EMC® VNX™ Family
VNX7500™

Hardware Information Guide

REV A03

October, 2011

This guide describes one of five models available in the VNX Series, the EMC® VNX7500™. This document provides an overview of the architecture, components, and features of the VNX7500. The specific aspects of the Block and File (Unified) VNX7500 platform hardware and its major components include the front and rear connectors and LED indicators on the storage processor enclosure (SPE), the 1U and 2U standby power supply (SPS), the Control Station, the Data Mover enclosure, and the 2U, 25 (2.5-inch), the 3U, 15 (3.5-inch), or the 4U, 60 (2.5-inch or 3.5-inch) disk drive disk-array enclosure (DAE).

This guide is available online at https://mydocs.emc.com/VNX/. Go to the **About VNX** section, and then select **Learn about VNX**. Next, follow the steps in the wizard.

Topics include:

EMC²

Product software and hardware release revisions

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC representative if a product does not function properly or does not function as described in this document.

Note: This document was accurate at publication time. New versions of this document might be released on the EMC online support website. Check the EMC online support website to ensure that you are using the latest version of this document.

Revision history

The following table presents the revision history of this document:

Revision	Date	Description
A03	October, 2011	The following items were updated: • New EMC look and feel • Several minor editorial changes • "4U, 60 (2.5- or 3.5-inch) DAE" on page 80
A02	May, 2011	Made several minor editorial changes.
A01	March, 2011	First release of the *VNX7500 Hardware Information Guide*

Where to get help

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Product information — For documentation, release notes, software updates, or information about EMC products, licensing, and service, go to the EMC online support website (registration required) at:

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Technical support — For technical support, go to EMC online support and select Support. On the Support page, you will see several options, including one to create a service request. Note that to open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

How this document is organized

The major sections of this guide are listed in the following table.

Title	Description
"Overview" on page 6	Describes the software and hardware features of a typical VNX7500 along with a front view example of the VNX7500.
"VNX7500 Block and File product description" on page 8	Describes and shows the front and rear views of a typical VNX7500.
"System component description" on page 17	Provides a description of the components that comprise a VNX7500. Along with a description, illustrations of each component are also shown.
"SPE front view" on page 17	Describes and illustrates the front of an SPE and the components that comprise the front of the SPE.
"DME front view" on page 20	Describes and illustrates the front of the DME and the components that comprise the front of the DME.
"Control Station front view" on page 22	Describes and illustrates the rear view of the Control Station used in the VNX7500.
"1U SPS rear view" on page 25	Describes and illustrates the 1U SPS used in the VNX7500.
"2U SPS rear view" on page 29	Describes and illustrates the 2U SPS used in the VNX7500.
"SPE rear view" on page 33	Describes and illustrates the rear of an SPE and the components that comprise the rear of the SPE.
"DME rear view" on page 37	Describes and illustrates the rear of the DME and the components that comprise the rear of the DME.
"Control Station rear view" on page 40	Describes and illustrates the rear view of the Control Station used in the VNX7500.
"Disk-array enclosure (DAE)" on page 63	Describes and illustrates the three types of DAEs available for the VNX7500.
"VNX7500 DAE cabling" on page 96	Describes the types of cabling available for the VNX7500 platform. The cabling can be either interleaved or stacked depending your specific requirements.

Related documentation

EMC provides the ability to create step-by-step planning, installation, and maintenance instructions tailored to your environment. To create VNX customized documentation, go to: https://mydocs.emc.com/VNX/.

To download a PDF copy of the desired publication, go to the following sections:

- For hardware-related books, go to the **About VNX** section, and then select **Learn about VNX**. Next, follow the steps in the wizard.
- For technical specifications, go to the **About VNX** section, and then select **View technical specifications**. Next, follow the steps in the wizard.

- For installation, adding, or replacing tasks, go to the **VNX tasks** section, and then select the appropriate heading. For example, to download a PDF copy of the *VNX7500 Block Installation Guide*, go to **Install VNX** and follow the steps in the wizard.
- For server-related tasks, go to the **Server tasks for the VNX5300, VNX5500, VNX5700, and VNX7500** section, and then select the appropriate heading. For example, to download a PDF copy of Adding or replacing hardware, go to **Add or replace hardware** and follow the steps in the wizard.

Overview

The EMC VNX series implements a modular architecture that integrates hardware components for Block, File, and Object with concurrent support for native NAS, iSCSI, Fiber Channel, and Fibre Channel over Ethernet (FCoE) protocols. The VNX series is based on Intel Xeon-based PCI Express 2.0 processors and delivers File (NAS) functionality via two to eight Data Movers and Block (iSCSI, FCoE, and FC) storage via dual storage processors using a full 6-Gb/s SAS disk drive topology.

The VNX7500 is a high-end/large-capacity storage platform. It offers Block, File, or Unified Block and File services. These services are composed of:

- **Block-only**—Includes a storage processor enclosure (SPE), a 1U 1.2 KW or a 2U 2.2 KW standby power supply (SPS), and disk-array enclosures (DAEs) for holding hard disk drives that are integrated to facilitate Fibre Channel, Fibre Channel over Ethernet (FCoE), and iSCSI Block services to Windows and UNIX hosts.
- **File-only**—Adds the Data Mover enclosure (DME) and Control Station (CS) to SPE, SPS, and DAEs to facilitate File services to CIFS/NFS clients.
- **Unified Block and File**—Uses same hardware as the File-only configuration but adds FC, iSCSI, and FCoE I/O connectivity to provide Block services to host simultaneously so as to provide File services to clients.

The VNX7500 platform supports three types of DAEs; a 15 drive 3.5-inch disk 3U enclosure, a 25 drive 2.5-inch disk 2U enclosure, and a 60 drive 2.5- or 3.5-inch disk 4U enclosure. Expansion of up to fifteen 4U DAEs and one 3U DAE (a maximum of 915 disk drives), sixty-six 3U DAEs (a maximum of 990 3.5-inch disk drives), or up to forty 2U DAEs (a maximum of 1000 2.5-inch disk drives) is possible.The VNX series is targeted at the entry-level to high-end/large-capacity storage environments that require advanced features, flexibility and configurability. The VNX series provides significant advancements in efficiency, simplicity, and performance.

As an high-end/large-capacity storage platform offering Block, File, and Unified services, the VNX7500 (Figure 1 on page 7) is one of the five models that make up the VNX series. For a quick look at the VNX7500 platform hardware features, see Table 1, “VNX7500 hardware feature quick reference,” on page 13.

Benefits include:

- Support for File (CIFS and NFS), Block (FC, iSCSI & FCoE) and Object
- Simple conversions when starting with a VNX series Block only platform by simply adding File services or starting with File only and adding Block services
- Support for both block and file auto-tiering with Fully Automated Storage Tiering (FAST) for Virtual Pools (VP - FAST VP)

- Unified replication with RecoverPoint support for both file and block data
- Updated unified management with Unisphere™ now delivering a more cohesive unified user experience

Figure 1 Example of a VNX7500 platform with front bezel

VNX7500 Block and File product description

This section shows an example of the front and rear views of a Block and File (Unified) VNX7500 platform.

Note: A fully configured Block and File (Unified) VNX7500 platform includes up to sixty-six 3U DAEs (a maximum of 990 3.5-inch disk drives), or up to forty 2U DAEs (a maximum of 1000 2.5-inch disk drives), up to fifteen[1] 4U DAEs and one 3U DAE (a maximum of 915 disk drives).

Front view

Figure 2 shows an example of the front view of a Block and File (Unified) VNX7500 platform configuration having a dual 1U SPS, an SPE, four DMEs (with two Data Movers per enclosure), and two Control Stations.

IMPORTANT

Use a dual 2U SPS when a 4U DAE with Flash drives is used in a Vault drive configuration. Otherwise, the dual 1U SPS is used with the 2U or 3U DAE as the Vault drive.

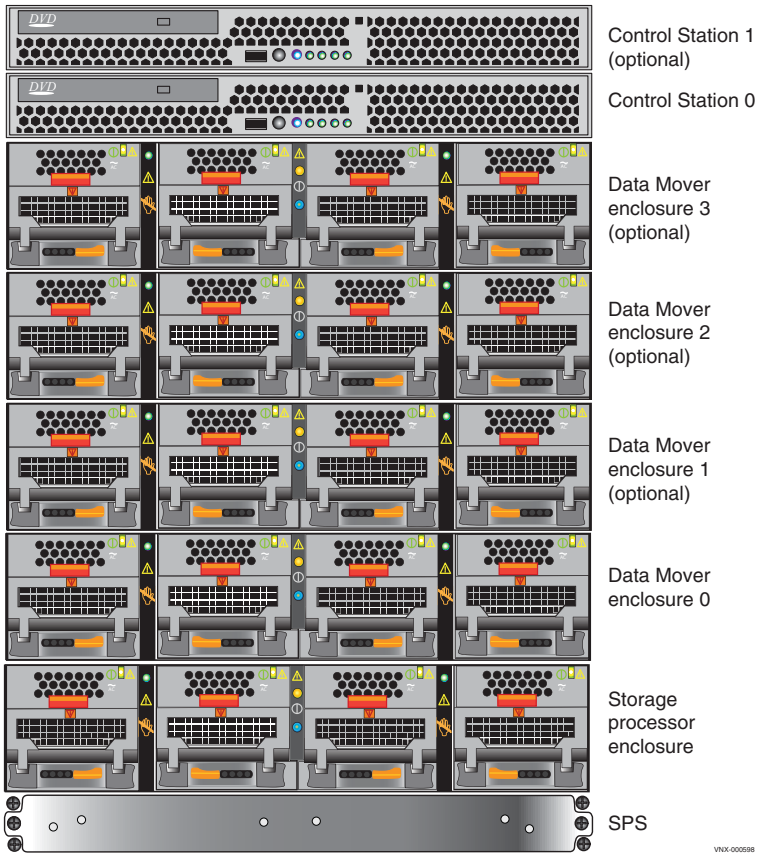


Figure 2 Example of a Block and File (Unified) VNX7500 platform (front view)

1. This configuration is true for a Block and File (Unified) VNX7500 platform. In the Block version, up to sixteen 4U DAEs and two 3U DAE (a maximum of 990 disk drives) is possible

Note: Figure 2 on page 8 shows only the VNX7500 platform components. The DAEs are not shown.

Note: The configuration in Figure 2 on page 8 is primarily used with the 3U or 2U DAEs only. The configuration in Figure 4 on page 10 is primarily used with a combination of the 4U and 3U DAEs.

Rear view

Figure 3 shows an example of the rear view of the Block and File (Unified) VNX7500 platform configuration having a dual 1U SPS, an SPE with two storage processors (SP A and B, each SP includes a management module and three I/O modules), four Data Mover enclosures (with two Data Movers per enclosure), and two Control Stations. Each Data Mover includes a management module and one I/O module.

IMPORTANT

You use a dual 2U SPS when a 4U DAE with Flash drives is used in a Vault drive configuration. Otherwise, the dual 1U SPS is used with the 2U or 3U DAE as the Vault drive.

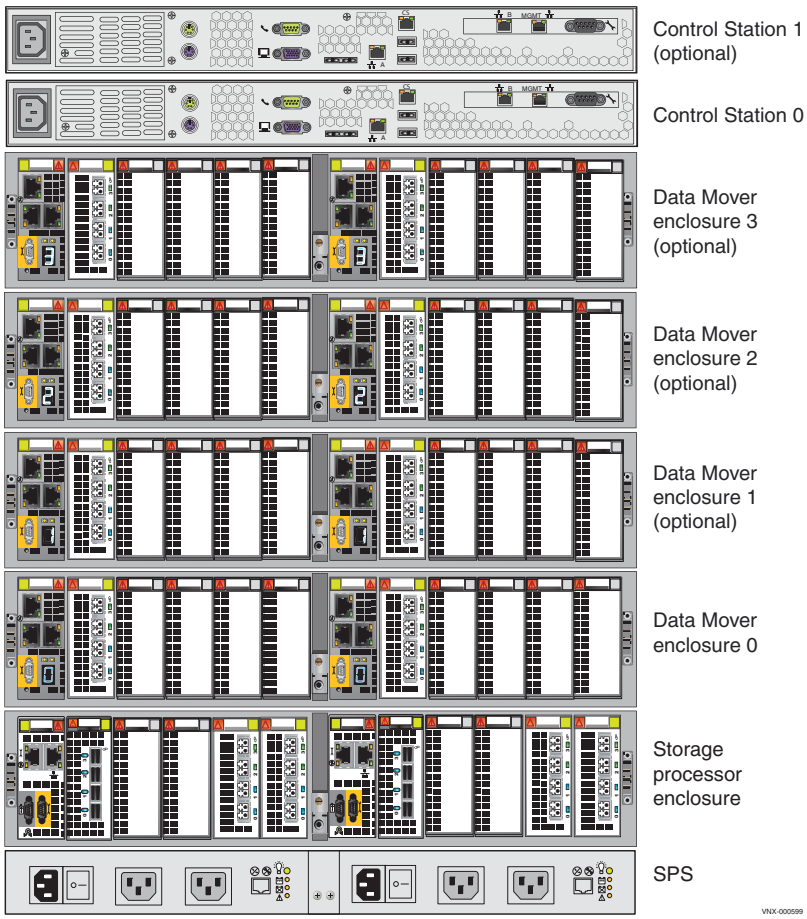


Figure 3 Example of a Block and File (Unified) VNX7500 platform (rear view)

Note: Figure 3 on page 9 shows only the VNX7500 platform components. The DAEs are not shown.

IMPORTANT

The 6-Gb/s SAS I/O module is always located in slot 0 of SP A and SP B.)

Note: In the example storage processor enclosure in Figure 3 on page 9, the first FC I/O module is located in slot 4 and the second FC is located in slot 3. As a rule, the second FC is in slot 3 when assembled at the factory. However, if your Block and File (Unified) VNX7500 platform did not come from the factory this way, you can install the FC I/O module in slots 1, 2, or 3.

Front view

Figure 4 shows an example of the front view of a Block and File (Unified) VNX7500 platform configuration having a dual 2U SPS, an SPE, four DMEs (with two Data Movers per enclosure), and two Control Stations.

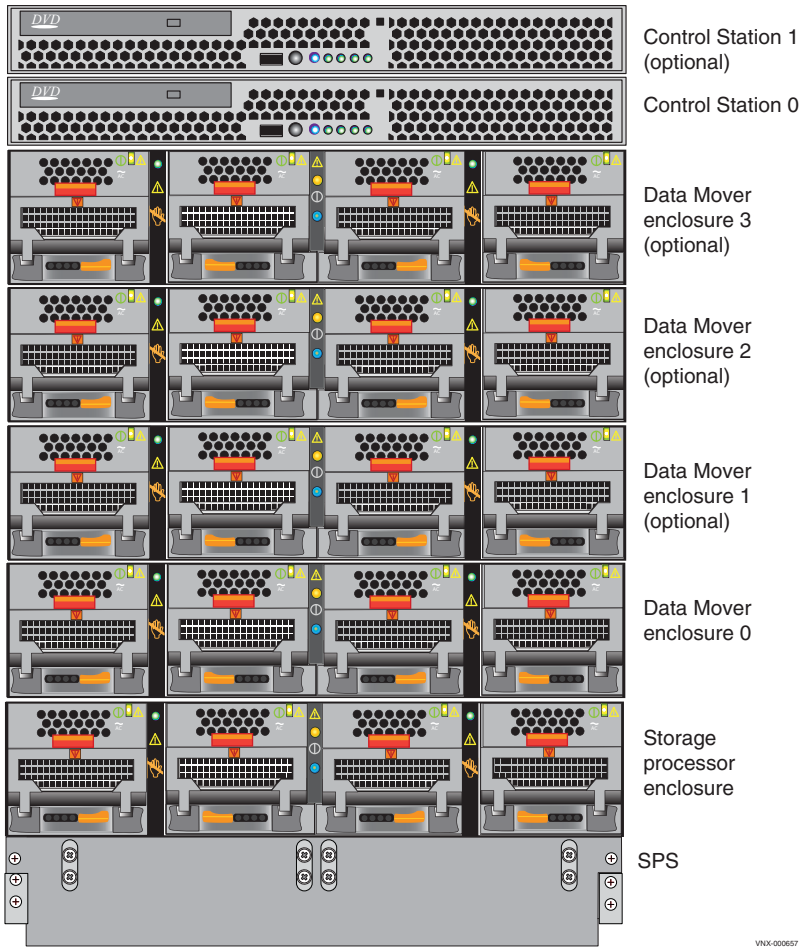


Figure 4 Example of a Block and File (Unified) VNX7500 platform using a 2U SPS (front view)

IMPORTANT

A dual 2U SPS is used when a 4U DAE with Flash drives is used in a Vault drive configuration. Otherwise, the dual 1U SPS is used with the 3U DAE as the Vault drive.

Note: Figure 4 on page 10 shows only the VNX7500 platform components. The DAEs are not shown.

Note: The configuration in Figure 2 on page 8 is primarily used with the 3U or 2U DAEs only. The configuration in Figure 4 on page 10 is primarily used with a combination of the 4U and 3U DAEs.

Rear view

Figure 5 shows an example of the rear view of the Block and File (Unified) VNX7500 platform configuration having a dual 2U SPS, an SPE with two storage processors (SP A and B, each SP includes a management module and three I/O modules), four Data Mover enclosures (with two Data Movers per enclosure), and two Control Stations. Each Data Mover includes a management module and one I/O module.

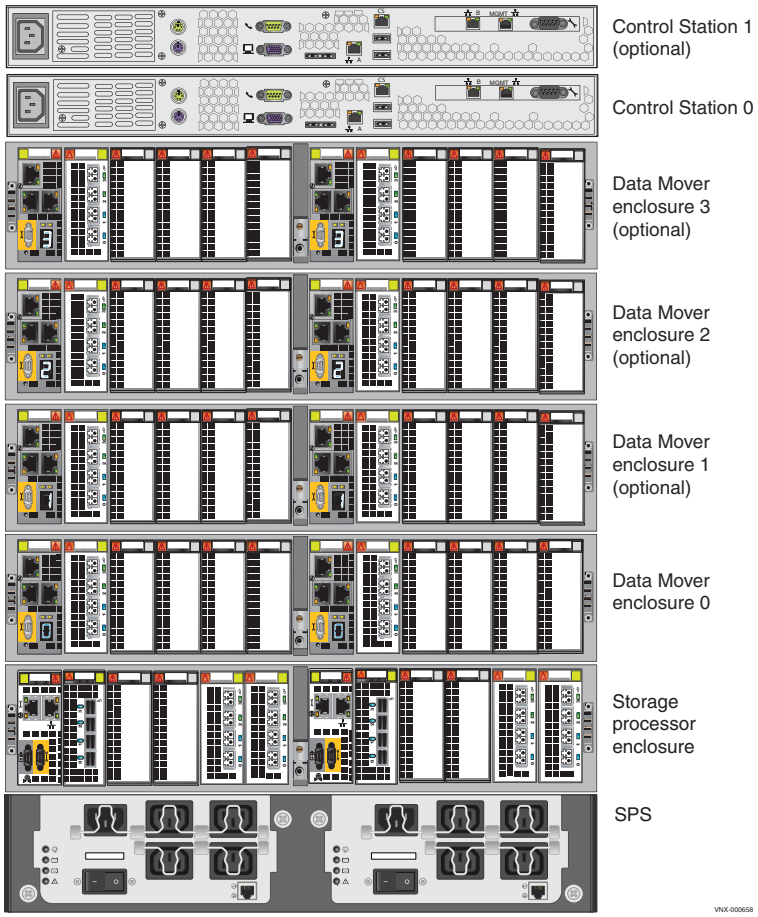


Figure 5 Example of a Block and File (Unified) VNX7500 platform using a 2U SPS (rear view)

IMPORTANT

A dual 2U SPS is used when a 4U DAE with Flash drives is used in a Vault drive in a 40U Dense rack. Otherwise, the dual 1U SPS is used with the 3U DAE as the Vault drive.

Note: Figure 5 on page 11 shows only the VNX7500 platform components. The DAEs are not shown.

IMPORTANT

The 6-Gb/s SAS I/O module is always located in slot 0 of SP A and SP B.)

Note: In the example storage processor enclosure in Figure 5 on page 11, the first FC I/O module is located in slot 4 and the second FC is located in slot 3. As a rule, the second FC is in slot 3 when assembled at the factory. However, if your Block and File (Unified) VNX7500 platform did not come from the factory this way, you can install the FC I/O module in slots 1, 2, or 3.

Hardware features

The hardware features for the Block and File (Unified) VNX7500 platform are described in this section of the guide.

Topics covered include:

- A VNX7500 platform using only 2U or 3U DAEs
- A VNX7500 platform using a combination of the 4U and 3U DAEs

VNX7500 platform using 2U or 3U DAEs

Contained in a 8 to 12U architecture, the Block and File (Unified) VNX7500 platform weighs approximately 428.5 lb (194.36 kg)[2]. With the SPE or Data Mover enclosure having the deepest dimension within the cabinet, the Block and File (Unified) VNX7500 platform measures 14 to 21 inches high (8 to 12U) x 18.92 inches wide x 24.25 inches deep (35.56 to 53.34 cm x 48.05 cm x 61.59 cm). Between the front and rear enclosure, a midplane distributes power and signals to all the enclosure components. The CPU modules and the power supply/cooling (fan) modules plug directly into the midplane connections.

Note: The previously mentioned dimensions are approximate and do not include the cabinet enclosure and any DAEs.

For physical, environmental, and power details, refer to the *VNX7500 Storage System Technical Specifications and Operating Limits* document.

2. A fully loaded VNX7500 system includes two Control Stations, one SPE, two SPSs, and four Data Mover enclosures.

Table 1 VNX7500 hardware feature quick reference

			File				Block			
Minimum form factor	Maximum # of drives	Drive types	Config. I/O slots per Data Mover	Data Movers	System memory per Data Mover	Protocols	Config. I/O slots per SP	SPs	System memory per SP	Protocols
8U-12U[1]	1000	3.5 in. SAS, NL-SAS, Flash, and 2.5 in. 10 K SAS	5	2 to 8	24 GB	NFS, CIFS, MPFS[2] and pNFS[3]	5	2	24 GB	FC, iSCSI, and FCoE

1. Does not include DAEs.
2. MPFS = Multi-Path File System
3. pNFS = parallel-NFS

Configured for AC-input power, the Block and File (Unified) VNX7500 platform includes the following hardware features:

- One dual 1U standby power supply (SPS)
- One SPE:
  - On the front of the SPE, two power supply/cooling (fan) modules and one CPU module per SP are supported.
    - A CPU module with an Intel Xeon 4-core 2.8-GHz processor with six Double Data Rate Three (DDR3) synchronous dynamic RAM (SDRAM) slots supporting 2-, 4-, and 8-GB SDRAM
  - On the rear of the SPE, each storage processor (Figure 3 on page 9) consists of:
    - One management module
    - Five PCI Gen 2 x4 I/O module slots supporting a combination of the following five UltraFlex™ I/O modules:

      Four-port 6-Gb/s SAS (slot 0 only)

      Four-port 8-Gb/s optical Fibre Channel (running at 2, 4, or 8-Gb/s)

      Two-port 10-Gb/s optical or active Twinax[3] (iSCSI protocol)

      Two-port 10-Gb/s optical or active Twinax[6] Fibre Channel over Ethernet (FCoE)

      Four-port 1-Gb/s copper iSCSI
- One to four Data Mover enclosures with the first Data Mover enclosure having two Data Movers and the remaining three Data Mover enclosures having from two to six Data Movers for a total of 8 Data Movers. Each Data Mover consists of:

3. The two-port 10-Gb/s and FCoE I/O modules can also use active twinaxial (Twinax) cables. Twinax is a type of cable similar to coax, but with two inner conductors instead of one. These cables will be supplied in lieu of the SFP+ when so ordered.

- A CPU module with an Intel Xeon 4-core 2.8-GHz processor with six Double Data Rate Three (DDR3) synchronous dynamic RAM (SDRAM) slots supporting 2-, 4-, and 8-GB SDRAM
- Five PCI Gen 2 x4 I/O module slots supporting a combination of the following four UltraFlex I/O modules:
  - Four-port 8-Gb/s optical (running at 2, 4, or 8 Gb/s); in slot 0
  - Two-port 10-Gb/s optical or active Twinax[6]
  - Four-port 1-Gb/s copper
  - Two-port 1-Gb/s copper plus two-port 1 Gb/s optical

  Note: The maximum number of I/O modules for the Block and File (Unified) VNX7500 platform is five per Data Mover and any the combination of these I/O modules must be the same for each Data Mover.
- Two management modules per Data Mover enclosure (or, one per Data Mover)
- Two power supply/cooling (fan) modules per CPU module

◆ One to two Control Stations. Each Control Station consists of the following features:

- Intel 2.0 GHz single core Celeron processor
- 2 GB of RAM
- One 250-GB SATA hard drive
- Two rear-mounted USB ports and one front-mounted USB port
- Four RJ-45 10BASE-T/100BASE-TX/1000BASE-T network interface connectors (located on the rear panel)
- Two integrated serial ports, one for laptop/console redirection and one for the CallHome modem
- One DVD-ROM drive

◆ Expansion of up to sixty-six 3U, 15 (3.5-inch) disk drive DAEs (maximum of 990 drives) or up to forty 2U, 25 (2.5-inch) disk drive DAEs (maximum of 1000 drives)

◆ Any required cables including LAN cables, modem cables, and serial DB-9 cable.

◆ Mounting rails with hardware

◆ Front bezel with VNX7500 badge

VNX7500 platform using a combination of 4U and 3U DAEs

Contained in a 9 to 13U architecture, the Block and File (Unified) VNX7500 platform weighs approximately 501.5 lb (227.47 kg)[4]. With the 2U SPS having the deepest dimension within the cabinet, the Block and File (Unified) VNX7500 platform measures 15.75 to 22.75 inches high (9 to 13U) x 18.92 inches wide x 28 inches deep (40 to 57.78

4. A fully loaded VNX7500 system includes two Control Stations, one SPE, on dual 2U SPS, and four Data Mover enclosures.

cm x 48.05 cm x 71.12 cm). Between the front and rear enclosure, a midplane distributes power and signals to all the enclosure components. The CPU modules and the power supply/cooling (fan) modules plug directly into the midplane connections.

Note: The previously mentioned dimensions are approximate and do not include the cabinet enclosure and any DAEs.

Table 2 VNX7500 hardware feature quick reference

			File				Block			
Minimum form factor	Maximum # of drives	Drive types	Config. I/O slots per Data Mover	Data Movers	System memory per Data Mover	Protocols	Config. I/O slots per SP	SPs	System memory per SP	Protocols
9U-13U[1]	1000	3.5 in. SAS, NL-SAS, Flash, and 2.5 in. 10 K SAS	5	2 to 8	24 GB	NFS, CIFS, MPFS[2] and pNFS[3]	5	2	24 GB	FC, iSCSI, and FCoE

1. Does not include DAEs.
2. MPFS = Multi-Path File System
3. pNFS = parallel-NFS

For physical, environmental, and power details, refer to the *VNX7500 Storage System Technical Specifications and Operating Limits* document.

Configured for AC-input power, the Block and File (Unified) VNX7500 platform includes the following hardware features:

- One dual 2U standby power supply (SPS)[5]
- One SPE:
  - On the front of the SPE, two power supply/cooling (fan) modules and one CPU module per SP are supported.
    - A CPU module with an Intel Xeon 4-core 2.8-GHz processor with six Double Data Rate Three (DDR3) synchronous dynamic RAM (SDRAM) slots supporting 2-, 4-, and 8-GB SDRAM
  - On the rear of the SPE, each storage processor (Figure 3 on page 9) consists of:
    - One management module
    - Five PCI Gen 2 x4 I/O module slots supporting a combination of the following five UltraFlex™ I/O modules:

      Four-port 6-Gb/s SAS (slot 0 only)

      Four-port 8-Gb/s optical Fibre Channel (running at 2, 4, or 8-Gb/s)

5. A dual 2U SPS is used when the 4U DAE with Flash drives is used in a Vault drive in a 40U Dense rack. Otherwise, the dual 1U SPS is used with the 3U DAE as the Vault drive.

Two-port 10-Gb/s optical or active Twinax[6] (iSCSI protocol)

Two-port 10-Gb/s optical or active Twinax[9] Fibre Channel over Ethernet (FCoE)

Four-port 1-Gb/s copper iSCSI

- One to four Data Mover enclosures with the first Data Mover enclosure having two Data Movers and the remaining three Data Mover enclosures having from two to six Data Movers for a total of 8 Data Movers. Each Data Mover consists of:
  - A CPU module with an Intel Xeon 4-core 2.8-GHz processor with six Double Data Rate Three (DDR3) synchronous dynamic RAM (SDRAM) slots supporting 2-, 4-, and 8-GB SDRAM
  - Five PCI Gen 2 x4 I/O module slots supporting a combination of the following four UltraFlex I/O modules:
    - Four-port 8-Gb/s optical (running at 2, 4, or 8 Gb/s); in slot 0
    - Two-port 10-Gb/s optical or active Twinax[9]
    - Four-port 1-Gb/s copper
    - Two-port 1-Gb/s copper plus two-port 1 Gb/s optical

    Note: The maximum number of I/O modules for the Block and File (Unified) VNX7500 platform is five per Data Mover and any the combination of these I/O modules must be the same for each Data Mover.

  - Two management modules per Data Mover enclosure (or, one per Data Mover)
  - Two power supply/cooling (fan) modules per CPU module
- One to two Control Stations. Each Control Station consists of the following features:
  - Intel 2.0 GHz single core Celeron processor
  - 2 GB of RAM
  - One 250-GB SATA hard drive
  - Two rear-mounted USB ports and one front-mounted USB port
  - Four RJ-45 10BASE-T/100BASE-TX/1000BASE-T network interface connectors (located on the rear panel)
  - Two integrated serial ports, one for laptop/console redirection and one for the CallHome modem
  - One DVD-ROM drive
- In a Block environment, expansion of up to sixteen 4U, 60 (2.5- or 3.5-inch) disk drive DAEs and two 3U, 15 (3.5-inch) disk drive DAEs (a maximum of 990 drives) is supported

6. The two-port 10-Gb/s and FCoE I/O modules can also use active twinaxial (Twinax) cables. Twinax is a type of cable similar to coax, but with two inner conductors instead of one. These cables will be supplied in lieu of the SFP+ when so ordered.

- In a Block and File (Unified) environment, expansion of up to thirteen 4U, 60 (2.5- or 3.5-inch) disk drive DAEs and three 3U, 15 (3.5-inch) disk drive DAEs (a maximum of 825 drives) is supported
- Any required cables including LAN cables, modem cables, and serial DB-9 cable.
- Mounting rails with hardware
- Front bezel with VNX7500 badge

System component description

This section provides a description of the Block and File (Unified) VNX7500 platform components. The description includes illustrations and explanations of the front and rear connectors and LED indicators.

Note: In the following sections, the illustrations and corresponding tables describe these individual components. These descriptions are for illustrative purposes only.

VNX7500 front view

As previously described, the Block and File (Unified) VNX7500 platform is made up of a dual 1U SPS or dual 2U SPS[7], an SPE, one to four DMEs with two to eight Data Movers, and one to two Control Stations. The following sections will describe the front (Figure 2 on page 8) view of the Block and File (Unified) VNX7500 platform components separately.

SPE front view

The front of the Block and File (Unified) VNX7500 platform SPE contains two enclosure status (power and fault) LEDs, as shown in Figure 6. Table 3 describes the SPE power and fault LEDs.

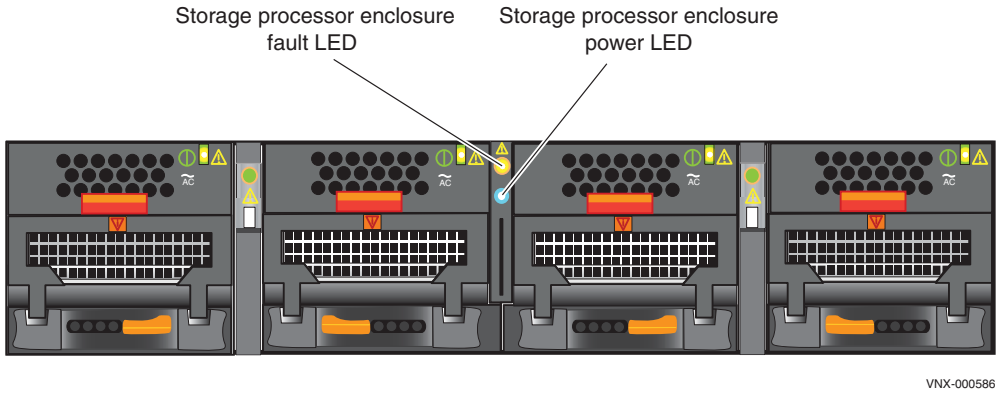


Figure 6 Storage processor enclosure LEDs

7. The dual 2U SPS is used in a VNX7500 platform environment when using the 4U, 60 disk drive DAE as a Vault drive in a 40U Dense rack.

Note: Figure 6 is a graphical representation of the Block and File (Unified) VNX7500 platform SPE with four power supply/cooling (fan) modules and two CPU modules installed.

Table 3 Storage processor enclosure LEDs

LED	Color	State	Description
Power	Blue	On	Storage processor enclosure is powered up, operating normally
	—	Off	Storage processor enclosure is powered down.
Fault	Amber	On	A replaceable component failed within the enclosure.
	—	Off	Storage processor enclosure operating normally.

CPU LEDs

The CPU modules in the Data Mover enclosure contain the power, fault, and unsafe-to-remove LEDs. Figure 7 shows the CPU LEDs and Table 4 describes them.

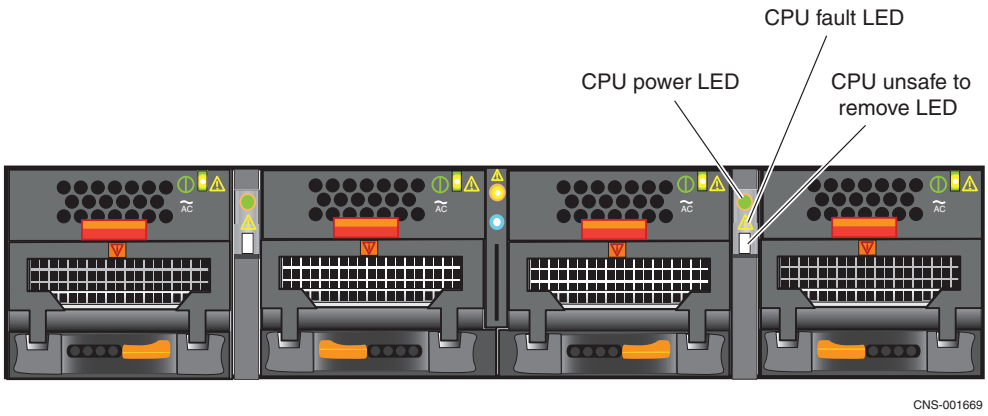


Figure 7 CPU LEDs

Table 4 CPU LEDs

LED	Color	State	Description
Power	Green	On	Storage processor is powered up, operating normally
	—	Off	Storage processor is powered down.

Table 4 CPU LEDs (continued)

LED	Color	State	Description
Fault	Amber	On	Storage processor has faulted.
		Blinking	Storage processor goes through six stages of power up: 1. Executes a BIOS check, blinking once every 4 seconds 2. Executes a POST check, blinking once every second 3. Loads the operating system, blinking four times a second
	Blue (see Note)	Blinking	4. Operating system loaded, blinking once every 4 seconds 5. Operating system starting drivers, blinking once every second 6. Operating system drivers operating, blinking four times a second
	—	Off	Storage processor operating normally.
Unsafe-to-remove	White	On	Storage processor is unsafe to remove.
	—	Off	Storage processor is safe to remove.
Note: The fault LED changes color from amber to blue when the operating system is loading, see step 4 in the description.			

Power supply/cooling (fan) module LED

The power supply/cooling (fan) modules have status LED on the front. Figure 8 shows the LEDs for the power supply/cooling (fan) modules and Table 5 describes them.

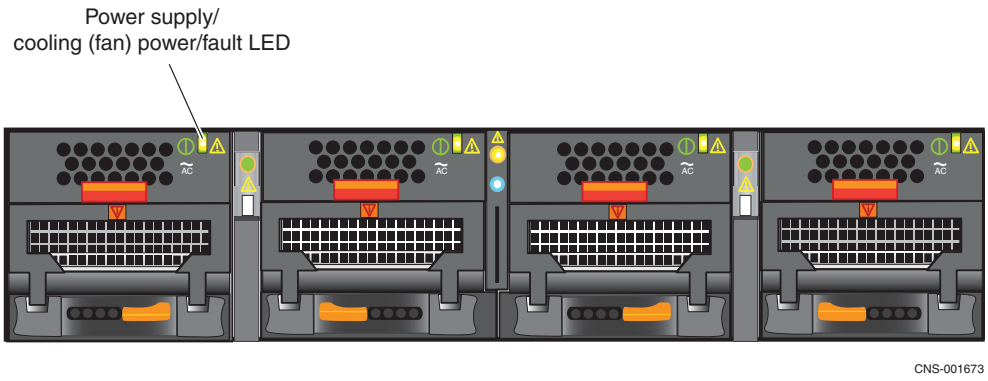


Figure 8 Power supply/cooling (fan) module LED

Table 5 Power supply/cooling (fan) module LED

LED	Color	State	Description
Power/Fault	Green	On	Normal (no faults detected)
	Amber	Blinking	Power supplied but external fault detected
	Amber	On	No power

DME front view

The front of the Block and File (Unified) VNX7500 platform Data Mover enclosure contains two enclosure status (power and fault) LEDs, as shown in Figure 9. Table 6 on page 20 describes the Data Mover enclosure power and fault LEDs.

Note: Figure 9 is a graphical representation of the Block and File (Unified) VNX7500 platform Data Mover enclosure with four power supply/cooling (fan) modules and two CPU modules installed.

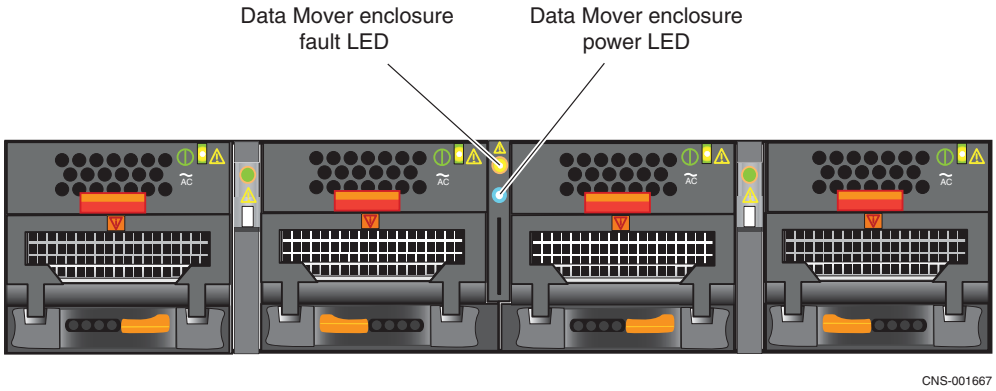


Figure 9 Data Mover enclosure LEDs

Table 6 Data Mover enclosure LEDs

LED	Color	State	Description
Power	Blue	On	Data Mover enclosure is powered up, operating normally
	—	Off	Data Mover enclosure is powered down.
Fault	Amber	On	A replaceable component failed within the enclosure. **Note:** When the enclosure fault LED is amber, look for the replaceable component within the enclosure that is causing the fault. Refer to the other status LED definitions in this section to determine which replaceable component failed.
	—	Off	Data Mover Enclosure operating normally.

CPU LEDs

The CPU modules in the Data Mover enclosure contain the power, fault, and unsafe-to-remove LEDs. Figure 10 shows the CPU LEDs and Table 7 describes them.

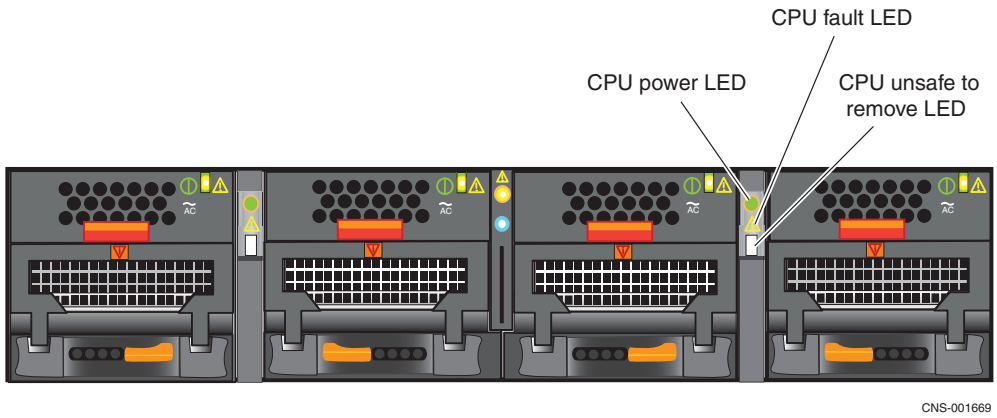


Figure 10 CPU LEDs

Table 7 CPU LEDs

LED	Color	State	Description
Power	Green	On	Data Mover is powered up and all components in the Data Mover are operating properly.
	—	Off	Data Mover is powered down.
Fault	Amber	On	Data Mover has faulted.
		Blinking	Data Mover goes through six stages of power up: 1. Executes a BIOS check, blinking once every 4 seconds 2. Executes a POST check, blinking once every second 3. Loads the operating system, blinking four times a second
	Blue (see Note)	Blinking	4. Operating system loaded, blinking once every 4 seconds 5. Operating system starting drivers, blinking once every second 6. Operating system drivers operating, blinking four times a second
	—	Off	Data Mover operating normally.
Unsafe-to-remove	White	On	Data Mover is unsafe to remove.
	—	Off	Data Mover is safe to remove.
Note: The fault LED changes color from amber to blue when the operating system is loading, see step 4 in the description.			

Power supply/cooling (fan) module LED

The power supply/cooling (fan) modules have status LED on the front. Figure 11 shows the LEDs for the power supply/cooling (fan) modules and Table 8 describes them.

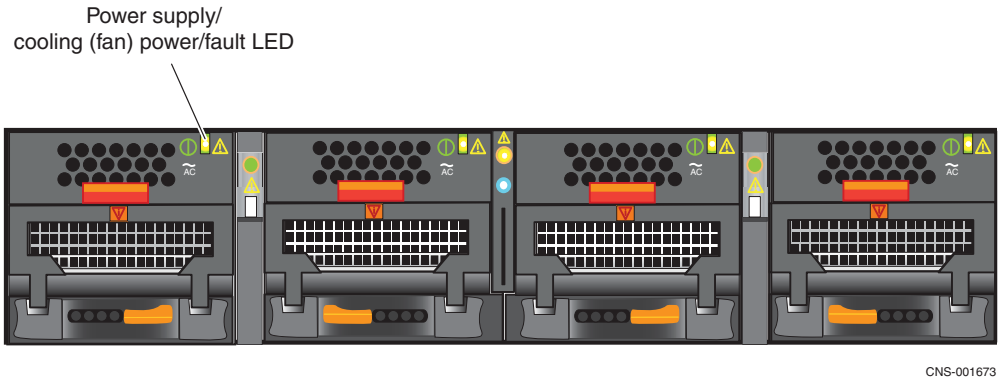


Figure 11 Power supply/cooling (fan) module LED

Table 8 Power supply/cooling (fan) module LED

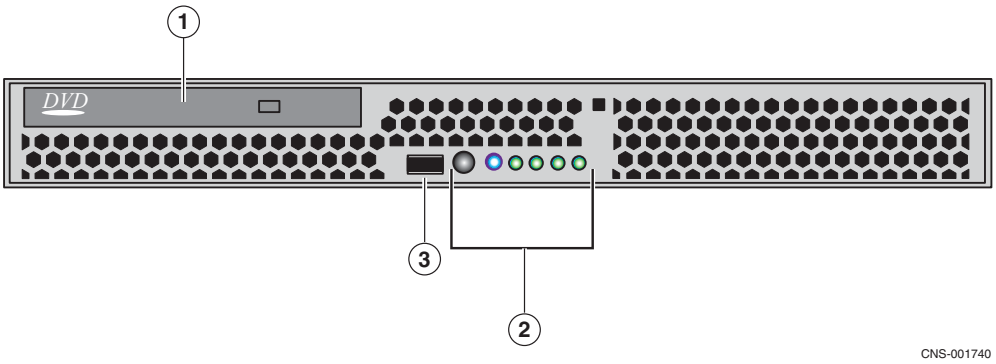
LED	Color	State	Description
Power/Fault	Green	On	Normal (no faults detected)
	Amber	Blinking	Power supplied but external fault detected
	Amber	On	No power

Control Station front view

On the front, viewing from left to right, the Block and File (Unified) VNX7500 platform Control Station includes the following hardware components:

- DVD-ROM drive
- USB 2.0 connector (not used)
- Control switch and status LEDs

Figure 12 on page 23 shows the orientation of these components.



1	DVD-ROM drive	3	USB 2.0 connector (not used)
2	Control Station switch and status LEDs (for a closer view, see Figure 13 on page 23)		

Figure 12 VNX7500 platform Control Station (front view)

Control Station switch and LEDs

Figure 13 shows the location of the Block and File (Unified) VNX7500 platform Control Station switch and LEDs on the front panel. Table 9 on page 24 describes the switch located on the front panel. Table 10 on page 24 describes the LEDs located on the front panel.

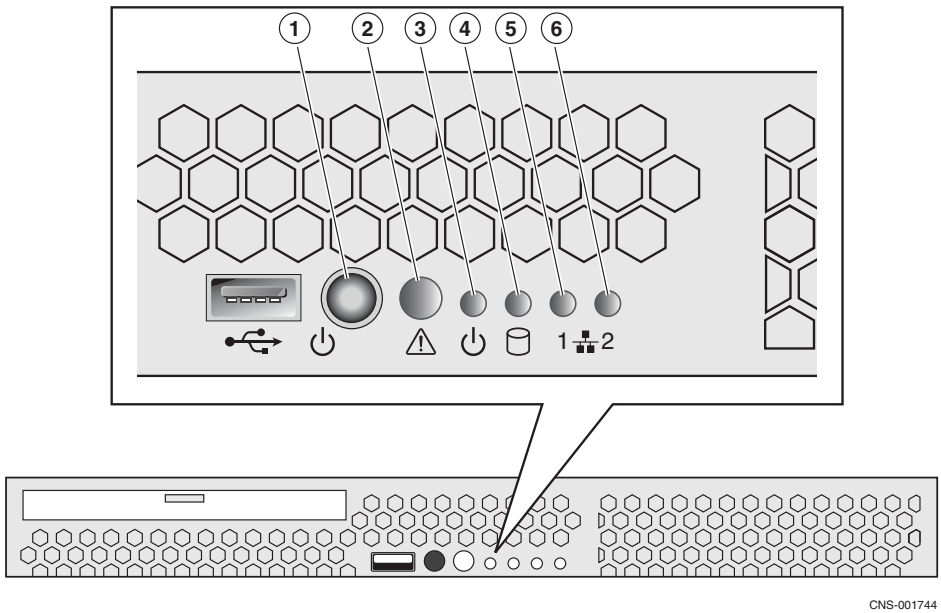


Figure 13 VNX7500 platform Control Station switch and LEDs

Table 9 Control Station switch

Switch	Description
Power push-button (location 1)	Toggles the Control Station power (push in and hold for about 10 seconds)

Table 10 Control Station LEDs

LED	Color	State	Description
System status/boot (location 2)	Green	On	Power on/system loaded and ready
		Blinking	Booting up[1] or system degraded
	Amber	On	Critical, non-recoverable error; system has failed due to: • Themtrip asserted • IERR asserted • Non-recoverable temperature threshold asserted. • Non-recoverable voltage asserted. • Power fault/Power control failure
		Blinking	Non-fatal alarm; system is likely to fail due to: • Critical temperature threshold asserted. • Critical voltage threshold asserted. • Critical fan threshold asserted.
	—	Off	Power off
System power/sleep or standby (location 3)	Green	On	Power on
		Blinking	Sleep (standby)
	—	Off	Power off
Internal hard drive activity (location 4)	Green	Blinking	Hard drive access
	—	Off	No hard drive activity
Onboard (integrated) Ethernet NIC 1 and 2 (locations 5 and 6, respectively)	Green	On	NIC link/no access
		Blinking	NIC link/LAN access

1. The system status LED flashes green while booting up.

VNX7500 rear view

On the rear, viewing from top to bottom, a Block and File (Unified) VNX7500 platform includes the following hardware components:

- One to two Control Stations
- One to four Data Mover enclosures with two to eight Data Movers
- One SPE with two storage processors (SPs), each SP (A and B) having one CPU module and one power supply module
- One dual 1U SPS or one dual 2U SPS

IMPORTANT

The dual 2U SPS is used in a VNX7500 platform environment when the 4U DAE is used as a Vault drive with Flash drives in 40U Dense rack. If the 3U, 15 DAE is used as the Vault drive, then you use the dual 1U SPS.

1U SPS rear view

The Block and File (Unified) VNX7500 platform includes two 1U, 1.2-kilowatt standby power supplies (SPSs) to maintain power to the Block and File (Unified) VNX7500 platform SP during power loss. Within the 1U SPS, a built-in DC battery pack is charged by way of an AC-DC converter. AC input power from the power distribution unit (PDU) goes into the SPS AC power inlet to the AC-DC converter. This converter then converts the AC power to DC power, which is then stored into the built-in DC battery pack. When emergency power is needed by the Block and File (Unified) VNX7500 platform SP, a second DC-AC converter inside the 1U SPS takes the DC power from the DC battery pack and then converts it to AC power. This AC power then goes from the 1U SPS AC power outlet to the Block and File (Unified) VNX7500 platform SP (Figure 14 on page 27).

Note: Two SPSs provide higher availability and allow write caching, which prevents data loss during a power failure, to continue.

IMPORTANT

A faulted or not fully charged SPS disables the write caching.

SPS failure functionality

Both the 1U and 2U SPS perform the same functions.

If AC power fails, the SPS provides backup power until the SP has flushed its write cache data to the DAE disks. The SP then shuts off SPS power. If the cache flush has not completed within 90 seconds—more than enough time to flush a full cache—or if the SP has failed, then the SPS shuts down to prevent a deep discharge. If no AC input power is available and the SPS is shut down, all the status lights will be off.

The output voltage, when the SPS is in the On-Line state, is a straight pass-through of the AC-line from inlet to outlets. When in the On-Battery state, the output voltage shall be at an AC level within the specified limits (see the SPS battery LED in Table 11 on page 28).

When power returns, the SPS starts recharging the DC battery pack. It might reach a state of full charge relatively quickly. If power remains off for a long period—days or weeks—the DC battery might require more time to charge fully.[8] The storage processor will not use the write cache unless it detects at least one fully charged SPS.

Battery lifetime depends on the number of discharge cycles and the depth of discharge. In a typical environment, a battery pack can last 3 to 5 years. The DC battery pack lifetime is shorter in locations that have frequent AC outages.

Looking from left to right, Figure 14 shows an example of the rear view of two SPSs (B and A, respectively).

Extra SPS for redundancy

An additional SPS can be added for redundancy. When only one SPS is used, the AC power out connectors for the SPS supply AC power to both SP A and SP B.

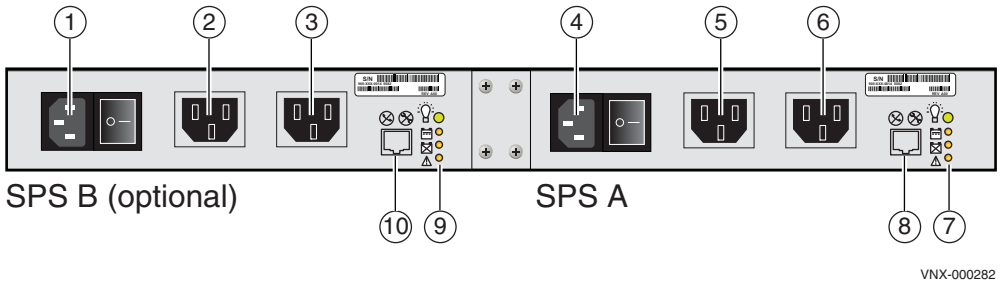
It is important to cable each SPS so that it connects completely to either the A side or the B side. For example, if you are looking at the SPSs from the rear, they should be configured as:

- SPS A (rear, right side)—Power-out and sense (management) cables connected to the SP A power supply.
- SPS B (rear, left side)—Power-out and sense (management) cables connected to the SP B power supply.

Note: If an SPS is cabled with the SPS sense (management) cable going to the power supply on SP A and the power-out cable going to the power supply on SP B (or vice versa), an error condition will occur when the SPS is tested or when it is charging.

8. After a full power outage, an SPS typically requires 45 minutes or a maximum of 75 minutes to charge. To charge the SPS after being off-line usually requires at least 2 hours.

Looking from left to right, Figure 14 shows an example of the rear view of two SPSs (B and A, respectively).



1	SPS B AC power in (recessed plug)	6	Power out socket to LCC A on the 1st DAE (ID 2)
2	Power out socket to LCC B on the 1st DAE (ID 2)	7	Four SPS A status LEDs (green and amber)
3	Power out socket to the SP B power supply on the SPE	8	SPS A to SP A management (RJ-12) connector
4	SPS A AC power in (recessed plug)	9	Four SPS B status LEDs (green and amber)
5	Power out socket to the SP A power supply on the SPE	10	SPS B to SP B management (RJ-12) connector

Note: A faulted or not fully charged SPS disables write caching.

Figure 14 Example of 1U SPS B and A viewing from left to right (rear view)

1U SPS LEDs

Figure 15 shows the LEDs located on each SPS (A and B).

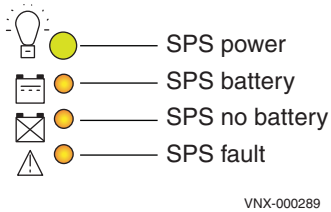


Figure 15 1U SPS LEDs

Table 11 describes the LEDs located on each 1U SPS (A and B).

Table 11 1U SPS LEDs

Led	Color	State	Description
SPS power	Green	On	SPS ready and operating normally; battery fully charged
		Blinking	On/battery charging
	—	Off	Off/disconnected
SPS battery	Amber	On	AC line power is no longer available and the SPS is supplying DC output power from the battery. **Note:** When battery power comes on, and no other online SPS is connected to the SP, the system writes all cached data to disk, and the event log records the event.
SPS no battery	Amber	On	SPS battery is not fully charged and might not be able to serve its cache flushing function. With the battery in this state, and no other online SPS connected to the SP, the system disables write caching, and writes any modified pages to the disk first. Replace the SPS as soon as possible.
SPS fault	Amber	On	The SPS has an internal fault. The SPS might still be able to run online, but write caching cannot occur. Replace the SPS as soon as possible.

1U SPS RJ-12 connector

Figure 16 on page 29 shows the 1U SPS (RJ-12 or modular jack) management port (labeled with two symbols; one depicting a telephone handset with a line through it and the other depicting a rectangle with a line through it). Both symbols mean that you cannot connect telephone type circuits to this connector (see the following **WARNING**). This port connects the 1U SPS (A and B) ports to the SP (A and B) ports, respectively.

⚠WARNING

The 1U SPS (RJ-12) port is a LAN port not a WAN port. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. An RJ-45 (or TNV-type) looks the same as the RJ-12 except for two very important differences. An RJ-45 is an 8-wire modular jack. The RJ-12 is a six-wire modular jack. The RJ-45 plugs and jacks are wider than their RJ-12 counterparts - 7/16" vs 3/8". An RJ-45 plug won't fit into an R-J12 jack. But an RJ-12 plug will fit into an RJ-45 jack. Use caution when connecting cables. To avoid electric shock, do not attempt to connect TNV circuits to SELV circuits.

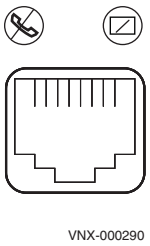


Figure 16 1U SPS RJ-12 port

Table 12 lists the 1U SPS (RJ-12) pin signals used on the connector.

Table 12 1U SPS (RJ-12) port and connector pinout

RJ-45 pin	Signal	Description
1	RTS/DSR	Ready to send Data transmit ready
2	Shield	Shield
3	TXD	Transmit data
4	RXD	Receive data
5	GND	Ground
6	CTS/DCD	Clear to send Data

RJ-12 modular jack to micro DB-9 cable

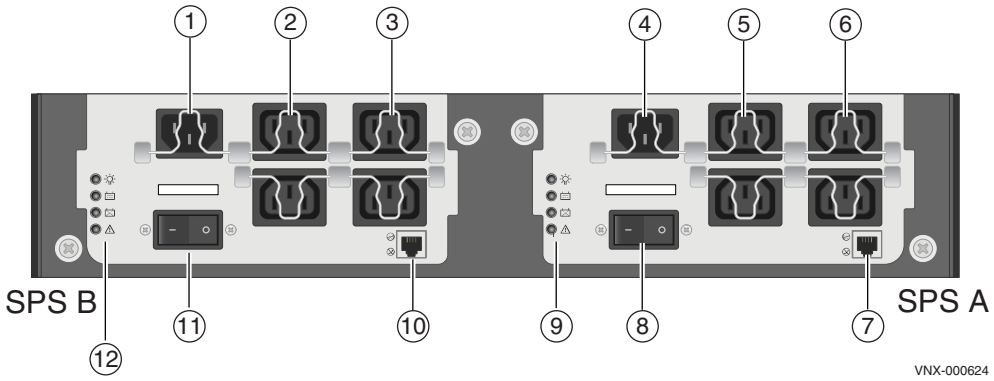
The cable connecting the 1U SPS to the SP is an RJ-12 to micro DB-9 cable (plug). It has an RJ-12 connector (SPS side) on one end and a micro DB-9 connector (SP side) on the other end. Figure 17 shows an example of an SPS A to SP A cable.

Note: Each cable end is labeled to assist the user during system cabling.

Figure 17 Example of SP A (micro DB-9) to SPS (RJ-12) cable

2U SPS rear view

When using the Block and File (Unified) VNX7500 platform with the 4U, 60 disk drive DAE as the Vault drive in 40U Dense rack, the dual 2U, 2.2-kilowatt standby power supply (SPS) is used to maintain power to the Block and File (Unified) VNX7500 platform SP during power loss. Just like the 1U SPS, the 2U SPS performs the same functionality. Looking from left to right, Figure 18 on page 30 shows an example of the rear view of a dual 2U SPS.



1	SPS B AC power in (recessed plug)	**7**	SPS A to SP A management (RJ-12) connector
2	SPS B power out socket to LCC B on the 1st DAE (ID 2)	**8**	SPS A power on/off toggle switch
3	SPS B power out socket to the SP B power supply on the SPE	**9**	Four SPS A status LEDs (green and amber)
4	SPS A AC power in (recessed plug)	**10**	SPS B to SP B management (RJ-12) connector
5	SPS A power out socket to the SP A power supply on the SPE	**11**	SPS B power on/off toggle switch
6	SPS A power out socket to LCC A on the 1st DAE (ID 2)	**12**	Four SPS B status LEDs (green and amber)

Figure 18 Example of 2U SPS B and A viewing from left to right (rear view)

2U SPS LEDs

Figure 19 shows the LEDs located on each 2U SPS (A and B)

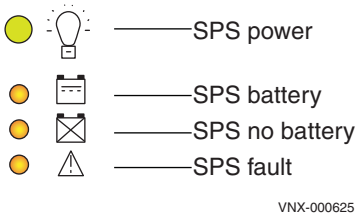


Figure 19 2U SPS LEDs

Table 13 describes the rear panel 2U SPS LEDs.

Table 13 2U SPS LEDs description

Led	Color	State	Description
SPS power	Green	On	SPS ready and operating normally; battery fully charged
		Blinking	On/battery charging
	—	Off	Off/disconnected
SPS battery	Amber	On	AC line power is no longer available and the SPS is supplying DC output power from the battery. **Note:** When battery power comes on, and no other online SPS is connected to the SP, the system writes all cached data to disk, and the event log records the event.
SPS no battery	Amber	On	SPS battery is not fully charged and might not be able to serve its cache flushing function. With the battery in this state, and no other online SPS connected to the SP, the system disables write caching, and writes any modified pages to the disk first. Replace the SPS as soon as possible.
SPS fault	Amber	On	The SPS has an internal fault. The SPS might still be able to run online, but write caching cannot occur. Replace the SPS as soon as possible.

2U SPS RJ-12 connector

Figure 20 shows the 2U SPS (RJ-12 or modular jack) management port (labeled with two symbols; one depicting a telephone handset with a line through it and the other depicting a rectangle with a line through it). Both symbols mean that you cannot connect telephone type circuits to this connector (see the following **WARNING**). This port connects the 2U SPS (A and B) ports to the SP (A and B) ports, respectively.

⚠WARNING

The 2U SPS (RJ-12) port is a LAN port not a WAN port. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. An RJ-45 (or TNV-type) looks the same as the RJ-12 except for two very important differences. An RJ-45 is an 8-wire modular jack. The RJ-12 is a six-wire modular jack. The RJ-45 plugs and jacks are wider than their RJ-12 counterparts - 7/16" vs 3/8". An RJ-45 plug won't fit into an R-J12 jack. But an RJ-12 plug will fit into an RJ-45 jack. Use caution when connecting cables. To avoid electric shock, do not attempt to connect TNV circuits to SELV circuits.

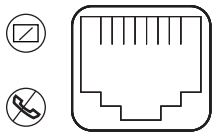


Figure 20 2U SPS RJ-12 port

Table 14 lists the 2U SPS (RJ-12) pin signals used on the connector.

Table 14 2U SPS (RJ-12) port and connector pinout

RJ-45 pin	Signal	Description
1	RTS/DSR	Ready to send Data transmit ready
2	Shield	Shield
3	TXD	Transmit data
4	RXD	Receive data
5	GND	Ground
6	CTS/DCD	Clear to send Data

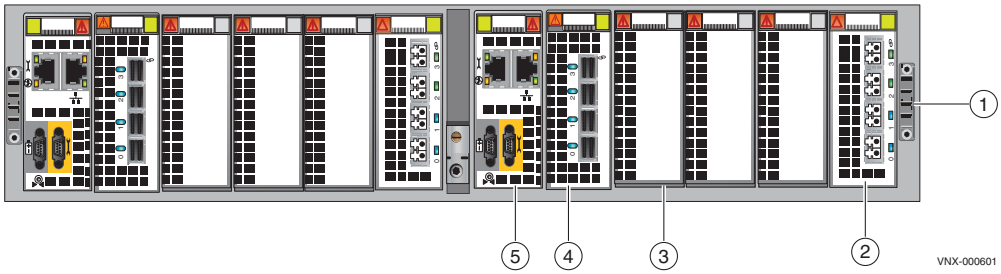
RJ-12 modular jack to micro DB-9 cable

The cable connecting the 2U SPS to the SP is an RJ-12 to micro DB-9 cable (plug). It has an RJ-12 connector (SPS side) on one end and a micro DB-9 connector (SP side) on the other end. Figure 21 shows an example of an SPS A to SP A cable.

Figure 21 Example of SP A (micro DB-9) SPS (RJ-12) cable

SPE rear view

Figure 22 shows an example of an SPE with two SPs (A and B) and the location of the major hardware components that make up these SPs.



1	Storage processor enclosure	4	Four-port 6-Gb/s SAS I/O module (default)[1]
2	Four-port 8-Gb/s (4-Gb/s) FC I/O module	5	SP management module[2]
3	Filler panel module		

1. In the Block and File (Unified) VNX7500 platform, you could optionally have another pair of 6-Gb/s SAS I/O modules.
2. The management module in the Block and File (Unified) VNX7500 platform SP comprises two types; one with a USB port and one without a USB port. "SP management module" on page 34 shows an example of the SP management module without the USB port.

Figure 22 Example of SPE with two SPs (rear view)

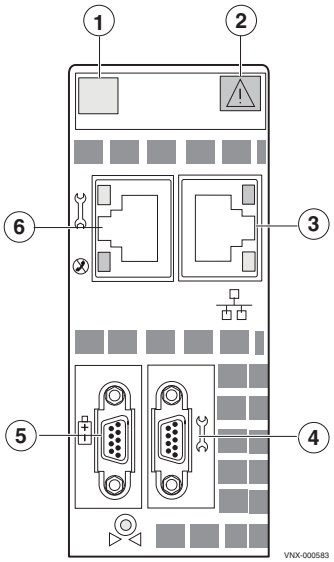
Note: All the Block and File (Unified) VNX7500 platforms have an SPE, a dual SPS, one to two Control Stations, and one to four Data Mover enclosures. In the following sections, the illustrations and corresponding tables describe these individual components. These descriptions are for illustrative purposes only.

The rear of the Block and File (Unified) VNX7500 platform storage processor enclosure (SPE) does not contain any LEDs (Figure 22). Only the management module and the I/O modules in each SP have LEDs.

Note: Figure 22 is a graphical representation of the Block and File (Unified) VNX7500 platform storage processor enclosure rear view with two SPs (each SP has one management module, one four-port 8-Gb/s FC I/O module, one four-port 6-Gb/s SAS I/O module, and three filler panel modules).

SP management module

The SP management module provides the management connections via one 10/100/1000 Ethernet (RJ-45) port. Another RJ-45 port is available to support a service laptop connection. The SP management module includes two RS-232/EIA 232 (DB-9) serial socket connectors (one for service laptop connection and the other for SPS connection) and several LEDs (Figure 23).



1	Power/fault LED	4	DB-9 serial console socket connector (service laptop)
2	SP management module push button latch handle	5	DB-9 serial console socket connector (SPS)
3	RJ-45 Ethernet port (management)	6	RJ-45 Ethernet port (service laptop)

Figure 23 SP management module

SP management module Ethernet (RJ-45) ports

The Block and File (Unified) VNX7500 platform SP management module comes with two integrated dual-port Ethernet ports (labeled with a symbol depicting a wrench and the other depicting network management) on the rear of the management module. The SP management port provides an interface for connecting a 10-, 100-, or 1000-Mb/s cable to the LAN providing full-duplex (FDX) capability, which enables simultaneous transmission and reception of data.

To access the SP management port, connect a Category 3, 4, 5, 5E, or 6 unshielded twisted-pair (UTP) cable to this RJ-45 modular jack connector on the back of the SP management module, as described in Table 19 on page 42.

Since the Control Station and the management module have the same type of management (RJ-45) ports, "Control Station Ethernet (RJ-45) ports" on page 41 provides detailed information about the SP management module ports, connector, and adapter.

SP management module LEDs

Figure 24 shows the LEDs and Table 15 describes them.

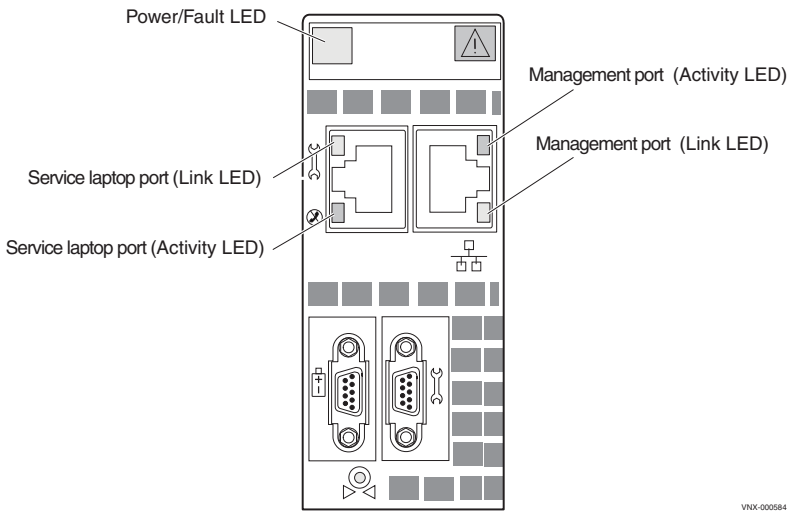


Figure 24 SP management module LEDs

Table 15 SP management module LEDs

LED	Color	State	Description
Power/Fault	Green	On	SP management module is powered up.
	Amber	On	SP management module has faulted. **Note:** LED is always illuminated at powerup, until it is initialized.
	—	Off	SP management module is powered down.
Link (each port has one)	Green	On	Network connection
	—	Off	No network connection
Activity (each port has one)	Amber	Blinking	Transmit/receive activity
	—	Off	No network activity

SP management module serial console (DB-9) socket connector

The back of the Block and File (Unified) VNX7500 platform SP management module includes two standard serial console Electronics Industries Association (EIA) RS-232 interface (DB-9) socket connectors (one labeled with a symbol depicting a wrench on the right and the other depicting a battery on the left). Notice the orientation of the pins (Figure 25 on page 36).

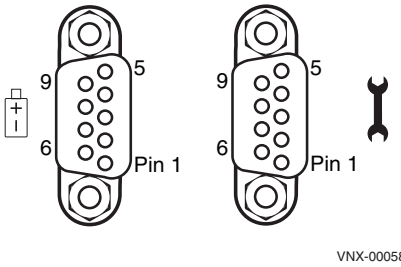


Figure 25 SP management module serial console (DB-9) socket connectors

Table 16 lists the SP management module Ethernet (DB-9) pin signals used on the connectors.

Table 16 SP management module (DB-9) socket connector pinout

DB-9 Pin	Signal	Description
1	CD	Carrier detect
2	TXD	Transmitted data
3	RXD	Received data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Clear to send
8	CTS	Request to send
9	RI	Ring indicator (not used)

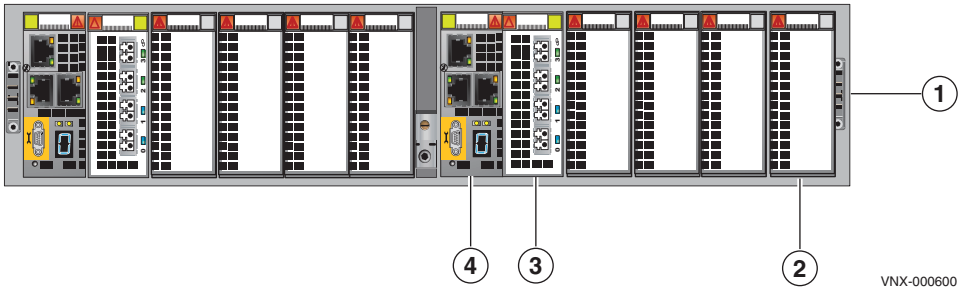
SP null modem (micro DB-9 to DB-9 serial) cable — The cable connecting the SP management module to the PC or service laptop is a micro DB-9 cable (plug) to serial DB-9 (socket). It has a micro DB-9 plug (SP side) on one end and a serial DB-9 socket (PC or service laptop side) on the other end. Figure 26 shows an example of an SP management module to PC (service laptop) cable.

Figure 26 Example of SP null modem (micro DB-9) to serial (DB-9) cable

DME rear view

The rear of the Block and File (Unified) VNX7500 platform DME does not contain any LEDs (Figure 27). Only the Data Mover management module and the I/O modules have LEDs.

Note: Figure 27 is a graphical representation of the Block and File (Unified) VNX7500 platform DME rear view with two Data Movers (each Data Mover shows one management module, one four-port 8-Gb/s FC I/O module, and four filler panel modules).

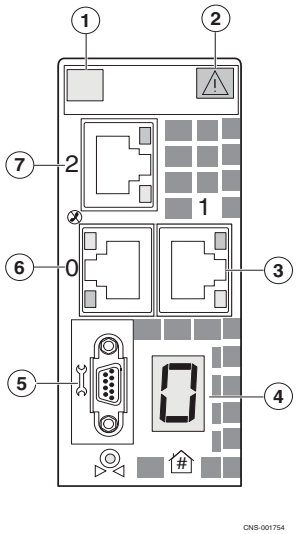


1	Data Mover enclosure	3	Four-port 8-Gb/s FC I/O module
2	Filler panel module	4	Data Mover management module

Figure 27 DME (rear view)

Data Mover management module

The Data Mover management module provides the management connections via three 10/100/1000 Ethernet (RJ-45) ports. The Data Mover management module also includes one RS-232 (EIA) DB-9 serial socket connector for service laptop connection and several LEDs (Figure 28 on page 38).



1	Power/fault LED	5	DB-9 serial console socket connector
2	Data Mover management module push button latch handle	6	RJ-45 Ethernet port (labeled 0)
3	RJ-45 Ethernet port (labeled 1)	7	RJ-45 Ethernet port (labeled 2)
4	Data Mover enclosure ID numeric display		

Figure 28 Data Mover management module

Data Mover management module Ethernet (RJ-45) ports

The Block and File (Unified) VNX7500 platform Data Mover management module comes with three integrated dual-port Ethernet ports (labeled 0, 1, and 2) on the rear of the Data Mover management module. These ports provide an interface for connecting to 10-, 100-, or 1000-Mb/s networks and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data.

⚠WARNING

To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

To access the Ethernet ports, connect a Category 3, 4, 5, 5E, or 6 unshielded twisted-pair (UTP) cable to the RJ-45 connector on the back of the management module (Table 19 on page 42).

Since the Control Station and the management module have the same type of RJ-45 ports, "Control Station Ethernet (RJ-45) ports" on page 41 provides detailed information about the management module ports, connector, and adapter.

Data Mover management module LEDs

Figure 29 shows the LEDs and Table 17 describes them.

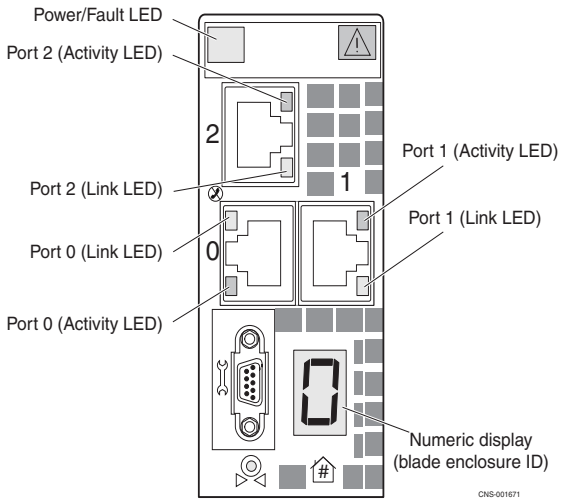


Figure 29 Data Mover management module LEDs

Table 17 Data Mover management module LEDs

LED	Color	State	Description
Power/Fault	Green	On	Data Mover management module is powered up.
	Amber	On	Data Mover management module has faulted. **Note:** LED is always illuminated at powerup, until it is initialized.
	—	Off	Data Mover management module is powered down.
Link (each port has one)	Green	On	Network connection
	—	Off	No network connection
Activity (each port has one)	Amber	Blinking	Transmit/receive activity
	—	Off	No network activity
numeric (7-segment) display for enclosure ID	—	On	Displays the enclosure ID assigned to the Data Mover enclosure. **Note:** Each enclosure is assigned a number at installation.

Data Mover management module serial console (DB-9) socket connector

The back of the Block and File (Unified) VNX7500 platform Data Mover management module includes a standard serial console Electronics Industries Association (EIA) RS-232 interface (DB-9) socket connector (labeled with a wrench tool icon on the left). Notice the orientation of the pins (Figure 30 on page 40).

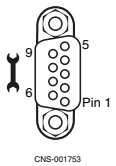


Figure 30 Data Mover management module serial console (DB-9) socket connector

Table 18 lists the Data Mover management module Ethernet (DB-9) pin signals used on the connector.

Table 18 Data Mover management module (DB-9) socket connector pinout

DB-9 Pin	Signal	Description
1	CD	Carrier detect
2	TXD	Transmitted data
3	RXD	Received data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Clear to send
8	CTS	Request to send
9	RI	Ring indicator (not used)

Control Station rear view

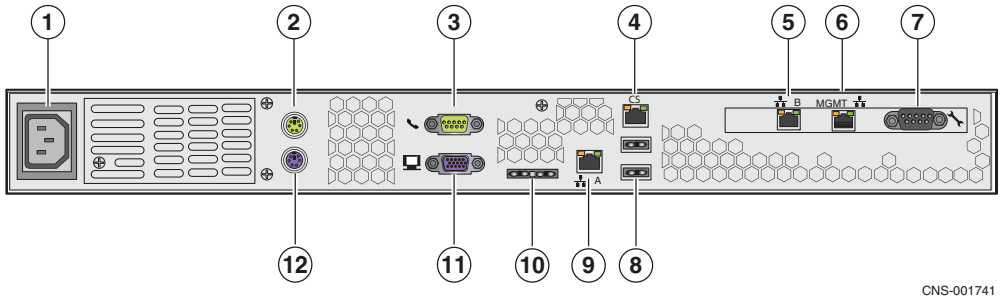
On the rear, viewing from left to right, the Block and File (Unified) VNX7500 platform Control Station includes the following hardware components:

- AC power in connector
- Two PS/2 connectors (keyboard and mouse)—not used
- One (DB-9 plug) serial modem connector
- One (DB-15) video (VGA socket) connector—not used
- Four (RJ-45) connectors (labeled A, CS, B, and MGMT)

  Note: The RJ-45 (labeled A and CS) are integrated into the rear of the Control Station while the RJ-45 (labeled B and MGMT) are on a PCI-e card in the expansion slot on the rear of the Control Station.

- One (DB-9 plug) serial console (RS-232/EIA-232) connector
- Two USB 2.0 connectors—not used
- POST diagnostic LEDs

Figure 31 shows the orientation of these components.



1	AC power in connector	7	DB-9 serial console plug connector
2	PS/2 connector (mouse)—not used	8	Two USB 2.0 connectors (not used)
3	DB-9 serial modem plug connector	9	RJ-45 Ethernet port (labeled A)
4	RJ-45 Ethernet port (labeled CS[1])	10	POST diagnostic LEDs[2]
5	RJ-45 Ethernet port (labeled B)	11	DB-15 Video (VGA) socket connector—not used
6	RJ-45 Ethernet port (labeled MGMT)	12	PS/2 connector (keyboard)—not used

1. The CS port uses an IPMI (Intelligent Platform Management Interface) cable to connect to a standby Control Station).
2. These LEDs might light during power on self test (POST); they are not important for the administration or maintenance of the Control Station.

Figure 31 VNX7500 Control Station (rear view)

Control Station Input/output ports and connectors

The Block and File (Unified) VNX7500 platform Control Station supports the following I/O ports on the rear of the Control Station:

- Four Ethernet (RJ-45) ports
- One serial modem (DB-9) plug connector
- One serial console (DB-9) plug connector

⚠WARNING

To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ-45 connectors. Use caution when connecting cables.

Control Station Ethernet (RJ-45) ports

The Block and File (Unified) VNX7500 platform Control Station comes with two integrated dual-port Ethernet ports (labeled A and CS) and two Peripheral Component Interconnect Express (PCI-E)[9] low profile card dual-port Ethernet ports (labeled B and MGMT) in an expansion slot on the rear of the Control Station. These ports (Figure 32 on page 42)

provide an interface for connecting to 10-, 100-, or 1000-Mb/s networks and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local-area network (LAN).

To access the Ethernet ports, connect a Category 3, 4, 5, 5E, or 6 unshielded twisted-pair (UTP) cable to the RJ-45 connectors on the back of the Control Station, as described in Table 19.

Table 19 Ethernet cabling guidelines

Type	Description
10BASE-T	EIA Categories 3, 4, or 5 UTP (2 or 4 pairs) up to 328 ft (100 m)
100BASE-TX	EIA Category 5 UTP (2 pairs) up to 328 ft (100 m)
1000BASE-T	EIA Category 6 (recommended), Category 5E or 5 UTP (2 pairs) up to 328 ft (100 m)

Control Station Ethernet (RJ-45) port and connector (adapter)

Figure 32 shows an example of the Ethernet RJ-45 port and cable connector.

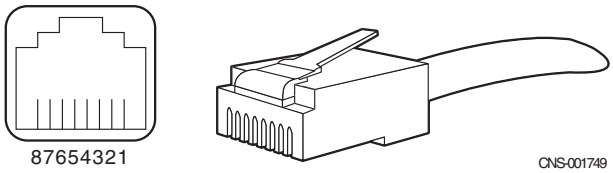


Figure 32 Control Station Ethernet (RJ-45) port and connector (adapter)

Table 20 lists the Control Station Ethernet (RJ-45) pin signals used on the connector.

Table 20 Control Station Ethernet (RJ-45) port and connector pinout

RJ-45 pin	Signal	Description
1	BI_DA+	Bidirectional pair A, +
2	BI_DA-	Bidirectional pair A, -
3	BI_DB+	Bidirectional pair B, +
4	BI_DC+	Bidirectional pair C, +
5	BI_DC-	Bidirectional pair C, -
6	BI_DB-	Bidirectional pair B, -
7	BI_DD+	Bidirectional pair D, +
8	BI_DD-	Bidirectional pair D, -

9. PCI Express is used in consumer, server, and industrial applications, as a motherboard-level interconnect (to link motherboard-mounted peripherals) and as an expansion card interface for add-in boards.

Control Station Ethernet (RJ-45) port LEDs

The Control Station (RJ-45) has two LEDs—a green LED to the left of the connector and a bi-color (green/amber) LED to the right of the connector—that indicates the link/activity and speed of the Control Station (RJ-45) ports, respectively (Figure 33).

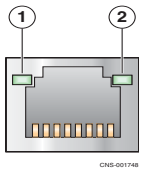


Figure 33 Control Station Ethernet (RJ-45) port LEDs

Table 21 describes the link/activity and connection speed associated with the Control Station (RJ-45) port LEDs.

Table 21 Control Station RJ-45 port LEDs

Led	Color	State	Description
Left, link/activity (location 1)	Green	On	Network/link connection
	Green	Blinking	Transmit/receive activity
	—	Off	No network/link connection
Right, link speed (location 2)	Green	On	100-Mb/s connection
	Amber	On	1000-Mb/s (or 1-Gb/s) connection
	—	Off	10-Mb/s connection (if left LED is on or blinking)

Ethernet cable extensions for the Control Station B and MGMT ports

Each Block and File (Unified) VNX7500 platform Control Station comes with two modular Ethernet cable extensions (or patch cords) for the RJ-45 ports (labeled on the CS as B and MGMT, respectively). These cables allow you to extend the length of the Ethernet cables from the CS 0, port B to Data Mover enclosure 0, management module B, port 1 and CS 0, MGMT port to the public LAN.

If your Block and File (Unified) VNX7500 platform includes a second optional Control Station (CS 1), another set of Ethernet cable extensions for the RJ-45 ports is provided. These cables allow you to extend the length of the Ethernet cables from the CS 1, port B to Data Mover enclosure 0, management module B, port 2 and CS 1, MGMT port to the public LAN. Each cable includes a corresponding label clip to assist you during system cabling.

Note: If you received the Block and File (Unified) VNX7500 platform already installed in a cabinet rack with all of the Block and File (Unified) VNX7500 platform components, all the cabling has already been installed.

Figure 34 Example of an Ethernet extension (modular plug to modular jack) cable

Control Station serial console (DB-9) plug connector

The back of the Block and File (Unified) VNX7500 platform system Control Station includes a standard serial console Electronics Industries Association (EIA) RS-232 interface (DB-9) plug connector (labeled with a wrench tool icon on the right). Notice the orientation of the pins (Figure 35).

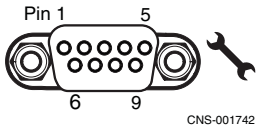


Figure 35 Control Station serial console (DB-9) plug connector

Table 22 lists the Control Station Ethernet (DB-9) pin signals used on the connector.

Table 22 Control Station (DB-9) plug connector pinout

DB-9 Pin	Signal	Description
1	CD	Carrier detect
2	RXD	Received data
3	TXD	Transmitted data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator (not used)

Control Station modem (DB-9) plug connector

The back of the Block and File (Unified) VNX7500 platform Control Station includes a standard modem serial interface (DB-9) plug connector (labeled with a telephone handset icon on the left). Notice the orientation of the pins (Figure 36).

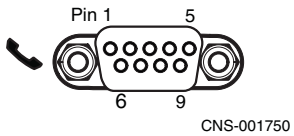


Figure 36 Control Station modem (DB-9) plug connector

Table 23 lists the Control Station Ethernet (DB-9) pin signals used on the connector.

Table 23 Control Station modem (DB-9) plug connector pinout

DB-9 Pin	Signal	Description
1	CD	Carrier detect
2	RXD	Received data
3	TXD	Transmitted data
4	DTR	Data terminal ready
5	GND	Ground
6	DSR	Data set ready
7	RTS	Clear to send
8	CTS	Request to send
9	RI	Ring indicator (not used)

I/O modules

Several types of I/O modules supported in the Block and File (Unified) VNX7500 platform are available. The SP supports five types of I/O modules (see "SP I/O module types" on this page) and the Data Mover supports four types (see "Data Mover I/O module types" on page 54). In this section, each I/O module description includes the type of port (copper or optical) as well as a description of the LEDs.

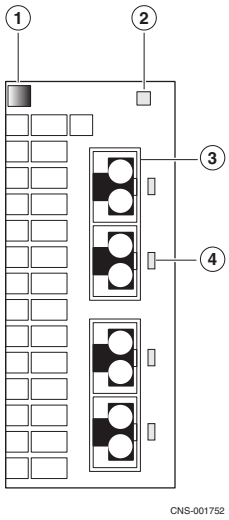
SP I/O module types

The following I/O module types are supported by the Block and File (Unified) VNX7500 platform SP:

- "Four-port 8-Gb/s FC I/O module" on page 46
- "Four-port 1-Gb/s copper iSCSI I/O module" on page 48
- "Two-port 10-Gb/s optical or active Twinax iSCSI I/O module" on page 50
- "Four-port 6-Gb/s SAS I/O module" on page 51
- "Two-port 10-Gb/s optical or active Twinax Fibre Channel over Ethernet (FCoE) I/O module" on page 53

Four-port 8-Gb/s FC I/O module

The four-port 8-Gb/s FC I/O module comes with four optical (fibre) ports, one power/fault LED, and a link/activity LED for each optical port (Figure 37).



1	Push button latch handle	3	SFP+ (optical) port (four)
2	Power/fault LED	4	SFP+ link/activity LED

Figure 37 Four-port 8-Gb/s FC I/O module

This I/O module can interface at speeds of 2, 4, and 8 Gb/s. The four-port 8-Gb/s FC I/O module uses SFP+ transceiver modules to connect to LC-type optical fibre cables (see following note). These SFP+ transceiver modules are input/output (I/O) devices that plug into the FC port of the FC I/O modules. These SFP+ modules are hot swappable[10]. This means that you can install and remove an SFP+ module while the Block and File (Unified) VNX7500 platform is operating.

Note: The Lucent Connector (LC) type interface was developed by Lucent Technologies (hence, Lucent Connector). It uses a push-pull mechanism. LC connectors are normally held together in a multimode duplex configuration with a plastic clip. These cables are usually colored orange with the duplex connectors encased in a gray plastic covering. To determine the send or transmit (TX) and receive (RX) ferrules (connector ends), these cables will show a letter and numeral (for example A1 and A2 for the TX and RX, respectively) or a white and yellow rubber gasket (jacket) for the send or transmit (TX) and receive (RX) ends.

10. Be careful when replacing or swapping out SFP+ modules, your Data Mover will lose access to the SP or tape drive to which it is connected.

Four-port 8-Gb/s FC I/O module LEDs

The four-port 8-Gb/s Fibre Channel (FC) I/O module has two different types of status LEDs. Figure 38 shows the LEDs and Table 24 describes them.

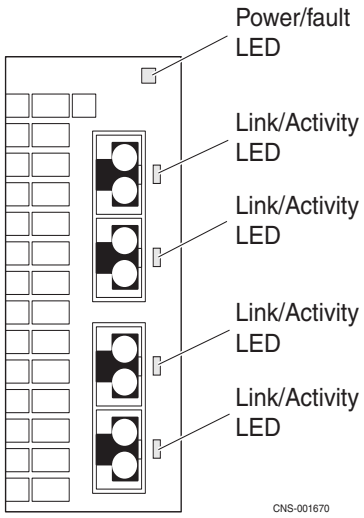


Figure 38 Four-port 8-Gb/s FC I/O module LEDs

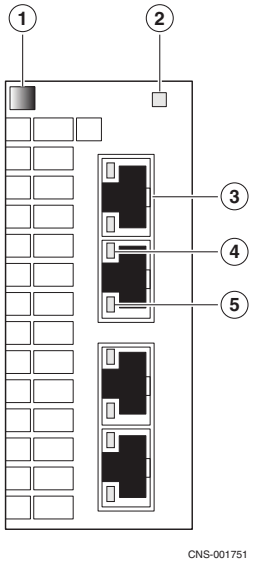
Table 24 Four-port 8-Gb/s FC I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link/Activity (each port has one LED)	Green	On	2- or 4-Gb link speed (suboptimal speed)
	Blue	On	8-Gb/s link speed (maximum speed)
	Green or Blue	Blinking	Small form-factor pluggable (SFP+[1]) transceiver module faulted, unsupported, or optical cable fault.
	—	Off	No network connection

1. Refer to the *VNX7500 Parts Location Guide* for the correct SFP+ part number.

Four-port 1-Gb/s copper iSCSI I/O module

The four-port 1-Gb/s copper iSCSI I/O module comes with four 1-Gb/s copper ports, one power/fault LED, and a link and activity LED for each port (Figure 39). The copper ports on this I/O module can interface at speeds up to 1 Gb/s for iSCSI (Internet Small Computer System Interface) networks[11].



1	Push button latch handle	4	RJ-45 link LED
2	Power/fault LED	5	RJ-45 activity LED
3	RJ-45 (copper) port (four)		

Figure 39 Four-port 1-Gb/s copper iSCSI I/O module

11. iSCSI is a protocol for sending SCSI packets over TCP/IP networks.

Four-port 1-Gb/s copper iSCSI I/O module LEDs

The four-port 1-Gb/s copper iSCSI I/O module has three types of status LEDs. Figure 40 shows the LEDs and Table 25 describes them.

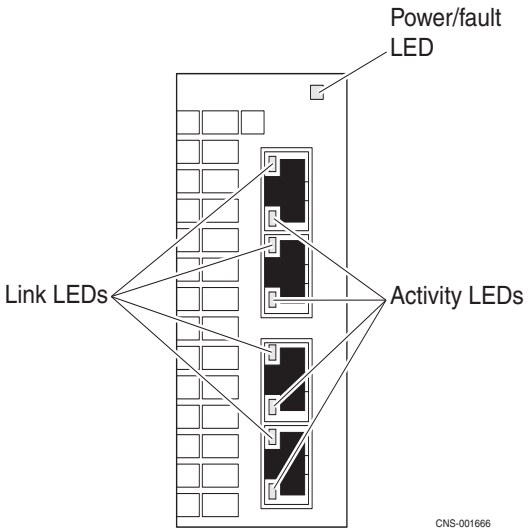


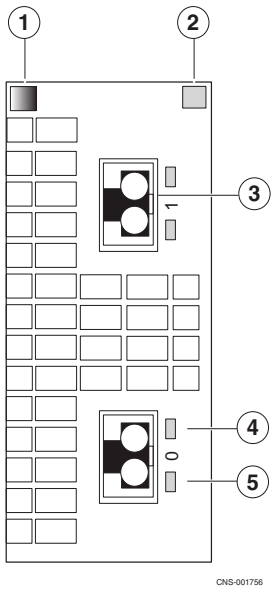
Figure 40 Four-port 1-Gb/s copper iSCSI I/O module LEDs

Table 25 Four-port 1-Gb/s copper iSCSI I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link (each port has one)	Green	On	Network connection
	—	Off	No network connection
Activity (each port has one)	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Two-port 10-Gb/s optical or active Twinax iSCSI I/O module

The two-port 10-Gb/s optical or active Twinax[12] iSCSI I/O module comes with two optical or active twisted pair ports, one power/fault LED, and a link and activity LED for each port, as shown in Figure 41. The optical ports on this I/O module can interface at speeds of 10 Gb/s for iSCSI (Internet Small Computer System Interface) networks[13]. The two-port 10-Gb/s optical I/O module uses the SFP+ transceiver module.



1	Push button latch handle	4	SFP+ link LED (right)
2	Power/fault LED	5	SFP+ activity LED (left)
3	SFP+ (optical) port (two)		

Figure 41 Two-port 10-Gb/s optical I/O module

12. The two-port 10-Gb/s I/O module can also use active twinaxial (Twinax) cables. Twinax is a type of cable similar to coax, but with two inner conductors instead of one. These cables will be supplied in lieu of the SFP+ when so ordered.
13. iSCSI is a protocol for sending SCSI packets over TCP/IP networks.

Two-port 10-Gb/s optical I/O module LEDs

The two-port 10-Gb/s optical I/O module has three types of status LEDs. Figure 42 shows the LEDs and Table 26 describes them.

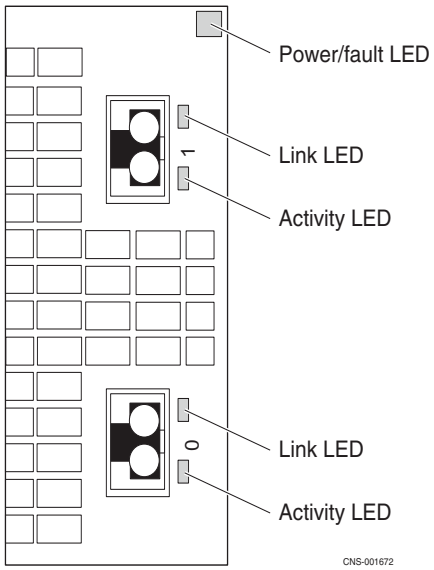


Figure 42 Two-port 10-Gb/s optical I/O module LEDs

Table 26 Two-port 10-Gb/s optical I/O module LEDs

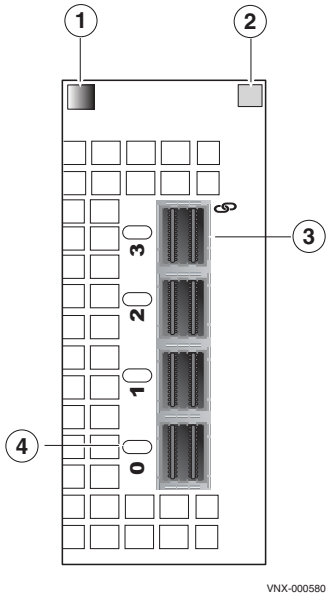
LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link	Green	On	Network connection
	—	Off	No network connection
Activity	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Four-port 6-Gb/s SAS I/O module

The four-port 6-Gb/s SAS I/O module comes with four ports, one power/fault LED, and a combination link/activity LED for each port (Figure 43). The ports on this I/O module can interface at speeds of 6 Gb/s for supporting serial SCSI protocol (SSP), serial management protocol (SMP), and SATA tunneling protocol (STP) networks. The four-port 6-Gb/s SAS I/O module uses the mini-SAS connectors (for more information describing the mini-SAS HD connector, see Figure 58 on page 70).

This port is a 26-circuit small form-factor 8088 (SFF-8088) specification (socket or receptacle) using an SFF-8088 specification mini-SAS 26-circuit cable (plug) with a pull tab.

Note: Each cable is keyed with an *in* and *out* connection to prevent incorrect cabling.



1	Push button latch handle	3	port (four)
2	Power/fault LED	4	LED (four

Figure 43 Four-port 6-Gb/s SAS I/O module

Four-port 6-Gb/s SAS I/O module LEDs

The four-port 6-Gb/s SAS I/O module has two types of status LEDs. Figure 44 shows the LEDs and Table 27 on page 53 describes them.

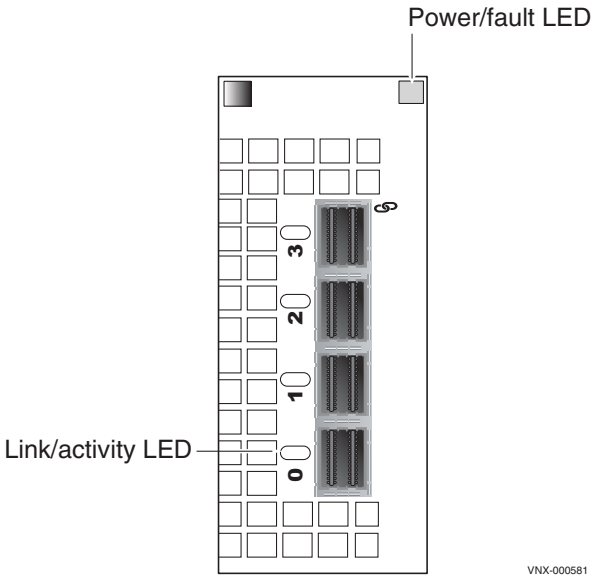


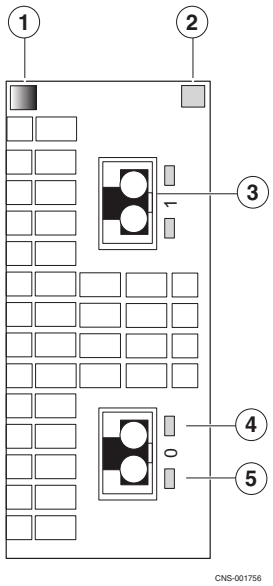
Figure 44 Four-port 6-Gb/s SAS I/O module LEDs

Table 27 Four-port 6-Gb/s SAS I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link/activity	Blue	On	Network connection
		Blinking	Transmit/receive activity
	—	Off	No activity

Two-port 10-Gb/s optical or active Twinax Fibre Channel over Ethernet (FCoE) I/O module

The two-port 10-Gb/s optical or active Twinax[14] FCoE I/O module comes with two FCoE ports, one power/fault LED, and a link and activity LED for each port (Figure 45). The ports on this I/O module can interface at speeds up to 10 Gb/s for Fibre Channel over Ethernet networks. The two-port 10-Gb/s FCoE I/O module uses the SFP+ transceiver module. For part number label location, see the *VNX7500 Parts Location Guide*.



1	Push button latch handle	4	SFP+ link LED (right)
2	Power/fault LED	5	SFP+ activity LED (left)
3	SFP+ (optical) port (two)		

Figure 45 Two-port 10-Gb/s FCoE I/O module

14. The FCoE I/O module can also use active twinaxial (Twinax) cables. Twinax is a type of cable similar to coax, but with two inner conductors instead of one. These cables will be supplied in lieu of the SFP+ transceiver module when so ordered.

Two-port 10-Gb/s FCoE I/O module LEDs

The two-port 10-Gb/s FCoE I/O module has three types of status LEDs. Figure 46 shows the LEDs and Table 28 describes them.

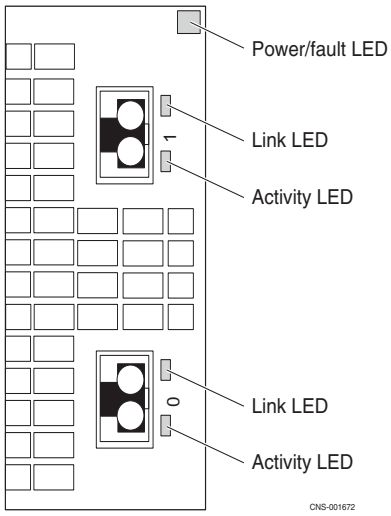


Figure 46 Two-port 10-Gb/s FCoE I/O module LEDs

Table 28 two-port 10-Gb/s FCoE I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link	Green	On	Network connection
	—	Off	No network connection
Activity	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Data Mover I/O module types

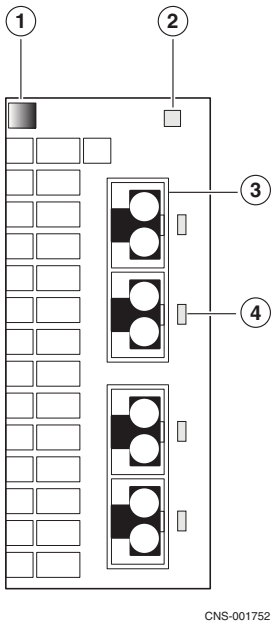
The following I/O module types are supported by the Block and File (Unified) VNX7500 platform Data Mover:

- "Four-port 8-Gb/s FC I/O module" on page 55
- "Four-port 1-Gb/s copper I/O module" on page 57
- "Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module" on page 59
- "Two-port 10-Gb/s optical or active Twinax I/O module" on page 61

Note: For SP module types, go to "SP I/O module types" on page 45.

Four-port 8-Gb/s FC I/O module

The four-port 8-Gb/s FC I/O module comes with four optical (fibre) ports, one power/fault LED, and a link/activity LED for each optical port, as shown in Figure 47. This I/O module can interface at speeds of 2, 4, and 8 Gb/s.



1	Push button latch handle	3	SFP+ (optical) port (four)
2	Power/fault LED	4	SFP+ link/activity LED

Figure 47 Four-port 8-Gb/s FC I/O module

The four-port 8-Gb/s FC I/O module uses SFP+ transceiver modules to connect to LC-type optical fibre cables (see the following note). These SFP+ transceiver modules are input/output (I/O) devices that plug into the FC port of the FC I/O modules. These SFP+ modules are hot swappable[15]. This means that you can install and remove an SFP+ module while the Block and File (Unified) VNX7500 platform is operating.

Note: The Lucent Connector (LC) type interface was developed by Lucent Technologies (hence, Lucent Connector). It uses a push-pull mechanism. LC connectors are normally held together in a multimode duplex configuration with a plastic clip. These cables are usually colored orange with the duplex connectors encased in a gray plastic covering. To determine the send or transmit (TX) and receive (RX) ferrules (connector ends), these cables will show a letter and numeral (for example A1 and A2 for the TX and RX, respectively) or a white and yellow rubber gasket (jacket) for the send or transmit (TX) and receive (RX) ends.

15. Be careful when replacing or swapping out SFP+ modules, your Data Mover will lose access to the SP or tape drive to which it is connected.

Four-port 8-Gb/s FC I/O module LEDs

The four-port 8-Gb/s Fibre Channel (FC) I/O module has two different types of status LEDs. Figure 48 shows the LEDs and Table 29 describes them.

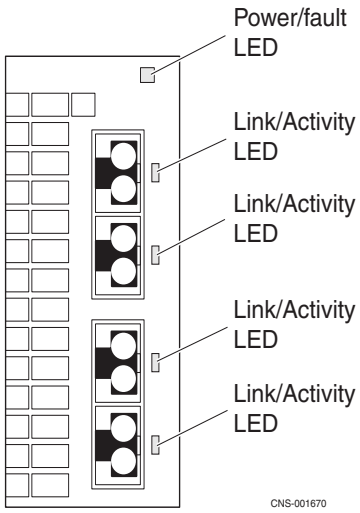


Figure 48 Four-port 8-Gb/s FC I/O module LEDs

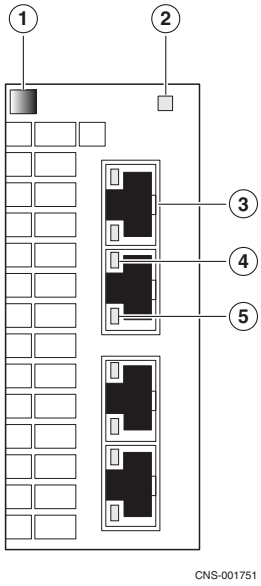
Table 29 Four-port 8-Gb/s FC I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link/Activity (each port has one LED)	Green	On	2- or 4-Gb link speed (suboptimal speed)
	Blue	On	8-Gb/s link speed (maximum speed)
	Green or Blue	Blinking	Small form-factor pluggable (SFP+[1]) transceiver module faulted, unsupported, or optical cable fault.
	—	Off	No network connection

1. Refer to the *VNX7500 Parts Location Guide* for the correct SFP+ part number.

Four-port 1-Gb/s copper I/O module

The four-port 1-Gb/s copper I/O module comes with four copper ports, one power/fault LED, and a link and activity LED for each copper port (Figure 49). This I/O module can interface at speeds of 10 Mb/s, 100 Mb/s, and 1000 Mb/s (1 Gb/s). Another way to describe this type of module is that it runs Ethernet over twisted pair.



1	Push button latch handle	4	RJ-45 link LED
2	Power/fault LED	5	RJ-45 activity LED
3	RJ-45 (copper) port (four)		

Figure 49 Four-port 1-Gb/s copper I/O module

Four-port 1-Gb/s copper I/O module LEDs

The four-port 1-Gb/s copper I/O module has three types of status LEDs. Figure 50 shows the LEDs and Table 30 describes them.

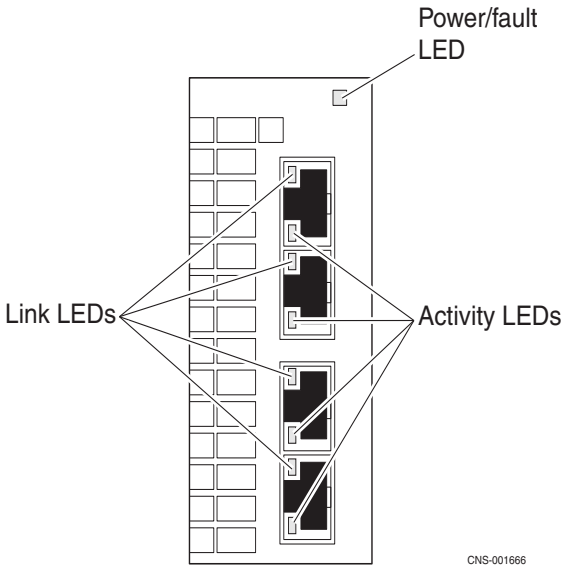


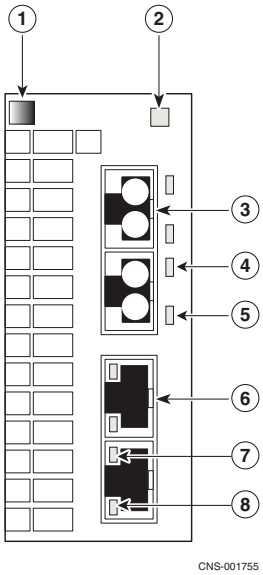
Figure 50 Four-port 1-Gb/s copper I/O module LEDs

Table 30 Four-port 1-Gb/s copper I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link (each port has one)	Green	On	Network connection
	—	Off	No network connection
Activity (each port has one)	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module

The two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module comes with two copper ports and two optical ports, one power/fault LED, and a link and activity LED for each port (Figure 51). The copper ports on this I/O module can interface at speeds of 10 Mb/s, 100 Mb/s, and 1000 Mb/s (1 Gb/s). While the optical ports can interface at a speed of 1 Gb/s.



1	Push button latch handle	5	SFP+ activity LED (left)
2	Power/fault LED	6	RJ-45 (copper) port (two)
3	SFP+ (optical) port (two)	7	RJ-45 link LED (right)
4	SFP+ link LED (right)	8	RJ-45 activity LED (left)

Figure 51 Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module

Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module LEDs

The two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module has three types of status LEDs. Figure 52 shows the LEDs and Table 31 describes them.

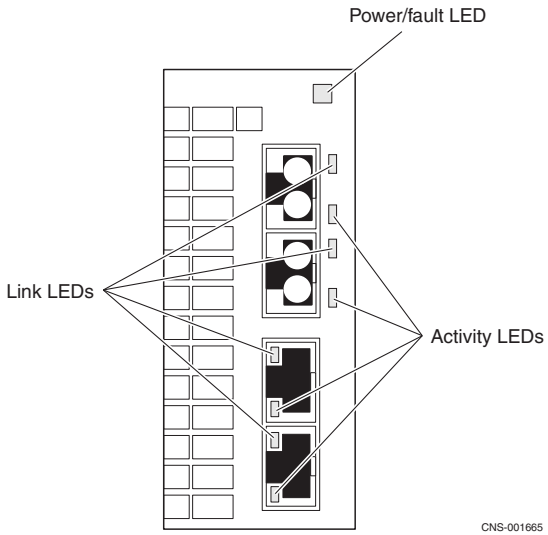


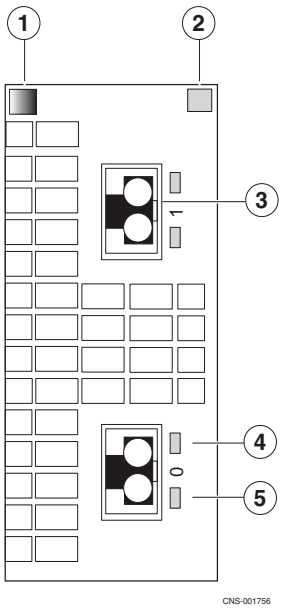
Figure 52 Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module LEDs

Table 31 Two-port 1-Gb/s copper plus two-port 1-Gb/s optical I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link (each port has one)	Green	On	Network connection
	—	Off	No network connection
Activity (each port has one)	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Two-port 10-Gb/s optical or active Twinax I/O module

The two-port 10-Gb/s optical or active Twinax[16] I/O module comes with two optical ports, one power/fault LED, and a link and activity LED for each port (Figure 53). The optical ports on this I/O module can interface at speeds of 10-Gb/s networks. The two-port 10-Gb/s optical I/O module uses the SFP+ transceiver module. For part number label location, see the *VNX7500 Parts Location Guide*.



1	Push button latch handle	4	SFP+ link LED (right)
2	Power/fault LED	5	SFP+ activity LED (left)
3	SFP+ (optical) port (two)		

Figure 53 Two-port 10-Gb/s optical I/O module

16. The two-port 10-Gb/s I/O module can also use active twinaxial (Twinax) cables. Twinax is a type of cable similar to coax, but with two inner conductors instead of one. These cables will be supplied in lieu of the SFP+ transceiver module when so ordered.

Two-port 10-Gb/s optical I/O module LEDs

The two-port 10-Gb/s optical I/O module has three types of status LEDs. Figure 54 shows the LEDs and Table 32 describes them.

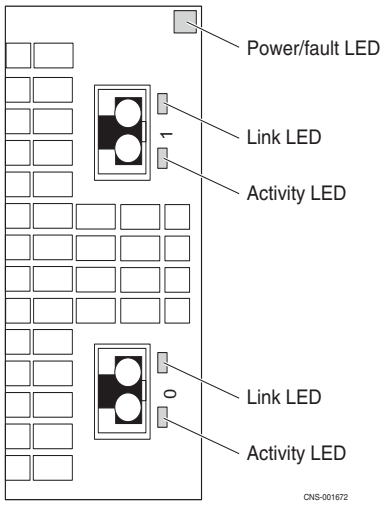


Figure 54 Two-port 10-GbE optical I/O module LEDs

Table 32 Two-port 10-Gb/s optical I/O module LEDs

LED	Color	State	Description
Power/Fault	Green	On	I/O module is powered up.
	Amber	On	I/O module has faulted.
	—	Off	I/O module is powered down.
Link	Green	On	Network connection
	—	Off	No network connection
Activity	Amber	Blinking	Transmit/receive activity
	—	Off	No activity

Disk-array enclosure (DAE)

⚠CAUTION

Lifting the DAE and installing it to or removing it from a rack is a two-person job. If needed, use an appropriate lifting device. A fully loaded 2U DAE, 3U DAE, or 4U DAE weighs approximately 45 lb (20.41 kg), 68 lb (30.84 kg), or 213 lb (96.62 kg), respectively.

The Block and File (Unified) VNX7500 platform supports the expansion of three types of disk-array enclosures (DAEs) across a 6-Gb/s SAS bus:

- 3U, 15 (3.5-inch) DAE
- 2U, 25 (2.5-inch) DAE
- 4U, 60 (2.5- or 3.5-inch) DAE[17]

Note: "4U, 60 (2.5- or 3.5-inch) DAE" on page 80 provides a complete description of the 4U, 60 disk drive DAE.

The Block and File (Unified) VNX7500 platform supports up to sixty-six 3U, 15 (3.5-inch) DAEs (for a total of 990 3.5-inch disk drives), up to forty 2U, 25 (2.5-inch) DAEs (500 2.5-inch disk drives), or up to fifteen 4U, 60 (2.5- or 3.5-inch) DAEs[18] (for a total of 915 disk drives)[19].

IMPORTANT

As described in the previous paragraph, you cannot build an environment beyond the supported software and hardware requirements for that VNX7500 platform. *Do not* try to add more disk drives than the software can support.

Each Block and File (Unified) VNX7500 platform DAE consists of the following components:

- Drive carrier
- Disk drives
- Midplane
- Link control cards (LCCs)
- Inter Connect Modules (ICMs)[20]
- Power supply/cooling modules[21]
- EMI shielding

17. The 4U, 60 disk drive DAE with the VNX7500 platform environment is factory only delivery.
18. This configuration is true when a 4U, 60 disk drive DAE is used as the vault drive. If the 3U, 15 disk drive DAE is used as the vault drive, the total disk drive count is 870 disk drives.
19. This configuration is true for a Block and File VNX7500 platform. In the Block version, a maximum of sixteen 4U DAEs and two 3U DAE (a maximum of 990 disk drives) is possible.
20. The 4U, 60 disk drive DAE includes Inter Connect Modules (ICMs). "4U, 60 (2.5- or 3.5-inch) DAE" on page 80 provides more information about the 4U, 60 disk drive DAE.
21. The 4U, 60 disk drive DAE has separate power supplies and cooling modules (fans).

Drive carrier

The disk drive carriers are metal and plastic assemblies that provide smooth, reliable contact with the enclosure slot guides and midplane connectors. Each carrier has a handle with a latch and spring clips. The latch holds the disk drive in place to ensure proper connection with the midplane. Disk drive activity/fault LEDs are integrated into the carrier (Figure 55 on page 66 and Figure 62 on page 73).

Disk drives

Each disk drive consists of one disk drive in a carrier. You can visually distinguish between module types by their different latch and handle mechanisms and by type, capacity, and speed labels on each module. You can add or remove a disk drive while the DAE is powered up, but you should exercise special care when removing modules while they are in use. Drive modules are extremely sensitive electronic components.

IMPORTANT

The 4U DAE cannot use disk drives from a 2U or 3U DAE. The 4U DAE employs different types of SAS, NL-SAS, or Flash disk drives.

Midplane

In a 2U or 3U DAE, a midplane separates the front-facing disk drives from the rear-facing LCCs and power supply/cooling modules. It distributes power and signals to all components in the enclosure. LCCs, power supply/cooling modules, and disk drives plug directly into the midplane.

LCCs

In a 2U or 3U DAE, an LCC supports, controls, and monitors the DAE, and is the primary interconnect management element. Each LCC includes connectors for input and expansion to downstream devices. An enclosure address (EA) indicator is located on each LCC (Figure 61 on page 72 and Figure 68 on page 79)[22]. Each LCC includes a bus (loop) identification indicator (Figure 61 on page 72 and Figure 68 on page 79).

In a 4U DAE, the primary functionality of an LCC is to be a SAS expander as well as to provide enclosure services to all the disk drives (60 in all). In other words, the LCC in a 4U DAE (“LCC” on page 86) implements a version of the Common Disk Enclosure Sub-system (CDES) architecture. CDES consists of the PMC-Sierra PM8005 SXP 6G SAS expander, the Common Disk Enclosure FPGA (CDEF) and supporting logic.

In the 4U DAE LCC, two SAS expanders are available. As previously described, the SAS expanders are PMC-Sierra SXP36 6G (PM8005, rev C) components. Each expander functions or operates separately. That is, each expander has its own CDEF and supporting logic to support 30 drives each. A 4-lane SAS wide port connecting each expander to the Inter Connect Module (ICM) expander on the same side (A or B) of the 4U DAE is available. Each expander manages the drives it is connected to. The only shared resources are the LCC LED and the expander I^2C (inter-integrated circuit) bus.

22. The EA is sometimes referred to as an enclosure ID.

Power supply

In a 2U or 3U DAE, the power supply/cooling module integrates independent power supply and blower cooling assemblies into a single module.

Each power supply is an auto-ranging power-factor-corrected, multi-output, off-line converter with its own line cord. The drives and LCC have individual soft-start switches that protect the disk drives and LCC if you install them while the disk enclosure is powered up. A disk or blower with power-related faults will not affect the operation of any other device.

In a 2U or 3U DAE, each power/cooling module has three status LEDs (Figure 57 on page 69 and Figure 64 on page 75).

In a 4U DAE, the power supplies ("4U, 60 DAE AC power supply" on page 94) and cooling modules are separated and located at opposite ends of the 4U DAE. The power supplies are located on the rear of the 4U DAE while the cooling modules or fans are located on the rear of the 4U DAE. The power supplies can be installed/removed from the rear of the DAE while the cooling modules or fans can only be installed/removed by sliding the DAE forward, then sliding the DAE cover to the rear. You access the cooling modules or fans from inside the DAE "Access to disk drives, LCCs, and cooling modules" on page 80 provides more information).

Cooling modules

In a 2U or 3U DAE, the enclosure cooling system consists of dual-blower modules in each power supply/cooling module.

In a 4U DAE, the cooling modules are separate from the power supply modules.

EMI shielding

EMI compliance requires a properly installed electromagnetic interference (EMI) shield in front of the DAE disk drives. When installed in cabinets that include a front door, the DAE includes a simple EMI shield. Other installations require a front bezel that has a locking latch and integra ed EMI shield. You must remove the bezel/shield to remove and install disk drive modules.

3U, 15 (3.5-inch) DAE front view

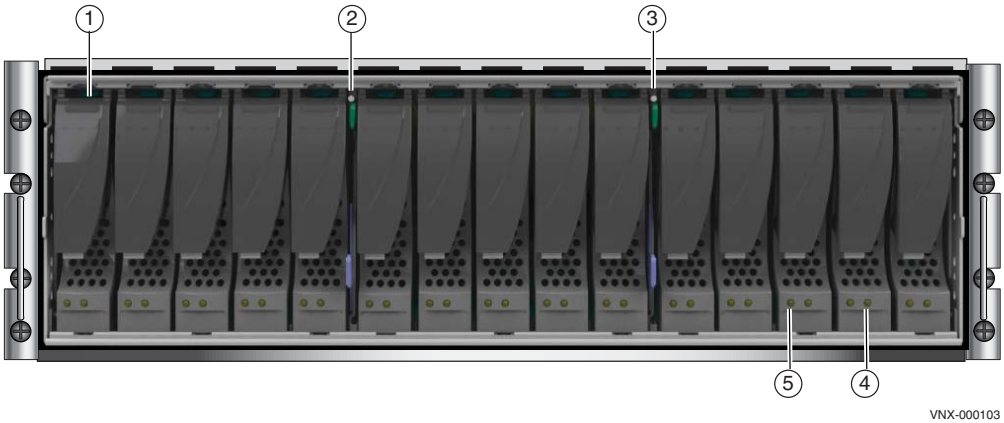
On the front, viewing from left to right, the Block and File (Unified) VNX7500 platform 3U, 15 (3.5-inch) disk drive DAE carrier includes the following hardware components:

- 3.5-inch 6-Gb/s SAS, 6-Gb/s NL- SAS, or Flash disk drives (hot-swappable[23])
- Status LEDs

Figure 55 on page 66 shows the location of these components.

Note: In a Block and File (Unified) VNX7500 platform, when using the 3U, 15 (3.5-inch) disk drive carrier, the maximum amount of disk drives is 990.

23. You can add or remove a disk drive while the DAE is powered up, but you should exercise special care when removing modules while they are in use. Drive modules are extremely sensitive electronic components.



1	3.5-inch 6-Gb/s drives or 6-Gb/s NL- disk drives	**4**	Disk drive fault LED (amber)
2	DAE fault LED (amber)	**5**	Disk drive on/activity LED (green)
3	DAE power on LED (blue)		

Figure 55 3U, 15 (3.5-inch) disk drive (front view)

Table 33 describes the Block and File (Unified) VNX7500 platform DAE and the 3.5-inch disk drive status LEDs

Table 33 3U, 15 (3.5-inch) DAE and disk drive LEDs

LED	Color	State	Description
DAE fault (location 2)	Amber	On	Fault has occurred
DAE power (location 3)	Green	On	Powering and powered up with backend bus running at 2 Gb/s
	Blue	On	Powering and powered up with backend bus running at 6 Gb/s
	—	Off	Powered down
Disk drive fault (location 4)	Amber	On	Fault has occurred
	—	Off	No fault has occurred

Table 33 3U, 15 (3.5-inch) DAE and disk drive LEDs (continued)

LED	Color	State	Description
Disk drive on/activity (location 5)	Green	On	Powering and powered up
		Blinking, mostly on	Disk drive is on with I/O activity
		Blinking at constant rate	Disk drive is spinning up or down normally
		Blinking, mostly off	Disk drive is powered up but not spinning **Note:** This is a normal part of the spin-up sequence, occurring during the spin-up delay of a slot.
	—	Off	Disk is powered down

3U, 15 (3.5-inch) DAE rear view

On the rear, viewing from top to bottom, a 3U, 15 (3.5-inch) disk drive DAE chassis includes the following hardware components:

- Two 6-Gb/s LCCs (A and B)
- Two power supply/cooling modules

6-Gb/s SAS LCC

The LCC supports and controls one 6-Gb/s SAS bus and monitors the DAE. A blue link/activity LED indicates a DAE operating at 6 Gb/s.

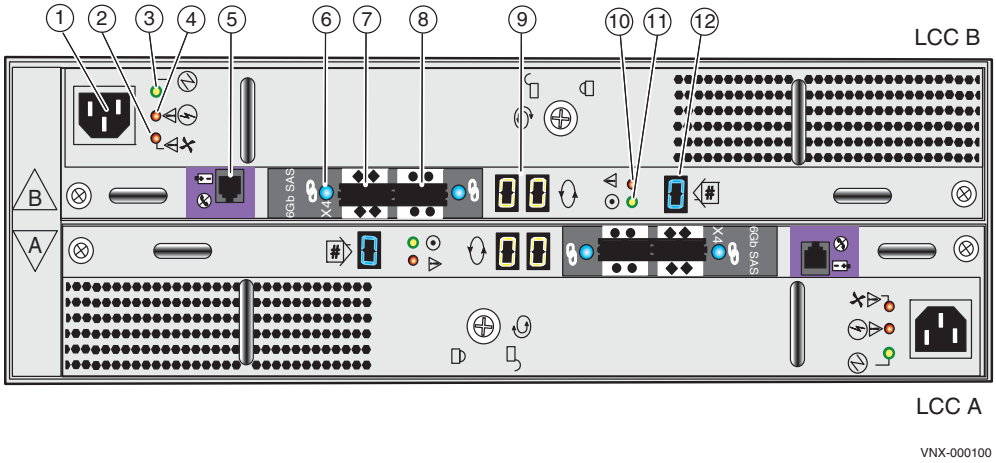
The LCCs in a DAE connects to the SPE and other DAEs with 6-Gb/s cables. The cables connect the LCCs in a system in a daisy-chain topology.

Internally, each DAE LCC connects to the drives in its enclosure in a point-to-point fashion through a switch. The LCC independently receives and electrically terminates incoming signals. For traffic from the system's storage processors, the LCC switch passes the signal from the input port to the drive being accessed; the switch then forwards the drive output signal to the port.

Note: If the target drive is not in the LCC's enclosure, the switch passes the input signal directly to the output port.

Each LCC independently monitors the environmental status of the entire enclosure, using a microcomputer-controlled monitor program. The monitor communicates the status to the storage processor, which polls disk enclosure status. LCC firmware also controls the SAS PHYs and the disk-module status LEDs.

Figure 56 shows an example of the rear view of a 3U, 15 (3.5-inch) disk drive DAE.



1	LCC B AC power supply power in (recessed plug)	**7**	LCC B connector (output)[1]
2	LCC B power supply fan fault LED (on, amber)	**8**	LCC B connector (input)[2]
3	LLC B power supply LED (on, green)	**9**	LCC B bus ID
4	LCC B power supply fault LED (on, amber)	**10**	LCC B bus LED (fault, amber)
5	LCC B management (RJ-12) connector to SPS (not used)	**11**	LCC B bus LED (on, green)
6	LCC B connector link LED	**12**	DAE enclosure ID or address

1. The connector (output) is labeled with a double diamond symbol.
2. The connector (input) is labeled with a double circle (or dot) symbol.

Figure 56 3U, 15 (3.5-inch) disk drive DAE with two LCCs and two power supply/cooling modules (rear view)

As shown in Figure 56, an enclosure ID[24] indicator is located on each LCC. Each LCC also includes a bus (back-end port) identification indicator. The SP initializes the bus ID when the operating system is loaded.

Note: An LCC might be in either the A slot, as shown, or the B slot above it, depending on the DAE placement within a system. For example, the front DAE in some systems is in slot A; the rear enclosure LCC is inverted, and in slot B.

24. The enclosure ID is sometimes referred to as the enclosure address (EA).

3U, 15 (3.5-inch) DAE AC power supply/cooling module

Figure 57 shows an example of the 3U, 15 (3.5-inch) disk drive DAE AC power supply/cooling module with a power in recessed connector (plug) and status LEDs.

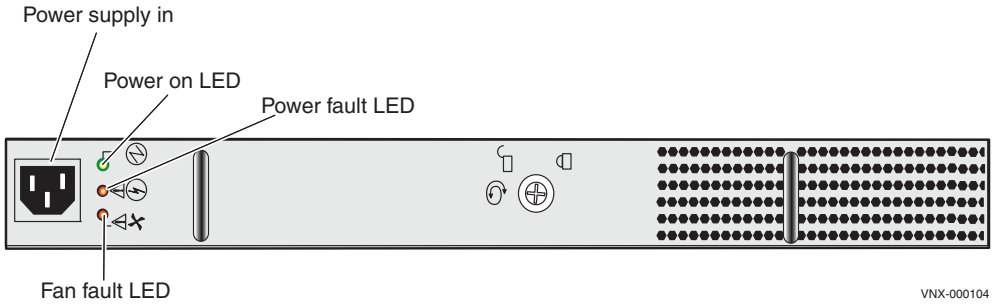


Figure 57 Example of 3U, 15 (3.5-inch) DAE AC power supply/cooling module (power in) recessed connector (plug) and status LEDs

Table 34 describes the 3U, 15 (3.5-inch) DAE power supply/cooling module LEDs.

Table 34 3U, 15 (3.5-inch) disk drive DAE AC power supply/cooling module LEDs

Led	Color	State	Description
Power on	Green	On	Power on
	—	Off	Power off
Power fault	Amber	On	Fault
		Blinking	During power shutdown and during overvoltage and undervoltage protection (OVP/UVP) fault
	—	Off	No fault or power off
Fan fault	Amber	On	Fault, one or both not operating normally
	—	Off	No fault, fans operating normally

The power supply/cooling modules are located above and below the LCCs. The units integrate independent power supply and dual-blower cooling assemblies into a single module.

Each power supply is an auto-ranging, power-factor-corrected, multi-output, offline converter with its own line cord. Each supply supports a fully configured DAE and shares load currents with the other supply. The drives and LCCs have individual soft-start switches that protect the disk drives and LCCs if they are installed while the disk enclosure is powered up.

The enclosure cooling system includes two dual-blower modules.

The 3U, 15 (3.5-inch) DAE LCC input/output ports and connectors

The 3U, 15 (3.5-inch) DAE LCC supports the following I/O ports on the rear:

- Two 6-Gb/s SAS x4 ports
- One management (RJ-45) connector to the SPS (not used)

6-Gb/s SAS x4 ports

The 3U DAE LCC supports two (one input and one output) 6-Gb/s SAS x4 ports (labeled 6Gb 0 x4) on the rear of each LCC (A and B). This port provides an interface for SAS and NL-SAS drives on the DAE. This port is a 26-circuit small form-factor 8088 (SFF-8088 specification (socket or receptacle) using an SFF-8088 specification mini-SAS 26-circuit cable (plug) with a pull tab.

Note: Each SAS cable is keyed with an *in* and *out* connection to prevent incorrect cabling.

Figure 58 shows an example of the port connector (socket) and cable connector (plug) with pull tab.

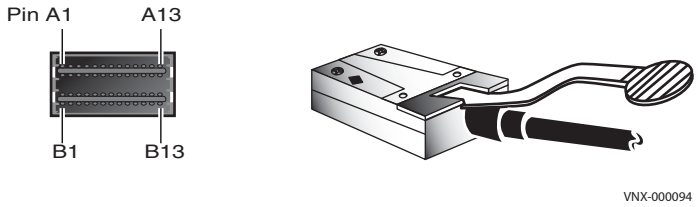


Figure 58 6-Gb/s port and cable connector

Table 35 lists the 3U DAE LCC 6-Gb/s SAS port pin signals used on the connector.

Table 35 6-Gb/s port connector pinout

Pin	Signal	Pin	Signal
A1	GND	B1	GND
A2	Rx 0+	B2	Tx 0+
A3	Rx 0-	B3	Tx 0-
A4	GND	B4	GND
A5	Rx 1+	B5	Tx 1+
A6	Rx 1-	B6	Tx 1-
A7	GND	B7	GND
A8	Rx 2+	B8	Tx 2+
A9	Rx 2-	B9	Tx 2-
A10	GND	B10	GND
A11	Rx 3+	B11	Tx 3+
A12	Rx 3-	B12	Tx 3-
A13	GND	B13	GND

6-Gb/s SAS port LEDs and port direction (input or output)

Figure 59 shows the LCC 6-Gb/s SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the port. Figure 59 also shows a double circle (or dot) symbol (for input) or a double diamond symbol (for output).

Note: Looking from the rear of the DAE, LCC B is located on the top and LCC A is located on the bottom (Figure 59).

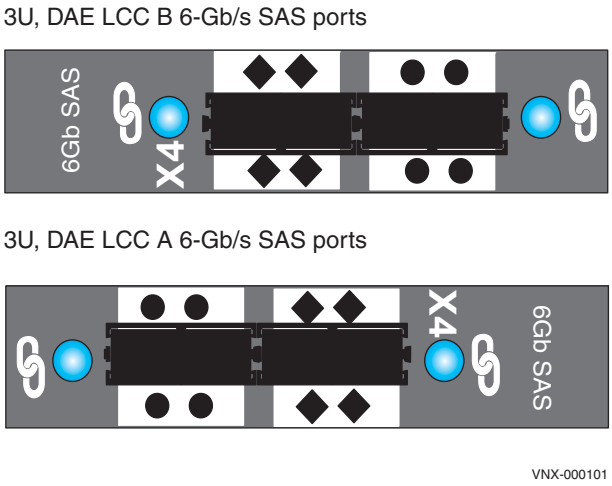


Figure 59 6-Gb/s SAS port LED

Table 36 describes the 3U, DAE LCC 6-Gb/s SAS port LEDs.

Table 36 6-Gb/s port LEDs

LED	Color	State	Description
Link/activity	Blue	On	All lanes are running at 6 GB/s
	Green	On	One or more lanes is not running at full speed or disconnected
	Alternating Blue/Green	Blinking	Port is being marked by the host
	—	Off	Not connected

Management (RJ-12) connector

Note: The management Ethernet (RJ-12) LCC to SPS connector is not used at this time.

Figure 60 on page 72 shows the management port connector (labeled with two symbols; one depicting a telephone handset with a line through it and the other depicting a battery). The telephone handset with a line through it symbol means that you cannot connect telephone type circuits to this connector (see the following **WARNING**). This port connects the LCC (A and B) ports to the SPS (A and B) ports, respectively.

⚠WARNING

The SPS (RJ-12) port is a LAN port not a WAN port. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. An RJ-45 (or TNV-type) looks the same as the RJ-12 except for two very important differences. An RJ-45 is an 8-wire modular jack. The RJ-12 is a six-wire modular jack. The RJ-45 plugs and jacks are wider than their RJ-12 counterparts - 7/16" vs 3/8". An RJ-45 plug won't fit into an R-J12 jack. But an RJ-12 plug will fit into an RJ-45 jack. Use caution when connecting cables. To avoid electric shock, do not attempt to connect TNV circuits to SELV circuits.

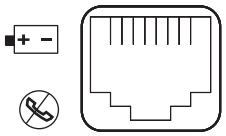


Figure 60 LCC RJ-12 port

The cable connecting the LCC to the SPS is an RJ-12 to RJ-12. It has an RJ-45 adapter (LCC side) on one end and a RJ-12 (SPS side) adapter on the other end.

LCC enclosure ID (enclosure address) and bus ID

On the rear of the LCC (A and B), an LCC enclosure ID indicator is provided. This ID indicator is a seven-segment LED display for displaying decimal numbers. The LCC enclosure ID appears on both LCCs (A and B) which is the same ID number. The enclosure ID is set at installation (Figure 61).

Each LCC includes a bus (loop) identification indicator. This indicator includes two seven-segment LED displays for displaying decimal numbers. The SP initializes the bus ID when the operating system is loaded (Figure 61).

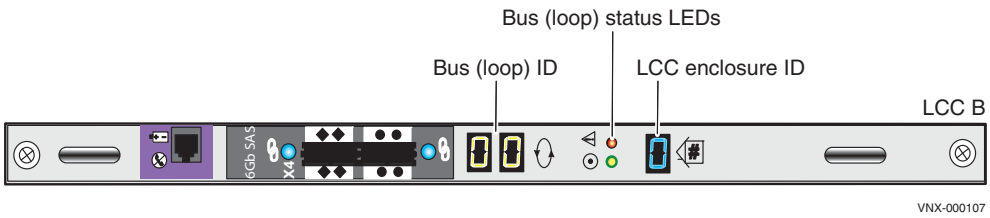


Figure 61 Example of LCC B enclosure ID and bus ID

Table 37 describes the bus (loop) indicator status LEDs.

Table 37 LCC bus (loop) status LEDs

Led	Color	State	Description
Power fault	Amber	On	Fault
	—	Off	No fault or power off
Power on	Green	On	Power on
	—	Off	Power off

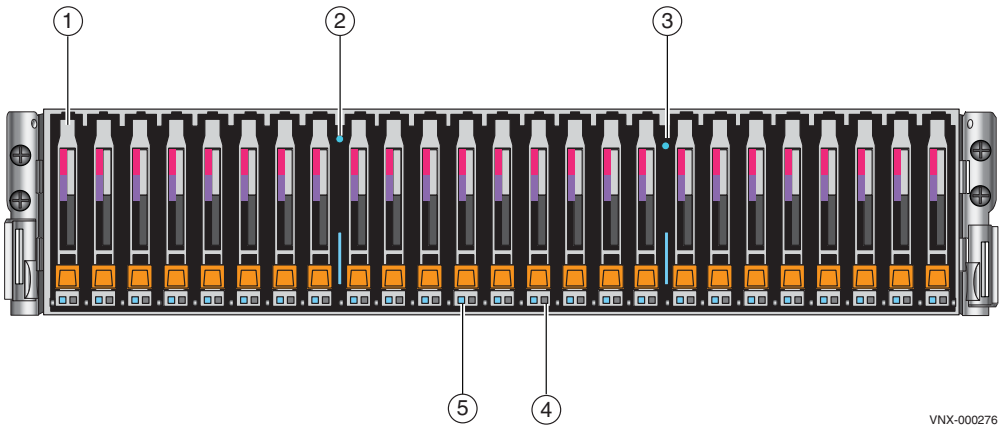
2U, 25 (2.5-inch) DAE front view

On the front, viewing from left to right, the Block and File (Unified) VNX7500 platform 2U, 25 (2.5-inch) disk drive DAE includes the following hardware components:

- 2.5-inch 6-Gb/s SAS, 6-Gb/s NL-SAS, or Flash disk drives (hot-swappable)
- Status LEDs

Figure 62 shows the location of these components.

Note: In a Block and File (Unified) VNX7500 platform, when using the 2U, 25 (2.5-inch) disk drive carrier, the maximum amount of disk drives is 1000.



1	2.5-inch 6-Gb/s SAS or 6-Gb/s NL-SAS drives	4	Disk drive fault LED (amber)
2	DAE fault LED (amber)	5	Disk drive status/activity (blue)
3	DAE power status LED (blue)		

Figure 62 2U, 25 (2.5-inch) DAE (front view)

Table 38 describes the 2U, 25 (2.5-inch) DAE and disk drive status LEDs.

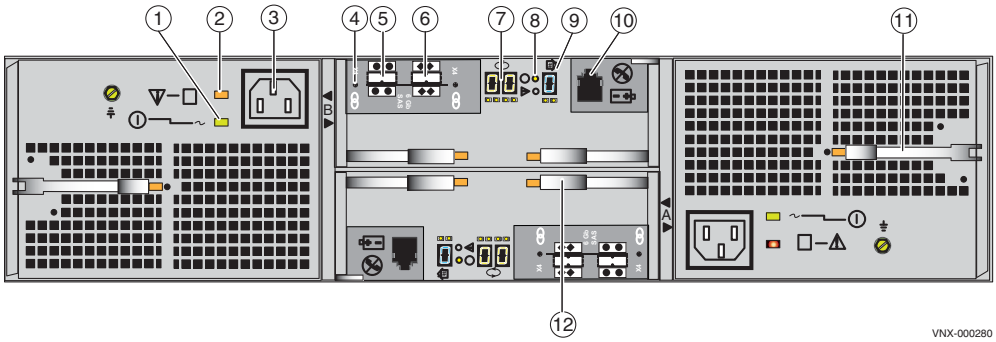
Table 38 2U, 25 (2.5-inch) DAE and disk drive status LEDs

LED	Color	State	Description
DAE fault (location 2)	Amber	On	Fault has occurred
DAE power (location 3)	Blue	On	Powering and powered up
	—	Off	Powered down
Disk drive fault (location 4)	Amber	On	Fault has occurred
	—	Off	No fault has occurred
Disk drive on/activity (location 5)	Blue	On	Powering and powered up
		Blinking	Disk drive activity

2U, 25 (2.5-inch) DAE rear view

On the rear, viewing from top to bottom, a 2U, 25 (2.5-inch) DAE includes the following hardware components as shown Figure 63:

- Two LCCs (A and B)
- Two power supply/cooling modules



1	LLC B power supply LED (on, green)	**7**	LCC B bus ID
2	LCC B power supply fault LED (on, amber)	**8**	LCC B power and fault LEDs
3	LCC B AC power supply power in (recessed plug)	**9**	DAE enclosure ID or address
4	LCC B SAS connector link LED (on, blue)	**10**	LCC B management (RJ-12) connector to SPS (not used)
5	LCC B SAS connector (input)[1]	**11**	LCC A power supply latch handle
6	LCC B SAS connector (output)[2]	**12**	LCC A right latch handle

1. The SAS connector (input) is labeled with a double circle (dot) symbol.
2. The SAS connector (output) is labeled with a double diamond symbol.

Figure 63 Example of 2U, DAE with two LCCs and two power supply/cooing modules (rear view)

6-Gb/s LCC

The 6-Gb/s LCC supports, controls, and monitors the DAE, and is the primary interconnect management element. Each LCC includes connectors for input and output to downstream devices.

As described previously, the LCCs in a DAE connects to the SPE and other DAEs with 6-Gb/s SAS cables. The cables connect the LCCs in a system in a daisy-chain (loop) topology.

Internally, each DAE LCC connects to the drives in its enclosure in a point-to-point fashion through a switch. The LCC independently receives and electrically terminates incoming signals. For traffic from the system's storage processors, the LCC switch passes the signal from the input port to the drive being accessed; the switch then forwards the drive output signal to the port.

Note: If the target drive is not in the LCC's enclosure, the switch passes the input signal directly to the output port.

Each LCC independently monitors the environmental status of the entire enclosure, using a microcomputer-controlled monitor program. The monitor communicates the status to the storage processor, which polls disk enclosure status. LCC firmware also controls the SAS PHYs and the disk-module status LEDs.

As shown in Figure 63 on page 74, an enclosure ID[25] indicator is located on each LCC. Each LCC also includes a bus (back-end port) identification indicator. The SP initializes the bus ID when the operating system is loaded.

2U, 25 (2.5-inch) DAE AC power supply/cooling module

Figure 64 shows an example of the 2U, 25 (2.5-inch) DAE AC power supply/cooling module with a power in recessed connector (plug) and status LEDs.

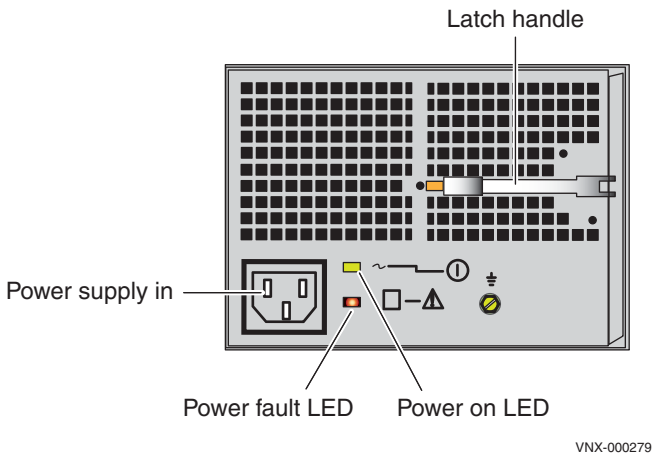


Figure 64 Example of 2U, 25 (2.5-inch) DAE AC power supply/cooling module (power in) recessed connector (plug) and status LEDs

25. The enclosure ID is sometimes referred to as the enclosure address (EA).

Table 39 describes the 2U, 25 (2.5-inch) DAE power supply/cooling module LEDs.

Table 39 2U, 25 (2.5-inch) DAE AC power supply/cooling module LEDs

Led	Color	State	Description
Power fault	Amber	On	Fault
		Blinking	During power shutdown and during overvoltage and undervoltage protection (OVP/UVP) fault
	—	Off	No fault or power off
Power on	Green	On	Power on
	—	Off	Power off

The power supply/cooling modules are located to the left and right of the LCCs. The units integrate independent power supply and dual-blower cooling assemblies into a single module.

Each power supply is an auto-ranging, power-factor-corrected, multi-output, offline converter with its own line cord. Each supply supports a fully configured DAE and shares load currents with the other supply. The drives and LCCs have individual soft-start switches that protect the disk drives and LCCs if they are installed while the disk enclosure is powered up.

The enclosure cooling system includes two dual-blower modules.

The 2U, 25 (2.5-inch) DAE LCC input/output ports and connectors

The 2U, 25 (2.5-inch) DAE LCC supports the following I/O ports on the rear:

- Two 6-Gb/s PCI Gen 2 SAS ports
- One management (RJ-12) connector to the SPS (not used)

6-Gb/s SAS x4 ports

The DAE LCC supports two (one input and one output) 6-Gb/s SAS x4 ports (labeled 6Gb 0 x4) on the rear of each LCC (A and B). This port provides an interface for SAS and NL-SAS drives on the DAE. This port is a 26-circuit small form-factor 8088 (SFF-8088) specification (socket or receptacle) using an SFF-8088 specification mini-SAS 26-circuit cable (plug) with a pull tab.

Note: Each SAS cable is keyed with an *in* and *out* connection to prevent incorrect cabling.

Figure 65 shows an example of the port connector (socket) and cable connector (plug) with pull tab.

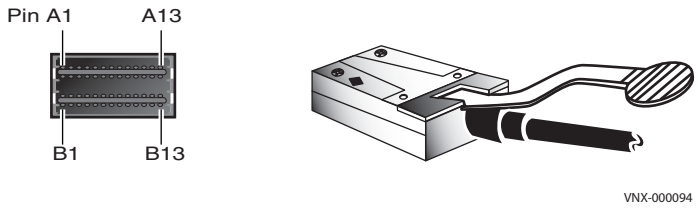


Figure 65 6-Gb/s SAS port and cable connector

Table 40 lists the 2U, DAE 6-Gb/s SAS port pin signals used on the connector.

Table 40 6-Gb/s SAS port connector pinout

Pin	Signal	Pin	Signal
A1	GND	B1	GND
A2	Rx 0+	B2	Tx 0+
A3	Rx 0-	B3	Tx 0-
A4	GND	B4	GND
A5	Rx 1+	B5	Tx 1+
A6	Rx 1-	B6	Tx 1-
A7	GND	B7	GND
A8	Rx 2+	B8	Tx 2+
A9	Rx 2-	B9	Tx 2-
A10	GND	B10	GND
A11	Rx 3+	B11	Tx 3+
A12	Rx 3-	B12	Tx 3-
A13	GND	B13	GND

6-Gb/s SAS port LEDs and port direction (input or output)

Figure 66 on page 78 shows the 6-Gb/s SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the port.

Note: Looking from the rear of the 2U DAE, LCC B is located on the left and LCC A is located on the right (Figure 66 on page 78).

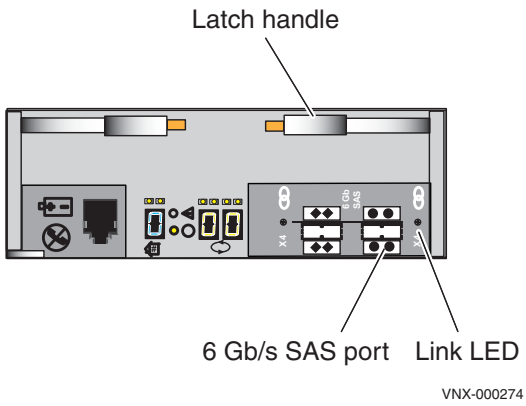


Figure 66 2U DAE LCC 6-Gb/s port LED

Table 41 describes the 2U DAE LCC 6-Gb/s port LEDs.

Table 41 2U, DAE LCC 6-Gb/s port LEDs

LED	Color	State	Description
Link/activity	Blue	On	All lanes are running at 6 GB/s
	Green	On	One or more lanes is not running at full speed or disconnected
	Alternating Blue/Green	Blinking	Port is being marked by the host
	—	Off	Not connected

Management (RJ-12) port connector

Note: The management Ethernet (RJ-12) LCC to SPS port connector is not used at this time.

Figure 67 on page 79 shows the management port (labeled with two symbols; one depicting a telephone handset with a line through it and the other depicting a battery). The telephone handset with a line through it symbol means that you cannot connect telephone type circuits to this connector (see the following **WARNING**). This port connects the LCC (A and B) ports to the SPS (A and B) ports, respectively.

⚠WARNING

The SPS (RJ-12) port is a LAN port not a WAN port. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. An RJ-45 (or TNV-type) looks the same as the RJ-12 except for two very important differences. An RJ-45 is an 8-wire modular jack. The RJ-12 is a six-wire modular jack. The RJ-45 plugs and jacks are wider than their RJ-12 counterparts - 7/16" vs 3/8". An RJ-45 plug won't fit into an R-J12 jack. But an RJ-12 plug will fit into an RJ-45 jack. Use caution when connecting cables. To avoid electric shock, do not attempt to connect TNV circuits to SELV circuits.

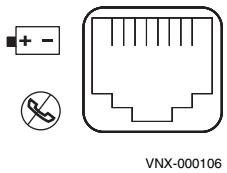


Figure 67 LCC RJ-12 port

The cable connecting the LCC to the SPS is an RJ-12 to RJ-12. It has an RJ-12 adapter (LCC side) on one end and a RJ-12 (SPS side) adapter on the other end.

LCC enclosure ID (enclosure address) and bus ID

On the rear of the LCC (A and B), an LCC enclosure ID indicator is provided. This ID indicator is a seven-segment LED display for displaying decimal numbers. The LCC enclosure ID appears on both LCCs (A and B) which is the same ID number. The enclosure ID is set at installation (Figure 68).

Each LCC includes a bus (loop) identification indicator. This indicator includes two seven-segment LED displays for displaying decimal numbers. The SP initializes the bus ID when the operating system is loaded (Figure 68).

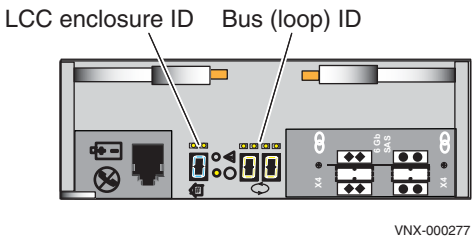


Figure 68 Example of LCC B enclosure ID and bus ID

Table 42 describes the bus (loop) status LEDs.

Table 42 LCC bus (loop) status LEDs

Led	Color	State	Description
Power fault	Amber	On	Fault
	—	Off	No fault or power off
Power on	Green	On	Power on
	—	Off	Power off

4U, 60 (2.5- or 3.5-inch) DAE

IMPORTANT

The 4U, 60 (2.5- or 3.5-inch) DAE is assembled and configured at the factory before shipping. If replacing or adding a 4U, 60 (2.5- or 3.5-inch) DAE becomes necessary. Refer to the **CAUTION** on page 81 that discusses the mounting and servicing of the 4U, 60, (2.5- or 3.5-inch) DAE in a 40U Dense rack. Additionally, refer to the *Replacing* or *Adding a DAE* for the 4U, 60, (2.5- or 3.5-inch) DAE documents.

⚠CAUTION

Access to internal components in a 4U, 60 DAE mounted 31U (4.5 feet or 1.38 meters) or more above the floor requires special equipment and is restricted to authorized service personnel only. Attempts to service disks, fans, or LCCs mounted 31U or higher without appropriate tools and personnel might result in serious personal injury.

The 4U, 60 (2.5- or 3.5-inch) DAE includes up to 60, 2.5- or 3.5-inch disk drives. Supporting 6-Gb/s data transfer speeds, this DAE has the following hardware components: three fan (or cooling modules), 60 disks (30 per side), two Link Control Cards (LCCs), two Inter Connect Modules (ICMs), and two power supplies.

To replace or add any of these components, refer to their respective Customer Replaceable Unit (CRU) procedure for the 4U, 60 DAE. For example, to replace a disk drive, refer to the *Replacing a disk in a 60-disk enclosure* document.

IMPORTANT

To accommodate the 4U, 60 DAE, a 40U Dense rack is required. The Dense rack is 44 inches (111.76 cm) deep. Because each DAE weighs 57.8 lb (26.28 kg) empty and 213 lb (96.62 kg) fully loaded, a DAE interlock mechanism is provided in the Dense rack to prevent the extension of no more than one DAE at a time.

Access to disk drives, LCCs, and cooling modules

Unlike the 2U and 3U DAEs, the 4U, 60 DAE is a drawer-type of DAE that slides in and out of the 40U Dense rack. It is not fixed to the rack. The disk drives, LCCs, and cooling modules for the DAE are located inside the DAE.

⚠CAUTION

When sliding the 4U, 60 DAE out of or into the rack, be careful not to bind the power and SAS cabling attached to the cable management arms on the back of the DAE.

To gain access to the DAE, you must first, release the cable management arms and move them to either side on the back of the DAE (see the Opening the cable management arms task in the procedure). Then, pull up on the Dense rack vertical slide bar interlock mechanism. Next, to unlock the DAE from the rails, pull on the orange loops on each side of the DAE (location 1 in Figure 69 on page 81). Finally, pull the orange tabs on each side of the DAE to slide the DAE out of the rack on its rails until it locks into the secure service position (location 2 in Figure 69 on page 81).

Note: If the DAE does not slide out of the rack, verify that all the other DAEs are completely seated in the rack by pushing firmly on them.

⚠CAUTION

To prevent bodily injury when mounting or servicing the 4U, 60 DAE in a Dense rack, you must take special precautions to ensure that the DAE remains stable. The following guidelines are provided to ensure your safety:

When lifting this DAE, always use two people and a lifting device.

For service personnel, when accessing this unit in a rack above 31U, always use an EMC authorized step ladder.

When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at or close to the bottom of the rack.

If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the DAE in the rack. The *Replacing a DAE* document for the 4U, 60 DAE provides more information.

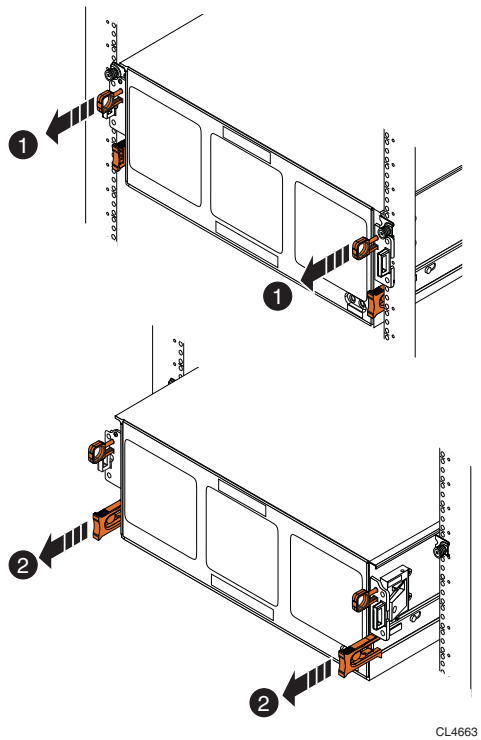


Figure 69 4U, 60 (2.5- or 3.5-inch) DAE (unlocking top, front ring pull latch mechanism and bottom slide extension release levers)

Figure 70 shows an example of a 4U DAE with the top cover closed.

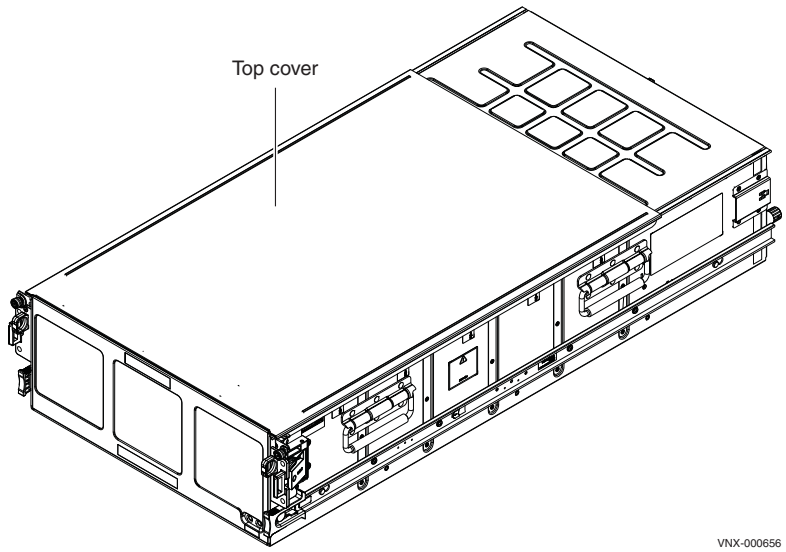


Figure 70 4U, 60 (2.5- or 3.5-inch) DAE (with top cover closed)

Figure 71 shows an example of a 4U DAE with the top cover open showing the disk drives, LCCs, and the cooling modules or fans.

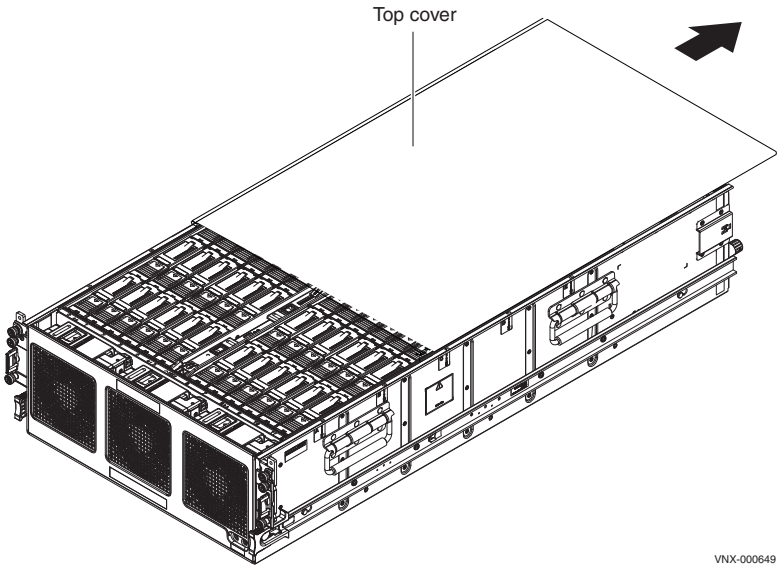


Figure 71 4U, 60 (2.5- or 3.5-inch) DAE (with top cover open)

Figure 72 shows an example of the interior view of a 4U DAE.

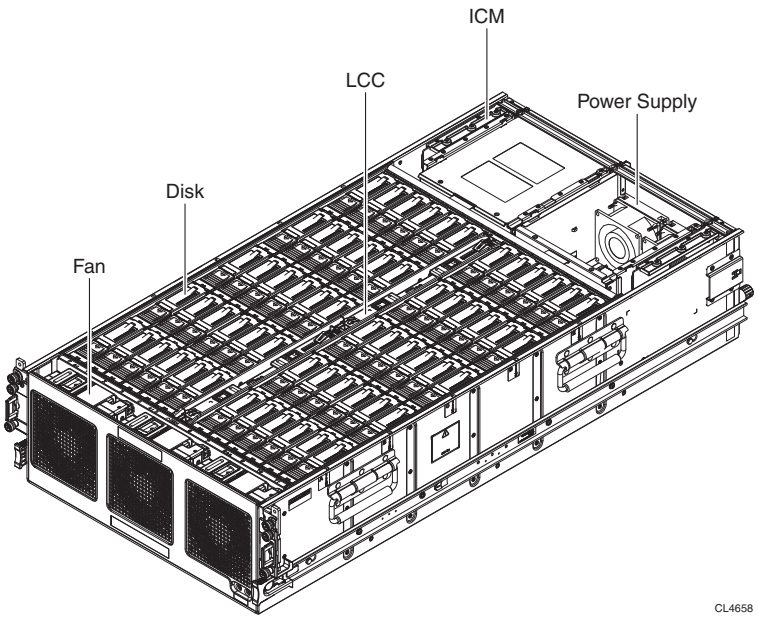


Figure 72 4U, 60 (2.5- or 3.5-inch) DAE (interior view)

The ICMs and power supplies shown in Figure 72 are accessed from the rear of the 4U DAE. "Rear view" on page 88 provides more information.

Disk drives

The disk drives for the 4U DAE are encased in cartridge-style enclosures. This enclosure is used so that varied types and sizes of disk drives can be supported. Each cartridge has an easy-to-pull and push latch. The latch allows you to quickly and efficiently snap-out a disk drive for removal and snap-in for installation.

Two drive sizes are supported in the 4U DAE:

- 2.5-inch 6-Gb/s SAS, 6-Gb/s NL-SAS, or Flash disk drives (hot-swappable)[26]
- 3.5-inch 6-Gb/s SAS, 6-Gb/s NL-SAS, or Flash disk drives (hot-swappable)

Figure 73 on page 84 shows a top-down cut-away interior view of 4U, 60 DAE showing the location of the disk drives, fans (cooling modules), and LCC A.

26. You can add or remove a disk drive while the DAE is powered up, but you should exercise special care when removing modules while they are in use. Drive modules are extremely sensitive electronic components.

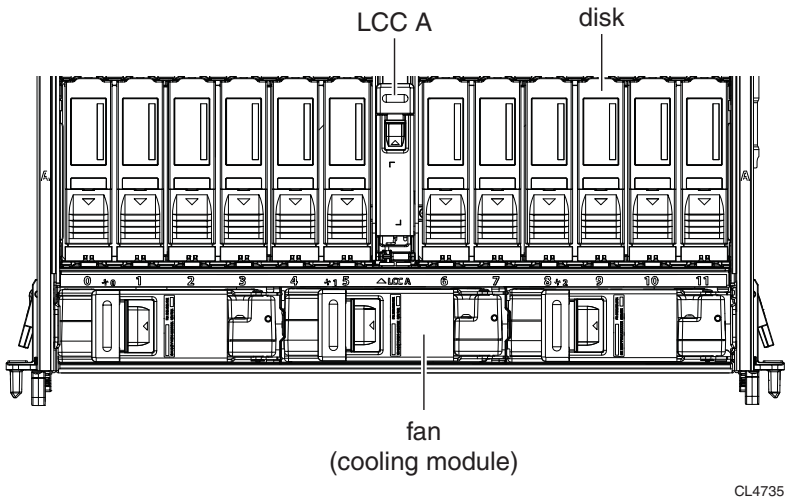


Figure 73 4U, 60 (2.5- or 3.5-inch) top-down cut-away of disk drives, fans (cooling modules), and LCC A (interior view)

Disk drive layout

Looking at the 4U DAE from the front and above, the inside of each DAE has physically printed labels located on the left and the front sides of the DAE. These labels describe the rows (or banks) and the columns (or slots) of where the disks are installed in the DAE. The banks are labeled from A to E, while the slots are labeled from 0 to 11. When describing the layout of disks within a 4U DAE, the interface format for the DAE is called B_E_D. That is, B indicates the bus, E the enclosure, and D the disk. For example, you could have an interface format of 0_1_B11. This format is interpreted as bus 0, enclosure 1, in row (bank) B, in slot number 11. Looking at the 4U DAE from the front and above, Figure 74 on page 85 shows you the disk drive layout of the 4U, 60 DAE.

Note: The labels for the banks, slots, and LCCA shown in Figure 74 on page 85 are the physical labels in the 4U DAE.

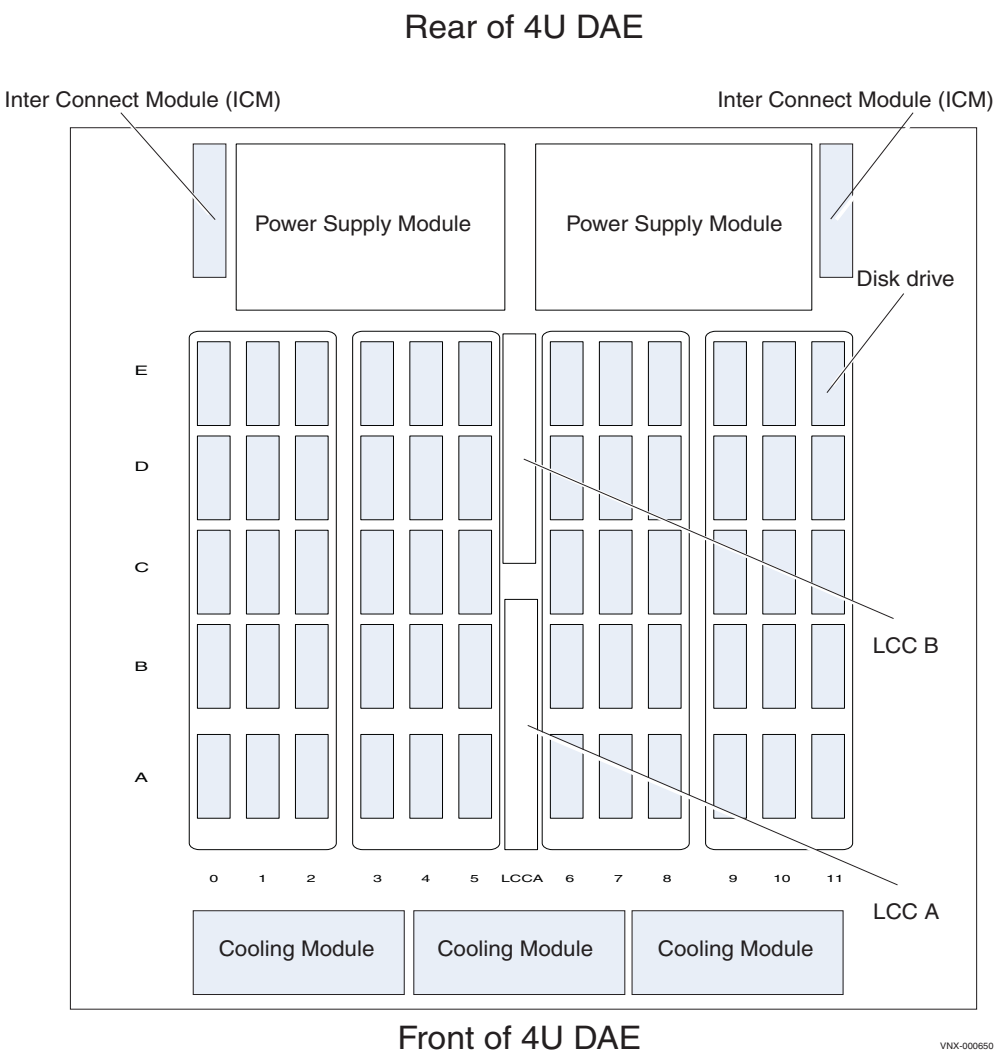


Figure 74 4U, 60 DAE disk drive layout and notation (top-down interior view)

Rules for disk drive population

The required order of loading the disk drives into a 4U DAE is (Figure 74):

1. Start at row (or bank) A, slot 0.
2. Fill up row (or bank) A before inserting any disk drives into row B.
3. Continue this order until you fill all the rows with row E being the last row filled.

Note: If a partially filled row is available, the remaining empty slots are to be loaded with filler panel modules. Rows with no or zero (0) drives do not require filler panel modules. Spare filler panel modules do not have to be placed into specific slots, but they must be placed in the same row.

LCC

Each 4U, 60 DAE includes two LCCs. The primary function of each LCC is to be a SAS expander providing services to 30 drive slots per LCC in the 4U, 60 DAE.

The LCC implements Common Disk Enclosure Subsystem (CDES). CDES consists of a 6-Gb/s SAS expander, Common Disk Enclosure FPGA (CDEF), and supporting logic.

The primary components on the LCC are the two SAS expanders. A four lane SAS wide port connecting each expander to the ICM expander on the same side (A or B) of the 4U, 60 DAE is available. Each LCC independently monitors the environmental status of the entire enclosure, using a microcomputer-controlled monitor program. The monitor communicates the status to the storage processor, which polls disk enclosure status.

Figure 75 shows the location of the status LEDs on the 4U, 60 DAE LCC.

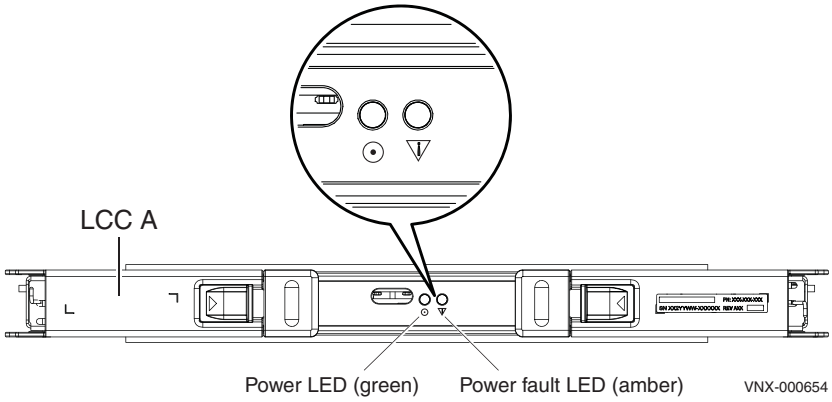


Figure 75 Example of 4U, 60 DAE LCC A showing the status LEDs

Table 43 describes the 4U, 60 DAE LCC status LEDs.

Table 43 LCC status LED

Led	Color	State	Description
Power	Green	On	Power on
	—	Off	Power off
Power fault	Amber	On	Fault
	—	Off	No fault or power off

Fan control module (cooling module)

Each 4U, 60 DAE includes three fan control modules (cooling modules) located on the front of the DAE. The fan control module is a field replaceable unit (FRU) that includes a fan, fuse, and microcontroller with an I^2C interface inside a rugged enclosure.

The fan control module augments the cooling capacity of each 4U, 60 DAE. It plugs directly into the DAE baseboard from the top of the DAE. Inside the fan control module, sensors measure the external ambient temperatures to ensure even cooling throughout the DAE.

Figure 76 shows the location of the (status) fan fault LED on the 4U, 60 DAE fan control module.

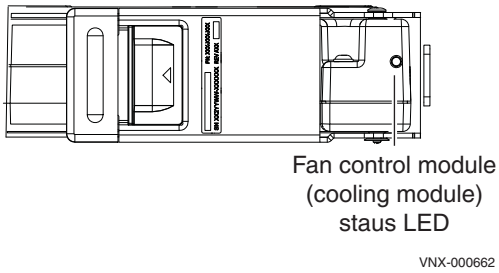


Figure 76 Example of 4U, 60 DAE fan control module showing the fan fault LED

Table 44 describes the 4U, 60 DAE fan fault LED.

Table 44 Fan control module fan fault LED

Led	Color	State	Description
Fan fault	Amber	On	Fault detected, one or more fans faulted
	—	Off	No fault detected, fans operating normally

Front view

On the front, viewing from left to right, the 4U, 60 DAE includes three fans or cooling modules and two Status LEDs.

Figure 77 shows the location of the fan or cooling module and the 4U, 60 DAE status LEDs.

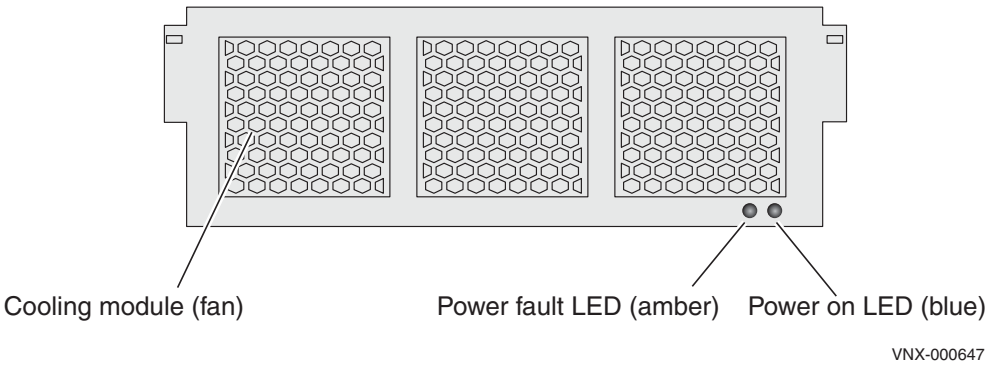


Figure 77 4U, 60 DAE (front view)

Table 45 describes the 4U, 60 DAE status LEDs.

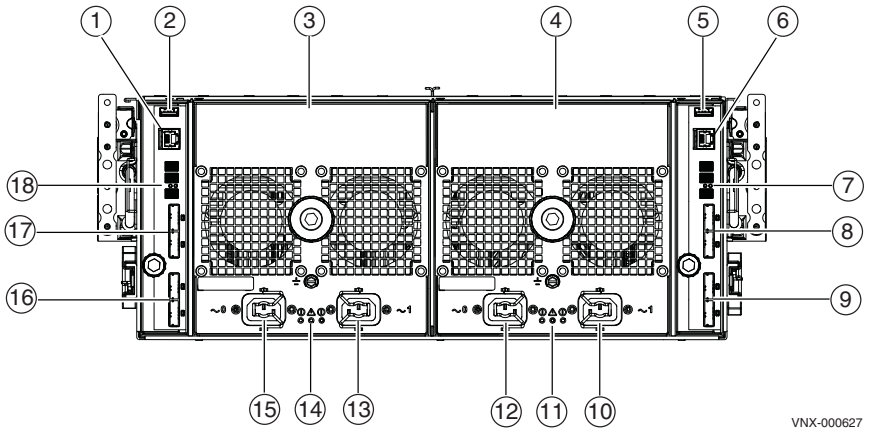
Table 45 4U, 60 DAE status LEDs

LED	Color	State	Description
DAE power	Blue	On	Powering and powered up
	—	Off	Powered down
DAE power fault	Amber	On	Fault detected
	—	Off	No fault detected

Rear view

On the rear, viewing from left to right, a 4U, 60 (2.5- or 3.5-inch) DAE includes two 6 Gb/s SAS ICMs (A and B) and two power supply modules (A and B)

Figure 78 shows an example of the location of the ICMs and power supply modules on the rear of a 4U, 60 DAE.



1	ICM A management (RJ-12) connector to SPS	**10**	4U, 60 DAE B AC power supply power in (recessed plug), labeled 1
2	ICM A USB connector	**11**	4U, 60 DAE B power and fault LEDs
3	4U, 60 DAE A AC power supply)	**12**	4U, 60 DAE B AC power supply power in (recessed plug), labeled 0
4	4U, 60 DAE B AC power supply power in (recessed plug)	**13**	4U, 60 DAE A AC power supply power in (recessed plug), labeled 1
5	ICM B USB connector	**14**	4U, 60 DAE A power and fault LEDs
6	ICM B management (RJ-12) connector to SPS	**15**	4U, 60 DAE A AC power supply power in (recessed plug), labeled 0
7	4U, 60 DAE B bus ID and enclosure ID	**16**	ICM A SAS connector (output)
8	ICM B SAS connector (input)[1]	**17**	ICM A SAS connector (input)
9	ICM B SAS connector (output)[2]	**18**	4U, 60 DAE A bus ID and enclosure ID

1. The SAS connector (input) is labeled with a double circle (dot) symbol.
2. The SAS connector (output) is labeled with a double diamond symbol.

Figure 78 Example of 4U, 60 DAE with two ICMs and two power supply/cooing modules (rear view)

ICM

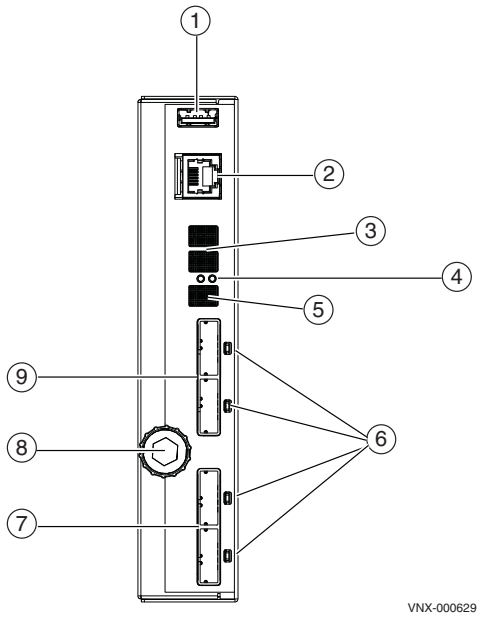
The 4U, 60 DAE external interfaces are made through the ICM. The ICM is the primary interconnect management element.

The ICM is a plug-in module that includes a USB connector, RJ-12 management adapter, Bus ID indicator, enclosure ID indicator, two input SAS connectors and two output SAS connectors with corresponding LEDs indicating the link and activity of each SAS connector for input and output to devices.

The ICM is hot-swapable. It has a built-in thumbscrew for ease of installation and removal.

As described previously, the ICMs in a 4U, 60 DAE connect to the SPE and other DAEs with 6-Gb/s SAS cables. The cables connect the ICMs in a system in a daisy-chain topology.

As shown in Figure 79, an enclosure ID[27] indicator is located on each ICM. Each ICM also includes a bus (back-end port) identification indicator. The SP initializes the bus ID when the operating system is loaded.



1	ICM USB connector	6	Four ICM SAS input/output connector LEDs (bi-color blue/green)
2	ICM management (RJ-12) connector to SPS	7	Two ICM SAS output connectors[1]
3	ICM bus ID indicator (yellowish green)	8	ICM thumbscrew
4	Two ICM bus ID LEDs (power, green; fault, amber)	9	Two ICM SAS input connectors[2]
5	ICM enclosure ID indicator (blue)		

1. The SAS connector (output) is labeled with a double diamond symbol.
2. The SAS connector (input) is labeled with a double circle (dot) symbol.

Figure 79 Example of ICM connectors and LEDs (rear view)

27. The enclosure ID is sometimes referred to as the enclosure address (EA).

Table 46 describes the ICM bus (loop) status LEDs.

Table 46 ICM bus (loop) status LEDs

Led	Color	State	Description
Power on	Green	On	Power on
	—	Off	Power off
Power fault	Amber	On	Fault
	—	Off	No fault or power off

The 4U, 60 DAE ICM input/output ports and connectors

The 4U, 60 DAE ICM supports the following I/O ports on the rear:

- Four 6-Gb/s PCI Gen 2 SAS ports
- One management (RJ-12) connector to the SPS
- One USB connector

6-Gb/s SAS x8 ports

The DAE ICM supports four (two input and two output) 6-Gb/s SAS x8 ports on the rear of each ICM (A and B). This port provides an interface for SAS and NL-SAS drives in the DAE. The port is a 26-circuit SAS small form-factor 8088 (SFF-8088) specification (socket or receptacle) using an SFF-8088 specification mini-SAS 26-circuit cable (plug) with a pull tab.

Note: Each SAS cable is keyed with an *in* and *out* connection to prevent incorrect cabling.

Figure 80 shows an example of the port connector (socket) and cable connector (plug) with pull tab.

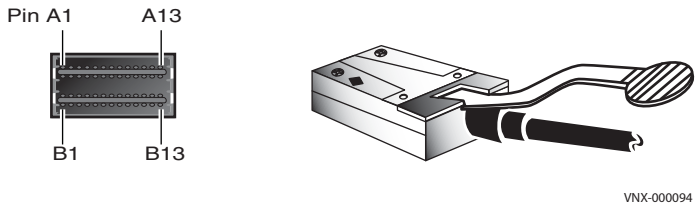


Figure 80 6-Gb/s SAS port and cable connector

Table 47 lists the 4U, DAE ICM 6-Gb/s SAS port pin signals used on the connector.

Table 47 6-Gb/s SAS port connector pinout

Pin	Signal	Pin	Signal
A1	GND	B1	GND
A2	Rx 0+	B2	Tx 0+
A3	Rx 0-	B3	Tx 0-
A4	GND	B4	GND

Table 47 6-Gb/s SAS port connector pinout (continued)

Pin	Signal	Pin	Signal
A5	Rx 1+	B5	Tx 1+
A6	Rx 1-	B6	Tx 1-
A7	GND	B7	GND
A8	Rx 2+	B8	Tx 2+
A9	Rx 2-	B9	Tx 2-
A10	GND	B10	GND
A11	Rx 3+	B11	Tx 3+
A12	Rx 3-	B12	Tx 3-
A13	GND	B13	GND

6-Gb/s SAS port LEDs and port direction (input or output) — Figure 81 shows the 6-Gb/s SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the SAS port.

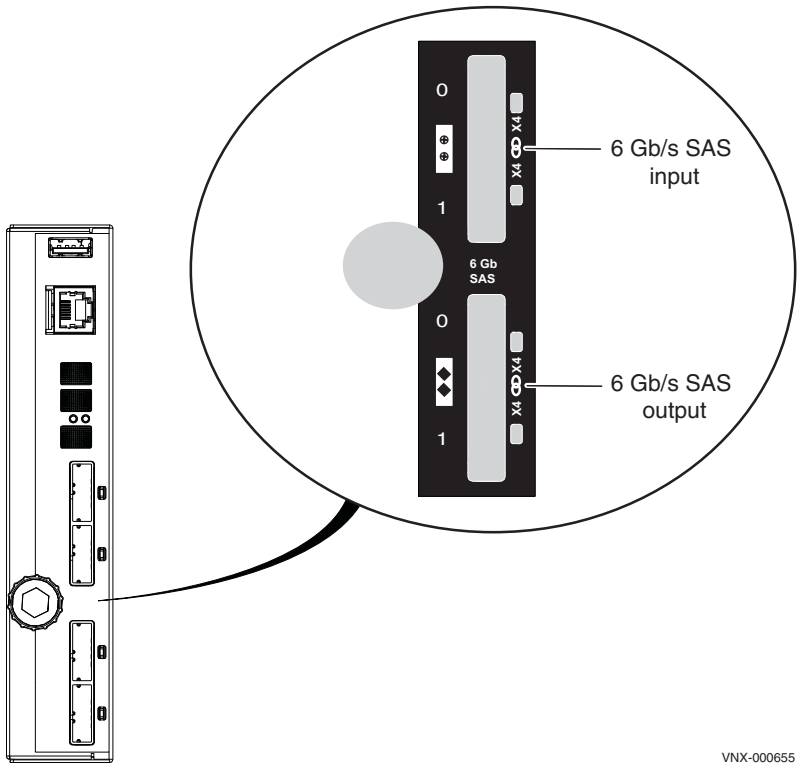


Figure 81 6-Gb/s SAS connectors and LEDs

Table 48 describes the 4U DAE ICM 6-Gb/s port LEDs.

Table 48 6-Gb/s SAS port LEDs

LED	Color	State	Description
Link/activity	Blue	On	Indicates a 4x or 8x connection with all lanes running at 6 Gb/s
	Green	On	Indicates that a wide port width other than 4x or 8x has been established or one or more lanes is not running at full speed or disconnected
	—	Off	Not connected

Management (RJ-12) port connector

Note: The management Ethernet (RJ-12) ICM to SPS port connector is not used at this time.

Figure 82 shows the management port (labeled with two symbols; one depicting a telephone handset with a line through it and the other depicting a battery). The telephone handset with a line through it symbol means that you cannot connect telephone type circuits to this connector (see the following **WARNING**). This port connects the ICM (A and B) ports to the SPS (A and B) ports, respectively.

⚠WARNING

The SPS (RJ-12) port is a LAN port not a WAN port. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. An RJ-45 (or TNV-type) looks the same as the RJ-12 except for two very important differences. An RJ-45 is an 8-wire modular jack. The RJ-12 is a six-wire modular jack. The RJ-45 plugs and jacks are wider than their RJ-12 counterparts - 7/16" vs 3/8". An RJ-45 plug won't fit into an R-J12 jack. But an RJ-12 plug will fit into an RJ-45 jack. Use caution when connecting cables. To avoid electric shock, do not attempt to connect TNV circuits to SELV circuits.

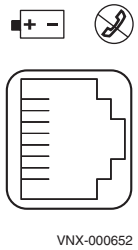


Figure 82 ICM RJ-12 port

The cable connecting the ICM to the SPS is an RJ-12 to RJ-12. It has an RJ-12 adapter (ICM side) on one end and a RJ-12 (SPS side) adapter on the other end.

USB connector

The USB connector provides a power connection to the front console.

4U, 60 DAE ICM enclosure ID (enclosure address) and bus ID

On the rear of the ICM (A and B), an ICM enclosure ID indicator is provided. This ID indicator is a seven-segment LED display for displaying decimal numbers. The ICM enclosure ID appears on both ICMs (A and B) which is the same ID number. The enclosure ID is set at installation (Figure 83).

Each ICM includes a bus (loop) identification indicator. This indicator includes two seven-segment LED displays for displaying decimal numbers. The SP initializes the bus ID when the operating system is loaded (Figure 83).

Note: Figure 83 shows both the bus ID indicator and enclosure ID indicator when viewed from the horizontal side of the ICM. Normally, you would have to turn your head to view these indicators.

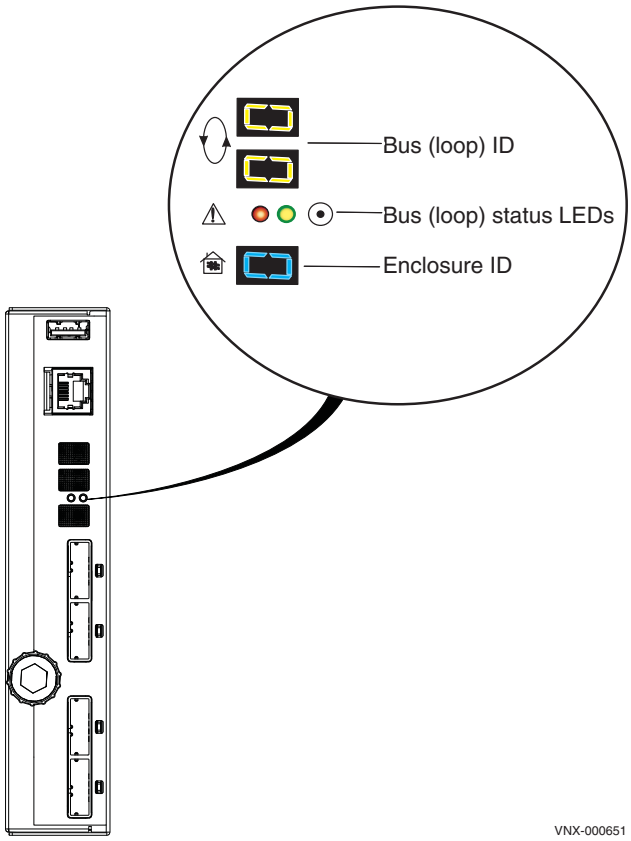


Figure 83 Example of ICM enclosure ID indicator, bus ID indicator, and the bus LEDs

Table 49 describes the bus (loop) status LEDs.

Table 49 ICM bus (loop) status LEDs

Led	Color	State	Description
Power on	Green	On	Power on
	—	Off	Power off
Power fault	Amber	On	Fault
	—	Off	No fault or power off

4U, 60 DAE AC power supply

The power supply is hot-swapable. It has a built-in thumbscrew for ease of installation and removal.

Each power supply includes a fan to provide cooling to the power supply. The power supply is an auto-ranging, power-factor-corrected, multi-output, offline converter with its own line cord. Each supply supports a fully configured DAE and shares load currents with the other supply.

In the 4U DAE, the power supplies provide four independent power zones. Each of the hot-swappable power supplies has the capability to deliver 1300 W at 12 V in its load-sharing highly-available configuration. Control and status are implemented throughout the I^2C interface.

Figure 84 shows an example of the 4U, 60 DAE AC power supply with two power in recessed connectors (or plugs) and status LEDs.

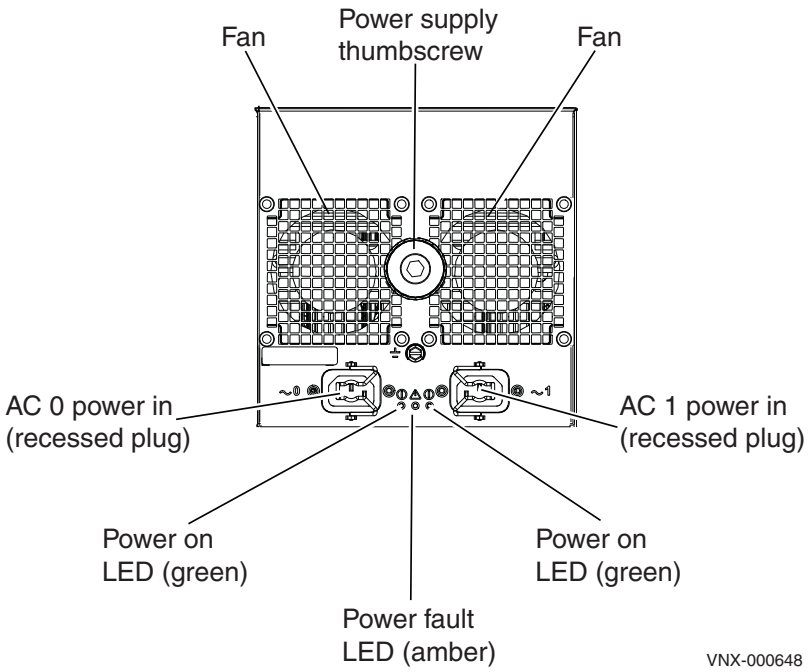


Figure 84 Example of 4U, 60 DAE AC power supply showing the (power in) recessed connector (plugs) and status LEDs

Table 50 describes the 4U, 60 (2.5- or 3.5-inch) DAE power supply LEDs.

Table 50 4U, 60 (2.5- or 3.5-inch) DAE AC power supply/cooling module LEDs

Led	Color	State	Description
AC 1 power on (12 V power)	Green	On	OK. AC or SPS power applied. All output voltages are within respective operating ranges, not including fan fault.
	—	Off	12 V power is out of operation range, or in shutdown or fault detected within the unit.
AC 0 power on (12 V power)	Green	On	OK. AC or SPS power applied. All output voltages are within respective operating ranges, not including fan fault.
	—	Off	12 V power is out of operation range, or in shutdown or fault detected within the unit.
Power fault	Amber	On	Under ICM control. On if any fans or outputs are outside the specified operating range while the unit is not in low power mode.
	—	Off	All outputs are within the specified range, or in shutdown or fault detected within unit.

Cabling

This section describes the types of cabling you will to connect the DAEs to your VNX series platform. The descriptions are presented in illustrations and text. Each illustration shows an example of the cable connection points (ports) located on the specific hardware components for the VNX7500 platform.

IMPORTANT

The following sections only discuss the DAE cabling of the VNX7500 platform with either the 3U, 15 disk drive DAE or the 2U, 25 disk drive DAE. The 4U, 60 disk drive DAE used in the 40U Dense rack is not discussed.

For all other cabling of your VNX7500 platform, the *VNX7500 Installation Guide* provides information about the SPS power cabling, SPE power cabling, DAE power cabling, PDU power cabling, LAN cabling, and so on.

Cable label wraps

Each VNX series platform comes with a cable label wrap guide or set of cable label wraps to affix to the cables on your VNX series platform. These labels should be affixed to the appropriate cables as you connect the cables to your VNX series platform. Figure 85 shows an example of the cable wrap guide and how to affix the cable label wrap to a cable.

Note: If your VNX series platform was assembled at the factory, all the cable labels have been affixed to the cables except for any DAEs you have ordered. Additionally, if your VNX series platform was not assembled at the factory, the cable kit supplied with your product will have all the required cables already labeled except for the DAEs.

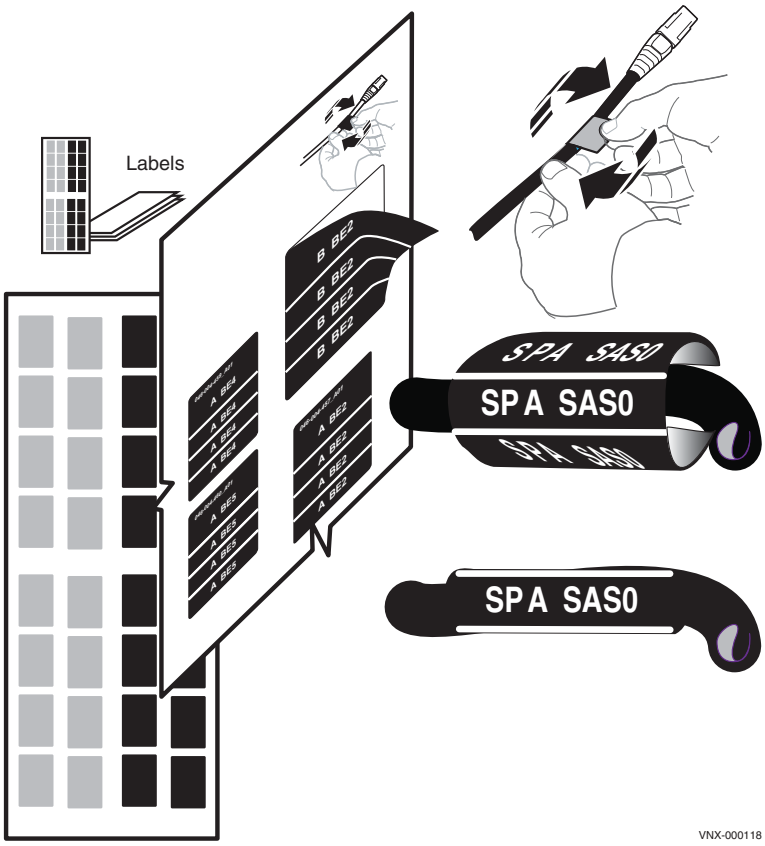


Figure 85 Example of a cable label wrap

VNX7500 DAE cabling

Shown in the upcoming figures (Figure 86 on page 98, Figure 87 on page 101, and Figure 88 on page 102) are graphical representations of SAS cabling in an SPE-based VNX storage platform, the VNX7500 Block. The Storage Processors connect to the DAEs with SAS cables. The cables connect LCCs in the DAEs of a storage platform in a daisy-chain topology.

The VNX7500 platform supports two types of DAEs; a 15 drive 3.5-inch disk 3U enclosure and a 25 drive 2.5-inch disk 2U enclosure. Expansion of up to sixty-six 3U DAEs (a maximum of 990 3.5-inch disk drives) or up to forty 2U DAEs (a maximum of 1000 2.5-inch disk drives).

IMPORTANT

Do Not connect more DAEs than the VNX7500 platform can support. When calculating the number of drives for your VNX7500 platform, if the total drive slot quantity exceeds between 990 and 1000 depending on type of DAE installed, you will not be able to add another DAE.

Cabling with two DAEs in a VNX7500 Block platform

The first DAE connected to the Storage Processor SAS output port 0 is designated Enclosure 0 (EA 0). Each DAE connected after the first DAE increments the enclosure number by one. All enclosures connected to SAS Port 0 will be on ID 0, but the addresses will increment.

Figure 86 on page 98 shows the first example of a VNX7500 Block platform with two DAEs (one 3U, 15 disk drive DAE and the other a 2U, 25 disk drive DAE) or a VNX7500 platform with a total of 40 disk drives.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0 and 1.

In Figure 86 on page 98, notice that each DAE device supports two completely redundant buses (LCC A and LCC B).

The rule of load or bus balancing is applied to all DAEs. That is, Bus 0 is Enclosure Address 0 (EA 0), Bus 1 is EA 0, and so on. In the case of the VNX7500 platform, Bus 0 EA 0 is the first DAE. So, to balance the load, Bus 1 EA0 becomes the second DAE (LCC A and B) in the cabinet with the next DAE (LCC A and LCC B) as Bus 1 EA1, and so on. If you have several DAEs in your VNX7500 platform, you can daisy chain them within that particular bus. However, it is recommended that you balance each bus. In other words, always optimize your environment by using every available bus, and spreading the number of enclosures as evenly as possible across the buses.

Note: On the DAE, each cable connector includes a symbol to denote the direction the cable needs to connect to. The cable connector that has a double circle symbol is the input to the device. The cable connector with the double diamond symbol is the output from the device.

IMPORTANT

Notice the description of the cable labels affixed to the SP to DAE cables.

The cables shown in Figure 86 on page 98 are:

Note: The cable colors shown in the example are orange for Bus 0 and blue for Bus 1.

- Cable 1, orange, 6-Gb/s SAS I/O port 0 (SP A) to 1st DAE (labels SPA A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O port 0 (SP B) to 1st DAE (labels SPB B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O port 1 (SP A) to 2nd DAE (labels SP A A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O port 1 (SP B) to 2nd DAE (labels SP B B0 Port 1 to LCC B)

Note: If your VNX7500 platform was not cabled at the factory, refer to the cable wrap guide ("Cable label wraps" on page 95) that came with your VNX7500 platform for the correct cable labels.

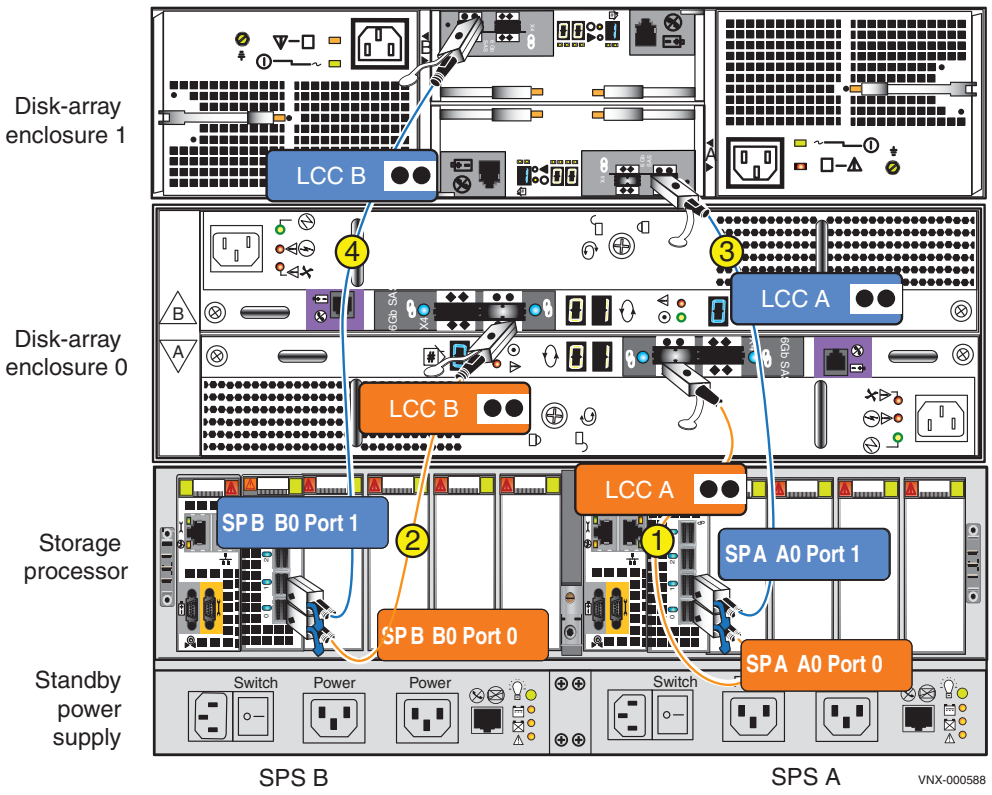


Figure 86 Example of the VNX7500 Block platform with two DAEs (3U, 15 disks and 2U, 25 disks) cabling

Note: Each cable end includes a symbol to denote the direction the cable needs to connect to. The cable end that has a single circle symbol is the input end. While the cable connector with the single diamond symbol is the output end.

Interleaved cabling with forty DAEs in a VNX7500 Block platform

Figure 87 on page 101 and Figure 88 on page 102 show a second example of a VNX7500 Block platform with three racks and forty DAEs (all are 2U, 25 disk drive DAEs) or a VNX7500 platform with a total of 1000 disk drives. This example shows the interleaved cabling with three 40U racks, the first rack having thirteen DAEs, the second rack having twenty DAEs, and the third and final rack having seven DAEs.

Note: If you want to use the 3U, 15 disk drive DAE, six 40U racks would be necessary. Each 40U rack can accommodate up to thirteen DAEs (ten DAEs per Bus) without difficulty. So, in this situation, the first rack would have nine DAEs (reserving 6U of space for File hardware). The second through fifth racks would have thirteen DAEs each. And, the six and final rack would have five DAEs for a total DAE count of sixty-six with a disk drive count of 990.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0, 1, 2 and 3.

In Figure 87 on page 101 and Figure 88 on page 102, notice that each DAE device supports two completely redundant buses on LCC A and LCC B.

Since forty DAEs are available for a maximum of 1000 disk drives, it is recommended that the DAEs be load balanced. To do this, it is recommended that you daisy-chain the DAEs for the most efficient load balancing. So, in Figure 87 on page 101 and Figure 88 on page 102, four buses (Bus 0, Bus 1, Bus 2, and Bus 3) are available.

The cables shown in Figure 87 on page 101 and Figure 88 on page 102 are:

- Cable 1, orange, 6-Gb/s SAS I/O module port 0 (SP A) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP A A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O module port 0 (SP B) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP B B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O module port 1 (SP A) to 2nd DAE (EA 0/Bus 1) in rack 1 (labels SP A A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O module port 1 (SP B) to 2nd DAE (EA 0/Bus 1) in rack 1 (labels SP B B0 Port 1 to LCC B)
- Cable 5, black, 6-Gb/s SAS I/O module port 2 (SP A) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP A A0 Port 2 to LCC A)
- Cable 6, black, 6-Gb/s SAS I/O module port 2 (SP B) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP B B0 Port 2 to LCC B)
- Cable 7, green, 6-Gb/s SAS I/O module port 3 (SP A) to 9th DAE (EA 0/Bus 3) in rack 2 (labels SP A A0 Port 3 to LCC A)
- Cable 8, green, 6-Gb/s SAS I/O module port 3 (SP B) to 9th DAE (EA 0/Bus 3) in rack 2 (labels SP B B0 Port 3 to LCC B)

The remaining cables are daisy-chained for load balancing. So, the orange cable for Bus 0 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 0
- EA 2/Bus 0, and continue interleaving the DAEs up to EA 9/Bus 0.

The blue cable for Bus 1 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 1
- EA 2/Bus 1, and continue interleaving the DAEs up to EA 9/Bus 1.

The black cable for Bus 2 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 2
- EA 2/Bus 2, and continue interleaving the DAEs up to EA 9/Bus 2.

The green cable for Bus 3 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 3
- EA 2/Bus 3, and continue interleaving the DAEs up to EA 9/Bus 3.

Note: Figure 87 on page 101 shows 10U of reserved space to allow for upgrading your VNX7500 Block to VNX7500 File/Unified platform. If you are planning to upgrade your Block platform to a File/Unified platform, it is recommended that at least 6U of rack space be reserved for adding one to two Controls Stations and one to two Data Mover enclosures.

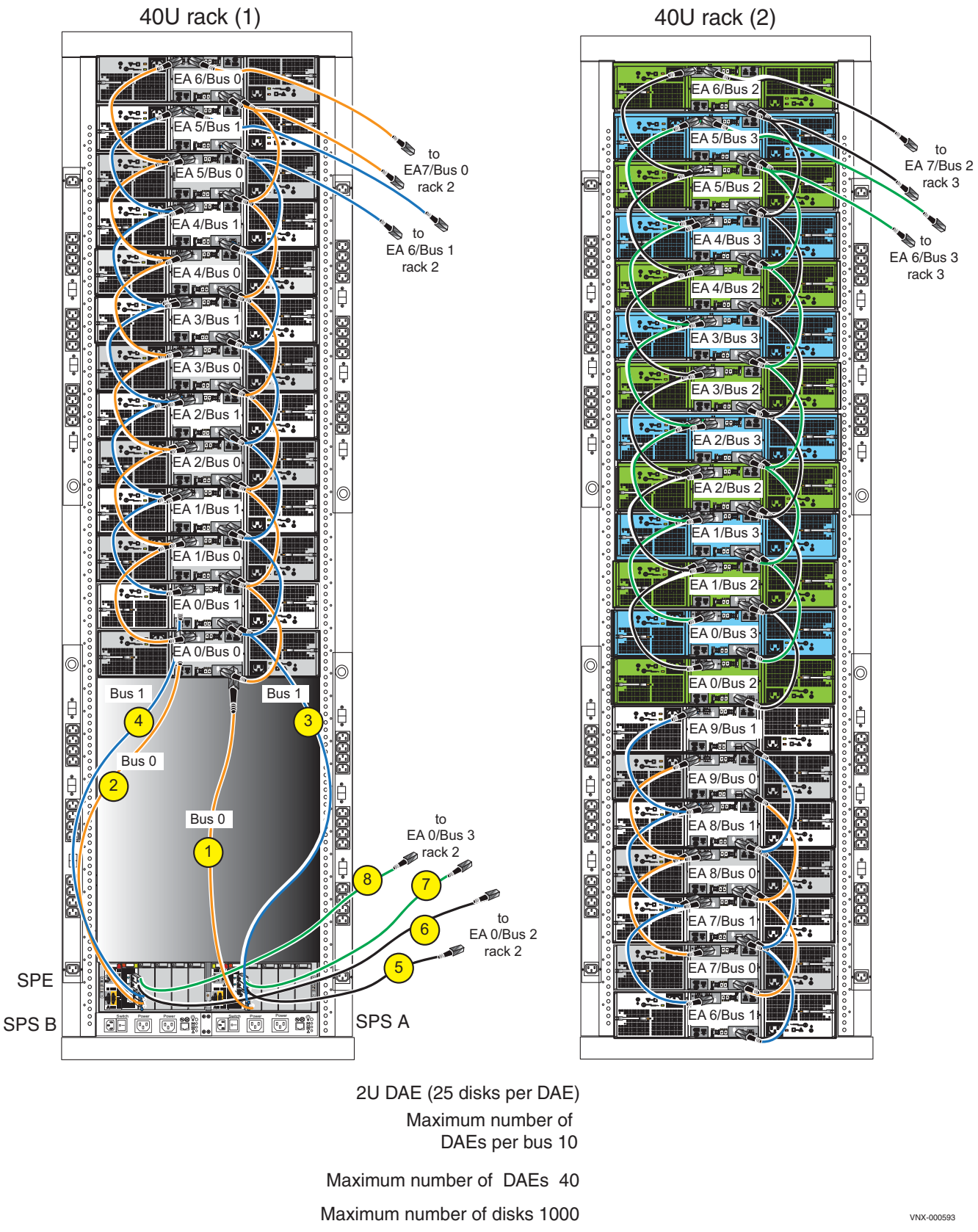


Figure 87 Example of the VNX7500 Block platform with forty DAEs (2U, 25 disks) interleaved cabling

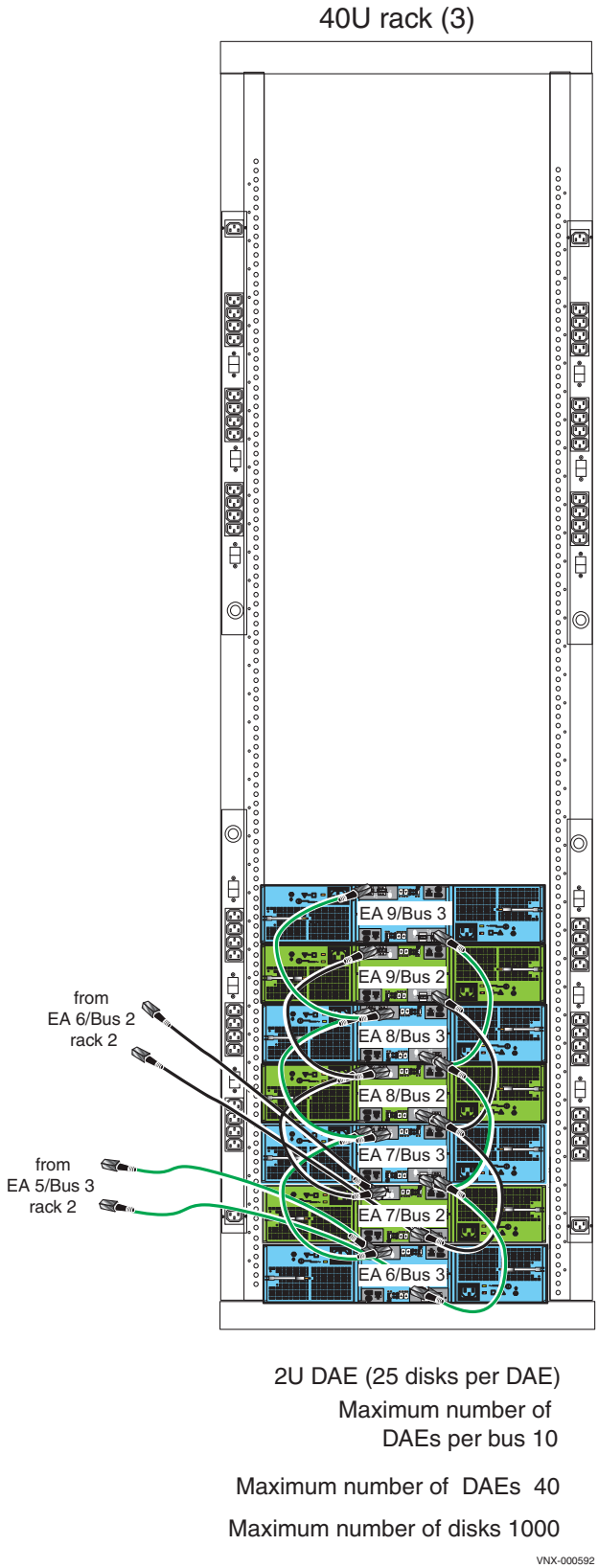


Figure 88 Example of the VNX7500 Block platform with forty DAEs (2U, 25 disks) interleaved cabling (continued)

Stacked cabling with forty DAEs in a VNX7500 Block platform

Figure 89 on page 105 and Figure 90 on page 106 show a third example of a VNX7500 Block platform with three racks and forty DAEs (all are 2U, 25 disk drive DAEs) or a VNX7500 platform with a total of 1000 disk drives. This example shows the stacked cabling with three 40U racks, the first rack having thirteen DAEs, the second rack having twenty DAEs, and the third and final rack having seven DAEs.

Note: If you want to use the 3U, 15 disk drive DAE, six 40U racks would be necessary. Each 40U rack can accommodate up to thirteen DAEs (ten DAEs per Bus) without difficulty. So, in this situation, the first rack would have nine DAEs (reserving 6U of space for File hardware). The second through fifth racks would have thirteen DAEs each. And, the six and final rack would have five DAEs for a total DAE count of sixty-six with a disk drive count of 990.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0, 1, 2 and 3.

In Figure 89 on page 105 and Figure 90 on page 106, notice that each DAE device supports two completely redundant buses on LCC A and LCC B.

Since forty DAEs are available for a maximum of 1000 disk drives, it is recommended that the DAEs be load balanced. To do this, it is recommended that you daisy-chain the DAEs for the most efficient load balancing. So, in Figure 89 on page 105 and Figure 90 on page 106, four buses (Bus 0, Bus 1, Bus 2, and Bus 3) are available.

The cables shown in Figure 89 on page 105 and Figure 90 on page 106 are:

- Cable 1, orange, 6-Gb/s SAS I/O module port 0 (SP A) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP A A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O module port 0 (SP B) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP B B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O module port 1 (SP A) to 11th DAE (EA 0/Bus 1) in rack 1 (labels SP A A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O module port 1 (SP B) to 11th DAE (EA 0/Bus 1) in rack 1 (labels SP B B0 Port 1 to LCC B)
- Cable 5, black, 6-Gb/s SAS I/O module port 2 (SP A) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP A A0 Port 2 to LCC A)
- Cable 6, black, 6-Gb/s SAS I/O module port 2 (SP B) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP B B0 Port 2 to LCC B)
- Cable 7, green, 6-Gb/s SAS I/O module port 3 (SP A) to 18th DAE (EA 0/Bus 3) in rack 2 (labels SP A A0 Port 3 to LCC A)
- Cable 8, green, 6-Gb/s SAS I/O module port 3 (SP B) to 18th DAE (EA 0/Bus 3) in rack 2 (labels SP B B0 Port 3 to LCC B)

So, the orange cable for Bus 0 is daisy-chained through the remaining DAEs:

- EA 1/Bus 0
- EA 2/Bus 0, and continue cabling the DAEs up to EA 9/Bus 0.

The blue cable for Bus 1 is daisy-chained through the remaining DAEs:

- EA 1/Bus 1
- EA 2/Bus 1, and continue cabling the DAEs up to EA 9/Bus 1.

The black cable for Bus 2 is daisy-chained through the remaining DAEs:

- EA 1/Bus 2
- EA 2/Bus 2, and continue cabling the DAEs up to EA 9/Bus 2.

The green cable for Bus 3 is daisy-chained through the remaining DAEs:

- EA 1/Bus 3
- EA 2/Bus 3, and continue cabling the DAEs up to EA 9/Bus 3.

Note: Figure 89 on page 105 shows 10U of reserved space to allow for upgrading your VNX7500 Block to VNX7500 File/Unified platform. If you are planning to upgrade your Block platform to a File/Unified platform, it is recommended that at least 6U of rack space be reserved for adding one to two Controls Stations and one to two Data Mover enclosures.

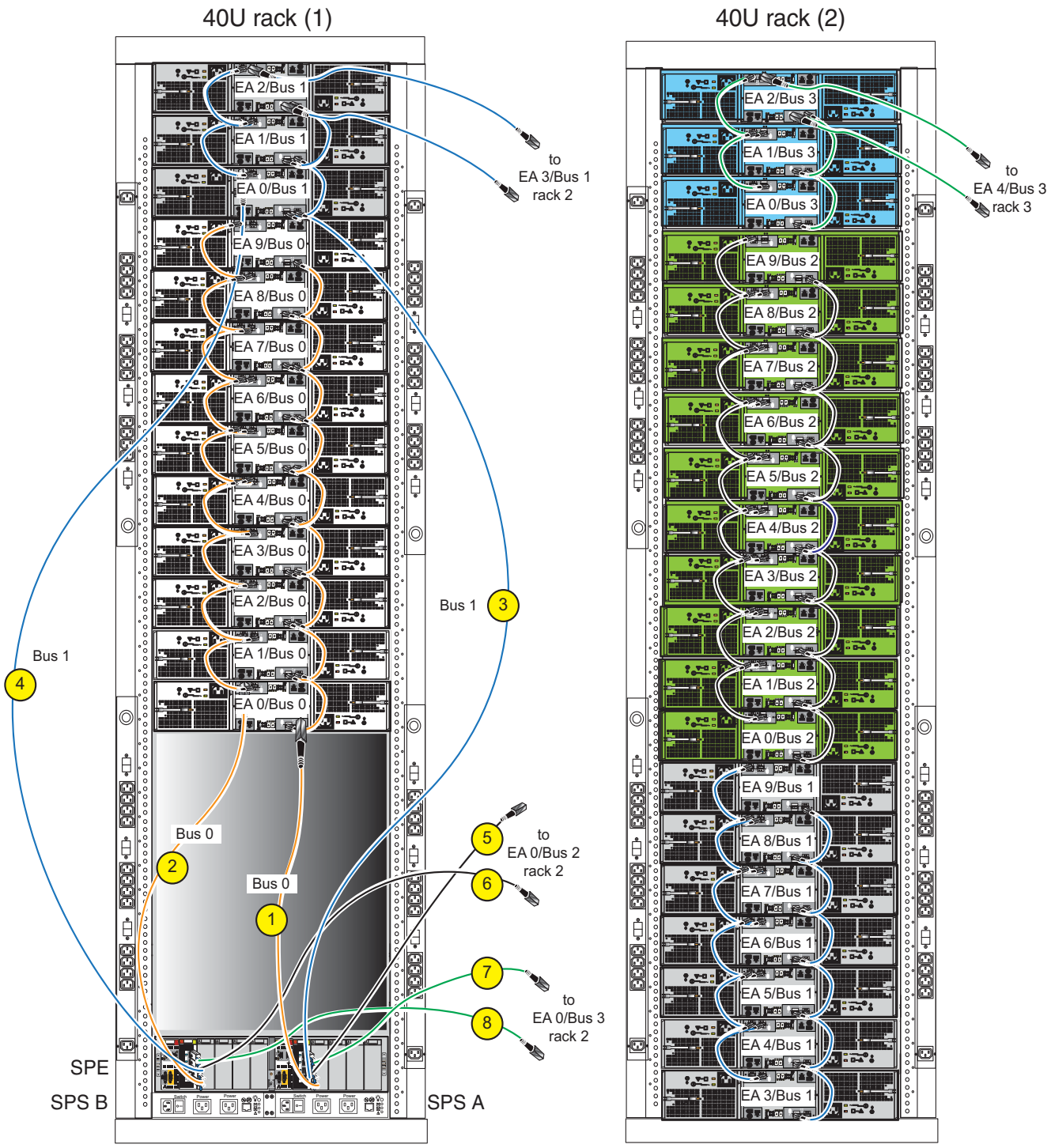


Figure 89 Example of the VNX7500 Block platform with forty DAEs (2U, 25 disks) stacked cabling

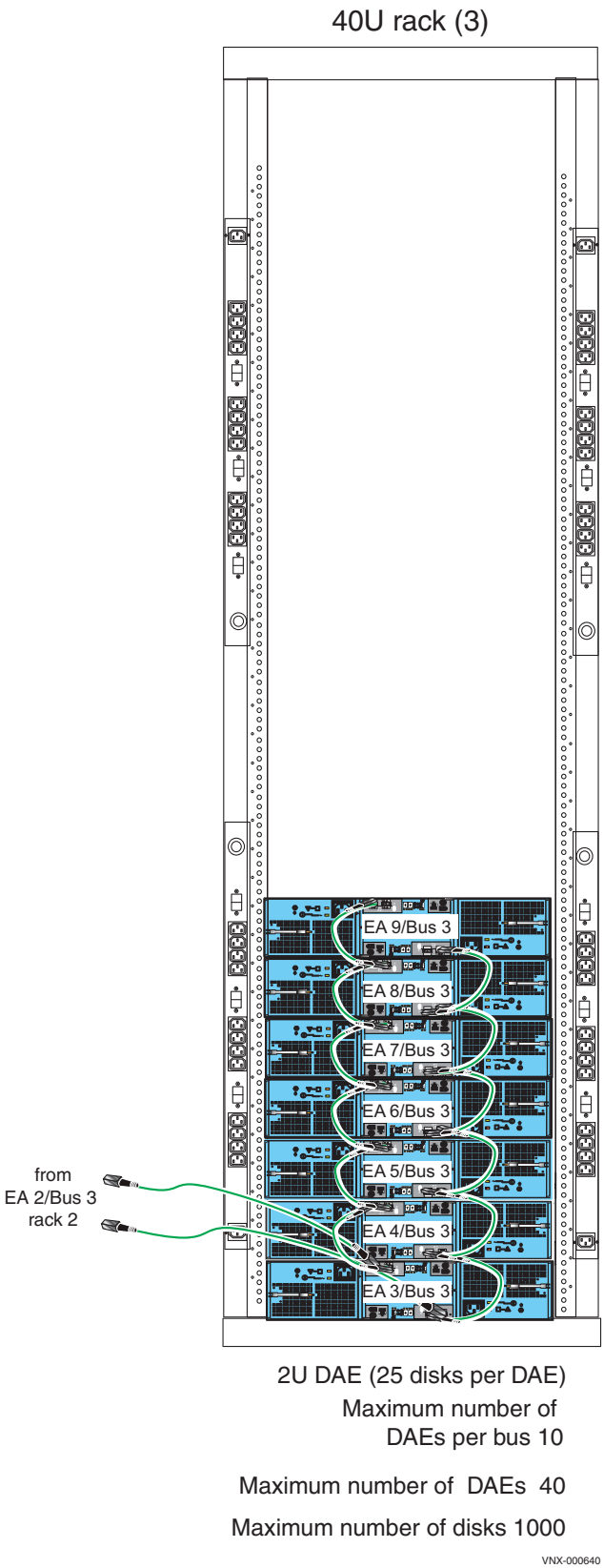


Figure 90 Example of the VNX7500 Block platform with forty DAEs (2U, 25 disks) stacked cabling (continued)

Cabling with two DAEs in a VNX7500 File/Unified platform

Shown in the upcoming figures (Figure 91 on page 108, Figure 92 on page 111, and Figure 93 on page 112) are graphical representations of SAS cabling in an SPE-based VNX storage platform, the VNX7500 File. The Storage Processors connect to the DAEs with SAS cables. The cables connect LCCs in the DAEs of a storage platform in a daisy-chain topology.

The first DAE connected to the Storage Processor SAS output port 0 is designated Enclosure 0 (EA 0). Each DAE connected after the first DAE increments the enclosure number by one. All enclosures connected to SAS Port 0 will show an ID of 0.

Figure 91 on page 108 shows the first example of a VNX7500 File/Unified platform with two DAEs (one 3U, 15 disk drive DAE and the other a 2U, 25 disk drive DAE) or a VNX7500 platform with a total of 40 disk drives.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0 and 1.

In Figure 91 on page 108, notice that each DAE device supports two completely redundant buses (LCC A and LCC B).

The rule of load or bus balancing is applied to all DAEs. That is, Bus 0 is Enclosure Address 0 (EA 0), Bus 1 is EA 0, and so on. If you have several DAEs in your VNX7500 platform, you can daisy chain them within that particular bus. However, it is recommended that you balance each bus. In other words, always optimize your environment by using every available bus, and spreading the number of enclosures as evenly as possible across the buses.

Note: On the DAE, each cable connector includes a symbol to denote the direction the cable needs to connect to. The cable connector that has a double circle symbol is the input to the device. The cable connector with the double diamond symbol is the output from the device.

IMPORTANT

Notice the description of the cable labels affixed to the SP to DAE cables.

The cables shown in Figure 91 on page 108 are:

Note: The cable colors shown in the example are orange for Bus 0 and blue for Bus 1.

- Cable 1, orange, 6-Gb/s SAS I/O module port 0 (SP A) to 1st DAE (labels SP A A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O module port 0 (SP B) to 1st DAE (labels SP B B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O module port 1 (SP A) to 2nd DAE (labels SP A A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O module port 1 (SP B) to 2nd DAE (labels SP B B0 Port 1 to LCC B)

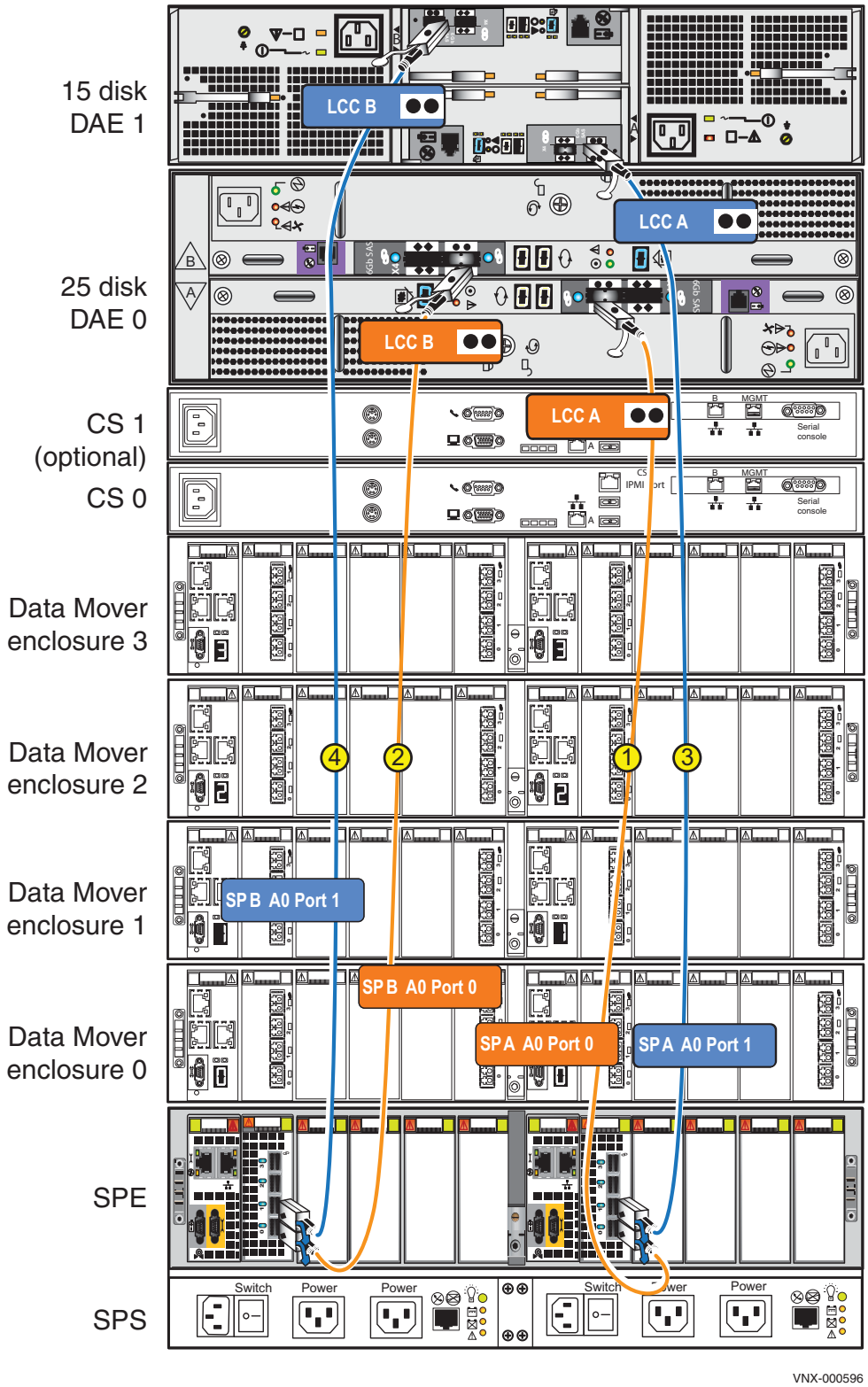


Figure 91 Example of the VNX7500 File/Unified platform with two DAEs (3U, 15 disks) cabling

Note: In Figure 91 the VNX7500 File/Unified platform shows a dual SPS, an SPE (with two SPs), a CS (with optional CS), two DMEs (with four DMs), a 3U 15 DAE and the 2U 25 DAE.

Interleaved cabling in a VNX7500 File/Unified platform with forty DAEs

Figure 92 on page 111 and Figure 93 on page 112 show an example of a VNX7500 File/Unified platform with three racks and forty DAEs (all are 2U, 25 disk drive DAEs) or a VNX7500 platform with a total of 1000 disk drives. This example has three 40U racks with the first rack having thirteen DAEs, the second rack having twenty DAEs, and the third and final rack having seven DAEs.

Note: If you want to use the 3U, 15 disk drive DAE, six 40U racks would be necessary. Each 40U rack can ac como date up to thirteen DAEs (ten DAEs per Bus) without difficulty. So, in this situation, the first rack would have nine DAEs (reserving 6U of space for File hardware). The second through fifth racks would have thirteen DAEs each. And, the six and final rack would have five DAEs for a total DAE count of sixty-six having a disk drive count of 990.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0, 1, 2 and 3.

In Figure 92 on page 111 and Figure 93 on page 112, notice that each DAE device supports two completely redundant buses (LCC A and LCC B).

Since forty DAEs are available for a maximum of 1000 disk drives, it is recommended that the DAEs be load balanced. To do this, it is recommended that you daisy-chain the DAEs for the most efficient load balancing. So, in Figure 92 on page 111 and Figure 93 on page 112, four buses (Bus 0, Bus 1, Bus 2, and Bus 3) are available.

The cables shown in Figure 92 on page 111 and Figure 93 on page 112 are:

- Cable 1, orange, 6-Gb/s SAS I/O module port 0 (SP A) to 1st DAE (labels SP A A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O module port 0 (SP B) to 1st DAE (labels SP B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O module port 1 (SP A) to 2nd DAE (labels SP A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O module port 1 (SP B) to 2nd DAE (labels SP B0 Port 1 to LCC B)
- Cable 5, black, 6-Gb/s SAS I/O module port 2 (SP A) to 8th DAE in rack 2 (labels SP A A0 Port 2 to LCC A)
- Cable 6, black, 6-Gb/s SAS I/O module port 2 (SP B) to 8th DAE in rack 2 (labels SP B B0 Port 2 to LCC B)
- Cable 7, green, 6-Gb/s SAS I/O module port 3 (SP A) to 9th DAE in rack 2 (labels SP A A0 Port 3 to LCC A)
- Cable 8, green, 6-Gb/s SAS I/O module port 3 (SP B) to 9th DAE in rack 2 (labels SP B B0 Port 3 to LCC B)

The remaining cables are daisy-chained for load balancing. So, the orange cable for Bus 0 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 0
- EA 2/Bus 0, and continue interleaving the DAEs up to EA 9/Bus 0.

The blue cable for Bus 1 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 1
- EA 2/Bus 1, and continue interleaving the DAEs up to EA 9/Bus 1.

The black cable for Bus 2 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 2
- EA 2/Bus 2, and continue interleaving the DAEs up to EA 9/Bus 1.

The green cable for Bus 3 is interleaved and daisy-chained through the remaining DAEs:

- EA 1/Bus 3
- EA 2/Bus 3, and continue interleaving the DAEs up to EA 9/Bus 3.

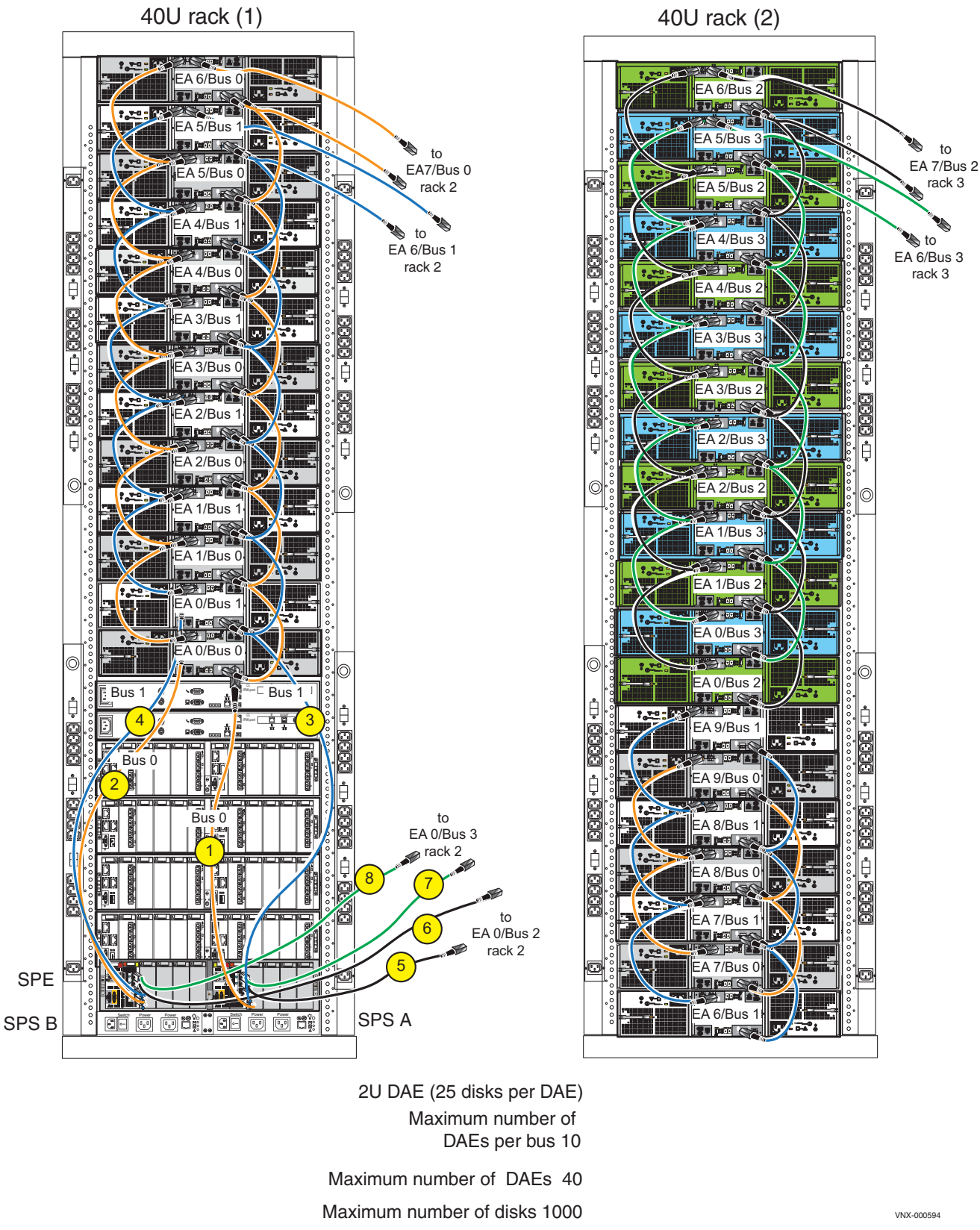


Figure 92 Example of the VNX7500 File/Unified platform with forty DAEs (2U, 25 disks) interleaved cabling

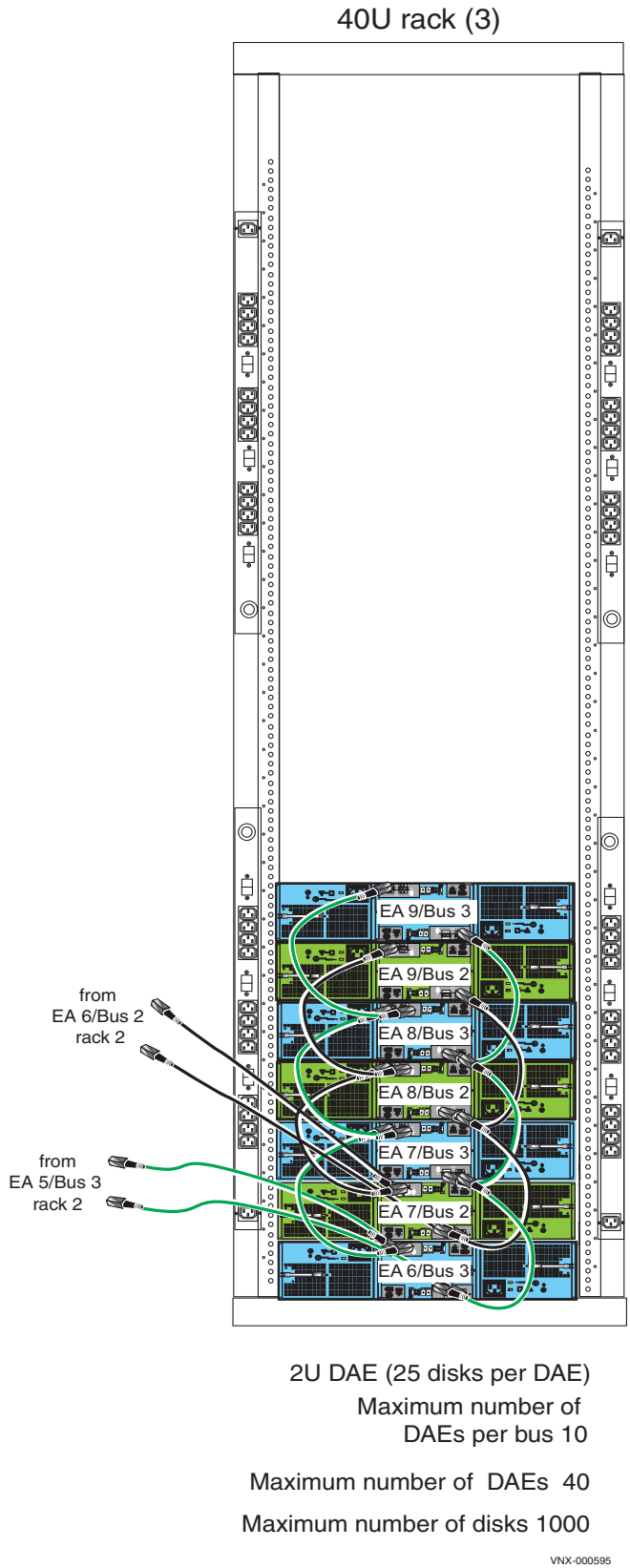


Figure 93 Example of the VNX7500 File/Unified platform with forty DAEs (2U, 25 disks) interleaved cabling (continued)

Stacked cabling in a VNX7500 File/Unified platform with forty DAEs

Figure 94 on page 115 and Figure 95 on page 116 show an example of a VNX7500 File/Unified platform with three racks and forty DAEs (all are 2U, 25 disk drive DAEs) or a VNX7500 platform with a total of 1000 disk drives. This example shows the staked cabling with three 40U racks, the first rack having thirteen DAEs, the second rack having twenty DAEs, and the third and final rack having seven DAEs.

Note: If you want to use the 3U, 15 disk drive DAE, six 40U racks would be necessary. Each 40U rack can accommodate up to thirteen DAEs (ten DAEs per Bus) without difficulty. So, in this situation, the first rack would have nine DAEs (reserving 6U of space for File hardware). The second through fifth racks would have thirteen DAEs each. And, the six and final rack would have five DAEs for a total DAE count of sixty-six with a disk drive count of 990.

The SAS ports on the 6-Gb/s SAS I/O module in each SP of the VNX7500 platform SPE are labeled 0, 1, 2 and 3.

In Figure 94 on page 115 and Figure 95 on page 116, notice that each DAE device supports two completely redundant buses on LCC A and LCC B.

Since forty DAEs are available for a maximum of 1000 disk drives, it is recommended that the DAEs be load balanced. To do this, it is recommended that you daisy-chain the DAEs for the most efficient load balancing. So, in Figure 94 on page 115 and Figure 95 on page 116, four buses (Bus 0, Bus 1, Bus 2, and Bus 3) are available.

The cables shown in Figure 94 on page 115 and Figure 95 on page 116 are:

- Cable 1, orange, 6-Gb/s SAS I/O module port 0 (SP A) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP A A0 Port 0 to LCC A)
- Cable 2, orange, 6-Gb/s SAS I/O module port 0 (SP B) to 1st DAE (EA 0/Bus 0) in rack 1 (labels SP B B0 Port 0 to LCC B)
- Cable 3, blue, 6-Gb/s SAS I/O module port 1 (SP A) to 11th DAE (EA 0/Bus 1) in rack 1 (labels SP A A0 Port 1 to LCC A)
- Cable 4, blue, 6-Gb/s SAS I/O module port 1 (SP B) to 11th DAE (EA 0/Bus 1) in rack 1 (labels SP B B0 Port 1 to LCC B)
- Cable 5, black, 6-Gb/s SAS I/O module port 2 (SP A) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP A A0 Port 2 to LCC A)
- Cable 6, black, 6-Gb/s SAS I/O module port 2 (SP B) to 8th DAE (EA 0/Bus 2) in rack 2 (labels SP B B0 Port 2 to LCC B)
- Cable 7, green, 6-Gb/s SAS I/O module port 3 (SP A) to 18th DAE (EA 0/Bus 3) in rack 2 (labels SP A A0 Port 3 to LCC A)
- Cable 8, green, 6-Gb/s SAS I/O module port 3 (SP B) to 18th DAE (EA 0/Bus 3) in rack 2 (labels SP B B0 Port 3 to LCC B)

So, the orange cable for Bus 0 is daisy-chained through the remaining DAEs:

- EA 1/Bus 0
- EA 2/Bus 0, and continue cabling the DAEs up to EA 9/Bus 0.

The blue cable for Bus 1 is daisy-chained through the remaining DAEs:

- EA 1/Bus 1
- EA 2/Bus 1, and continue cabling the DAEs up to EA 9/Bus 1.

The black cable for Bus 2 is daisy-chained through the remaining DAEs:

- EA 1/Bus 2
- EA 2/Bus 2, and continue cabling the DAEs up to EA 9/Bus 2.

The green cable for Bus 3 is daisy-chained through the remaining DAEs:

- EA 1/Bus 3
- EA 2/Bus 3, and continue cabling the DAEs up to EA 9/Bus 3.

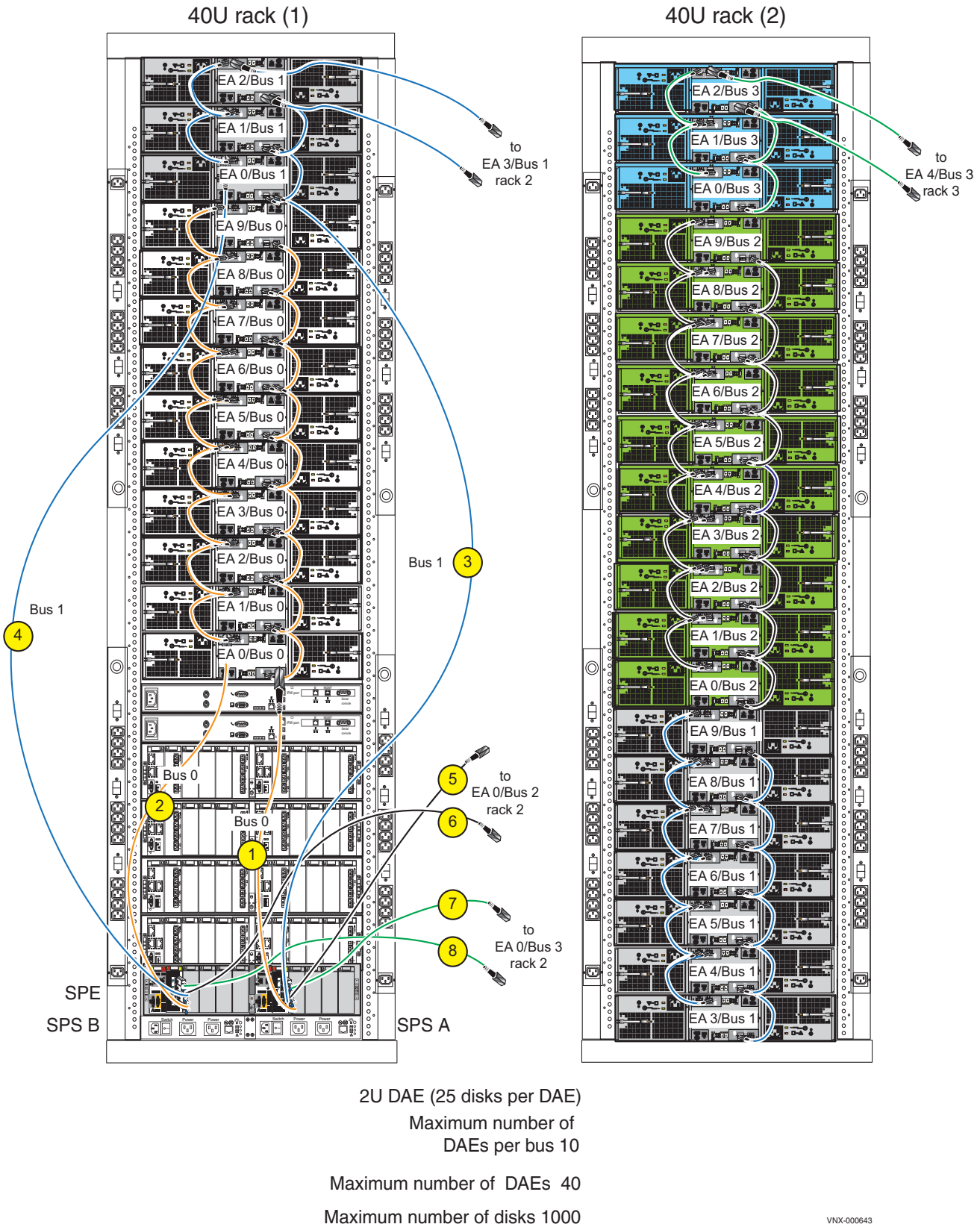


Figure 94 Example of the VNX7500 File/Unified platform with forty DAEs (2U, 25 disks) stacked cabling

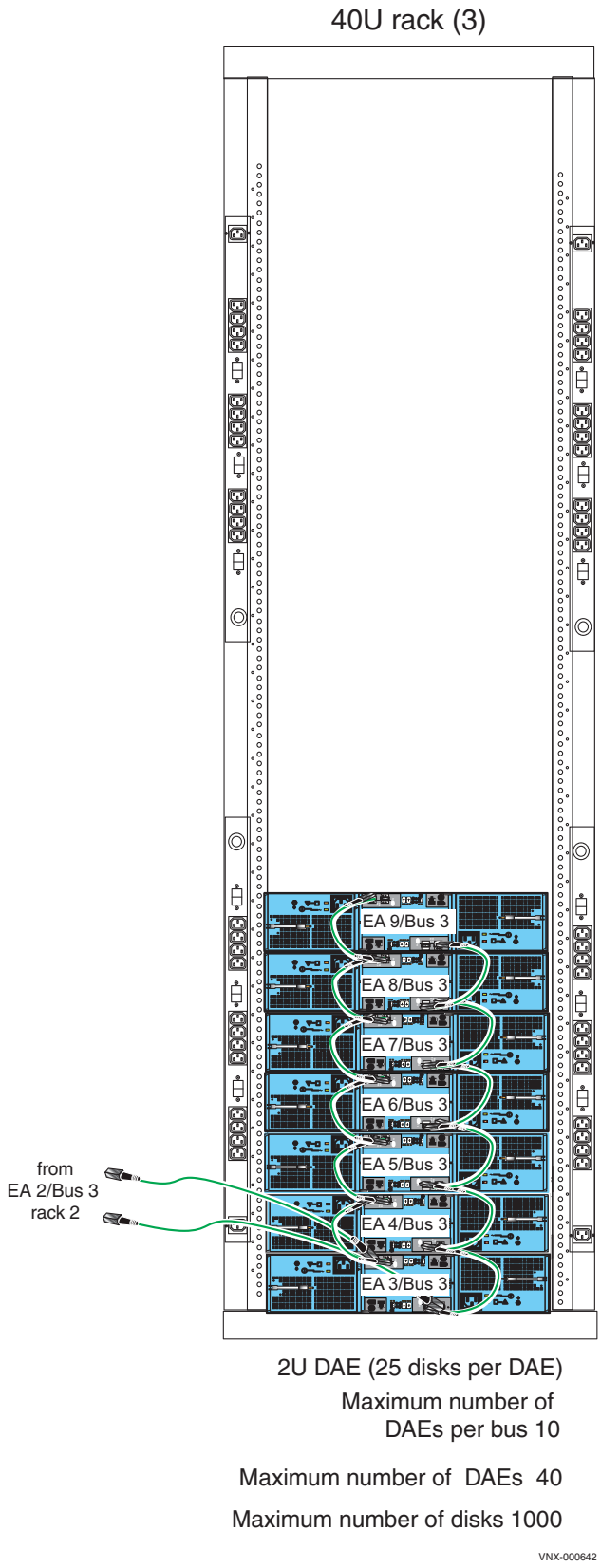


Figure 95 Example of the VNX7500 File/Unified platform with forty DAEs (2U, 25 disks) stacked cabling (continued)

Published October, 2011