Dell EMC VxRail Appliances on Dell PowerEdge Servers

Version 01

VxRail P580N Owner's Manual

Rev 01

December 2019

DELLEMC

CONTENTS

CHAPTER 1

Introduction

Revision history

The following table lists the revision history for this document.

Table 1 Revision history

Date	Revision	Description of change
December 10, 2019	01	Initial release.

About this guide

This document describes the VxRail P580N Appliance hardware, lists technical specifications, and describes high-level operations.

The target audience for this document includes customers, field personnel, and partners who want to operate and maintain a VxRail P580N Appliance. This document is designed for people familiar with:

- Dell EMC systems and software
- VMware virtualization products
- Data center appliances and infrastructure

Support

Create an Online Support account to get access to support and product resources for your VxRail Appliance.

If you already have an account, register your VxRail Appliance to access the available resources.

For convenience, you can link your Online Support account with VxRail Manager and access support resources without having to log in separately.

(i) **Note:** If you plan to set up Secure Remote Services, your Online Support account must be linked to VxRail Manager under the same party ID or the deployment will fail. Your appliance must also be in an installed state in the Install Base.

Registering for online support

Create an Online Support account to access support resources.

About this task

After you register, you can:

- Register your system
- Obtain product license files and software updates
- Download VxRail Series product documentation
- Access SolVe Online for VxRail, or download the SolVe Desktop application for hardware replacement and upgrade procedures
- Browse the VxRail Series community and support information
- Link your support account for access to resources from within VxRail Manager

Procedure

1. Point your Web browser to www.emc.com/vxrailsupport (or http://www.dell.com/support).

2. Fill in your first name, last name, email, and preferred password.

3. Select whether you would like to subscribe to email updates.

4. Click **Create an Account**.

   Support will send you a confirmation email, typically within 48 hours.

Where to go for support resources

Access support resources for your VxRail Appliance by doing any of the following:

- In the vSphere Client, select **VxRail** from the menu and use the **Support** functions on the **VxRail Dashboard**.

- Point your Web browser to www.emc.com/vxrailsupport (or https://www.dell.com/support).

Using SolVe Online for VxRail Series procedures

Step-by-step instructions for procedures such as replacing hardware or performing system administrative tasks are available through SolVe Online and the SolVe Desktop application.

⚠️ CAUTION To avoid potential data loss, refer to the VxRail Series procedures in SolVe Online or the SolVe Desktop application before performing any hardware replacement or upgrade activity.

Access SolVe Online for VxRail through your Web browser.

For more information about SolVe for VxRail, refer to KB 525271.

You must have an online support account to use SolVe Online.

Locating your appliance serial number

To get support for your appliance, use the VxRail Appliance serial number, also called the Product Serial Number Tag (PSNT). The PSNT is a 14-digit number used to identify individual appliances to Dell EMC support.

ⓘ Note: Only use the VxRail Appliance serial number to contact Customer Support. Sometimes, you may need to supply the 7-digit Service Tag number.

There are two identification tags on your appliance:

- The VxRail appliance serial number—You can find the serial number in **VxRail Manager**, or printed on the information tag.

- The Service Tag — You can find the Service Tag printed on the physical appliance.

Looking up your VxRail Appliance serial number in VxRail Manager

Follow these steps to look up your VxRail Appliance serial number in VxRail Manager.

Procedure

1. On the main page of the vSphere Client click **Hosts and Clusters** in the left navigation bar.

2. Select your VxRail cluster.

3. Select the **Monitor** tab.

4. Select **VxRail** > **Appliances** from the inner left navigation bar.

5. Click **Open physical view for this cluster**.

6. Observe the VxRail Appliance serial number, listed under each appliance ID.

   The serial number is also called the "PSNT".

   Figure 1 VxRail Appliance serial number (PSNT)
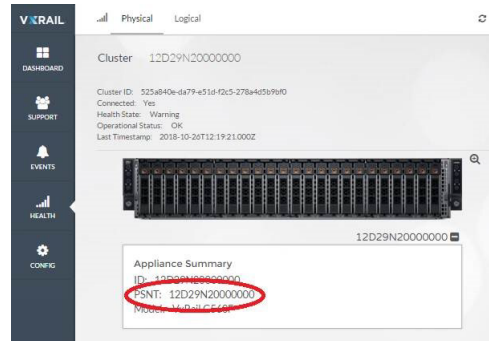
Locating the Service Tag of your system

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 to route support calls to the appropriate personnel.

Figure 2 Locating Service Tag of your system
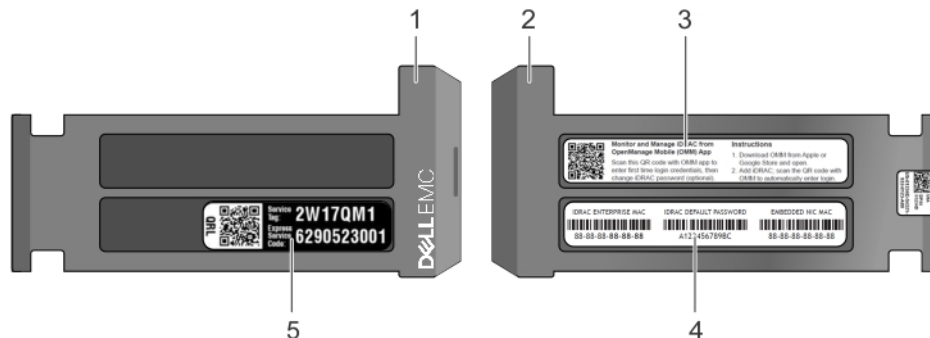
1. Information tag (top view)

2. Information tag (bottom view)

3. OpenManage Mobile (OMM) label (optional)

4. iDRAC MAC address and iDRAC secure password label

   (i) 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 calvin.

5. Service Tag

VxRail documentation

The following table lists available documents about VxRail Manager and VxRail Appliances.

Table 2 VxRail Documentation

Document	Description
SolVe Online for VxRail	(Login required) Step-by-step instructions for procedures such as replacing hardware or performing system administrative tasks are available through SolVe Online and the SolVe Desktop application. For more information about SolVe for VxRail, refer to KB 525271.
VxRail Appliance 4.7.x Administration Guide VxRail Appliance 4.5.x Administration Guide	These document describe the VxRail Appliance, how it works, and how to perform administrative tasks.
VxRail 4.7.x Release Notes VxRail 4.5.x Release Notes	(Login required) These documents contain a brief description of VxRail Manager releases, including lists of known issues and workarounds.
VxRail Support Matrix	This document provides information about supported software, firmware, and hardware versions for Dell EMC VxRail appliances based on Dell PowerEdge hardware, including the E Series, P Series, S Series, and V Series.
VxRail Appliance Owner's Manuals • VxRail Appliances on 14th Generation PowerEdge Servers P Series, V series, and S Series Owner's Manual • VxRail Appliances on 14th Generation PowerEdge Servers E Series Owner's Manual • VxRail G560 and G560F Owner's Manual • VxRail 60 Series Appliance Owner's Manual • VxRail 100 Series and 200 Series Appliance Owner's Manual • VxRail G Series Appliance Owner's Manual	These documents describe the various VxRail appliances, including their physical features and technical specifications.
VxRail Appliance Getting Started Guides • VxRail G560 and G560F Getting Started Guide • VxRail E Series Appliance Getting Started With Your Appliance • VxRail P Series, S Series, and V Series Appliances Getting Started With Your Appliance	These documents describe considerations for unpacking and preparing to install VxRail appliances.
VxRail Appliance API User Guide	This document describes the API for the VxRail Appliance versions 4.5.x and 4.7.x.
VxRail Event Code Reference	(Login required) This reference guide lists the alert and event codes generated by VxRail Manager.

Table 2 VxRail Documentation (continued)

Document	Description
VxRail Security Configuration Guide	(Login required) This guide provides an overview of the configuration, deployment, and usage settings needed to ensure secure operation of the VxRail Appliance.
VxRail Appliance STIG Compliance Guide	(Login required) This document provides guidance on the secure installation and secure use of the VxRail Appliance for the DoDIN Approved Products List (APL) Deployment Configuration.
VxRail vCenter Server Planning Guide	This planning guide discusses guidance for the various vCenter Server deployment options supported on VxRail Appliances.
VxRail Planning Guide for Virtual SAN Stretched Cluster	This planning guide provides better insights into the requirements necessary for VxRail to implement Virtual SAN Stretched Cluster.
vSAN 2-Node Cluster on VxRail Planning Guide	This guide provides information for the planning of a VMware vSAN 2-Node Cluster infrastructure on a VxRail platform. (Not for VCF on VxRail solution deployments.)
VxRail Networking Guide with Dell EMC S4148-ON Switches	The deployment guide covers the process of connecting a cluster of VxRail nodes to Dell EMC Networking S4148-ON switches in a high-availability configuration.
VxRail Network Planning Guide	This is a network planning and consideration guide for the VxRail. It provides valuable insight into supported switch requirements and the networking required to support VxRail.
Networking Guides > VxRail Networking Solutions	The networking guides provided on this website assist with the deployment of your infrastructure and the optimal connectivity of your Dell EMC Networking products. Click VxRail Networking Solutions for specific VxRail solutions.
VxRail Fabric Automation SmartFabric Services User Guide	This solution brief provides an overview of how VxRail works with HCI network fabrics using Dell OS10 Enterprise Edition SmartFabric services. (Not for VCF on VxRail solution deployments.)

CHAPTER 2

Product overview

The VxRail P580N Appliance is a 4-socket, 2U rack system designed to run complex workloads using highly scalable memory, I/O capacity, and network options. The VxRail P580N features the latest Intel Xeon Scalable Processor family, up to 48 DIMM slots, PCI Express 3.0 enabled expansion slots, and a choice of network interface technologies to cover NIC and network daughter cards.

Figure 3 VxRail P580N Appliance

Chassis overview

The VxRail P580N is a 4-socket, 2U rack appliance with up to 48 DIMM slots, storage capacity of up to 24 drive slots, and the Intel Xeon Scalable Processor Family processors.

The VxRail P580N appliance is available in the following chassis configurations:

Table 3 VxRail P580N chassis options

Chassis options	Configurations
Twenty-four drive chassis	Up to twenty-four 2.5-inch NVMe front accessible drives in slots 0–23

Front view of the system

Figure 4 Front view 24 x 2.5-inch drive system
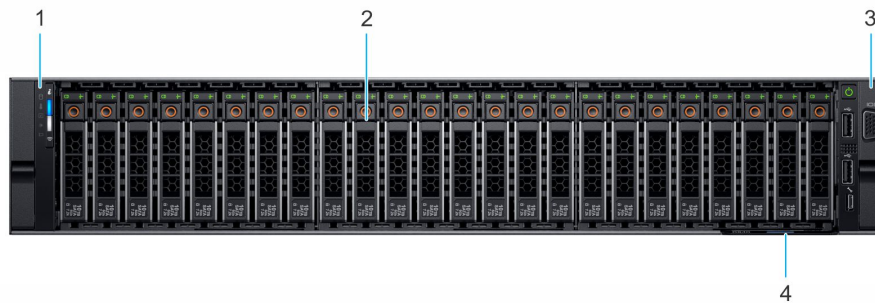
1. Left control panel
2. Drives
3. Right control panel
4. Service Tag

(i) **Note:** For more information about the ports and connectors, see the Technical Specifications section.

Rear view of the system

Figure 5 Rear view of the 24 x 2.5-inch drive system
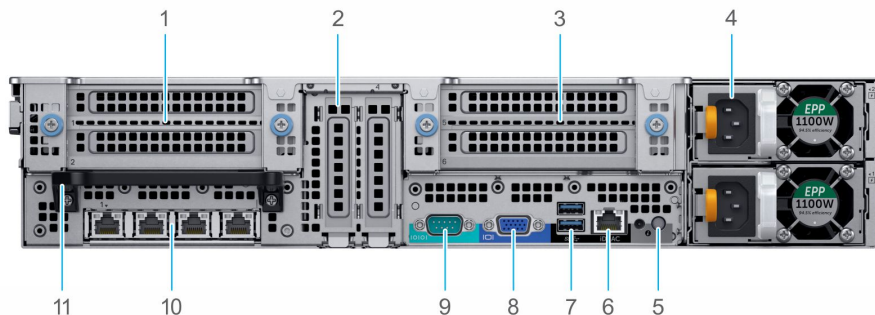
1. Riser 1 - Full-height PCIe expansion card (Slot 1 and 2)
2. Half-height PCIe expansion card slots located on the system board (Slot 3 and 4)
3. Riser 2 -Full-height PCIe expansion card slots (Slot 5 and 6)
4. Power supply units (2)
5. System identification button
6. iDRAC9 dedicated port
7. USB 3.0 ports (2)
8. VGA port
9. Serial port
10. NIC ports (2 or 4)
11. Rear handle

(i) **Note:** For more information about the ports and connectors, see the Technical Specifications section.

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 6 NIC indicator codes
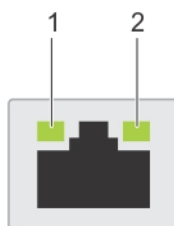
1. Link LED indicator
2. Activity LED indicator

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

Table 4 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 7 AC PSU status indicator
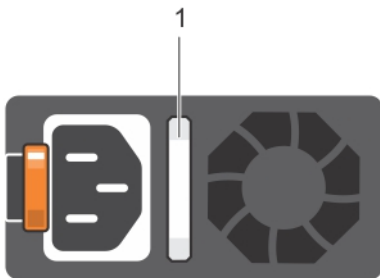
1. AC PSU status indicator/handle

This table describes the AC PSU status indicators and the condition of the PSU when the power indicator light is green, blinking green, blinking amber, and when it is not lit.

Table 5 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 5 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 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 concerning 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 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 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 8 DC PSU status indicator
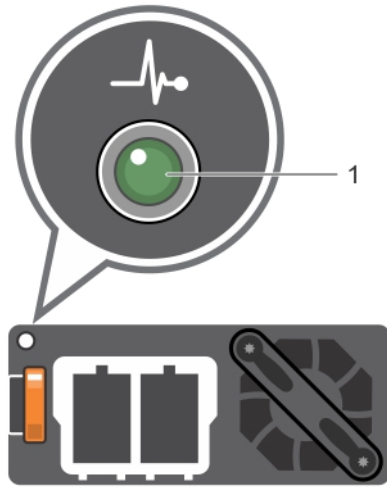
1. DC PSU status indicator

This table describes the DC PSU status indicators and the condition of the PSU when the power indicator light is green, blinking green, blinking amber, and when it is not lit.

Table 6 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 about 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 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.

Table 6 DC PSU status indicator codes (continued)

Power indicator codes	Condition
	⚠ **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

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 9 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.

The drive indicator codes table describes the indicator codes: flashing green twice per second, Off, flashes green, amber, and then turns off, flashes amber four times per second, flashes green slowly, solid green, flashes green for three seconds, amber for three seconds, and then turns off after six seconds.

Table 7 Drive indicator codes

Drive status indicator code	Condition
Flashes green twice per second	Identifying drive or preparing for removal.
Off	Drive ready for removal.

Table 7 Drive indicator codes (continued)

Drive status indicator code	Condition
	ⓘ Note: The drive status indicator remains off until all drives are initialized after the appliance 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.

Inside the system

ⓘ **Note:** Components that are hot swappable have orange touch points and the components that are not hot swappable have blue touch points.

Figure 10 Inside the system
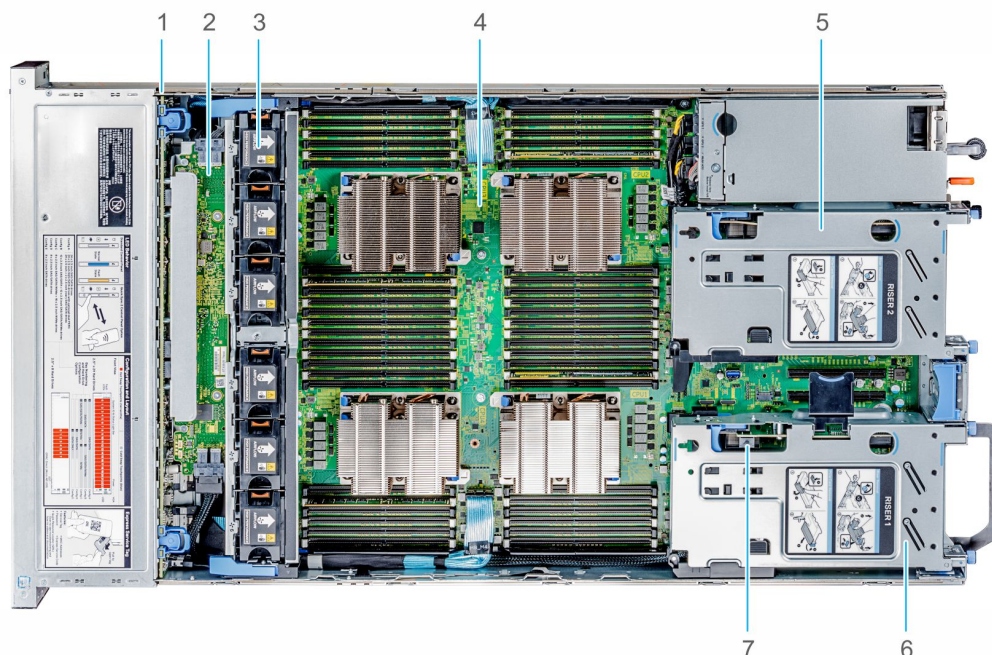
1. Drive backplane
2. SAS Expander board
3. Cooling fans (6)

4. System board
5. Full-height expansion card Riser 2
6. Full-height expansion card Riser 1
7. Intrusion switch

System board diagnostic LED indicators

The system board LED indicators provide status of the system when it is powered on, which help
identify POST and hardware issues.
Below table shows what the LED status indicates.

Table 8 LED status

○	**LED Off**
●	**LED on**
B	**Blinking LED**
*	**LED Off : PFAULT**
	LED Blink : FAILSAFE Timeout
	LED On : FAILSAFE Strike Out

This table describes power-up LED sequence.

Table 9 Power-up LED sequence

Power-Up Sequence							
LED7	LED6	LED5	LED4	LED3	LED2	LED1	Description
○	○	○	○	○	○	●	2.5V_AUX EN. Waiting for 2.5V_AUX PG
○	○	○	○	○	●	○	1.8V_AUX EN. Waiting for 1.8V_AUX PG
○	○	○	○	○	●	●	5V SW EN. CKMNG EN. Waiting for 5V SW PG
○	○	○	○	●	○	○	V_PVNN EN. Waiting for V_PVNN PG
○	○	○	○	●	○	●	1.05V SW EN. Waiting for 1.05V SW PG
○	○	○	○	●	●	○	V_VSBM EN. Waiting for V_VSBM PG
○	○	○	○	●	●	●	V_VSB11 EN. Waiting for V_VSB11 PG
○	○	○	●	○	○	●	Waiting for PCH_SLP_SUS_N. PCH_RSMRST_N still asserted
○	○	○	●	○	●	○	Config check. Waiting for BMC to boot. PCH_RSMRST_N de-asserted
○	○	○	●	○	●	●	Waiting for PWR button
○	○	○	●	●	○	○	12V EN. Waiting for PSU* PG
○	○	○	●	●	●	●	3.3V_AB EN. Waiting for 3.3V A+B PG
○	○	●	○	○	○	○	BP VRs EN. Waiting for BP* PG

Table 9 Power-up LED sequence (continued)

○	○	●	○	○	○	●	MEM VPP EN. Waiting for MEM VPP PGs
○	○	●	○	○	●	○	MEM VDDQ EN. Waiting for MEM VDDQ PGs
○	○	●	○	○	●	●	MEM VTT EN. Waiting for MEM VTT PGs
○	○	●	○	●	○	○	CPU* VCCIO and PCIe clocks EN. Waiting for CPU VCCIO PGs
○	○	●	○	●	○	●	CPU* VCORE/VSA EN. Waiting for CPU* VCORE+VSA PGs
○	○	●	○	●	●	○	Waiting for NDC PG
○	○	●	○	●	●	●	Waiting for PCH PROCPWRGD
○	○	●	●	○	○	○	CPU* PG Asserted. SYS PWRGOOD Asserted
●	●	●	●	●	●	●	RUN State
○	○	●	●	○	●	○	PLTRST_N Asserted
○	○	●	●	○	●	●	CPU & MEM VR's Shutdown
○	○	●	●	●	○	○	MAIN Rails Shutdown (7 seconds)

This table describes system board LED sequence.

Table 10 System board LED sequence

Error							
LED7	LED6	LED5	LED4	LED3	LED2	LED1	Description
B	○	○	○	○	○	B	Config Error: CPU1 present? DIMMs OK? Install DBG JMPR1 to bypass
B	B	○	○	○	B	B	CPU IERR
○	●	●	●	●	●	○	CPU COMBINED MCERR
B	B	B	B	B	B	B	Thermal Issue on CPU* or MEM
B	○	B	B	B	○	B	Internal VR Issue on CPU*
B	○	○	●	○	○	B	AUX Power Failsafe

This table describes the Pfault or failsafe errors LED sequence.

Table 11 Pfault or failsafe errors LED sequence

Pfault or Failsafe Errors							
LED7	LED6	LED5	LED4	LED3	LED2	LED1	Description
*	B	○	○	○	○	○	12V Failure
*	B	○	○	○	○	●	5V BP0 Failure
*	B	○	○	○	●	○	5V BP1 Failure
*	B	○	○	○	●	●	5V BP2 Failure
*	B	○	○	●	○	○	3.3V A Failure
*	B	○	○	●	○	●	3.3V B Failure
*	B	○	○	●	●	○	5V SW Failure

Table 11 Pfault or failsafe errors LED sequence (continued)

*	B	○	○	●	●	●	1.05V SW Failure
*	B	○	●	○	○	○	CPU1 VCORE Failure
*	B	○	●	○	○	●	CPU2 VCORE Failure
*	B	○	●	○	●	○	CPU1 VCCIO Failure
*	B	○	●	○	●	●	CPU2 VCCIO Failure
*	B	○	●	●	○	○	CPU1 VSA Failure
*	B	○	●	●	○	●	CPU2 VSA Failure
*	B	○	●	●	●	○	CPU1 MEM012 VTT Failure
*	B	○	●	●	●	●	CPU1 MEM345 VTT Failure
*	B	●	●	○	○	○	CPU2 MEM012 VTT Failure
*	B	●	○	○	○	●	CPU2 MEM345 VTT Failure
*	B	●	○	○	●	○	CPU1 MEM012 VPP Failure
*	B	●	○	○	●	●	CPU1 MEM345 VPP Failure
*	B	●	○	●	○	○	CPU2 MEM012 VPP Failure
*	B	●	○	●	○	●	CPU2 MEM345 VPP Failure
*	B	●	○	●	●	○	CPU1 MEM012 VDDQ Failure
*	B	●	○	●	●	●	CPU1 MEM345 VDDQ Failure
*	B	●	○	○	○	○	CPU2 MEM012 VDDQ Failure
*	B	●	●	○	○	●	CPU2 MEM345 VDDQ Failure
*	B	●	●	○	●	○	V_PVNN SW Failure
*	B	●	●	○	●	●	1.8V SW Failure
*	B	●	●	●	○	○	V_VSB11 SW Failure
*	B	●	●	●	○	●	V_VSBM SW Failure
*	B	●	●	●	●	○	NDC Failure
*	B	●	●	●	●	●	2.5V SW Failure

CHAPTER 3

Technical specifications

Chassis dimensions

Figure 11 Dimensions of the VxRail P580N system
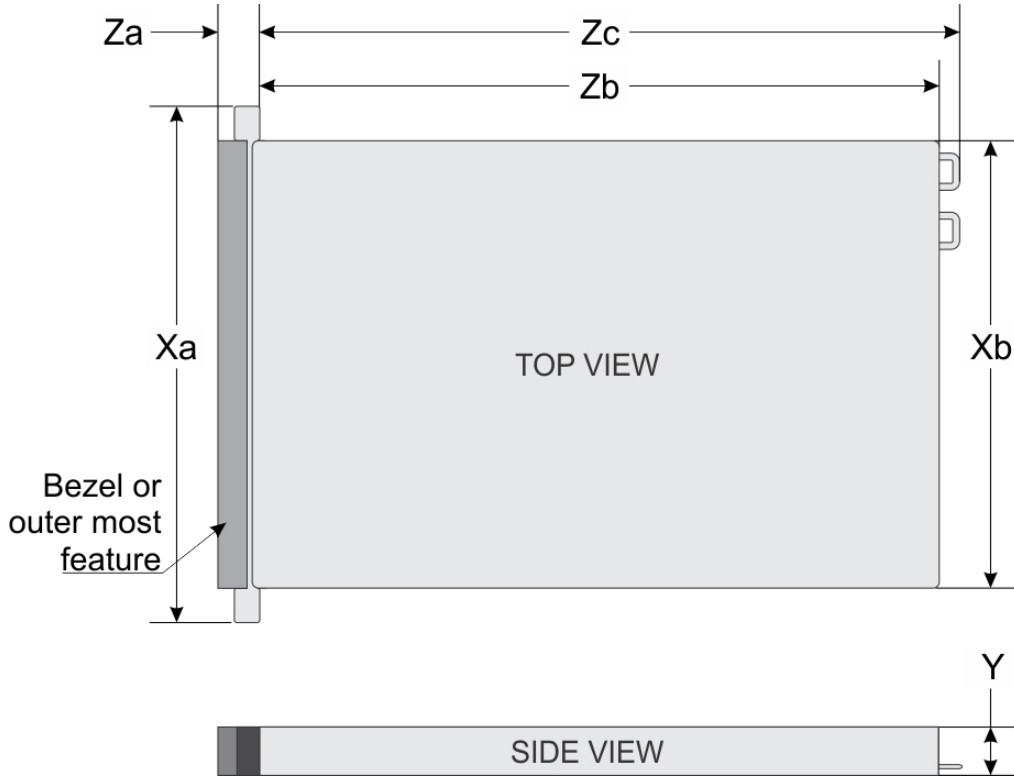
This table gives details of the dimensions of the VxRail P580N system:

Table 12 Dimensions of the VxRail P580N system

Xa	Xb (without brackets)	Xb (w brackets)	Y	Za (with bezel)	Za (without bezel)	Zb*	Zc (with PSU handle)	Zc (with chassis rear wall handle)
482 mm (18.97 inches)	434 mm (17.08 inches)	444.0 (17.48 inches)	86.8 mm (3.41 inches)	37.84 mm (1.41 inches)	23.9 mm (0.94 inches)	812 mm (31.96 inches)	842 mm (33.14 inches)	902 mm (35.51 inches)

$*$ - Zb refers to the nominal rear wall external surface, where the system board I/O connectors are located.

Chassis weight

The following table shows the maximum weight of the VxRail P580N system:

Table 13 Chassis weight

System	Maximum weight (with all drives/SSDs)
2.5 inch	36.6 kg (80.68 lb)

Processor specifications

The VxRail P580N system supports four processors - Intel Xeon Scalable Processor family.

PSU specifications

The VxRail P580N system supports up to two AC or DC power supply units (PSUs).
The table below are the specifications for 1600 W, 2000 W, and 2400 W power supplies.

Table 14 PSU specifications

PSU	Class	Heat dissipation (maximum)	Frequency	Voltage	High line 200V–240 V	Low line 100 V– 140 V	DC	Current
1600 W AC	Platinum	6000 BTU/hr	50/60 Hz	100–240 V AC, autoranging	1600 W	800 W	NA	10 A
2000 W AC	Platinum	7500 BTU/hr	50/60 Hz	100–240 V AC, autoranging	2000 W	1000 W	NA	11.5 A
2400 W AC	Platinum	9000 BTU/hr	50/60 Hz	100–240 V AC, autoranging	2400 W	1400 W	NA	16 A

(i) **Note:** Heat dissipation is calculated using the PSU wattage rating.

(i) **Note:** This system is also designed to connect to the IT power systems with a phase-to-phase voltage not exceeding 240 V.

System battery specifications

The VxRail P580N system supports CR 2032 3.0-V lithium coin cell system battery.

Expansion card riser specifications

The VxRail P580N system supports up to six PCI express (PCIe) generation 3 expansion cards that can be installed on the system board and expansion card risers.

Figure 12 24 x 2.5-inch drive system

This image shows the PCIe slot numbers.

The following table provides detailed information about the expansion card riser specifications:

This table describes the expansion card riser specifications.

Table 15 Expansion card riser specifications

PCIe slot	Riser	Processor connection	Height	Length	Slot width
1	X8 PCIe Riser 1	Processor 1	Full height	Half length	x8
2	X16 PCIe Riser 1	Processor 1	Full height	Full length	x16
	X8 PCIe Riser 1	Processor 1	Full height	Half length	x8
3	On the system board	Processor 1	Low profile	Half length	x16
4	On the system board	Processor 2	Low profile	Half length	x16
5	X8 PCIe Riser 2	Processor 2	Full height	Half length	x8
6	X16 PCIe Riser 2	Processor 2	Full height	Full length	x16
	X8 PCIe Riser 2	Processor 2	Full height	Half length	x8

Memory specifications

.

The following table shows the memory specifications for the VxRail P580N appliance:

Table 16 Memory specifications

Memory module sockets	DIMM type	DIMM rank	DIMM capacity	Dual processors		Quad processors	
				Minimum RAM	Maximum RAM	Minimum RAM	Maximum RAM
48 288-pins	LRDIMM	Octal rank	128 GB	256 GB	3072 GB	512 GB	6144 GB
	LRDIMM	Quad rank	64 GB	128 GB	1536 GB	256 GB	3072 GB
	RDIMM	Dual rank	64 GB	128 GB	1536 GB	256 GB	3072 GB
	RDIMM	Dual rank	32 GB	64 GB	768 GB	128 GB	1536 GB

Table 16 Memory specifications (continued)

Memory module sockets	DIMM type	DIMM rank	DIMM capacity	Dual processors		Quad processors	
				Minimum RAM	Maximum RAM	Minimum RAM	Maximum RAM
	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

The following table shows the DIMM blank population rules for the VxRail P580N appliance:

Table 17 DIMM blank population rules

Processor configuration	Processor 1	Processor 2	Processor 3	Processor 4
Quad processor	Required	Required	Required	Required

RAID controller specifications

The VxRail P580N system supports:

- Internal storage controller cards: Boot Optimized Server Storage (BOSS-S1)
- External storage controller cards: 12 Gbps SAS HBA

Drive specifications

Drives

The VxRail P580N system supports NVMe drives.

This table lists out the supported drive and SSD options for the VxRail P580N system:

Table 18 Supported drive options for the VxRail P580N system

Chassis options	Configurations
Twenty-four drive chassis	Up to twenty-four 2.5-inch NVMe front accessible drives in slots 0–23

Optical drives

The VxRail P580N system does not provide support for optical drives.

Tape drives

The VxRail P580N system does not provide support for external tape backup devices.

Ports and connectors specifications

USB ports

The VxRail P580N system supports both USB 2.0-compliant ports and USB 3.0-compliant ports:

The following table provides more information about the USB specifications:

The following table shows the USB specifications for the VxRail P580N system.

Table 19 USB specifications

Front panel	Back panel	Internal USB
- Two USB 2.0-compliant ports - One micro USB 2.0-compliant port for iDRAC Direct ⓘ Note: The micro USB 2.0 compliant port can only be used as an iDRAC Direct or a management port. - One optional USB 3.0-compliant port	Two USB 3.0-compliant ports	One internal USB 3.0-compliant port

NIC ports

The VxRail P580N system supports up to four Network Interface Controller (NIC) ports that are integrated on the network daughter card (NDC), and are available in the following configurations:

- Four RJ-45 ports that support 1 Gbps, and 10 Gbps
- Four RJ-45 ports, where two ports support maximum of 10 Gbps and the other two ports maximum of 1 Gbps
- 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 connector

The serial connector on the rear of system for serial device connection and console redirection.

The VxRail P580N system supports one serial connector on the back panel, which is a 9-pin connector, Data Terminal Equipment (DTE), 16550-compliant.

VGA ports

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

The VxRail P580N system supports two 15-pin VGA ports, one each, on the front and back of the system.

IDSDM or vFlash module

The VxRail P580N system features an Internal Dual SD module (IDSDM) or vFlash module. The IDSDM or vFlash module is combined into a single card module, and includes both vFlash and IDSDM. The IDSDM or vFlash module is located in a slot on the back of the system. The module supports three microSD cards; two cards for IDSDM and one card for vFlash. The following capacities are supported:

- IDSDM: 64 GB

ⓘ **Note:** There are two dip switches on the IDSDM or vFlash module for write-protection.

ⓘ **Note:** One IDSDM card slot is dedicated for redundancy.

ⓘ **Note:** Use Dell branded microSD cards associated with the IDSDM or vFlash configured systems.

Video specifications

VxRail P580N appliances support the integrated Matrox G200eW3 graphics controller with 16 MB of video frame buffer.

The following table describes the supported video resolution options.

Video resolution options

Table 20 Supported video resolution options

Resolution	Refresh rate (Hz)	Color depth (bits)
1024 x 768	60	8, 16, 32
1280 x 800	60	8, 16, 32
1280 x 1024	60	8, 16, 32
1360 x 768	60	8, 16, 32
1440 x 900	60	8, 16, 32
1600 x 900	60	8, 16, 32
1600 x 1200	60	8, 16, 32
1680 x 1050	60	8, 16, 32
1920 x 1080	60	8, 16, 32
1920 x 1200	60	8, 16, 32

ⓘ **Note:** 1920 x 1080 and 1920 x 1200 resolutions are supported only in reduced blanking mode.

Environmental specifications

When the system is in continuous operation (for altitude less than 950 m or 3117 ft), the temperature specification ranges 10 °C–35°C (50–95°F) with no direct sunlight on the equipment. When the system is not in operation, the temperature specification is –40 °C–65°C (–40–149°F). For more information about fresh air, see the Expanded Operating Temperature section. The Maximum temperature gradient for both operation and nonoperational systems is

20°C/h (36°F/h). Information about fresh air specification is described in the Expanded Operating Temperature section.

Table 21 Temperature specifications

Temperature	Specifications
Storage	−40–65°C (−40 °F–149°F)
Continuous operation (for altitude less than 950 m or 3117 ft)	10–35°C (50 °F–95°F) with no direct sunlight on the equipment
Maximum temperature gradient (operating and storage)	20°C/h (36°F/h)

For a nonoperational system, the ambient relative humidity ranges from 5% to 95% with 33°C (91°F) maximum dew point. Atmosphere must be noncondensing at all times. For an operational system, the ambient relative humidity ranges from 10% to 80% with 29°C (84.2°F) maximum dew point.

Table 22 Relative humidity specifications

Relative humidity	Specifications
Storage	5% to 95% RH with 33°C (91°F) maximum dew point. Atmosphere must be noncondensing at all times.
Operating	10% to 80% RH with 29°C (84.2°F) maximum dew point.

The maximum vibration specification of an operational system is 0.26 Grms at 5 Hz to 350 Hz (all operation orientations).The maximum vibration specification of a nonoperational system is 1.88 Grms at 10 Hz to 500 Hz for 15 min (all six sides tested).

Table 23 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 minutes (all six sides tested)

The maximum shock specification of an operational system is six consecutively executed shock pulses in the positive and negative x, y, and z axes of 40 G for up to 2.3 ms. The maximum shock specification of a nonoperational system is 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 24 Maximum shock pulse specifications

Maximum shock pulse	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.

The maximum altitude specification for an operational system is 3048 m (10,000 ft). The maximum altitude specification for a nonoperational system is 12,000 m (39,370 ft).

Table 25 Maximum altitude specifications

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

If the operating temperature of a system is up to 35°C (95°F), the maximum temperature is reduced by 1°C/300 m (1°F/547 ft) above 950 m (3,117 ft). If the operating temperature of a system is 35 °C–40 °C (95 °F–104 °F), the maximum temperature is reduced by 1°C/175 m (1°F/319 ft) above 950 m (3,117 ft). If the operating temperature of a system is 40 °C–45 °C (104–113 °F), the maximum temperature is reduced by 1°C/125 m (1°F/228 ft) above 950 m (3,117 ft).

Table 26 Operating temperature derating specification

Operating temperature derating	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).
35–40 °C (95–104 °F)	Maximum temperature is reduced by 1°C/175 m (1°F/319 ft), above 950 m (3,117 ft).
40–45 °C (104 °F–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 standard operating temperature for altitude less than 950 m or 3117 ft ranges 10 °C–35°C with no direct sunlight on the equipment.

ⓘ **Note:** The 2.5-inch hard drive chassis supports a maximum of 145 W processors.

Table 27 Standard operating temperature specifications

Standard operating temperature	Specifications
Continuous operation (for altitude less than 950 m or 3117 ft)	10 °C–35°C (50 °F–95°F) with no direct sunlight on the equipment.

Expanded operating temperature

When the system is in continuous operation, the expanded operating temperature ranges 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 35 °C – 40°C, derate maximum allowable temperature by 1°C per 175 m above 950 m (1°F per 319 ft). When the system is operating at < 1% of annual operating hours, the expanded operating temperature is –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 40 °C–45°C, derate maximum allowable temperature by 1°C per 125 m above 950 m (1°F per 228 ft).

Table 28 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 35 °C – 40°C, derate maximum allowable temperature by 1°C per 175 m (1°F per 319 ft.) above 950 m (3,1171 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 40 °C – 45°C, derate maximum allowable temperature by 1°C per 125 m (1°F per 228 ft.) above 950 m (3.117 ft.).

ⓘ **Note:** When operating in the expanded temperature range, the performance of the system 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.

Particulate and gaseous contamination specifications

The following table defines the limitations that help avoid any damages to the IT equipment and/or, or both 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 must rectify the environmental conditions. Remediation of environmental conditions is the responsibility of the customer.

Air filtration specification: Data center air filtration as defined by ISO Class 8 per ISO 14644-1 should have a 95% upper confidence limit. Note: This condition applies only to data center environments. 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 MERV11 or MERV13 filtration. Conductive dust specification: Air must be free of conductive dust, zinc whiskers, or other conductive particles. Note: This condition applies to data center and nondata center environments. Corrosive dust specification: 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 29 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 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.

The copper coupon corrosion rate is <300 Å/month per Class G1 as defined by ANSI/ISA71.04-1985. The silver coupon corrosion rate is <200 Å/month as defined by AHSRAE TC9.9.

Table 30 Gaseous contamination specifications

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

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

Technical specifications

CHAPTER 4

Initial setup and configuration

For assistance on installation and deployment, contact your Dell EMC account team or your reseller for installation services.

⚠️ **WARNING** During the VxRail deployment process, an iDRAC account named **vxadmin** or **PTAdmin** is created. This account provides hardware information the **VxRail Manager** and is required for **VxRail Manager** and cluster to function properly. Ensure that you do not modify or delete this account.

ⓘ **Note:** Do not install the appliance into a rack, or turn on the appliance without the initial configuration of your appliance.

CHAPTER 5

Pre-operating system management applications

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

(i) Note:

- This appliance requires installation and deployment services. Do not rack the appliance, or turn on the appliance without the initial configurations on your appliance. Contact your Dell EMC account team or your reseller for setting up your appliance.

- Dell EMC has optimized your appliance. It is not recommended to change any of these settings.

Options to manage the pre-operating system applications

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

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

(i) **Note:** Dell EMC has optimized your appliance and it is not recommended to change any of these settings.

iDRAC configuration

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

Log in to iDRAC

You can log in to iDRAC as:

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

If you have opted for secure default access to iDRAC, the iDRAC secure default password is available on the back of the appliance Information tag. If you have not opted for secure default access to iDRAC, then the default user name and password are `root` and `calvin`. You can also log in by using Single Sign-On or Smart Card.

(i) **Note:** You must have iDRAC credentials to log in to iDRAC.

(i) **Note:** Ensure that you change the default user name and password after setting up the iDRAC IP address.

The iDRAC IP address is pre-configured for DHCP. This can be changed to a static IP address by logging into iDRAC.

(i) **Note:**

- To access iDRAC, connect the network cable to the Ethernet connector 1 on the system board.
- Ensure that you change the default user name and password after setting up the iDRAC IP address.

CHAPTER 6

Replacing and adding hardware

You may be able to add or replace hardware components on your VxRail Appliance such as hard disk drives (HDDs), solid state drives (SSDs), power supplies, and so on. Only qualified personnel should perform these procedures. For some hardware components, you may need to contact Customer Support to arrange for repair or replacement. Refer to the online support website or SolVe Online for VxRail for hardware-specific information.

Using SolVe Online for VxRail Series procedures

Step-by-step instructions for procedures such as replacing hardware or performing system administrative tasks are available through SolVe Online and the SolVe Desktop application.

⚠ CAUTION To avoid potential data loss, refer to the VxRail Series procedures in SolVe Online or the SolVe Desktop application before performing any hardware replacement or upgrade activity.

Access SolVe Online for VxRail through your Web browser.

For more information about SolVe for VxRail, refer to KB 525271.

You must have an online support account to use SolVe Online.

Supported hardware components

Refer to the online support website or SolVe Online for VxRail for hardware-specific information.

ⓘ Note: The list of FRU and CRU components is not exhaustive.

This table describes Supported hardware components.

Table 31 Supported hardware components

Hardware Components	Customer Replaceable Unit (CRU)	Field Replaceable Unit (FRU)
System Memory	No	Yes
NVMe Drive	Yes	No
PCIe Network Interface Cards	No	Yes
Micro SDHC Card	No	Yes
Power Supply Unit	Yes	No
Processor	No	Yes
System board	No	Yes
M.2 SATA disk	No	Yes

System memory

The system supports DDR4 registered DIMM (RDIMMs) slots and load reduced DIMM (LRDIMMs) slots.

The system contains 48 memory sockets split into four sets of 12 sockets; one set for each 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 13 Memory socket locations
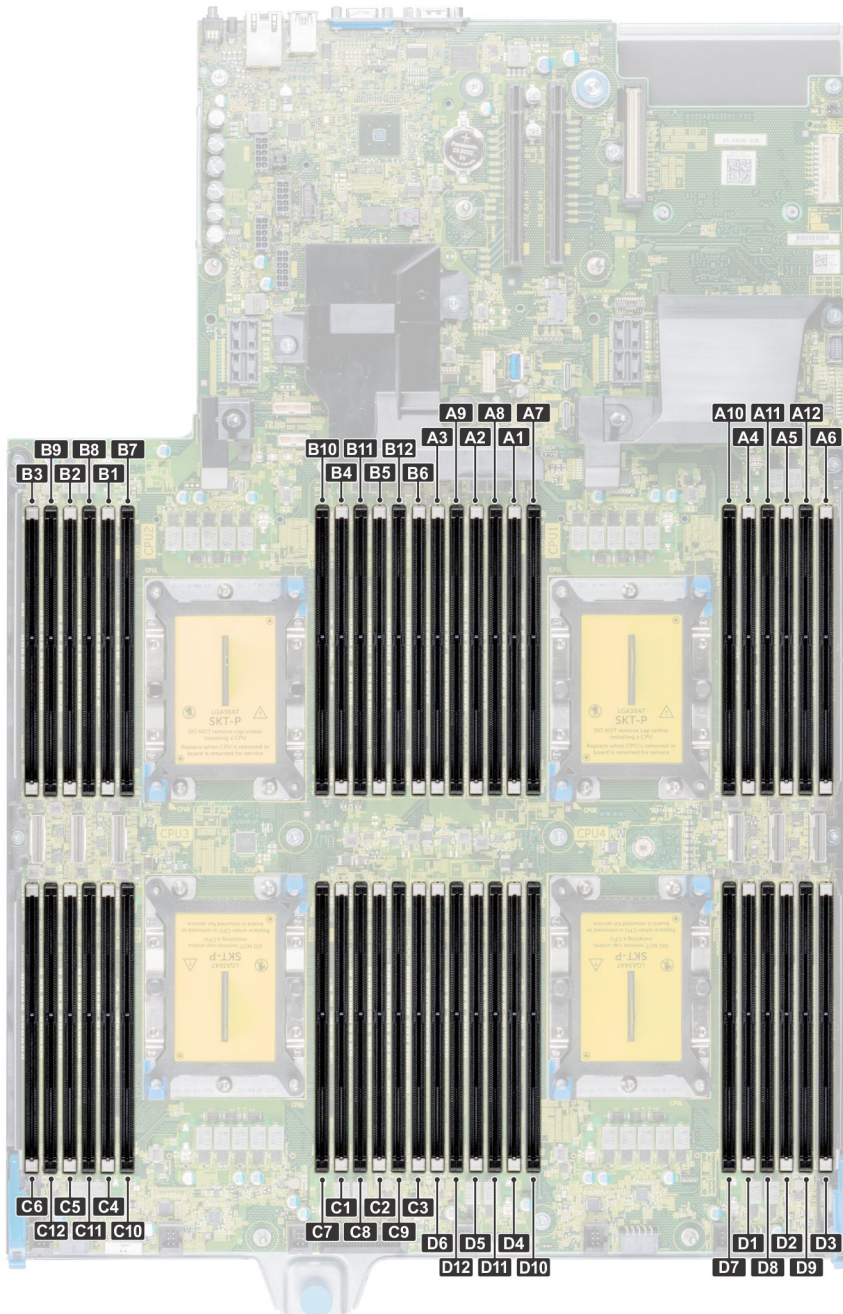
The following table provides detailed information about the memory channels:

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

Table 32 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

Table 32 Memory channels (continued)

Processor	Channel 0	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5
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

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 may operate at frequency can be 2933 MT/s, 2666 MT/s, 2400 MT/s, or 2133 MT/s depending on the following factors:

- System profile selected (for example, Performance Optimized, or Custom [can be run at high speed or lower]).
- Maximum supported DIMM speed of the processors. For memory frequency of 2933 MT/s, one DIMM per channel is supported.
- Maximum supported speed of the DIMMs.

(i) **Note:** MT/s indicates DIMM speed in MegaTransfers per second.

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:

- All DIMMs must be DDR4.
- 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 quad-processor systems, sockets A1 to A12, sockets B1 to B12, sockets 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.
- Mixing of more than two memory module capacities in a system is not supported.
- Unbalanced memory configurations will result in a performance loss so always populate memory channels identically with identical DIMMs for best performance.

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.

PCIe Risers and slots

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

The VxRail P580N appliance supports PCI express (PCIe) generation 3 expansion cards that can be installed on the system board using expansion card risers.

ⓘ **Note:** To avoid data loss, ensure that you refer to the procedures in SolVe Online for VxRail or the SolVe Desktop application before performing any memory or expansion card replacement or upgrade procedures.

ⓘ **Note:** A System Event Log (SEL) event is logged if an expansion card riser is unsupported or missing. It does not prevent your appliance from turning on and no BIOS POST message or F1/F2 pause is displayed.

The following table provides detailed information about the expansion card riser specifications:

This table provides information about the expansion card riser configuration for the VxRail P580N system.

Table 33 Expansion card riser configurations

				CPU1 (PCIe Ports)		CPU2 (PCIe Ports)	
				RSR1A	On Planar	On Planar	RSR2A
Platform location	Width	Length	Height	XHXXK			4KN16
PCIe Slot-2	DW	FL	FH	X16			
PCIe Slot-3	SW	HL	LP		X16		
PCIe Slot-4	SW	HL	LP			X16	
PCIe Slot-6	DW	FL	FH				X16

ⓘ **Note:** For more information on expansion card risers, see Meeseeks PCIe Configuration Tool.

Expansion card installation guidelines

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

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

This table shows the x16 PCIe riser 1+ x16 PCIe riser 2 configuration details.

Table 34 x16 PCIe riser 1+ x16 PCIe riser 2 configuration

Card type	Manufacturer	Slot priority	Riser height	Maximum number of cards supported	Card length	Card height	Maximum PCIe width supported
BOSS	Dell design	3	LP	1	HL	LP	x4
BOSS	Dell design	3	LP	1	HL	LP	x4
BOSS	Dell design	3	LP	1	HL	LP	x8
BOSS	Dell design	3	LP	1	HL	LP	x8
BOSS	Dell design	3	LP	1	HL	LP	x8
25G NICs	Broadcom	4	LP	1	HL	LP	x8
25G NICs	Broadcom	2,6	FH	2	HL	FH	x8
25G NICs	Mellanox	2,6	FH	2	HL	FH	x8
25G NICs	Mellanox	4	LP	1	HL	LP	x8
FC16 HBA	Emulex	4	LP	1	HL	LP	x8
FC16 HBA	Qlogic	4	LP	1	HL	LP	x8
10Gb NICs	INTEL	2,6	FH	2	HL	FH	x8
10Gb NICs	INTEL	2,6	FH	2	HL	FH	x8
10Gb NICs	INTEL	2,6	FH	2	HL	FH	x8
10Gb NICs	INTEL	4	LP	1	HL	LP	x8
10Gb NICs	INTEL	2,6	FH	2	HL	LP	x4
10Gb NICs	INTEL	4	LP	1	HL	LP	x4
10Gb NICs	Qlogic	2,6	FH	2	HL	LP	x8
10Gb NICs	Qlogic	2,6	FH	2	HL	LP	x8
10Gb NICs	Qlogic	4	LP	1	HL	LP	x8
10Gb NICs	Qlogic	4	LP	1	HL	LP	x8
10Gb NICs	Qlogic	2,6	FH	2	HL	FH	x8
10Gb NICs	Qlogic	4	LP	1	HL	LP	x8
10Gb NICs	Qlogic	2,6	FH	2	HL	FH	x8
10Gb NICs	INTEL	4	LP	1	HL	LP	x8
rNDC	Broadcom	Integrated Slot	None	1	None	rNDC	x8
rNDC	Broadcom	Integrated Slot	None	1	None	rNDC	x8
rNDC	INTEL	Integrated Slot	None	1	None	rNDC	x8
rNDC	INTEL	Integrated Slot	None	1	None	rNDC	x8

Table 34 x16 PCIe riser 1+ x16 PCIe riser 2 configuration (continued)

Card type	Manufacturer	Slot priority	Riser height	Maximum number of cards supported	Card length	Card height	Maximum PCIe width supported
rNDC	Mellanox	Integrated Slot	None	1	None	rNDC	x8
rNDC	Qlogic	Integrated Slot	None	1	None	rNDC	x8
rNDC	Qlogic	Integrated Slot	None	1	None	rNDC	x8
rNDC	Qlogic	Integrated Slot	None	1	None	rNDC	x8
rNDC	Qlogic	Integrated Slot	None	1	None	rNDC	x8
100G NICs	Mellanox	4	LP	1	HL	LP	X16
100G NICs	Mellanox	2,6	FH	2	HL	FH	X16