card cable first, and then the PCIe SSD cables along the right side of the chassis wall.
4. Install the following:
   a. SAS expander daughter card
   b. Memory riser and fan cage
   c. Cooling fans
   d. Memory risers or memory riser blank, as applicable
   e. Hard drives
   f. Front bezel, if removed
5. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the SAS expander daughter card on page 159
Installing the memory riser and fan cage on page 81

Installing a cooling fan on page 83
Installing a memory riser on page 74
Installing a hot swappable hard drive carrier on page 93
Installing the optional front bezel on page 62
After working inside your system on page 61

SAS expander daughter card

The systems storage uses SAS expander daughter card to facilitate:

- Transition of SAS technology from 6 Gbps to 12 Gbps
- Maximize the hard disk drive space
- Provide the configuration flexibility and cabling and signalling issues of the system

The daughter card uses LSI expander chips that support:

- Up to 12 Gbps SAS
- Up to 6 Gbps SAS and SATA
- Serial SCSI Protocol (SSP)
- Spanning-Tree Protocol (STP)
- Simple Management Protocol (SMP) and their communication with the RAID controllers.

NOTE: The SAS expander daughter card tray supports up to two daughter cards (depending on the system configuration).

Removing the SAS expander daughter card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Disconnect the SAS cables connected to the SAS expander daughter card and hard drive backplane.
1. Push the release tabs up to release the SAS expander daughter card.

   The SAS expander daughter card slides out disengaging itself from the backplane slots, towards the front of the system.
2. Pull the SAS expander daughter card out of the system.

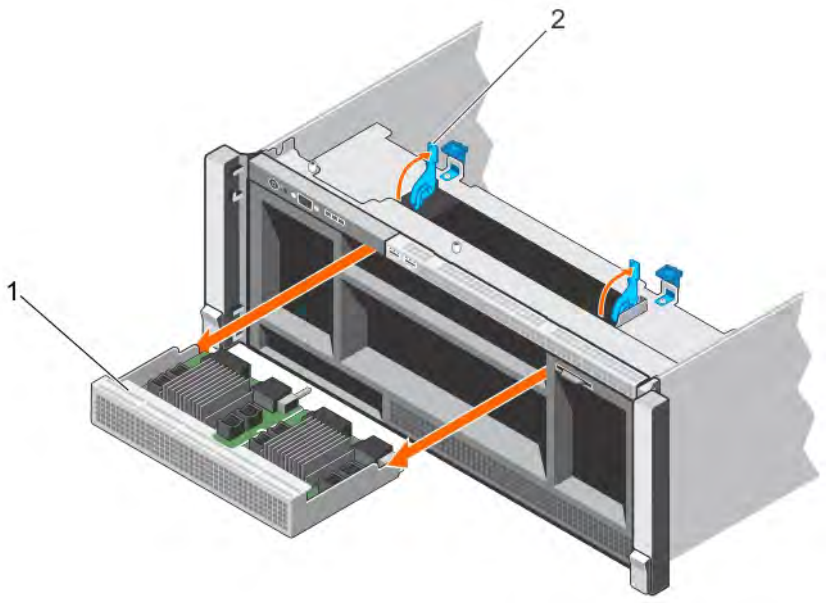

Figure 97. Removing the SAS expander daughter card

a. SAS expander daughter card
b. release tab (2)

1. Install the SAS expander daughter card.
2. Reconnect the SAS cables connected to the SAS expander daughter card and hard drive backplane.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the SAS expander daughter card on page 159
After working inside your system on page 61

Installing the SAS expander daughter card

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
1. Open the release tabs, and insert the SAS expander daughter card into the slot in the front of the system.
2. Push the SAS expander daughter card into the system until the release tabs click into place.

   NOTE: Ensure that the SAS expander daughter card pins engage with the slots on the backplane.

3. Press the release tabs to lock the SAS expander daughter card in place.

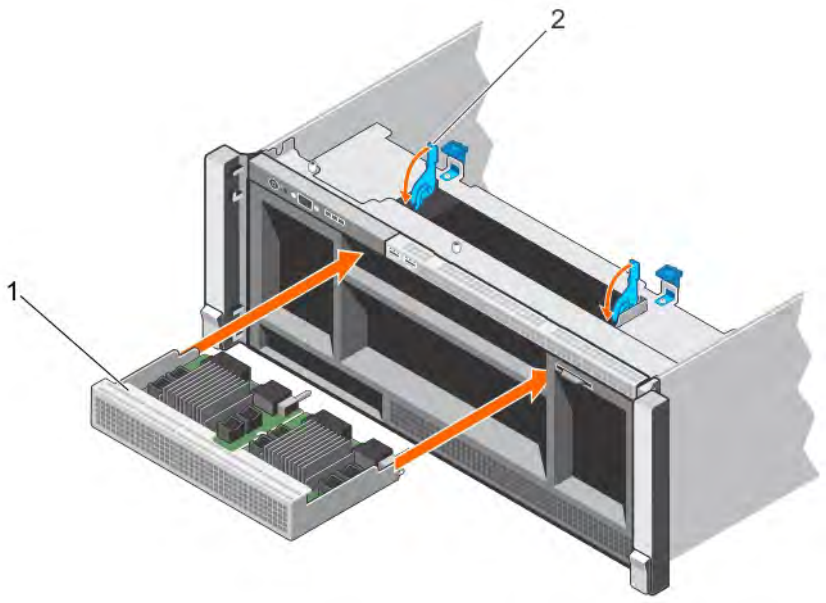

Figure 98. Installing the SAS expander daughter card

a. SAS expander daughter card
b. release tab (2)

1. Reconnect the SAS cables connected to the SAS expander daughter card and hard drive backplane.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

After working inside your system on page 61

Control panel

The control panel contains the power button, the diagnostic indicators, and the front USB ports.

Removing the control panel board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready.
4. Disconnect the cables connected to the control panel board.

NOTE: Note the routing of the cables on the side of the system as you remove them from the control panel board. You must route these cables properly when you replace them inside the shim stock pieces to prevent them from being pinched or crimped.

1. Remove the screws that secure the control panel board to the chassis.
2. Slide the control panel board toward the back of the system, and remove the control panel board away from the system.

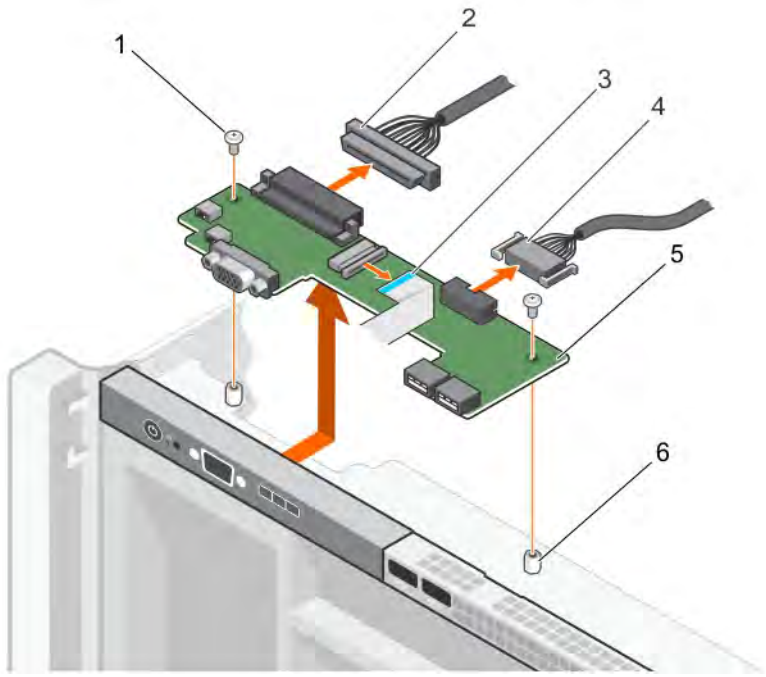

Figure 99. Removing the control panel board

1. screw (2)
2. control panel connector cable
3. display module cable
4. USB connector cable
5. control panel board
6. standoff (2)

1. Install the control panel board.
2. Reconnect all the cables to the control panel board.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Installing the control panel board on page 161
After working inside your system on page 61

Installing the control panel board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Keep the Phillips #2 screwdriver ready.

1. Align the screw holes on the control panel board with the holes on the chassis.
2. Tighten the screws that secure the control panel board to the chassis.

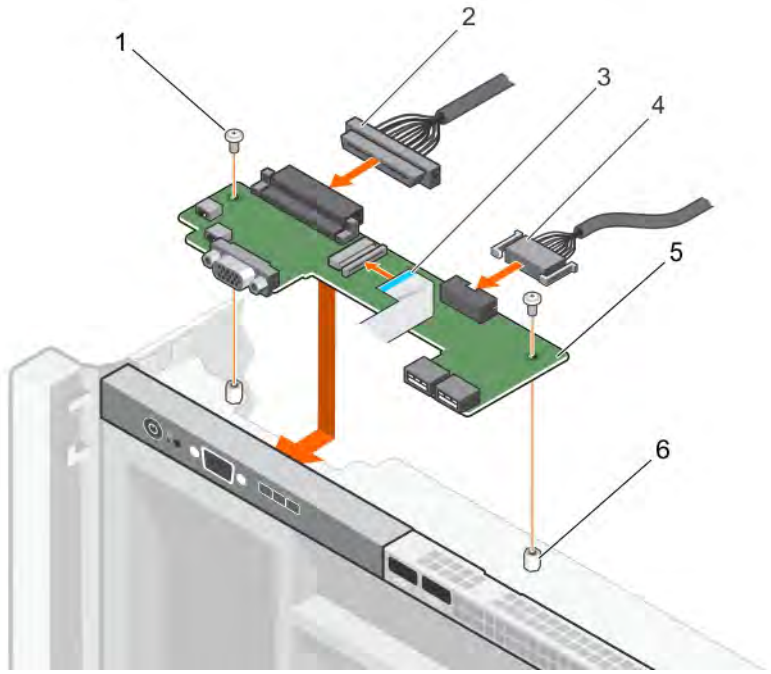

Figure 100. Installing the control panel board

1. screw (2)
2. control panel connector cable
3. display module cable
4. USB connector cable
5. control panel board
6. standoff (2)

1. Reconnect all the cables to the control panel board.
2. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

After working inside your system on page 61

System board

A system board (also known as the motherboard) is the main printed circuit board in the system with different connectors used to connect different components or peripherals of the system. A system board provides the electrical connections to the components in the system to communicate.

Removing the system board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: If you are using the Trusted Platform Module (TPM) with an encryption key, you may be prompted to create a recovery key during program or System Setup. Be sure to create and safely store this recovery key. If you replace this system board, you must supply the recovery key when you restart your system or program before you can access the encrypted data on your hard drives.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Disconnect the cables connected to the system board, SAS backplane, and control panel board.
4. Remove the following:
   a. Cable management tray
   b. Cooling fans (6)
   c. Memory risers (8)
   d. Memory riser and fan cage
   e. Fan tray
   f. Processor blank and heat sink blank
   g. Processors and heat sinks
   h. Power supply units
   i. Power supply unit bays with power distribution boards (2)
   j. NDC riser
   k. Expansion card risers, expansion cards, integrated storage controller cards
   l. Internal USB key, if installed
   m. Hard drive backplanes
   n. Optical drive

   NOTE: The heat sink is hot to touch for some time after the system has been powered down. Ensure that you do not touch the heat sink(s) while removing the system board.
5. Disconnect all cables from the system board.

CAUTION: Do not lift the system board by holding a memory module, processor, or other components.

NOTE: Exercise caution when you install the system board into the chassis, because installing the system board may cause damage to the optical drive cable connector that is connected to front of the system board.

1. Hold the system board by the memory riser guide, lift the blue release pin, and slide the system board toward the front of the system.
2. Lift the system board away from the chassis until it clears the retention pins on the chassis.
3. Holding the memory riser guide and metal bracket, angle the system board toward the back of the chassis.

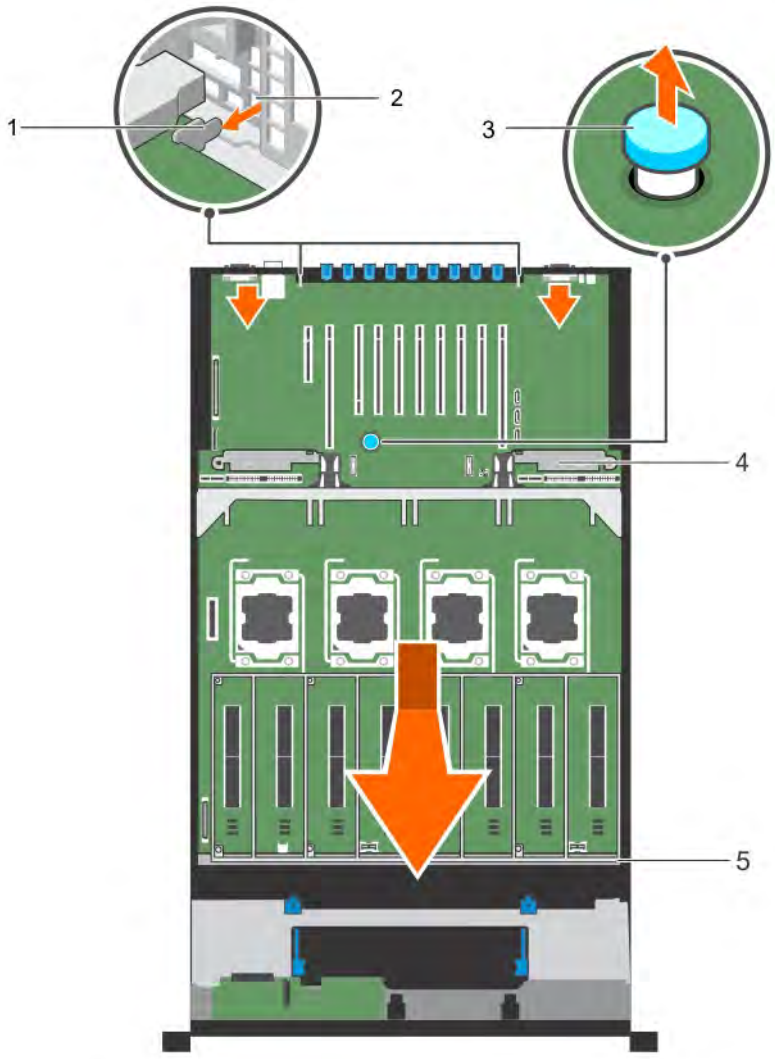

Figure 101. Removing the system board

1. tabs on the system board (2)
2. slots on the chassis
3. release pin
4. metal bracket
5. memory riser guide

1. Install the system board.
2. Reconnect the cables to the system board, hard drive backplane, control panel board, and the optical drive cable.

   NOTE: Ensure that the cables inside the system are routed along the chassis wall and secured using the shimstock pieces.
3. Follow the procedure listed in the After working inside your system section.

Related references

Safety instructions on page 60
Before working inside your system on page 61

Related tasks

Removing the cable management tray on page 87
Removing a cooling fan on page 82
Removing a memory riser on page 73
Removing the memory riser and fan cage on page 79
Removing the fan tray on page 84

Removing a heat sink on page 126
Removing a processor and heat sink blank on page 133
Removing a processor on page 127
Removing an AC power supply unit on page 136
Removing the power supply unit bay on page 140
Removing the power distribution board on page 143
Removing the Network Daughter Card riser on page 111
Removing the left or right expansion card riser on page 103
Removing an expansion card from expansion card risers on page 105
Removing the integrated storage controller card on page 123
Replacing the optional internal USB memory key on page 98
Removing the hard drive backplane on page 146
Removing the optical drive on page 96

Installing the system board

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures should be performed only by Dell certified service technicians.

1. Follow the safety guidelines listed in the Safety instructions section.
2. Follow the procedure listed in the Before working inside your system section.
3. Unpack the new system board.
1. Holding the memory riser guide and metal bracket, lower the system board into the chassis.

   CAUTION: Do not lift the system board by holding a memory module, processor, or other components.

   NOTE: Exercise caution when you install the system board into the chassis, because installing the system board may cause damage to the optical drive cable connector that is connected to front of the system board.

2. Push the system board toward the back of the chassis until the release pin on the board clicks into place.

   NOTE: Ensure that the two tabs at the back of the system board engage with the slots on the chassis.

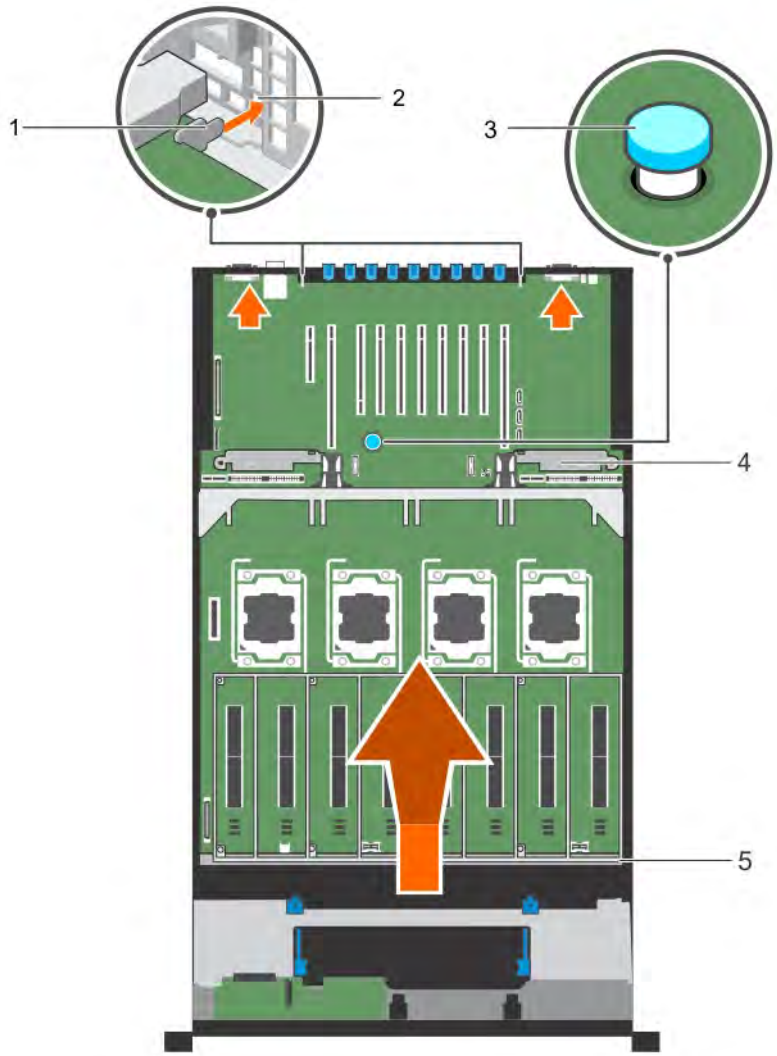

Figure 102. Installing the system board

1. tabs on the system board (2)
2. slots on the chassis
3. release pin
4. metal bracket
5. memory riser guide

1. Install the following:
   a. Power supply unit bay (2) with power distribution board (2)
   b. Power supply units
   c. NDC riser
   d. Expansion card risers, expansion card, integrated storage controller
   e. Processors and heat sinks
   f. Processor blank and heat sink blank
   g. Fan tray
   h. Memory riser and fan cage
   i. Memory risers (8)
   j. Cooling fans (6)
   k. Cable management tray
   l. Hard drive backplane
   m. Internal USB key, if removed
   n. Optical drive
2. Reconnect the cables to the system board, hard drive backplane, control panel board, and the optical drive cable.

NOTE: Ensure that the cables inside the system are routed along the chassis wall and secured using the shimstock pieces.

3. Follow the procedure listed in the After working inside your system section.
4. Ensure that you perform the following steps:
   a. If the service tag is not backed up in the backup flash device, enter the system service tag manually. For more information, see the Entering the system Service Tag by using System Setup section.
   b. Update the BIOS and iDRAC versions.
   c. Re-enable the Trusted Platform Module (TPM). For more information, see the Initializing the TPM for TXT users section.
5. Import your new or existing iDRAC8 Enterprise license. For more information, see iDRAC8 User's Guide, at **Dell.com/esmmanuals**.

Related references

Safety instructions on page 60

Related tasks

Before working inside your system on page 61
Installing the power supply unit bay on page 141
Installing the power distribution board on page 144
Installing an AC power supply unit on page 137
Installing the Network Daughter Card riser on page 113
Installing an expansion card into the expansion card risers on page 108
Installing the left or right expansion card riser on page 104
Installing the integrated storage controller card on page 125
Installing a heat sink on page 132
Installing a processor and heat sink blank on page 135
Installing the fan tray on page 85
Installing the memory riser and fan cage on page 81
Installing a memory riser on page 74
Installing a cooling fan on page 83
Installing the cable management tray on page 88
Installing the hard drive backplane on page 154
Replacing the optional internal USB memory key on page 98
Installing the optical drive on page 97
After working inside your system on page 61

Entering the system Service Tag by using System Setup

1. Turn on the system.
2. Press F2 to enter System Setup.
3. Click **Service Tag Settings**.
4. Enter the Service Tag.

   NOTE: You can enter the Service Tag only when the **Service Tag** field is empty. Ensure that you enter the correct Service Tag. After the Service Tag is entered, it cannot be updated or changed.

5. Click **OK**.
6. Import your new or existing iDRAC Enterprise license.
   For more information, see the *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/poweredgemanuals .

Trusted Platform Module

Trusted Platform Module (TPM) is a dedicated microprocessor designed to secure hardware by integrating cryptographic keys into devices. A software can use a Trusted Platform Module to authenticate hardware devices. As each TPM chip has a unique and secret RSA key burned in as it is produced, it can perform the platform authentication.

NOTE: This is a Field Replaceable Unit (FRU). Removal and installation procedures must be performed only by Dell certified service technicians.

Initializing the TPM for BitLocker users

Initialize the TPM.

For more information about initializing the TPM, see https://technet.microsoft.com/en-us/library/cc753140.aspx.

The **TPM Status** changes to **Enabled, Activated**.

Initializing the TPM for TXT users

1. While booting your system, press F2 to enter System Setup.
2. On the **System Setup Main Menu** screen, click **System BIOS** > **System Security Settings**.
3. From the **TPM Security** option, select **On with Pre-boot Measurements**.
4. From the **TPM Command** option, select **Activate**.
5. Save the settings.
6. Restart your system.
7. Enter **System Setup** again.
8. On the **System Setup Main Menu** screen, click **System BIOS** > **System Security Settings**.
9. From the **Intel TXT** option, select **On**.

7

Troubleshooting your system

Safety first — for you and your system

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: Solution validation was performed by using the factory shipped hardware configuration.

Topics:

- Troubleshooting system startup failure
- Troubleshooting external connections
- Troubleshooting the video subsystem
- Troubleshooting a USB device
- Troubleshooting a serial input and output device
- Troubleshooting a NIC
- Troubleshooting a wet system
- Troubleshooting a damaged system
- Troubleshooting the system battery
- Troubleshooting power supply units
- Troubleshooting cooling problems
- Troubleshooting cooling fans
- Troubleshooting system memory
- Troubleshooting an internal USB key
- Troubleshooting a micro SD card
- Troubleshooting an optical drive
- Troubleshooting a drive or SSD
- Troubleshooting a storage controller
- Troubleshooting expansion cards
- Troubleshooting processors

Troubleshooting system startup failure

If you boot the system to the BIOS boot mode after installing an operating system from the UEFI Boot Manager, the system stops responding. To avoid this issue, you must boot to the same boot mode in which you installed the operating system.

For all other startup issues, note the system messages that appear on the screen.

Troubleshooting external connections

Before troubleshooting any external devices, ensure that all external cables are securely attached to the external connectors on your system.

- Compare the technical specification of the system with the external device to check the compatibility.
- Check the external device functionality with some other similar system so that we are sure that the device is working fine.
- Check any other similar external device with this system so that we are sure that the system port is working fine.

For any further queries contact, Global Technical Support.

Troubleshooting the video subsystem

NOTE: Ensure that the **Local Server Video Enabled** option is selected in the iDRAC Graphical User Interface (GUI), under **Virtual Console**. If this option is not selected, local video is disabled.

NOTE: The VGA ports are not hot-pluggable.

1. Check the cable connections (power and display) to the monitor.
2. Check the video interface cabling from the system to the monitor.

If the tests run successfully, the problem is not related to video hardware.

If the tests fail, see the Getting help section.

Related references

Getting help on page 187

Troubleshooting a USB device

NOTE: Follow steps 1 to 6 to troubleshoot a USB keyboard or mouse. For other USB devices, go to step 7.

1. Disconnect the keyboard and/or mouse cables from the system and reconnect them.
2. If the problem persists, connect the keyboard and/or mouse to another USB port on the system.
3. If the problem is resolved, restart the system, enter System Setup, and check if the non-functioning USB ports are enabled.

   NOTE: Older operating systems may not support USB 3.0.

4. Check if USB 3.0 is enabled in System Setup. If enabled, disable it and see if the issue is resolved.
5. In **iDRAC Settings Utility**, ensure that **USB Management Port Mode** is configured as **Automatic** or **Standard OS Use**.
6. If the problem is not resolved, replace the keyboard and/or mouse with a known working keyboard or mouse.

   If the problem is not resolved, proceed to step 7 to troubleshoot other USB devices attached to the system.

   If the problem is not resolved, proceed to troubleshoot other USB devices attached to the system.

7. Turn off all attached USB devices, and disconnect them from the system.
8. Restart the system.
9. If your keyboard is functioning, enter System Setup, verify that all USB ports are enabled on the **Integrated Devices** screen. If your keyboard is not functioning, use remote access to enable or disable the USB options.
10. Check if USB 3.0 is enabled in System Setup. If it is enabled, disable it and restart your system.
11. If the system is not accessible, reset the NVRAM_CLR jumper inside your system and restore the BIOS to the default settings. See the System board jumper setting section
12. In the **IDRAC Settings Utility**, ensure that **USB Management Port Mode** is configured as **Automatic** or **Standard OS Use**.
13. Reconnect and turn on each USB device one at a time.
14. If a USB device causes the same problem, turn off the device, replace the USB cable with a known good cable, and turn on the device.

If all troubleshooting fails, see the Getting help section.

Related references

Getting help on page 187
System board jumper settings on page 182

Troubleshooting a serial input and output device

1. Turn off the system and any peripheral devices connected to the serial port.

2. Swap the serial interface cable with a known working cable, and turn on the system and the I/O serial device.

   If the problem is resolved, replace the interface cable with a known working cable.

3. Turn off the system and the I/O serial device, and swap the serial device with a compatible device.
4. Turn on the system and the I/O serial device.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187

Troubleshooting a NIC

NOTE: Network Daughter Card (NDC) slot is not hot-pluggable.

1. Run the appropriate diagnostic test. For more information, see the Using system diagnostics section for the available diagnostic tests.
2. Restart the system and check for any system messages pertaining to the NIC controller.
3. Check the appropriate indicator on the NIC connector:
   - If the link indicator does not glow, the cable connected might be disengaged.
   - If the activity indicator does not glow, the network driver files might be damaged or missing.

     Install or replace the drivers as necessary. For more information, see the NIC documentation.

   - Try another known good network cable.
   - If the problem persists, use another connector on the switch or hub.
4. Ensure that the appropriate drivers are installed and the protocols are bound. For more information, see the NIC documentation.
5. Enter System Setup and confirm that the NIC ports are enabled on the **Integrated Devices** screen.
6. Ensure that all the NICs, hubs, and switches on the network are set to the same data transmission speed and duplex. For more information, see the documentation for each network device.
7. Ensure that all the NICs and switches on the network are set to the same data transmission speed and duplex. For more information, see the documentation for each network device.
8. Ensure that all network cables are of the proper type and do not exceed the maximum length.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180

Troubleshooting a wet system

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the system cover.
3. Remove the following components (if installed) from the system:
   - Power supply unit(s)
   - Optical drive
   - Hard drives
   - Hard drive backplane

- USB memory key
- Hard drive tray
- Cooling shroud
- Expansion card risers (if installed)
- Expansion cards
- Cooling fan assembly (if installed)
- Cooling fan(s)
- Memory modules
- Processor(s) and heat sink(s)
- System board

4. Let the system dry thoroughly for at least 24 hours.
5. Reinstall the components you removed in step 3 except the expansion cards.
6. Install the system cover.
7. Turn on the system and attached peripherals.

   If the problem persists, see the Getting help section.

8. If the system starts properly, turn off the system, and reinstall all the expansion cards that you removed.
9. Run the appropriate diagnostic test. For more information, see the Using system diagnostics section.

If the tests fail, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180

Troubleshooting a damaged system

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the system cover.
3. Ensure that the following components are properly installed:
   - hard drive carriers
   - hard drive backplane
   - hard drives
   - cable management tray
   - expansion cards and expansion card risers
   - power supply unit(s)
   - memory risers
   - cooling fans
   - memory riser and fan cage
   - SD cards
   - USB memory key
   - NIC hardware key
   - network daughter card riser (Riser 1)
   - processor(s) and heat sink(s)
4. Ensure that all cables are properly connected.
5. Install the system cover.
6. Run the appropriate diagnostic test. For more information, see Using system diagnostics on page 180.

If the tests fail, see Getting Help.

Troubleshooting the system battery

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: If the system is turned off for long periods of time (for weeks or months), the NVRAM may lose the system configuration information. This situation is caused by a defective battery.

NOTE: Some software may cause the system time to speed up or slow down. If the system seems to operate normally except for the time set in System Setup, the problem may be caused by a software, rather than by a defective battery.

1. Re-enter the time and date in System Setup.
2. Turn off the system, and disconnect it from the electrical outlet for at least an hour.
3. Reconnect the system to the electrical outlet, and turn on the system.
4. Enter System Setup.

   If the date and time displayed in System Setup are not correct, check the System Error Log (SEL) for system battery messages.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187

Troubleshooting power supply units

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

CAUTION: At least one power supply (PSU) must be installed for the system to operate. Operating the system with only one PSU installed for extended periods of time can cause the system to overheat.

1. Identify the faulty PSU by the PSU's fault indicator.
2. Reseat the PSU by removing and reinstalling it.

   NOTE: After installing a PSU, allow several seconds for the system to recognize the PSU and to determine if it is working properly.

3. If the problem persists, see Getting Help.

Troubleshooting cooling problems

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

Ensure that the following conditions exist:

- System cover, cooling shroud, EMI filler panel, or back filler bracket is not removed.
- Ambient temperature is not higher than the system specific ambient temperature.
- External airflow is not obstructed.
- A cooling fan is not removed or has not failed.
- The expansion card installation guidelines have been followed.

Additional cooling can be added by one of the following methods:

From the iDRAC web GUI:

1. Click **Hardware** > **Fans** > **Setup**.
2. From the **Fan Speed Offset** drop-down list, select the cooling level that is required or set the minimum fan speed to a custom value.

From F2 System Setup:

1. Select **iDRAC Settings** > **Thermal**, and set a higher fan speed from the fan speed offset or minimum fan speed.

From RACADM commands:

1. Run the command `racadm help system.thermalsettings`

For more information, see *Integrated Dell Remote Access User's Guide* at www.dell.com/poweredgemanuals

Troubleshooting cooling fans

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. Open the system cover.

   CAUTION: The cooling fans are hot-swappable. To maintain proper cooling while the system is on, only replace one fan at a time.

2. Locate the faulty fan indicated by the Embedded Server Management (ESM).
3. Replace the fan or the fan's power cable.

   NOTE: Wait at least 30 seconds for the system to recognize the fan and determine whether it is working properly.

4. If the problem is not resolved, install a new fan.
5. If the fan functions properly, close the system cover.

If the problem persists, see Getting Help.

Troubleshooting system memory

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that came with the product.

1. If the system is operational, run the appropriate diagnostic test. See Using system diagnostics on page 180 for available diagnostic tests.

   If diagnostics indicates a fault, follow the corrective actions provided by the diagnostic program.

2. If the system is not operational, turn off the system and attached peripherals, and unplug the system from the power source. Wait at least 10 seconds and then reconnect the system to power.
3. Turn on the system and attached peripherals and note the messages on the screen.

   If an error message is displayed indicating a fault with a specific memory module, go to step 14.

4. Enter System Setup and check the system memory setting. Make any changes to the memory settings, if needed.

   If the memory settings match the installed memory but a problem is still indicated, go to step 14.

5. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
6. Remove the system cover.
7. Remove the memory risers.
8. Check the memory channels and ensure that they are populated correctly.

9. Reseat the memory modules in their sockets.
10. Install the memory risers.
11. Install the system cover.
12. Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
13. Enter System Setup and check the system memory setting.

    If the problem is not resolved, proceed with the next step.

14. If a diagnostic test or error message indicates a specific memory module as faulty, swap or replace the module with a known good memory module.
15. Remove the system cover.
16. Remove the memory risers.
17. To troubleshoot an unspecified faulty memory module, replace the memory module in the first DIMM socket with a module of the same type and capacity.

    If an error message is displayed on the screen, this may indicate a problem with the installed DIMM type(s), incorrect DIMM installation, or defective DIMM(s). Follow the on-screen instructions to resolve the problem. For more information, see General Memory Module Installation Guidelines.
18. Install the memory risers.
19. Install the system cover.
20. Reconnect the system to its electrical outlet, and turn on the system and attached peripherals.
21. As the system boots, observe any error message that is displayed and the diagnostic indicators on the front of the system.
22. If the memory problem is still indicated, repeat step 14 through step 19 for each memory module installed.

If the problem persists after all memory modules have been checked, see Getting Help.

Troubleshooting an internal USB key

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Enter System Setup and ensure that the **USB key port** is enabled on the **Integrated Devices** screen.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the system cover.
4. Locate the USB key and reseat it.
5. Install the system cover.
6. Turn on the system and attached peripherals, and check if the USB key is functioning.
7. If the problem is not resolved, repeat step 2 and step 3.
8. Insert a known working USB key.
9. Install the system cover.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187

Troubleshooting a micro SD card

NOTE: Certain micro SD cards have a physical write-protect power on the card. If the write-protect switch is turned on, the micro SD card is not writable.

NOTE: IDSDM and vFlash slots are not hot-pluggable.

1. Enter System Setup, and ensure that the **Internal SD Card Port** is enabled.

2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the system cover.

   NOTE: When an SD card failure occurs, the internal dual SD module controller notifies the system. On the next restart, the system displayed a message indicating the failure. If redundancy is enabled at the time of SD card failure, a critical alert is logged and chassis health will degrade.

4. Replace the failed micro SD card with a new micro SD card.
5. Install the system cover.
6. Reconnect the system to its electrical outlet and turn on the system, including any attached peripherals.
7. Enter System Setup, and ensure that the **Internal SD Card Port** and **Internal SD Card Redundancy** modes are set to the needed modes.

   Verify that the correct SD slot is set as **Primary SD Card**.

8. Check if the micro SD card is functioning properly.
9. If the **Internal SD Card Redundancy** option is set to **Enabled** at the time of the SD card failure, the system prompts you to perform a rebuild.

   NOTE: The rebuild is always sourced from the primary SD card to the secondary SD card.

Related tasks

Removing the system cover on page 63
Installing the system cover on page 64

Troubleshooting an optical drive

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Try using a different CD or DVD.
2. If the problem is not resolved, enter System Setup and ensure that the integrated SATA controller and the drive's SATA port are enabled.
3. Run the appropriate diagnostic test.
4. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
5. If installed, remove the bezel.
6. Remove the system cover.
7. Ensure that the interface cable is securely connected to the optical drive and to the controller.
8. Ensure that a power cable is properly connected to the drive.
9. Install the system cover.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187

Troubleshooting a drive or SSD

CAUTION: This troubleshooting procedure can erase data stored on the drive. Before you proceed, back up all files on the drive.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Run the appropriate diagnostic test. See the Using system diagnostics section.

   Depending on the results of the diagnostics test, proceed as required through the following steps.

2. If your system has a RAID controller and your drives are configured in a RAID array, perform the following steps:
   a. Restart the system and press F10 during system startup to run the Dell Lifecycle Controller, and then run the Hardware Configuration wizard to check the RAID configuration.

      See the Dell Lifecycle Controller documentation or online help for information about RAID configuration.
   b. Ensure that the drives are configured correctly for the RAID array.
   c. Take the drive offline and reseat the drive.
   d. Exit the configuration utility and allow the system to boot to the operating system.
3. Ensure that the needed device drivers for your controller card are installed and are configured correctly. For more information, see the operating system documentation.
4. Restart the system and enter the System Setup.
5. Verify that the controller is enabled and the drives are displayed in the System Setup.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180

Troubleshooting a storage controller

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: When troubleshooting a controller, see the documentation for your operating system and the controller.

NOTE: Mini-PERC socket is not hot-pluggable.

1. Run the appropriate diagnostic test. See the Using system diagnostics section.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the system cover.
4. Verify that the installed expansion cards are compliant with the expansion card installation guidelines.
5. Ensure that each expansion card is firmly seated in its connector.
6. Install the system cover.
7. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
8. If the problem is not resolved, turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
9. Remove the system cover.
10. Remove all expansion cards installed in the system.
11. Install the system cover.
12. Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
13. Run the appropriate diagnostic test. See the Using system diagnostics section.

    If the tests fail, see the Getting help section.

14. For each expansion card you removed in step 10, perform the following steps:
    a. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
    b. Remove the system cover.
    c. Reinstall one of the expansion cards.
    d. Install the system cover.
    e. Run the appropriate diagnostic test. See the Using system diagnostics section.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180
Safety instructions on page 60

Related tasks

Removing the system cover on page 63
Removing an expansion card from expansion card risers on page 105
Installing an expansion card into the expansion card risers on page 108
Installing the system cover on page 64

Troubleshooting expansion cards

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: When troubleshooting an expansion card, you also have to see the documentation for your operating system and the expansion card.

NOTE: Riser slots are not hot-pluggable.

1. Run the appropriate diagnostic test. See the Using system diagnostics section.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the system cover.
4. Ensure that each expansion card is firmly seated in its connector.
5. Install the system cover.
6. Turn on the system and attached peripherals.
7. If the problem is not resolved, turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
8. Remove the system cover.
9. Remove all expansion cards installed in the system.
10. Install the system cover.
11. Run the appropriate diagnostic test. See the Using system diagnostics section.

    If the tests fail, see the Getting help section.

12. For each expansion card you removed in step 8, perform the following steps:
    a. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
    b. Remove the system cover.
    c. Reinstall one of the expansion cards.
    d. Install the system cover.
    e. Run the appropriate diagnostic test. See the Using system diagnostics section.

If the problem persists, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180
Safety instructions on page 60

Related tasks

Removing the system cover on page 63
Removing an expansion card from expansion card risers on page 105
Installing an expansion card into the expansion card risers on page 108
Installing the system cover on page 64

Troubleshooting processors

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: Processor sockets are not hot-pluggable.

1. Run the appropriate diagnostics test. See the Using system diagnostics section.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Remove the system cover.
4. Ensure that the processor and heat sink are properly installed.
5. Install the system cover.
6. Run the appropriate diagnostic test. See the Using system diagnostics section.
7. If the problem persists, see the Getting help section.

Related references

Getting help on page 187
Using system diagnostics on page 180

Related tasks

Removing the system cover on page 63
Installing the system cover on page 64

8

Using system diagnostics

If you experience a problem with your system, run the system diagnostics before contacting Dell for technical assistance. The purpose of running system diagnostics is to test your system hardware without using additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use the diagnostics results to help you solve the problem.

NOTE: For more information about OEM diagnostic event messages, see the Event and Error Message Reference Guide for 13th Generation Dell PowerEdge Servers Version 1.2

Topics:

- Dell Embedded System Diagnostics

Dell Embedded System Diagnostics

NOTE: The Dell Embedded System Diagnostics is also known as Enhanced Pre-boot System Assessment (ePSA) diagnostics.

The Embedded System Diagnostics provides a set of options for particular device groups or devices allowing you to:

- Run tests automatically or in an interactive mode
- Repeat tests
- Display or save test results
- Run thorough tests to introduce additional test options to provide extra information about the failed device(s)
- View status messages that inform you if tests are completed successfully
- View error messages that inform you of problems encountered during testing

When to use the Embedded System Diagnostics

Run the Embedded System Diagnostics (ePSA) if your system does not boot.

Running the Embedded System Diagnostics from Boot Manager

Run the Embedded System Diagnostics (ePSA) if your system does not boot.

1. When the system is booting, press F10.
2. Use the up arrow and down arrow keys to select **System Utilities** > **Launch Diagnostics**.
   The **ePSA Pre-boot System Assessment** window is displayed, listing all devices detected in the system. The diagnostics starts executing the tests on all the detected devices.

Running the Embedded System Diagnostics from the Dell Lifecycle Controller

1. As the system boots, press F10.
2. Select **Hardware Diagnostics** → **Run Hardware Diagnostics**.
   The **ePSA Pre-boot System Assessment** window is displayed, listing all devices detected in the system. The diagnostics starts executing the tests on all the detected devices.

System diagnostic controls

Menu	Description
Configuration	Displays the configuration and status information of all detected devices.
Results	Displays the results of all tests that are run.
Systemhealth	Provides the current overview of the system performance.
Event log	Displays a time-stamped log of the results of all tests run on the system. This is displayed if at least one event description is recorded.

9

Jumpers and connectors

Topics:

- System board jumper settings
- System board connectors
- Disabling a forgotten password

System board jumper settings

For information about resetting the password jumper to disable a password, see Disabling a forgotten password on page 185.

Table 37. System board jumper settings

Jumper	Setting	Description
PWRD_EN		The password reset feature is enabled (pins 2–4).
		The password reset feature is disabled (pins 4–6). The iDRAC local access is unlocked at the next AC power cycle.
NVRAM_CLR		The configuration settings are retained at the next system boot (pins 3–5).
		The configuration settings are cleared at system boot (pins 1–3).

System board connectors

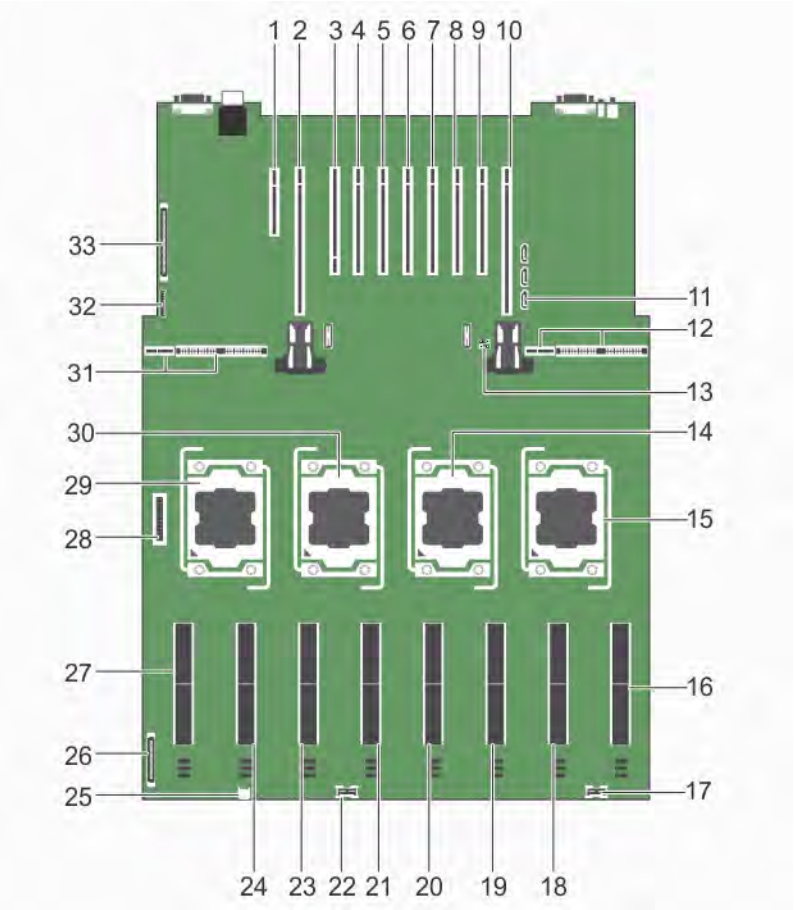

Figure 103. System board jumpers and connectors

Table 38. System board connectors and jumpers

Item	Connector	Description
1	INT_STORAGE/ J_PERC	Integrated storage controller card connector
2	J_PCIE_SLOT1	Left I/O riser connector (optional)
3	IO_RISER1/J_NDC_RISER	NDC riser connector
4	J_PCIE_SLOT3	Expansion-card connectors
5	J_PCIE_SLOT4	
6	J_PCIE_SLOT5	
7	J_PCIE_SLOT6	
8	J_PCIE_SLOT7	
9	J_PCIE_SLOT8	
10	J_PCIE_SLOT9	
11	SATA_A	SATA A connector
12	J_PDBR_SIG	Right power distribution board connector
13	J_PW_NVRAM	Jumpers
14	CPU3	Processor 3

Table 38. System board connectors and jumpers

Item	Connector	Description
15	CPU4	Processor 4
16	MEMORY RISER H	Memory Riser connector
17	J_BP_PWR_B	Backplane power connector B
18	MEMORY RISER G	Memory Riser connectors
19	MEMORY RISER F	
20	MEMORY RISER E	
21	MEMORY RISER D	
22	J_BP_PWR_A	Backplane power connector A
23	MEMORY RISER C	Memory Riser connectors
24	MEMORY RISER B	
25	J_SATA_PWR_A	Optical drive SATA power connector
26	J_BP_PWR_MISC	Backplane power connector
27	MEMORY RISER A	Memory Riser connector
28	J_FAN_MOD1	Fan tray connector
29	CPU1	Processor socket 1
30	CPU2	Processor socket 2
31	J_PDBL_SIG	Left power distribution board connector
32	J_USB_CNTRL_PNL	USB control panel connector
33	CONTROL PANEL	Control panel connector

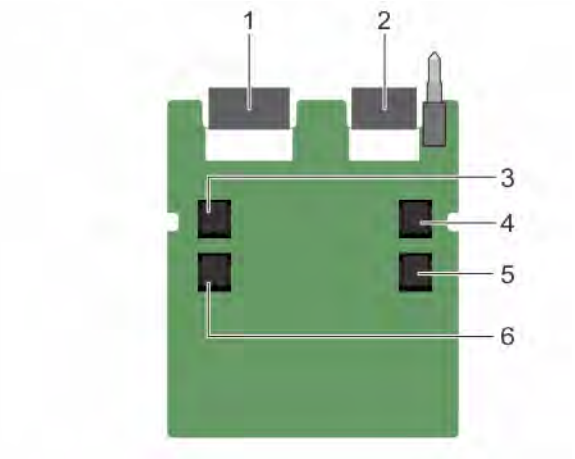

Figure 104. Expander daughter card board jumpers and connectors (unified mode)

Table 39. Expander daughter card board jumpers and connectors (unified mode)

Item	Connector	Description
1	J_XCEDE_SAS1	SAS 1 connector
2	J_XCEDE_SAS2	SAS 2 connector
3	J_SAS_A	SAS A connector
4	J_SAS_B	SAS B connector

Table 39. Expander daughter card board jumpers and connectors (unified mode)

Item	Connector	Description
5	J_SAS_B1	SAS B1 connector
6	J_SAS_A1	SAS A1 connector

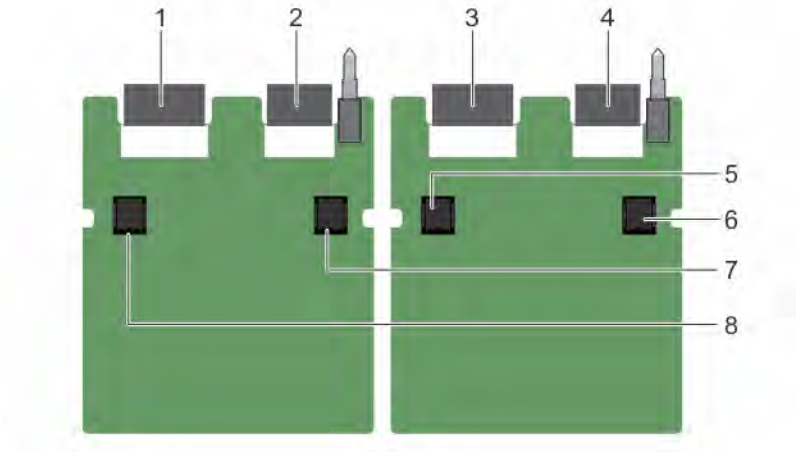

Figure 105. Expander daughter card board jumpers and connectors (performance mode)

Table 40. Expander daughter card board jumpers and connectors (performance mode)

Item	Connector	Description
1	J_XCEDE_SAS1	SAS 1 connector
2	J_XCEDE_SAS2	SAS 2 connector
3	J_XCEDE_SAS1	SAS 1 connector
4	J_XCEDE_SAS2	SAS 2 connector
5	J_SAS_A	SAS A connector
6	J_SAS_B	SAS B connector
7	J_SAS_B	SAS B connector
8	J_SAS_A	SAS A connector

Disabling a forgotten password

The system's software security features include a system password and a setup password. The password jumper enables these password features or disables them and clears any password(s) currently in use.

CAUTION: Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Remove the system cover.
3. Move the jumper on the system board jumper from pins 4 and 6 to pins 2 and 4.
4. Install the system cover.

   The existing passwords are not disabled (erased) until the system boots with the jumper on pins 2 and 4. However, before you assign a new system and/or setup password, you must move the jumper back to pins 4 and 6.

NOTE: If you assign a new system and/or setup password with the jumper on pins 2 and 4, the system disables the new password(s) the next time it boots.

5. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
6. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
7. Remove the system cover.
8. Move the jumper on the system board jumper from pins 2 and 4 to pins 4 and 6.
9. Install the system cover.
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.
11. Assign a new system and/or setup password.

10

Getting help

Topics:

- Contacting Dell EMC
- Documentation feedback
- Accessing system information by using QRL

Contacting Dell EMC

Dell EMC provides several online and telephone based support and service options. If you do not have an active internet connection, you can find contact information about your purchase invoice, packing slip, bill, or Dell EMC product catalog. Availability varies by country and product, and some services may not be available in your area. To contact Dell EMC for sales, technical assistance, or customer service issues:

1. Go to www.dell.com/support/home.
2. Select your country from the drop-down menu on the lower right corner of the page.
3. For customized support:
   a. Enter your system Service Tag in the **Enter your Service Tag** field.
   b. Click **Submit**.
   The support page that lists the various support categories is displayed.
4. For general support:
   a. Select your product category.
   b. Select your product segment.
   c. Select your product.
   The support page that lists the various support categories is displayed.
5. For contact details of Dell EMC Global Technical Support:
   a. Click Global Technical Support.
   b. Enter your system Service Tag in the **Enter your Service Tag** field on the Contac Us webpage.

Documentation feedback

Click the **Feedback** link in any of the Dell EMC documentation pages, fill out the form, and click **Submit** to send your feedback.

Accessing system information by using QRL

You can use the Quick Resource Locator (QRL) located on the information tag in the front of the system, to access the information about the PowerEdge system.

Ensure that your smartphone or tablet has the QR code scanner installed.

The QRL includes the following information about your system:

- How-to videos
- Reference materials, including the Installtion and Service Manual, LCD diagnostics, and mechanical overview
- Your system service tag to quickly access your specific hardware configuration and warranty information
- A direct link to Dell to contact technical assistance and sales teams

1. Go to www.dell.com/qrl and navigate to your specific product or
2. Use your smartphone or tablet to scan the model-specific Quick Resource (QR) code on your system or in the Quick Resource Locator section.

Quick Resource Locator (QRL)

Figure 106. Quick Resource Locator for PE R930 system