Dell EMC VxFlex Appliance and VxFlex Ready Node R640

Owner's Guide

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DELL EMC

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Dell EMC
Hopkinton, Massachusetts 01748-9103
1-508-435-1000 In North America 1-866-464-7381
www.DellEMC.com

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CHAPTER 1

About this guide

This guide provides an overview of the VxFlex Appliance and VxFlex Ready Node R640 system, diagnostic tools, and technical specifications.

Use this guide for information about your system.

- Typographical conventions 6
- Notes, cautions, and warnings 6

Typographical conventions

Dell EMC uses the following type style conventions in this document:

Bold	Used for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
Italic	Used for full titles of publications referenced in text
`Monospace`	Used for: • System code • System output, such as an error message or script • Pathnames, filenames, prompts, and syntax • Commands and options
Monospace italic	Used for variables
`Monospace bold`	Used for user input
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

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.

CHAPTER 2

VxFlex appliance and VxFlex Ready Node R640 system overview

The VxFlex appliance and VxFlex Ready Node R640 system is a 1U rack server that supports a maximum of:

- All
  - Two Intel Xeon Scalable Processors
  - 24 DIMM slots
  - 10 x 2.5-inch drives or 0 drives for diskless configuration
  - Two AC redundant power supply units
  - SAS, SATA, and NVMe
- VxFlex Ready Node only
  - HDD
  - BOSSless configuration

Note: All instances of SAS, SATA, and NVMe drives are referred to as drives in this document, unless specified otherwise.

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- System information tag 16

Front view of the R640 system

The front view displays the features available on the front of the R640 system.

Figure 1 Front view of system

Table 1 Features available on the front of the system

Item	Ports, panels, and slots	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. • Status LED: Enables you to identify any failed hardware components. There are up to five status LEDs and an overall system health LED (Chassis health and system ID) bar. For more information, see Status LED indicators on page 34. • Quick Sync 2 (wireless): Indicates a Quick Sync enabled system. The Quick Sync feature is optional. This feature allows management of the system by using mobile devices. This feature aggregates hardware or firmware inventory and various system level diagnostic and error information that can be used in troubleshooting the system. For more information, see the *Integrated Dell Remote Access Controller User's Guide* at dell.com/support/.
2	Drive slots	N/A	Enable you to install drives that are supported on your system. For more information, see Technical specifications.
3	VGA port		Enables you to connect a display device to the system. For more information, see Technical specifications.
4	Right control panel	N/A	Contains the power button, USB port, iDRAC Direct micro port, and the iDRAC Direct status LED.
5	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 the secure default access to iDRAC, the Information tag also contains the iDRAC secure default password.

Control panels

This section describes the system's control panels.

Left control panel view

The left control panel with optional iDRAC Quick Sync 2.0 indicator is explained as follows:

Figure 2 Left control panel

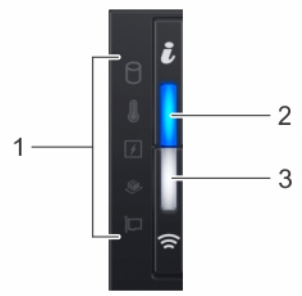


Table 2 Left control panel options

Item	Indicator or button	Icon	Description
1	Status LED indicators	N/A	Indicate the status of the system. For more information, see Status LED indicators.
2	System health and system ID indicator		Indicates the system health. For more information, see System health and system ID indicator codes.
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 EMC 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 about the feature, see the *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/idracmanuals. **Note:** iDRAC Quick Sync 2 wireless indicator is available only on certain configurations.

Note: For more information about the indicator codes, see System diagnostics and indicator codes.

Right control panel view

The right control panel is explained as follows:

Figure 3 Right control panel

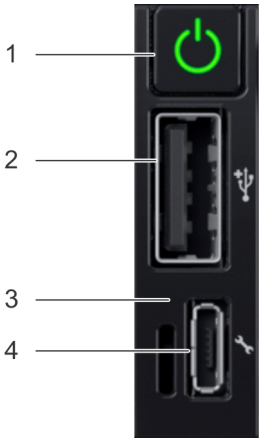


Table 3 Right control panel

Item	Indicator or button	Icon	Description
1	Power button		Indicates whether the system is turned on or off. Press the power to manually turn the system on or off.
2	USB port		The USB ports are 4-pin, 2.0-compliant. This port enables you to connect USB devices to the system.
3	iDRAC Direct LED	N/A	The iDRAC Direct LED indicator lights up to indicate that the iDRAC Direct port is actively connected to a device. For more information, see iDRAC Quick Sync 2 indicator codes on page 35.
4	iDRAC Direct port (Micro-AB USB)		The iDRAC Direct (Micro-AB USB) port enables you to access the iDRAC Direct (Micro-AB) features. For more information about the feature, see the *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/idracmanuals.

Note: For more information on the ports, see Technical specifications.

LCD panel

The LCD panel provides system information, status, and error messages to indicate whether the system is functioning correctly or requires attention. The LCD panel can also be used to configure or view the system's iDRAC IP address.

The LCD panel is available only on the optional front bezel. The optional front 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 "Getting help" at the end of this publication.
- The LCD backlight remains off if LCD messaging is turned off using the iDRAC utility, the LCD panel, or other tools.

Figure 4 LCD panel

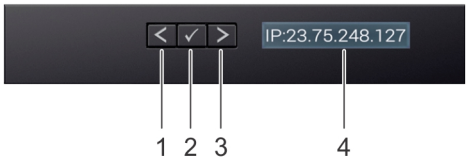


Table 4 LCD panel features

Item	Button or display	Description
1	Left	Moves the cursor back in one-step increments.
2	Select	Selects the menu item that is highlighted by the cursor.
3	Right	Moves the cursor forward in one-step increments. During message scrolling: • 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.

Procedure

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

The **Setup** menu contains the following options:

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

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 information about the event and error messages generated by the system firmware and agents that monitor system components, see the Error Code Lookup page at qrl.dell.com

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

The **View** menu contains the following options:

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

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.

Back view of the R640 system

The back view displays the features available on the back of the R640 system.

Figure 5 Back view of system with 3 PCIe expansion slots

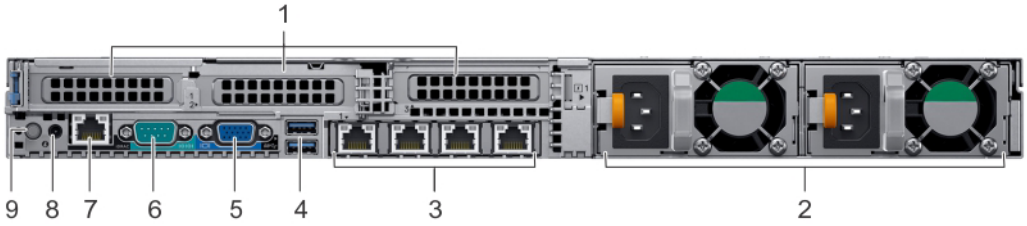


Table 5 2 X 2.5-inch drive system with 3 PCIe expansion slot

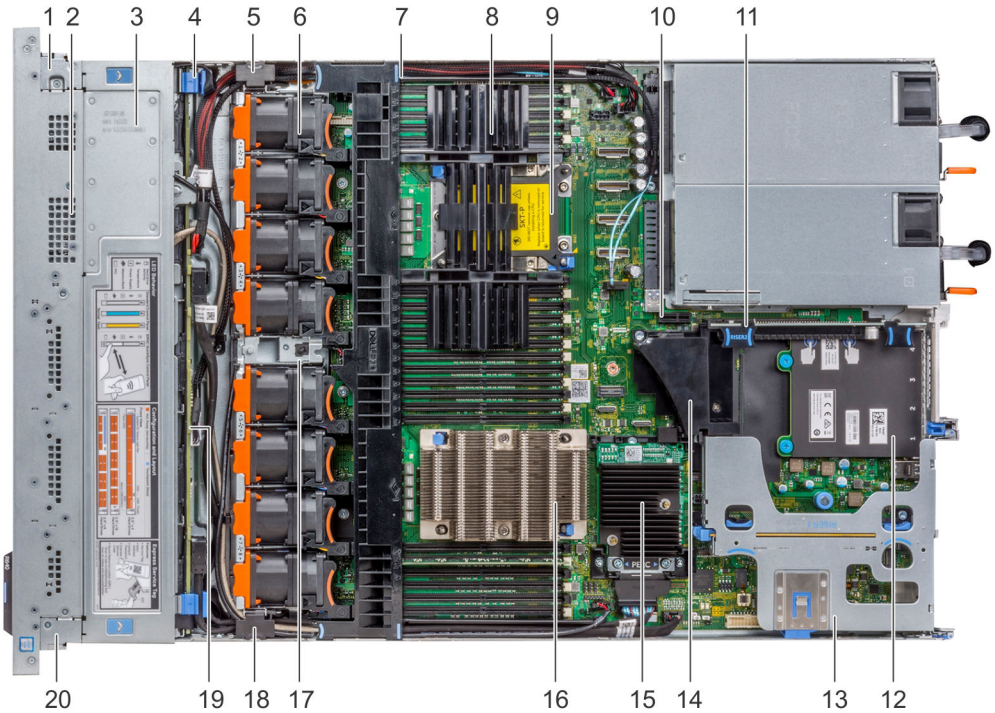
Item	Ports, panels, or slots	Icon	Description
1	PCIe expansion card slot(3)	N/A	The expansion slot(s) enable you to connect PCI Express expansion cards. For more information on the expansion cards that are supported on your system, see Expansion card guidelines.
2	Power supply unit (2)	N/A	For more information about the PSU configurations, see Technical specifications.
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 Technical specifications.
4	USB 3.0 port (2)		The USB ports are 9-pin and 3.0-compliant. These ports enable you to connect USB devices to the system.
5	VGA port		Enables you to connect a display device to the system. For more information, see Technical specifications.
6	Serial port		Enables you to connect a serial device to the system. For more information, see Technical specifications.
7	iDRAC9 dedicated network port		Use the iDRAC9 dedicated network port to securely access the embedded iDRAC on a separate management network. For more information about the feature, see the *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/idracmanuals.
8	System status indicator cable port	N/A	Enables you to connect the status indicator cable and view system status when the CMA is installed.
9	System identification button		The System Identification (ID) button is available on the front and back of the system. Press the system ID button to identify a system in a rack. You can also use the system ID button to reset iDRAC and access BIOS using the step through mode.

Inside the system

Internal components that are hot swappable are marked orange and touch points on the components are marked blue.

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 6 Inside the system - 3 PCIe expansion risers



1. right control panel cable cover
2. drive cage
3. backplane cover
4. backplane release latch
5. cabling latch
6. cooling fan (8)
7. air shroud
8. processor and DIMM blank
9. processor 2 slot
10. IDSDM/vFlash module slot (not supported)
11. expansion riser 2 A
12. network daughter card
13. expansion riser 1 A
14. PCIe shroud

Figure 6 Inside the system - 3 PCIe expansion risers (continued)

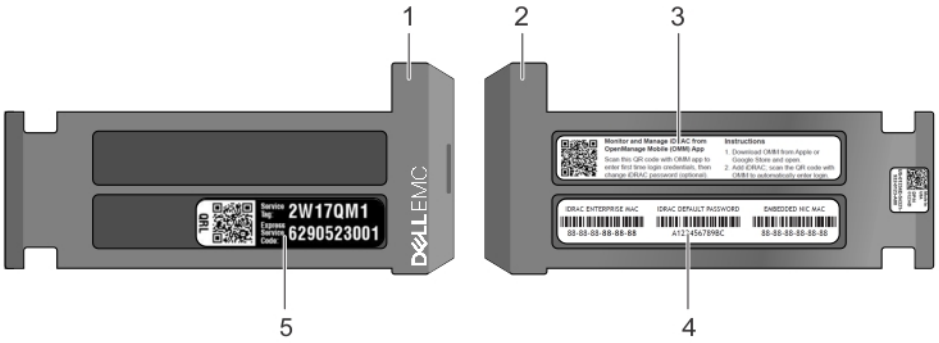
15. integrated storage controller card
16. processor 1
17. intrusion switch
18. cabling latch
19. drive backplane
20. left control panel cable cover

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 the 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 EMC to route support calls to the appropriate personnel.

Figure 7 Service Tag



1. Information tag (top view)
2. Information tag (bottom view)
3. OpenManage Mobile (OMM) label (optional)
4. iDRAC MAC address and iDRAC secure password label

   Note: If you have opted for secure default access to iDRAC, the iDRAC secure default password is available on the back of the system Information tag. This section of label will be blank, if you have not opted for secure default access to iDRAC, then the default user name and password are root and Scaleio123, respectively.
5. Service Tag

System information tag

The Information tag is a slide-out label panel that contains system information such as Service Tag, NIC, MAC address, and so on. If you have opted for the secure default access to iDRAC, the Information tag also contains the iDRAC secure default password.

Front system information

Front system information explains LED behavior and displays drive configuration and layout

Figure 8 LED behavior

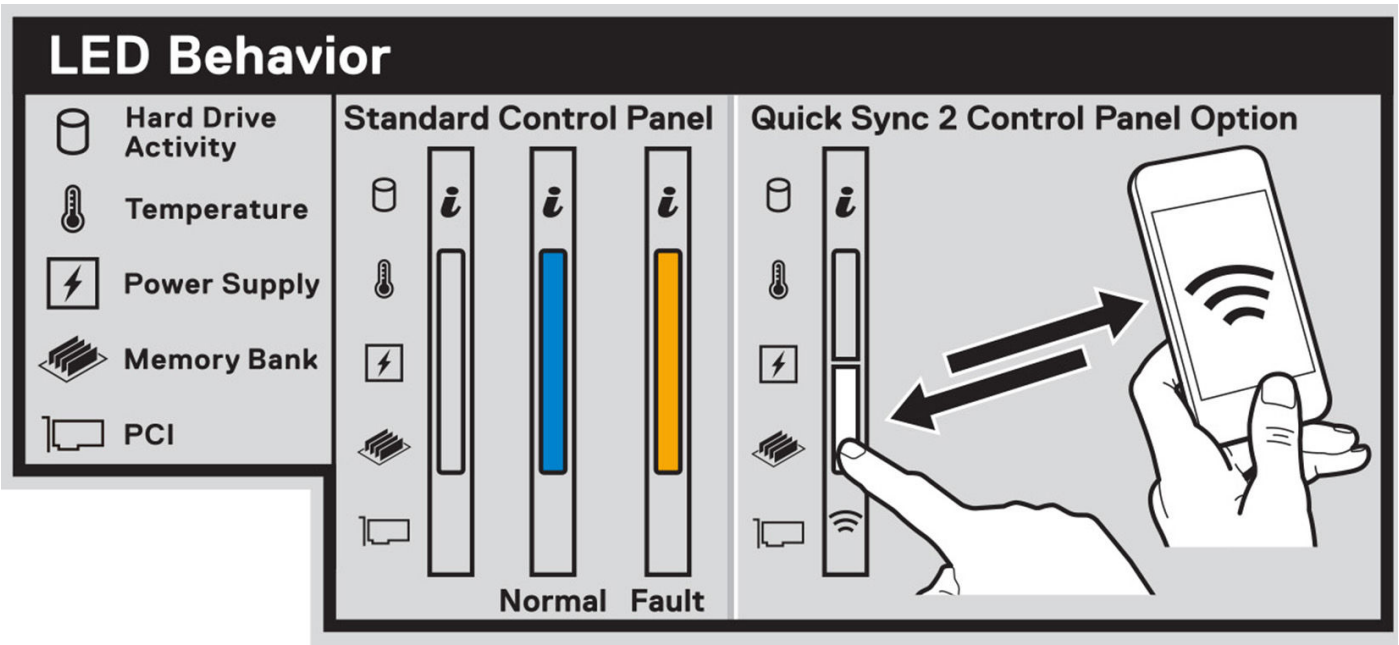
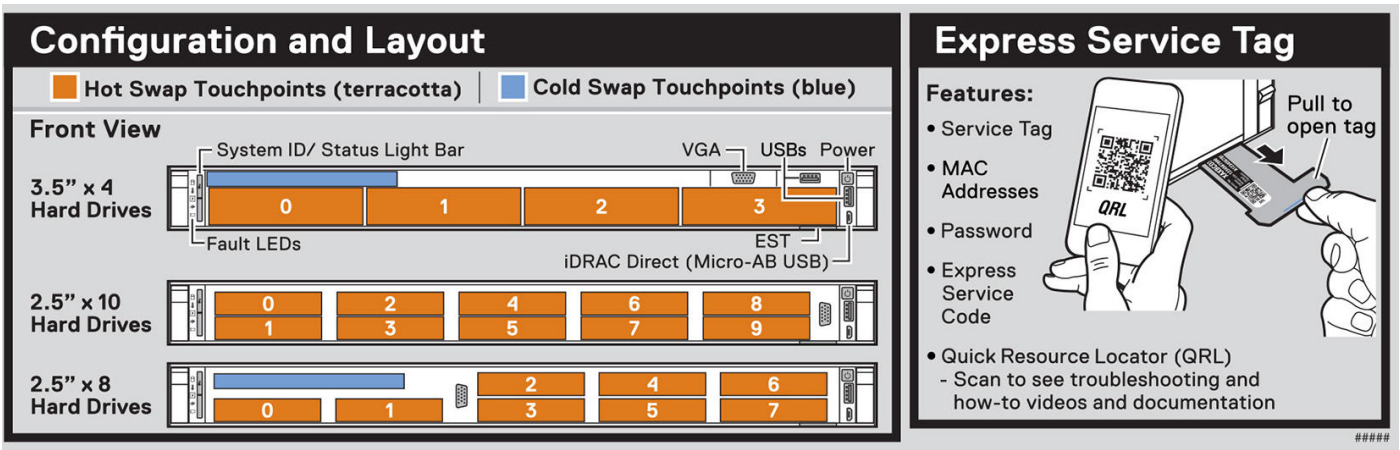


Figure 9 Configuration and layout and express Service Tag



Note: The VxFlex Appliance and VxFlex Ready Node only support the 2.5 x 10 configuration.

Front system information label

The information tag displays information to assist service technicians, including system touchpoints, electrical and mechanical overviews, and rear view configurations. It also displays jumper settings and memory information.

Figure 10 Service information, electrical overview, network daughter card and miniPERC installation

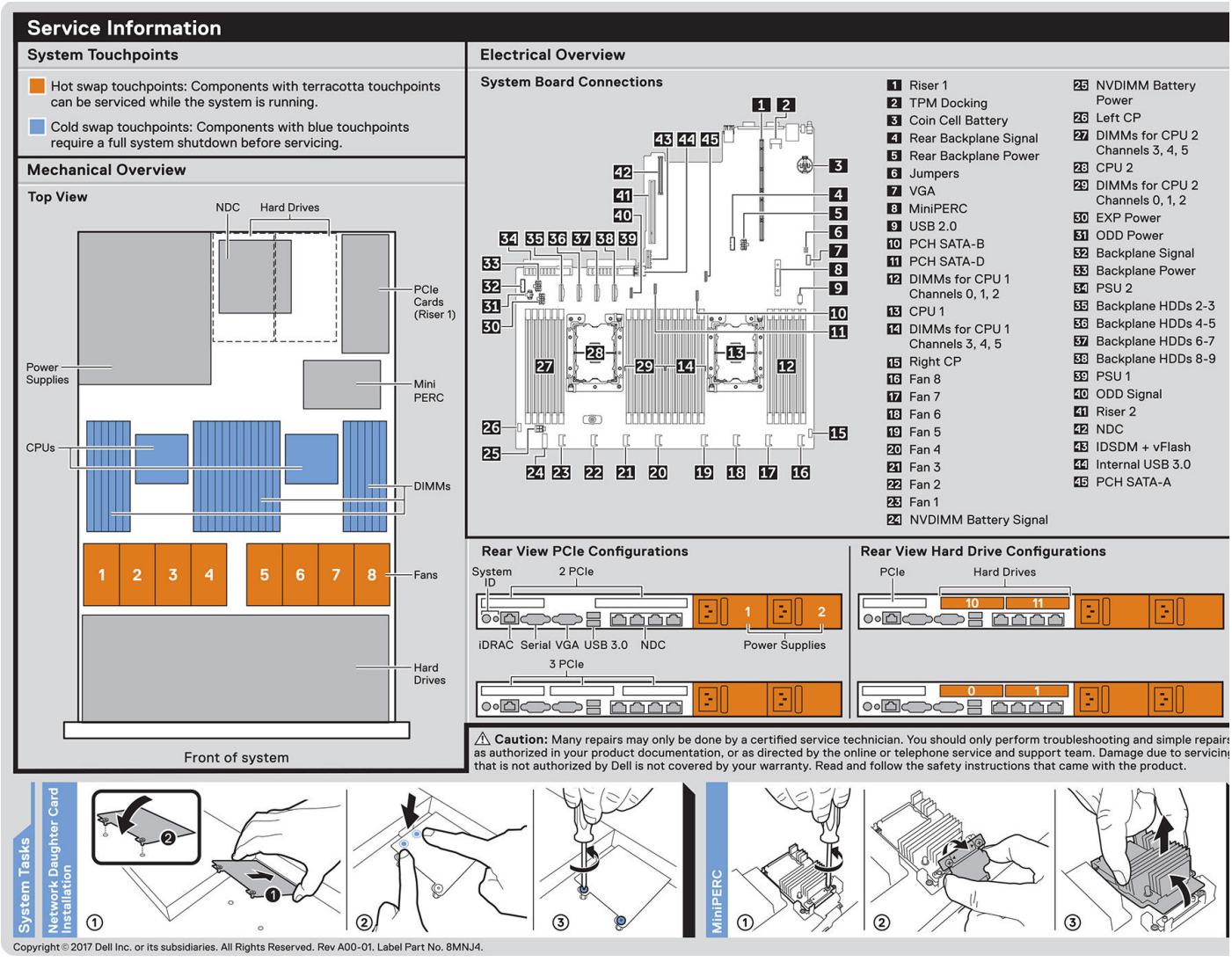


Figure 11 Memory information, jumper setting and NVDIMM battery removal

Jumper Settings

Jumper	Setting	Description
PWRD_EN	(default)	BIOS password is enabled.
		BIOS password is disabled. iDRAC local access unlocked at next AC power cycle. iDRAC password reset is enabled in F2 iDRAC settings menu.
NVRAM_CLR	(default)	BIOS configuration settings retained at system boot.
		BIOS configuration settings cleared at system boot.

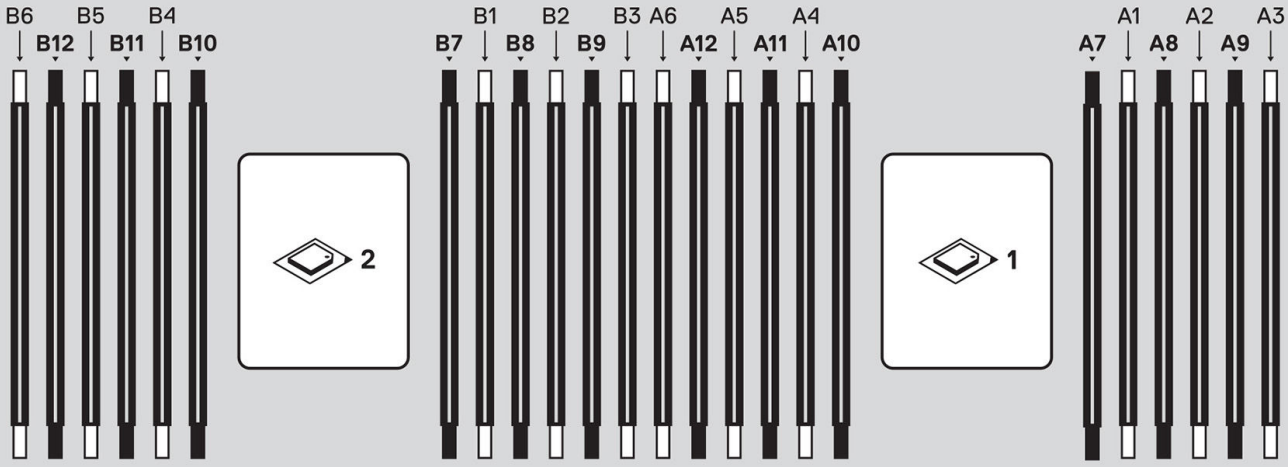
Scan to see hardware servicing and software setup videos, how-to's, and documentation.

Quick Resource Locator
Dell.com/QRL/Server/PER640

To learn more about this Dell product or to order additional or replacement parts, go to **Dell.com/support**

Memory Information

⚠ **Caution:** Memory (DIMMs) and CPUs may be hot during servicing.

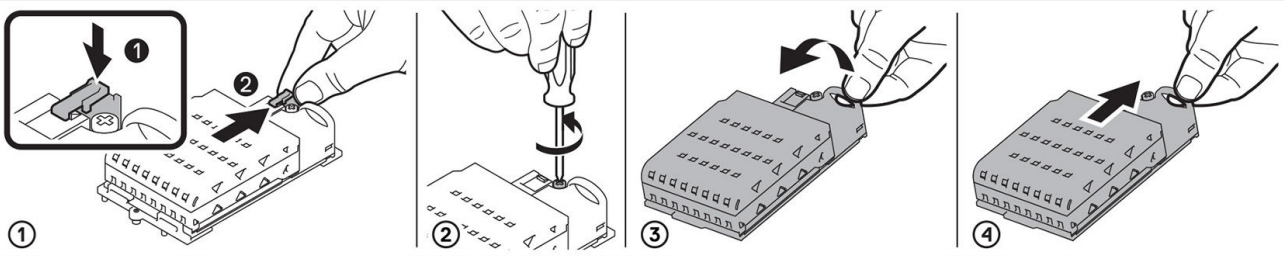


Memory Population

Configuration	Sequence
Memory-Optimized	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Mirroring	(1,2) (3,4) (5,6) (7,8) (9,10) (11,12)

Memory Sparing details are documented in the *Installation and Service Manual*.

NVDIMM Battery



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CHAPTER 3

Technical specifications

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

- System dimensions 20
- Chassis weight 21
- Processor specifications 21
- Cooling fan specifications 22
- PSU specifications 22
- System battery specifications 23
- Expansion card riser specifications 23
- System memory 23
- Storage controller specifications 27
- Drive specifications 28
- Ports and connector specifications 28
- Video specifications 29
- Environmental specifications 29

System dimensions

This topic provides details of the R640 system's dimensions:

Figure 12 System dimensions

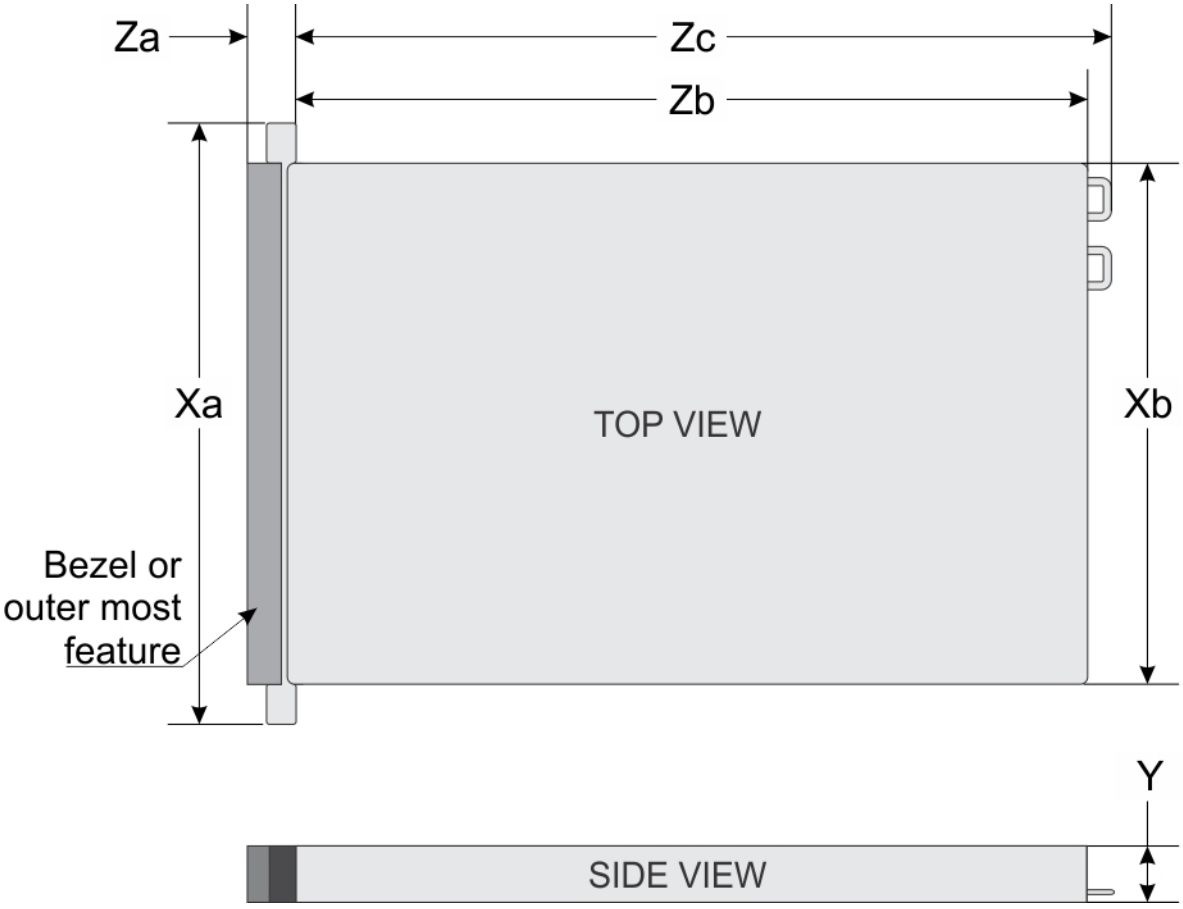


Table 6 R640 system dimensions

System	Xa	Xb	Y	Za (with bezel)	Za (without bezel)	Zb*	Zc
10 x 2.5-inches	482.0 mm (18.97-inches)	434.0 mm (17.08-inches)	42.8 mm (1.68-inches)	35.84 mm (1.41-inches)	22.0 mm (0.87-inches)	733.82 mm (29.61-inches)	772.67 mm (30.42-inches)

Chassis weight

The following table shows the maximum weight of the R640 system chassis:

Table 7 Chassis weight

System	Maximum weight (with all drives)
R640	21.9 kg (48.28 lbs)

Processor specifications

The R640 system supports two Intel Xeon Scalable Processors, up to 28 cores per processor.

Cooling fan specifications

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.

Your system supports up to eight standard or high-performance cooling fans.

Note:

- High-performance fans can be identified by a blue label on top of the cooling fan.
- Mixing of standard and high-performance cooling fans is not supported.
- Each fan is listed in the systems management software, referenced by the respective fan number. If there is a problem with a particular fan, you can easily identify and replace the proper fan by noting the fan number on the system.

PSU specifications

The R640 system supports up to two AC or DC power supply units (PSUs).

Table 8 PSU specifications

PSU	Class	Heat dissipation (maximum)	Frequency	Voltage
750 W AC	Platinum	2891 BTU/hr	50/60 Hz	100–240 V AC, autoranging
750 W AC	Titanium	2843 BTU/hr	50/60 Hz	200–240 V AC, autoranging
1100 W DC	Gold	4416 BTU/hr	50/60 Hz	–(48–60) V DC
1100 W AC	Platinum	4100 BTU/hr	50/60 Hz	100–240 V AC, autoranging
1600 W AC		6000 BTU/hr	50/60 Hz	100–240 V AC, autoranging

Note: If a system with 1100 W AC or HVDC PSU operates from 100 to 120V, the power rating per PSU is derated to 1050 W.

Note: If a system with 1600 W PSUs operates from 100 to 120 V, then the power rating per PSU is derated to 800 W.

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

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

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

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 .

System battery specifications

The R640 system supports CR 2032 3.0-V lithium coin cell system batteries.

Expansion card riser specifications

The R640 system supports PCI express (PCIe) generation 3 expansion cards that are installed on the system using expansion card risers. This system supports 1A and 2A expansion card risers.

Expansion card installation guidelines

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

Table 9 Expansion card riser configurations

Expansion card riser	PCIe slots on the riser	Processor connection	Height	Length	Slot width
Riser 1A	Slot 1	Processor 1	Low Profile	Half Length	x16
	Slot 2	Processor 1	Low Profile	Half Length	x16
Riser 2A	Slot 3	Processor 2	Low Profile	Half Length	x16

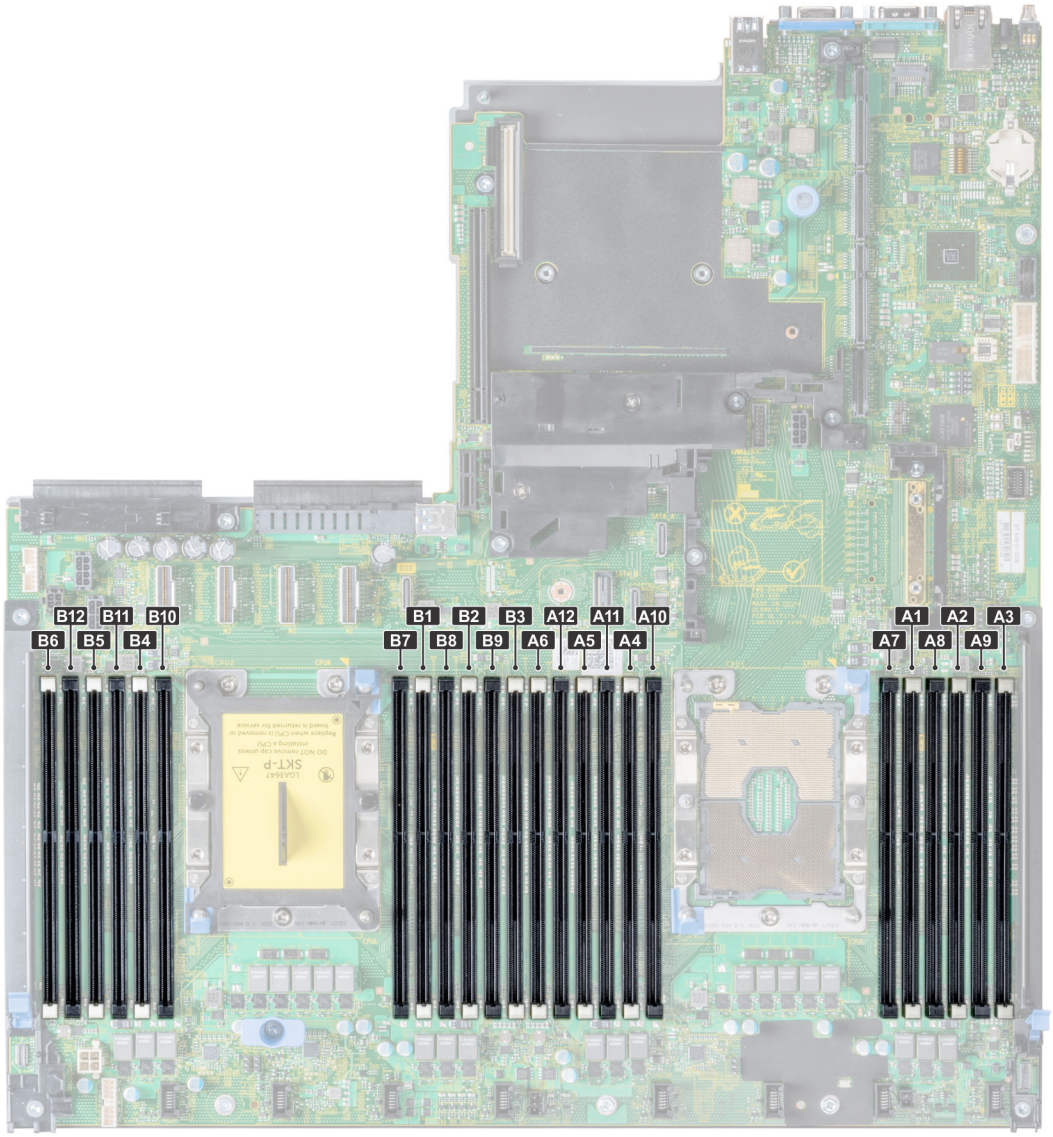
Note: The expansion card slots are not hot-swappable.

System memory

The system supports DDR4 Registered DIMMs (RDIMMs) and Non-Volatile DIMMs (NVDIMM-Ns). System memory holds the instructions that are executed by the processor.

Your system contains 24 memory sockets split into two sets of 12 sockets, one set per processor. Each 12-socket set is organized into six channels. Six memory channels are allocated to each processor. In each channel, the release tabs of the first socket are marked white, and the second socket black.

Figure 13 Memory socket locations



Memory channels are organized as follows:

This tables describes memory channels and how the channels are organized.

Table 10 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

Memory specifications

The following table shows the memory specifications for the R640 system:

Table 11 Memory specifications

DIMM type	DIMM rank	DIMM capacity	Single processors (VxFlex Ready Node only)		Dual processors	
			Minimum RAM	Maximum RAM	Minimum RAM	Maximum RAM
LRDIMM (VxFlex Ready Node only)	Octal rank	128 GB	128	1.5 TB	512 GB	6144 GB
RDIMM (VxFlex Ready Node only)	Single rank	8 GB	8 GB	96 GB	16 GB	192 GB
RDIMM	Dual rank	16 GB	16 GB	192 GB	32 GB	384 GB
RDIMM	Dual rank	32 GB	32 GB	384 GB	64 GB	768 GB
RDIMM	Dual rank	64 GB	64 GB	768 GB	128 GB	1536 GB
NVDIMM-N	Single rank	16 GB	NA	NA	RDIMM: 192 GB	RDIMM: 384 GB
					NVDIMM-N: 32 GB	NVDIMM-N: 96 GB

Note: 8 GB RDIMMs and NVDIMM-Ns must not be mixed.

Note: A minimum of two CPUs are required for any configurations that support NVDIMM-N.

General memory module installation guidelines

To ensure optimal performance of your system, observe the following general guidelines when configuring your system memory: If your system's memory configurations fail to observe these guidelines, your system might not boot, stop responding during memory configuration, or operate with reduced memory.

The memory bus operating frequency can be 2933 MT/s or 2666 MT/s, 2400 MT/s and 2100 MT/s depending on the following factors:

- Maximum supported DIMM speed of the processors
- Maximum supported speed of the DIMMs

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

The following are the recommended guidelines for installing memory modules:

- All DIMMs must be DDR4.
- RDIMMs and LRDIMMs must not be mixed.
- NVDIMMs and LRDIMMs must not be mixed.
- NVDIMMs and RDIMMs can be mixed.
- x4 and x8 DRAM based memory modules can be mixed.

- Up to two RDIMMs can be populated per channel regardless of rank count.
- A maximum of two different ranked DIMMs can be populated in a 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).
- 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.
- 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. (VxFlex Ready Node only)
- 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.
- In a dual-processor configuration, the memory configuration for each processor must be identical.
  For example, if you populate socket A1 for processor 1, then populate socket B1 for processor 2, and so on.
- Mixing of more than two memory module capacities in a system is not supported.
- Unbalanced memory configurations result in a performance loss so always populate memory channels identically with identical DIMMs for best performance.
- Populate six identical memory modules per processor (one DIMM per channel) at a time to maximize performance.
- To ensure proper system cooling, memory module blanks must be installed in memory sockets that are not occupied.

DIMM population update for Performance Optimized mode with quantity of 4 and 8 DIMMs per processor.

- When the DIMM quantity is 4 per processor, the population is slot 1, 2, 4, 5.
- When the DIMM quantity is 8 per processor, the population is slot 1, 2, 4, 5, 7, 8, 10, 11.

NVDIMM-N memory module installation guidelines

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

- Each system supports memory configurations with 2, 4, or 6 NVDIMM-Ns.
- Supported configurations have dual processors and a minimum of 12x RDIMMs.
- Maximum of 6 NVDIMM-Ns can be installed in a system.
- NVDIMM-Ns or RDIMMs must not be mixed with LRDIMMs. (VxFlex Ready Node only)
- DDR4 NVDIMM-Ns must be populated only on the black release tabs on processor 1 and 2.

Optimizer 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.

- Dual processor: Populate the slots in round robin sequence starting with processor 1.

Note: Processor 1 and processor 2 population should match.

Table 12 Memory population rules

Processor	Configuration	Memory population	Memory population information
Dual processor (Start with processor1. Processor1 and processor 2 population should match.)	Optimized (Independent channel) population order	A{1}, B{1}, A{2}, B{2}, A{3}, B{3}, A{4}, B{4}, A{5}, B{5}, A{6}, B{6}	Odd number of DIMM population per processor is allowed. **Note:** Odd number of DIMMs will result in unbalanced memory configurations, which in turn will result in performance loss. Dell EMC recommends that you populate all memory channels identically with identical DIMMs for best performance. Optimizer population order is not traditional for 8 and 16 DIMMs installations for dual processor. • For 8 DIMMs: A1, A2, A4, A5, B1, B2, B4, B5 • For 16 DIMMs: A1, A2, A4, A5, A7, A8, A10, A11 B1, B2, B4, B5, B7, B8, B10, B11

Storage controller specifications

The R640 system supports the following internal storage controller cards:

- **Internal storage controller cards:**
  - All
    - HBA330 (non-RAID)
  - Additional VxFlex Ready Node requirements
    - RAID Controller (PERC) H730p, H740p
- **Boot Optimized Storage Subsystem**: HWRAID 2 x M.2 SSDs, 240 GB.
  - 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.

Drive specifications

R640 systems support ten 2.5 inch, hot swappable SAS, SATA, or NVME SSD drives. VxFlex Ready Node supports HDD drives.

Ports and connector specifications

The R640 system supports the following ports and connectors:

USB ports

The following table provides information about the USB specifications for the R640 system:

Table 13 USB specifications

System	Front panel	Back panel	Internal
Ten drive systems	One 4-pins, USB 2.0-compliant port	Two 9-pin, USB 3.0-compliant ports	One 9-pin, USB 3.0-compliant ports
	One 5-pin micro USB 2.0 management port	N/A	N/A

NIC ports

The R640 system supports four Network Interface Controller (NIC) ports on the back panel, which are available in the following configurations:

Table 14 Available NICs for the R640

NIC	VxFlex Appliance	VxFlex Ready Node
Intel X550 2 Port 10 Gb Base-T + I350 2 Port 1 Gb Base-T, rNDC		X
Intel X710 DP 10 Gb DA/SFP+, + I350 DP 1 Gb Ethernet, Network Daughter Card	X	X
Mellanox ConnectX-4 Lx Dual Port 25 GbE DA/SFP rNDC	X	X
Intel X550 Dual Port 10G Base-T Adapter, Low Profile		X
Mellanox ConnectX-4 Lx Dual Port 25 GbE DA/SFP Network Adapter, Low Profile	X	X
Mellanox ConnectX-4 Dual Port 100 GbE QSFP28 PCIe Adapter, LP		X

Note: You can install up to three PCIe add-on NIC cards.

VGA ports

The Video Graphic Array (VGA) port enables you to connect the system to a VGA display.

The R640 system supports two 15-pin VGA ports: one each on the front and back of the system.

Serial port

The R640 system supports one serial port on the back panel. This port is a 9-pin connector, Data Terminal Equipment (DTE), 16550-compliant.

Video specifications

The R640 system supports the integrated Matrox G200eW3 graphics controller with 16 MB of video frame buffer.

Table 15 Supported video resolution options

Resolution	Refresh rate (Hz)	Color depth (bits)
640 x 480	60, 70	8, 16, 32
800 x 600	60, 75, 85	8, 16, 32
1024 x 768	60, 75, 85	8, 16, 32
1152 x 864	60, 75, 85	8, 16, 32
1280 x 1024	60, 75	8, 16, 32
1440 x 900	60	8, 16, 32
1920 x 1200	60	8, 16, 32

Environmental specifications

The following tables describe the general environmental specifications for the R640 system.

Note: For additional information about environmental certifications, see the *Product Environmental Datasheet* located with the Manuals & Documents at www.dell.com/poweredgemanuals.

Table 16 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. **Note:** Maximum of 205 W, 28 core processor is supported in systems with eight 2.5 inch processor direct attached PCIe SSD drives, and three PCIe slot chassis. **Note:** Certain configurations may have ambient temperature restrictions. For more information see the Ambient temperature limitations section.
Maximum temperature gradient (operating and storage)	20°C/h (68°F/h)

Table 17 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 29°C (84.2°F) maximum dew point.

Table 18 Maximum vibration specifications

Maximum vibration	Specifications
Operating	0.26 G_{rms} at 5 Hz to 350 Hz (all operation orientations).
Storage	1.88 G_{rms} at 10 Hz to 500 Hz for 15 min (all six sides tested).

Table 19 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 20 Maximum altitude specifications

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

Table 21 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).

Standard operating temperature

The following table lists standard operating temperature specifications.

Table 22 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.

Expanded operating temperature

The following table lists expanded operating temperature specifications for the R640 system.

Table 23 Expanded operating temperature specifications

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

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

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

Expanded operating temperature restrictions

The following additional restrictions apply:

- 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 C, 165 W/12 C and higher wattage processor(TDP>165 W) are not supported.
- Redundant power supply unit is required.
- Non-Dell qualified peripheral cards and/or peripheral cards greater than 25 W are not supported.
- PCIe SSD is not supported.
- Rear installed drives are not supported
- Tape backup unit is not supported.

Ambient temperature limitations

The ambient temperature limit must be adhered to ensure proper cooling and to avoid excess processor throttling, which may impact system performance.

Ambient temperature configurations require ambient temperatures of less than 35°C.

Particulate and gaseous contamination specifications

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

Table 24 Particulate contamination specifications

Particulate contamination	Specifications
Air filtration	Data center air filtration as defined by ISO Class 8 per ISO 14644-1 with a 95% upper confidence limit. **Note:** This condition applies to data center environments only. Air filtration requirements do not apply to IT equipment designed to be used outside a data center, in environments such as an office or factory floor. **Note:** Air entering the data center must have the MERV11 or MERV13 filtration.
Conductive dust	Air must be free of conductive dust, zinc whiskers, or other conductive particles. **Note:** This condition applies to data center and non-data center environments.
Corrosive dust	• Air must be free of corrosive dust. • Residual dust present in the air must have a deliquescent point less than 60% relative humidity. **Note:** This condition applies to data center and non-data center environments.

Table 25 Gaseous contamination specifications

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

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

CHAPTER 4

System diagnostics and indicator codes

This section explains the system diagnostics and indicator codes for your system.

- Indicator codes 34
- Using system diagnostics 41

Indicator codes

The diagnostic indicators on the system front panel display system status during system startup and assist you in diagnosing system health.

Status LED indicators

The status indicators display solid amber if any error occurs on the system.

Table 26 Status LED indicators and descriptions

Icon	Description	Condition	Corrective action
	Drive indicator	The indicator turns solid amber if there is a drive error.	• 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).
	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).	Ensure that none of the following conditions exist: • 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. If the problem persists, see Getting help on page 45.
	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).	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. If the problem persists, see Getting help on page 45.
	Memory indicator	The indicator turns solid amber if a memory error occurs.	Check the System Event Log or system messages for the location of the failed memory. Reseat the memory module. If the problem persists, see Getting help on page 45.
	PCIe indicator	The indicator turns solid amber if a PCIe card experiences an error.	Restart the system. Update any required drivers for the PCIe card. Reinstall the card. If the problem persists, see Getting help on page 45.

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 14 System health and system ID indicators

Table 27 System health and system ID indicator codes

System health and system ID indicator code	Condition
Solid blue	Indicates that the system is turned on, the 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 Getting help on page 45.
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.

iDRAC Quick Sync 2 indicator codes

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

Figure 15 iDRAC Quick Sync 2 indicators

Table 28 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, reseat the left control panel flex cable and check. If the problem persists, see "Getting help."
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 Getting help on page 45.
Blinks white rapidly	Indicates data transfer activity.	If the indicator continues to blink indefinitely, see Getting help on page 45.
Blinks white slowly	Indicates that firmware update is in progress.	If the indicator continues to blink indefinitely, see Getting help on page 45.
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 Getting help on page 45. For more information, see *Integrated Dell Remote Access Controller User's Guide* at www.dell.com/idracmanuals or *Dell OpenManage Server Administrator User's Guide* atwww.dell.com/openmanagemanuals .

Table 28 iDRAC Quick Sync 2 indicators and descriptions (continued)

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 Getting help on page 45.
Blinking amber	Indicates that the iDRAC Quick Sync 2 hardware is not responding properly.	Restart the system. If the problem persists, see Getting help on page 45.

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:

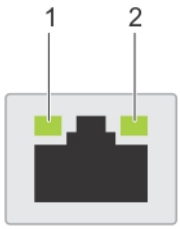
Table 29 iDRAC Direct LED indicator codes

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.

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 16 NIC indicator codes



1. Link LED indicator
2. Activity LED indicator

The NIC indicators table describes different NIC indicator codes and condition of the connectivity.

Table 30 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.

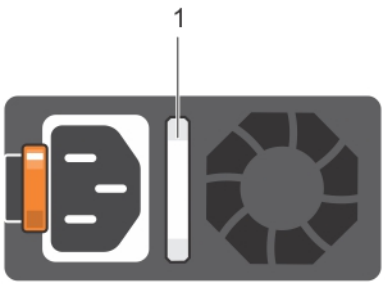
Power supply unit indicator codes

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 a power fault has occurred.

For more information about the PSU specifications, see the technical specifications for your system.

For information about the event and error messages generated during POST, see the Dell Event and Error Messages Reference Guide at www.dell.com/openmanagemanuals.

Figure 17 AC PSU status indicator



1. AC PSU status indicator/handle

Table 31 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.

Table 31 AC PSU status indicator codes (continued)

Power indicator codes	Condition
Blinking green	When the firmware of the PSU is being updated, the PSU handle blinks green. CAUTION Do not disconnect the power cable, or unplug the PSU when updating firmware. If a 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 regarding efficiency, feature set, health status, or supported voltage. CAUTION If two PSUs are installed, both the PSUs must have the same type of label; for example, the Extended Power Performance (EPP) label. Mixing PSUs from previous generations of systems based on 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 on the system. 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 conversely, you must turn off the system. AC PSUs support both 240 V and 120 V input voltages except for 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 18 DC PSU status indicator

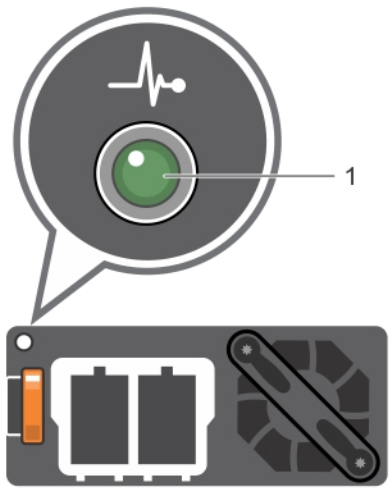


Figure 18 DC PSU status indicator (continued)

1. DC PSU status indicator

Table 32 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 regarding efficiency, feature set, health status, or supported voltage. 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 systems based on 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 on the system. 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 conversely, you must turn off the system. 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.

Drive indicator codes

The LEDs on the drive carrier indicate the state of each drive. Each drive carrier in your system has two LEDs: an activity LED (green) and a status LED (bicolor, green/amber). The activity LED flashes whenever the drive is accessed. The status LED indicator indicates the power condition of the drive.

Figure 19 Drive indicators on the drive and the mid drive tray backplane

1. Drive activity LED indicator
2. Drive status LED indicator
3. Drive capacity label

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

Table 33 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.

Using system diagnostics

If you experience a problem with your system, run the system diagnostics before contacting Dell EMC 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

The Embedded System Diagnostics provides a set of options for particular device groups or devices.

Also known as Enhanced Pre-boot System Assessment (ePSA) diagnostics, Embedded System Diagnostics allows 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 Embedded System Diagnostics from Boot Manager

If your system does not boot., run the Embedded System Diagnostics (ePSA).

Procedure

1. While the system is booting, press F11.
2. Use the keyboard arrows to select **System Utilities** > **Launch Diagnostics**.

Results

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 Embedded System Diagnostics from the Dell Lifecycle Controller

Perform the following steps to run the Embedded System Diagnostics from the Dell Lifecycle Controller.

Procedure

1. While the system is booting, 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.

Results

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

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.

CHAPTER 5

Reference material

This section contains additional information that may be required for the procedures described in this document.

- Trusted Platform Module.....44

Trusted Platform Module

The 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 contains a unique and secret RSA key embedded during the TPM's manufacture, the TPM is capable of performing platform authentication.

The TPM must be replaced only while installing a new system board.

Upgrading the Trusted Platform Module

Before you begin

- Follow all safety guidelines.
- Ensure that your operating system supports the version of the TPM 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. Ensure that you 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 After 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.

Initialize the TPM for BitLocker users

Procedure

1. Initialize the TPM.

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

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

Initialize the TPM 1.2 for TXT users

Procedure

1. While booting the system, press F2 to enter System Setup.
2. In 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 the 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**.

CHAPTER 6

Getting help

This section explains the different resources available for getting help for your system.

- Contacting Dell EMC 46
- Secure Remote Services 46
- Recycling or End-of-Life service information 46

Contacting Dell EMC

Use this topic to learn how to contact Dell EMC.

About this task

Dell EMC provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell EMC for sales, technical support, or customer service issues use the steps in this task.

Note: If you do not have an active internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell EMC product catalog.

Procedure

1. Go to **https://dell.com/support/incidents-online/contactus**.
2. For customized support:
   a. Type your system **Service Tag** in the **Service Tag** box.
   b. Click **Submit**.
3. 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.

Secure Remote Services

Secure Remote Services (formerly ESRS) is a secure, two-way connection between Dell EMC products and Dell EMC Customer Support that helps customers avoid and resolve issues up to 73 percent faster. It is completely virtual and offers flexibility for enterprise environments of any size.

Key benefits

- Proactive wellness monitoring and issue prevention
- Automated issue detection, notification and case creation for quicker uptime
- Predictive analytics-based recommendations through MyService360 and product consoles

The Secure Remote Services lifeline is a heartbeat that pulses outbound from the Secure Remote Services gateway to Dell EMC Customer Service in 30-second intervals, providing Dell EMC with connectivity status as well as the status of each product. The heartbeat ensures continuous monitoring, notification, and if necessary, proactive remote troubleshooting to ensure high availability of your products. As a result, you will experience faster resolution and greater uptime.

Recycling or End-of-Life service information

Take back and recycling services are offered for this product in certain countries.

If you want to dispose of system components, visit Dell.com/recyclingworldwide and select the relevant country.