

Dell EMC PowerEdge R940

Installation and Service Manual

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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PowerEdge R940 overview

The PowerEdge R940 is a 3U rack system, which is available in the following configurations:

Table 1. PowerEdge R940 configurations

| Configurations | Specifications |
|---|---|
| 8-drive bay system (without Processor Expansion Module) | <ul style="list-style-type: none"> Two Intel Xeon scalable family processors 24 DIMM slots supporting up to 3 TB of memory Up to two AC or DC power supply units (PSUs) 8 hard drives or SSDs |
| 24-drive bay system (with PEM) | <ul style="list-style-type: none"> Four Intel Xeon scalable family processors 48 DIMM slots supporting up to 6 TB of memory Up to two AC or DC power supply units (PSUs) 24 hard drives or SSDs |

NOTE: The PowerEdge R940 system supports hot swappable hard drives.

NOTE: The PowerEdge R940 system is also available in a diskless (no backplane) configuration.

Topics:

- Front view of the system
- Back view of the system
- Drive indicator codes
- LCD panel
- Locating the Service Tag of your system

Front view of the system

You can access the following components from the front of the system:

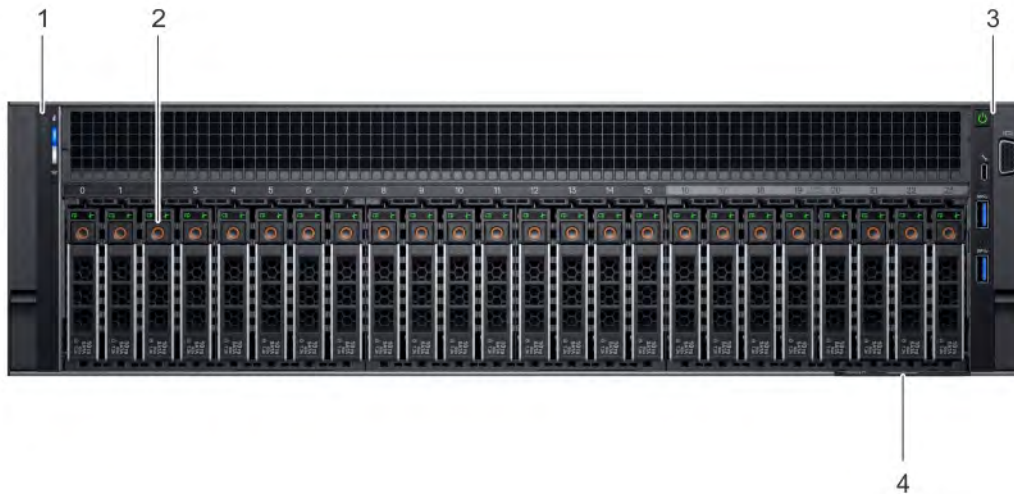


Figure 1. Front view of 24 x 2.5 inch hard drive system

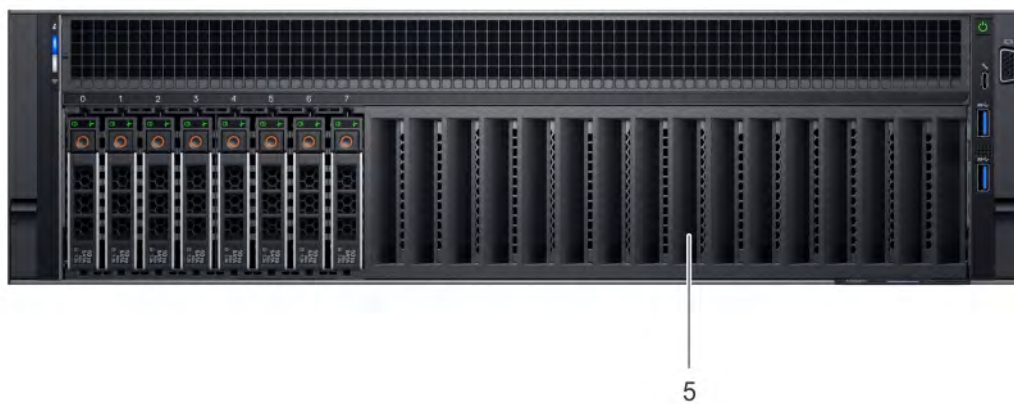


Figure 2. Front view of 8 x 2.5 inch hard drive system

Table 2. Features available on the front of the system

| Item | Component | Icon | Description |
|------|---------------------|------|--|
| 1 | Left control panel | N/A | Contains the system health and system ID, status LED, and the iDRAC Quick Sync 2 (wireless) indicator. NOTE: The iDRAC Quick Sync 2 indicator is available only on certain configurations. |
| 2 | Hard-drive slots | N/A | Enable you to install drives that are supported on your system. For more information about drives, see the Technical specifications section. |
| 3 | Right control panel | N/A | Contains the power button, VGA port, iDRAC Direct port and USB ports. |
| 4 | Information tag | N/A | 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 secure default access to iDRAC, the Information tag also contains the iDRAC secure default password. |

| Item | Component | Icon | Description |
|------|----------------------|------|---|
| 5 | Hard-drive bay blank | N/A | For the 8 x 2.5 inch hard drive system, a hard-drive bay blank is installed in the hard drive slots 8 - 23. |

Left control panel view

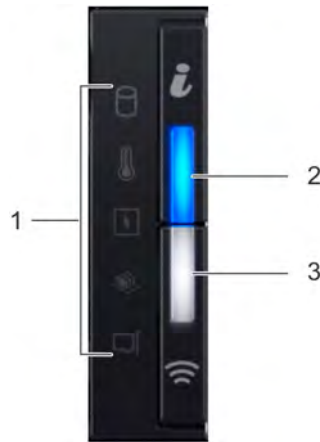


Figure 3. Left control panel view






Table 3. Left control panel features

| Item | Indicator, button, or connector | Icon | Description |
|------|--|------|---|
| 1 | Status LED indicators | N/A | Indicate the status of the system. For more information, see the Status LED indicators section. |
| 2 | System health and system ID indicator | | Indicates the system health. For more information, see the System health and system ID indicator codes section. |
| 3 | iDRAC Quick Sync 2 wireless indicator (optional) | | Indicates if the iDRAC Quick Sync 2 wireless option is activated. The Quick Sync 2 feature allows management of the system using mobile devices. This feature aggregates hardware/firmware inventory and various system level diagnostic/error information that can be used in troubleshooting the system. You can access system inventory, Dell Lifecycle Controller logs or system logs, system health status, and also configure iDRAC, BIOS, and networking parameters. You can also launch the virtual Keyboard, Video, and Mouse (KVM) viewer and virtual Kernel based Virtual Machine (KVM), on a supported mobile device. For more information, see the Integrated Dell Remote Access Controller User's Guide at Dell.com/idracmanuals . |

Status LED indicators

NOTE: The indicators display solid amber if any error occurs.

Table 4. Status LED indicators and descriptions

| Icon | Description | Condition | Corrective action |
|---|-----------------------|--|--|
|  | Drive indicator | The indicator turns solid amber if there is a drive error. | <ul style="list-style-type: none"> Check the System Event Log to determine if the drive has an error. Run the appropriate Online Diagnostics test. Restart the system and run embedded diagnostics (ePSA). If the drives are configured in a RAID array, restart the system, and enter the host adapter configuration utility program. |
|  | Temperature indicator | The indicator turns solid amber if the system experiences a thermal error (for example, the ambient temperature is out of range or there is a fan failure). | <p>Ensure that none of the following conditions exist:</p> <ul style="list-style-type: none"> A cooling fan has been removed or has failed. System cover, air shroud, memory module blank, or back filler bracket is removed. Ambient temperature is too high. External airflow is obstructed. <p>If the problem persists, see the Getting help section.</p> |
|  | Electrical indicator | The indicator turns solid amber if the system experiences an electrical error (for example, voltage out of range, or a failed power supply unit (PSU) or voltage regulator). | <p>Check the System Event Log or system messages for the specific issue. If it is due to a problem with the PSU, check the LED on the PSU. Reseat the PSU.</p> <p>If the problem persists, see the Getting help section.</p> |
|  | Memory indicator | The indicator turns solid amber if a memory error occurs. | <p>Check the System Event Log or system messages for the location of the failed memory. Reseat the memory module.</p> <p>If the problem persists, see the Getting help section.</p> |
|  | PCIe indicator | The indicator turns solid amber if a PCIe card experiences an error. | <p>Restart the system. Update any required drivers for the PCIe card. Reinstall the card.</p> <p>If the problem persists, see the Getting help section.</p> |

NOTE: For more information about the supported PCIe cards, see the Expansion card installation guidelines section.

System health and system ID indicator codes

The system health and system ID indicator is located on the left control panel of your system.



Figure 4. System health and system ID indicators

Table 5. System health and system ID indicator codes

| System health and system ID indicator code | Condition |
|--|---|
| Solid blue | Indicates that the system is turned on, system is healthy, and system ID mode is not active. Press the system health and system ID button to switch to system ID mode. |
| Blinking blue | Indicates that the system ID mode is active. Press the system health and system ID button to switch to system health mode. |
| Solid amber | Indicates that the system is in fail-safe mode. If the problem persists, see the Getting help section. |
| Blinking amber | Indicates that the system is experiencing a fault. Check the System Event Log or the LCD panel, if available on the bezel, for specific error messages. For more information about error messages, see the <i>Dell Event and Error Messages Reference Guide</i> at Dell.com/openmanagemanuals > OpenManage software . |

iDRAC Quick Sync 2 indicator codes

iDRAC Quick Sync 2 module (optional) is located on the left control panel of your system.



Figure 5. iDRAC Quick Sync 2 indicators

Table 6. iDRAC Quick Sync 2 indicators and descriptions

| iDRAC Quick Sync 2 indicator code | Condition | Corrective action |
|--|---|--|
| Off (default state) | Indicates that the iDRAC Quick Sync 2 feature is turned off. Press the iDRAC Quick Sync 2 button to turn on the iDRAC Quick Sync 2 feature. | If the LED fails to turn on, reseal the left control panel flex cable and check. If the problem persists, see the Getting help section. |
| Solid white | Indicates that iDRAC Quick Sync 2 is ready to communicate. Press the iDRAC Quick Sync 2 button to turn off. | If the LED fails to turn off, restart the system. If the problem persists, see the Getting help section. |
| Blinks white rapidly | Indicates data transfer activity. | If the indicator continues to blink indefinitely, see the Getting help section. |
| Blinks white slowly | Indicates that firmware update is in progress. | If the indicator continues to blink indefinitely, see the Getting help section. |
| Blinks white five times rapidly and then turns off | Indicates that the iDRAC Quick Sync 2 feature is disabled. | Check if iDRAC Quick Sync 2 feature is configured to be disabled by iDRAC. If the problem persists, see the Getting help section. For more information, see <i>Integrated Dell Remote Access Controller User's Guide</i> at Dell.com/idracmanuals or <i>Dell OpenManage Server Administrator User's Guide</i> at Dell.com/openmanagemanuals . |





| iDRAC Quick Sync 2 indicator code | Condition | Corrective action |
|-----------------------------------|--|--|
| Solid amber | Indicates that the system is in fail-safe mode. | Restart the system. If the problem persists, see the Getting help section. |
| Blinking amber | Indicates that the iDRAC Quick Sync 2 hardware is not responding properly. | Restart the system. If the problem persists, see the Getting help section. |

Right control panel



Figure 6. Right control panel

Table 7. Right control panel

| Item | Button or port | Icon | Description |
|------|-------------------|---|---|
| 1 | Power button |  | Indicates if the system is turned on or off. Press the power button to manually turn on or off the system. |
| | | | NOTE: Press the power button to gracefully shut down an ACPI-compliant operating system. |
| 2 | iDRAC Direct port |  | The iDRAC Direct port is micro USB 2.0-compliant. This port enables you to access the iDRAC Direct features. For more information, see the iDRAC User's Guide at Dell.com/idracmanuals . |
| 3 | USB ports |  | The USB ports are 9-pin, USB 3.0-compliant. These ports enable you to connect USB devices to the system. |
| 4 | VGA port |  | Enables you to connect a display device to the system. For more information, see the Technical specifications section. |

iDRAC Direct LED indicator codes

The iDRAC Direct LED indicator lights up to indicate that the port is connected and is being used as a part of the iDRAC subsystem.

You can configure iDRAC Direct by using a USB to micro USB (type AB) cable, which you can connect to your laptop or tablet. The following table describes iDRAC Direct activity when the iDRAC Direct port is active:

Table 8. iDRAC Direct LED indicator codes

| iDRAC Direct LED indicator code | Condition |
|---|--|
| Solid green for two seconds | Indicates that the laptop or tablet is connected. |
| Flashing green (on for two seconds and off for two seconds) | Indicates that the laptop or tablet connected is recognized. |
| Turns off | Indicates that the laptop or tablet is unplugged. |

Back view of the system

You can access the following components from the back of the system:

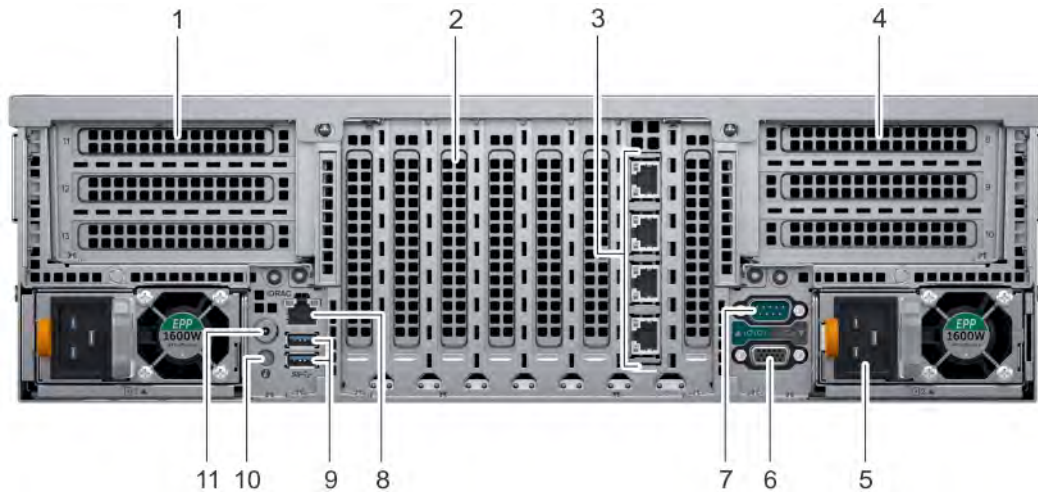









Figure 7. Back view features

Table 9. Features available on the back of the system

| Item | Slot, button, or connector | Icon | Description |
|------|------------------------------|---|---|
| 1 | expansion card riser (right) | N/A | The expansion card riser (right) supports up to three full-height PCI Express expansion cards. For more information, see the Expansion card installation guidelines section. |
| 2 | expansion card slot | N/A | The expansion slots on the system board supports full-height half-length PCI Express expansion cards. |
| 3 | NIC port (4) |  | The NIC ports that are integrated on the network daughter card (NDC) provide network connectivity. For more information about the supported configurations, see the Technical specifications section. |
| 4 | expansion card riser (left) | N/A | The expansion card riser (left) supports up to three full-height PCI Express expansion cards. For more information, see the Expansion card installation guidelines section. |
| 5 | Power supply unit (2) |  | For more information, see the Technical specifications section. |

| Item | Slot, button, or connector | Icon | Description |
|------|------------------------------|---|---|
| 6 | Video port |  | Enables you to connect a display device to the system. For more information, see the Technical specifications section. |
| 7 | Serial port |  | Enables you to connect a serial device to the system. For more information, see the Technical specifications section. |
| 8 | iDRAC9 Enterprise port |  | Enables you to remotely access iDRAC. For more information, see the iDRAC User's Guide at Dell.com/idracmanuals . |
| 9 | USB port (2) |  | The USB ports are 9-pin, USB 3.0-compliant. These ports enable you to connect USB devices to the system. |
| 10 | System identification button |  | The System Identification (ID) button is available on the front and back of the systems. Press the button to identify a system in a rack by turning on the system ID button. You can also use the system ID button to reset iDRAC and to access BIOS using the step through mode. |
| 11 | Status indicator cable port | | Enables you to connect the status indicator cable and view system status when the CMA is installed. |

NIC indicator codes

Each NIC on the back of the system has indicators that provide information about the activity and link status. The activity LED indicator indicates if data is flowing through the NIC, and the link LED indicator indicates the speed of the connected network.

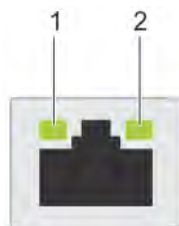


Figure 8. NIC indicator codes

- | | |
|----------------------|--------------------------|
| 1 link LED indicator | 2 activity LED indicator |
|----------------------|--------------------------|

Table 10. NIC indicator codes

| Status | Condition |
|--|---|
| Link and activity indicators are off | The NIC is not connected to the network. |
| Link indicator is green and activity indicator is blinking green | The NIC is connected to a valid network at its maximum port speed and data is being sent or received. |
| Link indicator is amber and activity indicator is blinking green | The NIC is connected to a valid network at less than its maximum port speed and data is being sent or received. |
| Link indicator is green and activity indicator is off | The NIC is connected to a valid network at its maximum port speed and data is not being sent or received. |
| Link indicator is amber and activity indicator is off | The NIC is connected to a valid network at less than its maximum port speed and data is not being sent or received. |
| Link indicator is blinking green and activity is off | NIC identify is enabled through the NIC configuration utility. |

Power supply unit indicator codes

AC power supply units (PSUs) have an illuminated translucent handle that serves as an indicator.

The DC PSUs have an LED that serves as an indicator.

The indicator shows whether power is present or if a power fault has occurred.

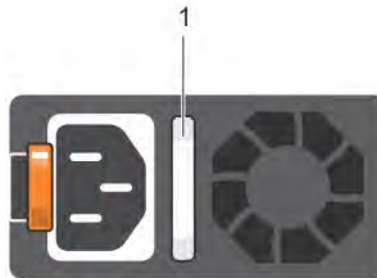


Figure 9. AC PSU status indicator

1 AC PSU status indicator/handle

Table 11. AC PSU status indicator codes

| Power indicator codes | Condition |
|------------------------------|--|
| Green | A valid power source is connected to the PSU and the PSU is operational. |
| Blinking amber | Indicates a problem with the PSU. |
| Not illuminated | Power is not connected to the PSU. |
| Blinking green | When the firmware of the PSU is being updated, the PSU handle blinks green. <ul style="list-style-type: none"> ⚠ CAUTION: Do not disconnect the power cord or unplug the PSU when updating firmware. If firmware update is interrupted, the PSUs do not function. |
| Blinking green and turns off | When hot-plugging a PSU, the PSU handle blinks green five times at a rate of 4 Hz and turns off. This indicates a PSU mismatch with respect to efficiency, feature set, health status, or supported voltage. <ul style="list-style-type: none"> ⚠ CAUTION: If two PSUs are installed, both the PSUs must have the same type of label; for example, Extended Power Performance (EPP) label. Mixing PSUs from previous generations of PowerEdge servers is not supported, even if the PSUs have the same power rating. This results in a PSU mismatch condition or failure to turn the system on. ⚠ CAUTION: When correcting a PSU mismatch, replace only the PSU with the blinking indicator. Swapping the 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 240 V and 120 V input voltages with the exception of Titanium PSUs, which support only 240 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. |

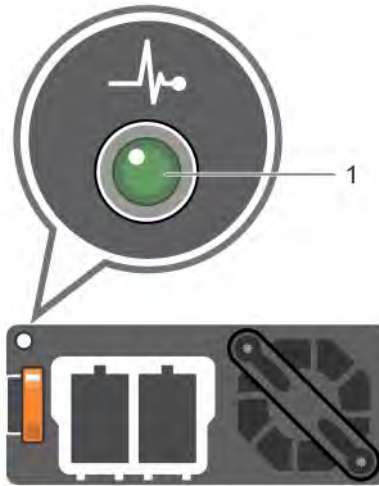


Figure 10. DC PSU status indicator

1 DC PSU status indicator

Table 12. DC PSU status indicator codes

| Power indicator codes | Condition |
|-----------------------|--|
| Green | A valid power source is connected to the PSU and the PSU is operational. |
| Blinking amber | Indicates a problem with the PSU. |
| Not illuminated | Power is not connected to the PSU. |
| Blinking green | When hot-plugging a PSU, the PSU indicator blinks green. This indicates that there is a PSU mismatch with respect to efficiency, feature set, health status, or supported voltage. |
| | <p>⚠ CAUTION: If two PSUs are installed, both the PSUs must have the same type of label; for example, Extended Power Performance (EPP) label. Mixing PSUs from previous generations of PowerEdge servers is not supported, even if the PSUs have the same power rating. This results in a PSU mismatch condition or failure to turn the system on.</p> <p>⚠ CAUTION: When correcting a PSU mismatch, replace only the PSU with the blinking indicator. Swapping the 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.</p> <p>⚠ CAUTION: If two PSUs are used, they must be of the same type and have the same maximum output power.</p> <p>⚠ CAUTION: Combining AC and DC PSUs is not supported and triggers a mismatch.</p> |

Drive indicator codes

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

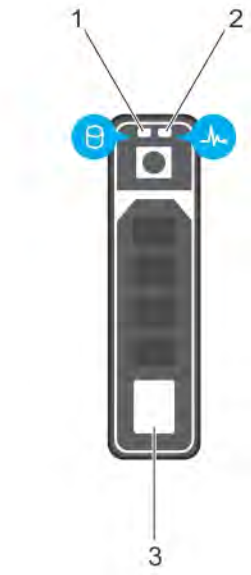


Figure 11. Drive indicators

- 1 Drive activity LED indicator
- 2 Drive status LED indicator
- 3 Drive

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

Table 13. Drive indicator codes

| Drive status indicator code | Condition |
|--|--|
| Flashes green twice per second | Identifying drive or preparing for removal. |
| Off | Drive ready for removal. |
| | NOTE: The drive status indicator remains off until all drives are initialized after the system is turned on. Drives are not ready for 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. |
| Solid green | Drive online. |
| Flashes green for three seconds, amber for three seconds, and then turns off after six seconds | Rebuild stopped. |

LCD panel

The LCD panel provides system information, status, and error messages to indicate if the system is functioning correctly or requires attention. The LCD panel can be used to configure or view the system's iDRAC IP address. For more information about error messages, see the *Dell Event and Error Messages Reference Guide* at Dell.com/openmanagemanuals > **OpenManage software**.

The LCD panel is available only on the optional LCD bezel. The optional LCD bezel is hot pluggable.

The statuses and conditions of the LCD panel are outlined here:

- The LCD backlight is white during normal operating conditions.
- When the system needs attention, the LCD backlight 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.

- 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.
- If the LCD panel stops responding, remove the bezel and reinstall it. If the problem persists, see the Getting help section.
- The LCD backlight remains off if LCD messaging is turned off using the iDRAC utility, the LCD panel, or other tools.



Figure 12. LCD panel features




Table 14. LCD panel features

| Item | Button or display | 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: <ul style="list-style-type: none">• Press and hold the right 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. |
| 4 | LCD display | Displays system information, status, and error messages or iDRAC IP address. |

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 **Home** icon  using the up arrow .
- c Select the **Home** icon.
- d On the **Home** screen, press the **Select** button to enter the main menu.

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 <i>Dell Event and Error Messages Reference Guide</i> 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. |

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 iDRAC9. 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. |

Locating the Service Tag of your system

You can identify your system using the unique Express Service Code and Service Tag. Pull out the information tag in front of the system to view the Express Service Code and Service Tag. Alternatively, the information may be on a sticker on the chassis of the system. The mini Enterprise Service Tag (EST) is found on the back of the system. This information is used by Dell to route support calls to the appropriate personnel.

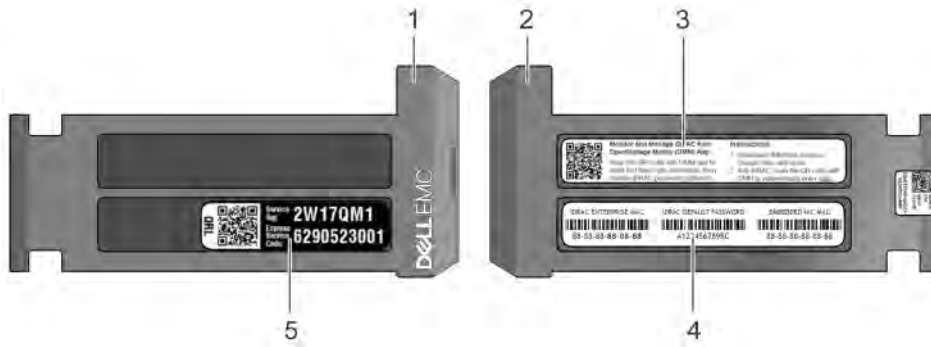


Figure 13. Locating Service Tag of your system

- | | |
|--|--|
| <ul style="list-style-type: none"> 1 information tag (front view) 3 OpenManage Mobile (OMM) label 5 Service Tag | <ul style="list-style-type: none"> 2 information tag (back view) 4 iDRAC MAC address and iDRAC secure password label |
|--|--|

Documentation resources

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

Table 15. Additional documentation resources for your system

| Task | Document | Location |
|-------------------------|--|--|
| Setting up your system | For more information about installing and securing the system into a rack, see the rack documentation included with your rack solution. | Dell.com/poweredgemanuals |
| | For information about setting up and turning on the system, see the <i>Getting Started Guide</i> document that is shipped with your system. | 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. | Dell.com/idracmanuals |
| | For information about installing the operating system, see the operating system documentation. | Dell.com/operatingsystemmanuals |
| | For information about understanding Remote Access Controller Admin (RACADM) subcommands and supported RACADM interfaces, see the RACADM Command Line Reference Guide for iDRAC. | Dell.com/idracmanuals |
| | For information about updating drivers and firmware, see the Methods to download firmware and drivers section in this document. | To download drivers: Dell.com/support/drivers |
| Managing your system | For information about systems management software offered by Dell, see the Dell OpenManage Systems Management Overview Guide. | Dell.com/openmanagemanuals |
| | For information about setting up, using, and troubleshooting OpenManage, see the Dell OpenManage Server Administrator User's Guide. | Dell.com/openmanagemanuals |
| | For information about installing, using, and troubleshooting Dell OpenManage Essentials, see the Dell OpenManage Essentials User's Guide. | Dell.com/openmanagemanuals |
| | For information about installing and using Dell SupportAssist, see the Dell EMC SupportAssist Enterprise User's Guide. | Dell.com/serviceabilitytools |
| | For understanding the features of Dell Lifecycle Controller, see the Dell Lifecycle Controller User's Guide. | Dell.com/idracmanuals |

| Task | Document | Location |
|--|--|--|
| | For information about partner programs enterprise systems management, see the OpenManage Connections Enterprise Systems Management documents. | Dell.com/openmanagemanuals |
| | For information about viewing inventory, performing configuration and monitoring tasks, remotely turning on or off servers, and enabling alerts for events on servers and components using the Dell Chassis Management Controller (CMC), see the CMC User's Guide. | Dell.com/esmmanuals |
| 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. | Dell.com/storagecontrollermanuals |
| Understanding event and error messages | For information about checking the event and error messages generated by the system firmware and agents that monitor system components, see the Dell Event and Error Messages Reference Guide. | Dell.com/openmanagemanuals > OpenManage software |
| Troubleshooting your system | For information about identifying and troubleshooting the PowerEdge server issues, see the Server Troubleshooting Guide. | Dell.com/poweredgemanuals |

Technical specifications

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

Topics:

- [System dimensions](#)
- [System weight](#)
- [Processor specifications](#)
- [PSU specifications](#)
- [System battery specifications](#)
- [Expansion bus specifications](#)
- [Memory specifications](#)
- [Storage controller specifications](#)
- [Remote management port specifications](#)
- [Drive specifications](#)
- [Ports and connectors specifications](#)
- [Video specifications](#)
- [Environmental specifications](#)

System dimensions

This section describes the physical dimensions of the system.

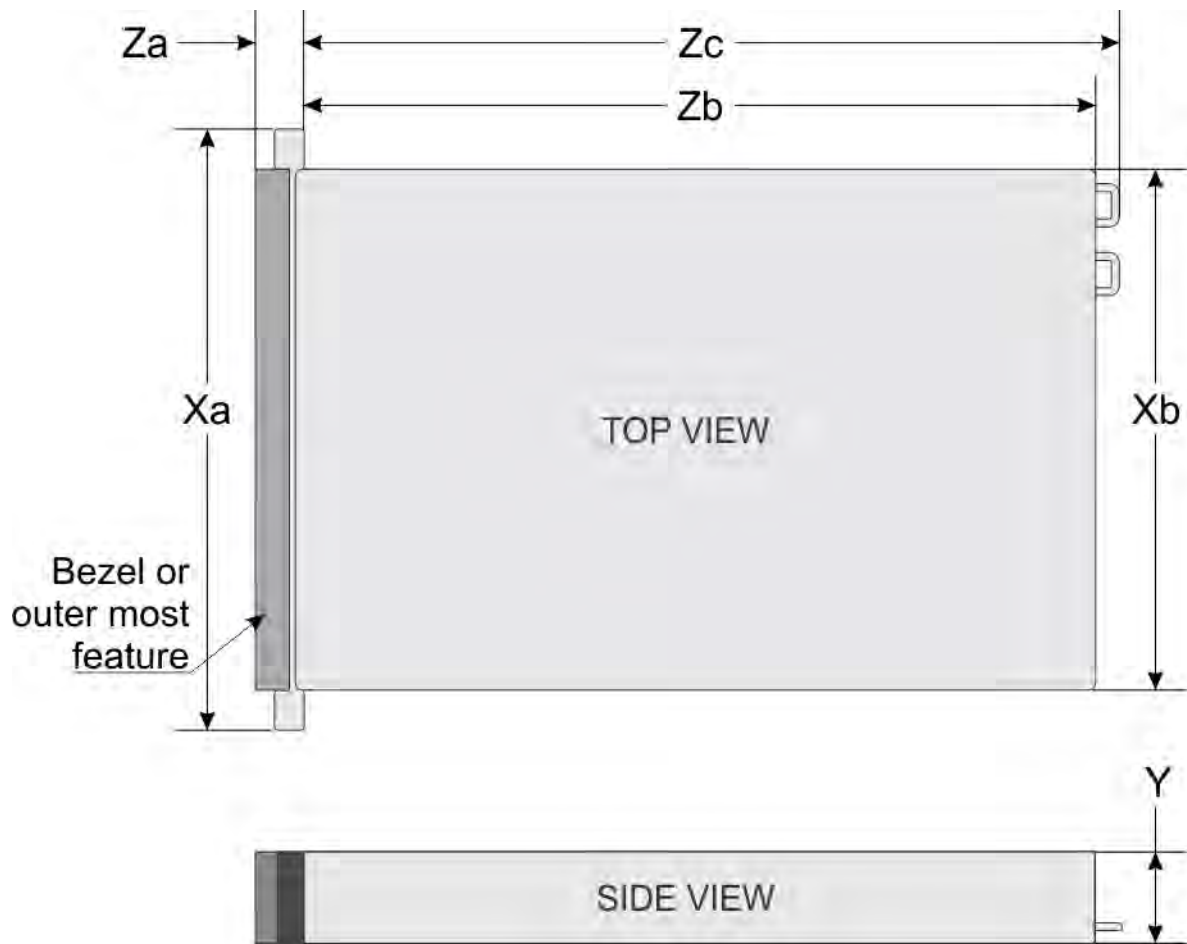


Figure 14. System dimensions of PowerEdge R940 system

Table 16. System dimensions of PowerEdge R940 system

| System | Xa | Xb | Y | Za (with bezel) | Za (without bezel) | Zb | Zc |
|----------------|---------------------------|----------------------------|---------------------------|--------------------------|--------------------------|----------------------------|------------------------------|
| PowerEdge R940 | 482.0 mm (18.9 inches) | 434.0 mm (17.08 inches) | 130.3 mm (5.13 inches) | 35.0 mm (1.37 inches) | 22.0 mm (0.86 inches) | 726.2 mm (28.59 inches) | 777.046 mm (30.59 inches) |

System weight

Table 17. System weight of PowerEdge R940 system

| System | Maximum weight (with all hard drive/SSDs) |
|----------------|---|
| PowerEdge R940 | 49.9 kg (110.01 lb) |

Processor specifications

The PowerEdge R940 system supports two or four Intel Xeon scalable family processors.

PSU specifications

The PowerEdge R940 system supports up to two AC or DC power supply units (PSUs).

Table 18. PSU specifications

| PSU | Class | Heat dissipation (maximum) | Frequency | Voltage | Power rating | Current |
|---|----------|----------------------------|-----------|--|-----------------------------|-------------|
| 1100 W AC | Platinum | 4100 BTU/hr | 50/60 Hz | 100–120 V AC, autoranging 200–240 V AC, autoranging | derated to 1050 W 1100 W | 12 A–6.5 A |
| 1100 W DC | N/A | 4416 BTU/hr | N/A | –(48–60) V DC, autoranging | 1100 W | 32 A |
| 1100 W Mixed Mode HVDC (for China and Japan only) | Platinum | 4100 BTU/hr | 50/60 Hz | 100–120 V AC, autoranging | derated to 1050 W | 12 A–6.5 A |
| | N/A | 4100 BTU/hr | N/A | 200–380 V DC, autoranging | 1100 W | 6.4 A–3.2 A |
| 1600 W AC | Platinum | 6000 BTU/hr | 50/60 Hz | 100–120 V AC, autoranging 200–240 V AC, autoranging | derated to 800 W 1600 W | 10 A |
| 2000 W AC | Platinum | 7500 BTU/hr | 50/60 Hz | 100–120 V AC, autoranging 200–240 V AC, autoranging | derated to 1000 W 2000 W | 11.5 A |
| 2400 W AC | Platinum | 9000 BTU/hr | 50/60 Hz | 100–120 V AC, autoranging 200–240 V AC, autoranging | derated to 1400 W 2400 W | 16 A |

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 240 V.

NOTE: PSUs rated for 1600 W and higher require high-line voltage (200–240 V) to supply their rated capacity.

System battery specifications

The PowerEdge R940 system supports CR 2032 3.0-V lithium coin cell system battery.

Expansion bus specifications

The PowerEdge R940 system supports PCI express (PCIe) generation 3 expansion cards, which you can install on the expansion slots available on the system board. If you are using PowerEdge R940 system with four processor configuration, then you can also install the cards by using the expansion card riser. This system supports up to two expansion card risers. The following table provides the expansion card riser specifications:

Table 19. Expansion card slots supported on the system board

| PCIe slot on the system board | Processor connection | PCIe slots on system board (Height) | PCIe slots on system board (length) | Link width | Slot width |
|-------------------------------|----------------------|-------------------------------------|-------------------------------------|------------|------------|
| Slot 1 | Processor 1 | full height | half length | x8 | x16 |
| Slot 2 | Processor 1 | full height | half length | x16 | x16 |
| Slot 3 | Processor 1 | full height | half length | x16 | x16 |
| Slot 4 | Processor 2 | full height | half length | x16 | x16 |
| Slot 5 | Processor 2 | full height | half length | x8 | x16 |
| Slot 6 | Processor 2 | full height | half length | x8 | x16 |
| Slot 7 | Processor 2 | full height | half length | x16 | x16 |

Table 20. Expansion card riser configurations

| Riser | PCIe slot on the expansion card riser | Processor connection | PCIe slots on riser (Height) | PCIe slots on riser (length) | Link width | Slot width |
|---------------------|---------------------------------------|----------------------|------------------------------|------------------------------|------------|------------|
| | Slot 8 | Processor 3 | full height | 3/4 length | x16 | x16 |
| Riser 2 (IO_RISER2) | Slot 9 | Processor 3 | full height | half length | x16 | x16 |
| | Slot 10 | Processor 3 | full height | half length | x16 | x16 |
| | Slot 11 | Processor 4 | full height | 3/4 length | x16 | x16 |
| Riser 3 (IO_RISER3) | Slot 12 | Processor 4 | full height | half length | x16 | x16 |
| | Slot 13 | Processor 4 | full height | half length | x16 | x16 |

Memory specifications

Table 21. Memory specifications

| DIMM type | DIMM rank | DIMM capacity | Dual processors | | Quad processors | |
|-----------|-------------|---------------|-----------------|-------------|---|-------------|
| | | | Minimum RAM | Maximum RAM | Minimum RAM | Maximum RAM |
| LRDIMM | Octal Rank | 128 GB | 256 GB | 3,072 GB | 512 GB | 6,144 GB |
| LRDIMM | Quad Rank | 64 GB | 128 GB | 1,536 GB | 256 GB | 3,072 GB |
| RDIMM | Dual Rank | 32 GB | 64 GB | 768 GB | 128 GB | 1,536 GB |
| RDIMM | Dual Rank | 16 GB | 32 GB | 384 GB | 64 GB | 768 GB |
| RDIMM | Single Rank | 8 GB | 16 GB | 192 GB | 32 GB | 384 GB |
| NVDIMM-N | Single Rank | 16 GB | 16 GB | 192 GB | Supported on the system board only (No NVDIMM-N on PEM) | |

NOTE: 8 GB RDIMM and NVDIMM-N must not be mixed.

NOTE: NVDIMM-N memory modules must be installed only on the memory sockets available on the system board.

Storage controller specifications

The PowerEdge R940 system supports:

- Internal storage controller cards: PowerEdge RAID Controller (PERC) H330, PERC H730P, PERC H740P, S140 (NVMe drives only), and NVMe PCIe SSD adapter.
- External storage controller cards: PERC H840 and 12Gbps SAS HBA.

Remote management port specifications

The PowerEdge R940 system supports one dedicated 1Gbe Ethernet port with optional card and up to two optional shared NIC ports.

Drive specifications

Hard drives

The PowerEdge R940 system supports SAS, SATA, Nearline SAS, NVMe hard drives or SSDs.

Table 22. Supported drive options for the PowerEdge R940 system

| | |
|---------------------------|--|
| Eight drives system | Up to eight 2.5 inch (SAS, SATA or Nearline SAS) front accessible drives in slots 0 through 7 |
| Twenty four drives system | Up to twenty four 2.5 inch (SAS, SATA or Nearline SAS) front accessible drives in slots 0 through 23 |
| Twenty four drives system | Up to twenty SAS + 4 NVMe SAS/SATA drives in slots 0 to 19 + slots 20 to 23 |
| Twenty four drives system | Up to sixteen SAS + 8 NVMe SAS/SATA drives in slots 0 to 15 + slots 16 to 23 |

Ports and connectors specifications

USB ports

The PowerEdge R940 system supports:

- Two USB 3.0-compliant ports on the front panel
- Two USB 3.0-compliant ports on the back panel
- One USB 3.0-compliant internal port

NIC ports

The PowerEdge R940 system supports up to four NDC ports on the back panel, which are available in the following configurations:

- Four RJ-45 ports that support 10, 100, and 1000 Mbps

- Four RJ-45 ports that support 100 M, 1 G and 10 Gbps
- Four RJ-45 ports, where two ports support maximum of 10 G and the other two ports maximum of 1 G
- Two RJ-45 ports that support up to 1 Gbps and 2 SFP+ ports that support up to 10 Gbps
- Four SFP+ ports that support up to 10 Gbps
- Two SFP28 ports that support up to 25 Gbps

Serial port

The PowerEdge R940 system supports one serial port on the back panel, which is a 9-pin connector, Data Terminal Equipment (DTE), 16550-compliant.

VGA ports

The PowerEdge R940 system supports two 15-pin VGA ports. One of the VGA ports is located on the front of the system and the other port is located on the back of the system.

Video specifications

The PowerEdge R940 system supports integrated Matrox G200eW3 graphics controller with 16 MB of video frame buffer.

Table 23. Resolution information for video modes

| Resolution | Refresh rate (Hz) |
|-------------|-------------------|
| 1024 x 768 | 60 |
| 1280 x 800 | 60 |
| 1280 x 1024 | 60 |
| 1360 x 768 | 60 |
| 1440 x 900 | 60 |
| 1600 x 900 | 60 (RB) |
| 1600 x 1200 | 60 |
| 1680 x 1050 | 60 (RB) |
| 1920 x 1080 | 60 |
| 1920 x 1200 | 60 |

Environmental specifications

NOTE: For additional information about environmental measurements for specific system configurations, see [Dell.com/environmental_datasheets](https://www.dell.com/environmental_datasheets).

Table 24. 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. |

| Temperature | Specifications |
|--|-----------------|
| Maximum temperature gradient (operating and storage) | 20°C/h (68°F/h) |

Table 25. 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 26. 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 27. 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 28. Maximum altitude specifications

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

Table 29. 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 30. Particulate contamination specifications

| Particulate contamination | Specifications |
|---------------------------|---|
| Air filtration | <p>Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit.</p> <p>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.</p> <p>NOTE: Air entering the data center must have MERV11 or MERV13 filtration.</p> |
| Conductive dust | <p>Air must be free of conductive dust, zinc whiskers, or other conductive particles.</p> <p>NOTE: This condition applies to data center and non-data center environments.</p> |
| Corrosive dust | <ul style="list-style-type: none"> Air must be free of corrosive dust. Residual dust present in the air must have a deliquescent point less than 60% relative humidity. <p>NOTE: This condition applies to data center and non-data center environments.</p> |

Table 31. 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 32. 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 33. Expanded operating temperature specifications

| Expanded operating temperature | Specifications |
|---|--|
| Less than or equal to 10% of annual operating hours | <p>5°C to 40°C at 5% to 85% RH with 29°C dew point.</p> <p>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.</p> <p>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).</p> |
| Less than or equal to 1% of annual operating hours | <p>–5°C to 45°C at 5% to 90% RH with 29°C dew point.</p> <p>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.</p> <p>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).</p> |

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

- Do not perform a cold startup below 5°C.
- The operating temperature specified is for a maximum altitude of 3050 m (10,000 ft).
- 150 W/8 core or higher wattage processor [Thermal Design Power (TDP)>165 W] is not supported.
- Redundant power supply unit is required.
- Non-Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- NVMe drives are not supported.
- NVDIMMs are not supported.

Thermal restrictions

Following table lists the configuration required for efficient cooling:

Table 34. Thermal restriction for efficient cooling

| Configuration | Number of processors | Heatsink | Processor blank | DIMM blanks | Fresh air | Fan |
|--|----------------------|--|-----------------|-------------|-----------|---------------------|
| Eight 2.5 inch hard drive system | 2 | Two heat sinks for CPU < 165W | Not required | 12 | Yes | eight standard fans |
| | | Two heat sinks for CPU ≥ 165 W | | | No | |
| | 4 | Four standard heat sinks for CPU < 165 W | Not required | 24 | Yes | eight standard fans |
| | | Four heat sinks CPU ≥ 165 W | | | No | |
| Twenty four 2.5 inch hard drive system | 2 | Two standard heat sinks for CPU < 165W | Not required | 12 | Yes | eight standard fans |
| | | Two heat sinks for CPU ≥ 165 W | | | No | |
| | 4 | Four standard heat sinks for CPU < 165 W | Not required | 24 | Yes | eight standard fans |
| | | Four heat sinks for CPU ≥ 165 W | | | No | |

Table 35. NIC card slot restrictions

| Configuration | Slot restriction | Ambient restriction |
|--|--|---------------------|
| Eight 2.5-inch hard drive system | Slots 1, 5, and 6 do not support NIC cards | 35°C |
| Twenty four 2.5-inch hard drive system | Slots 1, 5, and 6 do not support NIC cards | 35°C |

Initial system setup and configuration

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 *Rail Installation Guide* 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.

For more information about setting up your system, see your *Getting Started Guide* shipped with your system.

Related links

[iDRAC configuration](#)

[Options to set up iDRAC IP address](#)

iDRAC configuration

The Integrated Dell Remote Access Controller (iDRAC) is designed to make system administrators more productive and improve the overall availability of Dell 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 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. You can set up the IP address by using one of the following interfaces:

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

| Interfaces | Document/Section |
|--|--|
| iDRAC Direct and Quick Sync 2 (optional) | See <i>Dell Integrated Dell Remote Access Controller User's Guide</i> at Dell.com/idracmanuals |

NOTE: To access iDRAC, ensure that you connect the Ethernet cable to the iDRAC direct port. You can also access iDRAC through the shared LOM mode, if you have opted for a system that has the shared LOM mode enabled.

Log in to iDRAC

You can log in to iDRAC as:

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

You can also log in by using Single Sign-On or Smart Card.

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

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

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

You can also access iDRAC by using RACADM. For more information, see the *RACADM Command Line Interface Reference Guide* at [Dell.com/idracmanuals](https://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 36. Resources to install the operating system

| Resources | Location |
|---|---|
| Systems Management Tools and Documentation media | Dell.com/operatingsystemmanuals |
| Lifecycle Controller | Dell.com/idracmanuals |
| OpenManage Deployment Toolkit | Dell.com/openmanagemanuals |
| Dell certified VMware ESXi | Dell.com/virtualizationsolutions |
| Supported operating systems on PowerEdge systems | Dell.com/ossupport |
| Installation and How-to videos for supported operating systems on PowerEdge systems | Supported Operating Systems for Dell PowerEdge Systems |

Methods to download firmware and drivers

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

Table 37. Firmware and drivers

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

Downloading drivers and firmware

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

Prerequisite

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

Steps

- 1 Go to [Dell.com/support/drivers](https://dell.com/support/drivers).
- 2 In the **Drivers & Downloads** section, type the Service Tag of your system in the **Enter a Service Tag or product ID** box, and then click **Submit**.

 **NOTE: If you do not have the Service Tag, select Detect Product to allow the system to automatically detect your Service Tag, or click View products, and 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.

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

System Setup

By using the **System Setup** screen, you can configure the BIOS settings, iDRAC settings, and device settings of your system. These settings have already been pre-configured per solution requirements. Contact Dell EMC before you change these settings.

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.

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.

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 the 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 <i>Integrated Dell Remote Access Controller User's Guide</i> at Dell.com/idracmanuals . |
| Device Settings | Enables you to configure device settings. |

System BIOS

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

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**.

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. |
| NVMe Settings | Specifies options to change the NVMe settings. If the system contains the NVMe drives that you want to configure in a RAID array, you must set both this field and the Embedded SATA field on the SATA Settings menu to RAID mode. You might also need to change the Boot Mode setting to UEFI . Otherwise, you should set this field to Non-RAID mode. |
| Boot Settings | Specifies options to specify the Boot mode (BIOS or UEFI). Enables you to modify UEFI and BIOS boot settings. |

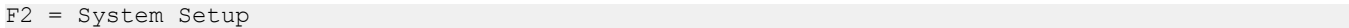
| Option | Description |
|--------------------------------|---|
| Network Settings | Specifies options to manage the UEFI network settings and boot protocols. Legacy network settings are managed from the Device Settings menu. |
| Integrated Devices | Specifies options to manage integrated device controllers and ports, specifies related features and options. |
| Serial Communication | Specifies options to manage the serial ports, its related features and options. |
| System Profile Settings | Specifies options to change the processor power management settings, memory frequency. |
| System Security | Specifies options to configure the system security settings, such as system password, setup password, Trusted Platform Module (TPM) security, and UEFI secure boot. It also manages the power button on the system. |
| Redundant OS Settings | Specifies the options to configure the Redundant OS settings. |
| Miscellaneous Settings | Specifies options to change the system date and time. |

System Information

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

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:

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

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.

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. |

| Option | Description |
|--|--|
| 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. |

Memory Settings

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

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**.

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 system memory speed. |
| System Memory Voltage | Specifies the system memory voltage. |
| Video Memory | Specifies the amount of video memory. |
| System Memory Testing | Specifies whether the system 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 , Single Rank Spare Mode , Multi-Rank Spare Mode , Mirror Mode , Fault Resilient Mode . This option is set to Optimizer Mode by default. |

| Option | Description |
|---|---|
| | <p> NOTE: Dell recommends Optimizer Mode for the Memory Operating Mode.</p> <p> NOTE: The 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.</p> |
| Current State of Memory Operating Mode | Specifies the current state of the memory operating mode. |
| Node Interleaving | Specifies if 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. |
| Opportunistic Self-Refresh | Enables or disables opportunistic self-refresh feature. This option is set to Disabled by default. |

Persistent Memory details

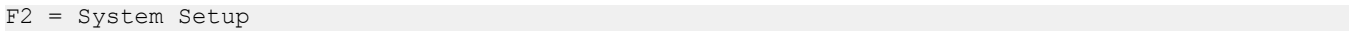
The **Persistent Memory** screen details can be found in the *NVDIMM-N User Guide* at Dell.com/poweredgedmanuals.

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, logical processor idling, and opportunistic self-refresh.

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:

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

 **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.

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. |
| CPU Interconnect Speed | Enables you to govern the frequency of the communication links among the CPUs in the system.  NOTE: The standard and basic bin processors support lower link frequencies. |

| Option | Description |
|--------------------------------------|---|
| | <p>The options available are Maximum data rate, 10.4 GT/s, and 9.6 GT/s. This option is set to Maximum data rate by default.</p> <p>Maximum data rate indicates that the BIOS runs the communication links at the maximum frequency supported by the processors. You can also select specific frequencies that the processors support, which can vary.</p> <p>For best performance, you should select Maximum data rate. Any reduction in the communication link frequency affects the performance of non-local memory accesses and cache coherency traffic. In addition, it can slow access to non-local I/O devices from a particular CPU.</p> <p>However, if power saving considerations outweigh performance, you might want to reduce the frequency of the CPU communication links. If you do this, you should localize memory and I/O accesses to the nearest NUMA node to minimize the impact to system performance.</p> |
| Virtualization Technology | Enables or disables the virtualization technology for the processor. 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. |
| Sub NUMA Cluster | Enables or disables the Sub NUMA Cluster. 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. |
| X2APIC Mode | Enables or disables the X2APIC mode. This option is set to Disabled by default. |
| Dell Controlled Turbo | Controls the turbo engagement. Enable this option only when System Profile is set to Performance .  NOTE: Depending on the number of installed CPUs, there might be up to four processor listings. |
| Number of Cores per Processor | Controls the number of enabled cores in each processor. This option is set to All by default. |
| Processor Core Speed | Specifies the maximum core frequency of the processor. |
| Process Bus Speed | Displays the bus speed of the processor. |
| Processor n |  NOTE: Depending on the number of CPUs, there might 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. |
| Level 2 Cache | Specifies the total L2 cache. |

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

SATA Settings

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

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

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.

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 AHCI , or RAID modes. This option is set to AHCI by default. | | | | | | | | |
| Security Freeze Lock | Sends Security Freeze Lock command to the embedded SATA drives during POST. This option is applicable only for ATA and AHCI mode. This option is set to Enable by default. | | | | | | | | |
| Write Cache | Enables or disables the command for the embedded SATA drives during POST. This option is set to Disable by default. | | | | | | | | |
| Port A | Sets the drive type of the selected device. For the 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. | | | | | | | | |
| | <table border="1"> <thead> <tr> <th>Option</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>Specifies the drive model of the selected device.</td> </tr> <tr> <td>Drive Type</td> <td>Specifies the type of drive attached to the SATA port.</td> </tr> <tr> <td>Capacity</td> <td>Specifies the total capacity of the hard drive. This field is undefined for removable media devices such as optical drives.</td> </tr> </tbody> </table> | 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. |
| 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 the 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 |
| 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 the 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 the 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. |

NVMe Settings

The NVMe settings enable you to set the NVMe drives to either **RAID** mode or **Non-RAID** mode.

NOTE: To configure these drives as RAID drives, you must set the NVMe drives and the Embedded SATA option in the SATA Settings menu to RAID mode. If not, you must set this field to Non-RAID mode.

Viewing NVMe Settings

To view the **NVMe 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
- 3 On the **System Setup Main Menu** screen, click **System BIOS**.
- 4 On the **System BIOS** screen, click **NVMe Settings**.

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.

NVMe Settings details

The NVMe Settings screen details are explained as follows:

| Option | Description |
|------------------|---|
| NVMe Mode | Enables you to set the NVMe mode. This option is set to RAID by default. |

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.

- **UEFI:** The Unified Extensible Firmware Interface (UEFI) is a new interface between operating systems and platform firmware. The interface consists of data tables with platform related information, also boot and runtime service calls that are available to the operating system and its loader. The following benefits are available when the **Boot Mode** is set to **UEFI**:
 - Support for drive partitions larger than 2 TB.
 - Enhanced security (e.g., UEFI Secure Boot).
 - Faster boot time.
- **NOTE:** You must use only the UEFI boot mode in order to boot from NVMe drives.
- **BIOS:** The **BIOS Boot Mode** is the legacy boot mode. It is maintained for backward compatibility.

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**.

Boot Settings details

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

| Option | Description |
|----------------------------|---|
| Boot Mode | <p>Enables you to set the boot mode of the system.</p> <p>CAUTION: Switching the boot mode may prevent the system from booting if the operating system is not installed in the same boot mode.</p> <p>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.</p> <p>NOTE: Setting this field to UEFI disables the BIOS Boot Settings menu.</p> |
| Boot Sequence Retry | <p>Enables or disables the Boot Sequence Retry feature. If this option is set to Enabled and the system fails to boot, the system re-attempts the boot sequence after 30 seconds. This option is set to Enabled by default.</p> |

| Option | Description |
|-----------------------------|---|
| 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 . This option is set to Disable by default. |
| 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. |

Choosing 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.
- UEFI boot mode (the default), 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 UEFI 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.

 **NOTE:** For the latest information about supported operating systems, go to Dell.com/ossupport.

Changing boot order

About this task

You may have to change the boot order if you want to boot from a USB key. 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**.

Steps

- 1 On the **System Setup Main Menu** screen, click **System BIOS > Boot Settings > UEFI/BIOS Boot Settings > UEFI/BIOS Boot Sequence**.
- 2 Click **Boot Option Settings > BIOS/UEFI Boot 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.

Network Settings

You can use the **Network Settings** screen to modify UEFI PXE, iSCSI, and HTTP boot 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.

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**.

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

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.

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**.

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). |
| iSCSI Device1 | Enables or disables the iSCSI device. When disabled, a UEFI boot option is created for the iSCSI device automatically. |
| iSCSI Device1 Settings | Enables you to control the configuration of the iSCSI device. |

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.

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**.

Integrated Devices details

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

| Option | Description |
|----------------------------------|--|
| User Accessible USB Ports | <p>Configures the user accessible USB ports. Selecting Only Back Ports On disables the front USB ports; selecting All Ports Off disables all front and back USB ports; selecting All Ports Off (Dynamic) disables all front and back USB ports during POST and front ports can be enabled or disabled dynamically by authorized user without resetting the system.</p> <p>The USB keyboard and mouse still function in certain USB ports during the boot process, depending on the selection. After the boot process is complete, the USB ports will be enabled or disabled as per the setting.</p> |

| Option | Description |
|---|---|
| | <p>NOTE: Selecting Only Back Ports On and All Ports Off disables the USB management port and also restricts access to the iDRAC features.</p> |
| iDRAC Direct USB Port | The iDRAC Direct USB port is managed by iDRAC exclusively with no host visibility. This option is set to ON or OFF . When set to OFF , iDRAC does not detect any USB devices installed in this managed port. |
| Internal USB Port | Enables or disables the internal USB port. This option is set to Enabled by default. |
| Integrated Network Card 1 | Enables or disables the integrated network card (NDC). When set to Disabled , the NDC is not available to the operating system (OS). This option is set to Enable by default. <p>NOTE: If set to Disabled (OS), the Integrated NICs might still be available for shared network access by iDRAC.</p> |
| I/OAT DMA Engine | Enables or disables the I/O Acceleration Technology (I/OAT) option. I/OAT is a set of DMA features designed to accelerate network traffic and lower CPU utilization. Enable only if the hardware and software support the feature. |
| Embedded Video Controller | Enables or disables the use of Embedded Video Controller as the primary display. When set to Enabled , the Embedded Video Controller will be the primary display even if add-in graphic cards are installed. When set to Disabled , an add-in graphics card will be used as the primary display. BIOS will output displays to both the primary add-in video and the embedded video during POST and pre-boot environment. The embedded video will then be disabled right before the operating system boots. This option is set to Enabled by default. <p>NOTE: When there are multiple add-in graphic cards installed in the system, the first card discovered during PCI enumeration is selected as the primary video. You might have to re-arrange the cards in the slots in order to control which card is the primary video.</p> |
| 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 the PCIe devices that need large amounts of memory. Enable this option only for 64-bit operating systems. This option is set to Enabled by default. |
| Memory Mapped I/O above Base | When set to 12 TB , the system will map MMIO base to 12 TB. Enable this option for an OS that requires 44 bit PCIe addressing. When set to 512 GB , the system will map MMIO base to 512 GB, and reduce the maximum support for memory to less than 512 GB. Enable this option only for the 4 GPU DGMA issue. This option is set to 56 TB by default. |
| Slot Disablement | Enables or disables the available PCIe slots on your system. The slot disablement feature controls the configuration of the 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. Only slots that are present on the system will be available for control. |

Table 38. Slot Disablement

| Option | Description |
|---------------|---|
| Slot 1 | Enables or disables the PCIe slot 1. This option is set to Enabled by default. |
| Slot 3 | Enables or disables or only the boot driver is disabled for the PCIe slot 3. This option is set to Enabled by default. |

| Option | Description |
|---------------|---|
| Slot 4 | Enables or disables or only the boot driver is disabled for the PCIe slot 4. This option is set to Enabled by default. |
| Slot 5 | Enables or disables or only the boot driver is disabled for the PCIe slot 5. This option is set to Enabled by default. |
| Slot 6 | Enables or disables or only the boot driver is disabled for the PCIe slot 6. This option is set to Enabled by default. |
| Slot 7 | Enables or disables or only the boot driver is disabled for the PCIe slot 7. This option is set to Enabled by default. |

NOTE: If your system supports four processors, you may have 13 PCIe slots.

Slot Bifurcation Allows **Platform Default Bifurcation**, **Auto discovery of Bifurcation** and **Manual bifurcation Control**. The default is set to **Platform Default Bifurcation**. The slot bifurcation field is accessible when set to **Manual bifurcation Control** and is grayed out when set to **Platform Default Bifurcation** or **Auto discovery of Bifurcation**.

Table 39. Slot Bifurcation

| Option | Description |
|---------------------------|---|
| Slot 1 Bifurcation | X4 or X8 or X4X4X4X8 or X8X4X4 Bifurcation |
| Slot 3 Bifurcation | X4 or X8 or X4X4X4X8 or X8X4X4 Bifurcation |
| Slot 4 Bifurcation | X16 or X4 or X8 or X4X4X4X8 or X8X4X4 Bifurcation |
| Slot 5 Bifurcation | X4 Bifurcation or X8 Bifurcation |

Serial Communication

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

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**.

Serial Communication details

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

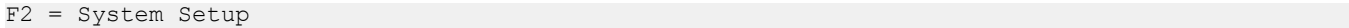
| Option | Description |
|----------------------------------|---|
| Serial Communication | <p>Selects serial communication devices (Serial Device 1 and Serial Device 2) in BIOS. BIOS console redirection can also be enabled, and the port address can be specified. This option is set to Auto by default.</p> <p>Enables the COM port or Console Redirection options. This option is set to Off by default.</p> <p>Selects serial communication devices (Serial Device 1 and Serial Device 2) in BIOS. Enables the COM1 port. This option is set to On with Console Redirection via COM1 by default.</p> |
| Serial Port Address | <p>Enables you to set the port address for serial devices. This option is set to Serial Device1=COM2, Serial Device 2=COM1 by default.</p> <p>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.</p> <p>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.</p> |
| External Serial Connector | <p>Enables you to associate the External Serial Connector to Serial Device 1, Serial Device 2, or the Remote Access Device by using this option. This option is set to Serial Device 1 by default.</p> <p>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.</p> <p>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.</p> <p>Enables you to associate the External Serial Connector to Serial Device 1.</p> |
| Failsafe Baud Rate | <p>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.</p> |
| Remote Terminal Type | <p>Sets the remote console terminal type. This option is set to ANSI VT 100/VT 220 by default.</p> |
| Redirection After Boot | <p>Enables or disables the BIOS console redirection when the operating system is loaded. This option is set to Enabled by default.</p> |

System Profile Settings

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

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:

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

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.

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. DBPM is Demand-Based Power Management. |
| Memory Frequency | Sets the speed of the system memory. You can select Maximum Performance , Maximum Reliability , or a specific speed. This option is set to Maximum Performance by default. |
| Turbo Boost | Enables or disables the processor to operate in the turbo boost mode. This option is set to Enabled by default. |
| 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. |
| Write Data CRC | Enables or disables the Write Data CRC. This option is set to Enabled 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. |

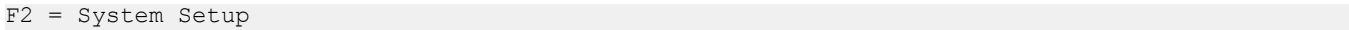
| Option | Description |
|---|--|
| | The CPU uses the setting to manipulate the internal behavior of the processor and determines whether to target higher performance or better power savings. |
| Number of Turbo Boot Enabled Cores for Processor 1 | <p>NOTE: If there are four processors installed in the system, you will see an entry for Number of Turbo Boost Enabled Cores for Processor 4.</p> <p>Controls the number of turbo boost enabled cores for Processor 1. The maximum number of cores is enabled by default.</p> |
| Monitor/Mwait | <p>Enables the Monitor/Mwait instructions in the processor. This option is set to Enabled for all system profiles, except Custom by default.</p> <p>NOTE: This option can be disabled only if the C States option in the Custom mode is set to disabled.</p> <p>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.</p> |
| CPU Interconnect Bus Link Power Management | Enables or disables the CPU Interconnect Bus Link Power Management. This option is set to Enabled by default. |
| PCI ASPM L1 Link Power Management | Enables or disables the PCI ASPM L1 Link Power Management. This option is set to Enabled by default. |

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.

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:

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

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.

System Security Settings details

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

| Option | Description |
|--|---|
| In-Band Manageability Interface | When set to Disabled , this setting will hide the Management Engine's (ME), HECI devices, and the system's IPMI devices from the operating system. This prevents the operating system from changing the ME power capping settings, and blocks access to all in-band management tools. All management should be managed through out-of-band. This option is set to Enabled by default. |

| Option | Description |
|---|---|
| | <p> NOTE: BIOS update requires HECI devices to be operational and DUP updates require IPMI interface to be operational. This setting needs to be set to Enabled to avoid updating errors.</p> |
| 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. |
| TPM Security | <p> NOTE: The TPM menu is available only when the TPM module is installed.</p> <p>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 the Intel TXT fields if the TPM Status field is set to either On with Pre-boot Measurements or On without Pre-boot Measurements.</p> |
| 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 | <p>Controls the Trusted Platform Module (TPM). When set to None, no command is sent to the TPM. When set to Activate, the TPM is enabled and activated. When set to Deactivate, the TPM is disabled and deactivated. When set to Clear, all the contents of the TPM are cleared. This option is set to None by default.</p> <p> 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.</p> <p>This field is read-only when TPM Security is set to Off. The action requires an additional reboot before it can take effect.</p> |
| Intel(R) 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. |
| 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 (60 s to 240 s) | 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 | Enables Secure Boot, where the BIOS authenticates each pre-boot image by using the certificates in the Secure Boot Policy. Secure Boot is set to Disabled by default. |
| 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 Mode | Configures how the BIOS uses the Secure Boot Policy Objects (PK, KEK, db, dbx). If the current mode is set to Deployed Mode , the available options are User Mode and Deployed Mode . If the current mode is set to User Mode , the available options are User Mode , Audit Mode , and Deployed Mode . |

| Option | Description | | | | | | | | |
|---|---|---------|-------------|------------------|--|-------------------|--|----------------------|---|
| | <table border="1"> <thead> <tr> <th>Options</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>User Mode</td> <td> <p>In User Mode, PK must be installed, and BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>The BIOS allows unauthenticated programmatic transitions between modes.</p> </td> </tr> <tr> <td>Audit Mode</td> <td> <p>In Audit mode, PK is not present. The BIOS does not authenticate programmatic updates to the policy objects, and transitions between modes.</p> <p>Audit Mode is useful for programmatically determining a working set of policy objects.</p> <p>BIOS performs signature verification on pre-boot images and logs results in the image Execution Information Table, but executes the images whether they pass or fail verification.</p> </td> </tr> <tr> <td>Deployed Mode</td> <td> <p>Deployed Mode is the most secure mode. In Deployed Mode, PK must be installed and the BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>Deployed Mode restricts the programmatic mode transitions.</p> </td> </tr> </tbody> </table> | Options | Description | User Mode | <p>In User Mode, PK must be installed, and BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>The BIOS allows unauthenticated programmatic transitions between modes.</p> | Audit Mode | <p>In Audit mode, PK is not present. The BIOS does not authenticate programmatic updates to the policy objects, and transitions between modes.</p> <p>Audit Mode is useful for programmatically determining a working set of policy objects.</p> <p>BIOS performs signature verification on pre-boot images and logs results in the image Execution Information Table, but executes the images whether they pass or fail verification.</p> | Deployed Mode | <p>Deployed Mode is the most secure mode. In Deployed Mode, PK must be installed and the BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>Deployed Mode restricts the programmatic mode transitions.</p> |
| Options | Description | | | | | | | | |
| User Mode | <p>In User Mode, PK must be installed, and BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>The BIOS allows unauthenticated programmatic transitions between modes.</p> | | | | | | | | |
| Audit Mode | <p>In Audit mode, PK is not present. The BIOS does not authenticate programmatic updates to the policy objects, and transitions between modes.</p> <p>Audit Mode is useful for programmatically determining a working set of policy objects.</p> <p>BIOS performs signature verification on pre-boot images and logs results in the image Execution Information Table, but executes the images whether they pass or fail verification.</p> | | | | | | | | |
| Deployed Mode | <p>Deployed Mode is the most secure mode. In Deployed Mode, PK must be installed and the BIOS performs signature verification on programmatic attempts to update policy objects.</p> <p>Deployed Mode restricts the programmatic mode transitions.</p> | | | | | | | | |
| Secure Boot Policy Summary | Specifies the list of certificates and hashes that secure boot uses to authenticate images. | | | | | | | | |
| Secure Boot Custom Policy Settings | Configures the Secure Boot Custom Policy. To enable this option, set the Secure Boot Policy to Custom option. | | | | | | | | |

Creating a system and setup password

Prerequisite

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.

Steps

- To enter System Setup, press F2 immediately after turning on or rebooting your system.
- On the **System Setup Main Menu** screen, click **System BIOS > System Security**.
- On the **System Security** screen, verify that **Password Status** is set to **Unlocked**.
- 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.

- Reenter the system password, and click **OK**.
- 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.

Using your system password to secure your system

About this task

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

Steps

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

Next step

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.

Deleting or changing system and setup password

Prerequisite

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

Steps

- 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.
- 7 Select **Setup Password**, change, or delete the existing setup password and press Enter or Tab.

NOTE: If you change the system password or setup password, a message prompts you to reenter the new password. If you delete the system password or setup password, a message prompts you to confirm the deletion.

Operating with 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.
```

```
Password Invalid. Number of unsuccessful password attempts: <x> Maximum number of password attempts exceeded. System halted.
```

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.

Redundant OS Control

You can use the **Redundant OS Control** screen to set the redundant OS info for redundant OS control. It enables you to set up a physical recovery disk on your system.

Viewing Redundant OS Control

To view the **Redundant OS Control** 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 **Redundant OS Control**.

Redundant OS Control screen details

The **Redundant OS Control** screen details are explained as follows:

| Option | Description |
|------------------------------|---|
| Redundant OS Location | <p>Enables you to select a backup disk from the following devices:</p> <ul style="list-style-type: none">• None• IDSDM• SATA Ports in AHCI mode• BOSS PCIe Cards (Internal M.2 Drives)• Internal USB <p>NOTE: RAID configurations and NVMe cards not are included as BIOS does not have the ability to distinguish between individual drives in those configurations.</p> |
| Redundant OS State | <p>NOTE: This option is disabled if Redundant OS Location is set to None.</p> <p>When set to Visible, the backup disk is visible to the boot list and OS. When set to Hidden, the backup disk is disabled and is not visible to the boot list and OS. This option is set to Visible by default.</p> |

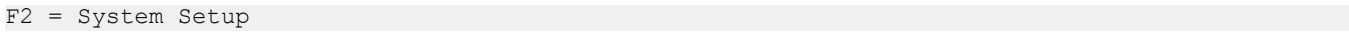

| Option | Description |
|--------------------------|---|
| |  NOTE: BIOS will disable the device in hardware, so it cannot be accessed by the OS. |
| Redundant OS Boot |  NOTE: This option is disabled if Redundant OS Location is set to None or if Redundant OS State is set to Hidden . When set to Enabled , BIOS boots to the device specified in Redundant OS Location . When set to Disabled , BIOS preserves the current boot list settings. This option is set to Enabled by default. |

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.


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:

-  **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**.

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. |
| Dell Wyse P25/P45 BIOS Access | Enables or disables the Dell Wyse P25/P45 BIOS Access. This option is set to Enabled by default. |
| Power Cycle Request | Enables or disables the Power Cycle Request. This option is set to None by default. |

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.

Device Settings

Device Settings enables you to configure device parameters.

Dell Lifecycle Controller

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

Embedded system management

The Dell Lifecycle Controller provides advanced embedded system management throughout the system's lifecycle. 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.

Boot Manager

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

Viewing Boot Manager

About this task

To enter Boot Manager:

Steps

- 1 Turn on, or restart your system.
Enter the result of your step here (optional).
- 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.

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. |

One-shot BIOS boot menu

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

System Utilities

System Utilities contains the following utilities that can be launched:

- Launch Diagnostics
- BIOS Update File Explorer
- Reboot System

PXE boot

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

To access the **PXE boot** option, boot the system and then press F12 during POST instead of using standard Boot Sequence from BIOS Setup. It does not pull any menu or allows managing of network devices.

Installing and removing system components

This section provides information about installing and removing the PowerEdge R940 components.

Topics:

- Safety instructions
- Before working inside your system
- After working inside your system
- Recommended tools
- Optional front bezel
- System cover
- Inside the system
- Air shroud
- Cooling fans
- Fan cage
- Intrusion switch
- Drives
- Backplane
- Cable routing
- System memory
- Processors and heat sinks
- Processor expansion module
- PEM power board
- Expansion cards and expansion card risers
- M.2 SSD module
- Network daughter card riser
- Network daughter card
- Storage controller card
- Optional IDSDM or vFlash module
- Power supply unit
- NVDIMM-N battery
- System battery
- Optional internal USB memory key
- System board
- Trusted Platform Module
- Control panel

Safety instructions

 **WARNING:** 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. Operating the system without the system cover can result in component damage.
- ⚠ 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.
- ⚠ CAUTION:** To ensure proper operation and cooling, all bays in the system and system fans must be always populated with a component or a blank.

Before working inside your system

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Turn off the system, including any attached peripherals.
- 2 Disconnect the system from the electrical outlet and disconnect the peripherals.
- 3 Remove the system cover.

After working inside your system

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Install the system cover.
- 2 Reconnect the peripherals and connect the system to the electrical outlet.
- 3 Turn on the system, including any attached peripherals.

Recommended tools

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

- Key to the bezel lock
The key is required only if your system includes a bezel.
- Phillips #1 screwdriver
- Phillips #2 screwdriver
- Torx #T30 screwdriver
- Torx #T8 screwdriver
- Wrist grounding strap

You need the following tools to assemble the cables for a DC power supply unit:

- AMP 90871-1 hand-crimping tool or equivalent
- Tyco Electronics 58433-3 or equivalent
- Wire-stripper pliers to remove insulation from size 10 AWG solid or stranded, insulated copper wire

ⓘ NOTE: Use alpha wire part number 3080 or equivalent (65/30 stranding).

Optional front bezel

The front bezel is attached to the front of the system to prevent unauthorized access to the system peripherals. The front bezel can be locked for additional security.

An optional metal bezel is mounted on the front of the system to display system branding. A lock on the bezel is used to protect unauthorized access to the drives. There are two versions of bezel available:

- With LCD panel
- Without LCD panel

For bezels with LCD panel, the system status can be viewed on the LCD panel. For more information, see the [LCD panel](#).

Removing the optional front bezel

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Unlock the bezel by using the bezel key.
- 2 Press the release button, and pull the left end of the bezel.
- 3 Unhook the right end, and remove the bezel.



Figure 15. Removing the optional front bezel with the LCD panel

Related links

[Installing the optional front bezel](#)

Installing the optional front bezel

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Locate and remove the bezel key.
- 2 Align and insert the right end of the bezel onto the system.
- 3 Press the release button and fit the left end of the bezel onto the system.
- 4 Lock the bezel by using the key.

NOTE: The bezel key is part of the LCD bezel package.



Figure 16. Installing the optional front bezel with the LCD panel

System cover

System cover provides security for the entire system and also helps in maintaining proper air flow inside the system.

Removing the system cover

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Turn off the system, including any attached peripherals.
- 3 Disconnect the system from the electrical outlet and disconnect the peripherals.

Steps

- 1 Using a 1/4 inch flat head or a Phillips #2 screwdriver, rotate the latch release lock counter clockwise to the unlocked position.
- 2 Lift the latch till the system cover slides back and the tabs on the system cover disengage from the guide slots on the system.
- 3 Hold the cover on both sides, and lift the cover away from the system.



Figure 17. Removing the system cover

Related links

[Installing the system cover](#)

Installing the system cover

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Ensure that all internal cables are routed correctly and connected, and no tools or extra parts are left inside the system.

Steps

- 1 Align the tabs on the system cover with the guide slots on the system.
- 2 Push the system cover latch down.
The system cover slides forward, the tabs on the system cover engage with the guide slots on the system and the system cover latch locks into place.
- 3 Using a 1/4 inch flat head or Phillips #2 screwdriver, rotate the latch release lock clockwise to the locked position.



Figure 18. Installing the system cover

Next steps

- 1 Reconnect the peripherals and connect the system to the electrical outlet.
- 2 Turn on the system, including any attached peripherals.

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.

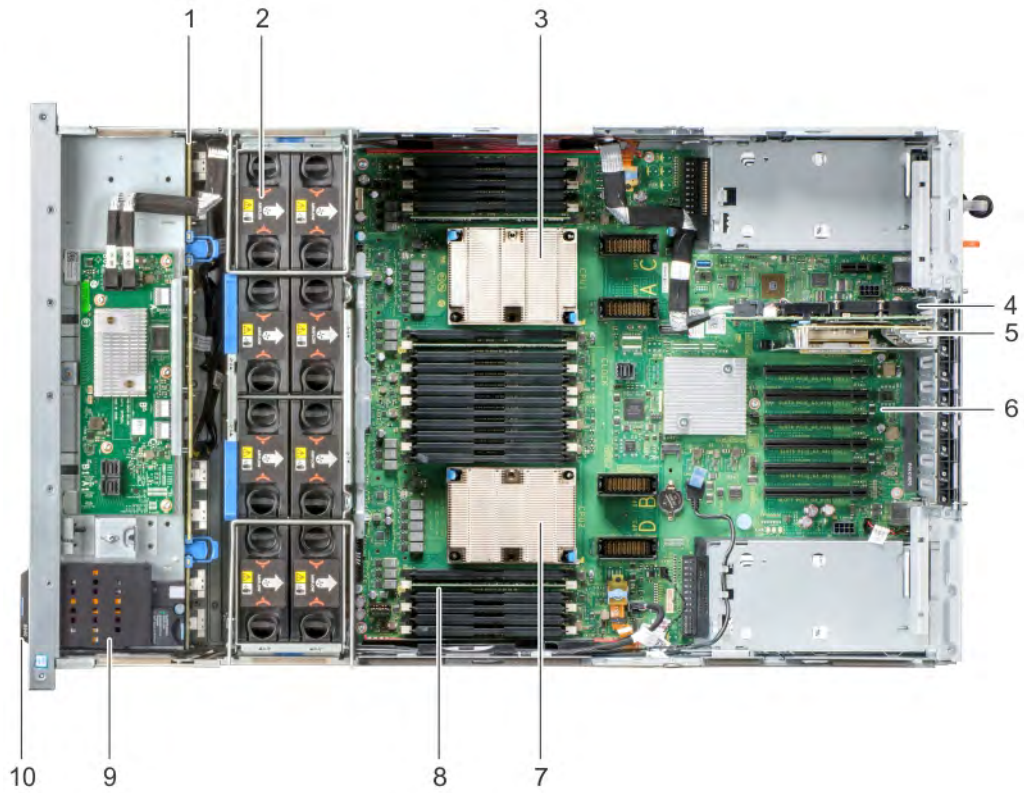


Figure 19. Inside the system — Two processor system

- | | | | |
|---|--|----|-------------------------|
| 1 | hard drive/SSD backplane with expander board | 2 | cooling fan (8) |
| 3 | heat sink (CPU1) | 4 | storage controller card |
| 5 | network daughter card riser | 6 | system board |
| 7 | heat sink (CPU2) | 8 | memory module (24) |
| 9 | NVDIMM-N battery | 10 | information tag |

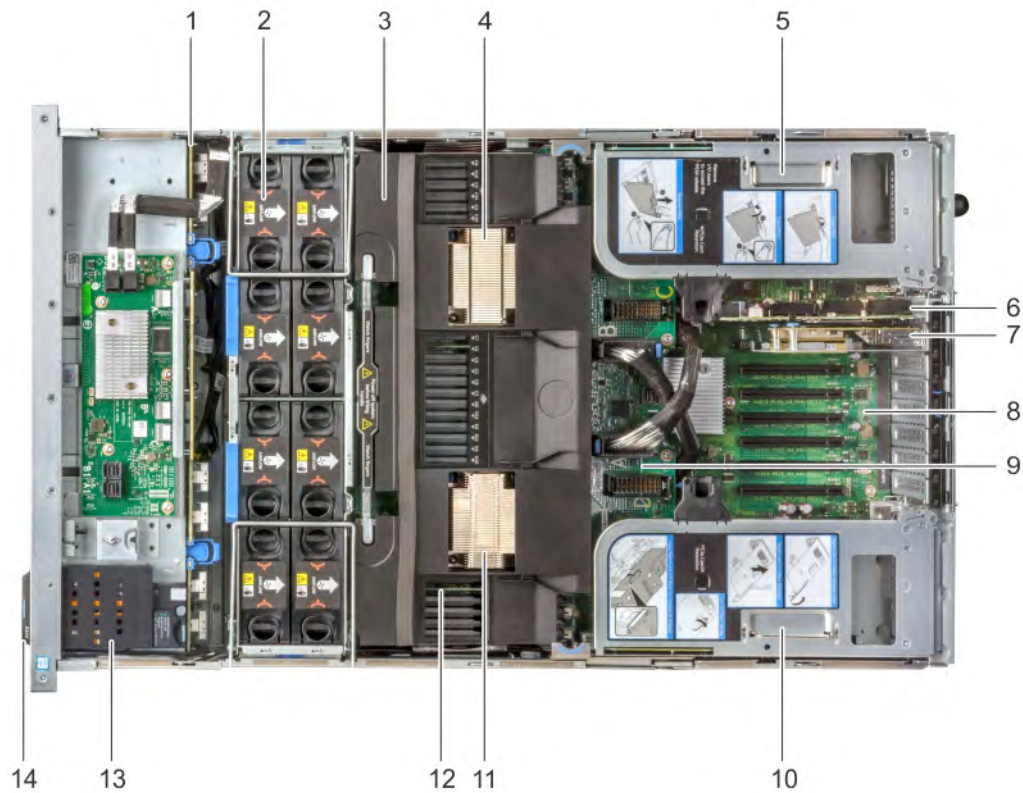


Figure 20. Inside the system — Four processor system with processor expansion module (PEM)

- | | | | |
|----|--|----|----------------------------|
| 1 | hard drive/SSD backplane with expander board | 2 | cooling fan (8) |
| 3 | air shroud | 4 | heat sink (CPU3) |
| 5 | left expansion card riser | 6 | storage controller card |
| 7 | network daughter card riser | 8 | system board |
| 9 | processor expansion module (PEM) | 10 | right expansion card riser |
| 11 | heat sink (CPU4) | 12 | memory module (48) |
| 13 | NVDIMM-N battery | 14 | information tag |

Air shroud

The air shroud directs the airflow across the entire system. Air shroud prevents the system from overheating and is used to maintain uniform airflow inside the system.

Removing the air shroud

Prerequisites

⚠ CAUTION: Never operate your system with the air shroud removed. The system may get overheated quickly, resulting in shutdown of the system and loss of data.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

Steps

- 1 To remove the air shroud from a two processor configuration system, hold the shroud at both ends and lift it out of the system.

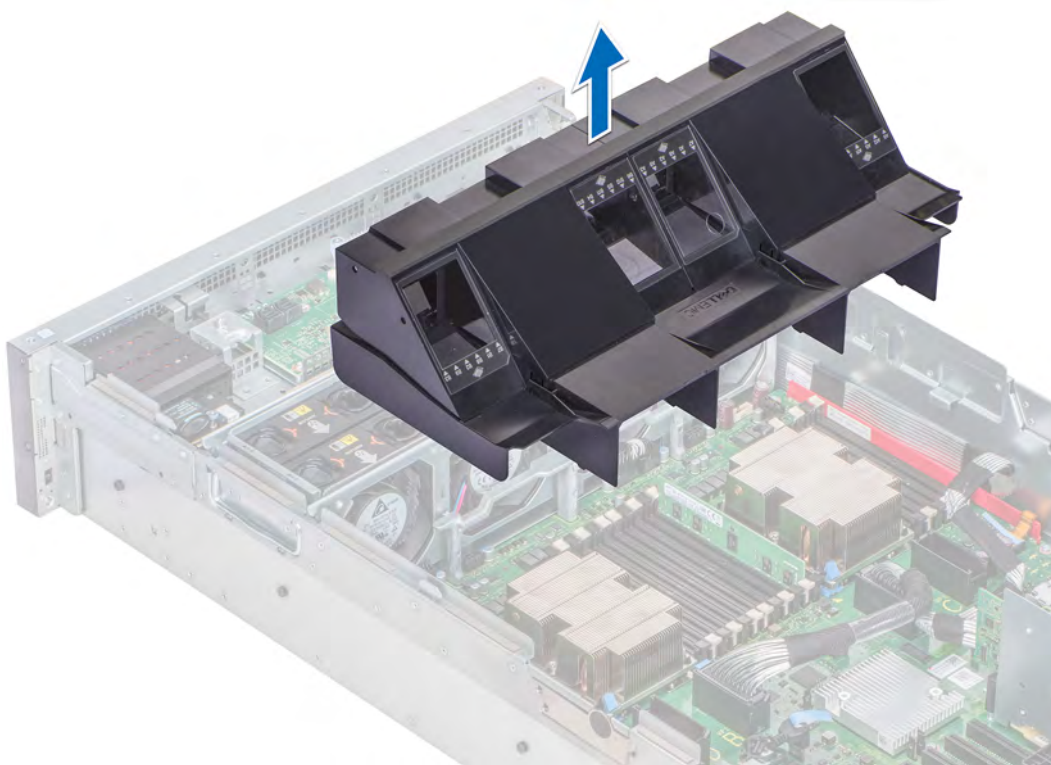


Figure 21. Removing the air shroud — Two processor system

- 2 To remove the air shroud from a four processor configuration system:
 - a Remove the expansion card risers. See [Removing the expansion card riser](#).
 - b Hook the expansion card riser on the side of the system by using the I/O riser handle on the expansion card riser.

CAUTION: To avoid damage to the PCIe cables connected to the NVMe cards installed in the expansion card riser, ensure that you hook the riser to the system using the I/O riser handle.

 - c Hold the shroud at both ends and lift it away from the system.

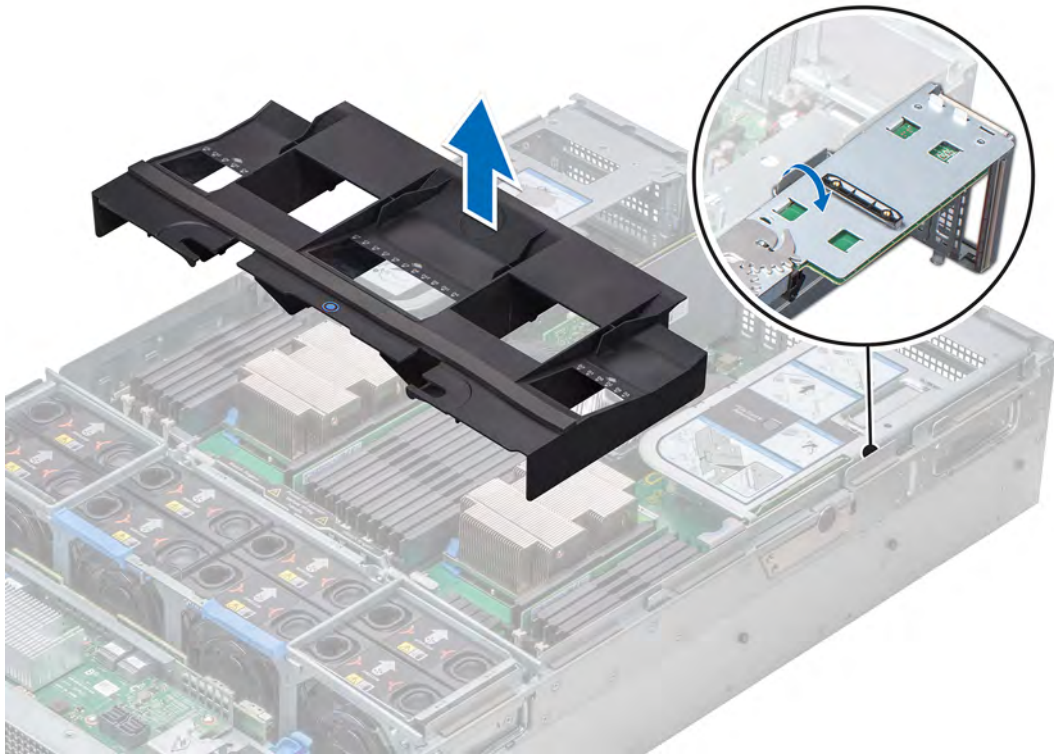


Figure 22. Removing the air shroud — Four processor system

Next step

Install the air shroud.

Related links

[Installing the air shroud](#)

Installing the air shroud

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 To install the air shroud in a two processor configuration system:
 - a Lower the air shroud into the system until it is firmly seated.
When firmly seated, the memory socket numbers marked on the air shroud align with the respective memory sockets on the system board.

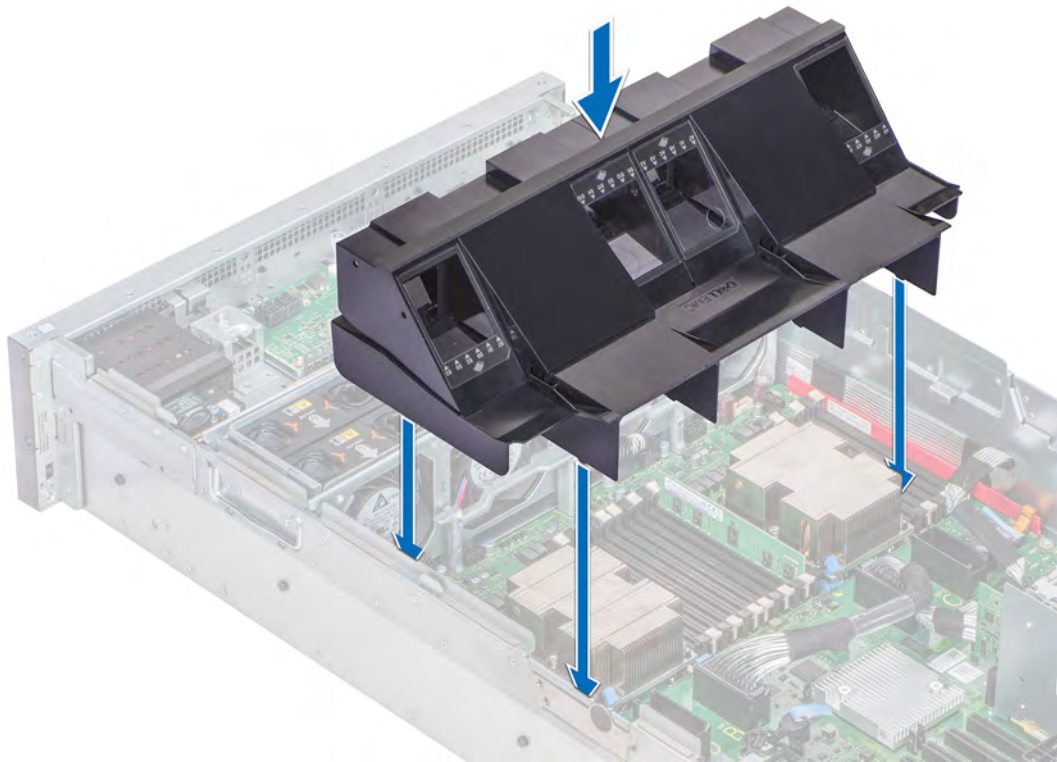


Figure 23. Installing the air shroud — Two processor system

- 2 To install the air shroud in a four processor configuration system:
 - a Align the slots on the air shroud with the tabs on the processor expansion module (PEM) handle.
 - b Lower the air shroud into the system until it is firmly seated.
When firmly seated, the memory socket numbers marked on the air shroud align with the memory sockets on the PEM.
 - c Press the blue touch point to ensure that the air shroud is seated firmly.
 - d Unhook the expansion card riser from the side of the system.
 - e Install the expansion card risers. See [Installing the expansion card riser](#).

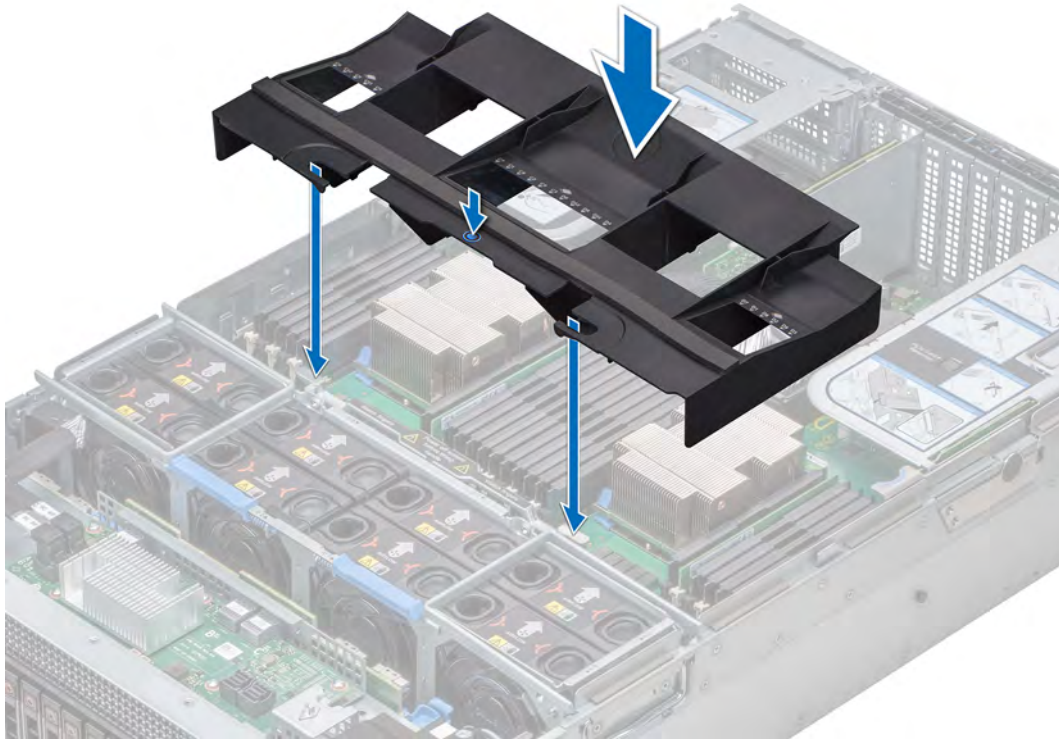


Figure 24. Installing the air shroud — Four processor system

Next step

- 1 Follow the procedure listed in [After working inside your system](#).

Cooling fans

The cooling fans are integrated into the system to dissipate the heat generated by the functioning of the system. These fans provide cooling for the processors, expansion cards, and memory modules.

NOTE: Your system supports up to eight standard or high performance hot swappable cooling fans.

Removing the cooling fan

Prerequisites

WARNING: Do not drop the fan into the fan cage while removing or installing the fan as this may cause damage to the connectors on the fan tray. Exercise utmost care while removing or installing cooling fans.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Remove the system cover.

Step

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

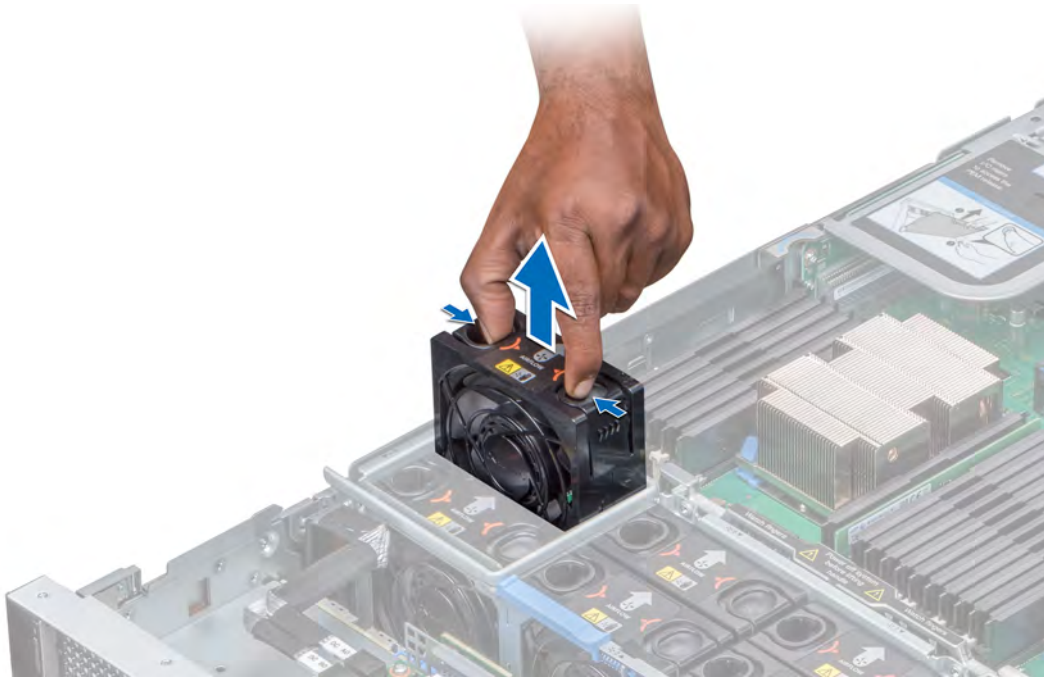


Figure 25. Removing the cooling fan

Next step

If applicable, install the cooling fan.

Related links

[Installing the cooling fan](#)

Installing the cooling fan

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

⚠ WARNING: Do not drop the fan into the fan cage while removing or installing the fan as this may cause damage to the connectors on the fan tray. Exercise utmost care while removing or installing cooling fans.

Steps

- 1 Holding the release tabs, insert the cooling fan into the fan cage with the arrow marked on the fan pointing towards the back of the system.
- 2 Lower the cooling fan until the connector on the cooling fan engages with the connector on the fan tray.
Lower the cooling fan to connect the connector on the fan to the connector on the fan tray.

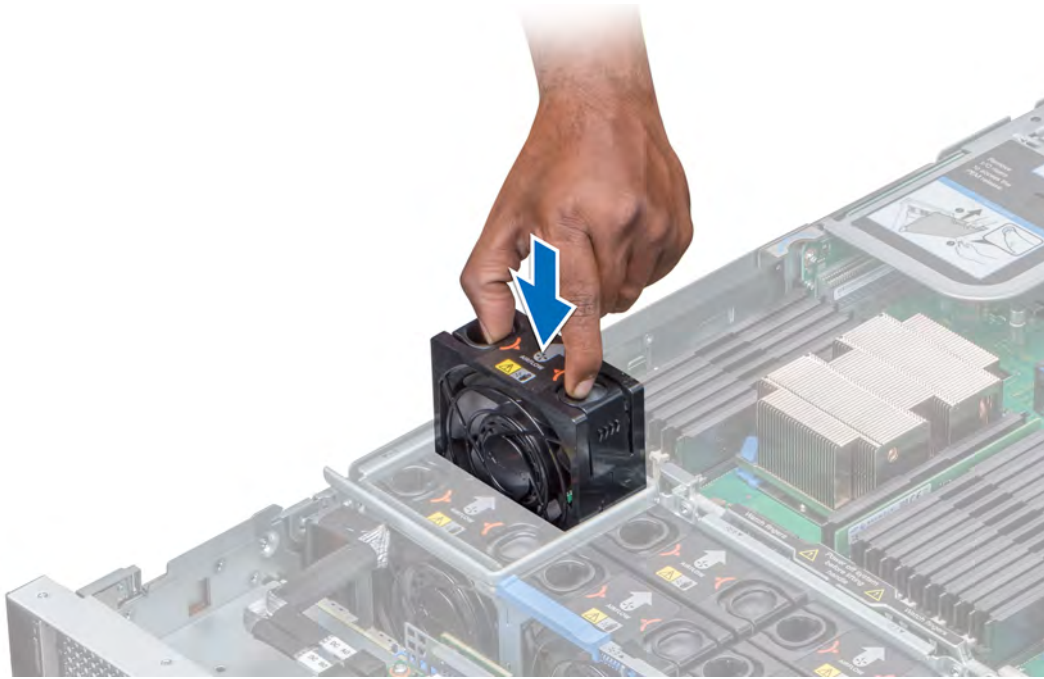


Figure 26. Installing the cooling fan

Next step

- 1 Install the system cover.

Fan cage

Removing the fan cage

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

Steps

- 1 Slide the fan cage locks in the direction of the arrow indicated on the locks.
- 2 Hold the cage handle and lift the cage out of the fan tray.

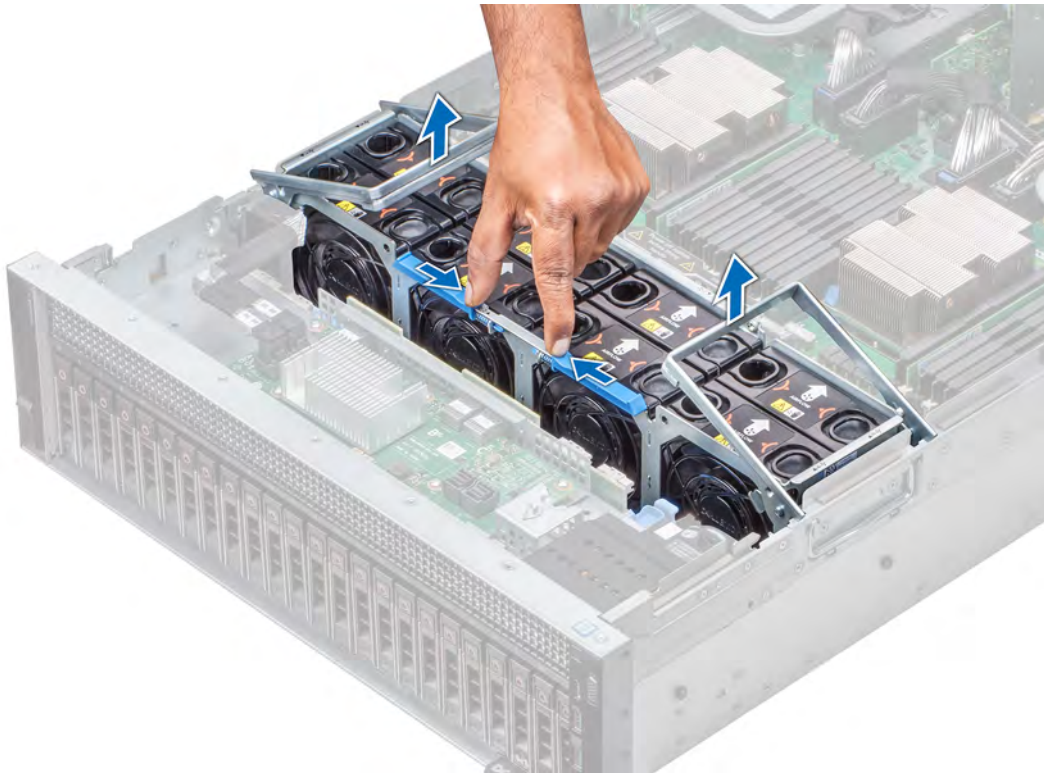


Figure 27. Removing the fan cage

Next step

If applicable, install the fan cage.

Related links

[Installing the fan cage](#)

Installing the fan cage

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Holding the cage handles, lower the cage into the fan tray.
- 2 Lower the cage handles until the handles lock into place.

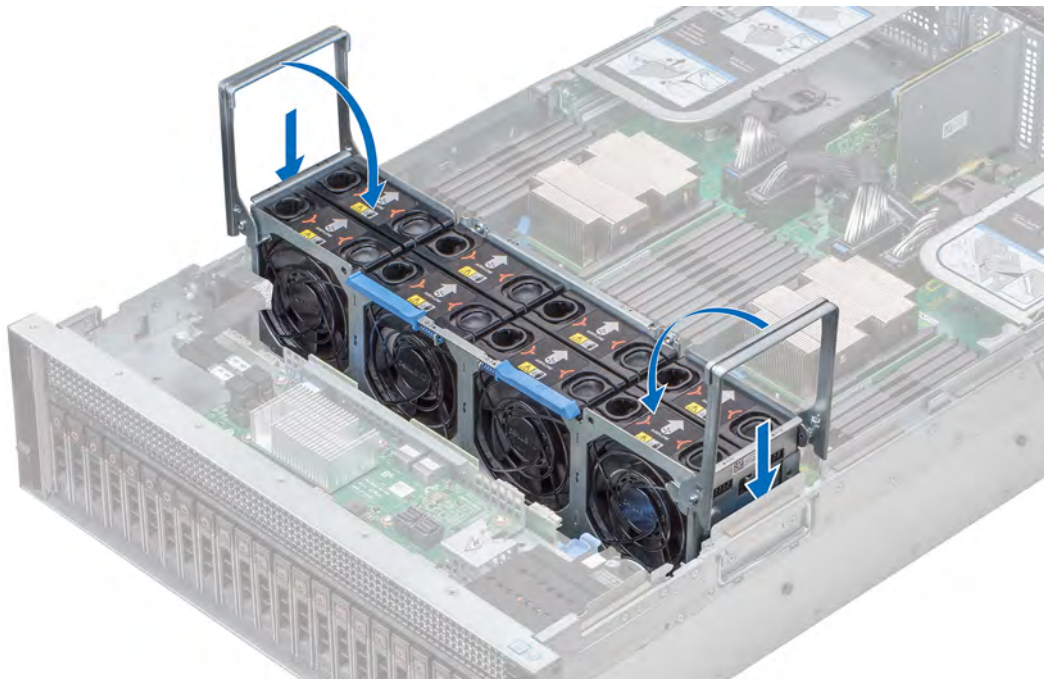


Figure 28. Installing the fan cage

Next step

- 1 Follow the procedure listed in [After working inside your system](#).

Removing the fan tray

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 Remove the fan cage.
- 5 If installed, remove the expansion card risers.
- 6 If applicable, lift the PEM by using the PEM handle until the PEM is in an upright position.
- 7 Release the backplane and fan power cables from the cable clips on the fan tray and disconnect the power cables from the connectors on the system board.

Steps

- 1 Press the blue release tabs on the side of the fan tray to unlock the tray.
- 2 Holding the fan tray lift the tray out of the system.

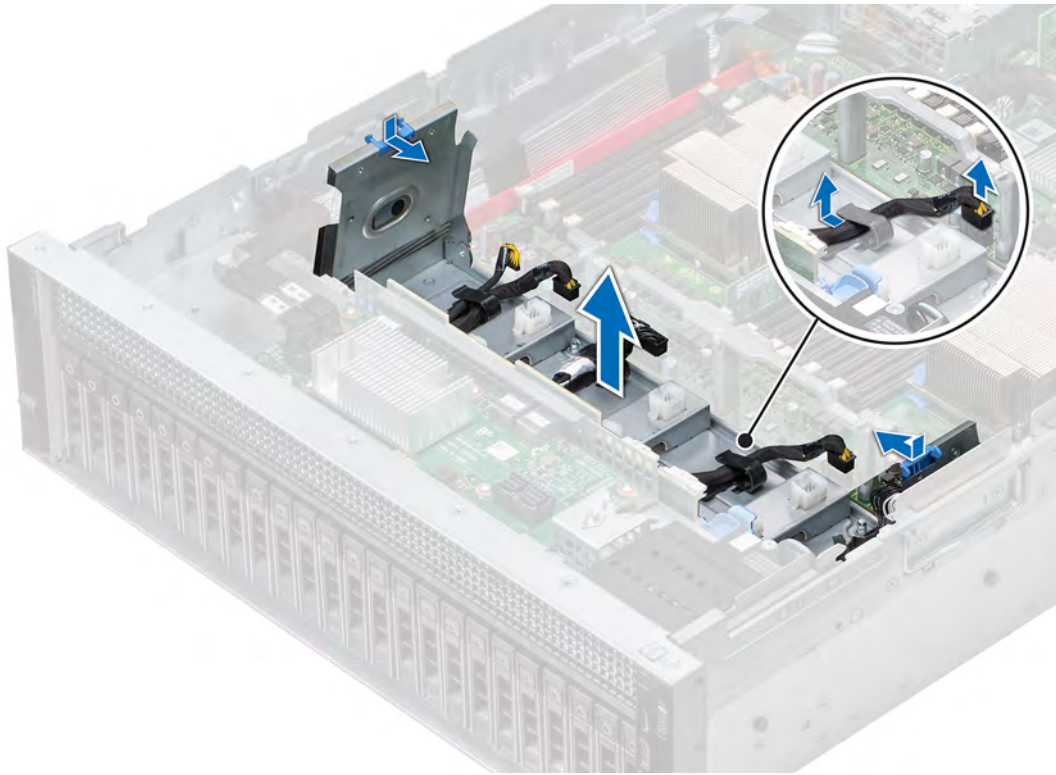


Figure 29. Removing the fan tray

Next step

If applicable, install the fan tray.

Related links

- [Removing the air shroud](#)
- [Removing the fan cage](#)
- [Removing the expansion card riser](#)
- [Installing the fan tray](#)

Installing the fan tray

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Holding the fan tray, align the slots on the fan tray with the standoffs on the system.
- 2 Lower the fan tray into the system until the slots on the fan tray engage with the standoffs on the system.
- 3 Press the blue release tabs on the side of fan tray towards the side of the system until the tabs click in place.

NOTE: Ensure that you route the cables correctly against the side of the system.

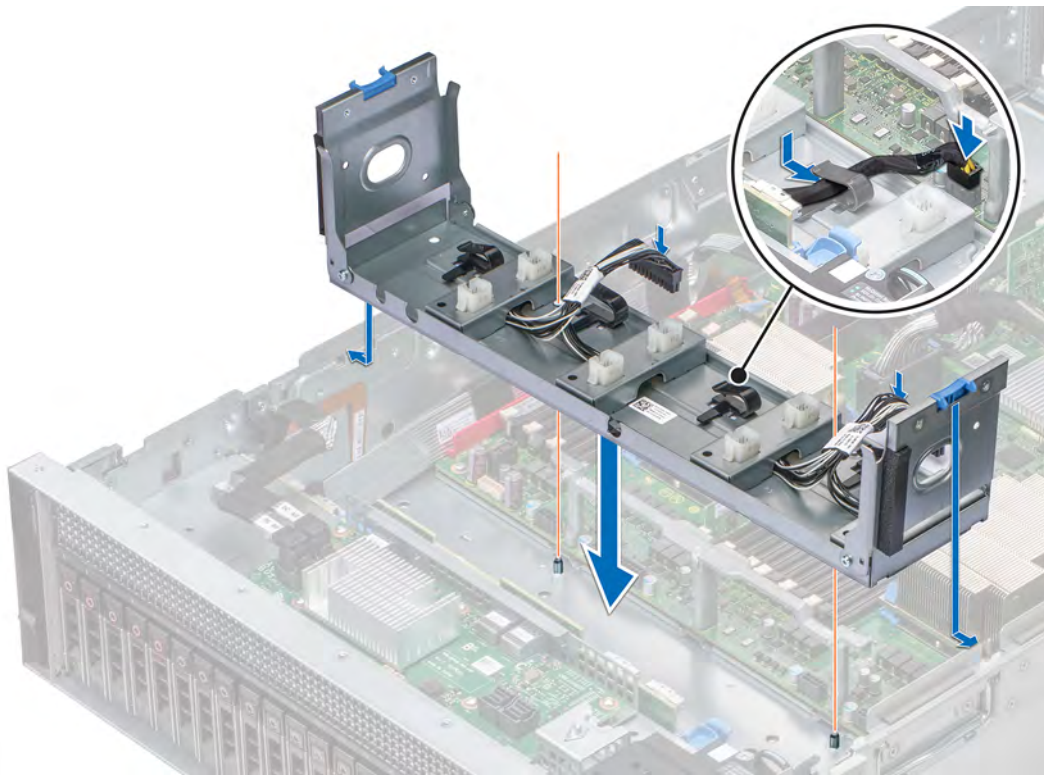


Figure 30. Installing the fan tray

Next steps

- 1 Route the fan power cables and the backplane cables through the cable clips on the fan tray and connect the cables to the connectors on the system board.
- 2 If applicable, lower the PEM by using PEM handle until the PEM clicks in place.
- 3 If removed, install the expansion card risers.
- 4 Install the fan cage.
- 5 Install the air shroud.
- 6 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the expansion card riser](#)

[Installing the fan cage](#)

[Installing the air shroud](#)

Intrusion switch

The Chassis Intrusion Switch is activated when the cover of your system is removed while your system is on. The system event logs [SEL] records the number of times the cover is removed when the system is turned on.

Removing an intrusion switch

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).

- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the fan cage.
- 4 Remove the air shroud.
- 5 If applicable, remove the expansion card risers
- 6 If applicable, remove the PEM.
- 7 Press the blue release tabs on the fan tray and lower the sides of the tray.
- 8 Disconnect the cable connected to the intrusion switch connector (INTRUSION) on the system board.

Steps

- 1 Press the cable management bracket down until the tabs on the bracket disengage from the slots on the side of the system.
- 2 Lift the cable management bracket out of the system.
- 3 Press the tab on the intrusion switch cable connector and disconnect the cable connected to the intrusion switch connector (INTRUSION) on the system board.
- 4 Remove the cables routed through the cable routing hooks on the right side of the system.
- 5 Push the intrusion switch out of the intrusion switch slot.

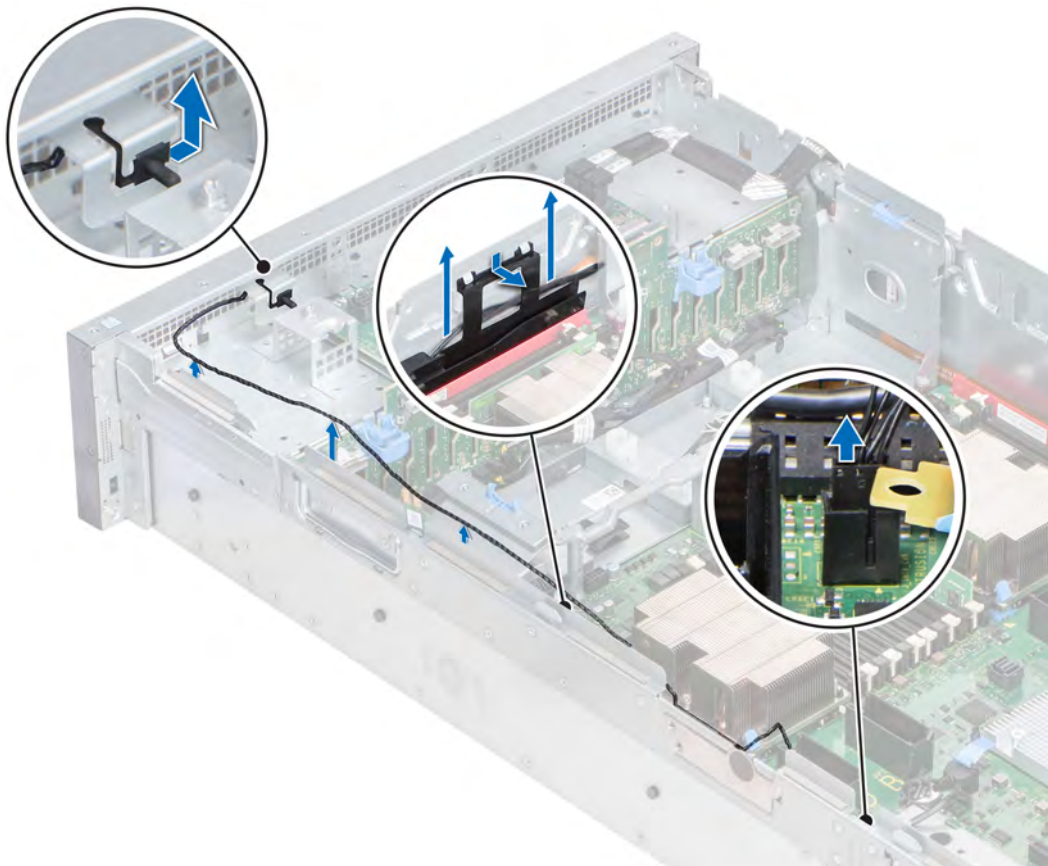


Figure 31. Removing an intrusion switch

Next step

Install an intrusion switch.

Related links

- [Removing the expansion card riser](#)
- [Removing the air shroud](#)
- [Removing the PEM](#)
- [Installing an intrusion switch](#)

Installing an intrusion switch

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Slide the intrusion switch into the intrusion switch slot.
- 2 Route the cables through the cable routing hooks on the side of the system.
- 3 Lower the cable management bracket into the system.
- 4 Press the bracket and insert the tabs on the bracket into the slots on the right side of the system.
- 5 Connect the cable to the connector (INTRUSION) on the system board.

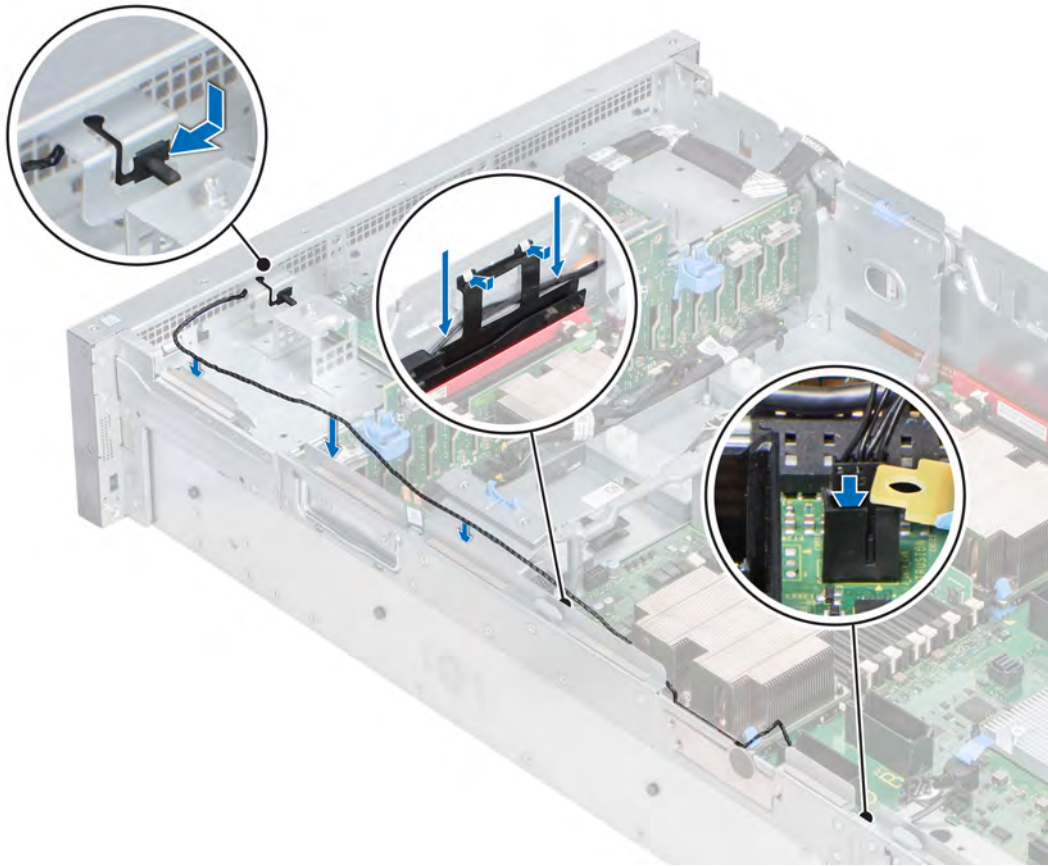


Figure 32. Installing an intrusion switch

Next steps

- 1 Lift the sides of the fan tray until the blue release tabs click in place.
- 2 If applicable, install the PEM.
- 3 If applicable, install the expansion card risers.
- 4 Install the air shroud.
- 5 Install the fan cage.
- 6 Follow the procedure listed in [After working inside your system](#).

Related links

- [Installing the expansion card riser](#)
- [Installing the air shroud](#)
- [Installing the PEM](#)

Drives

Drives are supplied in hot swappable drive carriers that fit in the drive slots.

CAUTION: Before attempting to remove or install a drive while the system is running, see the documentation for the storage controller card to ensure that the host adapter is configured correctly.

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

When you format a drive, allow enough time for the formatting to complete. Be aware that high-capacity drives can take a long time to format.

Removing a drive blank

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 If installed, remove the front bezel.

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

CAUTION: Mixing drive blanks from previous generations of PowerEdge servers is not supported.

Step

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



Figure 33. Removing a drive blank

Next steps

- Follow the procedure listed in [After working inside your system](#).
- Install a drive or a drive blank.

Related links

- [Removing the optional front bezel](#)
- [Installing a drive blank](#)
- [Installing a drive carrier](#)

Installing a drive blank

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

△ CAUTION: Mixing drive blanks from previous generations of PowerEdge servers is not supported.

Step

Insert the drive blank into the drive slot, and push the blank until the release button clicks into place.



Figure 34. Installing a drive blank

Next step

If removed, install the front bezel.

Related links

[Installing the optional front bezel](#)

Removing a drive carrier

Prerequisites

- 1 Follow the safety guidelines listed in .
- 2 If applicable, remove the front bezel.
- 3 Using the management software, prepare the drive for removal.

If the drive is online, the green activity or fault indicator flashes while the drive is turning off. When the drive indicators are off, the drive is ready for removal. For more information, see the documentation for the storage controller.

△ CAUTION: Before attempting to remove or install a 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 drive removal and insertion.

△ CAUTION: Mixing drives from previous generations of PowerEdge servers is not supported.

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

Steps

- 1 Press the release button to open the drive carrier release handle.
- 2 Holding the handle, slide the drive carrier out of the drive slot.



Figure 35. Removing a drive carrier

Next steps

- 1 Follow the procedure listed in [After working inside your system](#).
- 2 Install a drive carrier.
- 3 If you are not replacing the drive immediately, insert a drive blank in the empty drive slot to maintain proper system cooling.

Related links

- [Removing the optional front bezel](#)
- [Installing a drive carrier](#)

Installing a drive carrier

Prerequisites

- ⚠ **CAUTION:** Before attempting to remove or install a 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 drive removal and insertion.
- ⚠ **CAUTION:** Mixing drives from previous generations of PowerEdge servers is not supported.
- ⚠ **CAUTION:** Combining SAS and SATA drives in the same RAID volume is not supported.
- ⚠ **CAUTION:** When installing a drive, ensure that the adjacent drives are fully installed. Inserting a 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.

- 1 Follow the safety guidelines listed in .
- 2 If applicable, remove the drive blank.

Steps

- 1 Press the release button on the front of the drive carrier to open the release handle.
- 2 Insert the drive carrier into the drive slot and slide until the drive connects with the backplane.
- 3 Close the drive carrier release handle to lock the drive in place.



Figure 36. Installing a drive carrier

Next step

If applicable, install the front bezel.

Related links

[Installing the optional front bezel](#)

Removing the drive from the drive carrier

Prerequisite

⚠ CAUTION: Mixing drives from previous generations of PowerEdge servers is not supported.

Steps

- 1 Using Phillips #1 screwdriver, remove the screws from the slide rails on the drive carrier.
- 2 Lift the drive out of the drive carrier.



Figure 37. Removing the drive from the drive carrier

Next step

If applicable, install the drive into the drive carrier.

Related links

[Installing a drive into the drive carrier](#)

Installing a drive into the drive carrier

Prerequisites

⚠ CAUTION: Mixing drive carriers from other generations of PowerEdge servers is not supported.

📄 NOTE: When installing a drive into the drive carrier, ensure that the screws are torqued to 4 in-lbs.

Steps

- 1 Insert the drive into the drive carrier with the connector end of the drive towards the back of the carrier.
- 2 Align the screw holes on the drive with the screws holes on the drive carrier.
When aligned correctly, the back of the drive is flush with the back of the drive carrier.
- 3 Using the Phillips #1 screwdriver, secure the drive to the drive carrier with screws.



Figure 38. Installing a drive into the drive carrier

Backplane

This section contains information about the removal and installation of supported backplane of the system.

Depending on the configuration, your system supports the following backplanes:

Table 40. Supported drive backplane options for the PowerEdge R940 system

| | |
|-------------------------------|--|
| 8 x 2.5 inch drive backplane | Up to eight 2.5 inch (SAS, SATA or Nearline SAS) front accessible drives in slots 0 through 7 |
| 24 x 2.5 inch drive backplane | Up to twenty four 2.5 inch (SAS, SATA or Nearline SAS) front accessible drives in slots 0 through 23 |
| 24 x 2.5 inch drive backplane | Up to twenty SAS + 4 NVMe SAS/SATA drives in slots 0 to 19 + slots 20 to 23 |
| 24 x 2.5 inch drive backplane | Up to sixteen SAS + 8 NVMe SAS/SATA drives in slots 0 to 15 + slots 16 to 23 |

Hard drive backplane connectors

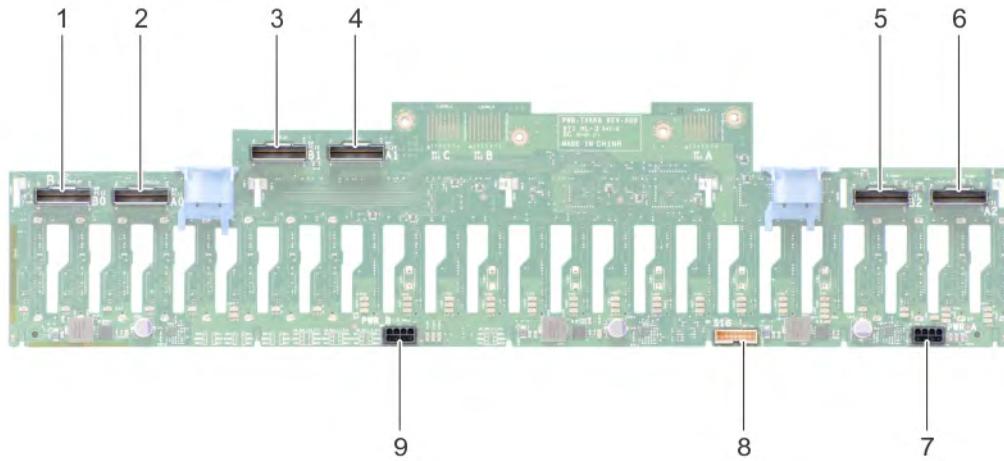


Figure 39. Connectors on the 24 x 2.5 inch hard drive backplane

- | | | | |
|---|-----------------------------|---|-----------------------------|
| 1 | PCIe connector (BP PCIE B0) | 2 | PCIe connector (BP PCIE A0) |
| 3 | PCIe connector (BP PCIE B1) | 4 | PCIe connector (BP PCIE A1) |
| 5 | PCIe connector (BP PCIE B2) | 6 | PCIe connector (BP PCIE A2) |
| 7 | power connector (BP PWR_A) | 8 | signal connector (BP SIG) |
| 9 | power connector (BP PWR_B) | | |

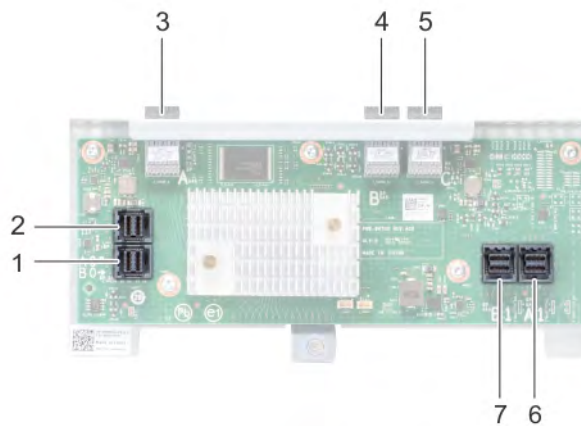


Figure 40. Connectors on the expander board

- | | | | |
|---|---------------------------|---|---------------------------|
| 1 | SAS connector (BP SAS B0) | 2 | SAS connector (BP SAS A0) |
| 3 | SAS connector (BP SAS A) | 4 | SAS connector (BP SAS B) |
| 5 | SAS connector (BP SAS C) | 6 | SAS connector (BP SAS A1) |
| 7 | SAS connector (BP SAS B1) | | |

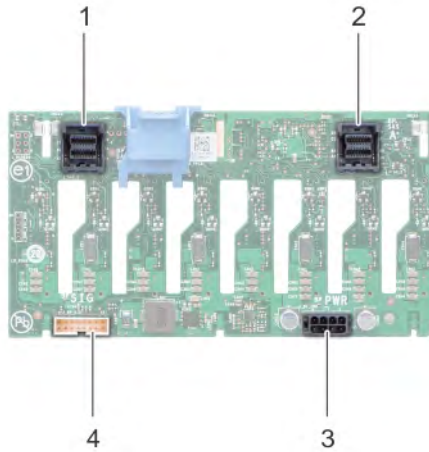


Figure 41. Connectors on the 8 x 2.5 inch hard drive backplane

- | | | | |
|---|--------------------------|---|---------------------------|
| 1 | SAS connector (BP SAS B) | 2 | SAS connector (BP SAS A) |
| 3 | power connector (BP PWR) | 4 | signal connector (BP SIG) |

Removing hard drive backplane

Prerequisites

CAUTION: To prevent damage to the drives and backplane, remove the hard drives from the system before removing the backplane.

CAUTION: Note the number of each hard drive and temporarily label them before you remove the hard drive so that you can replace them in the same location.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 If installed, remove the front bezel.
- 4 Remove the hard drives/SSDs.
- 5 Remove the fan cage.

Steps

- 1 To remove the 2.5 inch (x24) hard drive backplane:
 - a Disconnect all the cables connected to the hard drive backplane and expander board.

NOTE: To disconnect the NVMe cables, ensure that you remove the NVMe cables routed through the side of the system by lowering the fan tray side wall.

- b Loosen the retention screw that secures the expander board to the system.
- c Press the blue release tabs on the hard drive backplane.
- d Tilt the backplane to disengage the guides on the system from the slots on the backplane.
- e Lift the backplane out of the system.

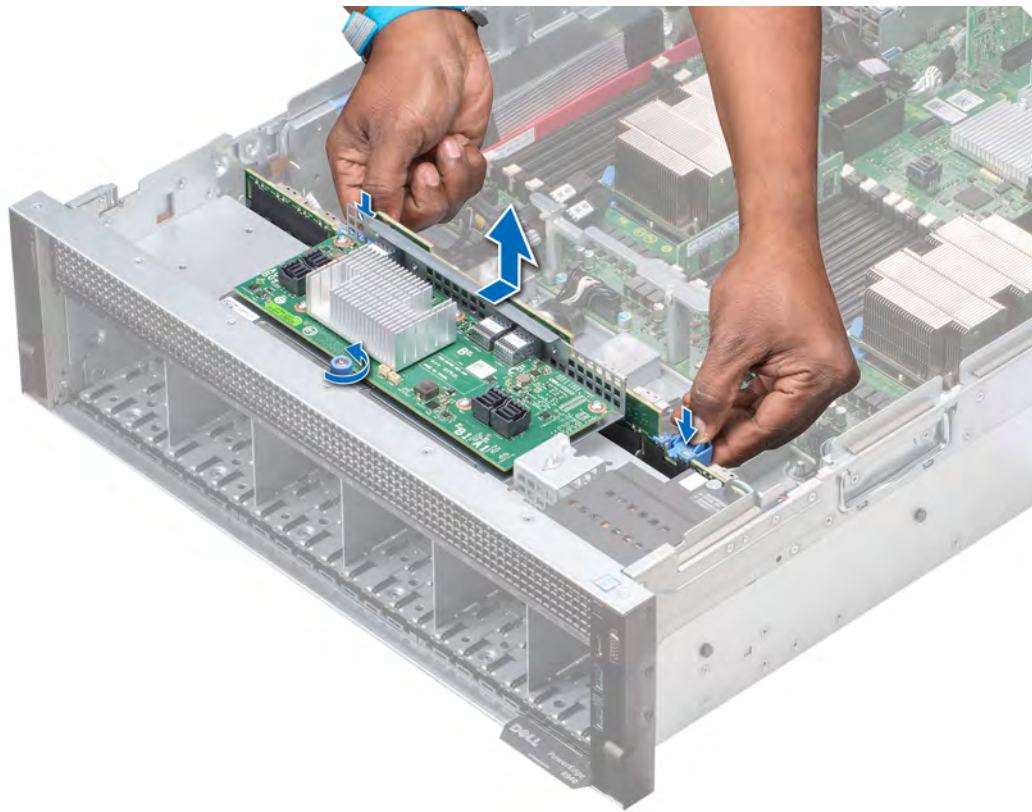


Figure 42. Removing the 2.5 inch (x24) hard drive backplane

- 2 To remove the 2.5 inch (x8) hard drive backplane:
 - a Disconnect all the cables connected to the hard drive backplane.
 - b Press the release tab on the hard drive backplane.
 - c Lift the backplane away from the system until the hooks on the system disengage from the slots on the backplane.

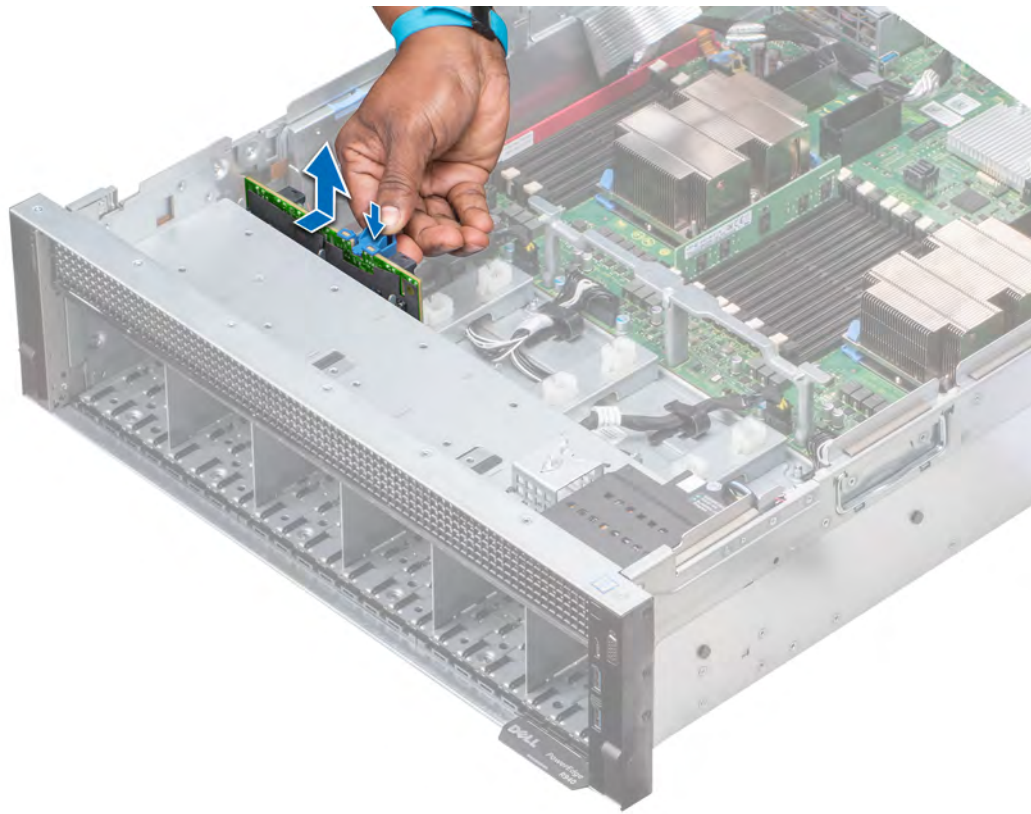


Figure 43. Removing the 2.5 inch (x8) hard drive backplane

Next step

Install the hard drive backplane.

Related links

- [Removing the optional front bezel](#)
- [Removing a drive carrier](#)
- [Removing the fan cage](#)
- [Installing hard drive backplane](#)

Installing hard drive backplane

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 To install the 2.5 inch (x24) hard drive backplane:
 - a Holding the release latches, align the hooks on the system with the slots on the hard drive backplane.
 - b Lower the backplane into the system until the hooks on the system engage with the slots on the backplane.
 - c Push the expander board bracket until the release latches on the backplane click into place.
 - d Tighten the retention screw to secure the expander board to the system.

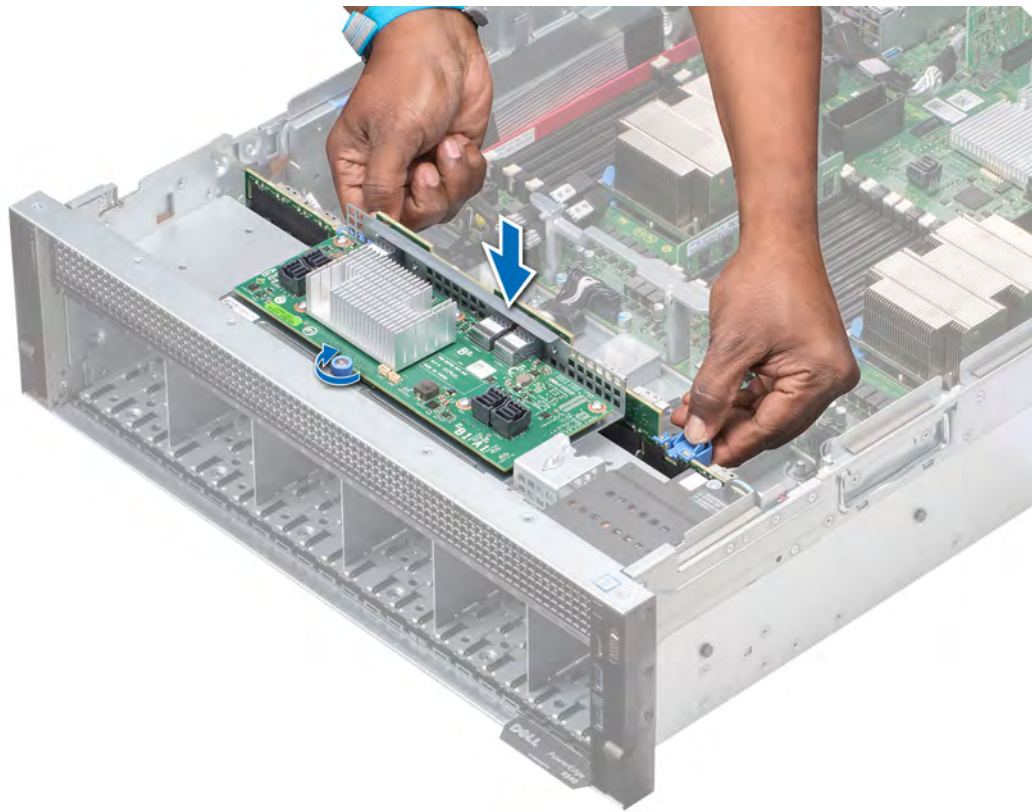


Figure 44. Installing the 2.5 inch (x24) hard drive backplane

- 2 To install the 2.5 inch (x8) hard drive backplane:
 - a Align the hooks on the system with the slots on the hard drive backplane.
 - b Lower the backplane into the system until the hooks on the system engage with the slots on the backplane.

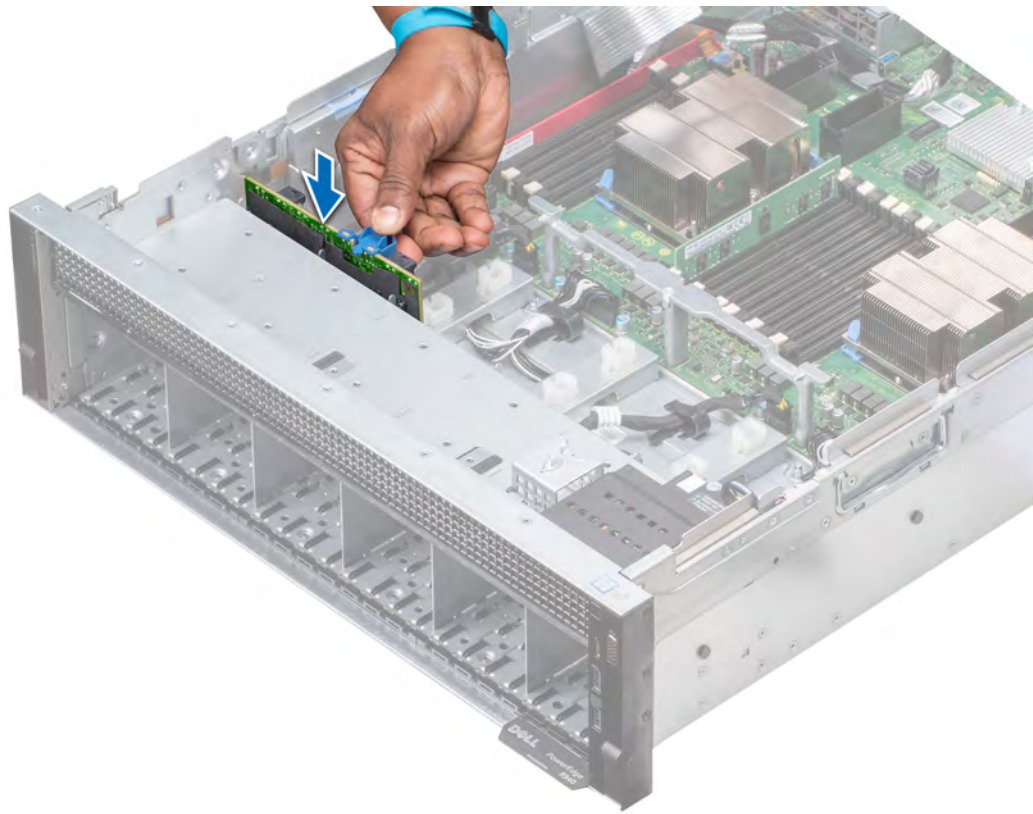


Figure 45. Installing the 2.5 inch (x8) hard drive backplane

Next steps

- 1 Connect all the cables to the hard drive backplane.
- 2 Install the fan cage.
- 3 Install the hard drives/SSDs.
- 4 If removed, install the front bezel.
- 5 Follow the procedure listed in [After working inside your system](#).

Related links

- [Installing the fan cage](#)
- [Installing a drive carrier](#)
- [Installing the optional front bezel](#)

Cable routing

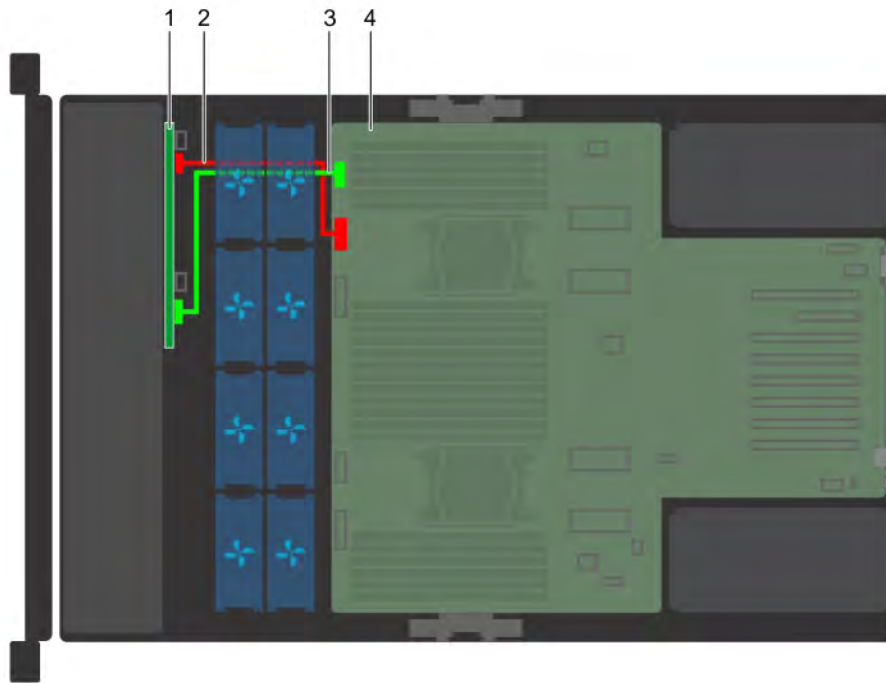


Figure 46. Cable routing – 8 x 2.5 inch hard drive backplane

- | | | | |
|---|-----------------------------------|---|-----------------------|
| 1 | 8 x 2.5 inch hard drive backplane | 2 | backplane power cable |
| 3 | backplane signal cable | 4 | system board |

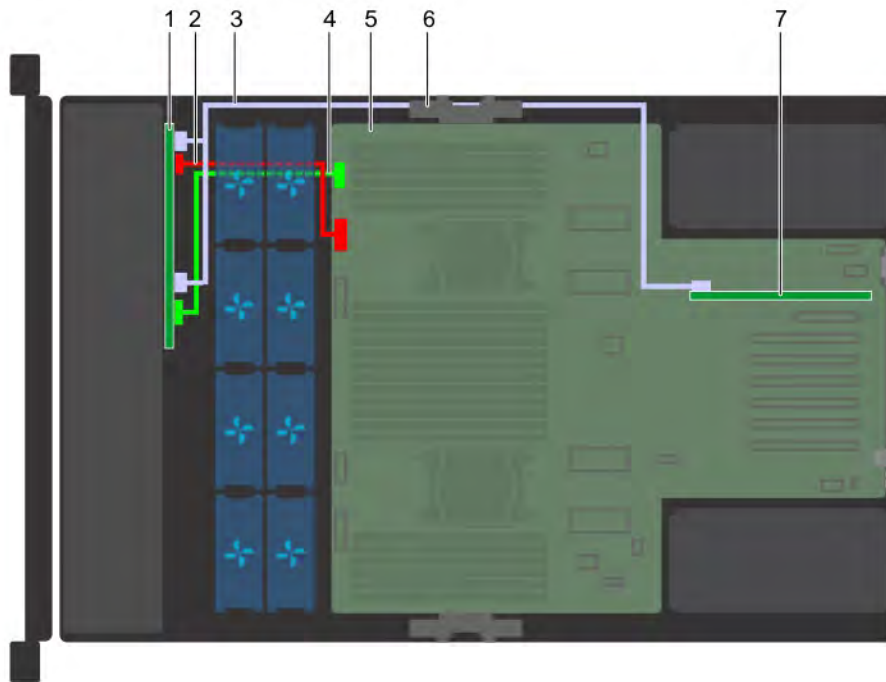


Figure 47. Cable routing – 8 x 2.5 inch hard drive backplane with PERC

- | | | | |
|---|-----------------------------------|---|--------------------------|
| 1 | 8 x 2.5 inch hard drive backplane | 2 | backplane power cable |
| 3 | SAS cable | 4 | backplane signal cable |
| 5 | system board | 6 | cable management bracket |
| 7 | storage controller card (slot 1) | | |

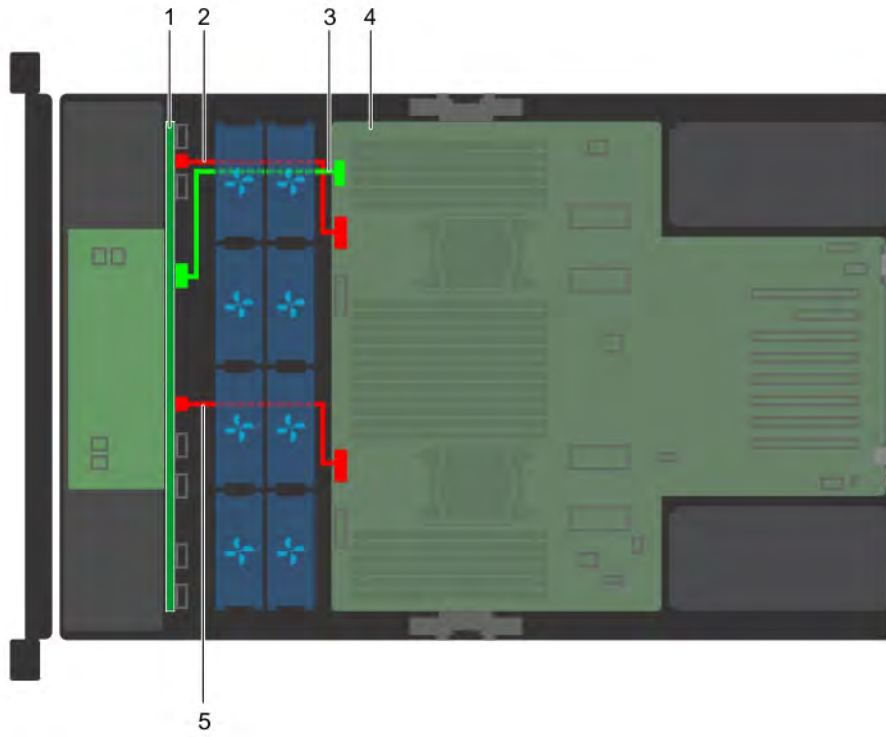


Figure 48. Cable routing – 24 x 2.5 inch hard drive backplane

- | | | | |
|---|--|---|-------------------------|
| 1 | 24 x 2.5 inch hard drive backplane with expander board | 2 | backplane power cable A |
| 3 | backplane signal cable | 4 | system board |
| 5 | backplane power cable B | | |

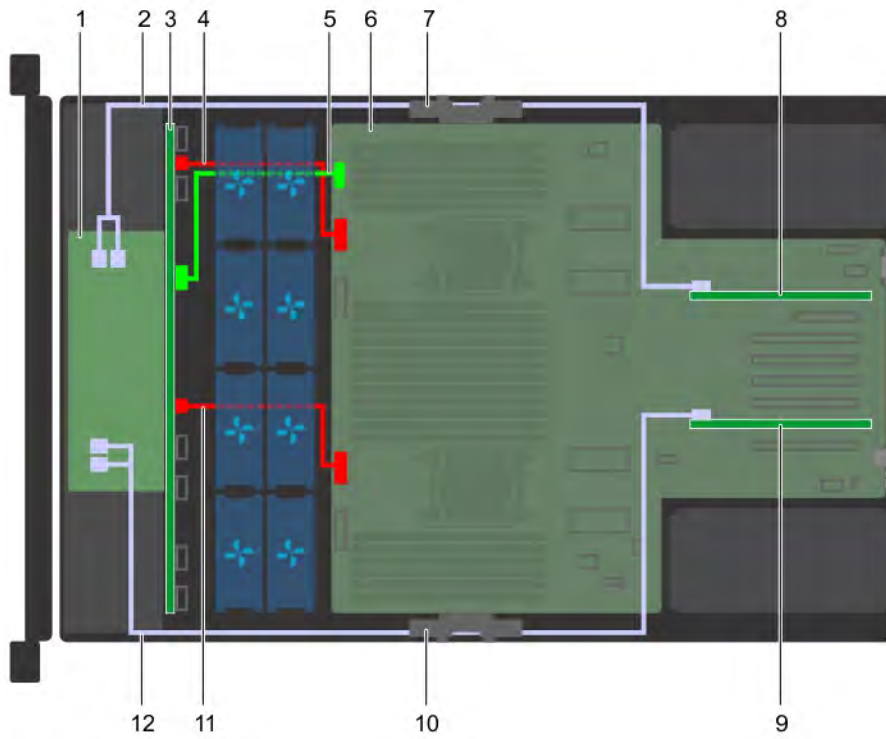


Figure 49. Cable routing – 24 x 2.5 inch hard drive backplane with PERC

- | | | | |
|----|------------------------------------|----|----------------------------------|
| 1 | expander board | 2 | SAS cable |
| 3 | 24 x 2.5 inch hard drive backplane | 4 | backplane power cable A |
| 5 | backplane signal cable | 6 | system board |
| 7 | cable management bracket (left) | 8 | storage controller card (slot 1) |
| 9 | storage controller card (slot 6) | 10 | cable management bracket (right) |
| 11 | backplane power cable B | 12 | SAS cable |

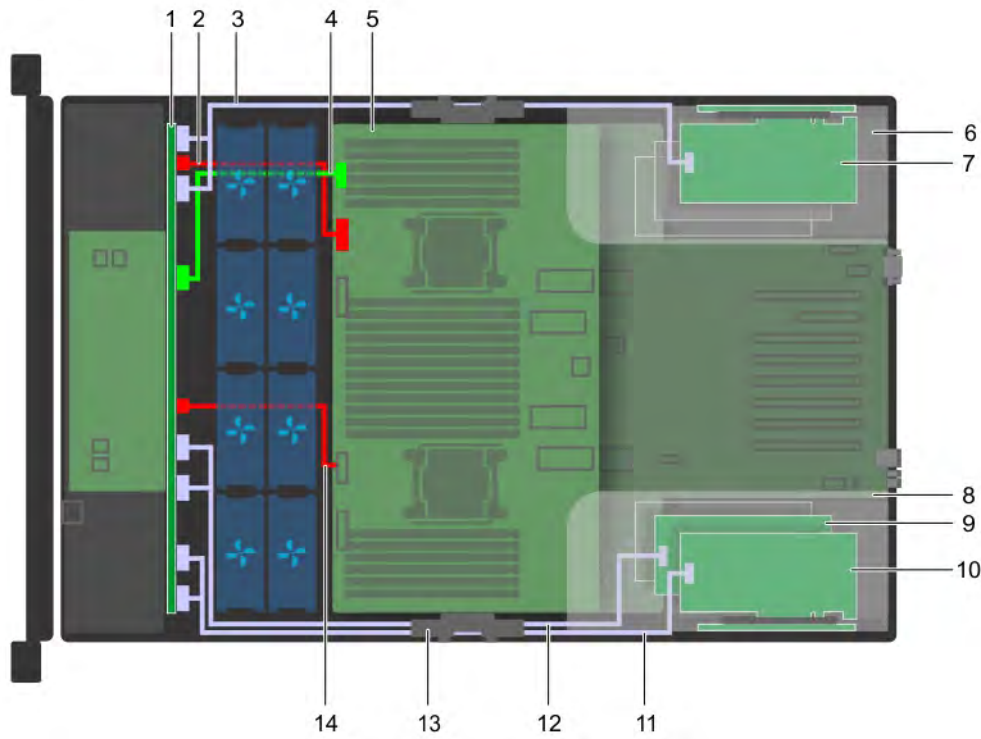


Figure 50. Cable routing – 24 x 2.5 inch hard drive backplane with NVMe cards

| | | | |
|----|--|----|------------------------------|
| 1 | 24 x 2.5 inch hard drive backplane with expander board | 2 | backplane power cable A |
| 3 | PCIe cable | 4 | backplane signal cable |
| 5 | system board | 6 | expansion card riser (left) |
| 7 | NVMe card (slot 8) | 8 | expansion card riser (right) |
| 9 | NVMe card (slot 12) | 10 | NVMe card (slot 11) |
| 11 | PCIe cable | 12 | PCIe cable |
| 13 | cable management bracket (right) | 14 | backplane power cable B |

System memory

The system supports DDR4 registered DIMMs (RDIMMs), load reduced DIMMs (LRDIMMs), and non-volatile dual in-line DIMM-Ns (NVDIMM-N). System memory holds the instructions that are executed by the processor.

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

Memory bus operating frequency can be 2666 MT/s, 2400 MT/s, or 2133 MT/s depending on the following factors:

- DIMM type (RDIMM, LRDIMM, or NVDIMM-N)
- System profile selected (for example, Performance Optimized, or Custom [can be run at high speed or lower])
- Maximum supported DIMM frequency of the processors

The PowerEdge R940 system (without PEM) contains 24 memory sockets split into two sets of 12 sockets, one set per processor. Each 12-socket set is organized into six channels. In each channel, the release tabs of the first socket are marked white, and the second socket black.

The PowerEdge R940 system (with PEM) contains 48 memory sockets split into four sets of 12 sockets, one set per processor. Each 12-socket set is organized into six channels. In each channel, the release tabs of the first socket are marked white, and the second socket black.

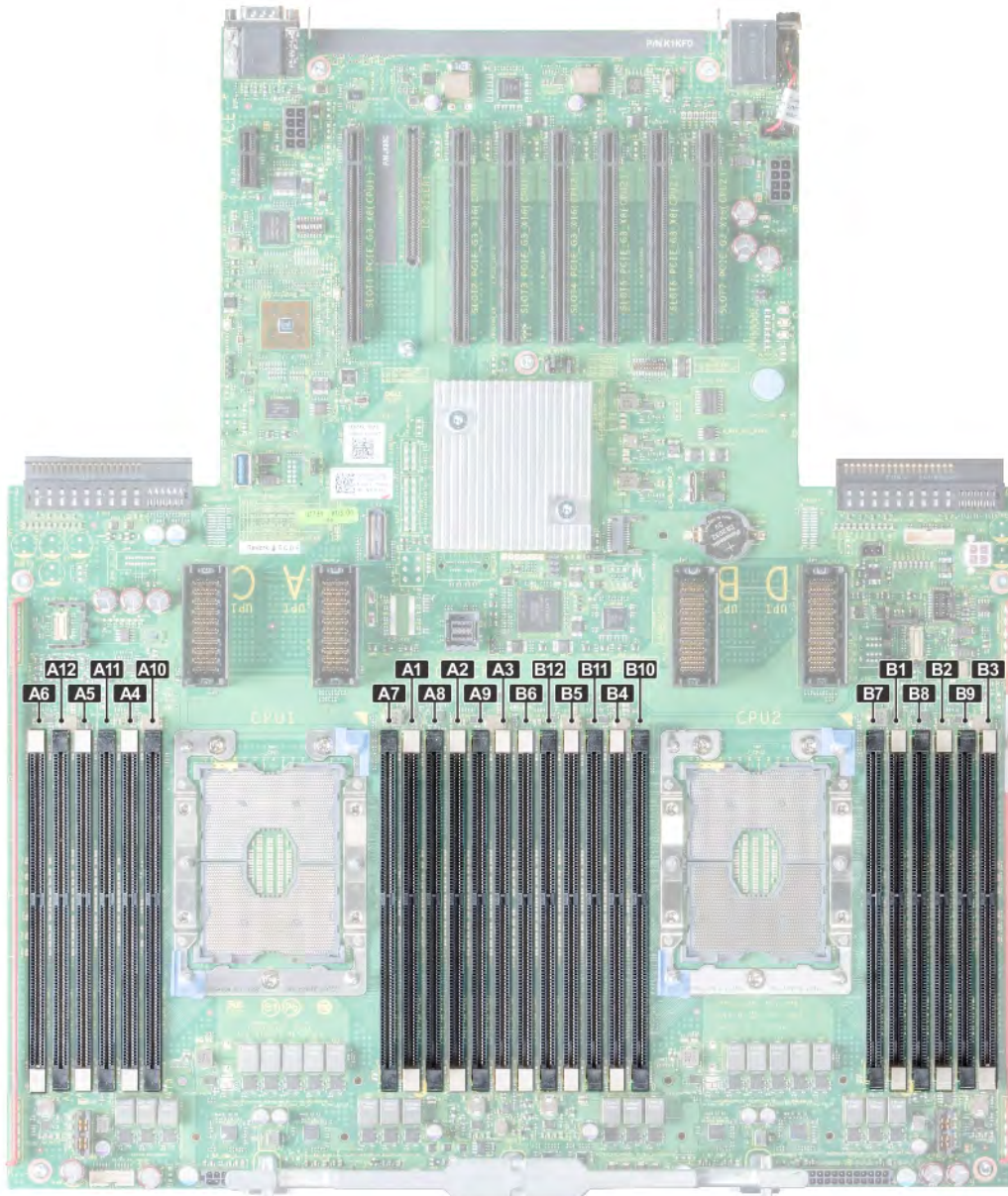


Figure 51. Memory socket location

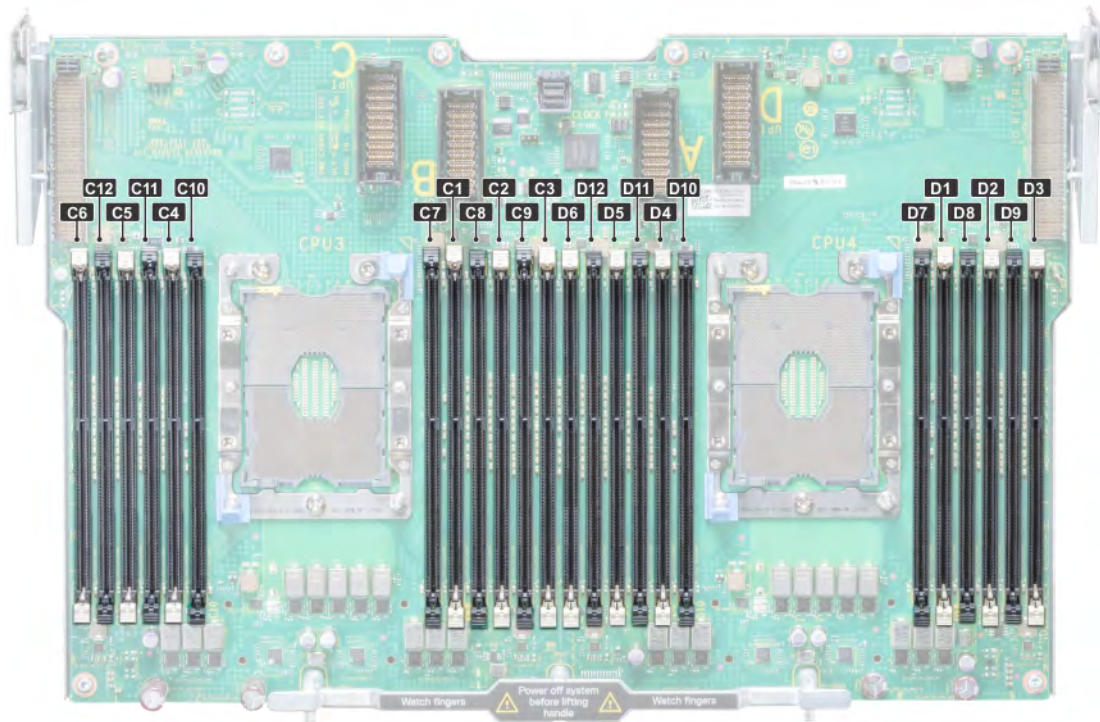


Figure 52. Memory socket location on the processor expansion module

Memory channels are organized as follows:

Table 41. Memory channels

| Processor | Channel 0 | Channel 1 | Channel 2 | Channel 3 | Channel 4 | Channel 5 |
|-------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Processor 1 | Slots A1 and A7 | Slots A2 and A8 | Slots A3 and A9 | Slots A4 and A10 | Slots A5 and A11 | Slots A6 and A12 |
| Processor 2 | Slots B1 and B7 | Slots B2 and B8 | Slots B3 and B9 | Slots B4 and B10 | Slots B5 and B11 | Slots B6 and B12 |
| Processor 3 | Slots C1 and C7 | Slots C2 and C8 | Slots C3 and C9 | Slots C4 and C10 | Slots C5 and C11 | Slots C6 and C12 |
| Processor 4 | Slots D1 and D7 | Slots D2 and D8 | Slots D3 and D9 | Slots D4 and D10 | Slots D5 and D11 | Slots D6 and D12 |

General memory module installation guidelines

NOTE: If your system's memory configurations fail to observe these guidelines, your system might not boot, might stop responding during memory configuration, or might operate with reduced memory.

The 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 installing memory modules:

- RDIMMs and LRDIMMs must not be mixed.
- Up to two RDIMMs can be populated per channel regardless of rank count.

- Up to two LRDIMMs can be populated per channel regardless of rank count.
- 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 the system DIMM configuration.
- Populate memory module sockets only if a processor is installed. For dual-processor systems, sockets A1 to A12 and sockets B1 to B12 are available. For quad-processor systems, sockets A1 to A12, B1 to B12, C1 to C12, and sockets D1 to D12 are available.
- Populate all the sockets with white release tabs first, followed by the black release tabs.
- When mixing memory modules with different capacities, populate the sockets with memory modules with the highest capacity first. For example, if you want to mix 8 GB and 16 GB memory modules, populate 16 GB memory modules in the sockets with white release tabs and 8 GB memory modules in the sockets with black release tabs.
- The memory configuration for each processor should be identical. For example, if you populate socket A1 for processor 1, then populate socket B1 for processor 2, and so on.
- Memory modules of different capacities can be mixed provided other memory population rules are followed (for example, 8 GB and 16 GB memory modules can be mixed).
- Mixing of more than two memory module capacities in a system is not supported.
- Populate six memory modules per processor (one DIMM per channel) at a time to maximize performance.

NVDIMM-N memory module installation guidelines

The following are the recommended guidelines for installing NVDIMM-N memory modules:

- Each system supports memory configurations with 1, 2, 4, 6, or 12 NVDIMM-Ns.
- Supported configurations have dual processors and a minimum of 12x RDIMMs.
- LRDIMMS and NVDIMM-Ns must not be mixed.
- Maximum of 12 NVDIMM-Ns can be installed in a system.

For more information on the supported NVDIMM-N configurations, see the *NVDIMM-N User Guide* at Dell.com/poweredge manuals.

Mode-specific guidelines

Six memory channels are allocated to each processor. The configurations allowed depend on the memory mode selected.

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 BIOS menu of System Setup.

Table 42. Memory sparing

| | |
|------------------------------|---|
| Memory sparing (Single Rank) | Memory sparing allocates one rank per channel as a spare. If excessive correctable errors occur in a rank or channel, they are moved to the spare area while the operating system is running to prevent errors from causing an uncorrectable failure. Requires population of two ranks or more per channel. |
| Memory sparing (Multi Rank) | Memory sparing allocates two ranks per channel as a spare. If excessive correctable errors occur in a rank or channel, they are moved to the spare area while the operating system is running to |

prevent errors from causing an uncorrectable failure. Requires population of three ranks or more per channel.

With single rank 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 twenty four 16 GB dual-rank memory modules, the available system memory is: 3/4 (ranks/channel) × 24 (memory modules) × 16 GB = 288 GB, and not 24 (memory modules) × 16 GB = 384 GB. This calculation changes based on if it is single rank sparing or multi rank sparing. For multi rank sparing, the multiplier changes to 1/2 (ranks/channel).

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

Memory mirroring

Memory mirroring offers the strongest memory module reliability mode, 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 Single Device Data Correction (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 must be populated in sets of 6 per CPU to enable memory mirroring.

Table 43. Memory population rules

| Processor | Configuration | Memory population | Memory population information |
|--|--|--|---|
| Dual CPU (Start with CPU1. CPU1 and CPU2 population should match) | Optimized (Independent channel) population order | C1{1}, C2{1}, C1{2}, C2{2}, C1{3}, C2{3}... | Odd amount of DIMMs per CPU allowed. |
| | Mirroring population order | C1{1, 2, 3, 4, 5, 6}, C2{1, 2, 3, 4, 5, 6}, C1{7, 8, 9, 10, 11, 12}, C2{7, 8, 9, 10, 11, 12} | Mirroring is supported with 6 or 12 DIMMs per CPU. |
| | Single rank sparing population order | C1{1}, C2{1}, C1{2}, C2{2}, C1{3}, C2{3}... | Populate in this order, odd amount per CPU allowed. Requires two ranks or more per channel. |
| | Multi rank spare population order | C1{1}, C2{1}, C1{2}, C2{2}, C1{3}, C2{3}, C1{4}, C2{4}, C1{5}, C2{5}... | Populate in this order, odd amount per CPU allowed. Requires three ranks or more per channel. |
| | Fault resilient population order | C1{1, 2, 3, 4, 5, 6}, C2{1, 2, 3, 4, 5, 6}, C1{7, 8, 9, 10, 11, 12}, C2{7, 8, 9, 10, 11, 12} | Supported with 6 or 12 DIMMs per CPU. |
| Quad CPU (Start with CPU1, CPU2, CPU3, and CPU4 population should match) | Optimized (Independent channel) population order | C1{1},C2{1},C3{1},C4{1},C1{2},C2{2},C3{2},C4{2}... | Odd amount of DIMMs per CPU allowed. |
| | Mirroring population order | C1{1,2,3,4,5,6},C2{1,2,3,4,5,6},C3{1,2,3,4,5,6},C4{1,2,3,4,5,6}... | Mirroring is supported with 6 or 12 DIMMs per CPU. |
| | Single rank sparing population order | C1{1},C2{1},C3{1},C4{1},C1{2},C2{2},C3{2},C4{2}... | Populate in this order, odd amount per CPU allowed. Requires two ranks or more per channel. |
| | Multi rank spare population order | C1{1},C2{1},C3{1},C4{1},C1{2},C2{2},C3{2},C4{2}... | Populate in this order, odd amount per CPU allowed. Requires three ranks or more per channel. |
| | Fault resilient population order | C1{1,2,3,4,5,6},C2{1,2,3,4,5,6},C3{1,2,3,4,5,6},C4{1,2,3,4,5,6}... | Supported with 6 or 12 DIMMs per CPU. |

Removing a memory module

The procedure for removing a DIMM module and an NVDIMM-N module is identical.

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
 - 2 Follow the procedure listed in [Before working inside your system](#).
- CAUTION:** To prevent data loss and potential damage to your system, ensure that your system, LEDs on system, LEDs on NVDIMM-N and LEDs on NVDIMM-N battery are turned off before removing the NVDIMM-N battery.
- 3 If applicable, remove the air shroud.

WARNING: Allow the memory modules to cool after you power off the system. 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.

Steps

- 1 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.
- 2 Push the ejectors outward on both ends of the memory module socket to release the memory module from the socket.
 - 3 Lift and remove the memory module from the system.

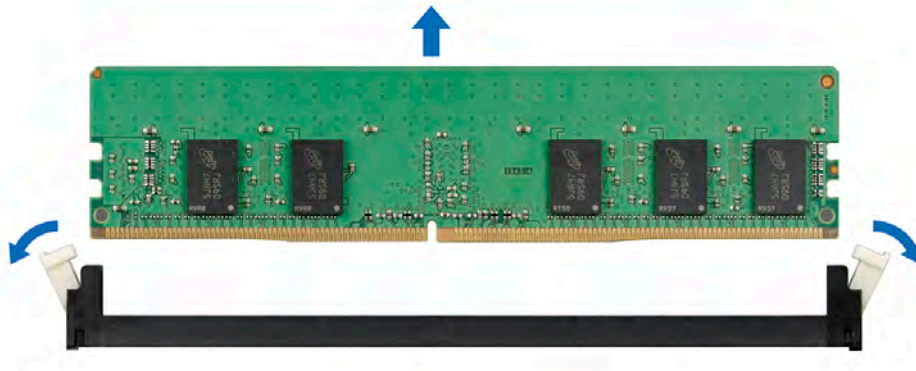


Figure 53. Removing a memory module

Next steps

- 1 Install the memory module.
- 2 If you are removing the memory module permanently, install a memory module blank. The procedure to install a memory module blank is similar to that of the memory module.

Related links

- [Removing the air shroud](#)
- [Installing a memory module](#)

Installing a memory module

The procedure for installing a DIMM module and an NVDIMM-N module is identical.

Prerequisites

Follow the safety guidelines listed in [Safety instructions](#).

△ **CAUTION:** Ensure that you install the NVDIMM-N battery if you are using NVDIMM-N.

△ **CAUTION:** To prevent data loss and potential damage to your system, ensure that your system, LEDs on system, LEDs on NVDIMM-N and LEDs on NVDIMM-N battery are turned off before installing the NVDIMM-N battery.

△ **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.

Steps

1 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.

△ **CAUTION:** To prevent damage to the memory module or the memory module socket during installation, do not bend or flex the memory module. You must insert both ends of the memory module simultaneously.

2 Open the ejectors on the memory module socket outward to allow the memory module to be inserted into the socket.

3 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.

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

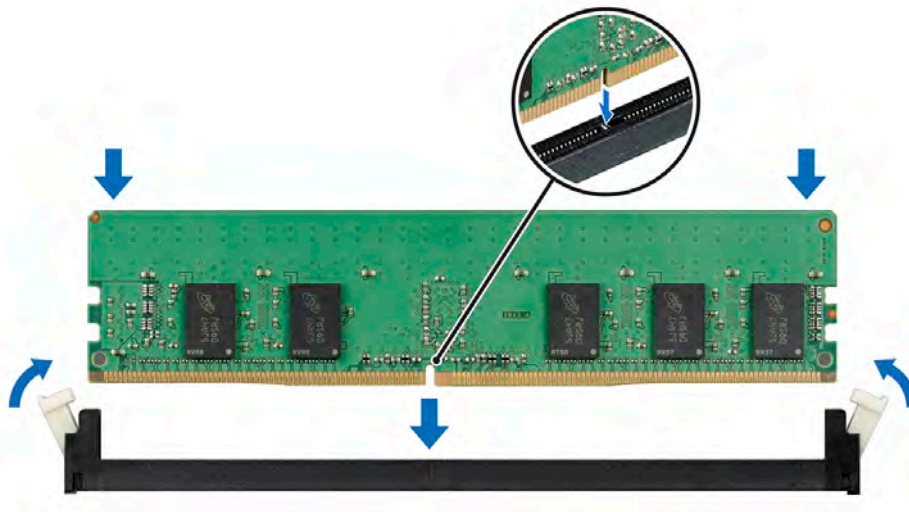


Figure 54. Installing a memory module

Next steps

1 Install the air shroud.

- 2 Follow the procedure listed in [After working inside your system](#).
- 3 To verify if the memory module has been installed properly, press F2 and navigate to **System Setup Main Menu > System BIOS > Memory Settings**. In the **Memory Settings** screen, the System Memory Size must reflect the updated capacity of 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 links

[Installing the air shroud](#)

Processors and heat sinks

The processor controls memory, peripheral interfaces, and other components of the system. The system can have more than one processor configurations.

The heat sink absorbs the heat generated by the processor, and helps the processor to maintain its optimal temperature level.

Removing a processor and heat sink module

Prerequisites

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

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 If installed, remove the expansion card risers and lift the PEM to the upright position.

ℹ NOTE: When using a four processor system, ensure to follow step 3 only if you have to remove the processors installed on the system board.

Steps

- 1 Using a Torx #T30 screwdriver, loosen the screws on the heat sink in the order below:
 - a Loosen the first screw three turns.
 - b Loosen the second screw completely.
 - c Return to the first screw and loosen it completely.

ℹ NOTE: It is normal for the heat sink to slip off the blue retention clips when the screws are partially loosened, continue to loosen the screw(s).

- 2 Pushing both blue retention clips simultaneously, lift the processor and heat sink module (PHM) out of the system.
- 3 Set the PHM aside with the processor side facing up.

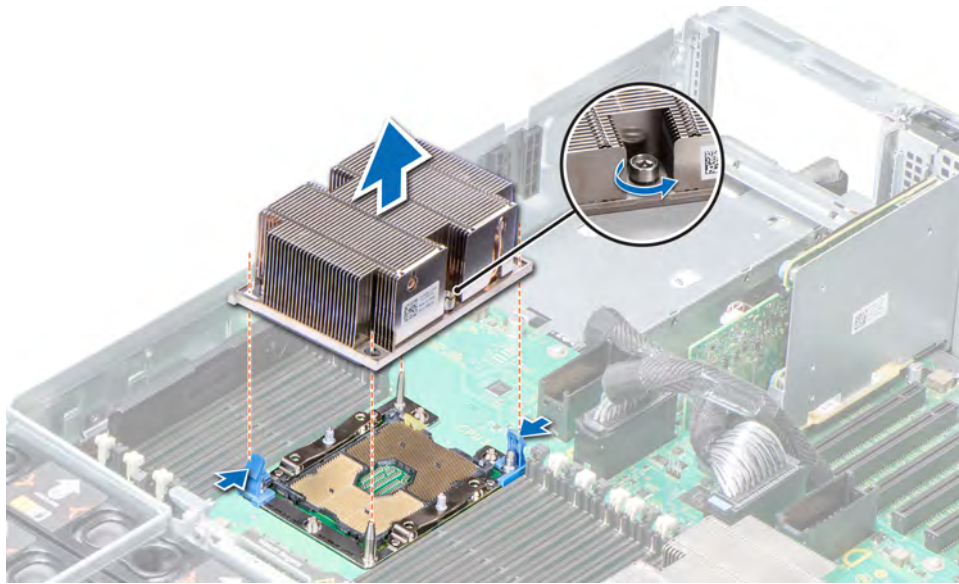


Figure 55. Removing the processor and heat sink module

Next step

Install the PHM.

Related links

[Removing the expansion card riser](#)

[Installing a processor and heat sink module](#)

Removing the processor from the processor and heat sink module

Prerequisites

① **NOTE:** Only remove the processor from the processor and heat sink module if you are replacing the processor or heat sink. This procedure is not required when replacing a system board.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 Remove the processor and heat sink module.

Steps

- 1 Place the heat sink with the processor side facing up.
- 2 Insert a flat blade screwdriver into the release slot marked with a yellow label. Twist (do not pry) the screwdriver to break the thermal paste seal.
- 3 Push the retaining clips on the processor bracket to unlock the bracket from the heat sink.

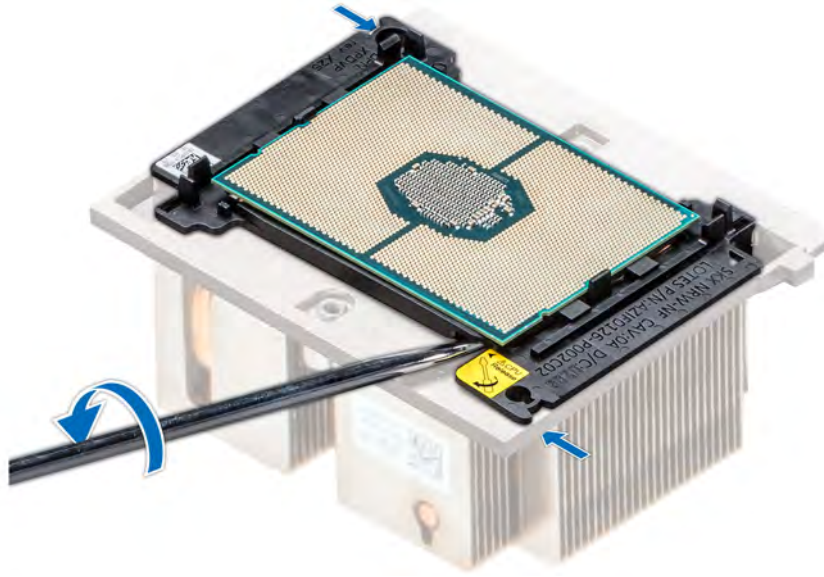


Figure 56. Loosening the processor bracket

- 4 Lift the bracket and the processor away from the heat sink, and place the processor connector side down on the processor tray.
- 5 Flex the outer edges of the bracket to release the bracket from the processor.

NOTE: Ensure that the processor and the bracket are placed in the tray after you remove the heat sink.



Figure 57. Removing the processor bracket

Next step

Install the processor into the processor and heat sink module.

Related links

[Removing the air shroud](#)

[Removing a processor and heat sink module](#)

Installing the processor into a processor and heat sink module

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Place the processor in the processor tray.
 - ① **NOTE:** Ensure that the pin 1 indicator on the processor tray is aligned with the pin 1 indicator on the processor.
- 2 Flex the outer edges of the bracket around the processor ensuring that the processor is locked into the clips on the bracket.
 - ① **NOTE:** Ensure that the pin 1 indicator on the bracket is aligned with the pin 1 indicator on the processor before placing the bracket on the processor.
 - ① **NOTE:** Ensure that the processor and the bracket are placed in the tray before you install the heat sink.



Figure 58. Installing the processor bracket

- 3 If you are using an existing heat sink, remove the thermal grease from the heat sink by using a clean lint-free cloth.
- 4 Use the thermal grease syringe included with your processor kit to apply the grease in a quadrilateral design 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.
 - ① **NOTE:** The thermal grease syringe is intended for single use only. Dispose the syringe after you use it.



Figure 59. Applying thermal grease on top of the processor

- 5 Place the heat sink on the processor and push down on the base of the heat sink until the bracket locks onto the heat sink.

NOTE:

- Ensure that the two guide pin holes on the bracket match the guide holes on the heat sink.
- Do not press on the heat sink fins.
- Ensure that the pin 1 indicator on the heat sink is aligned with the pin 1 indicator on the bracket before placing the heat sink onto the processor and bracket.

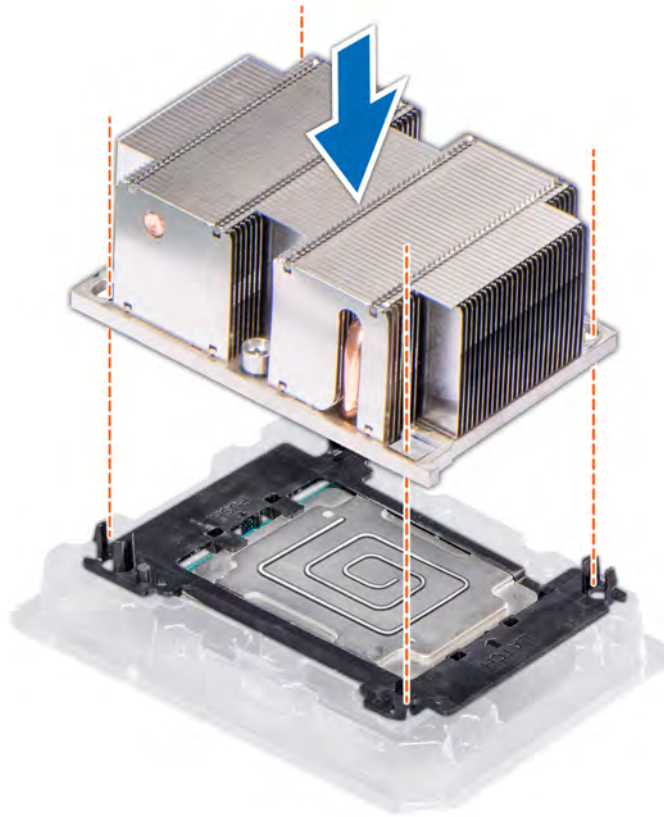


Figure 60. Installing the heat sink onto the processor

Next steps

- 1 Install the processor and heat sink module.
- 2 Install the air shroud.
- 3 Follow the procedure listed in [After working inside your system](#).

Related links

- [Installing a processor and heat sink module](#)
- [Installing the air shroud](#)

Installing a processor and heat sink module

Prerequisites

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

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 If installed, remove the processor/DIMM blank and CPU dust cover.
The procedure to remove the processor/DIMM blank is similar to that of the memory module.

Steps

- 1 Align the pin 1 indicator of the heat sink to the system board and then place the processor and heat sink module (PHM) on the processor socket.

CAUTION: To avoid damaging the fins on the heat sink, do not press down on the heat sink fins.

NOTE: Ensure that the PHM is held parallel to the system board to prevent damaging the components.

- 2 Push the blue retention clips inward to allow the heat sink to drop into place.
- 3 Supporting the heat sink with one hand.
- 4 Using the Torx #T30 screwdriver, tighten the screws on the heat sink in the order below:
 - a Partially tighten the first screw (approximately 3 turns).
 - b Tighten the second screw completely.
 - c Return to the first screw and tighten it completely.

If the PHM slips off the blue retention clips when the screws are partially tightened, follow these steps to secure the PHM:

- a Loosen both the heat sink screws completely.
- b Lower the PHM on to the blue retention clips, follow the procedure described in step 2.
- c Secure the PHM to the system board, follow the procedure described in step 4.

NOTE: The processor and heat sink module retention screws should not be tightened to more than 0.13 kgf-m (1.35 N.m or 12 in-lbf).

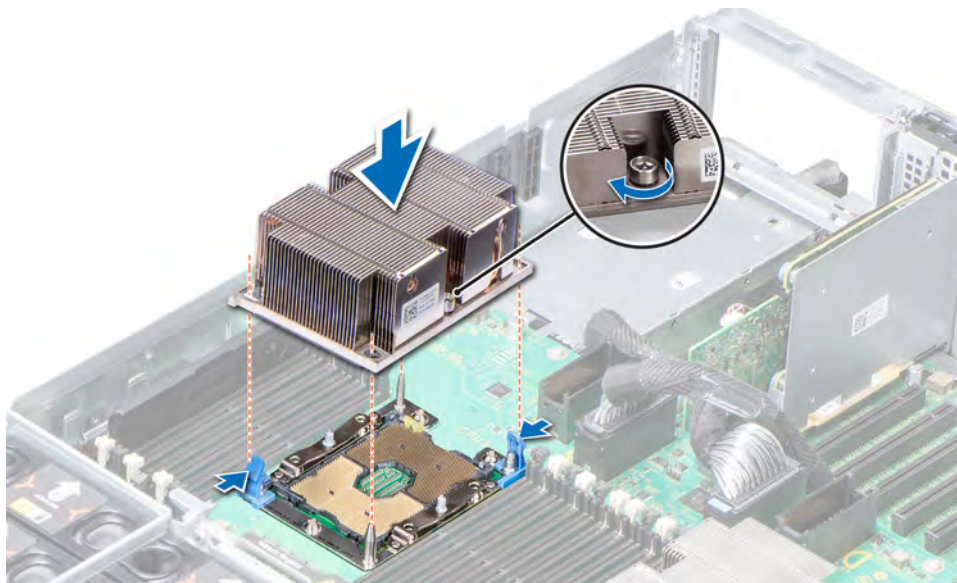


Figure 61. Installing the processor and heat sink module

Next steps

- 1 If applicable, lower the PEM until it firmly seats in place.
- 2 If removed, install the expansion card risers.
- 3 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the expansion card riser](#)

Processor expansion module

The processor expansion module (PEM) is a mezzanine system board. By installing a PEM, you can upgrade your two processor system to a four processor system.

Removing the PEM

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the expansion card risers.
- 4 Remove the air shroud.

Steps

- 1 Lift the PEM using the handle until the PEM is in an upright position.
- 2 Press the release latch on the cable and disconnect the cables connected to the connectors on the PEM.
- 3 Press the release latch on the side of the chassis and lift the PEM out of the system.

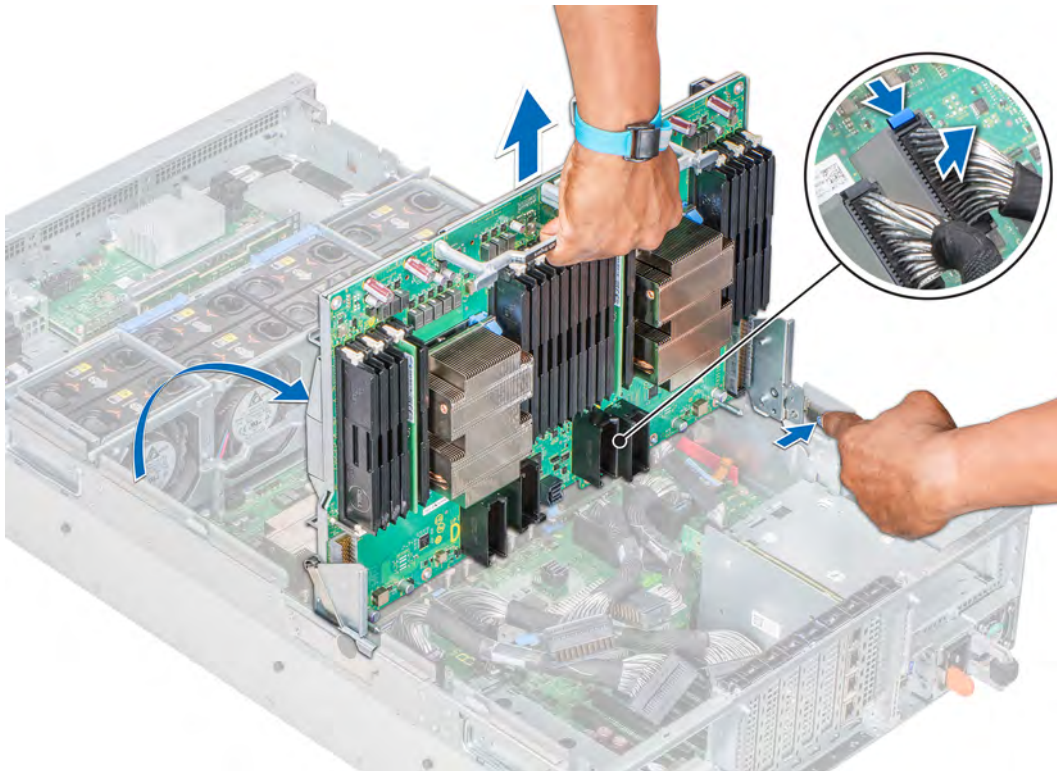


Figure 62. Removing the PEM

Next step

If applicable, install the PEM.

Related links

- [Removing the expansion card riser](#)
- [Removing the air shroud](#)
- [Installing the PEM](#)

Installing the PEM

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Hold the PEM using the handle and align the slots on the sides of the PEM with the standoffs on the sides of the system.
- 2 Lower the PEM until it clicks into place.
- 3 Re-connect the cables to the PEM. For information about cable routing, see the section [UPI cable routing](#).
- 4 Hold the PEM handle and lower the PEM until it firmly seats in place.

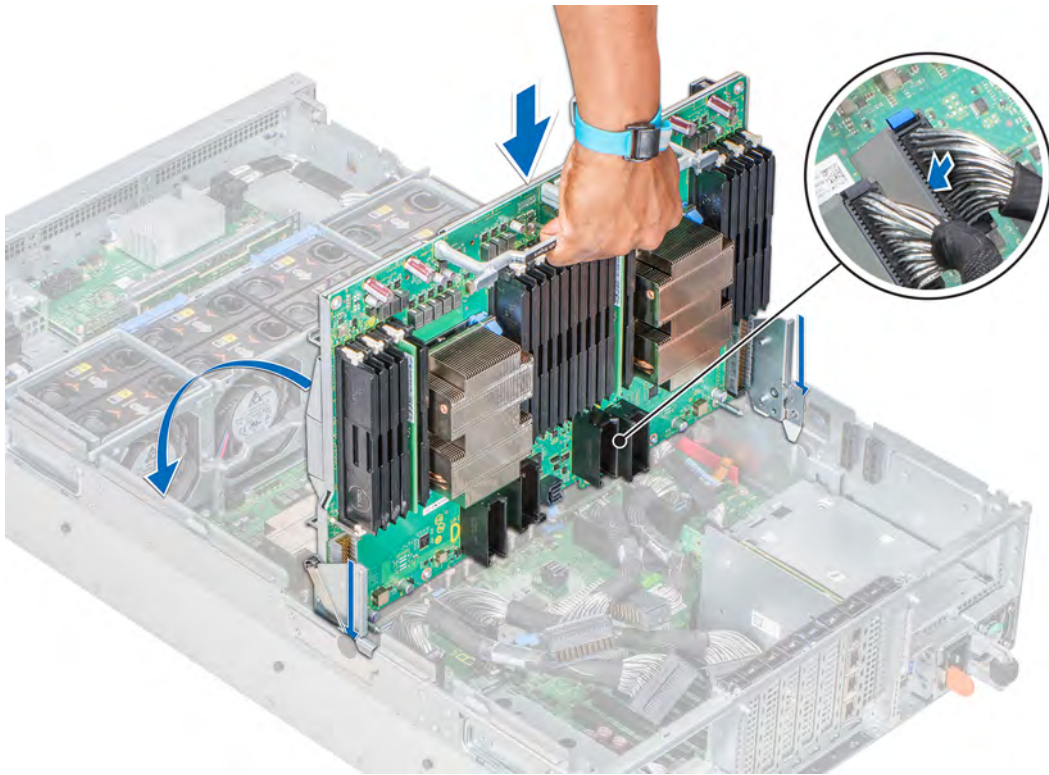


Figure 63. Installing the PEM

Next steps

- 1 Install the expansion card risers.
- 2 Install the air shroud.
- 3 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the expansion card riser](#)

[Installing the air shroud](#)

UPI cable routing

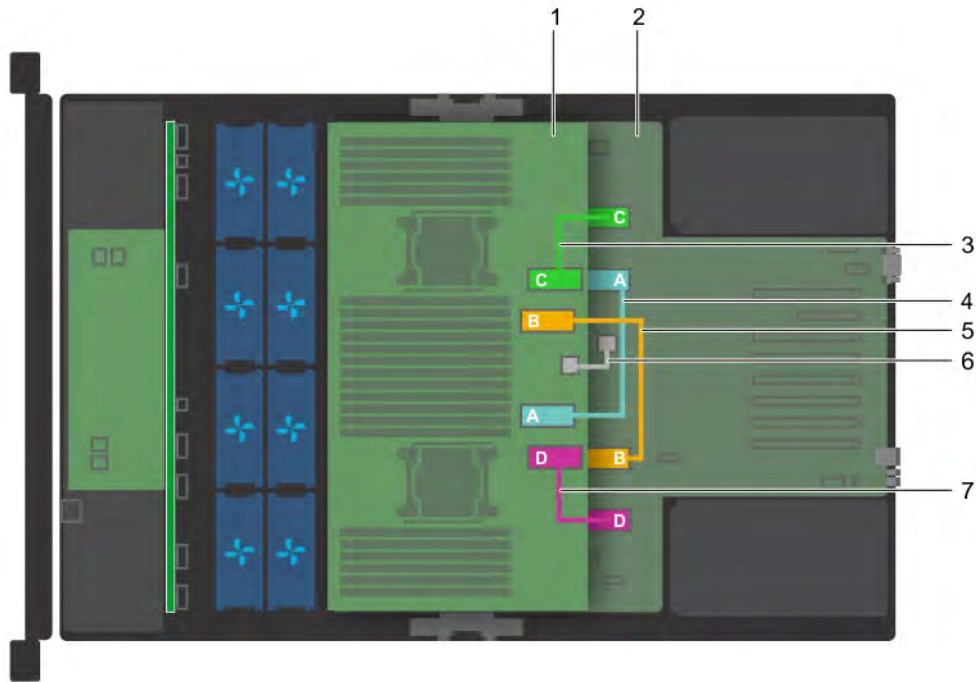


Figure 64. Cable routing - Four processor system

- | | | | |
|---|--|---|---|
| 1 | PEM | 2 | system board |
| 3 | UPI cable connecting RM_UPI_C connectors on system board and PEM | 4 | UPI cable connecting RM_UPI_A connectors on system board and PEM |
| 5 | UPI cable connecting RM_UPI_B connectors on system board and PEM | 6 | cable connecting the J_PEM_CLK connectors on system board and PEM |
| 7 | UPI cable connecting RM_UPI_D connectors on system board and PEM | | |

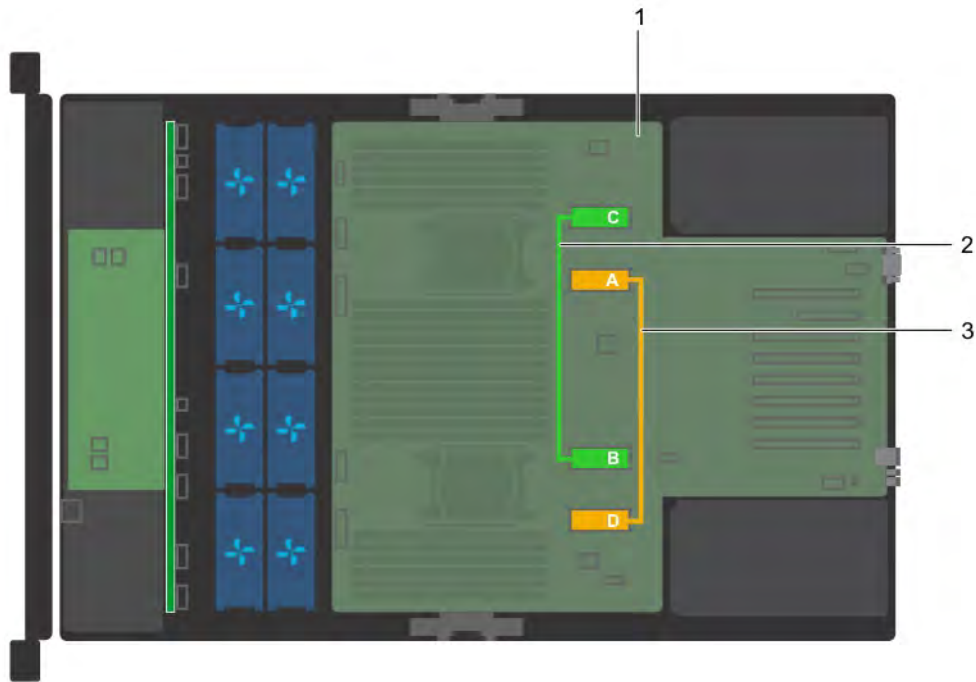


Figure 65. Cable routing - Two processor system

- | | |
|---|---|
| <ol style="list-style-type: none"> 1 system board 3 UPI cable connecting RM_UPI_C and RM_UPI_B connectors on system board | <ol style="list-style-type: none"> 2 UPI cable connecting RM_UPI_A and RM_UPI_D connectors on system board |
|---|---|

PEM power board

PowerEdge R940 supports two PEM power boards. These are mainly used to supply power to the PEM. The power boards are installed on the J_PEM_PWR_R and J_PEM_PWR_L connectors available on the system board. For more information on the location of these connectors, see the jumpers and connectors section.

Removing the PEM power board

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 Lift the PEM by using the PEM handle until the PEM is in an upright position.

Step

Hold the PEM power board by its edges and remove the power board from the connector on the system board.

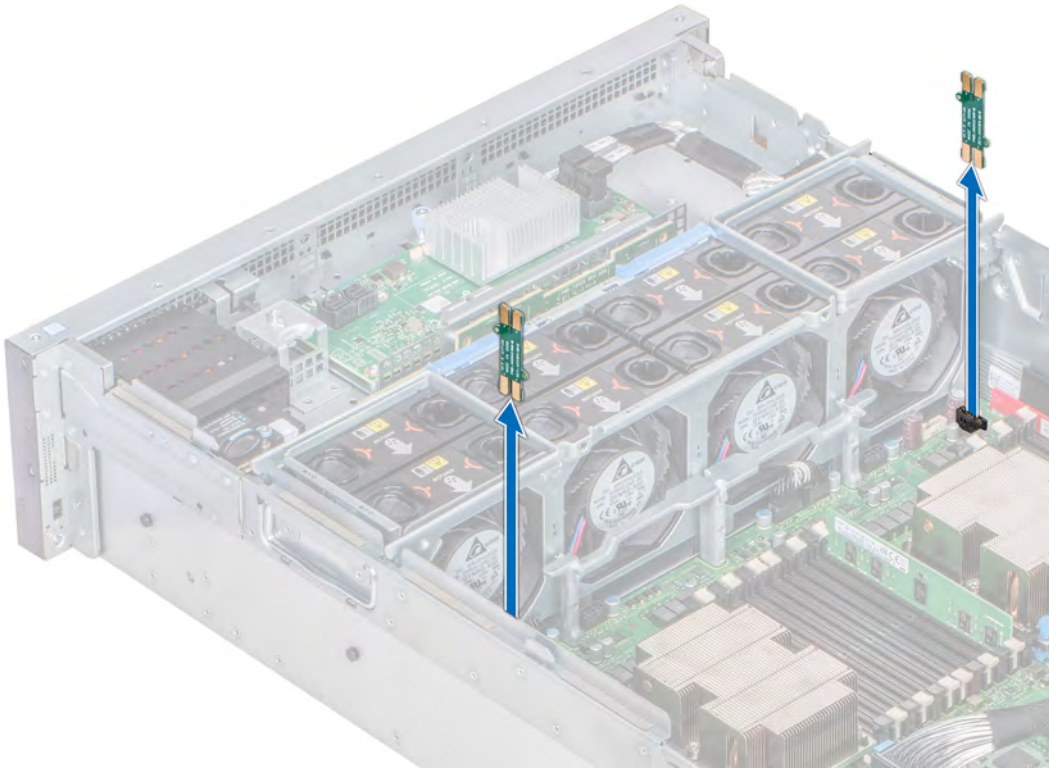


Figure 66. Removing the PEM power board

Next step

If applicable, install the PEM power board.

Related links

[Removing the air shroud](#)

[Installing the PEM power board](#)

Installing the PEM power board

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Hold the PEM power board by its edges, position the power board so that the power board connector aligns with the connector on the system board.
- 2 Insert the power board into the connector on the system board until the power board is fully seated.

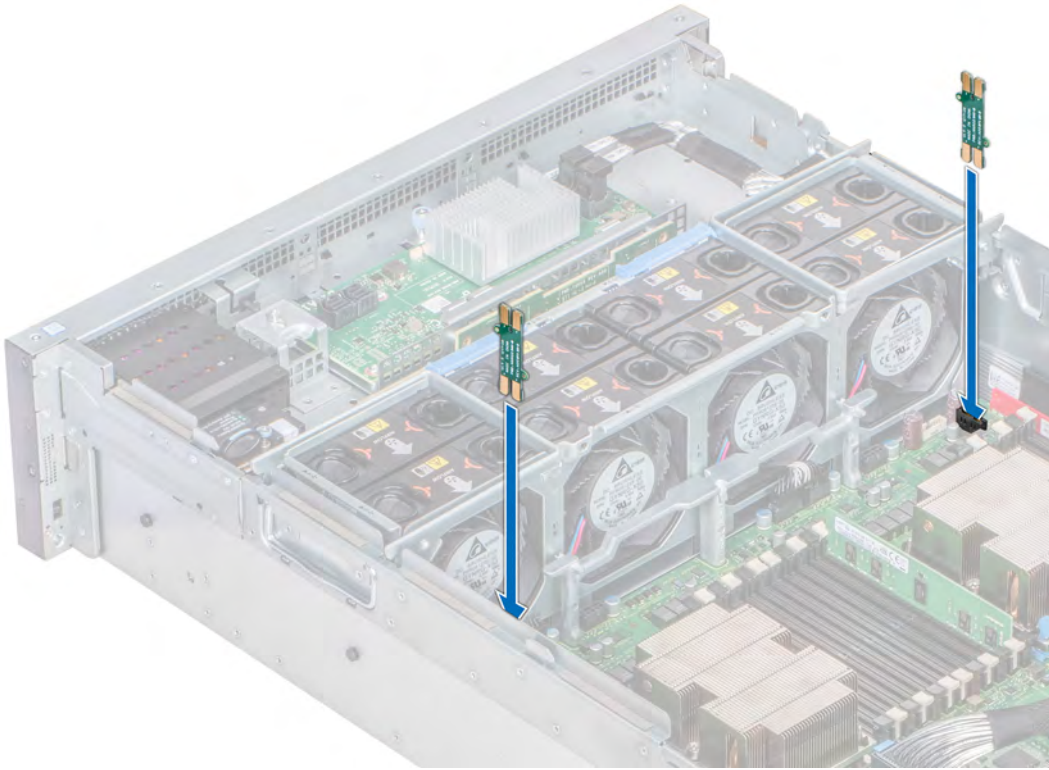


Figure 67. Installing the PEM power board

Next steps

- 1 Holding the PEM handle, lower the PEM until it firmly seats in place.
- 2 Install the air shroud.
- 3 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the air shroud](#)

Expansion cards and expansion card risers

An expansion card in the system is an add-on card that can be inserted into an expansion slot on the system board or a slot on a riser card to add enhanced functionality to the system through the expansion bus.

NOTE: A System Event Log (SEL) event is logged if an expansion card riser is not supported or missing. It does not prevent your system from turning on. However, if a F1/F2 pause occurs and an error message is displayed.

Expansion card installation guidelines

Depending on your system configuration, the following PCI Express (PCIe) generation 3 expansion cards are supported:

Table 44. Expansion card riser configurations

| Riser | PCIe slot on the expansion card riser | Processor connection | PCIe slots on riser (Height) | PCIe slots on riser (length) | Link width | Slot width |
|---------------------|---------------------------------------|----------------------|------------------------------|------------------------------|------------|------------|
| | Slot 8 | Processor 3 | full height | 3/4 length | x16 | x16 |
| Riser 2 (IO_RISER2) | Slot 9 | Processor 3 | full height | half length | x16 | x16 |
| | Slot 10 | Processor 3 | full height | half length | x16 | x16 |
| | Slot 11 | Processor 4 | full height | 3/4 length | x16 | x16 |
| Riser 3 (IO_RISER3) | Slot 12 | Processor 4 | full height | half length | x16 | x16 |
| | Slot 13 | Processor 4 | full height | half length | x16 | x16 |

NOTE: The expansion card slots are not hot-swappable.

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.

Table 45. Expansion card installation order — Two processor configuration

| Card Type | Slot priority | Maximum number of cards |
|--|---------------------|-------------------------|
| Internal storage adapter | 1, 6 | 2 |
| PERC H330 | 1 | 1 |
| PCIe extender card | 7, 4, 2 | 3 |
| PCIe card (Mellanox) | 4, 3, 2, 7 | 3 |
| 100 GB NIC (Mellanox) | 4, 3, 2, 7 | 3 |
| 100 G OPA (Intel) | 2, 3, 4, 7 | 4 |
| External adapter (12 Gbps HBA, H840, H830) | 5, 1, 6, 2, 4, 3, 7 | 2 |
| NVMe PCIe storage (Samsung) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 40 GB (x8) NIC (Intel) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 40 GB (x8) NIC (Mellanox) | 4, 3, 2, 7, 5, 1, 6 | 7 |
| FC32 HBA (Emulex and QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| FC32 HBA x8 (Emulex and QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 25 GB NIC (Broadcom) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 25 GB NIC (Mellanox) | 4, 3, 2, 7, 5, 1, 6 | 7 |
| 25 GB NIC x8 (QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| FC16 HBA (Emulex and QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 10 GB NIC (SolarFlare) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| FC 8 HBA (Emulex and QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 1 GB NIC (Broadcom and Intel) | 5, 1, 6, 2, 4, 3 | 6 |
| 10 GB NIC SFP, SFP+ (QLogic) | 5, 1, 6, 2, 4, 3, 7 | 7 |

| Card Type | Slot priority | Maximum number of cards |
|-----------------------------|---------------------|-------------------------|
| 10 GB NIC SFP+ (Intel) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 10 GB NIC (Broadcom) | 5, 1, 6, 2, 4, 3, 7 | 7 |
| 10 GB NIC (QLogic) | 5, 1, 6, 2, 4, 3 | 6 |
| 10 GB NIC dual port (Intel) | 5, 1, 6, 2, 4, 3 | 6 |
| 10 GB NIC quad port (Intel) | 4, 3, 5, 2 | 4 |
| 10 GB NIC SFP+ (Mellanox) | 4, 3, 2, 7, 5, 1, 6 | 7 |

Table 46. Expansion card installation order — Four processor configuration

| Card type | Slot priority | Maximum number of cards |
|---|---|-------------------------|
| Internal storage adapter | 1, 6 | 2 |
| PERC H330 | 1 | 1 |
| PCIe extender card | 11, 12, 8 | 3 |
| HBA PCIe dual and single ports (Mellanox) | 11, 8, 3, 4, 12, 9, 2, 10 | 4 |
| 100 GB NIC dual port (Mellanox) | 11, 8, 3, 4, 12, 9, 2, 10, 13, 7 | 4 |
| 100 GB OPA x16 (Intel) | 2, 4, 8, 11, 3, 7, 9, 12, 10, 13 | 10 |
| External adapter (12 Gbps HBA, H840, H830) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 2 |
| NVMe PCIe storage (Samsung) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 40Gb NIC x8 (Intel) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 40Gb NIC x8 (Mellanox) | 11, 8, 3, 4, 12, 9, 2, 10, 13, 7, 6, 1, 5 | 8 |
| FC32 HBA (Emulex and QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| FC32 HBA x8 (Emulex and QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 25 GB NIC (Broadcom) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 25 GB NIC (Mellanox) | 11, 8, 3, 4, 12, 9, 2, 10, 13, 7, 6, 1, 5 | 8 |
| 25 GB NIC x8 (QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| FC16 HBA (Emulex and QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| FC8 HBA (Emulex and QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 1 GB NIC (Broadcom and Intel) | 5, 1, 6, 11, 2, 4, 9, 12, 3, 10, 13 | 11 |
| 10 GB NIC dual port (SolarFlare) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 10 GB NIC dual port (Intel, QLogic, Broadcom) | 5, 1, 6, 11, 2, 4, 9, 12, 3, 10, 13 | 11 |
| 10 GB NIC SFP SFP+ dual port (QLogic) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 10 GB NIC SFP+ dual port (Mellanox) | 11, 8, 3, 4, 12, 9, 2, 10, 13, 7, 6, 1, 5 | 8 |
| 10 GB NIC dual port (Broadcom) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 10 GB NIC SFP+ (Intel) | 5, 1, 6, 8, 11, 2, 4, 9, 12, 3, 7, 10, 13 | 13 |
| 10 GB NIC Quad port (Intel) | 11, 10, 2, 4 | 4 |

Removing expansion card riser blank

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

Step

Hold the expansion card riser blank and lift the blank out of the system.

NOTE: When you upgrade your system from two processor configuration to four processor, ensure that you remove the riser blanks from the system.

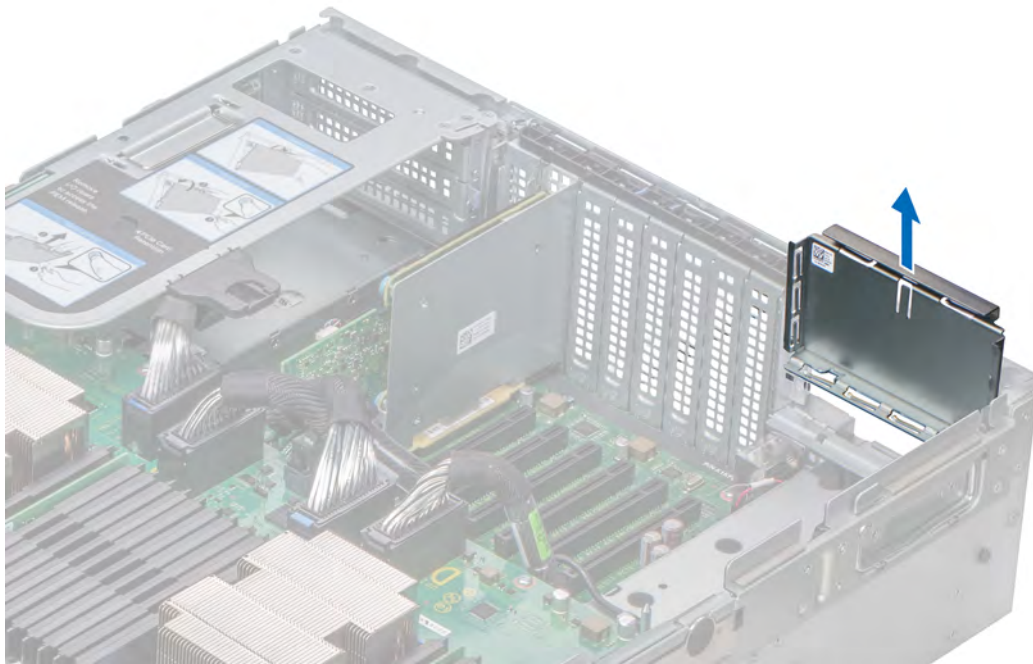


Figure 68. Removing expansion card riser blank

Next step

Install the expansion card riser blank.

Related links

[Installing expansion card riser blank](#)

Installing expansion card riser blank

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Step

Lower the expansion card riser blank into the system until the blank is seated on the corresponding slot at the back of the system.

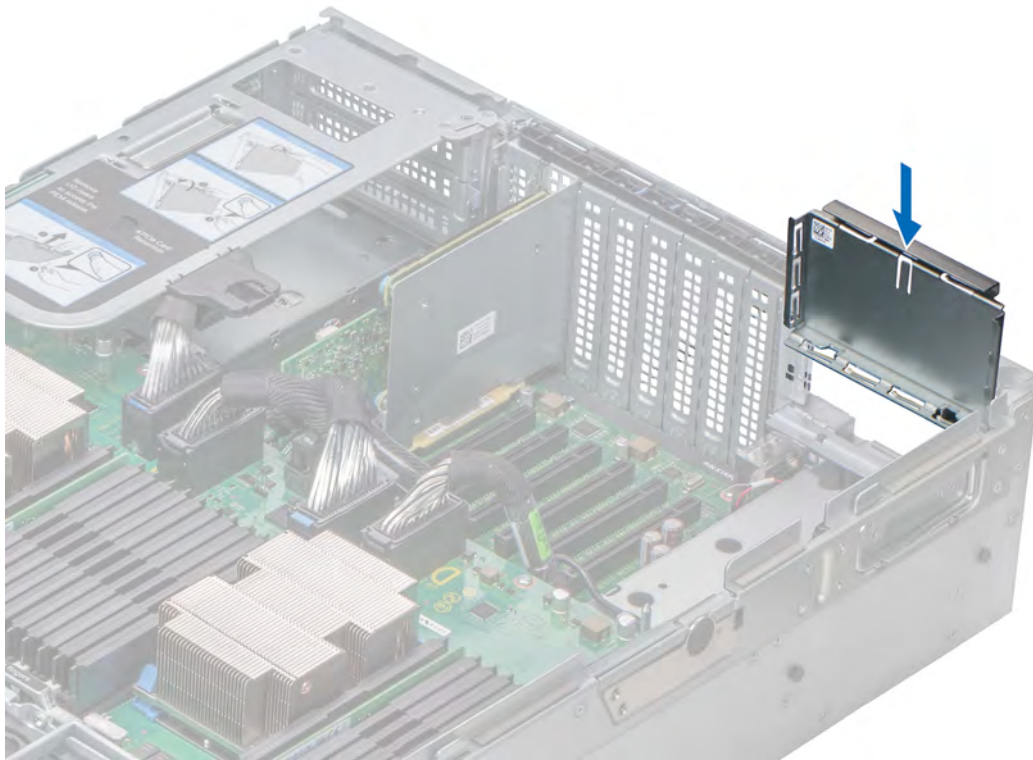


Figure 69. Installing expansion card riser blank (right)

Next step

- 1 Follow the procedure listed in [After working inside your system](#).

Removing the expansion card riser

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Disconnect any cables connected to the expansion card.

Steps

- 1 Lift the release lever until the connector on the riser disconnects from the connector on the processor expansion module (PEM).
- 2 Lift the riser away from the system.

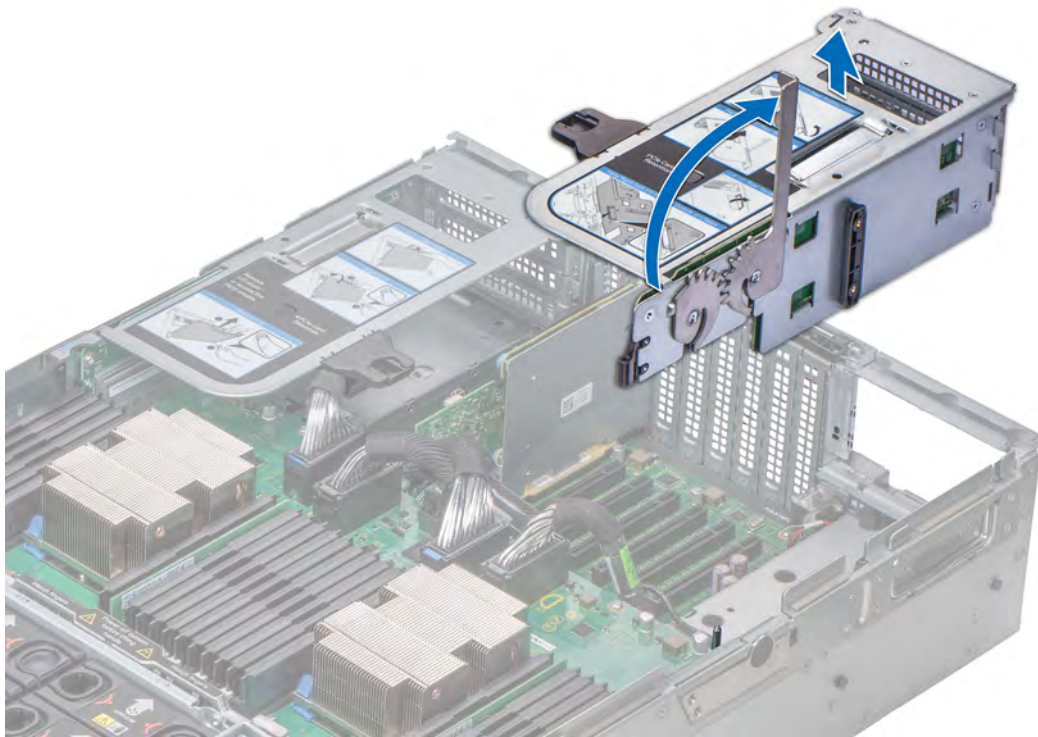


Figure 70. Removing expansion card riser (right)

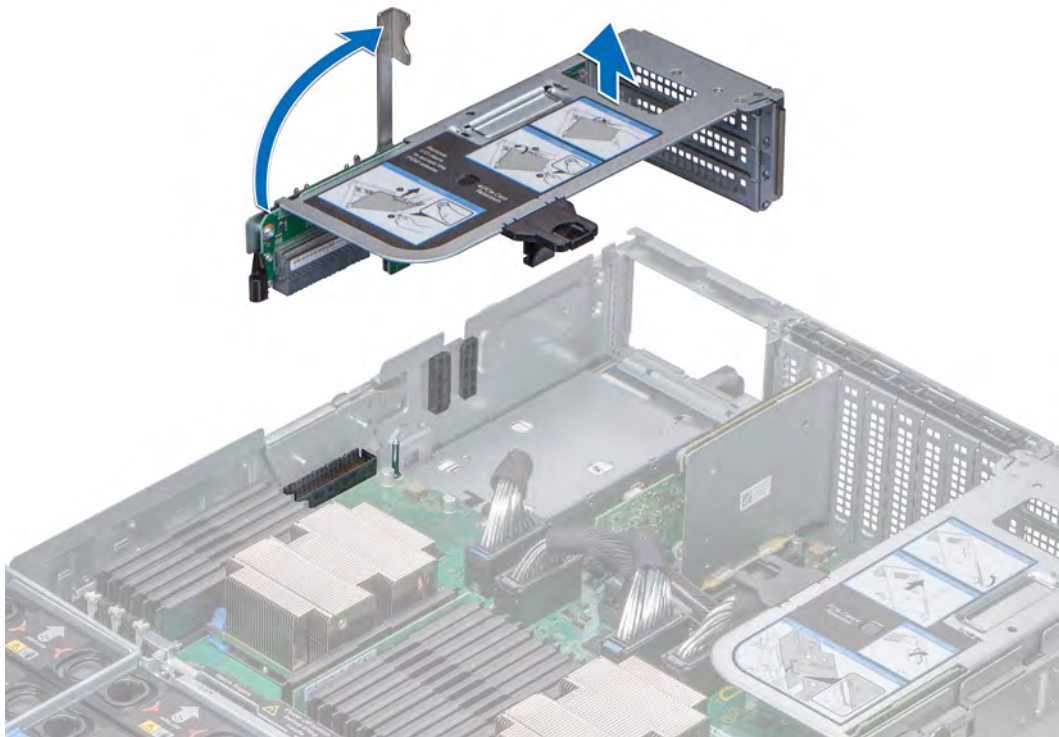


Figure 71. Removing expansion card riser (left)

Next step

Install the expansion card riser.

Related links

[Installing the expansion card riser](#)

Installing the expansion card riser

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Align the guide rail on the side of the riser with the slot on the side of the chassis and lower the riser into the system.
- 2 Lower the release lever until the connector on the riser connects with the connector on the processor expansion module (PEM).

CAUTION: To avoid damage to the connectors on the PEM, you must only use the release levers to seat the expansion card risers firmly on the PEM.

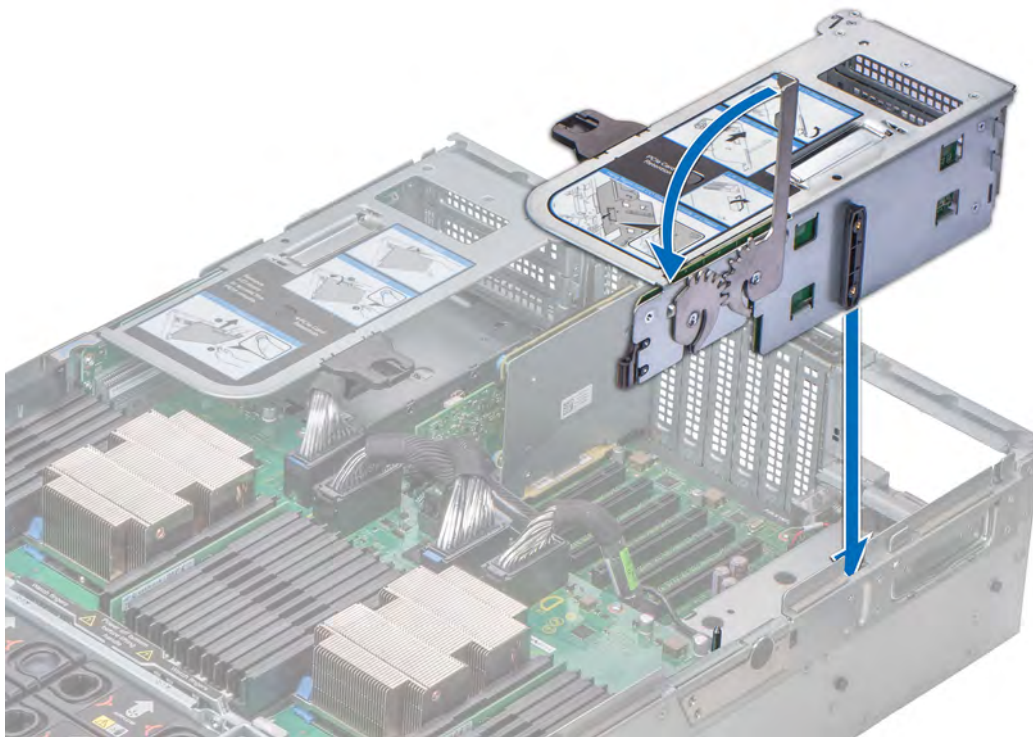


Figure 72. Installing expansion card riser (right)

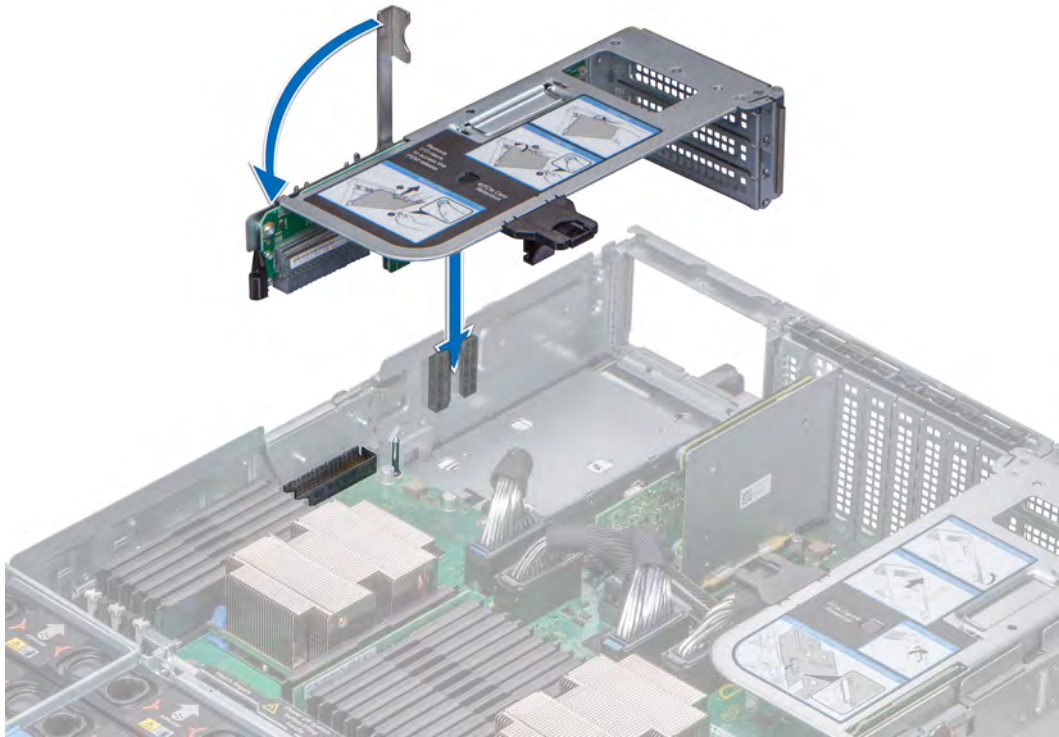


Figure 73. Installing expansion card riser (left)

Next steps

- 1 Connect the cables to the expansion card.
- 2 Follow the procedure listed in [After working inside your system](#).

Removing the expansion card from expansion card riser

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Disconnect the cables from the expansion card.
- 4 Remove the expansion card riser.

Steps

- 1 Press the tab on the expansion card riser and slide the PCIe retention bracket up.

NOTE: This step is applicable only if you are removing the expansion cards from the slots 12 and 13 of Riser 3 (IO_RISER3) and slots 9 and 10 of Riser 2 (IO_RISER2).

- 2 Lift the PCIe card latch.
- 3 Hold the expansion card by its edges, and lift the card out until the connector on the card disconnects from the connector on the riser.

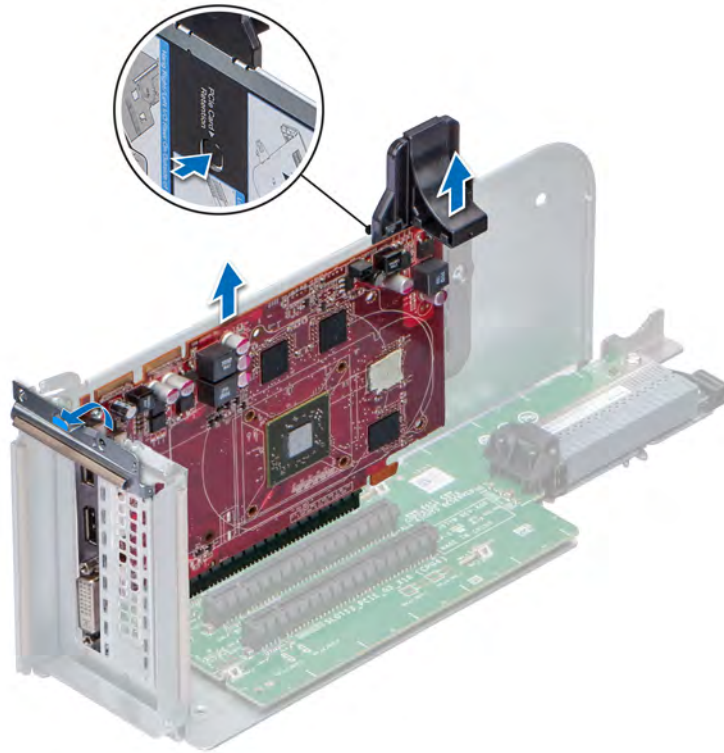


Figure 74. Removing the expansion card from expansion card riser

Next steps

- 1 Install the expansion card into expansion card riser.
- 2 If you are removing the card permanently, install a metal filler bracket over the empty expansion slot opening and lower the PCIe card latch to lock the bracket in place.

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

Related links

[Removing the expansion card riser](#)

[Installing expansion card into expansion card riser](#)

Installing expansion card into expansion card riser

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 If installing a new expansion card, unpack it and prepare the card for installation.

NOTE: For instructions, see the documentation accompanying the card.

Steps

- 1 If installed, remove the filler bracket.

NOTE: Store the filler bracket for future use. Filler brackets must be installed in empty expansion card slots to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.

- 2 Holding the expansion card by its edges, position the card so that the connector on the card aligns with the connector on the riser.
- 3 Insert the connector on the card into the connector on the riser until the card is fully seated.
- 4 Slide the PCIe retention bracket down to hold the card in place.

NOTE: This step is applicable only if you are installing the expansion cards in the slots 12 and 13 of Riser 3 (IO_RISER3) and slots 9 and 10 of Riser 2 (IO_RISER2).

- 5 Close the PCIe card latch.

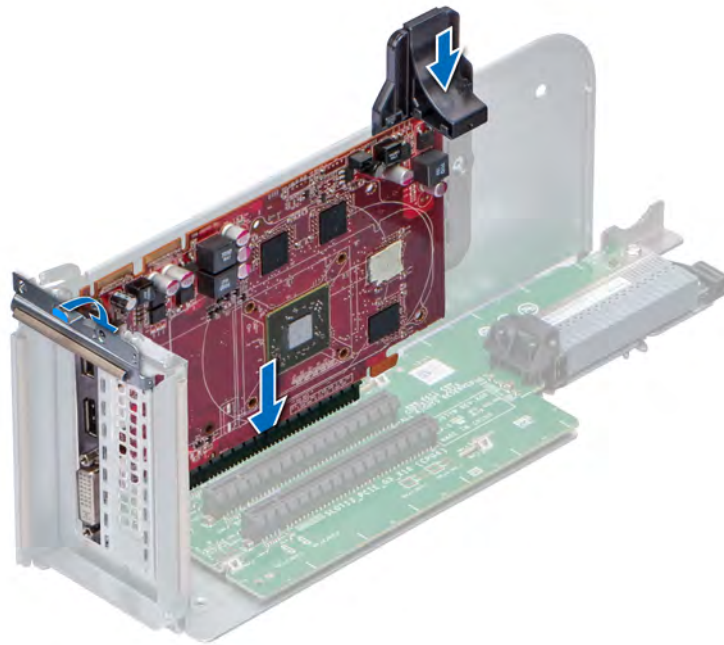


Figure 75. Installing expansion card into expansion card riser

Next steps

- 1 Install the expansion card riser.
- 2 Connect the cables to the expansion card.
- 3 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the expansion card riser](#)

M.2 SSD module

The BOSS card is a simple RAID solution card designed specifically for booting a server's operating system. The card supports up to two 6 Gbps M.2 SATA drives. The BOSS adapter card has a x8 connector using PCIe gen 2.0 x2 lanes, available only in the low-profile and half-height form factor.

Removing the M.2 SSD module

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 Remove the BOSS card.

NOTE: Removing the BOSS card is similar to the procedure for removing an expansion card riser.

Steps

- 1 Loosen and remove the screw that secures the M.2 SSD module on the BOSS card.
- 2 Lift the M.2 SSD module away from the BOSS card.

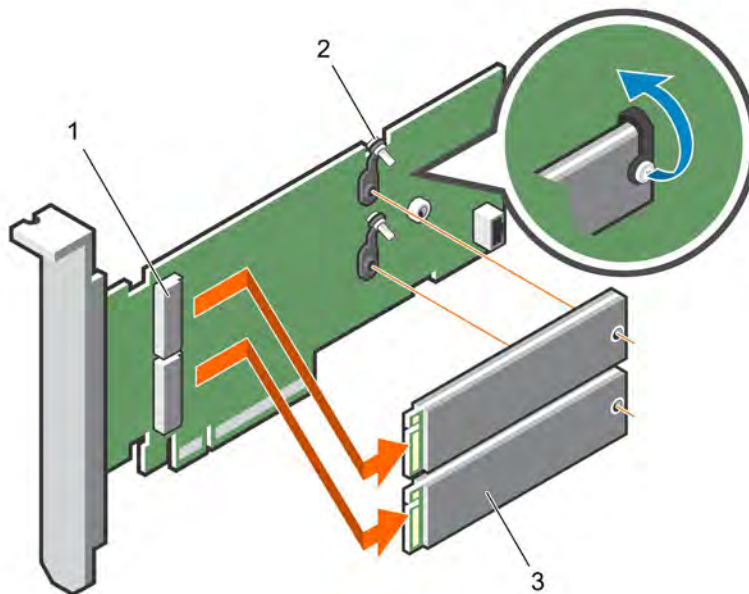


Figure 76. Removing the M.2 SSD module

1 module connector (2)

2 module (2)

Installing the M.2 SSD module

Prerequisite

- 1 Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Align the M.2 SSD module connectors with the connectors on the BOSS card.
- 2 Align the M.2 SSD module downwards until the module is seated firmly on the card.
- 3 Secure the M.2 SSD module on the BOSS card with the screw.

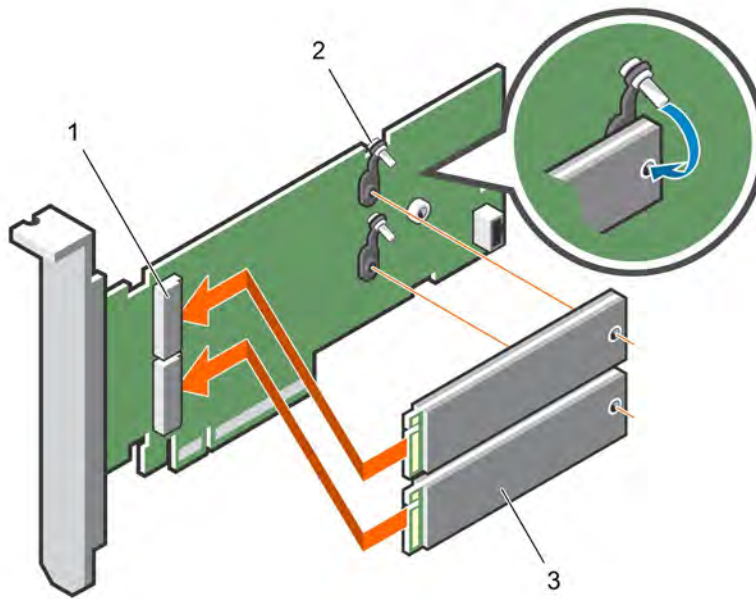


Figure 77. Installing the M.2 SSD module

1 module connector (2)

2 modules (2)

Next steps

1 Install the BOSS card.

NOTE: Installing the BOSS card is similar to installing the expansion card riser.

2 Install the air shroud.

3 Follow the procedure listed in [After working inside your system](#).

Network daughter card riser

The Network Daughter Card (NDC) riser is a half-length, full-height card installed in a dedicated PCIe slot (IO_RISER1) on the system board. The NDC riser is also known as I/O riser 1.

Removing the NDC riser

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Disconnect the cables connected to the Network Daughter Card (NDC) riser.

Steps

- 1 Slide the riser retention bracket to unlock the NDC riser.
- 2 Hold the NDC riser by its edges, and pull the NDC riser until the card edge connector disengages from the connector on the system board.
- 3 Lift the NDC riser from the system.

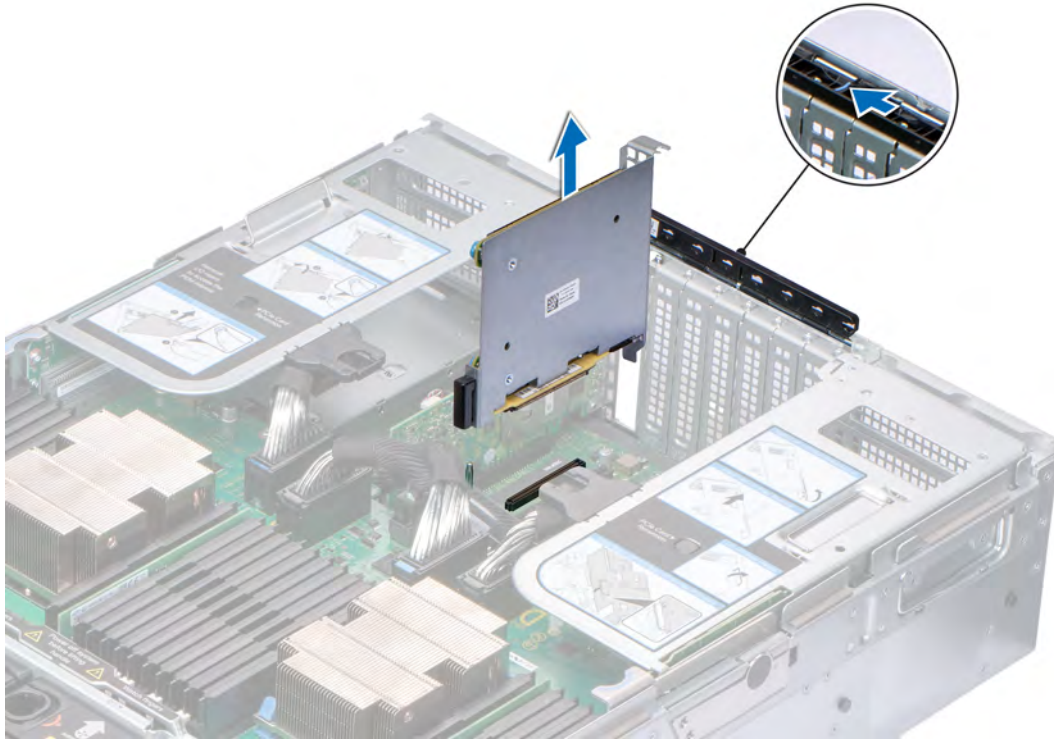


Figure 78. Removing the NDC riser

Next step

- 1 Install the NDC riser.

Related links

[Installing the NDC riser](#)

Installing the NDC riser

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Hold the Network Daughter Card (NDC) riser by its edges and align the connector on the NDC riser and guide pin on the system board.
- 2 Insert the NDC riser until the card is fully seated.
- 3 Close the riser retention bracket and slide the bracket to lock the NDC riser.

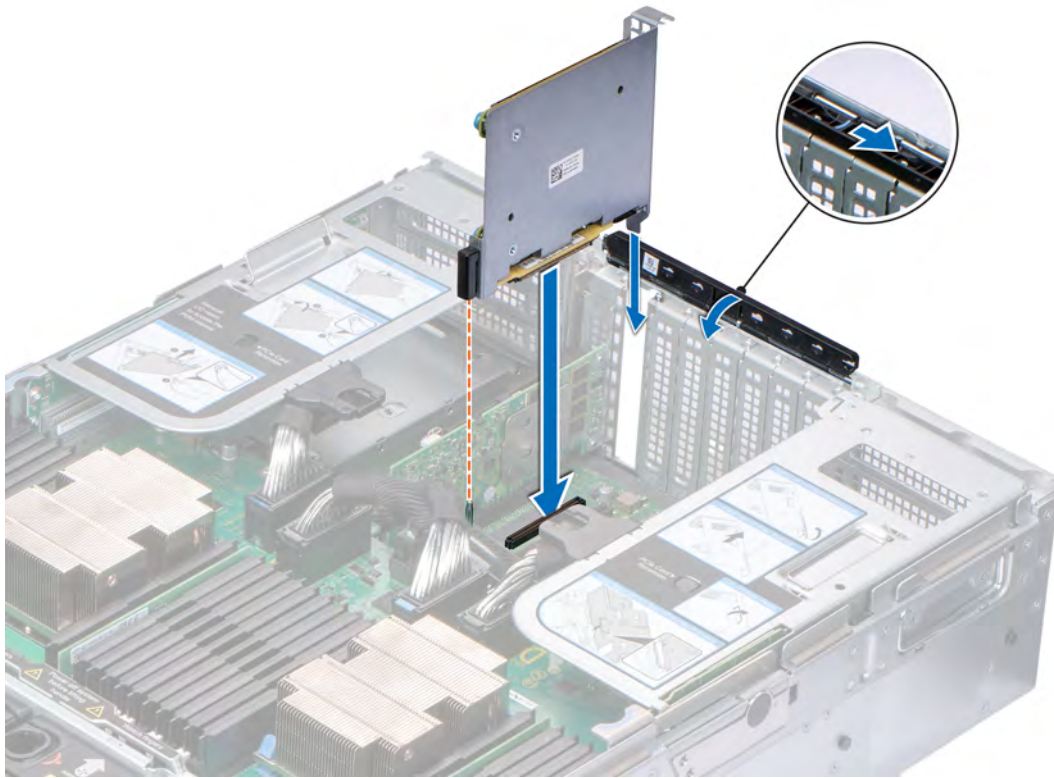


Figure 79. Install the NDC riser

Next steps

- 1 Connect the cables to the NDC riser.
- 2 Follow the procedure listed in [After working inside your system](#).

Network daughter card

The network daughter card (NDC) is a small, removable mezzanine card, which provides the flexibility of selecting different connectivity options.

Removing the NDC

Prerequisites

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

Steps

- 1 Using a Phillips #2 screwdriver, loosen the captive screws that secure the NDC to the NDC riser.
- 2 Hold the NDC by the edges on either side of the touch points, and lift to remove it from the connector on the NDC riser.
- 3 Slide the NDC away from the NDC riser bracket until the Ethernet connectors are clear of the slot in the NDC riser.



Figure 80. Removing the NDC

Next step

- 1 Install the NDC.

Related links

[Removing the NDC riser](#)

[Installing the NDC](#)

Installing the NDC

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Orient and slide the NDC so that the Ethernet ports fit through the slot in the NDC riser.
- 2 Align the captive screws on the card with the screw holes on the NDC riser.
- 3 Press the touch points on the card until the connector connects with the connector on the NDC riser.
- 4 Using a Phillips #2 screwdriver, tighten the captive screws to secure the NDC to the NDC riser.

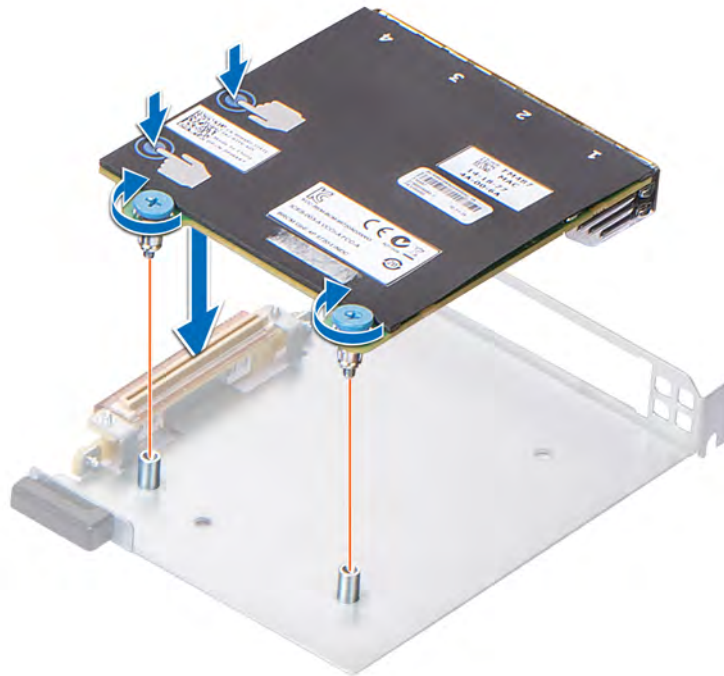


Figure 81. Installing the NDC

Next steps

- 1 Install the NDC riser.
- 2 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the NDC riser](#)

Storage controller card

The storage controller card is installed on the expansion card slot on the system board, which provides the integrated storage subsystem for your system's internal hard drives. 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 storage controller card

Prerequisites

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

Steps

- 1 Slide the riser retention bracket to unlock the storage controller card.
- 2 Hold the storage controller card by its edges and lift to remove it from the connector on the system board.

- 3 Press the release tab on the SAS cable connector to disconnect the cable from the storage controller card.



Figure 82. Removing the storage controller card

Next step

- 1 Install the storage controller card.

Related links

[Removing the NDC riser](#)

[Installing the storage controller card](#)

Installing the storage controller card

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Connect the SAS cables to the card.

NOTE: Ensure that you use the labels on the cable to connect the cables to the correct connectors. The cable does not function properly if reversed.

- 2 Hold the storage controller card by its edges, and align the connector on the card with the connector on the system board.
- 3 Lower the card into the system until the card is firmly seated.
- 4 Route the SAS 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. For more information about cabling images, see the [Cable routing](#).

- 6 Close the riser retention bracket and slide the bracket to lock the storage controller card.

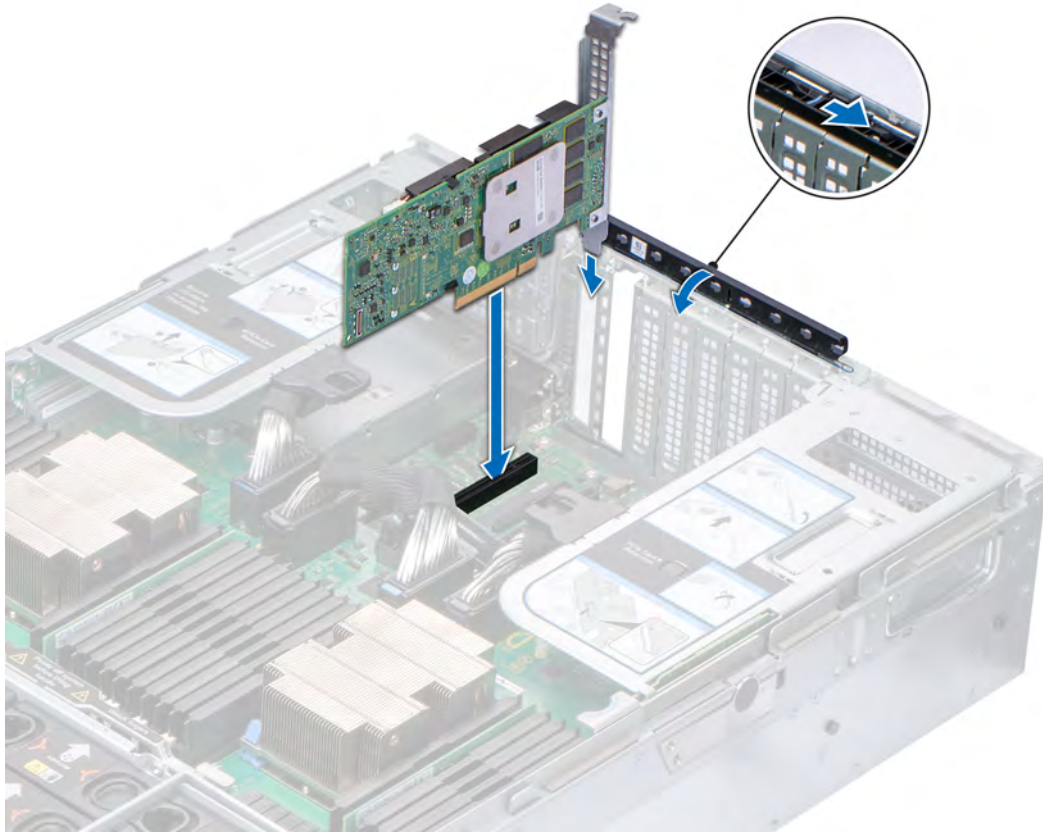


Figure 83. Installing the storage controller card

Next steps

- 1 Install the NDC riser.
- 2 Follow the procedure listed in [After working inside your system](#).

Related links

[Installing the NDC riser](#)

Optional IDSDM or vFlash module

The IDSDM or vFlash module combines the IDSDM or vFlash features into a single module.

NOTE: The write-protect switch is on the IDSDM or vFlash module.

Removing the MicroSD card

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

Steps

- 1 Locate the MicroSD card slot on the vFlash/IDSDM module, and press the card to partially release it from the slot. To locate IDSDM/vFlash module, see the System board jumpers and connectors section.
- 2 Hold the MicroSD card and remove it from the slot.

NOTE: Temporarily label each MicroSD card with its corresponding slot number after removal.

Next steps

- 1 Follow the procedure listed in [After working inside your system](#).
- 2 Install a MicroSD card.

Related links

[Installing the MicroSD card](#)

Installing the MicroSD card

Prerequisites

Follow the safety guidelines listed in [Safety instructions](#).

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

NOTE: If reinstalling, ensure that you install the MicroSD cards into the same slots based on the labels you had marked on the cards during removal.

Steps

- 1 Locate the MicroSD card connector on the IDSDM/vFlash module. Orient the MicroSD card appropriately and insert the contact-pin end of the card into the slot. To locate IDSDM/vFlash, see the System board jumpers and connectors section.

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.

Next step

Follow the procedure listed in [After working inside your system](#).

Removing the optional IDSDM or vFlash card

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 If you are replacing the IDSDM/vFlash card, remove the MicroSD cards.

NOTE: Temporarily label each MicroSD card with its corresponding slot number after removal.

Steps

- 1 Locate the IDSDM/vFlash connector on the system board.
To locate IDSDM/vFlash connector, see the System board jumpers and connectors section.
- 2 Holding the pull tab, lift the IDSDM/vFlash card out of the system.

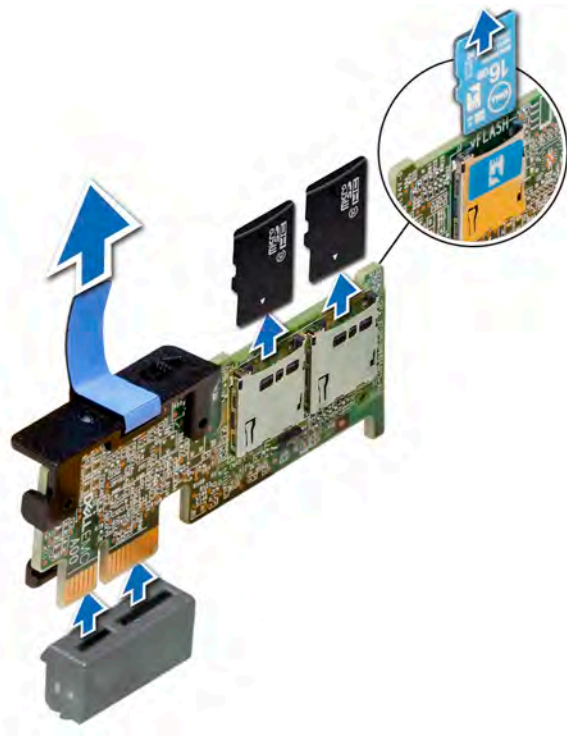


Figure 84. Removing the optional IDSDM/vFlash card

NOTE: There are two dip switches on the IDSDM/vFlash card for write-protection.

Next step

Install the optional IDSDM/vFlash card.

Related links

[Installing optional IDSDM or vFlash card](#)

Installing optional IDSDM or vFlash card

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Locate the IDSDM/vFlash connector on the system board.
To locate IDSDM/vFlash connector, see the [Jumpers and connectors](#) section.
- 2 Align the IDSDM/vFlash card with the connector on the system board.
- 3 Push the IDSDM/vFlash card until it is firmly seated on the system board.

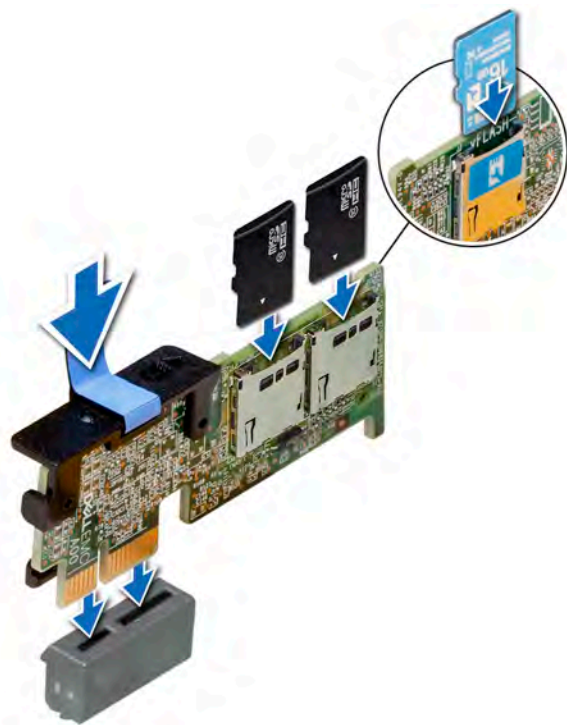


Figure 85. Installing optional IDSDM/vFlash card

Next steps

- 1 Install the MicroSD cards.

① **NOTE:** Reinstall the MicroSD cards into the same slots based on the labels you had marked on the cards during removal.

- 2 Follow the procedure listed in [After working inside your system](#).

Power supply unit

The power supply unit (PSU) is an internal hardware component which supplies power to the components in the system.

Your system supports one of the following:

- Two 2400 W, 2000 W, 1600 W, or 1100 W AC power supply units (PSUs)
- Two 1100 W DC PSUs
- Two 1100 W Mixed Mode HVDC PSUs

① **NOTE:** The PowerEdge R940 system supports hot swappable PSUs. For more information, see the [Technical specifications section](#).

⚠ **CAUTION:** If two PSUs are installed, both the PSUs must have the same type of label. For example, Extended Power Performance (EPP) label. Mixing PSUs from previous generations of PowerEdge servers is not supported, even if the PSUs have the same power rating. This results in a PSU mismatch condition or failure to turn the system on.

① **NOTE:** Titanium PSU is nominally rated for 200 V AC to 240 V AC input only.

① **NOTE:** When two identical PSUs are installed, power supply redundancy (1+1 – with redundancy or 2+0 – without redundancy) is configured in system BIOS. In redundant mode, power is supplied to the system equally from both PSUs when Hot Spare is disabled. When Hot Spare is enabled, one of the PSUs is put into the sleep mode when system utilization is low in order to maximize efficiency.

NOTE: If two PSUs are used, they must be of the same maximum output power.

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 system 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 of PSU rated power wattage, then the redundant PSU is switched to the active state.
- If the load on the active PSU falls below 20 percent of PSU rated power wattage, 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, see the iDRAC User's Guide available at Dell.com/idracmanuals.

Removing a power supply unit blank

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Step

If you are installing a second PSU, remove the PSU blank in the bay by pulling the blank outward.

CAUTION: To ensure proper system cooling, the PSU blank must be installed in the second PSU bay in a non-redundant configuration. Remove the PSU blank only if you are installing a second PSU.



Figure 86. Removing a power supply unit blank

Next step

Install the second PSU.

Related links

[Installing a power supply unit blank](#)

Installing a power supply unit blank

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Install the power supply unit (PSU) blank only in the second PSU bay.

Step

Align the PSU blank with the PSU slot and push it into the PSU slot until it clicks into place.



Figure 87. Installing a power supply unit blank

Next step

Follow the procedure listed in [After working inside your system](#).

Removing a power supply unit

The procedure for removing AC and DC PSUs is identical.

Prerequisites

⚠ 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.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Disconnect the power cable from the power source and from the PSU you intend to remove, and then remove the cable from the strap on the PSU handle.
- 3 Unlatch and lift the optional cable management arm if it interferes with the PSU removal.
For information about the cable management arm, see the system's rack documentation at Dell.com/poweredge/manuals.

Step

Press the orange release latch and slide the PSU out of the system by using the PSU handle.



Figure 88. Removing a power supply unit

Next step

Install the PSU.

Related links

[Installing a power supply unit](#)

Installing a power supply unit

The procedure for installing AC and DC PSUs is identical.

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 For systems that support redundant PSU, ensure that both the PSUs are of the same type and have the same maximum output power.

NOTE: The maximum output power (shown in watts) is listed on the PSU label.

Step

Slide the PSU into the system until the PSU is fully seated and the release latch snaps into place.



Figure 89. Installing a power supply unit

Next steps

- 1 If you have unlatched the cable management arm, relatch it. For information about the cable management arm, see the system's rack documentation at Dell.com/poweredgemanuals.
- 2 Connect the power cable to the PSU, and plug the cable into a power outlet.

⚠ **CAUTION:** When connecting the power cable to the PSU, secure the cable to the PSU with the strap.

ℹ **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.

Wiring instructions for a DC power supply unit

Your system supports up to two $-(48-60)$ V DC power supply units (PSUs).

⚠ **WARNING:** For equipment using $-(48-60)$ V DC power supply units (PSUs), a qualified electrician must perform all connections to DC power and to safety grounds. Do not attempt connecting to DC power or installing grounds yourself. All electrical wiring must comply with applicable local or national codes and practices. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow all safety instructions that came with the product.

⚠ **CAUTION:** Wire the unit with copper only, unless otherwise specified, use only 10 American Wire Gauge (AWG) wire rated minimum 90°C for source and return. Protect the $-(48-60)$ V DC (1 wire) with a branch circuit over-current protection rated 50 A for DC with a high interrupt current rating.

⚠ **CAUTION:** Connect the equipment to a $-(48-60)$ V DC supply source that is electrically isolated from the AC source (reliably grounded $-(48-60)$ V DC SELV source). Ensure that the $-(48-60)$ V DC source is efficiently secured to earth (ground).

ℹ **NOTE:** A readily accessible disconnect device that is suitably approved and rated shall be incorporated in the field wiring.

Input requirements

- Supply voltage: $-(48-60)$ V DC

- Current consumption: 32 A (maximum)

Kit contents

- Dell part number 6RYJ9 terminal block or equivalent (1)
- #6-32 nut equipped with lock washer (1)

Required tools

Wire-stripper pliers capable of removing insulation from size 10 AWG solid or stranded, insulated copper wire.


 **NOTE:** Use alpha wire part number 3080 or equivalent (65/30 stranding).

Required wires

- One UL 10 AWG, 2 m maximum (stranded) black wire [–(48–60) V DC].
- One UL 10 AWG, 2 m maximum (stranded) red wire (V DC return).
- One UL 10 AWG, 2 m maximum, green with a yellow stripe, stranded wire (safety ground).

Assembling and connecting safety ground wire

Prerequisite


 **WARNING:** For equipment using –(48–60) V DC power supply units (PSUs), a qualified electrician must perform all connections to DC power and to safety grounds. Do not attempt connecting to DC power or installing grounds yourself. All electrical wiring must comply with applicable local or national codes and practices. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow all safety instructions that came with the product.

Steps



- 1 Strip the insulation from the end of the green or yellow wire, exposing approximately 4.5 mm (0.175 inch) of copper wire.
- 2 Using a hand-crimping tool (Tyco Electronics, 58433-3 or equivalent), crimp the ring-tongue terminal (Jeeson Terminals Inc., R5-4SA or equivalent) to the green and yellow wire (safety ground wire).
- 3 Connect the safety ground wire to the grounding post on the back of the system by using a #6-32 nut equipped with a locking washer.

Assembling DC input power wires

Prerequisite

 **WARNING:** For equipment using –(48–60) V DC power supply units (PSUs), a qualified electrician must perform all connections to DC power and to safety grounds. Do not attempt connecting to DC power or installing grounds yourself. All electrical wiring must comply with applicable local or national codes and practices. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow all safety instructions that came with the product.

Steps

- 1 Strip the insulation from the ends of the DC power wires, exposing approximately 13 mm (0.5 inch) of copper wire.
 **WARNING:** Reversing polarity when connecting DC power wires can permanently damage the power supply or the system.
- 2 Insert the copper ends into the mating connectors and tighten the captive screws at the top of the mating connector using a Phillips #2 screwdriver.
 **WARNING:** To protect the power supply from electrostatic discharge, the captive screws must be covered with the rubber cap before inserting the mating connector into the power supply.

- 3 Rotate the rubber cap clockwise to fix it over the captive screws.
- 4 Insert the mating connector into the power supply.

NVDIMM-N battery

Removing the NVDIMM-N battery

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

CAUTION: NVDIMM-N battery is not hot swappable. To prevent data loss and potential damage to your system, ensure that your system, LEDs on system, LEDs on NVDIMM-N and LEDs on NVDIMM-N battery are turned off before removing the NVDIMM-N battery.

CAUTION: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

Steps

- 1 Disconnect the cables from the NVDIMM-N battery.
- 2 Using Phillips #2 screwdriver, loosen the retention screw that secures the battery to the system.
- 3 Holding the edges, slide the battery toward the back of the system until the battery disengages from the slot on the system.
- 4 Lift the battery away from the system.

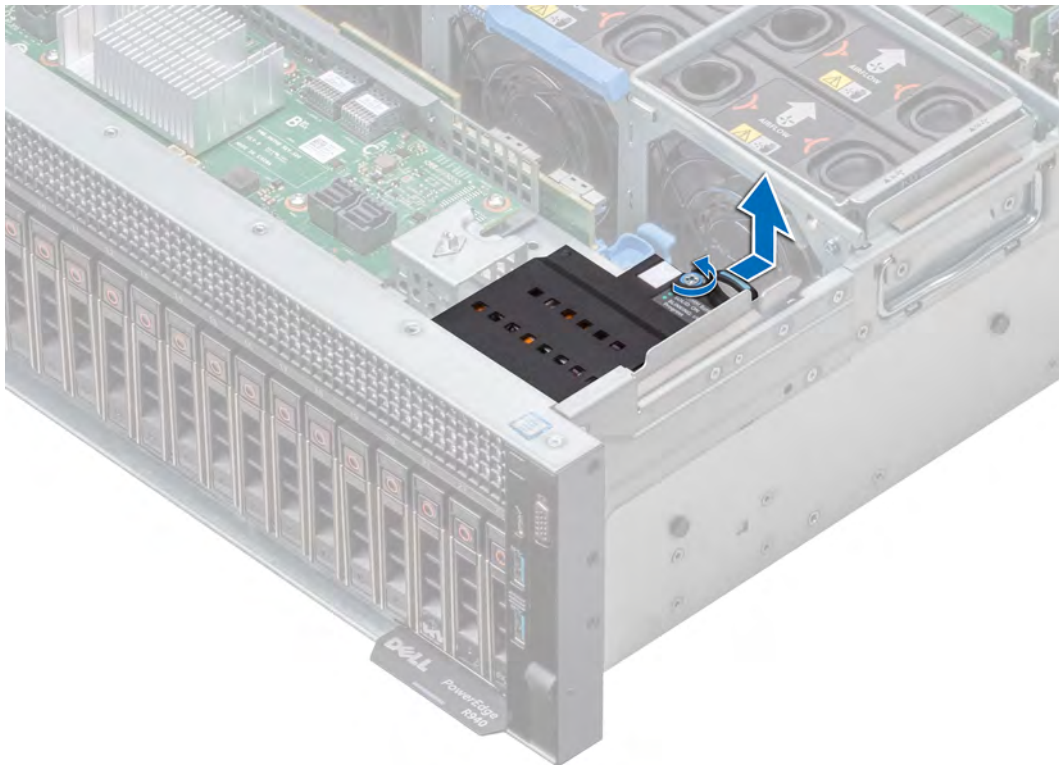


Figure 90. Removing the NVDIMM-N battery

Next step

Install the NVDIMM-N battery.

Installing NVDIMM-N battery

Prerequisite

1 Follow the safety guidelines listed in [Safety instructions](#).

CAUTION: NVDIMM-N battery is not hot swappable. To prevent data loss and potential damage to your system, ensure that your system, LEDs on system, LEDs on NVDIMM-N and LEDs on NVDIMM-N battery are turned off before installing the NVDIMM-N battery.

CAUTION: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

Steps

1 Place the NVDIMM-N battery on the NVDIMM slot on the system and slide the battery into place.

2 Using Phillips #2 screwdriver, tighten the retention screw to secure the battery to the system.

3 Reconnect the cables to the battery.

CAUTION: Exercise care when installing the NVDIMM-N battery so that you do not cause any damage to the intrusion switch cable.



Figure 91. Installing NVDIMM-N battery

Next step

Follow the procedure listed in [After working inside your system](#).

NVDIMM battery cable routing

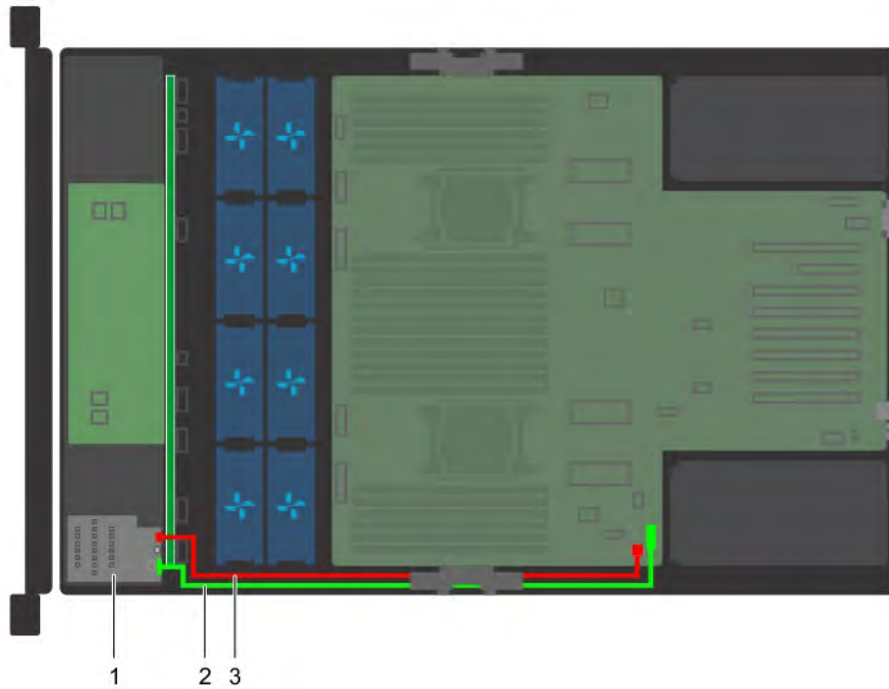


Figure 92. Cable routing – NVDIMM battery cables

- 1 NVDIMM battery
- 2 battery cable connecting J_NVDIMM_BATT connector on the system board
- 3 batter power cable connecting BATT_PWR connector on the system board

NOTE: For information about system board connectors, see [System board jumpers and connectors](#).

System battery

The system battery is used for low-level system functions such as powering the real-time and date settings of the system.

Replacing system battery

Prerequisites

WARNING: 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.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the air shroud.
- 4 If applicable, disconnect the power or data cables from expansion card(s).
- 5 If applicable, remove the expansion card risers.

- 6 If applicable, remove the PEM.

Steps

- 1 Locate the battery socket. For more information on locating the system battery, see the System board 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 Use a plastic scribe to pry out the system battery as shown in the illustration below.



Figure 93. Removing the system battery

- 3 To install a new system battery, hold the battery with the positive side facing up and slide it under the securing tabs.
- 4 Press the battery into the connector until it snaps into place.



Figure 94. Installing the system battery

Next steps

- 1 If applicable, install the PEM.
- 2 If applicable, install the expansion card risers.
- 3 If applicable, connect the cables to the expansion card(s).
- 4 Install the air shroud.
- 5 Follow the procedure listed in [After working inside your system](#).
- 6 While booting, press F2 to enter the System Setup and ensure that the battery is operating properly.
- 7 Enter the correct time and date in the System Setup **Time** and **Date** fields.
- 8 Exit the System Setup.

Related links

- [Removing the air shroud](#)
- [Removing the expansion card riser](#)
- [Removing the PEM](#)
- [Installing the PEM](#)
- [Installing the expansion card riser](#)
- [Installing the air shroud](#)

Optional internal USB memory key

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.

An optional USB memory key can be installed in the internal USB 3.0 port.

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

Replacing optional internal USB memory key

Prerequisites

CAUTION: To avoid interference with other components in the server, the maximum permissible dimensions of the USB memory key are 15.9 mm wide x 57.15 mm long x 7.9 mm high.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

Steps

- 1 Locate the USB port or USB memory key on the system board.
To locate the USB port, see the [Internal USB memory key \(optional\) section](#).
- 2 If installed, remove the USB memory key from the USB port.
- 3 Insert the replacement USB memory key into the USB port.

Next steps

- 1 Follow the procedure listed in [After working inside your system](#).
- 2 While booting, press F2 to enter **System Setup** and verify that the system detects the USB memory key.

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

Prerequisites

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.

CAUTION: Do not attempt to remove the TPM plug-in module from the system board. Once the TPM plug-in module is installed, it is cryptographically bound to that specific system board. Any attempt to remove an installed TPM plug-in module breaks the cryptographic binding, and it cannot be re-installed or installed on another system board.

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the following:

- a Air shroud
- b Fan cage with cooling fans
- c Power supply unit(s)
- d All expansion cards and risers
- e Processor expansion module (PEM)
- f Integrated storage controller card
- g IDSDM/vFlash card
- h Internal USB key (if applicable)
- i Processor and heat sink module
- j Processors and DIMM blank

CAUTION: To prevent damage to the processor pins when replacing a faulty system board, ensure that you cover the processor socket with the processor protective cap.

- k Memory modules and memory module blanks
- l Network daughter card
- m Cable management bracket

Steps

- 1 Disconnect all cables from the system board.
- 2 Holding the system board handle, pull the blue release pin, slide the system board towards the front of the system.
Sliding the system board toward the front of the system disengages the connectors from the back of the system slots.
- 3 Lift the system board out of the system.

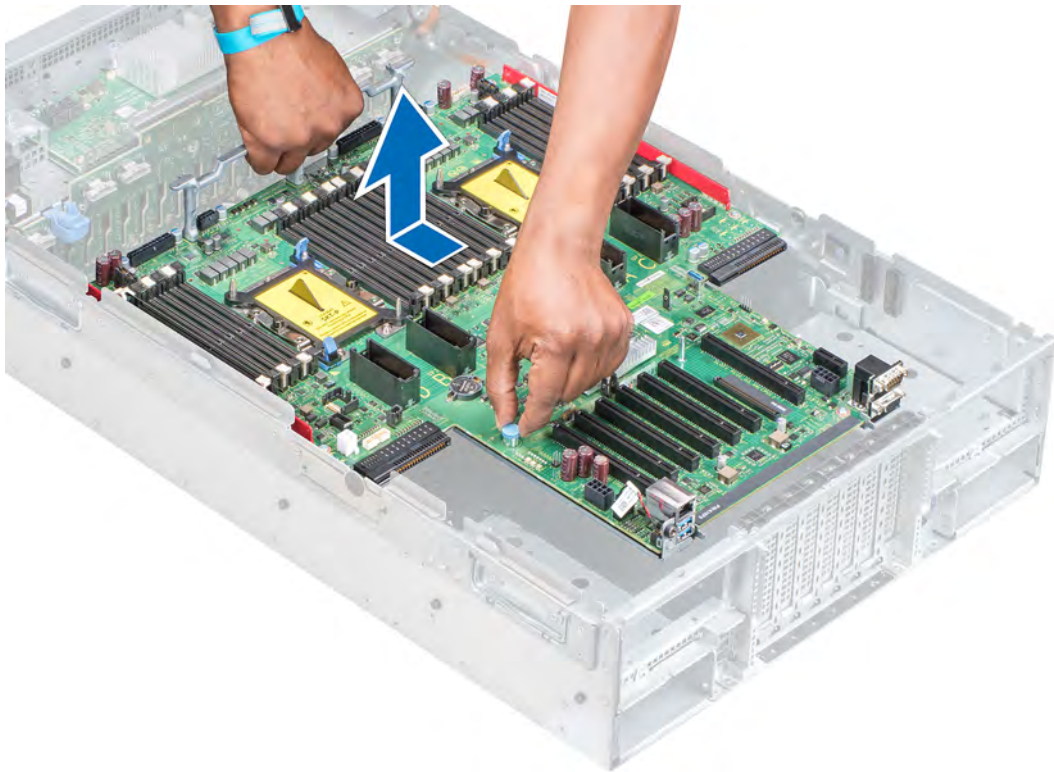


Figure 95. Removing system board

Next step

Install the system board.

Related links

- [Removing the air shroud](#)
- [Removing the fan cage](#)
- [Removing a power supply unit](#)
- [Removing the expansion card riser](#)
- [Removing the PEM](#)
- [Removing the MicroSD card](#)
- [Removing the optional IDSDM or vFlash card](#)
- [Removing a processor and heat sink module](#)
- [Installing the system board](#)

Installing the system board

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

1. Unpack the replacement system board assembly.
 - ⚠ **CAUTION:** Do not lift the system board by holding a memory module, processor, or other components.
 - ⚠ **CAUTION:** Take care not to damage the system identification button while placing the system board into the system.
2. Holding the system board handle and blue release pin, incline the system board and lower the system board into the system.
3. Slide the system board toward the back of the system until the release pin clicks into place.

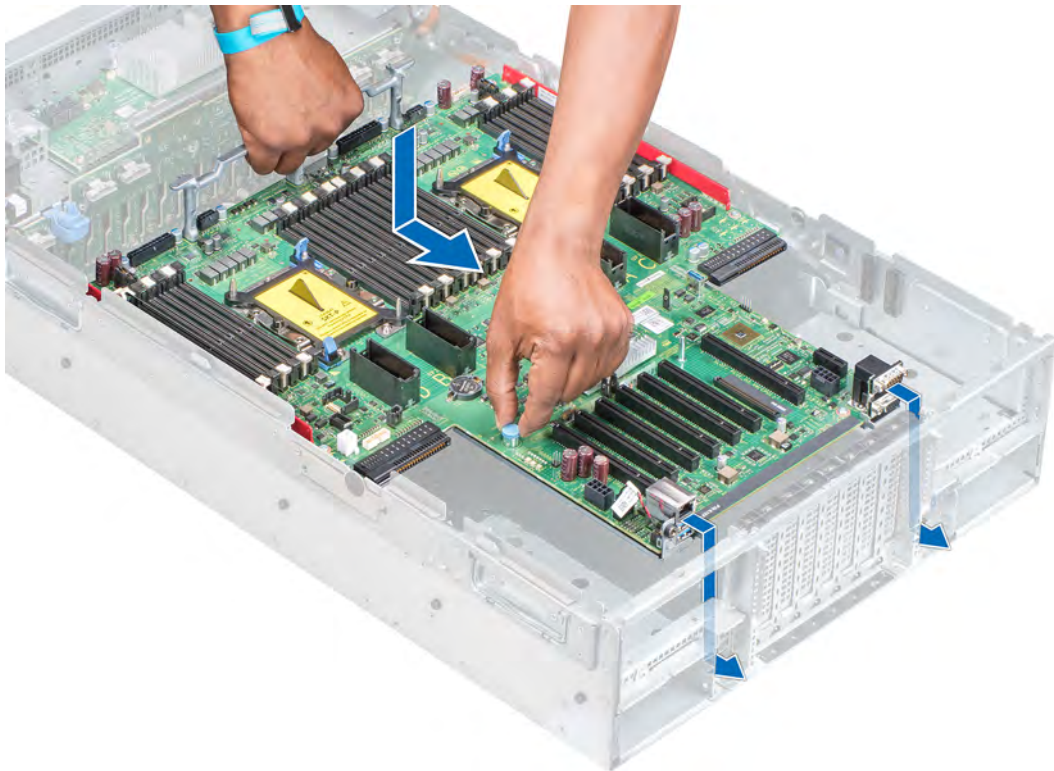


Figure 96. Installing system board

Next steps

- 1 Replace the following:
 - a Trusted Platform Module (TPM).

NOTE: The TPM plug-in module is attached to the system board and cannot be removed. A replacement TPM plug-in module will be provided for all system board replacements where a TPM plug-in module was installed.
 - b Cable management bracket
 - c Integrated storage controller card
 - d Internal USB key (if applicable)
 - e iDSDM/vFlash card
 - f Processor expansion module (PEM)
 - g Expansion cards and risers
 - h Processor and heat sink module
 - i Processor and DIMM blank
 - j Memory modules and memory module blanks
 - k Network daughter card
 - l Fan cage with cooling fans
 - m Air shroud
 - n Power supply unit(s)
- 2 Reconnect all cables to the system board.

NOTE: Ensure that the cables inside the system are routed along the chassis wall and secured using the cable securing bracket.
- 3 Follow the procedure listed in [After working inside your system](#).
- 4 Import your new or existing iDRAC Enterprise license. For more information, see Integrated Dell Remote Access Controller User's Guide, at Dell.com/esmmanuals.
- 5 Ensure that you:
 - a Use the Easy Restore feature to restore the Service Tag. For more information, see the Easy restore section.
 - b If the Service Tag is not backed up in the backup flash device, enter the Service Tag manually. For more information, see the Entering the Service Tag section.
 - c Update the BIOS and iDRAC versions.
 - d Re-enable the Trusted Platform Module (TPM). For more information, see the Upgrading the Trusted Platform Module (TPM) section.
- 6 Import your new or existing iDRAC Enterprise license. For more information, see Integrated Dell Remote Access Controller User's Guide at Dell.com/esmmanuals

Related links

- [Upgrading the Trusted Platform Module](#)
- [Installing the MicroSD card](#)
- [Installing optional iDSDM or vFlash card](#)
- [Installing the PEM](#)
- [Installing the expansion card riser](#)
- [Installing a processor and heat sink module](#)
- [Installing a memory module](#)
- [Installing the NDC](#)
- [Installing the fan cage](#)
- [Installing the air shroud](#)
- [Installing a power supply unit](#)

Entering the system Service Tag by using System Setup

If Easy Restore fails to restore the Service Tag, use System Setup to enter the Service Tag.

- 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 Dell.com/idracmanuals.

Restoring the Service Tag by using the Easy Restore feature

By using the Easy Restore feature, you can restore your Service Tag, license, UEFI configuration, and the system configuration data after replacing the system board. All data is automatically backed up in a backup flash device. If BIOS detects a new system board and the Service Tag in the backup flash device, BIOS prompts the user to restore the backup information.

- 1 Turn on the system.
If BIOS detects a new system board, and if the Service Tag is present in the backup flash device, BIOS displays the Service Tag, the status of the license, and the **UEFI Diagnostics** version.
- 2 Perform one of the following steps:
After the restore process is complete, BIOS prompts to restore the system configuration data.
- 3 Perform one of the following steps:
 - Press **Y** to restore the system configuration data.
 - Press **N** to use the default configuration settings.

After the restore process is complete, the system restarts.

Trusted Platform Module

Trusted Platform Module (TPM) is a dedicated microprocessor designed to secure hardware by integrating cryptographic keys into devices. Software can use a TPM to authenticate hardware devices. Because each TPM chip has a unique and secret RSA key which is embedded during the manufacture of the TPM, it is capable of performing platform authentication operation.

Upgrading the Trusted Platform Module

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).

NOTE:

- Ensure that your operating system supports the version of the TPM module being installed.
- Ensure that you download and install the latest BIOS firmware on your system.
- Ensure that the BIOS is configured to enable UEFI boot mode.

About this task

- ⚠ **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. Work with the customer to create and safely store this recovery key. When replacing 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.
- ⚠ **CAUTION:** Once the TPM plug-in module is installed, it is cryptographically bound to that specific system board. Any attempt to remove an installed TPM plug-in module breaks the cryptographic binding, the removed TPM cannot be reinstalled or installed on another system board.

Related links

[Installing the system board](#)

Removing the TPM

- 1 Locate the TPM connector on the system board.
- 2 Press to hold the module down and remove the screw using the security Torx 8-bit shipped with the TPM module.
- 3 Slide the TPM module out from its connector.
- 4 Push the plastic rivet away from the TPM connector and rotate it 90° counterclockwise to release it from the system board.
- 5 Pull the plastic rivet out of its slot on the system board.

Installing the TPM

Steps

- 1 To install the TPM, align the edge connectors on the TPM with the slot on the TPM connector.
- 2 Insert the TPM into the TPM connector such that the plastic rivet aligns with the slot on the system board.
- 3 Press the plastic rivet until the rivet snaps into place.



Figure 97. Installing the TPM

Next steps

- 1 Install the system board.
- 2 Follow the procedure listed in [After working inside your system](#).

Initializing TPM for BitLocker users

Initialize the TPM.

For more information, see <http://technet.microsoft.com/en-us/library/cc753140.aspx>.

The **TPM Status** changes to **Enabled, Activated**.

Initializing the TPM 1.2 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**.

Initializing the TPM 2.0 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**.
- 4 Save the settings.
- 5 Restart your system.
- 6 Enter **System Setup** again.
- 7 On the **System Setup Main Menu** screen, click **System BIOS > System Security Settings**.
- 8 Select the **TPM Advanced Settings** option.
- 9 From the **TPM2 Algorithm Selection** option, select **SHA256**, then go back to **System Security Settings** screen.
- 10 On the **System Security Settings** screen, from the **Intel TXT** option, select **On**.
- 11 Save the settings.
- 12 Restart your system.

Control panel

A control panel allows you to manually control the inputs to the server.

Your system supports:

- Left control panel: Contains status LEDs, system ID button, and iDRAC Quick Sync 2 (optional).
- Right control panel: Contains power button, USB 3.0 ports, VGA port micro USB for iDRAC Direct, and status LED for iDRAC Direct.

Removing the right control panel

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the fan cage.
- 4 Remove the air shroud.

- 5 If applicable, remove the expansion card risers and PEM.

① **NOTE:** Ensure that you note the routing of the cables as you remove them from the system board. You must route the cables properly when you replace them to prevent the cables from being pinched or crimped.

- 6 Press the blue release tabs on the fan tray and lower the sides of the tray.

Steps

- 1 Press the cable management bracket until the tabs on the bracket disengage from the slots on the right side of the system and lift the cable management bracket from the system.
- 2 Holding the pull tab, disconnect the control panel cable from the system board.
- 3 Using a Torx #T30 screwdriver, remove the screws that connect the control panel to the system.
- 4 Holding the control panel by its sides, remove the control panel away from the system.

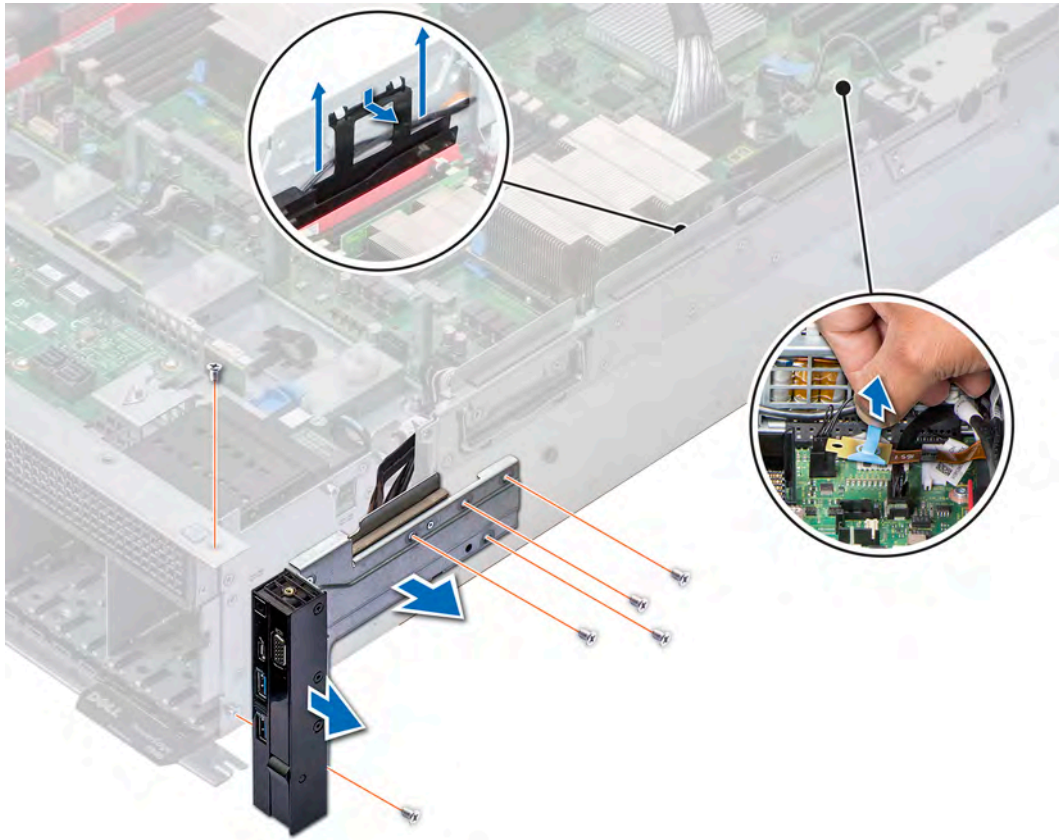


Figure 98. Removing the right control panel

Next step

Install the right control panel.

Related links

- [Removing the fan cage](#)
- [Removing the fan tray](#)
- [Removing the air shroud](#)
- [Removing the expansion card riser](#)
- [Removing the PEM](#)
- [Installing the right control panel](#)

Installing the right control panel

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Route the cables through the cable routing hooks on the side of the system.
- 2 Lower the cable management bracket into the system.
- 3 Press the bracket and insert the tabs on the bracket into the slots on the right side of the system.
- 4 Align the control panel with the control panel slot on the system and attach the control panel to the system.
- 5 Connect the control panel cable connector on the system board.
- 6 Using a Torx #T30 screwdriver, install the screws that secure the control panel to the system.

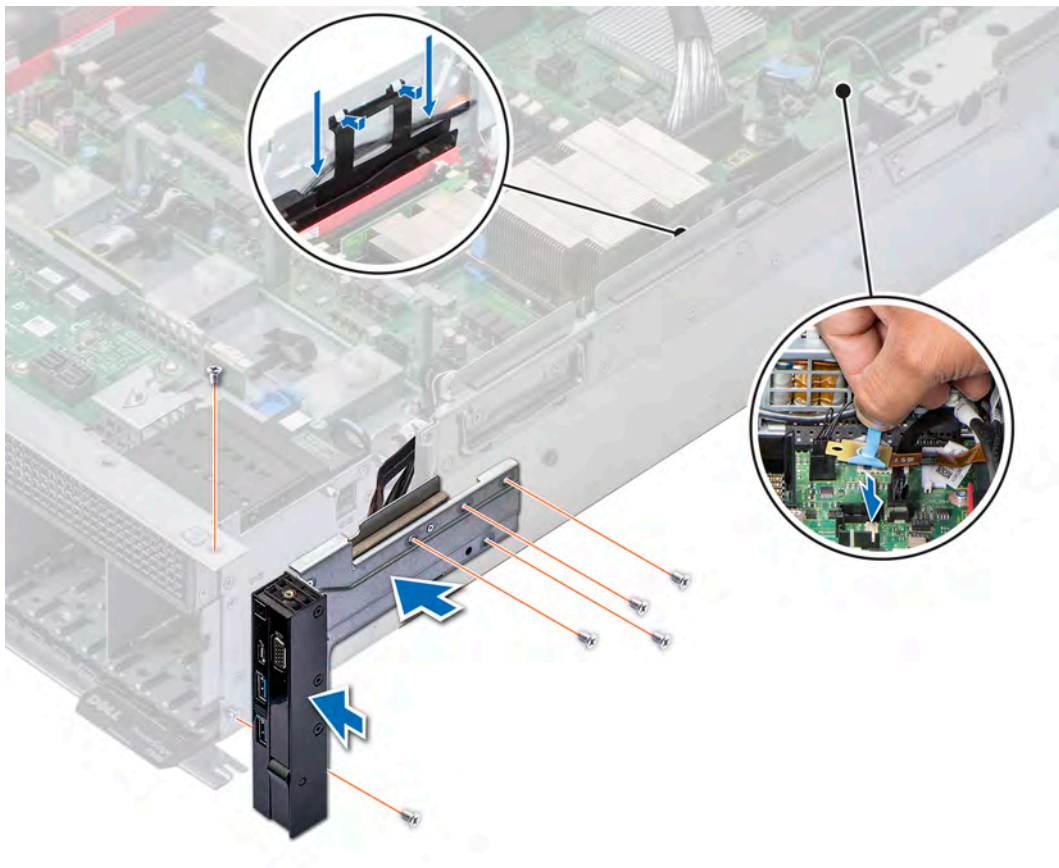


Figure 99. Installing the right control panel

Next steps

- 1 Lift the sides of the fan tray until the blue release tabs click in place.
- 2 If applicable, install the expansion card risers and PEM.
- 3 Install the air shroud.
- 4 Install the fan cage.

Related links

- [Installing the PEM](#)
- [Installing the expansion card riser](#)
- [Installing the air shroud](#)
- [Installing the fan tray](#)
- [Installing the fan cage](#)

Removing the left control panel

Prerequisites

- 1 Follow the safety guidelines listed in [Safety instructions](#).
- 2 Follow the procedure listed in [Before working inside your system](#).
- 3 Remove the fan cage.
- 4 Remove the air shroud.
- 5 If applicable, remove the expansion card risers and PEM.

NOTE: Ensure that you note the routing of the cables as you remove them from the system. You must route the cables properly when you replace them to prevent the cables from being pinched or crimped.

- 6 Press the blue release tabs on the fan tray and lower the sides of the tray.

Steps

- 1 Holding the pull tab, disconnect the control panel cable from the connector on the system board.
- 2 Using a Torx #T30 screwdriver, remove the screws that secure the left control panel to the system.
- 3 Holding the control panel by its sides, remove the control panel away from the system.

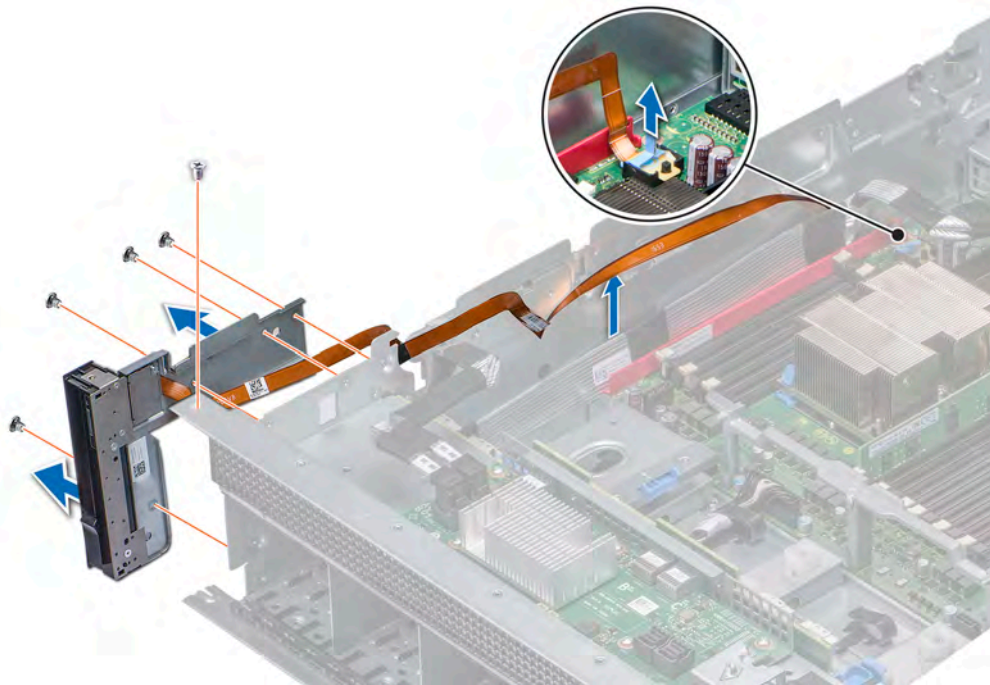


Figure 100. Removing left control panel

Next step

Install the left control panel.

Related links

- [Removing the fan cage](#)
- [Removing the air shroud](#)
- [Removing the expansion card riser](#)
- [Removing the PEM](#)
- [Installing the left control panel](#)

Installing the left control panel

Prerequisite

Follow the safety guidelines listed in [Safety instructions](#).

Steps

- 1 Route the control panel cable through the side wall of the system.
- 2 Align the control panel with the control panel slot on the system and attach the control panel to the system.
- 3 Connect the control panel cable connector on the system board.
- 4 Using a Torx #T30 screwdriver, install the screws that secure the control panel to the system.

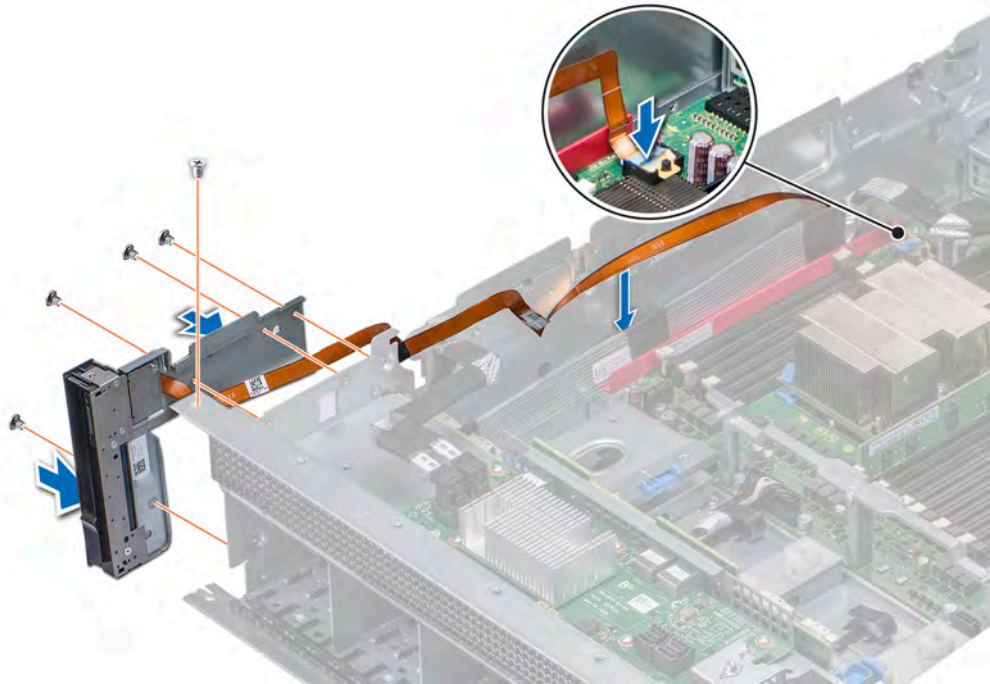


Figure 101. Installing left control panel

Next steps

- 1 Lift the sides of the fan tray until the blue release tabs click in place.
- 2 If applicable, install the expansion card risers and PEM.
- 3 Install the air shroud.
- 4 Install the fan cage.

Related links

- [Installing the PEM](#)
- [Installing the expansion card riser](#)
- [Installing the air shroud](#)
- [Installing the fan cage](#)

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.

Dell Embedded System Diagnostics

① | **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

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 F11.
- 2 Use the up arrow and down arrow keys to select **System Utilities > Launch Diagnostics**.
- 3 Alternatively, when the system is booting, press F10, 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.

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. |
| System health | 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. |

Jumpers and connectors

This topic provides specific information about the jumpers. It also provides some basic information about jumpers and switches and describes the connectors on the various boards in the system. Jumpers on the system board help to disable the system and setup passwords. You must know the connectors on the system board to install components and cables correctly.

Topics:

- [System board jumpers and connectors](#)
- [System board jumper settings](#)
- [Disabling forgotten password](#)

System board jumpers and connectors

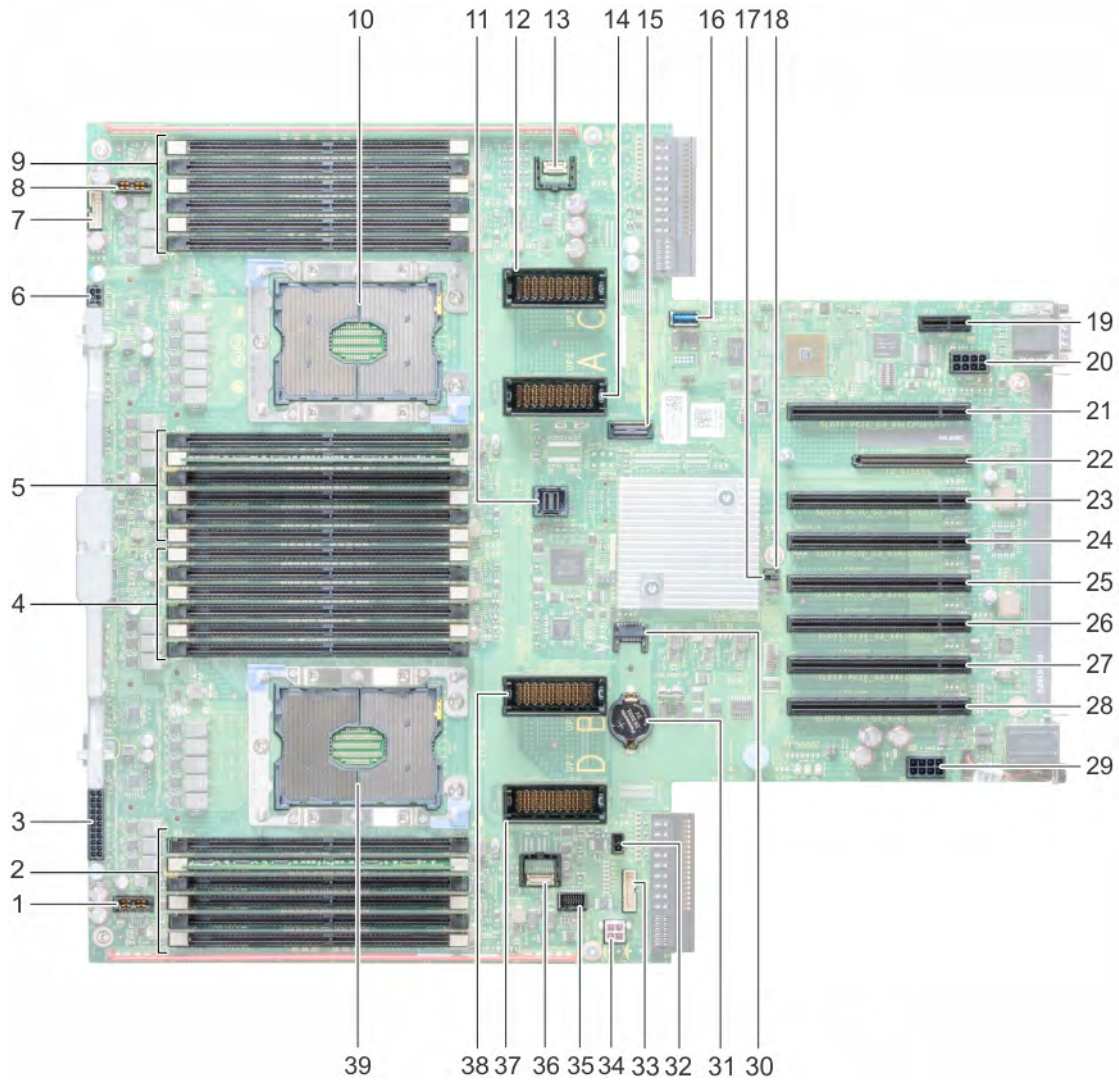


Figure 102. System board jumpers and connectors

Table 47. System board jumpers and connectors

| Item | Connector | Description |
|------|---------------------------|---------------------------------|
| 1 | J_PEM_PWR_R | Right PEM power board connector |
| 2 | B7, B1, B8, B2, B9, B3 | Memory module sockets |
| 3 | FAN_MOD2 | Fan module cable connector |
| 4 | B6, B12, B5, B11, B4, B10 | Memory module sockets |
| 5 | A7, A1, A8, A2, A9, A3 | Memory module sockets |
| 6 | J_BP_P1 | Backplane 1 power connector |
| 7 | J_BP_SIG1 | Backplane 1 signal connector |

| Item | Connector | Description |
|------|---------------------------|---|
| 8 | J_PEM_PWR_L | Left PEM power board connector |
| 9 | A6, A12, A5, A11, A4, A10 | Memory module sockets |
| 10 | CPU1 | CPU1 processor heat sink module socket |
| 11 | J_PEM_CLK | PEM clock connector |
| 12 | RM_UPI_C | UPI cable connector "C" |
| 13 | LFT_CTRL_PNL | Left control panel connector |
| 14 | RM_UPI_A | UPI cable connector "A" |
| 15 | J_M.2 | SATA M.2 connector |
| 16 | INT_USB_3.0 | Internal USB 3.0 connector |
| 17 | PWRD_EN | Reset BIOS password |
| 18 | NVRAM_CLR | Clear NVRAM |
| 19 | J_IDSDM | iDSDM and vFlash connector |
| 20 | PCIE_PWR1 | PCIe power connector 1 |
| 21 | SLOT1 PCIE_G3_X8(CPU1) | PCIe slot 1 |
| 22 | IO_RISER1 | Network daughter card riser connector |
| 23 | SLOT2 PCIE_G3_X16(CPU1) | PCIe slot 2 |
| 24 | SLOT3 PCIE_G3_X16(CPU1) | PCIe slot 3 |
| 25 | SLOT4 PCIE_G3_X16(CPU2) | PCIe slot 4 |
| 26 | SLOT5 PCIE_G3_X8(CPU2) | PCIe slot 5 |
| 27 | SLOT6 PCIE_G3_X8(CPU2) | PCIe slot 6 |
| 28 | SLOT7 PCIE_G3_X16(CPU2) | PCIe slot 7 |
| 29 | PCIE_PWR2 | PCIe power connector 2 |
| 30 | J_TPM | Trusted Platform Module (TPM) connector |
| 31 | BATTERY | System board battery connector |
| 32 | INTRUSION | Intrusion switch connector |
| 33 | J_NVDIMM_BATT | NVDIMM-N battery connector |
| 34 | BATT_PWR | NVDIMM-N battery power connector |
| 35 | RM_RGT_CP_GUIDE | VGA to right control panel connector |
| 36 | RGT_CTRL_PNL | Right control panel connector |
| 37 | RM_UPI_D | UPI cable connector "D" |
| 38 | RM_UPI_B | UPI cable connector "B" |
| 39 | CPU2 | CPU2 processor heat sink module socket |

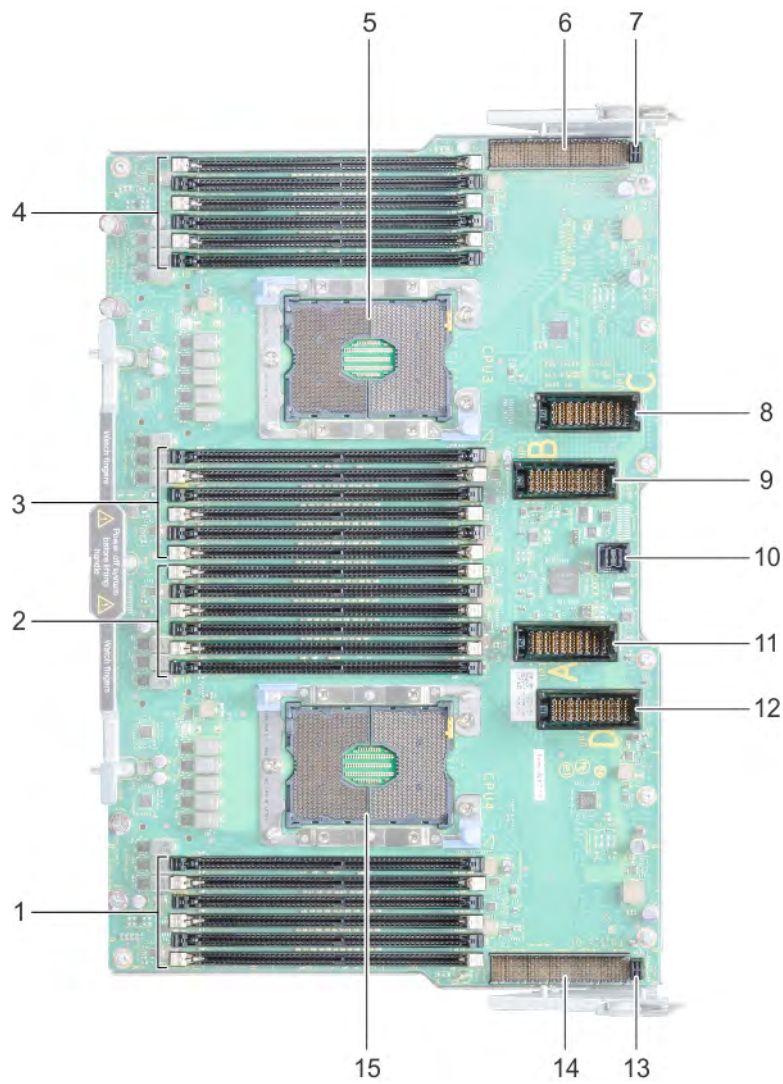


Figure 103. Processor expansion module (PEM) connectors

Table 48. Processor expansion module (PEM) connectors





| Item | Connector | Description |
|------|---------------------------|---|
| 1 | D7, D1, D8, D2, D9, D3 | Memory module sockets |
| 2 | D6, D12, D5, D11, D4, D10 | Memory module sockets |
| 3 | C7, C1, C8, C2, C9, C3 | Memory module sockets |
| 4 | C6, C12, C5, C11, C4, C10 | Memory module sockets |
| 5 | CPU3 | CPU3 processor heat sink module socket |
| 6 | IO_RISER2 | Riser 2 connector |
| 7 | J_IORL_PWR | Left expansion card riser power connector |
| 8 | RM_UPI_C | UPI cable connector "C" |
| 9 | RM_UPI_B | UPI cable connector "B" |
| 10 | J_PEM_CLK | PEM clock connector |

| Item | Connector | Description |
|------|------------|--|
| 11 | RM_UPI_A | UPI cable connector "A" |
| 12 | RM_UPI_D | UPI cable connector "D" |
| 13 | J_IORR_PWR | Right expansion card riser power connector |
| 14 | IO_RISER3 | Riser 3 connector |
| 15 | CPU4 | CPU4 processor heat sink module socket |

System board jumper settings

For information on resetting the password jumper to disable a password, see the Disabling a forgotten password section.

Table 49. System board jumper settings

| Jumper | Setting | Description |
|-----------|--|--|
| PWRD_EN |  | The BIOS password feature is enabled. |
| |  | The BIOS password feature is disabled. iDRAC local access is unlocked at next AC power cycle. iDRAC password reset is enabled in F2 iDRAC settings menu. |
| NVRAM_CLR |  | The BIOS configuration settings are retained at system boot. |
| |  | The BIOS configuration settings are cleared at system boot. |

Disabling forgotten password

The software security features of the system include a system password and a setup password. The password jumper enables or disables password features and clears any password(s) currently in use.

Prerequisite

⚠ 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.

Steps

- 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 2 and 4 to pins 4 and 6.
- 4 Install the system cover.

The existing passwords are not disabled (erased) until the system boots with the jumper on pins 4 and 6. However, before you assign a new system and/or setup password, you must move the jumper back to pins 2 and 4.

i NOTE: If you assign a new system and/or setup password with the jumper on pins 4 and 6, the system disables the new password(s) the next time it boots.

- 5 Reconnect the system to its electrical outlet and turn on the system, 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 4 and 6 to pins 2 and 4.
- 9 Install the system cover.
- 10 Reconnect the system to its electrical outlet and turn on the system, including any attached peripherals.
- 11 Assign a new system and/or setup password.

Getting help

Topics:

- [Contacting Dell](#)
- [Documentation feedback](#)
- [Accessing system information by using QRL](#)
- [Receiving automated support with SupportAssist](#)

Contacting Dell

Dell 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 product catalog. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical assistance, or customer service issues:

- 1 Go to Dell.com/support.
- 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 Global Technical Support:
 - a Click [Global Technical Support](#).
 - b The **Contact Technical Support** page is displayed with details to call, chat, or e-mail the Dell Global Technical Support team.

Documentation feedback

You can rate the documentation or write your feedback on any of our Dell documentation pages and click **Send Feedback** to send your feedback.

Accessing system information by using QRL

You can use the Quick Resource Locator (QRL) to get immediate access to the information about your system.

Prerequisites

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 Owner's 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

Steps

- 1 Go to 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 Dell PowerEdge system or in the Quick Resource Locator section.

Quick Resource Locator for PowerEdge R940 system



Figure 104. Quick Resource Locator for PowerEdge R940 system

Receiving automated support with SupportAssist

Dell SupportAssist is an optional Dell Services offering that automates technical support for your Dell server, storage, and networking devices. By installing and setting up a SupportAssist application in your IT environment, you can receive the following benefits:

- **Automated issue detection** — SupportAssist monitors your Dell devices and automatically detects hardware issues, both proactively and predictively.
- **Automated case creation** — When an issue is detected, SupportAssist automatically opens a support case with Dell Technical Support.
- **Automated diagnostic collection** — SupportAssist automatically collects system state information from your devices and uploads it securely to Dell. This information is used by Dell Technical Support to troubleshoot the issue.
- **Proactive contact** — A Dell Technical Support agent contacts you about the support case and helps you resolve the issue.

The available benefits vary depending on the Dell Service entitlement purchased for your device. For more information about SupportAssist, go to Dell.com/SupportAssist.