

EMC® VNX® Family
VNX5600™

Hardware Information Guide

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This guide is a hardware overview guide for the EMC® VNX5600™ platform and provides an overview of the architecture, features, and components of the VNX5600 platform. The specific aspects of the VNX5600 platform and its major components include the front and rear connectors and LED indicators on the 3U, 25 (2.5-inch) disk processor enclosure (DPE), the 1U Control Station (CS), the 2U Data Mover enclosure (DME), and the 2U, 25 (2.5-inch), the 3U, 15 (2.5- or 3.5-inch), the 3U, 120 (2.5-inch), and the 4U, 60 (2.5- or 3.5-inch) disk-array enclosures DAEs.

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

Topics include:

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About this guide

This guide is designed for personnel who install, configure, and maintain the VNX5600 platform. To use this hardware publication, you should be familiar with digital storage equipment and cabling.



Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Revision history

The following table presents the revision history of this document:

Revision	Date	Description
05	February 25, 2015	The following sections were updated: <ul style="list-style-type: none"> • SP Power supply (page 31) • Four-port 16 Gb/s optical FC I/O module (page 49) • 3U, 120 (2.5-inch) DAE (“3U, 120 (2.5-inch) DAE (DAE8S)” on page 93) • Appendix B, Alum-A-Lift (“Appendix B: Field lift tool and accessory kit” on page 140) • Miscellaneous edits
04	July 21, 2014	The following sections were updated: <ul style="list-style-type: none"> • Hardware features (“Hardware features” on page 9) • SP Power supply (page 31) • Miscellaneous edits
03	January 27, 2014	The following sections were updated: <ul style="list-style-type: none"> • Front view of the VNX5600 (Figure 1 on page 7) • Rear view of the VNX5600 (Figure 2 on page 8) • Hardware features (“Hardware features” on page 9) • SP Power supply (page 31) • Miscellaneous edits
02	October 11, 2013	Updated Table 4 on page 19 .
01	July 23, 2013	First release of the <i>VNX5600 Hardware Information Guide</i>

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.

Where to get help

EMC support, product, and licensing information can be obtained as follows:

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:

<https://Support.EMC.com>

Technical support — For technical support, go to EMC online support website (registration required) 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.

Table 1 Organization

Title	Description
“Overview” on page 5	Describes the software and hardware features of a typical VNX5600.
“VNX5600 product description” on page 6	Describes and shows the front and rear views of a typical VNX5600.
“System component description” on page 13	Provides a description of the components that comprise a VNX5600. Along with a description, illustrations of each component are also shown.
“DPE rear view” on page 23	Describes and illustrates the front of a DPE and the components that comprise it.
“Control Station front view” on page 18	Describes and illustrates the front view of the Control Station used in the VNX5600.

Table 1 Organization (continued)

Title	Description
“Data Mover enclosure front view” on page 21	Describes and illustrates the front view of a DME and the components that comprise it.
“DPE rear view” on page 23	Describes and illustrates the rear of a DPE and the components that comprise it.
“Control Station rear view” on page 36	Describes and illustrates the rear view of the Control Station used in the VNX5600.
“Data Mover enclosure rear view” on page 41	Describes and illustrates the rear of a DME and the components that comprise it.
“I/O modules” on page 44	Describes and illustrates the types of I/O modules supported in the VNX5600.
“Disk-array enclosures” on page 71	Describes and illustrates the three types of DAEs available for the VNX5600.
“Appendix A: Cabling” on page 127	Describes the types of DAE cabling available for the Block and File/Unified VNX5600 platform. The cabling can be either stacked or interleaved depending on your specific requirements.
“Appendix B: Field lift tool and accessory kit” on page 140	Describes the type of portable (mechanical) lift and accessory kit used for lifting hardware components into a rack.

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 guides, go to **About VNX**, then select **Learn about VNX hardware**. Next, follow the steps in the wizard.
- ◆ For technical specifications, go to **About VNX**, then select **View technical specifications**. Next, follow the steps in the wizard.
- ◆ For installation, adding, or replacing tasks, go to **VNX tasks**, then select the appropriate heading. For example, to download a PDF copy of the *VNX5600 Block Installation Guide*, go to **Install VNX**, and follow the steps in the wizard.
- ◆ For server-related tasks, go to the **VNX Server tasks** section, then select the appropriate heading. For example, to download a PDF copy of adding or replacing server hardware, go to **VNX Server tasks**, and select **Add or replace server hardware**. Next, follow the steps in the wizard.

Safety warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you or damage the equipment. A caution or warning symbol precedes each safety statement. The safety warnings provide safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

IMPORTANT

The portable (mechanical) lift tool described in [“Appendix B: Field lift tool and accessory kit” on page 140](#) is recommended as a safety precaution when lifting EMC components into an EMC or customer-provided rack. As described in the appendix, many of the EMC components are too heavy to be lifted by one person or in some cases by two persons. As a result, this portable (mechanical) lift tool is a necessary safety requirement, especially when lifting EMC components like the 3U, 120 and the 4U, 60 DAEs.

Overview

The EMC VNX series implements a modular architecture that integrates 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 3.0 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 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.

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

Offering Block and File services, Block services only, or File services only, the VNX5600 platform is an entry-level to mid-tier storage platform. For a quick look at the VNX5600 platform hardware features, see [Table 2, “Block and File VNX5600 platform hardware feature quick reference,” on page 9](#).

In a Block services configuration, the VNX5600 platform supports a 3U DPE and four types of DAEs. The 3U DPE supported is a 25 drive 2.5-inch disk 3U enclosure (or DPE9). The DAEs supported are a 25 drive 2.5-inch disk 2U enclosure (or DAE5S), a 15 drive 2.5- or 3.5-inch disk 3U enclosure (or DAE6S), a 120 drive 2.5-inch disk 3U enclosure (or DAE8S),

and a 60 drive 2.5- or 3.5-inch disk 4U enclosure (or DAE7S). Expansion of up to nineteen 2U, 25 DAEs (a maximum of 475, 2.5-inch disk drives), up to thirty-one 3U, 15 DAEs (a maximum of 465, 3.5-inch disk drives), up to three 3U, 120 DAE (a maximum of 360, 2.5-inch disk drives), or up to seven 4U, 60 DAEs (a maximum of 420, 2.5- or 3.5-inch disk drives) is supported.

Note: When the 4U DAEs are implemented in the VNX5600 platform, the 40U Dense rack is required because of the depth of the 4U DAE.

IMPORTANT

When calculating the number of disk drives for your Block or File/Unified services VNX5600 platform, the DPE is included in the total drive slot quantity of 500 drives. If the total drive slot quantity exceeds 500, you will not be able to add another DAE. Refer to the “[Disk-array enclosures](#)” section on [page 71](#) for more information about the available expansion DAEs for the VNX5600 platform.

In a File services or a Block and File services configuration ([Figure 1 on page 7](#)), the VNX5600 platform supports a 3U DPE, from one to two 1U Control Stations (CS0 and CS1), one to two 2U Data Mover enclosures having one to four Data Movers¹, and three types of DAEs. The 3U DPE supported is a 25 drive 2.5-inch disk 3U enclosure (or DPE9). The DAEs supported are a 25 drive 2.5-inch disk 2U enclosure (or DAE5S), a 15 drive 2.5- or 3.5-inch disk 3U enclosure (or DAE6S), a 120 drive 2.5-inch disk 3U enclosure (or DAE8S), and a 60 drive 2.5- or 3.5-inch disk 4U enclosure (or DAE7S). Expansion of up to nineteen 2U, 25 DAEs (a maximum of 475, 2.5-inch disk drives), up to thirty-one 3U, 15 DAEs (a maximum of 465, 3.5-inch disk drives), up to three 3U, 120 DAE (a maximum of 360, 2.5-inch disk drives), or up to seven 4U, 60 DAEs (a maximum of 420, 2.5- or 3.5-inch disk drives) is supported.

Note: The Block or the File and Unified services configuration of the VNX5600 platform can have a mix of DAE types to conform to your specific requirements. In other words, you can have a mix of 2U DAEs, 3U DAEs, and 4U DAEs in the same environment so as long as the VNX5600 platform does not have no more than the supported amount of 500 disk drives.

VNX5600 product description

This section shows examples of the front and rear views of a VNX5600 platform.

Note: A fully configured VNX5600 platform with a 3U DPE of 25 (2.5-inch disk drives) can include up to nineteen 2U, 25 DAEs (a maximum of 475, 2.5-inch disk drives), up to thirty-one 3U, 15 DAEs (a maximum of 465, 3.5-inch disk drives), up to three 3U, 120 DAEs (a maximum of 360 2.5-inch disk drives), or up to seven 4U, 60 DAEs (a maximum of 420, 2.5- or 3.5-inch disk drives). As a result, by using the DAEs described above in this paragraph, the maximum disk drive capacity would become 500, 490, 385, or 450, respectively.

1. The term Data Mover is used throughout this guide. The term Data Mover is also referred to as a blade. These terms are interchangeable and mean the same.

For additional details on the locations of orderable parts, and their part number labels, refer to the *VNX5600 Parts Location Guide*.

Front view

Figure 1 shows an example of the front view of a File/Unified VNX5600 platform having a 3U, 25 (2.5-inch) disk drive DPE, two 2U Data Mover enclosures with four Data Movers, and two 1U Control Stations (one optional).

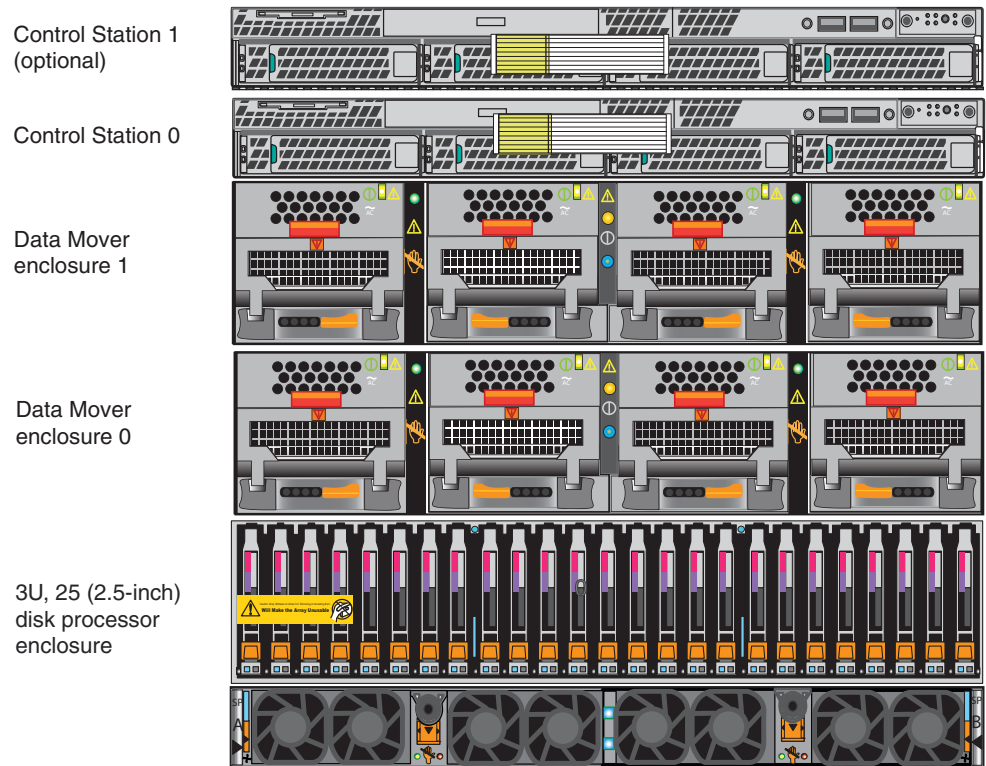


Figure 1 Example of a File/Unified VNX5600 platform (front view)

Note: The example shown in **Figure 1** does not show any DAEs.

Rear view

Figure 2 shows an example of the rear view of a File/Unified VNX5600 platform having a 3U DPE showing the two storage processors (SP A and B), two 2U Data Mover enclosures with four Data Movers, and two 1U Control Stations (one optional).

Note: The example shown in Figure 2 does not show any DAEs.

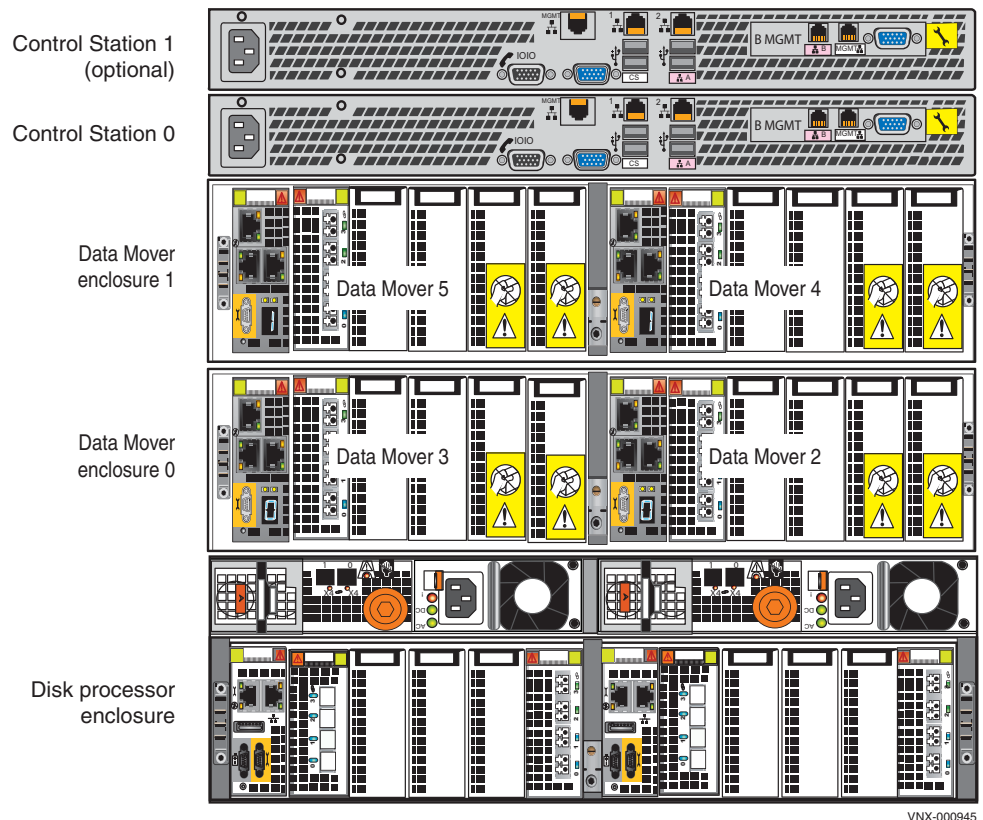


Figure 2 Example of a File/Unified VNX5600 platform (rear view)

Note: Figure 1 on page 7 and Figure 2 are examples of a File/Unified VNX5600 platform (front and rear views) without any DAEs. These figures are for illustrative purposes only.

Hardware features

Contained in a 9U architecture, the File/Unified VNX5600 platform weighs approximately 182.82 lb (82.925 kg) fully loaded² without I/O modules and DAEs. With the 3U DPE having the deepest dimension within the cabinet, the File/Unified VNX5600 without DAEs measures (9U) 12.25 inches high x 17.62 inches wide x 24.77 inches deep (31.11 cm x 44.76 cm x 69.92 cm). Between the front and rear of the enclosure, a midplane distributes power and signals to all the enclosure components. On the front of the VNX5600 DPE, the CPU modules, cooling fan modules, and disk drives plug directly into the midplane connections. On the rear of the VNX5600 DPE, the battery backup unit (BBU) modules, the base modules, power supply modules, management modules, and I/O modules plug directly into the midplane connections.

Note: The previously mentioned dimensions are approximate and do not include any I/O modules, DAEs, or the cabinet enclosure.

For more information about the weight and dimensions of a VNX5600 platform, go to <https://mydocs.emc.com/VNX/> and go to the **About VNX** section, and then select **View technical specifications**. Next, follow the steps in the wizard.

Table 2 Block and File VNX5600 platform hardware feature quick reference

Minimum form factor	Maximum # of drives	Drive types	Block					File			
			Config. I/O slots per SP	Built-in I/O ports per SP	SPs	System memory per SP	Protocols	Config. I/O slots per DM	DMs	System memory per DM	Protocols
3U w/out optional CS, DMEs, and DAEs	500	6-Gb/s 2.5 or 3.5 in. SAS and 2.5 or 3.5 in. Flash	5 ¹	Two 4x lane BE ² 6-Gb/s SAS ports	2	24 GB	FC, iSCSI, and FCoE	3	1 to 4 ³	12 GB	NFS, CIFS, and pNFS ⁴

1. For the type and number of Ultraflex I/O modules supported in the SP, refer to the I/O module section on page “Storage processor I/O module types” on page 46.
2. BE = back end
3. For the type and number of Ultraflex I/O modules supported in the DM, refer to the I/O module section on page “Data Mover I/O module types” on page 62.
4. pNFS = parallel-NFS

Configured for AC-input power, the VNX5600 includes the following hardware features:

Note: A DC powered VNX5600 model is also available.

2. A fully loaded VNX5600 (without any DAEs) includes two 1U Control Stations, one 3U DPE (with two SPs), and two 2U Data Mover enclosure with four Data Movers. In this fully loaded File/Unified VNX5600 platform, the 3U DPE (with two SPs) can have 25 (2.5-inch) disk drives. Separately, the 25 (2.5-inch) drives weigh 13.5 lb (6.13 kg).

- ◆ One 3U DPE:
 - On the front of the VNX5600, the 3U DPE (Figure 1 on page 7) has two SPs (SP A and B). Each SP consists of:
 - One disk drive carrier type; the 3U, 25 (2.5-inch) disk drive carrier (Figure 3 on page 15). Two types of disk drives are supported in this carrier: Serial attached-SCSI (SAS) and Flash
 - Four dual cooling fan packs (see “Storage processor (SP) dual fan pack (cooling module)” on page 14 for more information) or packs (eight fans total)

Note: The dual cooling fan pack is secured with push-tabs on the left and right sides of each pack.
 - One CPU module with an Intel Xeon 4-core 2.4-GHz processor facilitating Simultaneous Multi-Threading (SMT).
 - Eight Double Data Rate Three (DDR3) synchronous dynamic RAM (SDRAM) slots supporting up to 24 GB of SDRAM per CPU module or SP using 4 or 8 GB DIMMs
 - Three LEDs; power on, fault, and do not remove

Note: Each CPU is secured with a push tab/pop out latch.
 - On the rear of the VNX5600, the 3U DPE (Figure 2 on page 8) has two SPs (SP A and B). Each SP consists of:
 - One battery backup unit (BBU) providing back-up power for the SP and the disk drives allowing for the flushing (data cacheing) of the vault drives whenever an AC or DC input power loss to the storage system occurs (see “Battery backup unit” on page 26 for more information).

Note: The BBU module is secured with a push-pull type of latch.
 - One base module featuring two integrated 4x lane 6-Gb/s mini-SAS HD (encryption capable) back-end ports (labeled **1** and **0**, respectively).

Note: The base module is secured with a screw-type of latch (see “Base module” on page 26 for more information).
 - One management module (see “Storage processor management module” on page 32 for more information) featuring:
 - a.) One RS-232/EIA 232 serial (up to 115 K baud) service laptop (micro DB-9) port
 - b.) One RS-232/EIA 232 serial SPS management (micro DB-9) port
 - c.) One 10/100/1000 LAN network management (RJ-45) port
 - d.) One 10/100/1000 LAN service (RJ-45) port

Note: The management module is secured with a latch handle (labeled **MGMT**).
 - One power supply module (hot-swappable) featuring (see “Storage processor power supply module” on page 31 for more information):

Note: Two types of power supplies are supported in the VNX5600 storage system. One AC type power supply and one DC type power supply. For more information on the power supply types, see [“Storage processor power supply module” on page 31](#) and the *VNX5600 Parts Location Guide* for more information.

a.) One recessed power plug

b.) Three LEDs (labeled with ! for fault, **DC** and **AC**); the labels on the LEDs are printed upside down.

Note: The power supply is secured with a pull latch and handle.

- Five PCI Gen 3, 8x lane I/O module slots (A0 – A4 and B0 – B4) are available for use, supporting:

Note: The maximum number of I/O modules for the VNX5600 is 5 per SP. Any combination of the following I/O modules up to five per SP. For more information about slot limitations, see [“I/O module slots” on page 46](#).

a.) Four-port 8-Gb/s FC optical (running at 2, 4, or 8 Gb/s); labeled **8 GbE Fibre** on the latch handle

b.) Four-port 1-Gb/s Base-T iSCSI I/O module; labeled **1 GbE iSCSI/TOE** on the latch handle

b.) Four-port 16-Gb/s FC optical (running at 4, 8, or 16 Gb/s); labeled **16 GbE Fibre v1** on the latch handle

c.) Two-port 10-Gb/s optical or active Twinax5; labeled **10 GbE v3** on the latch handle

d.) Two-port 10-Gb/s RJ45 Base-T iSCSI/IP; labeled **10 GbE Base-T** on the latch handle

e.) Two-port 10-Gb/s Fibre Channel over Ethernet (FCoE); labeled **10 GbE/FCoE** on the latch handle

f.) Four-port 6-Gb/s SAS; labeled **6 Gb SAS v3** with an **e** inside a lock symbol on the latch handle

Note: The **e** inside the lock symbol indicates that the I/O module supports encryption.

- ◆ One to two 2U DMEs:
 - On the front, the DME has one to two Data Movers (DMs). Each DM consists of:
 - One CPU module (see [“CPU” on page 22](#) for more information)
 - Two power supply/cooling modules
 - On the rear, the DME has one to two Data Movers. Each DM consists of:
 - One management module (see [“Data Mover management module” on page 41](#) for more information) featuring:
 - a.) One RS-232/EIA 232 serial (up to 115 K baud) service laptop (micro DB-9) port
 - b.) Three 10/100/1000 LAN network management (RJ-45) ports

Note: The management module is secured with a latch handle (labeled **MGMT**).

- One CPU module consisting of one Intel Xeon 4-core 2.13-GHz processor. The CPU modules in the DME contain the power, fault, and unsafe-to-remove LEDs (see “CPU” on [page 22](#) for more information).
- Six DDR3 synchronous dynamic RAM (SDRAM) slots supporting up to 12 GB per CPU module using 2 or 4 GB DIMMs
- Three PCI Gen 2, 8x lane I/O module slots (0 – 2) available for use, supporting:

Note: The maximum number of I/O modules for the VNX5600 is three per DM. One FC I/O module and up to two other I/O modules. Any combination of these I/O modules must be the same for both Data Movers.

a.) One Fibre Channel (FC) I/O module with a:

- Four-port 8-Gb/s optical (running at 2, 4, or 8 Gb/s); in slot 0 only; labeled **8 GbE Fibre** on the latch handle

b.) One or two of the following network I/O modules in any combination:

- Two-port 10-Gb/s optical or active Twinax; labeled **10 GbE v3** on the latch handle
- Four-port 1-Gb/s copper; labeled **1 GbE** on the latch handle
- Two-port 10-Gb/s RJ45 Base-T iSCSI/IP; labeled **10 GbE Base-T** on the latch handle

- ◆ One to two 1U Control Stations
- ◆ A fully configured VNX5600 platform with a 3U DPE of 25 (2.5-inch disk drives) can include up to nineteen 2U, 25 DAEs (a maximum of 475, 2.5-inch disk drives), up to thirty-one 3U, 15 DAEs (a maximum of 465, 2.5- or 3.5-inch disk drives), up to three 3U, 120 DAEs³ (a maximum of 360 2.5-inch disk drives), or up to seven 4U, 60 DAEs³ (a maximum of 420, 2.5- or 3.5-inch disk drives). As a result, by using the DAEs described above in this paragraph, the maximum disk drive capacity would become 500, 490, 360, or 445, respectively.

IMPORTANT

When calculating the number of disk drives for your VNX5600 platform, the DPE is included in the total drive slot quantity of 500 drives. If the total drive slot quantity exceeds 500, you will not be able to add another DAE. Refer to the “[Disk-array enclosures](#)” section on [page 71](#) for more information about the available expansion DAEs for the VNX5600 platform.

- ◆ Any required cables including LAN cables, modem cables, and serial DB-9 cable.
- ◆ Mounting rails with hardware
- ◆ Front bezel with VNX5600 badge

3. When using a 3U, 120 or 4U, 60 DAE, a 40U Dense rack is required.

System component description

This section describes the VNX5600 platform components. Included in this section are illustrations and descriptions of the front and rear connectors as well as the LED indicators.

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

Installing, replacing, and removing faulted hardware components

Separate documents provide instructions for installing, replacing, and removing hardware components in the VNX5600 platform. For more information, refer to the respective document for the correct procedure. These documents are available online at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

Example: To replace a BBU in the DPE9 of a VNX5600, go to the *Replacing a battery backup unit in a disk processor enclosure* document for the correct procedures to replace a BBU module in a DPE9 disk processor enclosure. This procedure is available online at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

VNX5600 front view

As previously described, a Block VNX5600 platform is made up of a 3U DPE while a File/Unified VNX5600 platform is made up of a 3U DPE, one to two 2U DMEs, and one to two 1U Control Stations (one optional). The following sections describe the front view (Figure 3 on page 15) of the VNX5600 platform components.

General

On the front of the VNX5600 platform, the DPE comprises the following components:

- ◆ Drive carrier
- ◆ Disk drives
- ◆ Midplane
- ◆ Storage processor (SP) CPU
- ◆ Storage processor (SP) dual fan pack (cooling module)
- ◆ EMI shielding

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. The “3U, 25 (2.5-inch) disk processor enclosure” section on page 14 provides more information.

Disk drives

Each disk drive consists of one disk drive in a carrier. You can visually distinguish between disk drive types by their different latch and handle mechanisms and by type, capacity, and speed labels on each disk drive. You can add or remove a disk drive while the 3U DPE is powered up, but you should exercise special care when removing modules while they are in use. Disk drives are extremely sensitive electronic components.

IMPORTANT

When calculating the number of drives for your VNX5600 platform, the DPE is included in the total drive slot quantity of 500 drives. If the total drive slot quantity exceeds 500, you will not be able to add another DAE. Refer to the [“Disk-array enclosures”](#) section on [page 71](#) for more information about the available expansion DAEs for the VNX5600 platform.

Midplane

A midplane separates the front-facing disk drives from the rear-facing SPs. It distributes power and signals to all components in the enclosure. SPs and disk drives plug directly into the midplane.

Storage processor (SP) CPU

The storage process (SP) CPU is the intelligent component of the 3U disk processor enclosure (DPE). Acting as the control center, each SP CPU includes status LEDs. The [“3U, 25 \(2.5-inch\) disk processor enclosure”](#) section on this page provides more information.

Storage processor (SP) dual fan pack (cooling module)

When viewed from the front, each SP or CPU module has two dual fan packs located on the bottom of the SP. Each dual fan pack includes status LEDs. Latches on the fan pack lock it into place to ensure proper connection. The [“Storage processor \(SP\) dual fan pack \(cooling module\)”](#) section on [page 17](#) provides more information.

EMI shielding

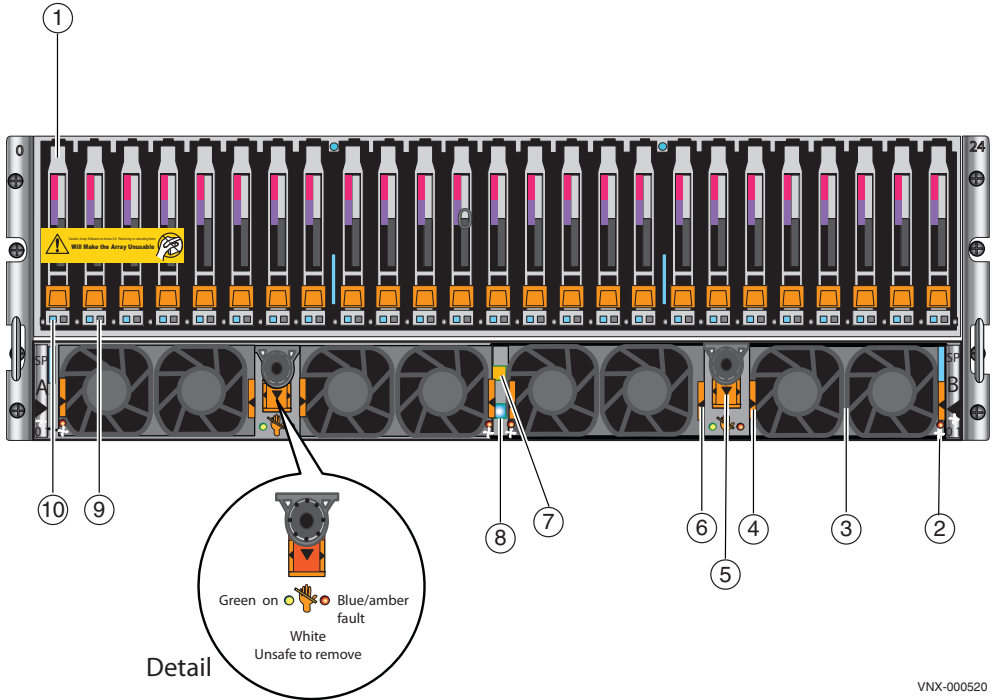
EMI compliance requires a properly installed electromagnetic interference (EMI) shield in front of the DPE disk drives. When installed in cabinets that include a front door, the DPE includes a simple EMI shield. Other installations require a front bezel that has a locking latch and integrated EMI shield.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

3U, 25 (2.5-inch) disk processor enclosure

The 25 (2.5-inch) disk processor enclosure (DPE) includes the following:

- ◆ 2.5-inch 6-Gb/s SAS or Flash disk drives (hot-swappable)
- ◆ Status LEDs
- ◆ CPU latches
- ◆ Fan packs and latches

Figure 3 on page 15 shows the location of the disk drives, fan packs, CPU latches, and status LEDs.



VNX-000520

1	Example of a 2.5-inch 6-Gb/s SAS disk drive	7	DPE fault LED (amber)
2	Dual fan pack fault LED (amber)	8	DPE power status LED (blue)
3	Dual fan pack (two dual packs per SP)	9	Disk drive fault LED (amber)
4	Dual fan pack pull tab (latch, left side), two places	10	Disk drive status/activity (blue)
5	See Detail	Detail	SP power/status LED (Green, on); SP fault LED (amber/blue, various modes - see “VNX5600 platform 3U, 25 DPE, SP, and disk drive status LEDs” on page 16 for more information); Unsafe to remove LED (white); CPU push/pop latch (two places)
6	Dual fan pack pull tab (latch, right side), two places		

Figure 3 Example of a VNX5600 platform 3U, 25 DPE (front view)

Table 3 describes the VNX5600 platform 3U, 25 DPE, SP, and disk drive status LEDs.

Table 3 VNX5600 platform 3U, 25 DPE, SP, and disk drive status LEDs

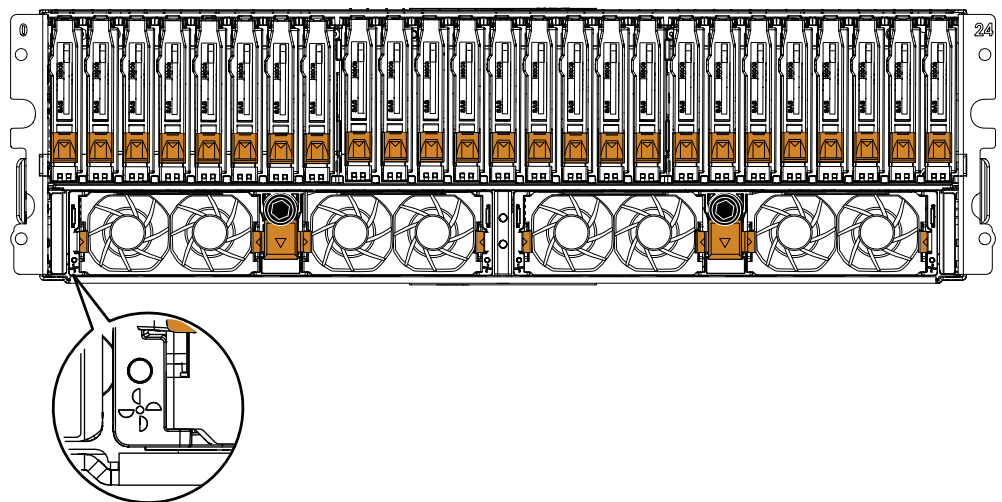
LED	Color	State	Description	
Dual fan pack fault (see location 2)	Amber	On	Fan fault	
	—	Off	Fan operating normally	
DPE fault (see location 7)	Amber	On	DPE faulted	
	—	Off	DPE not faulted	
DPE power (see location 8)	Green	On	Powering and powered up	
		Off	Powered down	
Disk drive fault (see location 9)	Amber	On	Fault has occurred	
	—	Off	No fault has occurred	
Disk drive on/activity (see location 10)	Blue	On	Powering and powered up	
		Blinking	Disk drive activity	
SP fault LED, behavior during normal boot (Detail)	Amber	On (steady)	SP fault	
		Blinks once every 4 seconds	Executing BIOS	
		Blinks once every second	Executing Post	
		Blinks four times a second	Post starting operating system	
	Blue	Blinks once every 4 seconds	Operating system booted	
		Blinks once every second	SEP start in progress	
		Blinks four times a second	SEP start completed	
	—	Off	Operating system ready for input	
	SP fault LED, during degraded boot (Detail)	Amber	Blinks once every 4 seconds	Executing BIOS
			Blinks once every second	Executing Post
Blinks four times a second			Post starting operating system	
Blue		Blinks once every 4 seconds	Operating system booted	
		On	Degraded mode	
SP fault LED, during faults (Detail)	—	Off	Powered down	
	Amber	On	Fault has occurred	

Table 3 VNX5600 platform 3U, 25 DPE, SP, and disk drive status LEDs (continued)

LED	Color	State	Description
SP fault LED, during faults (Detail) continued	Amber	Blinks once every 2 seconds	NMI reset pushed; blinking will continue until SP reboots and enters power on sequence.
		Blinks at 1, 3, 3, and 1 times a second	Memory problem
	Blue	On	Fault has occurred
SP unsafe to remove (Detail)	White	On	The SP peer has a panic or rebooted with the cache performance mode enabled. The SP is holding valid cache in memory.
			The SP is currently flashing the BIOS/Post firmware or updating the resume PROMs.
			The SP is currently dumping the cache data to the vault.
	—	Off	The SP can be safely removed for service.
SP power status (see Detail)	Green	On	SP is powered up normally
	—	Off	SP is powered off

Storage processor (SP) dual fan pack (cooling module)

As previously described, the SP dual fan pack cooling module provides cooling to the SP CPU. Four dual-fan packs are provided; two dual-fan packs per SP. Each dual-fan pack includes an amber fault LED (see [Figure 4](#)).



CL5184

Figure 4 Example of the fan fault LED

NOTICE

You have two minutes to remove the faulted fan pack (cooling module) and install a replacement before the SP shuts down. For more information, refer to the *Replacing a Storage Processor Fan module* procedure for the correct steps to take before and during removal of a fan pack. This procedure is available online at: <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, select **Replace VNX Hardware**. Next, follow the steps in the wizard.

Control Station front view

On the front, viewing from left to right, the File/Unified VNX5600 platform 1U Control Station includes the following hardware components:

- ◆ One DVD-ROM drive
- ◆ Two USB 2.0 connectors (not used)
- ◆ Front control panel with various buttons and status LEDs
- ◆ Four hot-swappable SATA hard drive bays

Figure 5 shows the orientation of these components.

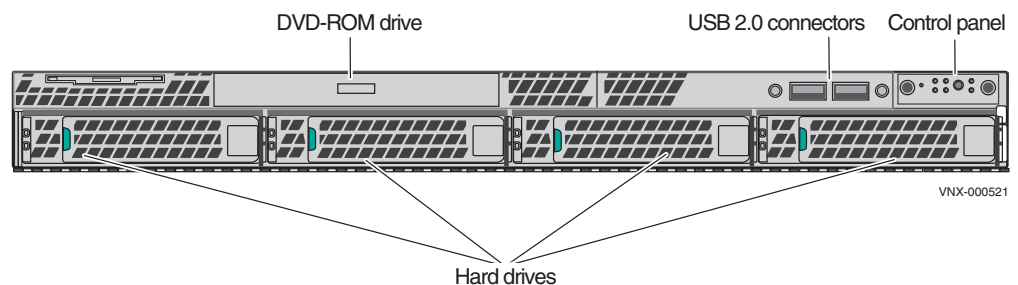


Figure 5 Example of a VNX5600 platform Control Station (front view)

Control Station front panel

Figure 6 shows the location of the File/Unified VNX5600 platform 1U Control Station front panel.

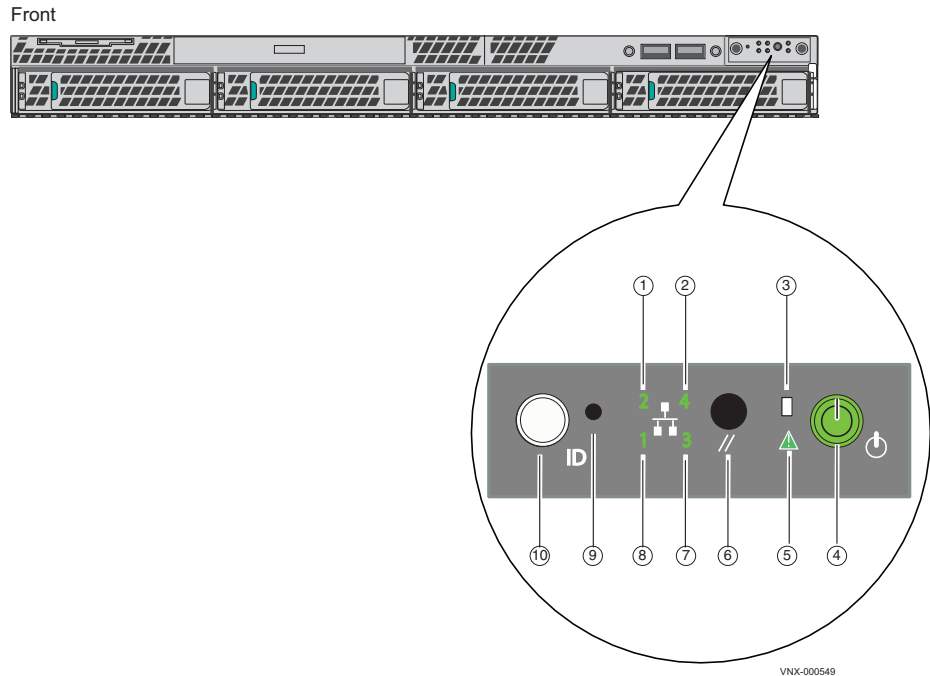


Figure 6 VNX5600 platform Control Station front panel

Table 4 describes the Control Station front panel.

Table 4 Control Station LEDs and push buttons

LED	Color	State	Description
Onboard (integrated) LAN 2 and 4 (see locations 1 and 2, respectively)	Green	On	NIC link/no access
		Blinking	NIC link/LAN access
	—	Off	Idle
Internal hard drive activity (see location 3)	Green	Blinking	Hard drive access
	—	Off	No hard drive activity, no fault
Power (see location 4) Note: For correct power up and down procedures, go to https://mydocs.emc.com/VNX/ and go to the VNX tasks section, then select Power up and down VNX . Next, follow the steps in the wizard.	Green	On	Power on/system loaded and ready
		Blinking	Sleep mode
	—	Off	Power off

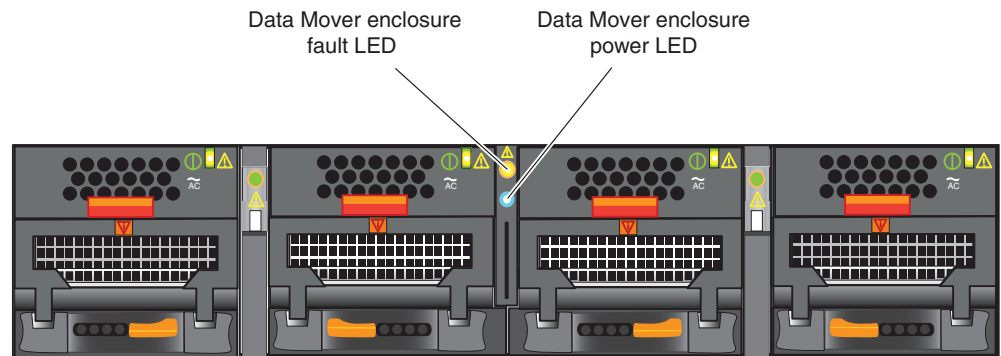
Table 4 Control Station LEDs and push buttons (continued)

LED	Color	State	Description
Status/fault (see location 5)	Green	On	Powered on; status ok
		Blinking	Powered on; degraded. Redundancy lost, such as power supply or fan failure, or predictive power supply failure.
	Amber	On	Critical fault: Voltage, thermal, or power fault; CPU missing; insufficient power unit redundancy resource offset asserted.
		Blinking	Non-critical failure: Critical temperature/voltage
	—	Off	Power off: System unplugged Powered on: System powered off and in standby, no prior degradation/critical state.
Reset button (see location 6)	—	—	Allows you to reset the CS. Same as turning the power off and then on again. Data loss will occur unless you have saved the data. The reset button would be used when a program error occurs and has caused the CS to freeze. Pressing the reset button performs a cold restart (reboot) which goes through the initial start-up stages including memory check.
Onboard (integrated) LAN 1 and 3 (see locations 7 and 8, respectively)	Green	On	NIC link/no access
		Blinking	NIC link/LAN access
	—	Off	Idle
NMI button (see location 9)	—	—	Not used
ID button with LED (see location 10)	Green	On	Powered on

Data Mover enclosure front view

The front of the File/Unified VNX5600 platform 2U Data Mover enclosure (DME) contains two enclosure status LEDs (power and fault) as shown in [Figure 7](#).

Note: [Figure 7](#) is a graphical representation of the File/Unified VNX5600 platform 2U Data Mover enclosure with four power supply/cooling (fan) modules and two CPU modules installed.



CNS-001667

Figure 7 Data Mover enclosure status LEDs

[Table 5](#) describes the 2U Data Mover enclosure status (power and fault) LEDs.

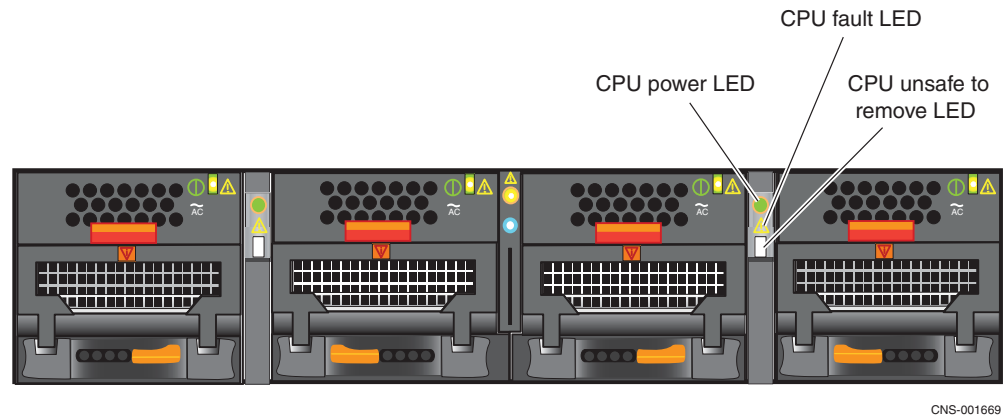
Table 5 DME status LEDs

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

The CPU modules in the DME contain the power, fault, and unsafe-to-remove LEDs.

Figure 8 shows the CPU LEDs.



CNS-001669

Figure 8 CPU LEDs

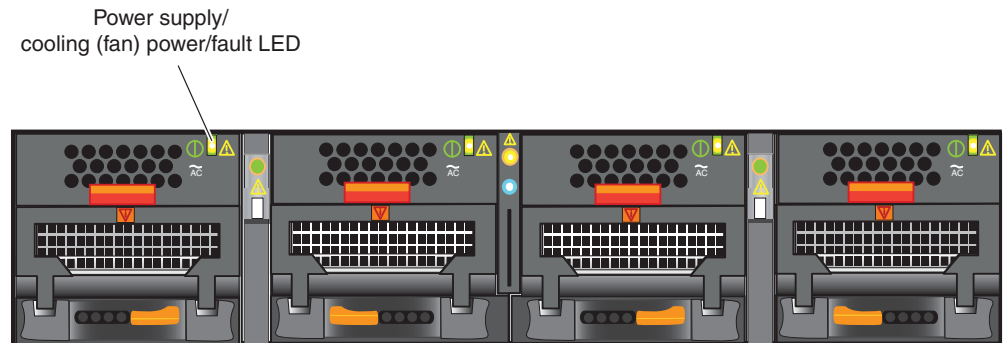
Table 6 describes the CPU LEDs.

Table 6 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.
<p>Note: The fault LED changes color from amber to blue when the operating system is loading, see step 4 in the fault LED description above.</p>			

Power supply/cooling (fan) module LED

The power supply/cooling (fan) modules have status LEDs on the front. [Figure 9](#) shows the LEDs for the power supply/cooling (fan) modules.



CNS-001673

Figure 9 Power supply/cooling (fan) module LED

[Table 7](#) describes the power supply/cooling (fan) LED.

Table 7 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

VNX5600 rear view

As previously described, the File/Unified VNX5600 platform is made up of a 3U DPE, two 1U Control Stations (one optional), and one to two 2U Data Mover enclosures having one to four Data Movers. The following sections will describe the rear view of the VNX5600 platform components as previously shown in [Figure 2 on page 8](#).

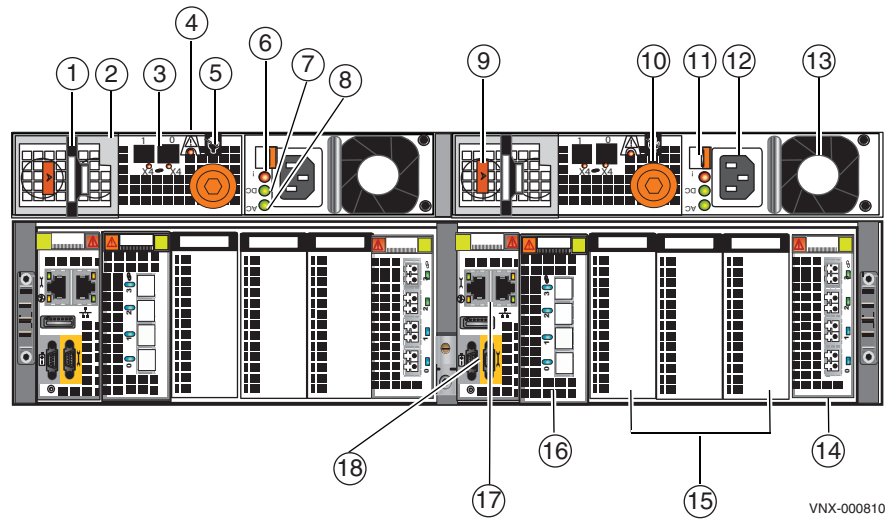
DPE rear view

[Figure 10 on page 25](#) shows an example of the rear of the 3U DPE. The following modules, connectors, status LEDs, and latch handles are described:

- ◆ Battery backup unit (BBU), two (one for each SP)
- ◆ Base module, two (one for each SP)
 - Two 6 Gb/s mini-SAS HD ports (looking from the left, they are labeled **1** and **0**, respectively). Below each mini-SAS HD port, the ports are labeled **x4**. To the left of mini-SAS HD port 1, the ports are vertically labeled **6 Gb SAS**.
 - Two LEDs (fault and unsafe to remove)

- ◆ Power supply, two (one for each SP)
 - One power in recessed connector (plug)
 - Two power supply status LEDs (power on and fault)
- ◆ SP B and A
 - Five PCI Gen 3 x8 I/O module slots (A0 – A4 and B0 – B4) featuring the following SP I/O module types:
 - Four-port 8-Gb/s FC optical (running at 2, 4, or 8 Gb/s); labeled **8 GbE Fibre** on the latch handle
 - Four-port 16-Gb/s FC optical (running at 4, 8, or 16 Gb/s); labeled **16 GbE Fibre v1** on the latch handle
 - Four-port 1-Gb/s Base-T iSCSI I/O module; labeled **1 GbE iSCSI/TOE** on the latch handle
 - Two-port 10-Gb/s optical or active Twinax5; labeled **10 GbE v3** on the latch handle
 - Two-port 10-Gb/s RJ45 Base-T iSCSI/IP; labeled **10 GbE Base-T** on the latch handle
 - Two-port 10-Gb/s Fibre Channel over Ethernet (FCoE); labeled **10 GbE/FCoE** on the latch handle
 - Four-port 6-Gb/s SAS; labeled **6 Gb SAS v3** with an **e** inside a lock symbol on the latch handle

Note: The **e** inside the lock symbol indicates that the I/O module supports encryption.
 - Two management modules (one per SP) featuring:
 - Two (RJ-45) LAN connectors (labeled with a network management symbol and a wrench symbol)
 - Two (micro DB-9) RS-232/EIA connectors (labeled with a battery symbol and a wrench symbol)
 - One USB port (not used)



VNX-000810

1	SP B Battery backup unit (BBU); for a closer view, see “Battery backup unit” on page 26	10	Base module release knob; for a closer view, see “Base module” on page 26 .
2	SP B BBU status LED (green)	11	SP A Power supply latch
3	SP B base module with two 6-Gb/s mini-SAS HD ports (labeled 6 Gb SAS 1 and 0 , respectively, the LEDs on the bottom of ports are labeled x4 and x4); for a closer view, see “Base module” on page 26	12	SP A Power supply AC (power in) recessed connector (plug)
4	SP B base module fault LED (amber)	13	SP A Power supply fan
5	SP B base module unsafe to remove LED (white with black background)	14	SP A four-port 8-Gb/s FC I/O module in slot A5; for a closer view, see “Four-port 8-Gb/s FC I/O module” on page 47
6	SP B Power supply fault LED (amber), labeled with an upside down exclamation point (!); for a closer view, see “Storage processor power supply module” on page 31	15	SP A I/O module slots (5); the three I/O module slots shown are covered with filler panel modules
7	SP B Power supply power on LED (green), labeled with an upside down DC (output)	16	SP A four-port 6-Gb/s SAS I/O module in slot A0; for a closer view, see “Four-port 6-Gb/s SAS I/O module” on page 59
8	SP B Power supply power on LED (green), labeled upside down AC (input)	17	SP A (management module) showing two RJ-45 (management and service laptop) connectors labeled with a network management symbol and a wrench symbol, respectively; for a closer view, see “Storage processor management module” on page 32
9	Battery backup unit push/pull latch; for a closer view see “Battery backup unit” on page 26	18	SPA (management module) showing two RS-232/EIA (micro DB-9) connectors (labeled with a battery symbol and a wrench symbol, respectively)

Figure 10 Example of SP components (rear view)

Battery backup unit

The VNX5600 platform includes a battery backup unit (BBU) module to maintain power to the VNX5600 platform SP during power loss. The BBU is an eight cell lithium-ion battery pack. It provides backup power for the associated SP CPU module, base module, fans, and the first four disk (or vault) drives during a power event. This module is inserted into the base module enclosure and does not require any external cabling (Figure 11).

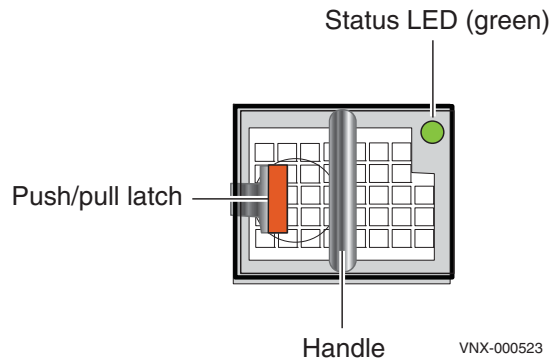


Figure 11 BBU push/pull latch, handle, and LED

The BBU is designed to provide under 12 V DC so as not to use power until the power supply drops. The power provided is enough to keep one CPU module, one base module, and four disk drives running long enough to do two cache vaults.

Table 8 describes the BBU status LED. See Figure 11 for location of the BBU status LED.

Table 8 BBU status LED

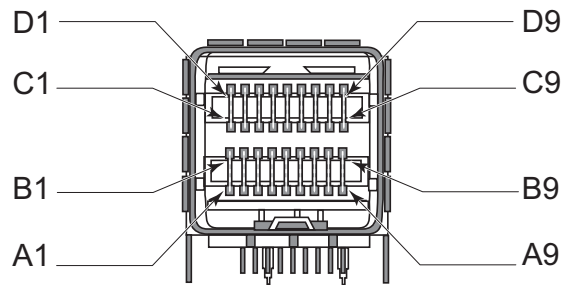
Led	Color	State	Description
Status	Green	On	BBU ready and operating normally; battery fully charged
	—	Off	Off/disconnected/not inserted/micro sleeping
	Amber	On	Faulted or marker
	Amber	Blinking	Marked

Base module

Each base module provides two 6-Gb/s PCI-e Gen 3 mini-SAS HD ports (from left to right labeled **1** and **0**, respectively). These ports (see the following illustration) provide an interface for SAS and NL-SAS drives on the DAE. This port is a 36-pin mini-SAS HD small form-factor 8644 (SFF-8644) specification connector (socket or receptacle) using an SFF-8644 specification mini-SAS HD cable (plug) with a pull (release) tab.

Note: The first DAE connection comes from these 6-Gb/s mini-SAS HD ports. This connection uses a 36-pin mini-SAS HD small form-factor 8644 (SFF-8644) specification connector (plug) with a pull (release) tab on one end (see [Figure 13 on page 29](#)) to a 26-pin mini-SAS small form-factor 8088 (SFF-8088) specification connector (plug) with a pull tab on the other end cable.

The following illustration shows an example of the 6-Gb/s mini-SAS HD connector (socket) and pinout.



VNXe-000510

Figure 12 6-Gb/s mini-SAS HD port connector (socket) and pinout

The following tables list the 6-Gb/s mini-SAS HD port pin signals used on the connector and define the connection requirements of the signal.

Table 9 6-Gb/s mini-SAS HD port connector pinout

Pin	Signal	Pin	Signal
A1	Reserved	C1	SCL ¹
A2	Int1 ¹	C2	SDA ¹
A3	Signal GND	C3	Signal GND
A4	Rx 1-	C4	Tx 1+
A5	Rx 1+	C5	Tx 1-
A6	Signal GND	C6	Signal GND
A7	Rx 3+	C7	Tx 3+
A8	Rx 3-	C8	Tx 3-
A9	Signal GND	C9	Signal GND
B1	Vact ¹	D1	Vact ¹
B2	ModPrsL ¹	D2	Vman ¹
B3	Signal GND	D3	Signal GND
B4	Rx 0+	D4	Tx 0+
B5	RX 0-	D5	Tx 0-
B6	Signal GND	D6	Signal GND

Table 9 6-Gb/s mini-SAS HD port connector pinout (continued)

Pin	Signal	Pin	Signal
B7	Rx 2+	D7	Tx 2+
B8	Rx 2-	D8	Tx 2-
B9	Signal GND	D9	Signal GND

Table 10 Management Interface connection requirements

Signal	Connection requirements
Intl	Active Low Module Interrupt: The cable assembly asserts this pin to indicate an interrupt bit has been set to one in the management interface memory map. This pin is connected to Vman on the receptacle side of the management interface. The source of the interrupt may be identified using the 2-wire serial management interface. If a cable assembly does not support interrupts, then all interrupt bits in the cable management interface memory map are set to zero and the cable assembly negates this pin (e.g., all interrupt bits of a passive cable assembly may be programmed to a clear state and the IntL pin not connected on the cable plug side of the management interface).
ModPrsL	Active Low Module Present: On the cable plug side of the management interface, ModPrsL is connected directly to the signal ground pins specified in Table 9 on page 27 . ModPrsL is connected to Vman on the receptacle side of the management interface to negate this signal when the plug is not fully mated to the receptacle.
Reserved	This pin is not connected on the receptacle side and cable plug side of the management interface.
SCL	Two-wire interface clock: The receptacle side of the management interface connects this signal to Vman.
SDA	Two-wire interface data: The receptacle side of the management interface connects this signal to Vman.
Vact	Active cable power: If the receptacle side of the management interface supports active cable assemblies, then it provides all non-management interface power to the cable assembly on the Vact pins. To support equal loading, both Vact pins are connected together on the receptacle side of the management interface. If the receptacle side of the management interface does not support active cable assemblies, then the Vact pins is not connected.
Vman	Management interface power: The receptacle side of the management interface provides power on the Vman pin to enable the management interface circuitry of the cable. Power may be removed to reset the management circuitry in the cable assembly.

Figure 13 shows an example of a mini-SAS HD cable connector (plug) with pull tab and pinout.

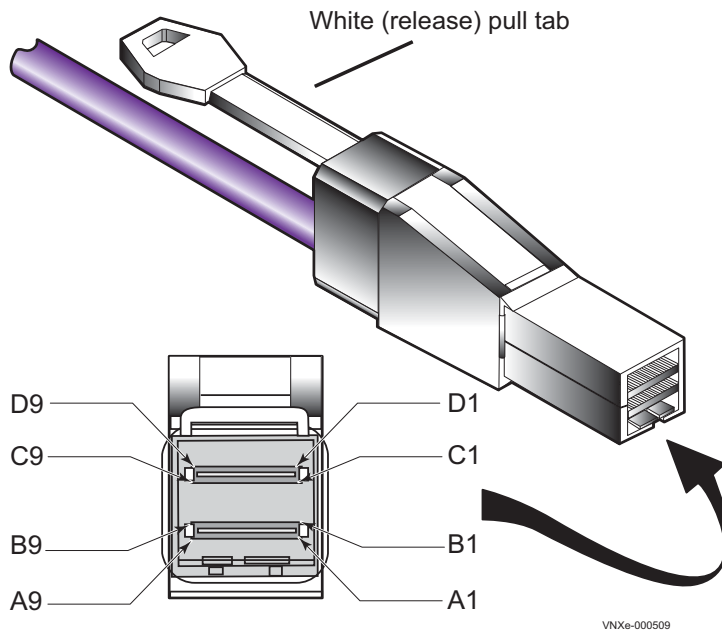


Figure 13 6-Gb/s mini-SAS HD cable connector (plug) and pinout

IMPORTANT

When connecting the mini-SAS HD cable connector (plug) into the Base module ports (sockets) **0** and **1**, be careful of the orientation of the cable end with the port. On the Base module, the ports have nubs (or keys). While the cable end has a notch. This notch aligns with the nub (or key) in the port. On the other side of the cable end is a white release tab opposite from the cable notch.

To connect, gently slide the cable into the port until you hear a small click aligning the notch with the nub (or key) in the port.

Do Not force the cable into the port.

A video describing how to properly connect mini-SAS HD cables and mini-SAS cables to a DPE and a DAE, respectively in a VNX product is available online at:

<https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

Below each port, a blue SAS link LED (labeled **x4**) is provided. The Base module plugs directly into the base module enclosure to the midplane. The module cannot be removed safely while the SP is running. The unsafe to remove LED (white hand with a right diagonal line through it) will light and the SP will immediately reboot. To the left of the unsafe to remove LED is the power/fault LED (bi-colored green/amber). The push/pull knob releases and seats the base module in the SP enclosure (turn left and pull to release the base module from the enclosure, push in and turn right to seat the base module into the enclosure).

Base module LEDs – Figure 14 shows the LEDs located on each base module (A and B).

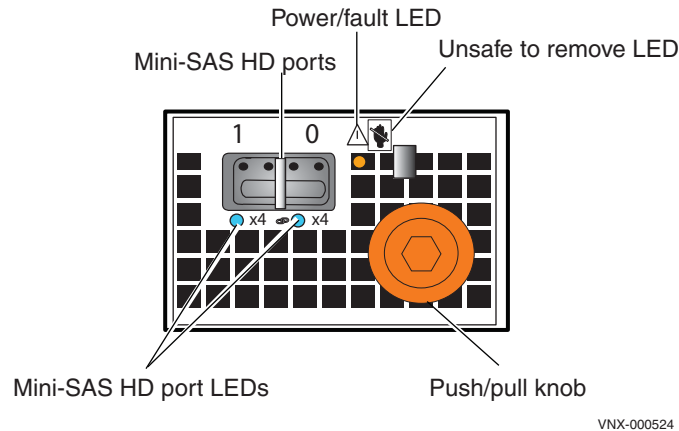


Figure 14 Base module LEDs and push/pull knob

Table 11 describes the base module LEDs.

Table 11 Base module LEDs

Led	Color	State	Description
Mini-SAS HD ports 1 & 0	Blue	On	Link
		Blinking once every second	Port is marked
	—	Off	No link
Power/fault	Green	On	Operating normally
	Amber	On	Faulted
	—	Off	Not powered
Unsafe to remove	White	On	<i>Do not</i> remove; the SP peer has a panic or has rebooted with the cache performance mode enabled. This SP is holding valid cache in memory.
			<i>Do not</i> remove; the SP is currently Flashing the BIOS/POST firmware or updating resume PROMs.
			<i>Do not</i> remove; the SP is currently dumping the cache data to the vault.
	—	Off	Safe to remove; the SP can be serviced without the risk of data loss.

Storage processor power supply module

Figure 15 shows the storage processor (SP) power supply module located on the top, right side of each SP base module enclosure when viewed from the rear. Each power supply includes three status LEDs (AC, DC, and DC fault). A latch on the power supply locks it into place to ensure proper connection.

SP power supply types — Two SP power supply modules are supported in the VNX5600 storage system. They are:

- ◆ AC Power supply; 200-240 V
- ◆ DC Power supply

Refer to the *VNX5600 Parts Location Guide* for the correct part numbers.

IMPORTANT

For VNX models with the DC power supply, see the requirements in the *DC-Powered VNX Series Enclosures Installation and Operation Guide*. For full power specifications, go to <https://mydocs.emc.com> and select **View technical specifications** under the **About VNX section**.

CAUTION

Do not remove the SP power supply module while the SP is plugged in. Power supply module removal for more than a few minutes can cause the SP to shut down due to lack of cooling. Refer to the *Replacing a Power Supply (PS) in a DPE* procedure for the correct steps to take before and during removal of an SP power supply module assembly from the base module enclosure in a DPE. This procedure is available online at <https://mydocs.emc.com/VNX/> and go to VNX tasks, then select Replace VNX hardware. Next, follow the steps in the wizard.

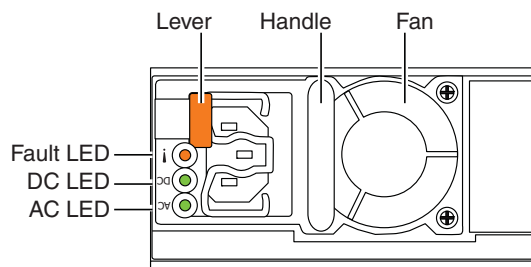


Figure 15 SP latch, power supply module (power in) recessed connector (plug), and status LEDs

Note: The LED labels on the SP power supply are upside down.

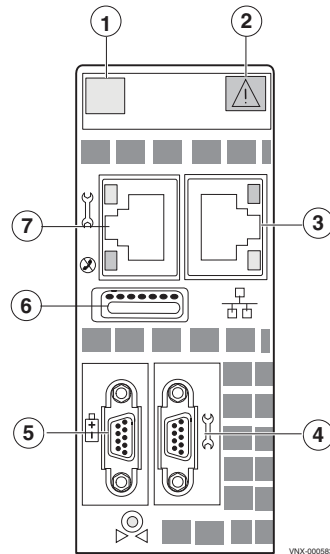
[Table 12](#) describes the power supply module (fault and power on) LEDs.

Table 12 SP power supply module (fault and power on) LEDs

Led	Color	State	Description
Fault	Amber	On	Power supply or backup fault, check cable connection
		Blinking	BIOS, POST and OS booting up or system overheating
	—	Off	No fault or power off
DC power (output)	Green	On	DC Power on
	—	Off	DC Power off, verify source power
AC power (input)	Green	On	AC Power on
	—	Off	AC Power off, verify source power

Storage processor management module

The storage processor (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 an SPS connection, not used in the VNX5600 platform), a USB port (not used), and several LEDs ([Figure 16 on page 33](#)).



1	Power/fault LED	5	DB-9 serial console socket connector (SPS); not used
2	SP management module push button latch handle	6	USB port; not used
3	RJ-45 Ethernet port (management)	7	RJ-45 Ethernet port (service laptop)
4	DB-9 serial console socket connector (service laptop)		

Figure 16 SP management module

Storage processor management module Ethernet (RJ-45) ports

The VNX5600 platform storage percussor (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 15 on page 37](#).

Since the 1U Control Station and the management module have the same type of management (RJ-45) ports, [“Control Station Ethernet \(RJ-45\) ports” on page 37](#) provides detailed information about the SP management module ports, connector, and adapter.

Storage percussor management module LEDs

Figure 17 shows the LEDs and Table 13 describes them.

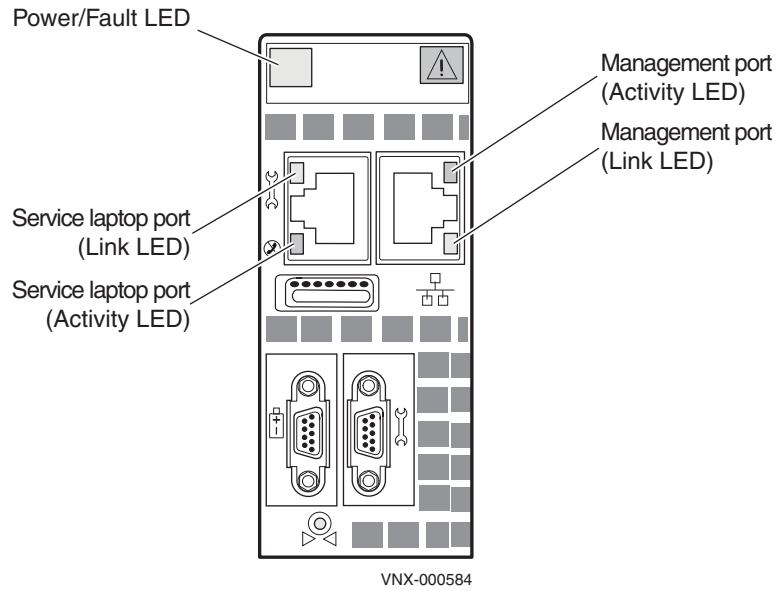


Figure 17 SP management module LEDs

Table 13 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

Storage processor management module serial console (DB-9) socket connector

The back of the VNX5600 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 18).

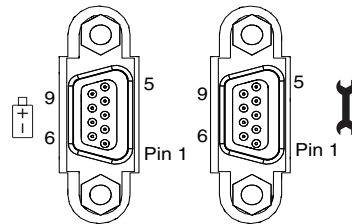


Figure 18 SP management module serial console (DB-9) socket connectors

Table 14 lists the SP management module Ethernet (DB-9) pin signals used on the connectors.

Table 14 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	Request to send
8	CTS	Clear to send
9	RI	Ring indicator (not used)

Storage processor 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 19 shows an example of an SP management module to PC (service laptop) cable.



VNX-000093

Figure 19 Example of an SP null modem (micro DB-9) to serial (DB-9) cable

Control Station rear view

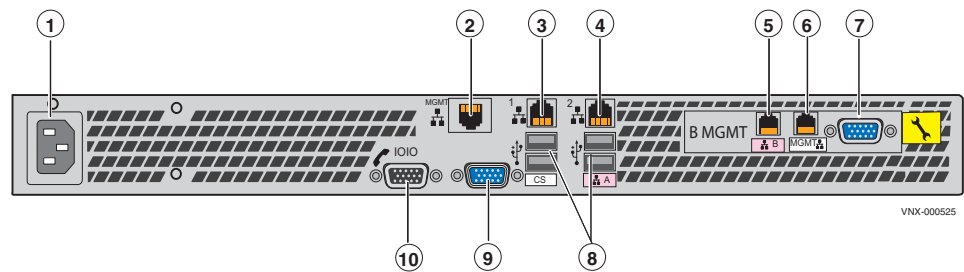
On the rear, viewing from left to right, the File/Unified VNX5600 platform Control Station includes the following components:

- ◆ AC power in connector
- ◆ Five (RJ-45) connectors (labeled **A**, **CS**, **B**, and two **MGMT** [one not used, see location 2 in Figure 20])

Note: The RJ-45 connectors (labeled **CS** and **A**, respectively) are integrated into the rear of the 1U Control Station while the RJ-45 connectors (labeled **B** and **MGMT**, respectively) are on a PCI-e card in the expansion slot on the rear of the Control Station. The fifth RJ-45 connector (labeled **MGMT**) is located to the left of the RJ-45 connector labeled **CS**. Newer CS models have a dust cover in this port.

- ◆ One (DB-9 plug) serial (RS-232/EIA-232) connector
- ◆ One (DB-9 plug) modem (RS-232/EIA-232) connector
- ◆ One (DB-15) video (VGA socket) connector—not used
- ◆ Four USB 2.0 connectors—not used

Figure 20 shows the orientation of these components.



1	AC power in connector	6	RJ-45 Ethernet port (labeled MGMT)
2	RJ-45 Ethernet port (labeled MGMT), not used; newer CS models have a dust cap in this port.	7	DB-9 serial console plug connector
3	RJ-45 Ethernet port (labeled CS ¹) Note: The CS label is located below the USB ports.	8	Four USB 2.0 connectors (not used)
4	RJ-45 Ethernet port (labeled A) Note: The A label is located below the USB ports.	9	DB-15 Video (VGA) socket connector (not used)
5	RJ-45 Ethernet port (labeled B)	10	DB-9 modem plug connector

1. The CS port uses an IPMI (Intelligent Platform Management Interface) cable to connect to a standby (optional) Control Station (CS1).

Figure 20 Example of a VNX5600 Control Station (rear view)

Control Station Input/output ports and connectors

The File/Unified VNX5600 platform 1U Control Station supports the following I/O ports on the rear of the 1U Control Station:

- ◆ Five Ethernet (RJ-45) ports (one not used [labeled **MGMT**], see location 2 in [Figure 20 on page 36](#))
- ◆ One serial console (DB-9 plug) connector
- ◆ One modem (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 File/Unified VNX5600 platform 1U Control Station comes with two integrated dual-port Ethernet ports (labeled **CS** and **A**, respectively) and two Peripheral Component Interconnect Express (PCI-E)⁴ low profile card dual-port Ethernet ports (labeled **B** and **MGMT**, respectively) in an expansion slot on the rear of the 1U Control Station.

Note: A fifth RJ-45 connector (labeled **MGMT**) is located to the left of the RJ-45 connected labeled **CS**. This connector is not used at this time.

These ports ([Figure 21 on page 38](#)) 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 1U Control Station, as described in [Table 15](#).

Table 15 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)

4. 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 and connector (adapter)

Figure 21 shows an example of the Ethernet RJ-45 port and cable connector.

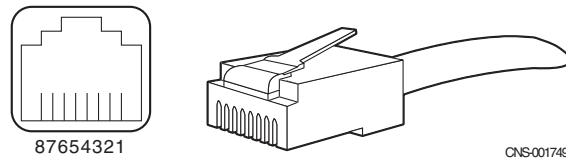


Figure 21 Control Station Ethernet (RJ-45) port and connector (adapter)

Table 16 lists the Control Station Ethernet (RJ-45) pin signals used on the connector.

Table 16 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, -

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 1U Control Station (RJ-45) ports, respectively (Figure 22).

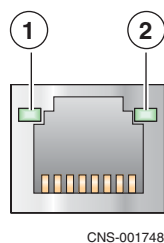


Figure 22 Control Station Ethernet (RJ-45) port LEDs

Table 17 describes the link/activity and connection speed associated with the Control Station (RJ-45) port LEDs.

Table 17 Control Station RJ-45 port LEDs

Led	Color	State	Description
Left, link/activity (see location 1)	Green	On	Network/link connection
	Green	Blinking	Transmit/receive activity
	—	Off	No network/link connection
Right, link speed (see 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 File/Unified VNX5600 platform 1U 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 (Figure 23) 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 File/Unified VNX5600 platform includes a second optional 1U 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 File/Unified VNX5600 platform already installed in a cabinet rack with all of the File/Unified VNX5600 platform components, all the cabling has already been installed.



Figure 23 Example of an Ethernet extension (modular plug to modular jack) cable

Control Station serial console (DB-9) plug connector

The back of the File/Unified VNX5600 platform system 1U Control Station includes a standard serial console Electronics Industries Association (EIA) RS-232 interface (DB-9) plug connector. Notice the orientation of the pins (Figure 24).

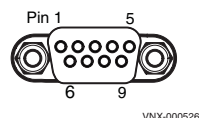


Figure 24 Control Station serial console (DB-9) plug connector

Table 18 lists the 1U Control Station Ethernet (DB-9) pin signals used on the connector.

Table 18 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 File/Unified VNX5600 platform 1U Control Station includes a standard modem serial interface (DB-9) plug connector (labeled with a telephone handset icon and the numbers **1 0 1 0** on the left). Notice the orientation of the pins (Figure 25).

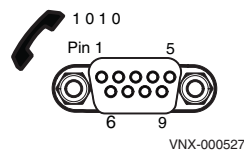


Figure 25 Control Station modem (DB-9) plug connector

Table 19 lists the 1U Control Station Ethernet (DB-9) pin signals used on the connector.

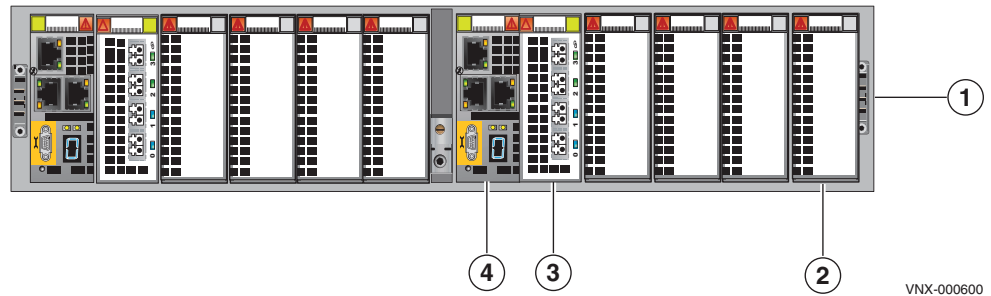
Table 19 Control Station modem (DB-9) plug connector pinout

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	Request to send
8	CTS	Clear to send
9	RI	Ring indicator (not used)

Data Mover enclosure rear view

The rear of the File/Unified VNX5600 platform Data Mover enclosure (DME) does not contain any LEDs (Figure 26). Only the Data Mover management module and the I/O modules have LEDs.

Note: Figure 26 is a graphical representation of the File/Unified VNX5600 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).

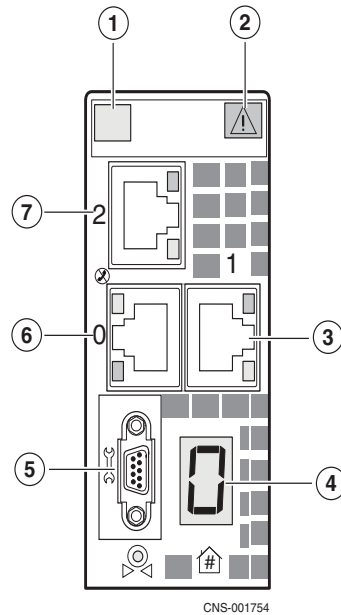


1	Data Mover enclosure	3	Four-port 8-Gb/s FC I/O module
2	Filler panel module	4	Data Mover management module

Figure 26 Example of a 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 27 on page 42).



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 27 Example of a Data Mover management module

Data Mover management module Ethernet (RJ-45) ports

The File/Unified VNX5600 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

The File/Unified VNX5600 Data Mover management module contains LAN ports. LAN ports contain safety extra-low voltage (SELV) circuits, and WAN ports contain telephone-network voltage (TNV) circuits. To avoid electric shock, do not connect TNV circuits to SELV 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 15 on page 37](#)).

Since the Control Station and the management module have the same type of RJ-45 ports, [“Control Station Ethernet \(RJ-45\) ports” on page 37](#) provides detailed information about the management module ports, connector, and adapter.

Data Mover management module LEDs

Figure 28 shows the LEDs and Table 20 describes them.

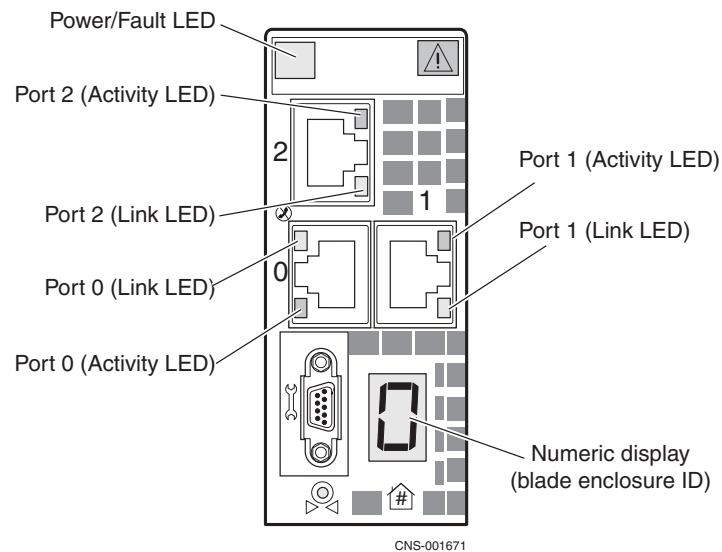


Figure 28 Data Mover management module LEDs

Table 20 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 File/Unified VNX5600 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 29 on page 44).

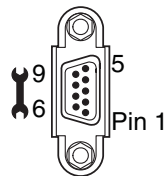


Figure 29 Data Mover management module serial console (DB-9) socket connector

[Table 21](#) lists the Data Mover management module Ethernet (DB-9) pin signals used on the connector.

Table 21 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	Request to send
8	CTS	Clear to send
9	RI	Ring indicator (not used)

I/O modules

Several types of I/O modules are supported in the Block, File, and Unified VNX5600. The SP supports six types of I/O modules (see [“Storage processor I/O module types” on page 46](#)) and the Data Mover supports four types (see [“Data Mover I/O module types” on page 62](#)). In this section, each I/O module description includes the type of port (copper or optical) as well as a description of the LEDs.

Fibre Channel (FC) ports

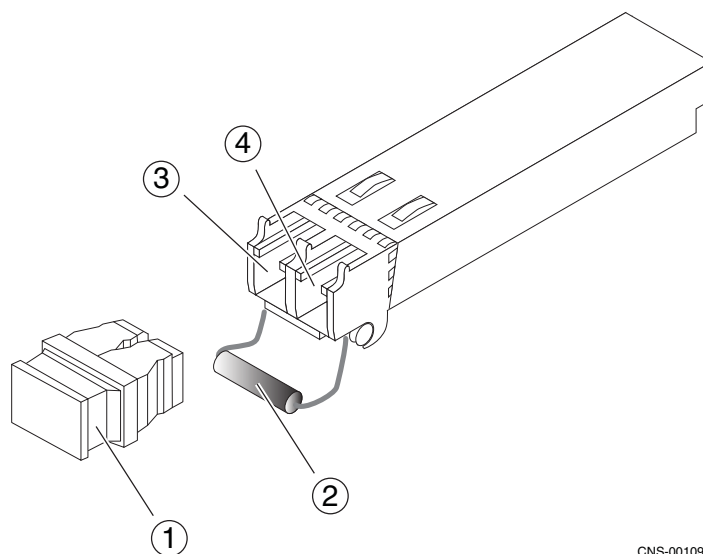
The Block, File, and Unified VNX5600 platform SP does not come with built-in optical Fibre Channel (FC) ports on the rear of each SP (A and B). As a result, the 8-Gb/s Fibre Channel (FC) I/O module or the 16-Gb/s Fibre Channel (FC) I/O module is used to provide these FC ports (see [“Four-port 8-Gb/s FC I/O module” on page 47](#) and [“Four-port 16-Gb/s FC I/O module” on page 49](#), respectively). These ports provide an optical interface for connecting to the front end.

Small form-factor pluggable transceiver modules

The FC ports on the 8-Gb/s FC I/O module support 2-, 4-, and 8-Gb/s Fibre Channels and on the 16-Gb/s FC I/O module supports 4, 8, and 16-Gb/s Fibre Channels using a small form-factor pluggable plus (SFP+) transceiver module. The SFP+ transceiver modules connect to Lucent Connector (LC) type interface (see “[Lucent Connector type interface](#)” on this page for more information) optical fibre cables. These SFP+ transceiver modules are input/output (I/O) devices. These SFP+ modules are hot swappable. This means that you can install and remove an SFP+ module while the SP is operating.

Figure 30 shows an example of an SFP+ module.

Note: Besides the FC I/O modules, the FCoE and the 10-Gb/s Optical I/O modules also use SFP modules. Each of these I/O modules use a different type of SFP. Refer to the Parts Location Guide for more information.



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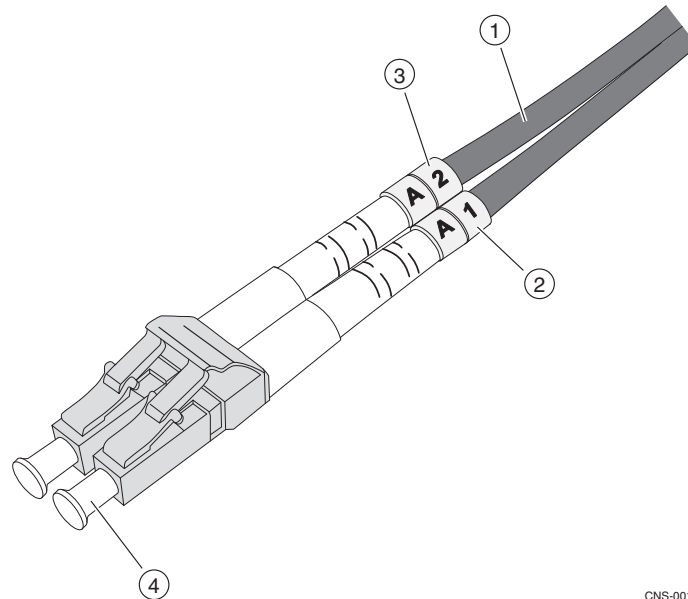
1	Dust plug (protective cap)	3	Send or transmit (TX) optical bore
2	Bale clasp latch	4	Receive (RX) optical bore

Figure 30 Example of an SFP+ module

Lucent Connector type interface

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 for OM2 multimode optical fiber type cables and aqua for OM3 multimode optical fiber type cables. These cables have 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 (Figure 31 on page 46).



CNS-001102

1	Orange cable	3	Rubber gasket (jacket), receive (RX)
2	Rubber gasket (jacket), send or transmit (TX)	4	Ferrule (connector end to SFP+ module)

Figure 31 Example of LC-type connectors

Storage processor I/O module types

Seven I/O module types are supported by the Block, File, and Unified VNX5600 platform SP. However, all five slots are supported per SP (A0 – A4 and B0 – B4) in the File/Unified VNX5600 platform DPE. For more information, refer to the *Adding Storage Processor I/O modules and SFPs to the DPE* document for the correct procedures to add an I/O module. This procedure is available online at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

IMPORTANT

When adding new I/O modules, always install I/O modules in pairs—one module in SP A and one module in SP B. Both SPs must have the same type of I/O modules in the same slots.

I/O module slots

Slots A4 and B4 in the DPE storage processors contain a Fibre Channel (FC) I/O module for Data Mover Fibre Channel connections. Slots A0 and B0 in the DPE SPs contain 6-Gb/s SAS I/O modules for DAE bus connections, if the 6-Gb/s SAS I/O module option is ordered. The other available slots can contain any type of I/O module that is supported for the File/Unified VNX5600 platform, within the supported I/O module limits. For more

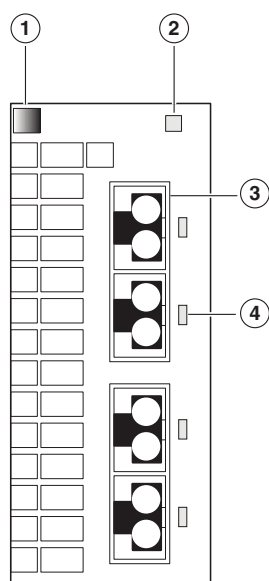
information, refer to the *Adding Storage Processor I/O modules and SFPs to the DPE* document for the correct procedures to add an I/O module. This procedure is available online at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

The following I/O modules are supported:

- ◆ “Four-port 8-Gb/s FC I/O module” on this page
- ◆ “Four-port 16-Gb/s FC I/O module” on page 49
- ◆ “Four-port 1-Gb/s copper iSCSI 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
- ◆ “Two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module” on page 55
- ◆ “Two-port 10-Gb/s optical I/O module” on page 57
- ◆ “Four-port 6-Gb/s SAS I/O module” on page 59

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

The four-port 8-Gb/s FC I/O module (labeled **8 GbE Fibre** on the latch handle) comes with four optical (fibre) ports, one power/fault LED, and a link/activity LED for each optical port (Figure 32). This I/O module can interface at speeds of 2, 4, and 8 Gb/s.



CNS-001752

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

Figure 32 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 (“[Lucent Connector type interface](#)” on page 45). These SFP+ transceiver modules are input/output (I/O) devices that plug into the FC port of the FC I/O modules. For more information about these SFP+ transceiver modules, see the “[I/O modules](#)” section on page 44.

Note: The 8-Gb/s I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

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 33](#) shows the LEDs and [Table 22](#) describes them.

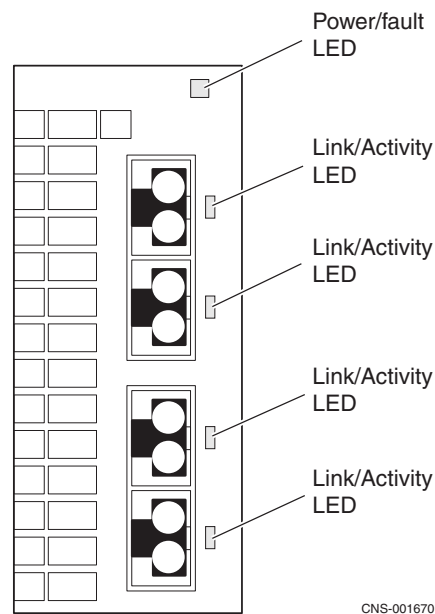


Figure 33 Four-port 8-Gb/s FC I/O module LEDs

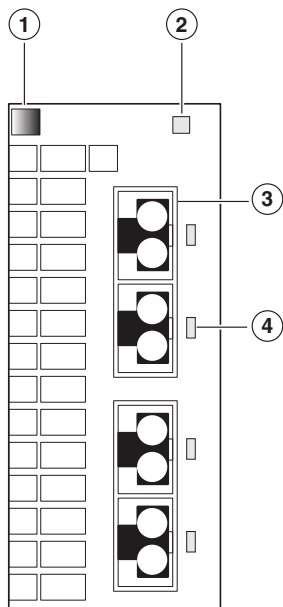
Table 22 Four-port 8-Gb/s FC I/O module LEDs

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 *VNX5600 Parts Location Guide* for the correct SFP+ part number.

Four-port 16-Gb/s FC I/O module

The four-port 16-Gb/s FC I/O module (labeled **16 Gb Fibre v1** on the latch handle) comes with four optical (fibre) ports, one power/fault LED, and a link/activity LED for each optical port (Figure 34). This I/O module can interface at speeds of 4, 8, and 16 Gb/s.



CNS-001752

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

Figure 34 Four-port 16-Gb/s FC I/O module

The four-port 16-Gb/s FC I/O module uses SFP+ transceiver modules to connect to LC-type optical fibre cables (“[Lucent Connector type interface](#)” on page 45). These SFP+ transceiver modules are input/output (I/O) devices that plug into the FC port of the FC I/O modules. For more information about these SFP+ transceiver modules, see the “[I/O modules](#)” section on page 44.

Note: The 16-Gb/s I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

Four-port 16-Gb/s FC I/O module LEDs

The four-port 16-Gb/s Fibre Channel (FC) I/O module has two different types of status LEDs. [Figure 35](#) shows the LEDs and [Table 23](#) describes them.

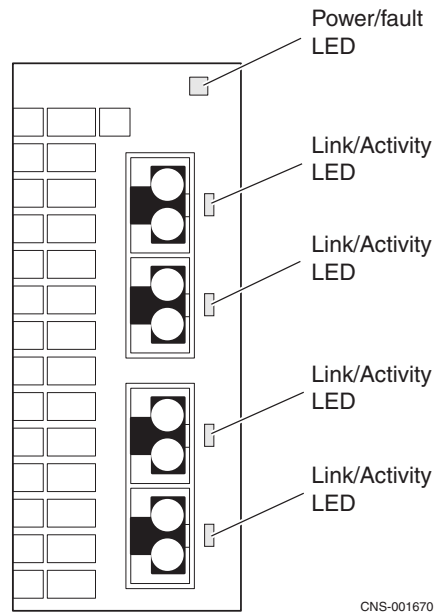


Figure 35 Four-port 16-Gb/s FC I/O module LEDs

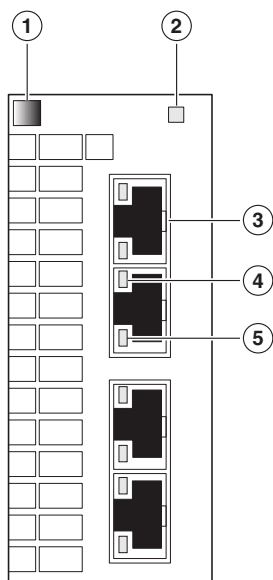
Table 23 Four-port 16-Gb/s FC I/O module LEDs

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)	Blue	On	4-, 8-, or 16-Gb/s link speed (autonegotiates)
	Blue	Blinking	Small form-factor pluggable (SFP+ ¹) transceiver module faulted, unsupported, or optical cable fault.
	—	Off	No network connection

1. Refer to the *VNX5600 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 (labeled **1 GbE iSCSI/TOE** on the latch handle) comes with four 1-Gb/s copper ports, one power/fault LED, and a link and activity LED for each port (Figure 36). The copper ports on this I/O module can interface at speeds up to 1 Gb/s for iSCSI (Internet Small Computer System Interface) networks⁵.



CNS-001751

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

5. 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 37](#) shows the LEDs and [Table 24](#) describes them.

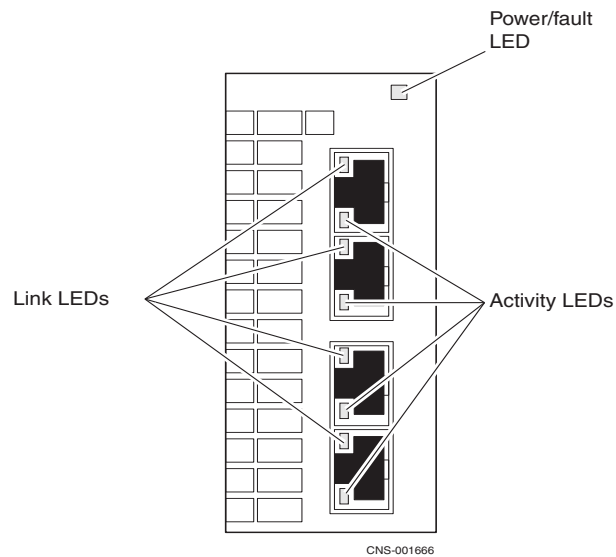


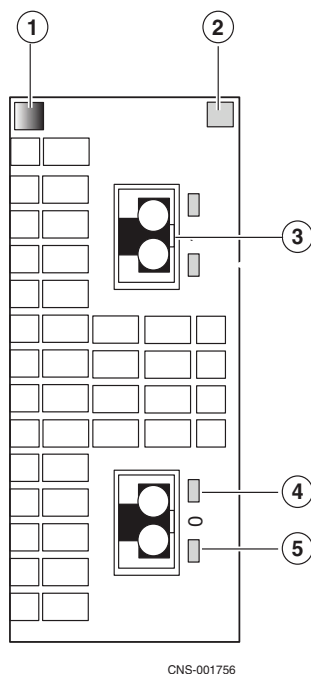
Figure 37 Four-port 1-Gb/s copper iSCSI I/O module LEDs

Table 24 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 Fibre Channel over Ethernet (FCoE) I/O module

The two-port 10-Gb/s optical or active Twinax⁶ FCoE I/O module (labeled **10 GbE/FCoE** on the latch handle) comes with two FCoE ports, one power/fault LED, and a link and activity LED for each port (Figure 38). 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 *VNX5600 Parts Location Guide* available online at <https://mydocs.emc.com/VNX/> and go to **Additional VNX documentation**, and select the related documentation software for the model desired, then go to **VNX Hardware Parts**, next select the **VNX5600 Parts Guide**.



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

Note: The 10-Gb/s FCoE I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

-
6. 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 39](#) shows the LEDs and [Table 25](#) describes them.

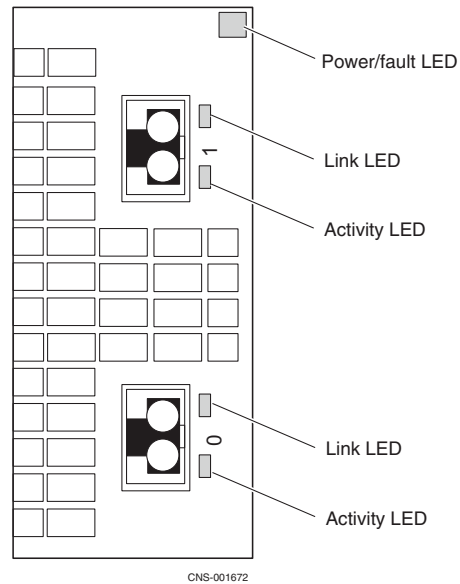


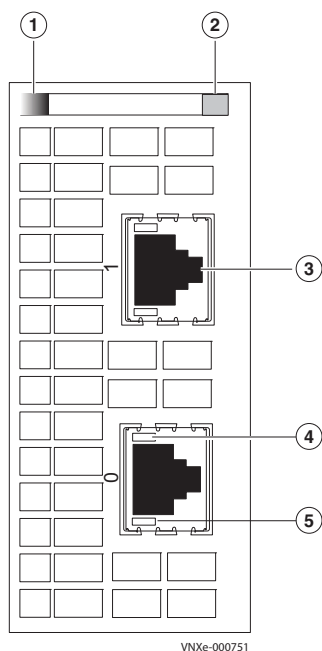
Figure 39 Two-port 10-Gb/s FCoE I/O module LEDs

Table 25 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

Two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module

The two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module (labeled **10 GbE Base-T** on the latch handle) comes with two 10-Gb/s Base-T copper ports, one power/fault LED, and a link and activity LED for each port (Figure 40). The Base-T ports on this I/O module can interface at speeds of 10 Gb/s for iSCSI (Internet Small Computer System Interface) networks⁷. The two-port 10-Gb/s Base-T I/O module uses EIA Category 6 or 6a Unshielded Twisted Pair (UTP) or EIA Category 7 fully Shielded Twisted Pair (STP) copper cabling.



1	Push button latch handle	4	Link LED (right)
2	Power/fault LED	5	Activity LED (left)
3	RJ-45 Base-T port (2)		

Figure 40 Two-port 10-Gb/s RJ-45 Base-T I/O module

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

Two-port 10-Gb/s RJ-45 Base-T I/O module LEDs

The two-port 10-Gb/s RJ-45 Base-T I/O module has three types of status LEDs. [Figure 41](#) shows the LEDs and [Table 26](#) describes them.

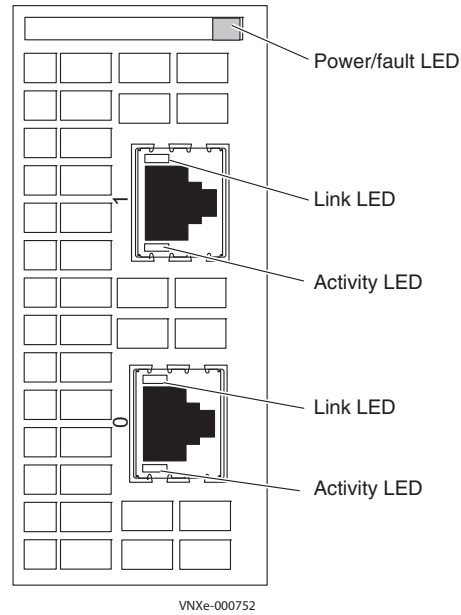


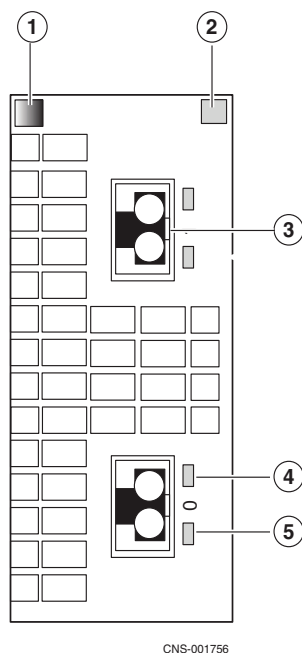
Figure 41 Two-port 10-Gb/s RJ-45 Base-T I/O module LEDs

Table 26 Two-port 10-Gb/s RJ-45 Base-T 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

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

The two-port 10-Gb/s optical or active and passive Twinax I/O module (labeled **10 GbE v3** on the latch handle) comes with two optical ports, one power/fault LED, and a link and activity LED for each port (Figure 42). 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 *VNX5600 Parts Location Guide* available online at <https://mydocs.emc.com/VNX/> and go to **Additional VNX documentation**, and select the related documentation software for the model desired, then go to **VNX Hardware Parts**, next select the **VNX5600 Parts Guide**.



CNS-001756

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

Note: The 10-Gb/s optical I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

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 43](#) shows the LEDs and [Table 27](#) describes them.

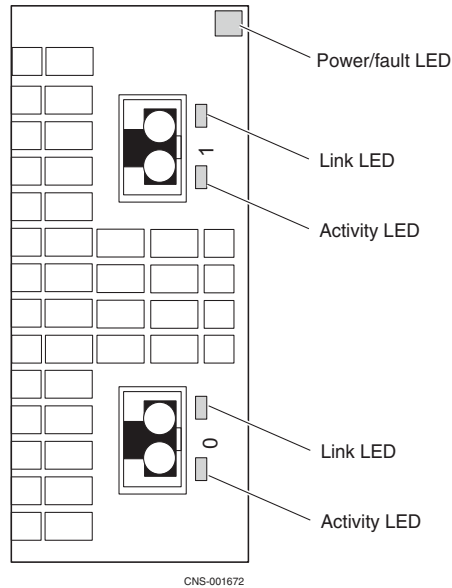


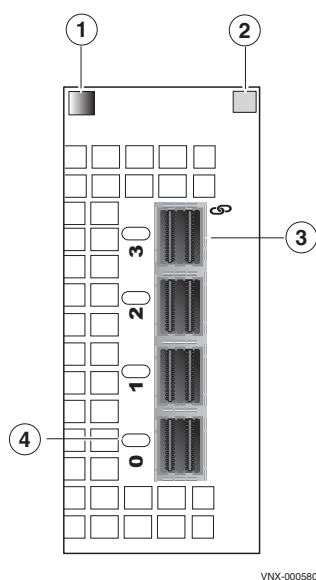
Figure 43 Two-port 10-Gb/s optical I/O module LEDs

Table 27 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 (labeled **6 Gb SAS v3** with an **e⁸** inside a lock symbol on the latch handle) comes with four ports, one power/fault LED, and a combination link/activity LED for each port (Figure 44). 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 mini-SAS HD connectors.



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

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

These connectors are 36-circuit small form-factor 8644 (SFF-8644) specification (sockets or receptacles, see Figure 45) using an SFF-8644 specification mini-SAS HD 36-circuit cable (plug) with a pull (release) tab (see Figure 46 on page 60).

Figure 45 shows an example of the port connector (socket) and pinout.

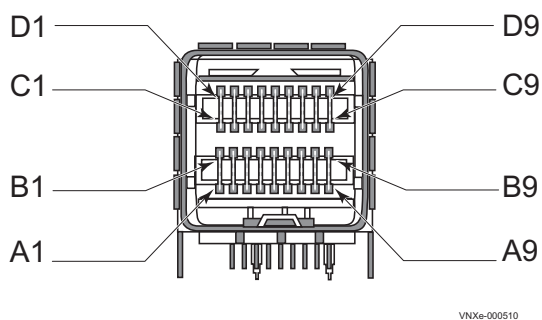


Figure 45 6-Gb/s mini-SAS HD port connector (socket) and pinout

- The **e** inside the lock symbol indicates that the I/O module supports encryption.

Figure 46 shows an example of a mini-SAS HD cable connector (plug) with pull (release) tab and pinout.

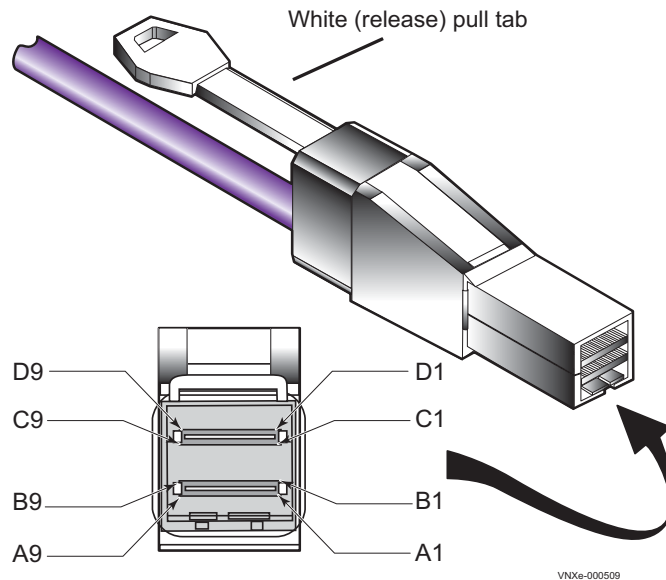


Figure 46 6-Gb/s mini-SAS HD cable connector (plug) and pinout

IMPORTANT

When connecting the mini-SAS HD cable connector (plug) into the SAS I/O module ports (sockets) **0, 1, 2, and 3**, be careful of the orientation of the cable end with the port. On the SAS I/O module, the ports have nubs (or keys). While the cable end has a notch. This notch aligns with the nub (or key) in the port. On the other side of the cable end is a white release tab opposite from the cable notch.

To connect, gently slide the cable into the port until you hear a small click aligning the notch with the nub (or key) in the port. For the SAS I/O module the notch on the cable aligns with the nub (or key) on the right side of each port. The white release tab should be on the left side of the port.

Do Not force the cable into the port.

A video describing how to properly connect mini-SAS HD cables and mini-SAS cables to a DPE and a DAE, respectively, in a VNX product is available online at: <https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

Note: The video does not show an example of the SAS I/O module, but the video does show how a mini-SAS HD cable connects to a mini-SAS HD port.

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 47](#) shows the LEDs and [Table 28](#) describes them.

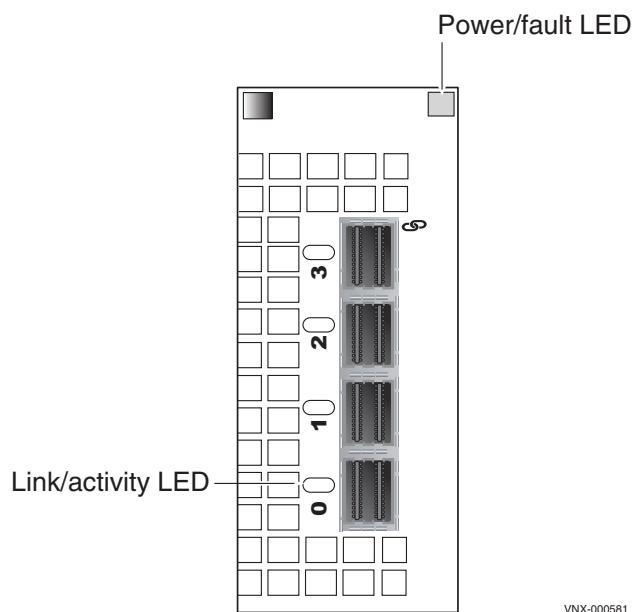


Figure 47 Four-port 6-Gb/s SAS I/O module LEDs

Table 28 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

Data Mover I/O module types

Four I/O module types are supported by the File/Unified VNX5600 platform Data Mover.

IMPORTANT

When adding new I/O modules, always install I/O modules in sets to each Data Mover within the File/Unified VNX5600 platform or failover group. All Data Movers in the File/Unified VNX5600 platform or failover group must have the same type of I/O modules in the same slots. For more information, refer to the *Adding an I/O module to a Data Mover* document for the correct steps to add an I/O module to a Data Mover. This procedure is available at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

I/O module slots

Slot 0 in each Data Mover is reserved for connections to the storage array and for optional tape backup devices. The other available slots can contain any type of network I/O module that is supported for the File/Unified VNX5600 platform. For more information, refer to the *Adding an I/O module to a Data Mover* document for the correct steps to add an I/O module to a Data Mover. This procedure is available at <https://mydocs.emc.com/VNX/> and go to **VNX tasks**, then select **Add VNX hardware**. Next, follow the steps in the wizard.

The following types of I/O modules are supported:

- ◆ “Four-port 8-Gb/s FC I/O module” on this page
- ◆ “Four-port 1-Gb/s copper I/O module” on page 65
- ◆ “Two-port 10-Gb/s optical I/O module” on page 67
- ◆ “Two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module” on page 69

Note: For SP module types, go to “Storage processor I/O module types” on page 46.

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

The four-port 8-Gb/s FC I/O module (labeled **8 GbE Fibre** on the latch handle) comes with four optical (fibre) ports, one power/fault LED, and a link/activity LED for each optical port, as shown in [Figure 48 on page 63](#). This I/O module can interface at speeds of 2, 4, and 8 Gb/s.

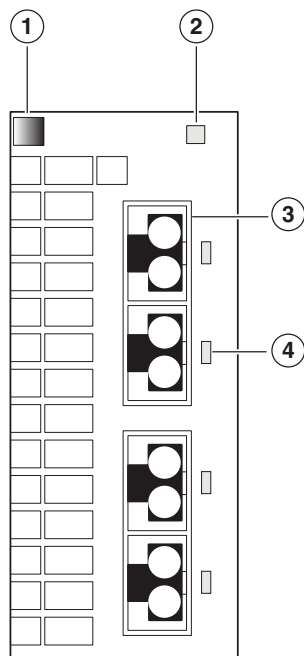
The four-port 8-Gb/s FC I/O module uses SFP+ transceiver modules to connect to LC-type optical fibre cables (“[Lucent Connector type interface](#)” on page 45). These SFP+ transceiver modules are input/output (I/O) devices that plug into the FC port of the FC I/O modules. These SFP+ modules are hot swappable⁹.

9. 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.

CAUTION

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.

This means that you can install and remove an SFP+ module while the VNX5600 platform is operating.



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

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

Note: The 8-Gb/s I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

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 49](#) shows the LEDs and [Table 29](#) describes them.

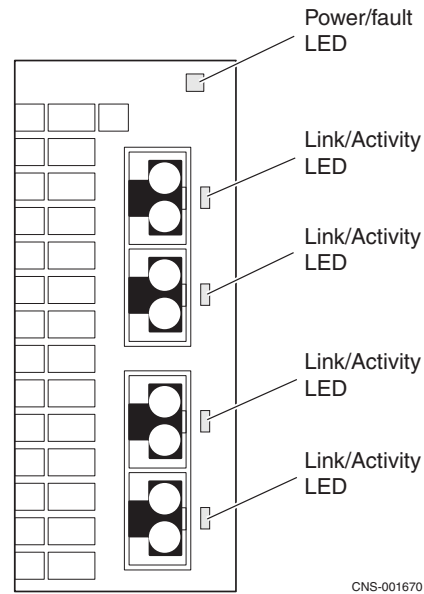


Figure 49 Four-port 8-Gb/s FC I/O module LEDs

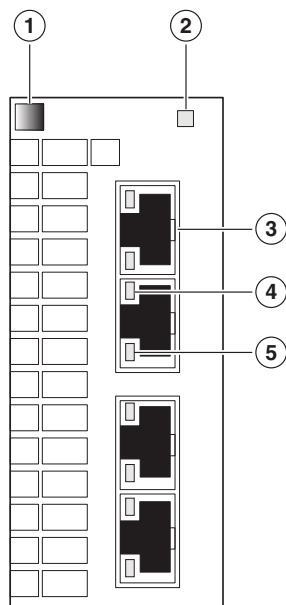
Table 29 Four-port 8-Gb/s FC I/O module LEDs

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 *VNX5600 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 (labeled **1 GbE** on the latch handle) comes with four copper ports, one power/fault LED, and a link and activity LED for each copper port (Figure 50). 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.



CNS-001751

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 50 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 51](#) shows the LEDs and [Table 30](#) describes them.

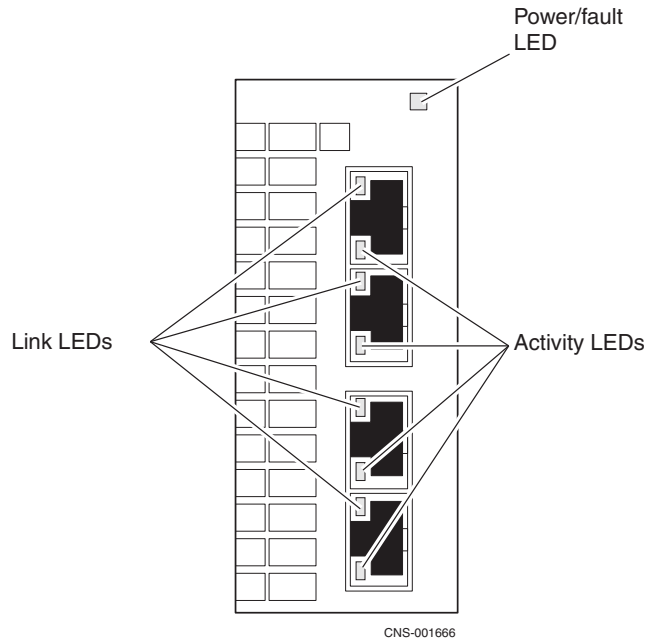


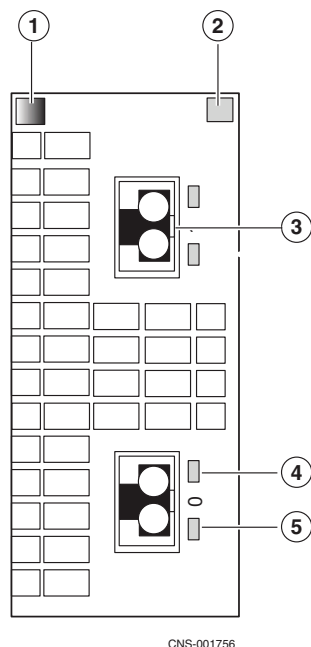
Figure 51 Four-port 1-Gb/s copper I/O module LEDs

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 10-Gb/s optical I/O module

The two-port 10-Gb/s optical or active and passive Twinax I/O module (labeled **10 GbE v3** on the latch handle) comes with two optical ports, one power/fault LED, and a link and activity LED for each port (Figure 52). 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 *VNX5600 Parts Location Guide* available online at <https://mydocs.emc.com/VNX/> and go to **Additional VNX documentation**, and select the related documentation software for the model desired, then go to **VNX Hardware Parts**, next select the **VNX5600 Parts Guide**.



1	Push button latch handle	3	Link LED (right)
2	Power/fault LED	4	Activity LED (left)

Figure 52 Two-port 10-Gb/s optical I/O module

Note: The 10-Gb/s optical I/O module uses a specific type of SFP module, ensure you are using the correct one. Refer to the Parts Location guide for more information.

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 53](#) shows the LEDs and [Table 31](#) describes them.

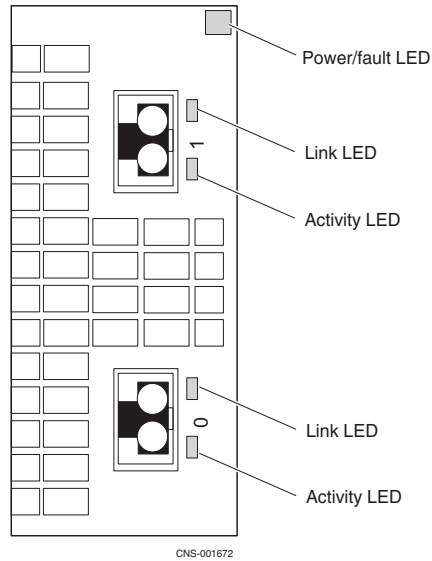


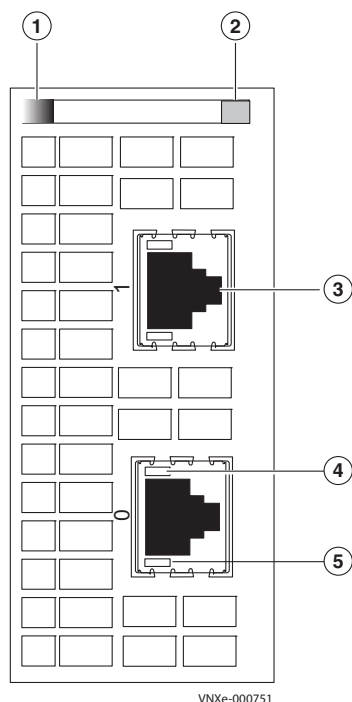
Figure 53 Two-port 10-Gb/s optical I/O module LEDs

Table 31 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

Two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module

The two-port 10-Gb/s RJ-45 Base-T iSCSI/IP I/O module (labeled **10 GbE Base-T** on the latch handle) comes with two 10-Gb/s Base-T copper ports, one power/fault LED, and a link and activity LED for each port (Figure 54). The Base-T ports on this I/O module can interface at speeds of 10 Gb/s for iSCSI (Internet Small Computer System Interface) networks¹⁰. The two-port 10-Gb/s Base-T I/O module uses EIA Category 6 or 6a Unshielded Twisted Pair (UTP) or EIA Category 7 fully Shielded Twisted Pair (STP) copper cabling.



1	Push button latch handle	4	Link LED (right)
2	Power/fault LED	5	Activity LED (left)
3	RJ-45 Base-T port (2)		

Figure 54 Two-port 10-Gb/s RJ-45 Base-T I/O module

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

Two-port 10-Gb/s RJ-45 Base-T I/O module LEDs

The two-port 10-Gb/s RJ-45 Base-T I/O module has three types of status LEDs. [Figure 55](#) shows the LEDs and [Table 32](#) describes them.

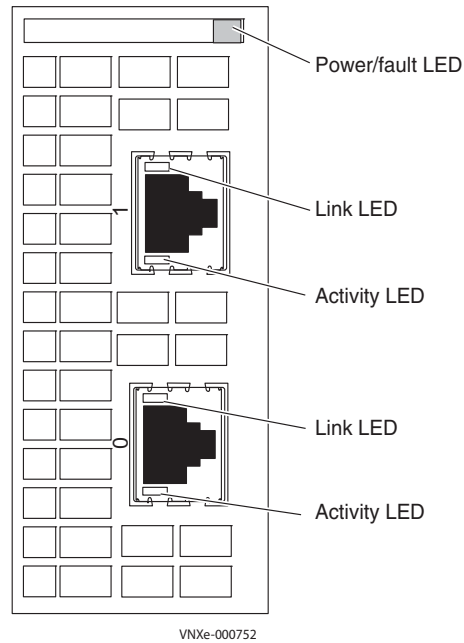


Figure 55 Two-port 10-Gb/s RJ-45 Base-T I/O module LEDs

Table 32 Two-port 10-Gb/s RJ-45 Base-T 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 enclosures

This section describes and illustrates the front- and rear-panel controls, ports, and LED indicators on the disk-array enclosures (DAEs) supported on the VNX5600 platform.

IMPORTANT

DAE configuration rules:

- 1.) Maximum number of enclosures per bus is 10.
- 2.) Maximum number of drives per bus is 250.
- 3.) Consider the maximum number of drives supported by the storage system model.

CAUTION

Lifting the DAE and installing it into or removing it from a rack is a two- to three-person job. If needed, use an appropriate lifting device (portable mechanical lift). A fully loaded 2U, 25 DAE; 3U, 15 DAE; 3U, 120 DAE; or 4U, 60 DAE weighs approximately 45 lb (20.41 kg), 68 lb (30.84 kg), 165 lb (74.8 kg), or 213 lb (96.62 kg), respectively.

Because the 3U, 120 and the 4U, 60 DAEs are extremely heavy, EMC recommends a portable mechanical lift manufactured by Alum-A-Lift. For more information about the EMC recommended portable mechanical lift and an example illustration depicting the lift, go to [“Appendix B: Field lift tool and accessory kit” on page 140](#).

WARNING

Access to the internal components in a 3U, 120 (DAE8S) or a 4U, 60 (DAE7S) enclosures mounted 31U (4.5 feet, or 1.38 meters) or higher above the floor requires an appropriate lifting device (portable mechanical lift) and is restricted to authorized service personnel only. Attempts to service disks, fans, or other DAE components mounted 31U or higher without a portable mechanical lift and personnel may result in serious personal injury.

For more information about the weight and dimensions of a VNX5600 platform DAEs, go to <https://mydocs.emc.com/VNX/> and go to the **About VNX** section, and then select **View technical specifications**. Next, follow the steps in the wizard.

The VNX5600 platform supports the expansion of three types of disk-array enclosures (DAEs) across a 6-Gb/s SAS bus:

- ◆ “2U, 25 (2.5-inch) DAE (DAE5S)” on page 75
- ◆ “3U, 15 (3.5-inch) DAE (DAE6S)” on page 83
- ◆ “3U, 120 (2.5-inch) DAE (DAE8S)” on page 93
- ◆ “4U, 60 (2.5- or 3.5-inch) DAE (DAE7S)” on page 110

Number of supported DAEs and disks

The number of DAEs and the disks supported by the VNX5600 platform is variable depending on the type of DAE. Typically, the VNX5600 platform supports up to nineteen 2U, 25 (2.5-inch) DAEs (for a total of 475, 2.5-inch disk drives), up to thirty-one 3U, 15 (2.5- or 3.5-inch) DAEs (for a total of 465, 2.5- or 3.5-inch disk drives), up to three 3U, 120 (3.5-inch) DAEs (for a total of 360, 2.5-inch disk drives), or up to seven 4U, 60 (2.5- or 3.5-inch) DAEs (for a total of 420, 2.5- or 3.5-inch disk drives).

IMPORTANT

Configurations with mixtures of 2U, 3U, and 4U DAEs are also possible depending on the drive slot count. However, if the 3U, 120 or the 4U, 60 DAE is used as part of your request for a mixture of DAE types, due to the depth of these 3U, 120 and 4U, 60 DAEs, the Dense rack is always required and the storage system is not customer installable.

Additionally, you cannot build an environment beyond the supported software and hardware requirements for the VNX5600 platform. *Do not* try to add more disk drives than the software can support. The VNX5600 platform supports up to a maximum of 500 disk drives.

General

Each VNX5600 platform DAE typically consists of the following components:

- ◆ Drive carrier
- ◆ Disk drive
- ◆ Midplane
- ◆ Link control cards (LCCs)
- ◆ Inter Connect Modules (ICMs)¹¹
- ◆ Power supplies¹²
- ◆ Cooling modules
- ◆ EMI shielding

Drive carrier

In a 2U, 25 and 3U, 15 DAE, 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 56 on page 75](#) and [Figure 64 on page 83](#)).

11. The 4U, 60 DAE includes Inter Connect Modules (ICMs). [“Table 41 describes the bus \(loop\) indicator status LEDs.” on page 91](#) provides more information about the 4U, 60 disk drive DAE.

12. The 3U, 120 and 4U, 60 DAEs have separate power supplies and cooling modules (fans).

For more information about the drive carrier in a 3U, 120 or 4U, 60 DAE, see the “[3U, 120 \(2.5-inch\) DAE \(DAE8S\)](#)” section on [page 93](#) and the “[4U, 60 \(2.5- or 3.5-inch\) DAE \(DAE7S\)](#)” section on [page 110](#).

Disk drives

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

Midplane

In a 2U, 25 or 3U, 15 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.

The 3U, 120 and 4U, 60 DAEs do not have midplanes. Both DAE are drawer type DAEs.

LCCs

In a 2U, 25 or 3U, 15 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 62 on page 81](#) and [Figure 70 on page 91](#))¹³. Each LCC includes a bus (loop) identification indicator ([Figure 62 on page 81](#) and [Figure 70 on page 91](#)).

In a 3U, 120 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 98 on page 118](#))¹¹. Each LCC also includes a bus (loop) identification indicator ([Figure 98 on page 118](#)).

In a 4U, 60 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 ([Figure 108 on page 127](#)) 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, 60 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 I²C (inter-integrated circuit) bus.

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

Power supply

In a 2U, 25 or 3U, 15 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, 25 or 3U, 15 DAE, each power/cooling module has three status LEDs ([Figure 63 on page 82](#) and [Figure 71 on page 91](#)).

In a 3U, 120 DAE, the power supplies and cooling modules or fans are separated. The power supplies are located on the rear. The power supply module has an orange knob used for removing and installing the power supply module from the DAE ([Figure 75 on page 96](#)). The cooling modules or fans are located in the front and in the middle of the DAE.

In a 4U, 60 DAE, the power supplies ([Figure 99 on page 119](#)) and cooling modules ([Figure 107 on page 126](#)) 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.

Cooling modules

In a 2U, 25 or 3U, 15 DAE, the enclosure cooling system consists of dual-blower modules in each power supply/cooling module.

In a 3U, 120 DAE, the cooling modules or fans are located in the front of the DAE and in the middle of the DAE. 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 (see the [“Access to disk drives and fan modules \(cooling modules\)”](#) section on [page 105](#) for more information).

In a 4U, 60 DAE, the cooling modules or fans are separate from the power supply modules. The cooling modules or fans are located on the front of the 4U, 60 DAE. 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 (see the [“Access to disk drives, fan modules, and LCCs”](#) section on [page 122](#) for more information).

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 integrated EMI shield. You must remove the bezel/shield to remove and install the disk drive modules.

2U, 25 (2.5-inch) DAE (DAE5S)

The 2U, 25 (2.5-inch) disk drive DAE used in the VNX5600 platform is 2U (3.5 inches) high and includes 25 disk drives. It uses a 6-Gb/s SAS interface for communication between the disk processor enclosure (DPE) storage processors (SPs) and the DAE.

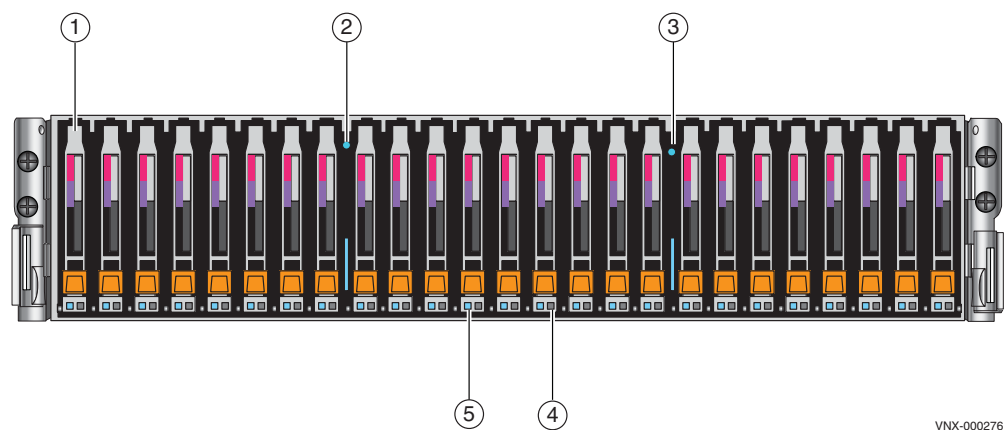
Front view

On the front of the VNX5600 platform, the 2U, 25 (2.5-inch) disk drive DAE includes the following components:

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

Figure 56 shows the location of these components.

Note: In a VNX5600 platform, when using the 2U, 25 (2.5-inch) disk drive carrier, the maximum amount of disk drives is 500 (including DPE and expansion DAEs).



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 56 Example of a 2U, 25 (2.5-inch) disk drive DAE (front view)

Table 33 describes the 2U, 25 (2.5-inch) DAE and disk drive status LEDs.

Table 33 2U, 25 (2.5-inch) DAE and disk drive status LEDs

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

Rear view

On the rear of a VNX5600 platform, a 2U, 25 (2.5-inch) DAE includes the following components:

- ◆ Two link control cards (LCCs) A and B
- ◆ Two power supply/cooling modules (A and B)

Figure 57 shows the location of these components.

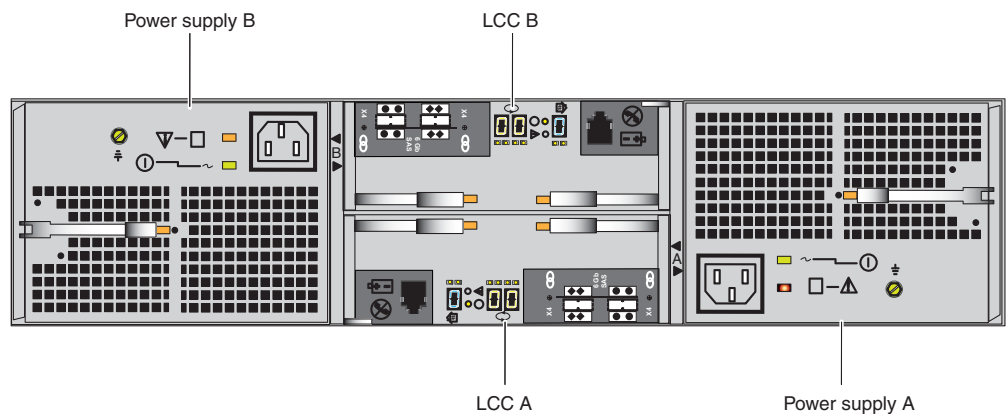


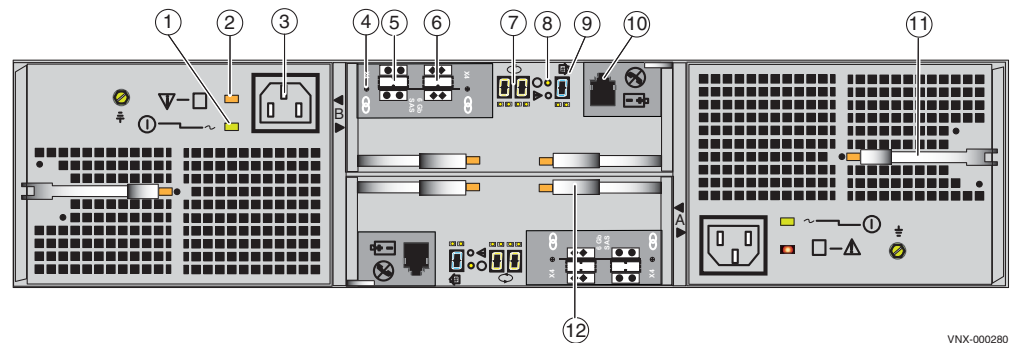
Figure 57 Example of 2U, 25 (2.5-inch) disk drive DAE (rear view)

2U, 25 (2.5-inch) DAE LEDs and connectors

Figure 58 on page 77 shows the location of the 2U, 25 (2.5-inch) DAE LEDs, connectors, and the latch handles:

- ◆ AC power supply (A and B) recessed power in (plug)
- ◆ AC power supply (A and B) LEDs (power and fault)
- ◆ AC power supply (A and B) latch handle

- ◆ LCC (A and B) mini-SAS connectors (input and output)
- ◆ LCC (A and B) mini-SAS link LEDs
- ◆ LCC (A and B) bus ID
- ◆ LCC (A and B) LEDs (power and fault)
- ◆ DAE enclosure ID
- ◆ LCC (A and B) management (RJ-12) connector (not used in VNX5600)
- ◆ LCC (A and B) latch handle



VNX-000280

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); labeled with a double circle (dot) symbol ●●.	11	LCC A power supply latch handle
6	LCC B SAS connector (output); labeled with a double diamond symbol ◆◆.	12	LCC A right latch handle

Figure 58 Example of 2U, 25 (2.5-inch) disk drive DAE (rear view)

LCC

The 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 DPE and other DAEs with 6-Gb/s SAS 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.

As shown in [Figure 58 on page 77](#), an enclosure ID¹⁴ 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.

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 mini-SAS ports
- ◆ One management (RJ-12) connector (not used in the VNX5600 platform)

6-Gb/s mini-SAS x4 ports

The DAE LCC supports two (one input and one output) 6-Gb/s mini-SAS x4 ports (labeled **6Gb SAS 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 mini-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.

A video describing how to properly connect mini-SAS HD cables and mini-SAS cables to a DPE and a DAE, respectively, in a VNX product is available online at: <https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

Note: The first half of the video shows an example of how to connect a mini-SAS HD cable to a mini-SAS HD port while the second half shows how to connect a mini-SAS cable to a DAE LCC mini-SAS port.

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

Figure 59 shows an example of the 6-Gb/s mini-SAS port connector (socket) and cable connector (plug) with pull tab.

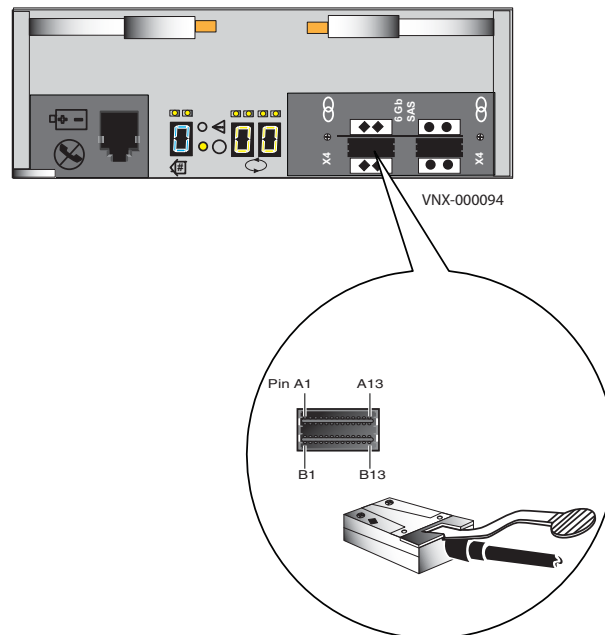


Figure 59 6-Gb/s mini-SAS port and cable connector

Table 34 lists the 2U, DAE 6-Gb/s mini-SAS port pin signals used on the connector.

Table 34 6-Gb/s mini-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 mini-SAS port LEDs and port direction (input or output) — Figure 60 shows the 6-Gb/s mini-SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the mini-SAS port.

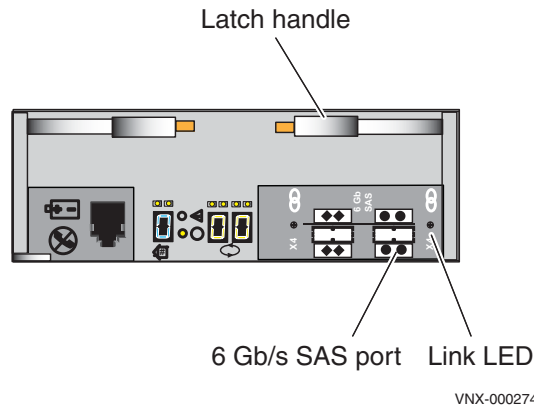


Figure 60 6-Gb/s mini-SAS port LED

Table 35 describes the 2U DAE LCC 6-Gb/s port LEDs.

Table 35 6-Gb/s mini-SAS 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 (not used in the VNX5600 platform) — Figure 61 on page 81 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**).

WARNING

The LCC (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-12 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.

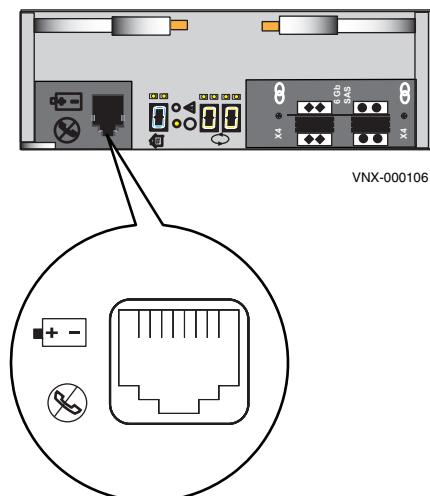


Figure 61 LCC RJ-12 port (not used in the VNX5600 platform)

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 62).

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 62).

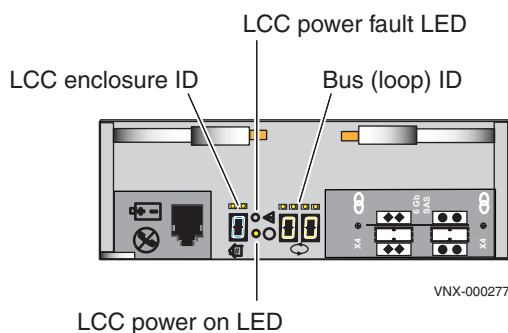


Figure 62 Example of an LCC B enclosure ID, bus ID, and power on and power fault LEDs

Table 36 describes the power on and power fault status LEDs.

Table 36 LCC power on and power fault status LEDs

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

AC power supply/cooling module

Figure 63 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.

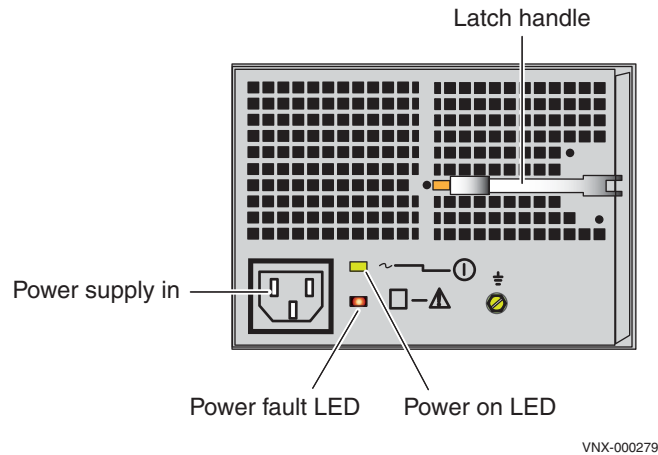


Figure 63 Example of a 2U, 25 (2.5-inch) DAE AC power supply/cooling module power in (recessed) connector (plug) and status LEDs

Table 37 describes the 2U, 25 (2.5-inch) DAE power supply/cooling module LEDs.

Table 37 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 (OVP) and undervoltage protection (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.

3U, 15 (3.5-inch) DAE (DAE6S)

The 3U, 15 DAE (2.5- or 3.5-inch) disk drive DAE in the VNX5600 platform is 3U (5.25 inches) high and includes 15 disk drives. It uses a 6-Gb/s SAS interface for communication between the disk processor enclosure (DPE) storage processors (SPs) and the DAE.

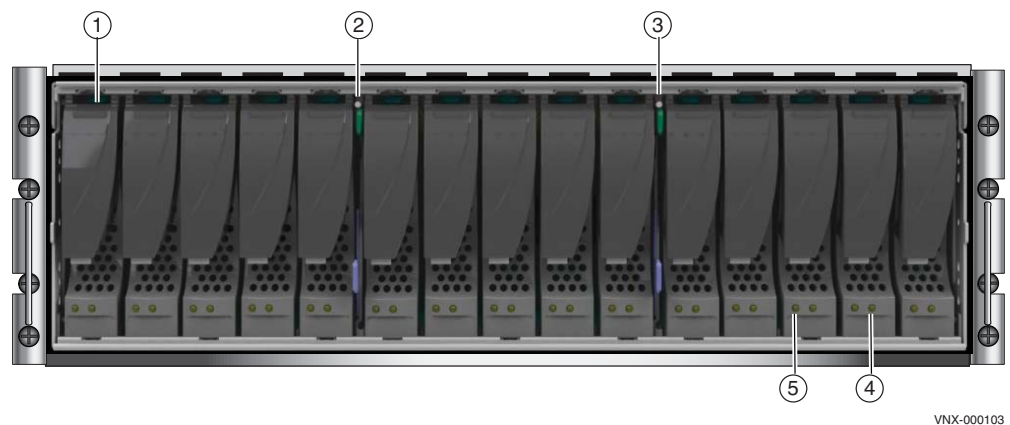
Front view

On the front of the VNX5600 platform, the 3U, 15 (2.5- or 3.5-inch) disk drive DAE carrier includes the following components:

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

Figure 64 shows the location of these components.

Note: In a VNX5600 platform, when using the 3U, 15 (2.5- or 3.5-inch) disk drive carrier, the maximum amount of disk drives is 490 (including DPE and expansion DAEs).



1	2.5- or 3.5-inch 6-Gb/s SAS drives or 6-Gb/s NL-SAS 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 64 Example of a 3U, 15 (2.5- or 3.5-inch) disk drive DAE (front view)

Table 38 describes the VNX5600 platform DAE and the 3.5-inch disk drive status LEDs

Table 38 3U, 15 (3.5-inch) DAE and disk drive LEDs

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

Rear view

On the rear of the VNX5600 platform, a 3U, 15 (2.5-or 3.5-inch) disk drive DAE includes the following components:

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

Figure 65 on page 85 shows an example of the rear view of a 3U, 15 (3.5-inch) disk drive DAE.

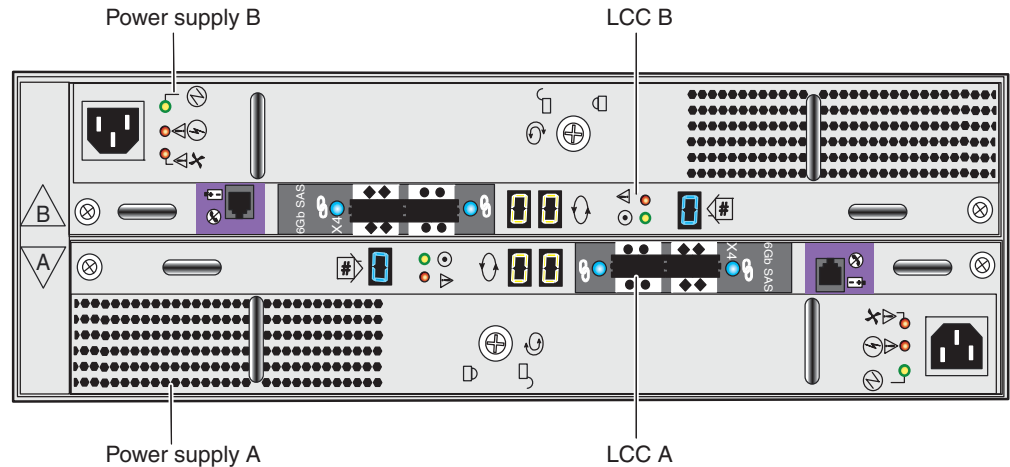


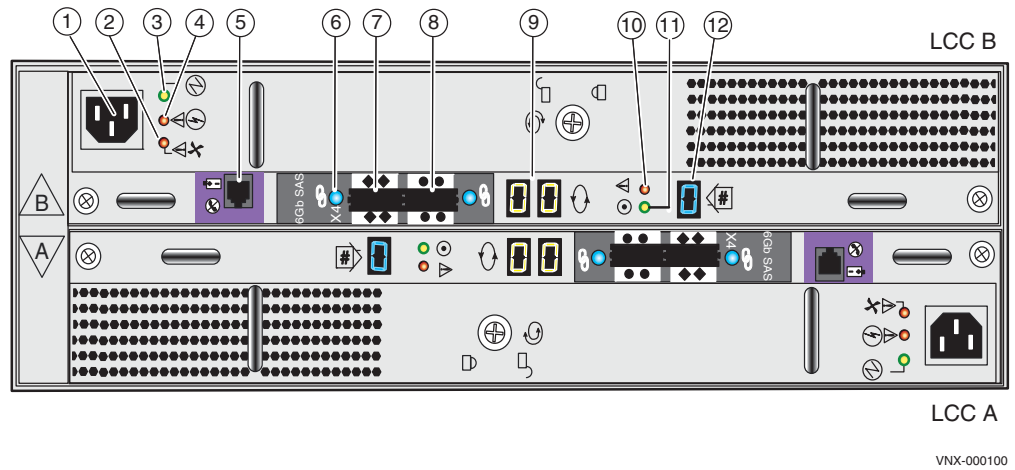
Figure 65 Example of a 3U, 15 (2.5- or 3.5-inch) disk drive DAE with two LCCs and two power supply/cooling modules (rear view)

3U, 15 (2.5- or 3.5-inch) DAE LEDs and connectors

[Figure 66 on page 86](#) shows the location of the 3U, 15 (2.5- or 3.5-inch) DAE LEDs, connectors, and the latch handles:

- ◆ AC power supply (A and B) recessed power in (plug)
- ◆ AC power supply (A and B) LEDs (power and fault)
- ◆ AC power supply (A and B) latch handle
- ◆ LCC (A and B) mini-SAS connectors (input and output)
- ◆ LCC (A and B) mini-SAS link LEDs
- ◆ LCC (A and B) bus ID
- ◆ LCC (A and B) LEDs (power and fault)
- ◆ DAE enclosure ID
- ◆ LCC (A and B) management (RJ-12) connector (not used in VNX5600)
- ◆ LCC (A and B) latch handle

Figure 66 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 mini-SAS connector (output); labeled with a double diamond symbol ◆◆.
2	LCC B power supply fan fault LED (on, amber)	8	LCC B mini-SAS connector (input); labeled with a double circle (or dot) symbol ●●.
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 mini-SAS connector link LED	12	DAE enclosure ID ¹

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

Figure 66 Example of a 3U, 15 (3.5-inch) disk drive DAE with two LCCs and two power supply/cooling modules (rear view)

LCC

The LCC supports and controls one 6-Gb/s mini-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 DPE and other DAEs with 6-Gb/s cables. The cables connect the LCCs in a system in a daisy-chain (loop) topology.

Internally, each DAE LCC uses protocols to emulate a loop; it 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 66 on page 86](#), an enclosure ID¹⁵ 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.

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 by four-lane mini-SAS ports
- ◆ One management (RJ-12) connector to the SPS (not used in the VNX5600 platform)

6-Gb/s mini-SAS x4 ports

The 3U DAE LCC supports two (one input and one output) 6-Gb/s mini-SAS x4 ports (labeled **6Gb SAS 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 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 67 on page 88](#) shows an example of the mini-SAS port connector (socket) and cable connector (plug) with pull tab.

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

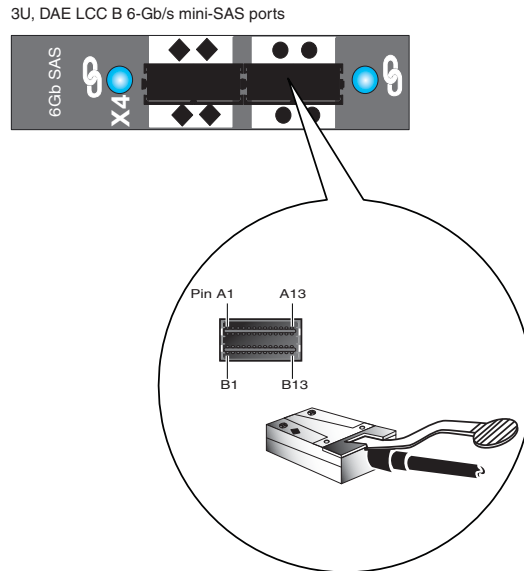


Figure 67 6-Gb/s mini-SAS port and cable connector

A video describing how to properly connect mini-SAS HD cables and mini-SAS cables to a DPE and a DAE, respectively, in a VNX product is available online at: <https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

Note: The first half of the video shows an example of how to connect a mini-SAS HD cable to a mini-SAS HD port while the second half shows how to connect a mini-SAS cable to a DAE LCC mini-SAS port.

Table 39 lists the 3U DAE LCC 6-Gb/s mini-SAS port pin signals used on the connector.

Table 39 6-Gb/s mini-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

Table 39 6-Gb/s mini-SAS port connector pinout (continued)

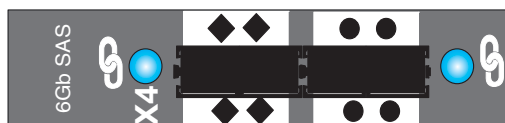
Pin	Signal	Pin	Signal
A11	Rx 3+	B11	Tx 3+
A12	Rx 3-	B12	Tx 3-
A13	GND	B13	GND

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

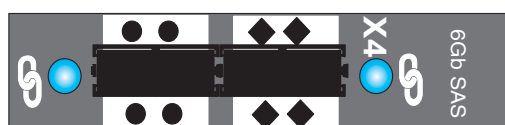
Figure 68 shows the LCC 6-Gb/s mini-SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the SAS port.

Figure 68 also shows a double circle (or dot) symbol ●● (for input) or a double diamond symbol ◆◆ (for output).

3U, DAE LCC B 6-Gb/s SAS ports



3U, DAE LCC A 6-Gb/s SAS ports



VNX-000101

Figure 68 6-Gb/s mini-SAS port LED

Table 40 describes the 3U DAE LCC 6-Gb/s mini-SAS port LEDs.

Table 40 6-Gb/s mini-SAS 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 (not used in the VNX5600 platform) — [Figure 69](#) 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**).

WARNING

The LCC (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-12 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.

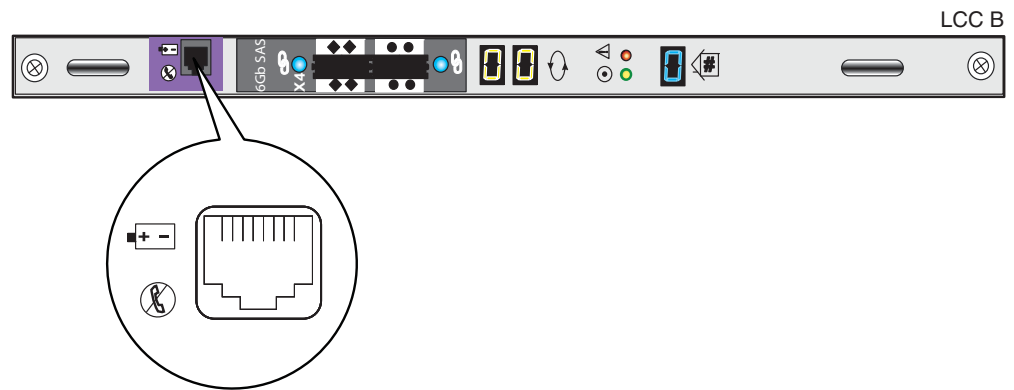


Figure 69 LCC RJ-12 port (not used in the VNX5600 platform)

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 70 on page 91](#)).

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 70 on page 91](#)).

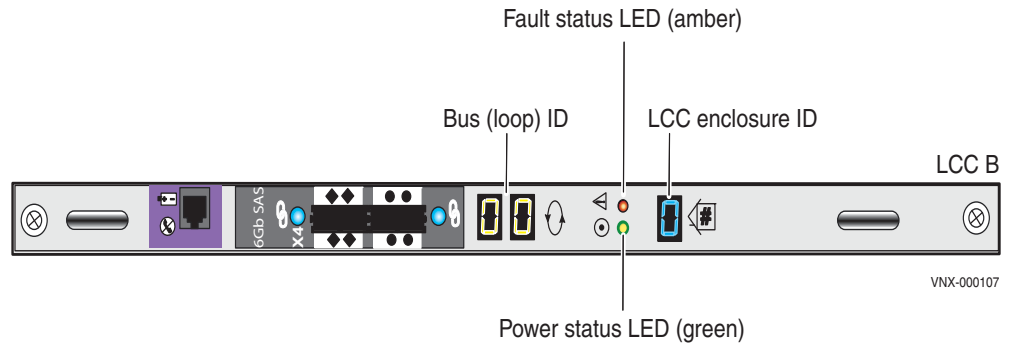


Figure 70 Example of an LCC B enclosure ID, bus (loop) fault and power status LEDs, and bus ID

[Table 41](#) describes the bus (loop) indicator status LEDs.

Table 41 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

AC power supply/cooling module

[Figure 71](#) 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.

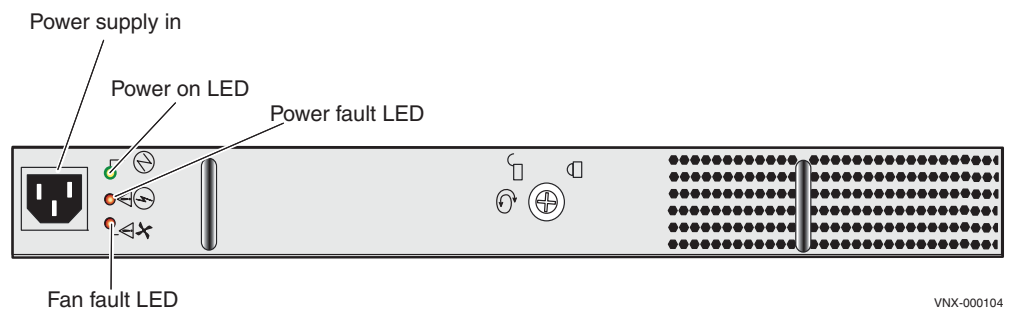


Figure 71 Example of a 3U, 15 (3.5-inch) DAE AC power supply/cooling module power in (recessed) connector (plug) and status LEDs

Table 42 describes the 3U, 15 (3.5-inch) DAE power supply/cooling module LEDs.

Table 42 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.

3U, 120 (2.5-inch) DAE (DAE8S)

IMPORTANT

In a VNX5600 platform, the 3U, 120 (2.5-inch) DAE is only supported in a Dense rack configuration. This Dense rack is 40U or 5.1 ft (1.55 m) high and 44 in. (11.18 cm) deep. Each 3U, 120 (2.5-inch) DAE that goes into the Dense rack weighs 50 lb (22.6 kg) empty and 165 lb (74.8 kg) fully loaded. As a result; whenever the 3U, 120 (2.5-inch) DAE configuration is ordered, it is assembled and configured at the factory before shipping.

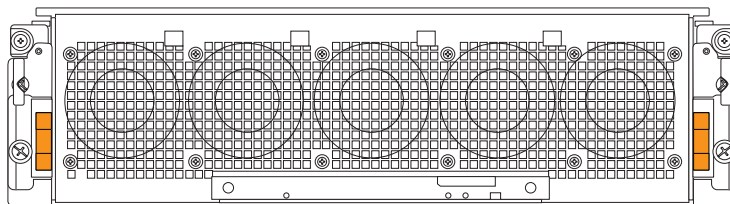
⚠ WARNING

Access to the internal components in a 3U, 120 (DAE8S) enclosure mounted 31U (4.5 ft, or 1.38 m) or higher above the floor requires an appropriate EMC service ladder and is restricted to authorized service personnel only. Attempts to service disks, fans, or other DAE components mounted 31U or higher without a recommended EMC service ladder and personnel may result in serious personal injury. If an EMC service ladder is on site, this ladder is the property of EMC and is only available for use by authorized EMC service personnel.

If installing a new 3U, 120 DAE or replacing an existing 3U, 120 DAE above 31U is necessary, then an appropriate portable mechanical lifting device is required. For more information about this type of device, see [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

The 3U, 120 (2.5-inch) DAE in the VNX5600 platform is 3U (5.25 in.) high. [Figure 72](#) shows an example of the front and rear views of a 3U, 120 (2.5-inch) DAE.

Front



Rear

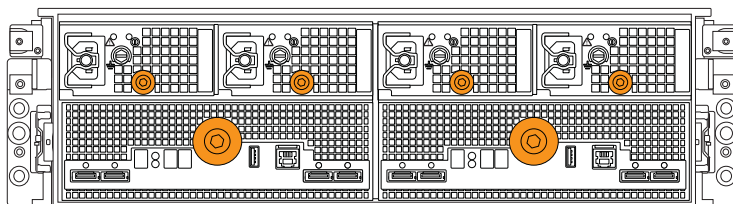


Figure 72 Example of a 3U, 120 (2.5-inch) DAE (front and rear views)

Front view

Supporting 6-Gb/s data transfer speeds, the 3U, 120 (2.5-inch) DAE has the following components:

- ◆ Ten fans (two separate rows of five fans each, front and mid-section), inside
- ◆ Up to 120 disks (six rows of twenty each), inside
- ◆ One system status card (SSC), front
- ◆ Two Link Control Cards (LCCs), rear
- ◆ Four power supplies supporting two types of power supply modules—a single DC output and a dual DC output version, rear

Note: To see an example of the interior view of a 3U, 120 (2.5-inch) DAE, go to [Figure 83 on page 103](#). In this illustration all of the main components except the power supplies and the LCCs are shown.

[Figure 73](#) shows the front view of the 3U, 120 (2.5-inch) DAE. The front shows five fan modules or cooling modules¹⁶ and a system status card (SSC) with three status LEDs (an enclosure fault led, an enclosure power led, and an SSC fault led).

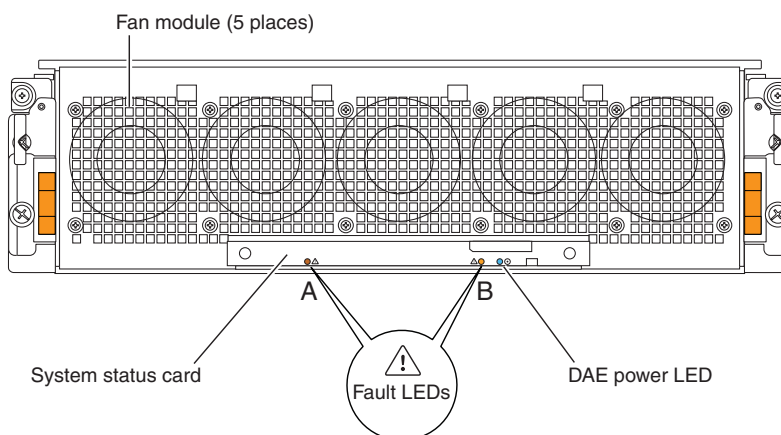


Figure 73 Example of a 3U, 120 (2.5-inch) DAE (front view) showing the SSC fault (see location A) and DAE fault (see location B) LEDs (amber) and the DAE power LED (blue)

Fan module (cooling module)

Five of the ten fan modules (cooling modules) of the 3U, 120 (2.5-inch) DAE are located ([Figure 73](#)) on the front. Cooling is provided by these front fan modules and the five fan modules located in the mid-section of the DAE ([Figure 85 on page 106](#)). All of the fan modules are installed or removed with the DAE pulled out of the cabinet (for information about how to install or remove the fan module, go to [“Access to disk drives and fan modules \(cooling modules\)” on page 105](#)). For a closer look of a fan module, go to [“Fan module \(cooling module\)” on page 108](#).

16. The 3U, 120 (2.5-inch) DAE has a total of ten fan modules or cooling module (five in the front and five in the mid-section of the DAE).

System status card

The system status card (SSC) is a removable circuit board located on the bottom, front of the 3U, 120 (2.5-inch) DAE and provides the following functionality ([Figure 73 on page 94](#)):

- ◆ Three status LEDs ([Table 43](#))
 - SSC fault LED
 - Enclosure fault LED
 - Enclosure power LED
- ◆ Fan voltage of 12 VDC is provided to two fans; fan 0 located in the front of the DAE and fan 7 located in the mid-section of the DAE; this maintains proper cooling,
- ◆ An inlet temperature sensor that determines the ambient temperature outside the enclosure
- ◆ SSC resume EEPROM for tracking manufacturing information

[Table 43](#) describes the 3U, 120 (2.5-inch) DAE status LEDs.

Table 43 3U, 120 (2.5-inch) DAE status LEDs

LED	Color	State	Description
SSC fault (see location A in Figure 73 on page 94)	Amber	On	Fault detected
	—	Off	No fault detected
DAE fault (see location B in Figure 73 on page 94)	Amber	On	Fault detected
	—	Off	No fault detected
DAE power	Blue	On	Powered on, normal
		Off	Not powered on or fault

Rear view

On the rear, the 3U, 120 (2.5-inch) DAE includes two LCCs (A and B) and four power supply modules (Figure 74).

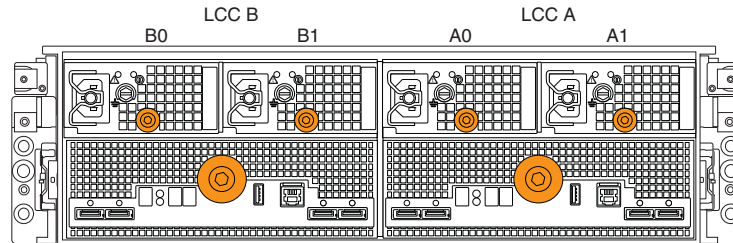


Figure 74 Example of a 3U, 120 (2.5-inch) DAE with two LCCs (A and B) and four power supply modules (locations A0, A1, B0, and B1)

The 3U, 120 (2.5-inch) DAE supports one type of power supply module: a dual DC output power supply. Figure 74 shows the dual DC output power supplies having an orange knob to install and remove the power supplies to and from the enclosure.

Power supply modules

As shown in Figure 74, the power supply module is described in the following paragraphs. For more information about the technical specifications of the single and the dual output power supplies, go to <https://mydocs.emc.com/VNX/>, select **View technical specifications**. Next, follow the steps in the wizard for your desired technical specification. For information about replacing a power supply module, go to *Replacing a power supply module in a 120-disk enclosure* procedure available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.

Dual DC output, knob-type power supply

The dual DC output, knob-type power supply (Figure 75) includes two status LEDs: a fault LED and a power LED. The dual output version is rated at 1080 W with two 12-V DC outputs (540 W each) and one AC input per power supply. Table 44 on page 97 describes the LEDs.

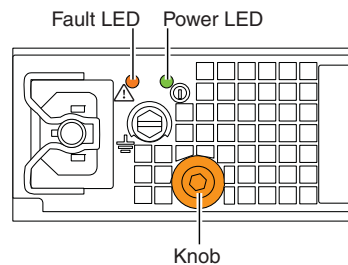


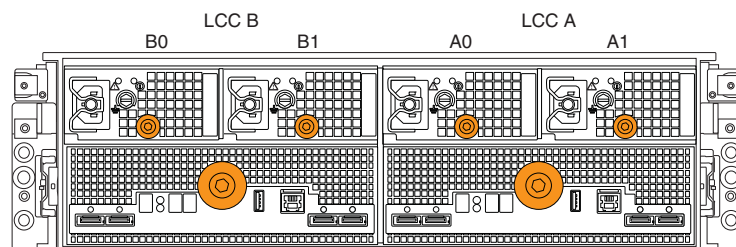
Figure 75 Example of a 3U, 120 (2.5-inch) DAE DC dual output, knob-type power supply module (rear view)

Table 44 3U, 120 (2.5-inch) DAE dual DC output, knob-type power supply (fault and power on) LEDs

LED	Color	State	Description
Fault	Amber	On	Fault, under LCC control. Fans or outputs are outside the specified operating range while the unit is in low power mode.
		Blinking	External fault, under LCC control. 12 VDC off due to all LCCs not being present.
	—	Off	No fault or power off
Power	Green	On	AC Power on
	—	Off	AC Power off, verify source power

LCC

[Figure 76](#) shows an example of the rear view of a 3U, 120 (2.5-inch) DAE showing LCC A and B with single output power supplies.

**Figure 76** Example of a 3U, 120 (2.5-inch) DAE showing LCC A and B (rear view)

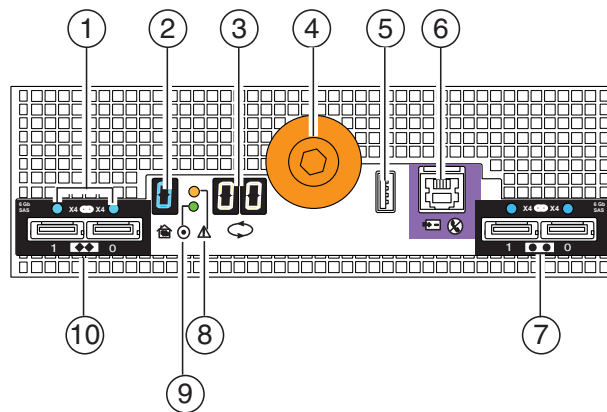
Each LCC ([Figure 77 on page 98](#)) provides 4x mini-SAS small form-factor 8088 (SFF-8088) specification connectors ([Figure 78 on page 99](#)). These ports are connected to a SAS expander with 36 PHYs. The expander allows for traffic to pass through the enclosure upstream and downstream. It also provides access to the disk drive SAS sub-system. This disk drive sub-system is made up of four 36 PHY edge expanders in parallel. Each expander provides SAS connectivity to 30 disk drives. These edge expanders connect to the fanout expander (IO expander) through a five lane SAS wide port. For information about replacing an LCC, go to the *Replacing an LCC in a 120-disk enclosure* procedure.

LCC status LEDs

The following table describes the LCC status LEDs.

Table 45 LCC status LEDs

LED	Color	State	Description
Power (bottom)	Green	On	Power on
	—	Off	Power off
Power fault (top)	Amber	On	Fault
	—	Off	No fault or power off



1	LCC mini-SAS connector LEDs (blue/green); for a closer view, see Figure 78 on page 99 .	6	LCC management (RJ-12) connector (not used in the VNX5600 platform); for a closer view, see Figure 80 on page 101 .
2	LCC enclosure ID	7	LCC mini-SAS connector (input or primary); labeled with a double circle (dot) symbol ●●. The right port is labeled 0 and the left port is labeled 1.
3	LCC enclosure bus ID	8	LCC power fault LED (amber); Table 45 on page 98
4	LCC lock knob (orange)	9	LCC power on LED (green); Table 45 on page 98
5	LCC USB connector (for a closer view, see Figure 81 on page 101)	10	LCC mini-SAS connector (output or expansion); labeled with a double diamond symbol ◆◆. The right port is labeled 0 and the left port is labeled 1.

Figure 77 Example of a 3U, 120 (2.5-inch) DAE LCC A (rear view)

LCC input/output ports, connectors, and LEDs

The 3U, 120 (2.5-inch) DAE LCC supports the following I/O ports on the rear:

- ◆ Four 6-Gb/s PCI Gen 2 mini-SAS ports
- ◆ One management (RJ-12) connector (not used in the VNX5600 platform)
- ◆ One USB connector

6-Gb/s mini-SAS x4 ports — The LCC supports four (two input with a double circle ●● and two output with a double diamond ◆◆) 6-Gb/s mini-SAS x4 ports (labeled **6 Gb SAS x4 1** or **0**) on the rear of each LCC (A and B) as shown in [Figure 78](#). 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.

Mini-SAS connector LED — A blue/green link/activity LED next to the mini-SAS port indicates the DAE connection status. Blue indicates that the port is established at a maximum bus speed of 6-Gb/s. Green indicates that a wide port width other than 4x is established or one or more lanes is not operating at the maximum bus speed.

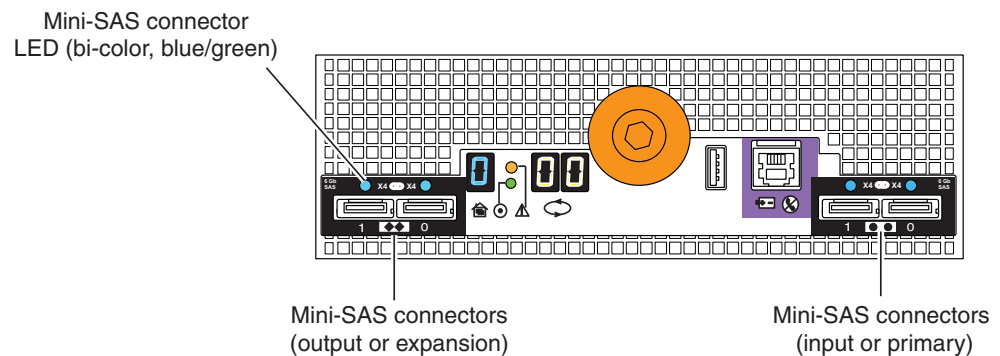


Figure 78 6-Gb/s mini-SAS input and output connectors and LEDs

Note: As described in the previous paragraphs, the first connection from the DAE comes from the four, 6-Gb/s mini-SAS ports. This connection uses a 26-pin mini-SAS small form-factor 8088 (SFF-8088) specification connector (plug) with a pull (release) tab on one end of the cable, while the DPE side uses a 36-pin mini-SAS HD small form-factor 8644 (SFF-8644) specification connector (plug) with a pull (release) tab (see [Figure 13 on page 29](#)) on the other end of the cable.

For more information about the mini-SAS HD to mini-SAS cable, refer to the DPE “[Base module](#)” on [page 26](#). A complete description of the mini-SAS HD connector and cable end is provided. Additionally, a video describing how to properly connect mini-SAS HD cables and mini-SAS cables from a DPE to a DAE, respectively in a VNX product is available online at: <https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

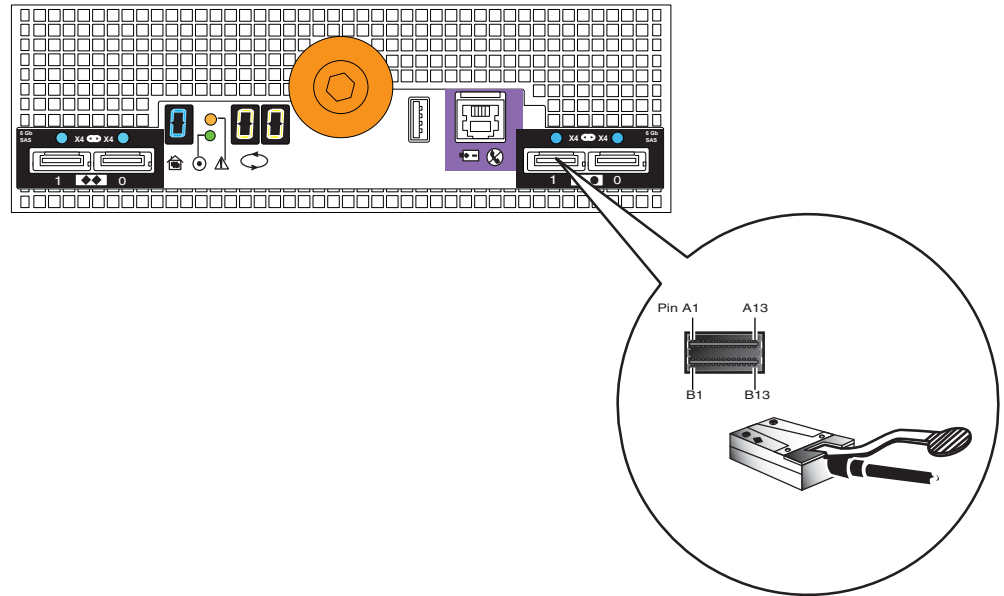


Figure 79 6-Gb/s mini-SAS connector and cable end

The following table describes the mini-SAS connector pinout.

Table 46 6-Gb/s mini-SAS 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

Management (RJ-12) port connector (not used in the VNX5600 platform) — [Figure 77 on page 98](#) (see location 6) and [Figure 80 on page 101](#) 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 **WARNING** on [page 101](#)).

⚠ WARNING

The (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.

The battery symbol means that you can connect a standby power supply (SPS) to this connector.

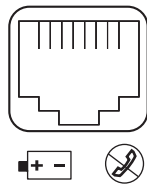


Figure 80 3U, 120 (2.5-inch) DAE management (RJ-12) port (not used in the VNX5600 platform)

USB

The USB port connects a USB cable to the blue light on the front bezel ([Figure 81](#)).

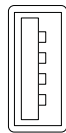


Figure 81 3U, 120 (2.5-inch) DAE USB port

3U, 120 (2.5-inch) DAE 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) with the same ID number. The enclosure ID is set at installation ([Figure 98 on page 118](#)).

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 98 on page 118](#)).

Note: [Figure 98 on page 118](#) 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.

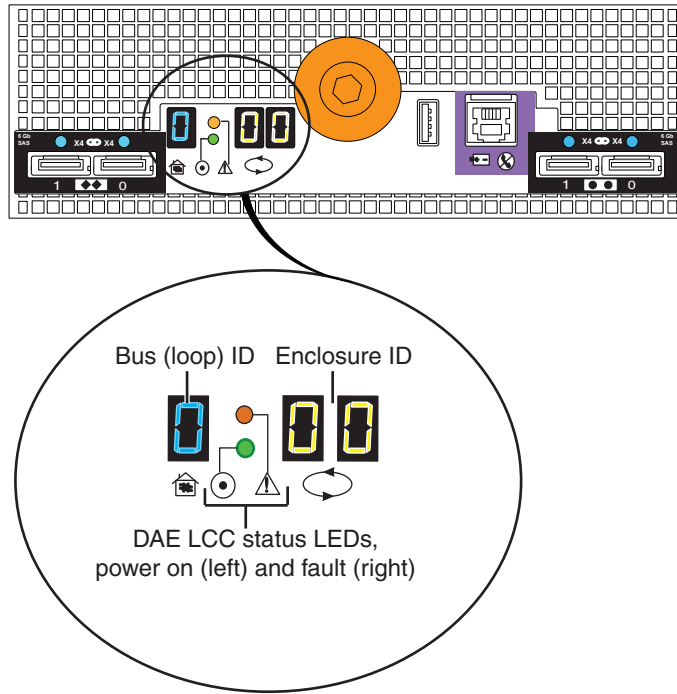


Figure 82 Example of an LCC enclosure ID indicator, bus ID indicator, and the LCC power and fault LEDs

[Table 47](#) describes the LCC status LEDs.

Table 47 LCC 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

Interior view

The interior of the 3U, 120 (2.5-inch) DAE shows the fan modules (front and mid-section), the disks the power supply modules, and the LCCs (Figure 83).

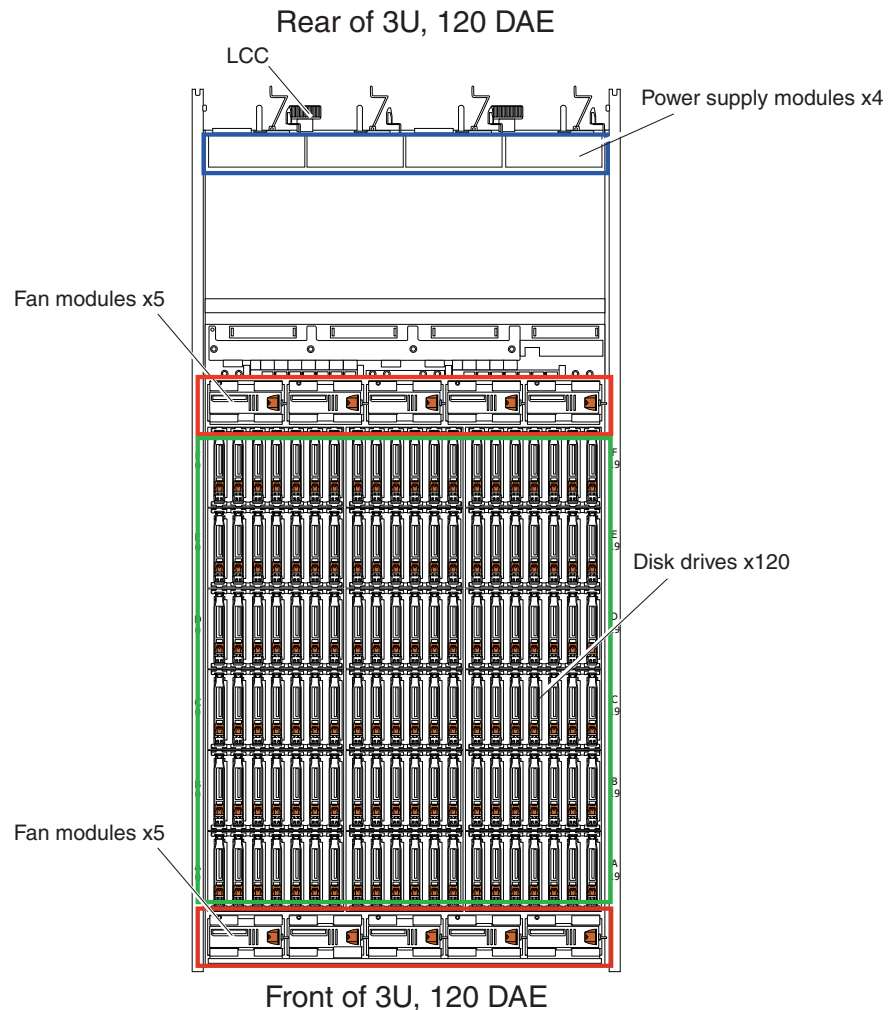


Figure 83 3U, 120 (2.5-inch) DAE (interior view)

The fan modules and disks are accessible only by sliding the DAE out from the rack (for more information, see [“Access to disk drives and fan modules \(cooling modules\)”](#) on [page 105](#)). The power supply modules and LCCs are accessed from the rear of the DAE (for mor information, see [“Rear view”](#) on [page 96](#)).

⚠ WARNING

Access to the internal components in a 3U, 120 (DAE8S) enclosure mounted 31U (4.5 ft, or 1.38 m) or higher above the floor requires an appropriate EMC service ladder and is restricted to authorized service personnel only. Attempts to service disks, fans, or other DAE components mounted 31U or higher without a recommended EMC service ladder and personnel may result in serious personal injury. If an EMC service ladder is on site, this ladder is the property of EMC and is only available for use by authorized EMC service personnel.

If installing a new 3U, 120 DAE or replacing an existing 3U, 120 DAE above 31U is necessary, then an appropriate portable mechanical lifting device is required. For more information about this type of device, see [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

If replacing or adding a 3U, 120 (2.5-inch) DAE becomes necessary, a portable mechanical lift is recommended by EMC. The portable lift commonly used by EMC service personnel is manufactured by Alum-A-Lift. Included with the lift is a lift kit which provides instructions for using the portable lift. For more information, refer to [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

IMPORTANT

The portable mechanical lift commonly used by EMC service personnel has two settings—one with a lower mast and one with both a lower and upper mast (dual mast). The lower mast setting is rated for 400 lb (178.09 kg) and is for raising or lowering of objects 28U (4.08 ft or 1.2 m) or less above the floor. The dual mast setting is rated well under 200 lb (89 kg) and is for raising objects more than 28U (4.08 ft or 1.2 m) above the floor. A conversion kit from Alum-A-Lift and a support table is available from the lift provider for installations above 28U. This kit is rated for 225 lb (102 kg). For more information, refer to [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

Refer to the following **CAUTION** that discusses the mounting and servicing of the 3U, 120 (2.5-inch) DAE in a 40U Dense rack.

To replace or add any of these components, refer to the respective Customer Replaceable Unit (CRU) procedure for the 3U, 120 DAE. For example, to replace a disk drive, refer to the *Replacing a disk in a 120-disk enclosure* document available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.



To prevent bodily injury when mounting or servicing the 3U, 120 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:

1. When lifting this DAE, always use two to three people and a portable mechanical lifting device.
 2. For service personnel, when accessing this unit in a rack above 31U, always use an EMC authorized ladder.
 3. 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.
 4. If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the DAE in the rack.
-

Access to disk drives and fan modules (cooling modules)

Unlike the 2U, 25 and 3U, 15 DAEs, the 3U, 120 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 and fans for the DAE are located inside the DAE.

To gain access to the DAE, you must first, open the console, then unlock and remove the front bezel. Next, unlock the DAE from the rails by grasping the orange enclosure latch handles (see location 1 in [Figure 84](#)) on each side of the DAE. Then, pull the orange enclosure latch handles (see location 2 in [Figure 84](#)) on each side of the DAE to slide the DAE out of the rack on its rails until it locks into place (secure service position). For complete instructions, see the *Replacing a disk in a 120-disk enclosure* procedure available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.

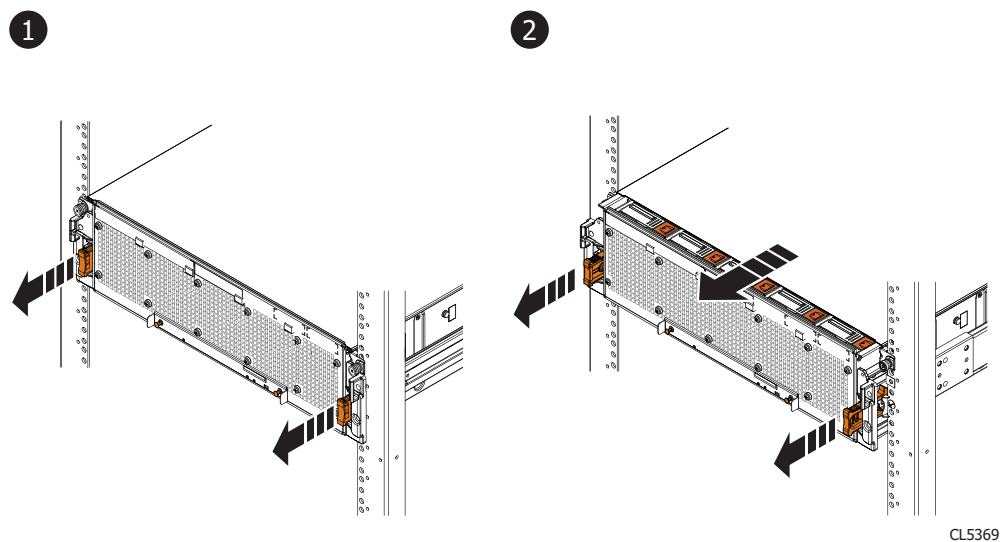


Figure 84 3U, 120 (2.5-inch) DAE (unlocking bottom enclosure latch handles)

Note: If the 3U, 120 (2.5-inch) DAE does not slide out of the rack (or cabinet) far enough for you to access the internal components and lock on the rails in the service position, verify that all the other DAEs are completely seated in the rack (or cabinet) by pushing firmly on them.

Disk drive

The disk drives (hot-swappable) for the 3U, 120 (2.5-inch) 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.

IMPORTANT

Refer to the *Removing a disk* procedure for the correct procedure to remove a disk from the DAE. Each disk contains LUN identifying information written when it was bound. Moving it to another slot can make the information on the original LUN inaccessible.

One drive size is supported in the 3U, 120 (2.5-inch) DAE, the 2.5-inch disk drive. This disk drive is available in three types:

- ◆ 6-Gb/s SAS
- ◆ Flash



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. However, all the 120 disk drives are not spun up at the same time.

IMPORTANT

The 3U, 120 (2.5-inch) DAE has designated A0 and A1 disks as the boot drives for the DAE.

Figure 85 shows a top-down cut-away interior view of 3U, 120 (2.5-inch) DAE showing the location of the first row of disk drives A0-A19 and the front fan modules.

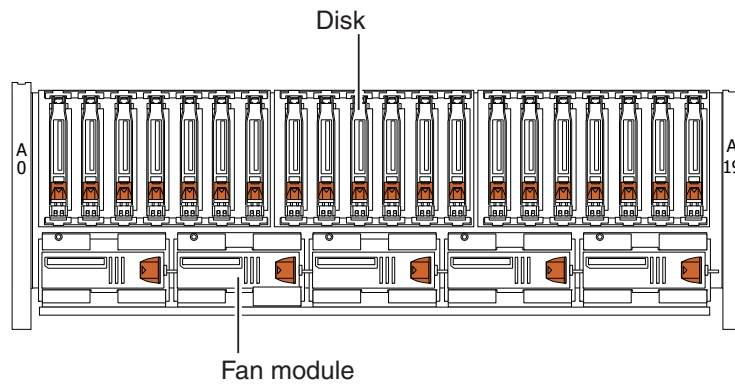


Figure 85 3U, 120 (2.5-inch) top-down cut-away view of the disk drives and the front fan modules (interior view)

Figure 86 shows an example of the disk drive power and fault LEDs.

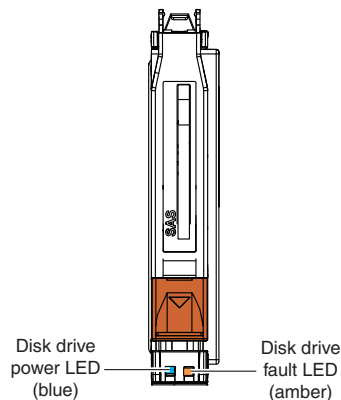


Figure 86 Disk drive power LED and fault LED

Disk drive layout

Looking at the 3U, 120 DAE from the front and above (Figure 87), the inside of each DAE has physically printed labels located on the left and right sides of the DAE enclosure.

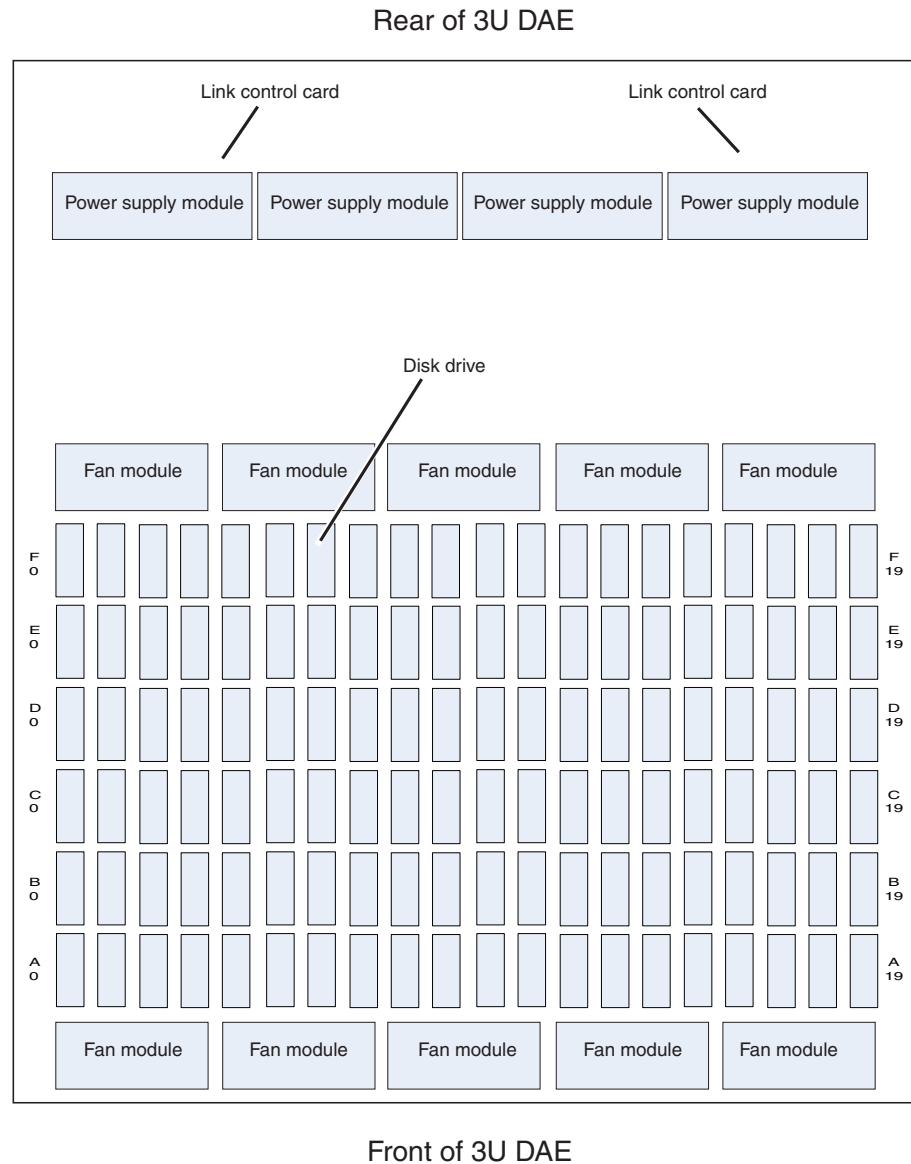


Figure 87 3U, 120 DAE disk drive layout and notation (top-down interior view)

These labels describe the rows (or banks) and the columns (or slots) of where the disks are installed in the DAE. From front to back, the DAE is labeled on the left **A0**, **B0**, **C0**, **D0**, **E0**, and **F0** while on the right, the DAE is labeled **A19**, **B19**, **C19**, **D19**, **E19**, and **F19**. The letters in front of the numbers denote the row (or bank) while the numbers denote the column (or slot).

Note: The labels for the banks and slots shown in Figure 87 are the actual labels in the 3U, 120 (2.5-inch) DAE.

Rules for disk drive population

As described in the previous paragraph, disks are arranged in six rows of twenty modules each. The first (front) row is denoted as A, then the remaining rows are B, C, D, E, and F. In each row, the disks are numbered with the first disk labeled with a letter and number together, for example **A0** or **A19**, and so on (for more information, refer to [“Disk drive layout” on page 107](#)).

The required order of loading the disk drives into a 3U, 120 (2.5-inch) DAE is as follows ([Figure 87 on page 107](#)):

1. Start at row (or bank) A, slot 0 or A0.
2. Fill up the row (or bank) A before inserting any disk drives into row B.
3. Continue this order until you fill all the rows with row F being the last row filled.

Note: If you partially fill a row, fill the remaining empty slots with filler panel modules. Rows with no or zero (0) drives do not require filler panel modules.

Fan module (cooling module)

As described previously in the section [“Fan module \(cooling module\)” on page 94](#), each 3U, 120 (2.5-inch) DAE includes 10 fan modules (cooling modules). [Figure 88](#) shows the location of the fan modules in the 3U, 120 (2.5-inch) DAE.

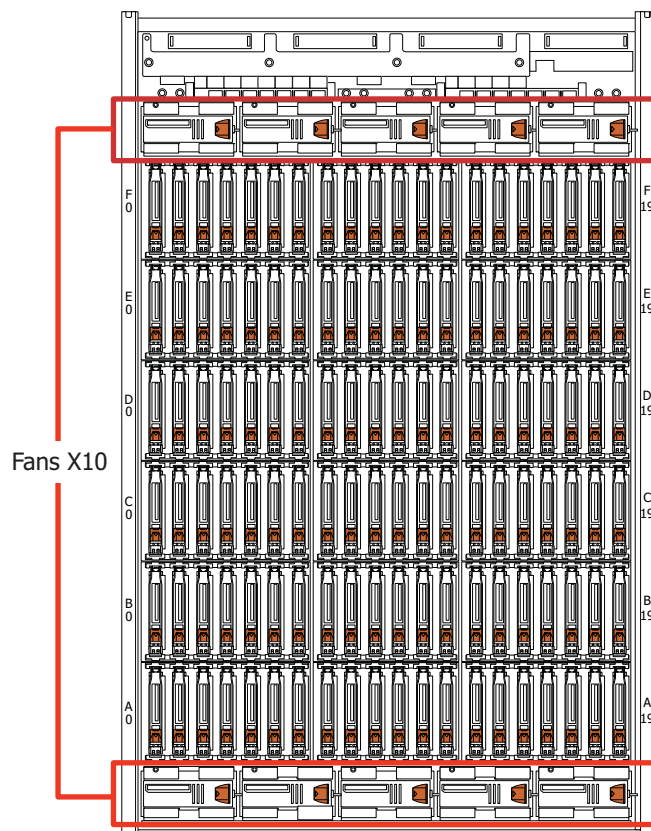


Figure 88 Example of the 3U, 120 DAE fan module location

The 10 fans within the DAE are arranged in two separate rows of 5 fans each (front and mid-section). Each row and instance is labeled with a fan icon and corresponding number; front = 0, mid-section = 5. Each fan is numbered sequentially 0-9, left to right, with 0-4 being in the front row. For information about replacing a fan module, go to *Replacing a fan module in a 120-disk enclosure* procedure available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.

Figure 89 shows the location of the status (fan fault) LED on the 3U, 120 (2.5-inch) DAE fan module.

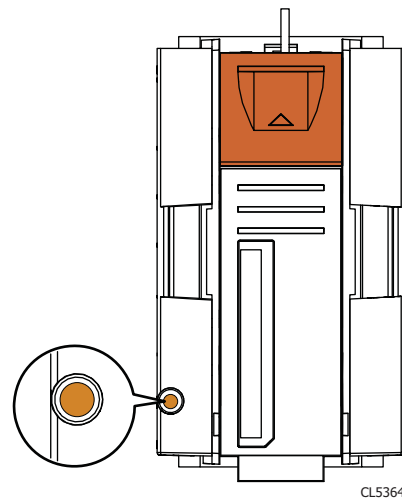


Figure 89 Example of a 3U, 120 (2.5-inch) DAE fan module showing the fan fault LED (amber)

Table 48 describes the 3U, 120 (2.5-inch) DAE fan fault LED.

Table 48 Fan 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

4U, 60 (2.5- or 3.5-inch) DAE (DAE7S)

IMPORTANT

In a VNX5600 platform, the 4U, 60 (2.5- or 3.5-inch) DAE is only supported in a Dense rack configuration. This Dense rack is 40U high and 44 in. (111.76 cm) deep. Each 4U, 60 DAE that goes in the Dense rack weighs 57.8 lb (26.28 kg) empty and 213 lb (96.62 kg) fully loaded. As a result; whenever the 4U, 60 DAE configuration is ordered, it is assembled and configured at the factory before shipping.

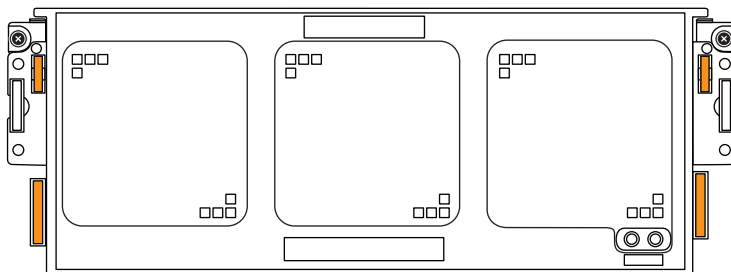
CAUTION

Access to the internal components in a 4U, 60 (DAE7S) enclosure mounted 31U (4.5 ft or 1.38 m) or higher above the floor requires an appropriate EMC service ladder and is restricted to authorized service personnel only. Attempts to service disks, fans, or other DAE components mounted 31U or higher without a recommended EMC service ladder and personnel may result in serious personal injury. If an EMC service ladder is on site, this ladder is the property of EMC and is only available for use by authorized EMC service personnel.

If installing a new 4U, 60 DAE or replacing an existing 4U, 60 DAE above 31U is necessary, then an appropriate portable mechanical lifting device is required. For more information about this type of device, see [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

The 4U, 60 (2.5- or 3.5-inch) disk drive DAE in the VNX5600 platform is 4U (7 inches) high and includes 60 disk drives. [Figure 90](#) shows an example of the front and rear views of a 4U, 60 (2.5- or 3.5-inch) DAE.

Front



Rear

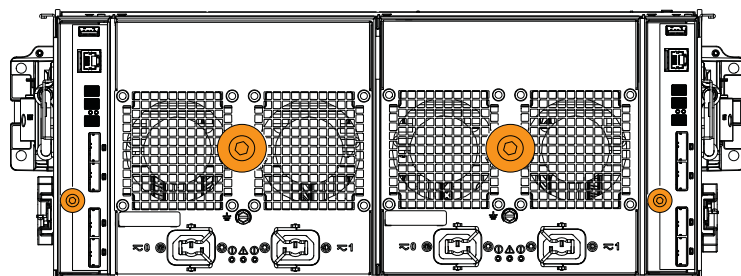


Figure 90 Example of a 4U, 60 (2.5- or 3.5-inch) DAE (front and rear views)

Front view

The 4U, 60 (2.5- or 3.5-inch) DAE has the following components:

- ◆ three fans, front
- ◆ up to 60 disks (five rows of twelve each), inside
- ◆ two link control cards (LCCs), inside
- ◆ two inter-connect modules (ICMs), rear
- ◆ two power supply modules, rear

Note: To see an example of the interior view of a 4U, 60 (2.5- or 3.5-inch) DAE, go to [Figure 100 on page 120](#). In this illustration, all of the main components are shown.

[Figure 91](#) shows the front view of the 4U, 60 (2.5- or 3.5-inch) DAE having three fan modules or cooling modules and two status LEDs (an enclosure fault led, an enclosure power led).

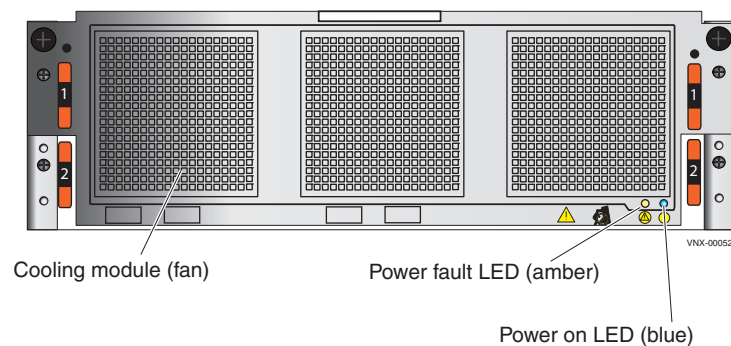


Figure 91 Example of a 4U, 60 (2.5- or 3.5-inch) DAE (front view) showing the fan modules and the DAE power fault LED (amber) and the DAE power on LED (blue)

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

On the front of the 4U, 60 (2.5- or 3.5-inch) DAE are two status LEDs:

- ◆ a DAE power fault LED (amber)
- ◆ a DAE power on LED (blue)

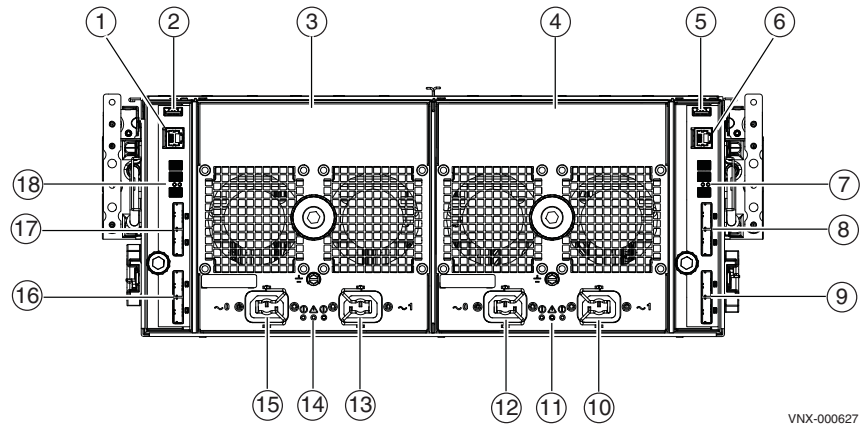
[Table 49](#) describes the 4U, 60 (2.5- or 3.5-inch) DAE front status LEDs

Table 49 4U, 60 DAE status LEDs

LED	Color	State	Description
DAE power on	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 (B and A) and two power supply modules (B and A) as shown in [Figure 92](#).



VNX-000627

1	ICM B management (RJ-12) connector (not used)	10	4U, 60 DAE A AC power supply power in (recessed plug), labeled 1
2	ICM B USB connector	11	4U, 60 DAE A power and fault LEDs
3	4U, 60 DAE B AC power supply)	12	4U, 60 DAE A AC power supply power in (recessed plug), labeled 0
4	4U, 60 DAE A AC power supply power in (recessed plug)	13	4U, 60 DAE B AC power supply power in (recessed plug), labeled 1
5	ICM A USB connector	14	4U, 60 DAE B power and fault LEDs
6	ICM A management (RJ-12) connector (not used)	15	4U, 60 DAE B AC power supply power in (recessed plug), labeled 0
7	4U, 60 DAE B bus ID and enclosure ID	16	ICM B SAS connector (output); the top port is labeled 0 and the bottom port is labeled 1.
8	ICM A SAS connector (input); labeled with a double circle (dot) symbol ●●. The top port is labeled 0 and the bottom port is labeled 1.	17	ICM B SAS connector (input); the top port is labeled 0 and the bottom port is labeled 1.
9	ICM A SAS connector (output); labeled with a double diamond symbol ◆◆. The top port is labeled 0 and the bottom port is labeled 1	18	4U, 60 DAE B bus ID and enclosure ID

Figure 92 Example of a 4U, 60 (2.5- or 3.5-inch) DAE with two ICMs and two power supply/cooling modules (rear view)

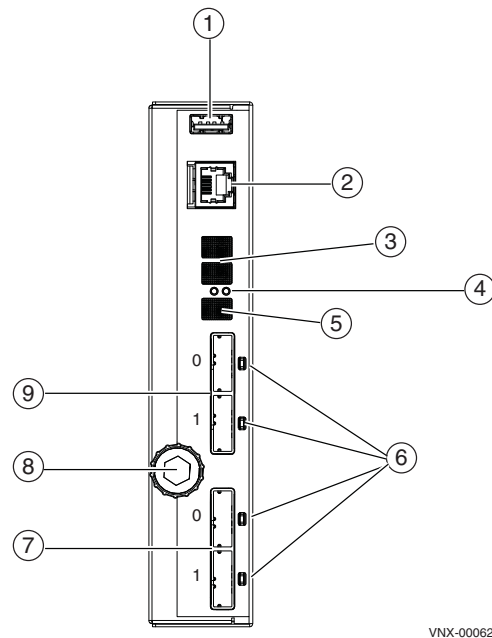
Note: Between the power supplies and the ICMs on the rear of the 4U, 60 DAE is a separator bar that indicates the location of the both power supplies and ICMs. Facing rear, on the right side of the 4U, 60 DAE, is power supply A and ICM A. On the left side of the 4U, 60 DAE is power supply B and ICM B.

ICM

The 4U, 60 (2.5- or 3.5-inch) DAE external interfaces are made through the ICM. The ICM is the primary interconnect management element (Figure 93).

The ICM is a plug-in module that includes a USB connector, RJ-12 management connector (not used), Bus ID indicator, enclosure ID indicator, two input mini-SAS connectors and two output mini-SAS connectors with corresponding LEDs indicating the link and activity of each mini-SAS connector for input and output to devices.

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



VNX-000629

1	ICM USB connector	6	Four ICM mini-SAS input/output connector LEDs (bi-color blue/green)
2	ICM management (RJ-12) connector (not used in the VNX5600 platform)	7	Two ICM mini-SAS connectors (output or expansion); labeled with a double diamond symbol $\blacklozenge\blacklozenge$. The top port is labeled 0 and the bottom port is labeled 1 .
3	ICM bus ID indicator (yellowish green)	8	ICM thumbscrew
4	Two ICM LEDs (power, green; fault, amber)	9	Two ICM mini-SAS input connectors (input or primary); labeled with a double circle (or dot) symbol $\bullet\bullet$. The top port is labeled 0 and the bottom port is labeled 1 .
5	ICM enclosure ID indicator (blue)		

Figure 93 Example of ICM connectors and LEDs (rear view)

As described previously, the ICMs in a 4U, 60 (2.5- or 3.5-inch) DAE connect to the DPE and other DAEs with 6-Gb/s mini-SAS cables. The cables connect the ICMs in a system in a daisy-chain topology.

As shown in [Figure 93 on page 113](#), an enclosure ID¹⁷ 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.

[Table 50](#) describes the ICM status LEDs.

Table 50 ICM 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

ICM input/output ports and connectors

The 4U, 60 (2.5- or 3.5-inch) DAE ICM supports the following I/O ports on the rear:

- ◆ Four 6-Gb/s PCI Gen 2 mini-SAS ports
- ◆ One management (RJ-12) connector (not used in the VNX5600 platform)
- ◆ One USB connector

6-Gb/s mini-SAS x8 ports — The DAE ICM supports four (two input and two output) 6-Gb/s mini-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 mini-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 mini-SAS cable is keyed with an *in* and *out* connection to prevent incorrect cabling.

A video describing how to properly connect mini-SAS HD cables and mini-SAS cables to a DPE and a DAE, respectively, in a VNX product is available online at: <https://edutube.emc.com/>, in the Search box, type in **Mini-SAS HD Cable Connectivity**. The video will start immediately.

Note: The first half of the video shows an example of how to connect a mini-SAS HD cable to a mini-SAS HD port while the second half shows how to connect a mini-SAS cable to a DAE LCC port.

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

Figure 94 shows an example of the port connector (socket) and cable connector (plug) with pull tab.

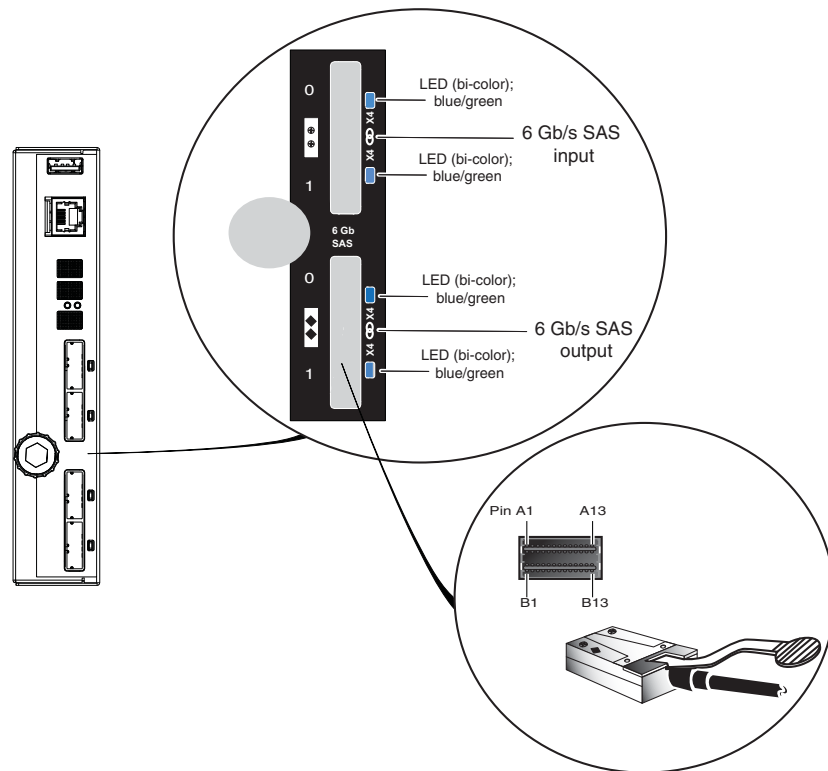


Figure 94 6-Gb/s mini-SAS port and cable connector

Table 51 lists the 4U, 60 (2.5- or 3.5-inch) DAE ICM 6-Gb/s mini-SAS port pin signals used on the connector.

Table 51 6-Gb/s mini-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

Table 51 6-Gb/s mini-SAS port connector pinout (continued)

Pin	Signal	Pin	Signal
A11	Rx 3+	B11	Tx 3+
A12	Rx 3-	B12	Tx 3-
A13	GND	B13	GND

6-Gb/s mini-SAS port LEDs and port direction (input or output) — Figure 95 shows the 6-Gb/s mini-SAS port LED—a bi-color (blue/green) LED next to the connector, either left or right—that indicates the link/activity of the mini-SAS port.

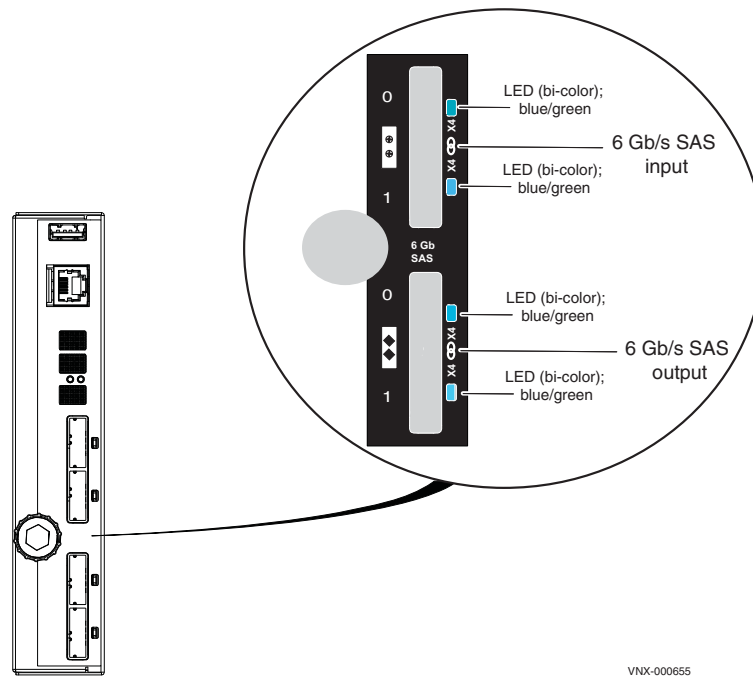


Figure 95 Example of an ICM 6-Gb/s mini-SAS connectors and LEDs

Table 52 describes the 4U, 60 (2.5- or 3.5-inch) DAE ICM 6-Gb/s mini-SAS port LEDs.

Table 52 6-Gb/s mini-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) connector (not used in the VNX5600 platform) — [Figure 96](#) 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**).

WARNING

The ICM (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.

The battery symbol means that you can connect a standby power supply (SPS) to this connector.

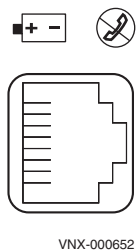


Figure 96 ICM management (RJ-12) connector (not used the VNX5600 platform)

USB — The USB port connects a USB cable to the blue light on the front bezel ([Figure 97](#)).

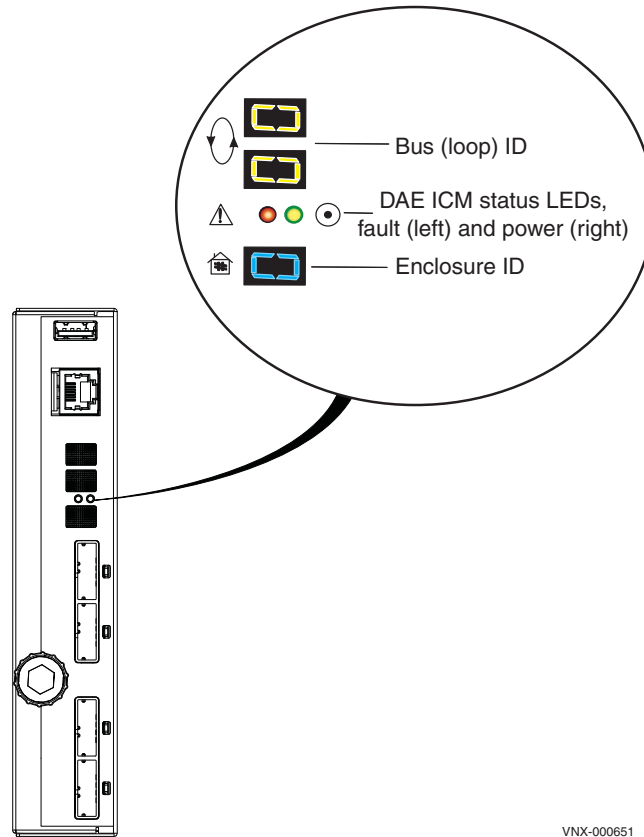


Figure 97 4U, 60 DAE USB port

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 98 on page 118](#)).

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 98 on page 118](#)).

Note: [Figure 98 on page 118](#) 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.



VNX-000651

Figure 98 Example of an ICM enclosure ID indicator, bus ID indicator, and the ICM power and fault LEDs

[Table 53](#) describes the ICM power and fault LEDs.

Table 53 ICM 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

Power supply

The power supply is hot-swappable. 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, 60 (2.5- or 3.5-inch) 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 I²C interface.

Figure 99 shows an example of the 4U, 60 DAE AC power supply with two power in recessed connectors (or plugs) and status LEDs.

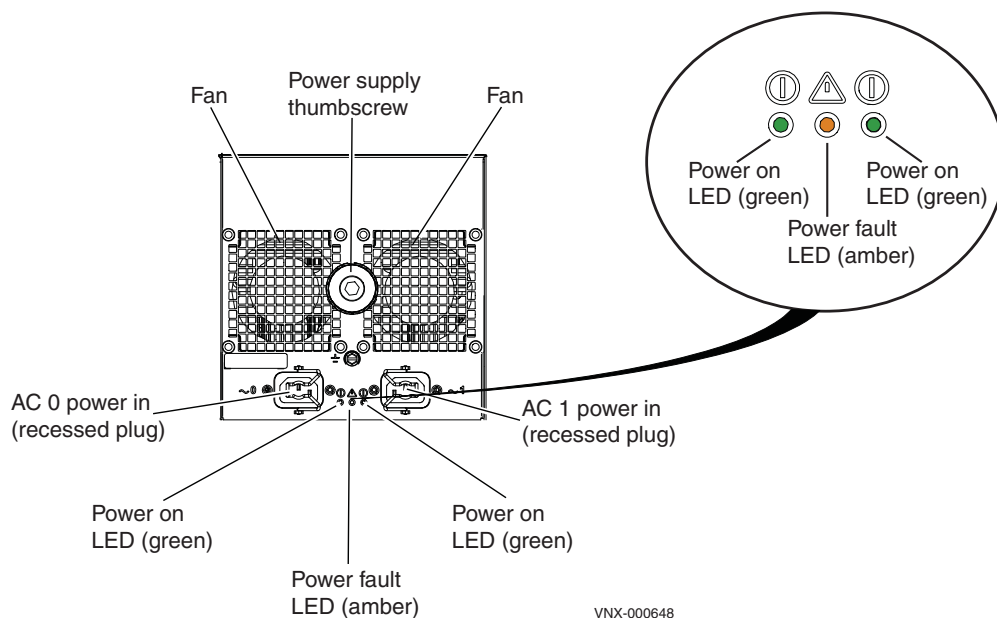


Figure 99 Example of a 4U, 60 (2.5- or 3.5-inch) DAE AC power supply showing the (power in) recessed connector (plugs) and status LEDs

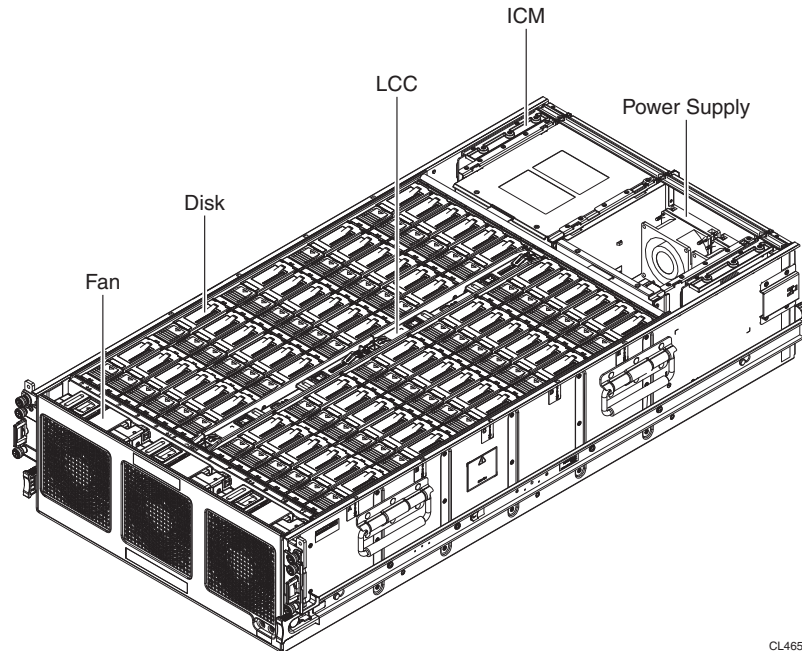
Table 54 describes the 4U, 60 (2.5- or 3.5-inch) DAE power supply LEDs.

Table 54 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.

Interior view

The interior of the 4U, 60 (2.5- or 3.5-inch) DAE shows the fan modules, the disks, the power supply modules, the LCCs, and the ICMs (Figure 100).



CL4658

Figure 100 4U, 60 (2.5- or 3.5-inch) DAE (interior view)

The fan modules, disks, and LCCs shown in Figure 100 are accessible only by sliding the DAE out of the rack and sliding the top cover back (see Figure 103 on page 123). The ICMs and power supplies shown in Figure 100 are accessed from the rear of the 4U DAE.

CAUTION

Access to the internal components in a 4U, 60 (DAE7S) enclosure mounted 31U (4.5 ft, or 1.38 m) or higher above the floor requires an appropriate EMC service ladder and is restricted to authorized service personnel only. Attempts to service disks, fans, or other DAE components mounted 31U or higher without a recommended EMC service ladder and personnel may result in serious personal injury. If an EMC service ladder is on site, this ladder is the property of EMC and is only available for use by authorized EMC service personnel.

If installing a new 4U, 60 DAE or replacing an existing 4U, 60 DAE above 31U is necessary, then an appropriate portable mechanical lifting device is required. For more information about this type of device, see [“Appendix B: Field lift tool and accessory kit”](#) on page 140.

If replacing or adding a 4U, 60 (2.5- or 3.5-inch) DAE becomes necessary, a portable mechanical lift is recommended by EMC. The portable lift commonly used by EMC service personnel is manufactured by Alum-A-Lift. Included with the lift is a lift kit which provides instructions for using the portable lift. For more information, refer to [“Appendix B: Field lift tool and accessory kit”](#) on page 140.

IMPORTANT

The portable mechanical lift commonly used by EMC service personnel has two settings—one with a lower mast and one with both a lower and upper mast (dual mast). The lower mast setting is rated for 400 lb (178.09 kg) and is for raising or lowering of objects 28U (4.08 ft or 1.2 m) or less above the floor. The dual mast setting is rated well under 200 lb (89 kg) and is for raising objects more than 28U (4.08 ft or 1.2 m) above the floor. A conversion kit from Alum-A-Lift and a support table is available from the lift provider for installations above 28U. This kit is rated for 225 lb (102 kg). For more information, refer to [“Appendix B: Field lift tool and accessory kit” on page 140.](#)

Refer to the following **CAUTION** that discusses the mounting and servicing of the 4U, 60 DAE in a 40U Dense rack.

To replace or add any of these components, refer to the respective Customer Replaceable Unit (CRU) procedure for the 4U, 60 (2.5- or 3.5-inch) DAE. For example, to replace a disk drive, refer to the *Replacing a disk in a 60-disk enclosure* document available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.

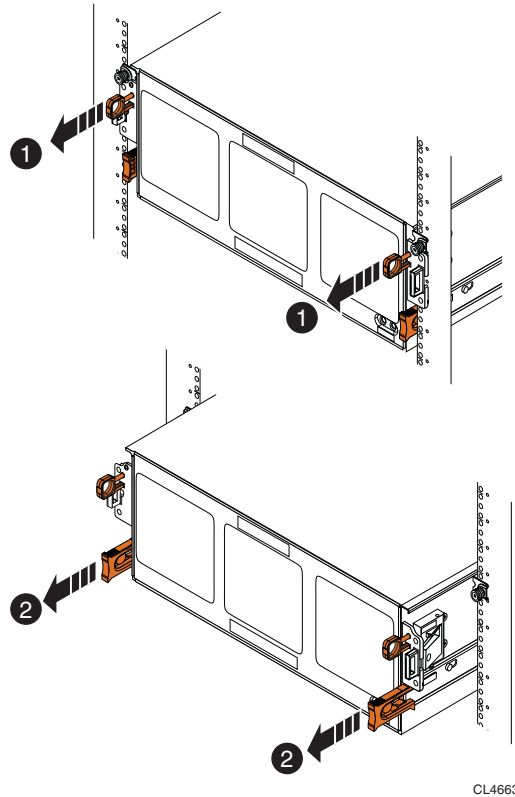
⚠ CAUTION

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:

1. When lifting this DAE, always use two to three people and a portable mechanical lifting device.
2. For service personnel, when accessing this unit in a rack above 31U, always use an EMC authorized ladder.
3. 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.
4. If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the DAE in the rack.

Access to disk drives, fan modules, and LCCs

To gain access to the DAE, you must first, open the console, then unlock and remove the front bezel. Next, to unlock the DAE from the rails, pull on the orange loops (see location 1 in [Figure 101](#)) on each side of the DAE. Finally, pull the orange tabs (see location 2 in [Figure 101](#)) 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. For complete instructions, see the *Replacing a disk in a 60-disk enclosure* procedure available online at <https://mydocs.emc.com/VNX/> and go to **VNX Tasks**, then select **Replace VNX hardware**. Next, follow the steps in the wizard.

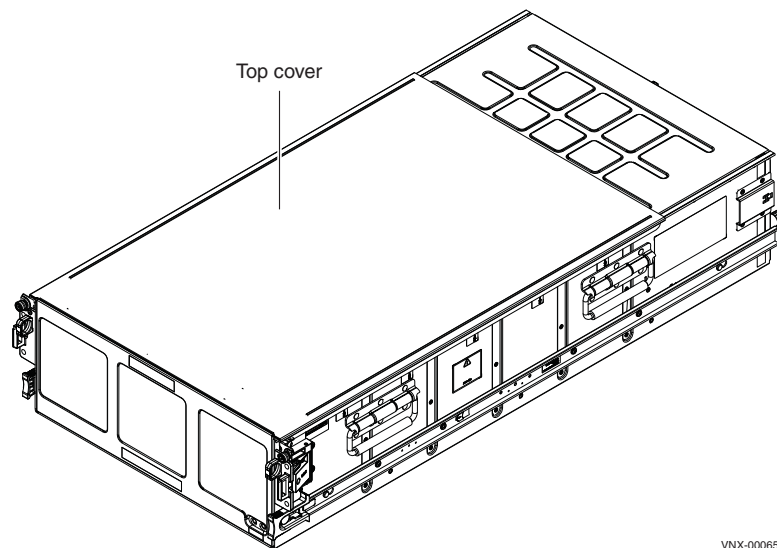


CL4663

Figure 101 4U, 60 (2.5- or 3.5-inch) DAE (unlocking top, front ring pull latch mechanism and bottom slide extension release levers)

Note: If the 4U, 60 (2.5- or 3.5-inch) DAE does not slide out of the rack (or cabinet) far enough for you to access the internal components and lock on the rails in the service position, verify that all the other DAEs are completely seated in the rack (or cabinet) by pushing firmly on them.

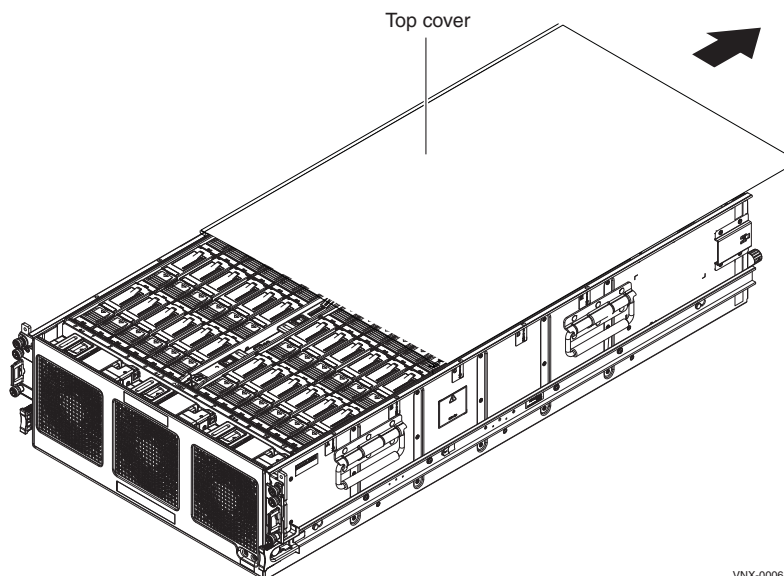
Figure 102 shows an example of a 4U, 60 (2.5- or 3.5-inch) DAE with the top cover closed.



VNX-000656

Figure 102 4U, 60 (2.5- or 3.5-inch) DAE (with top cover closed)

Figure 103 shows an example of a 4U, 60 (2.5- or 3.5-inch) DAE with the top cover open showing the disk drives, LCCs, and the cooling modules or fans.



VNX-000649

Figure 103 4U, 60 (2.5- or 3.5-inch) DAE (with top cover open)

Disk drive

The disk drives for the 4U, 60 (2.5- or 3.5-inch) 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.

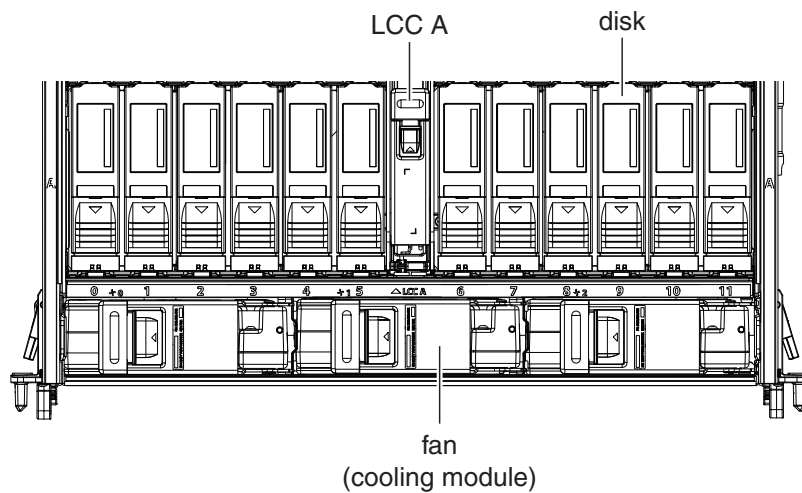
Two drive sizes are supported in the 4U, 60 (2.5- or 3.5-inch) DAE:

CAUTION

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.

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

Figure 104 shows a top-down cut-away interior view of 4U, 60 (2.5- or 3.5-inch) DAE showing the location of the disk drives, fans (cooling modules), and LCC A.



CL4735

Figure 104 4U, 60 (2.5- or 3.5-inch) top-down cut-away of disk drives, fans (cooling modules), and LCC A (interior view)

Figure 105 shows an example of the disk drive power and fault LEDs.

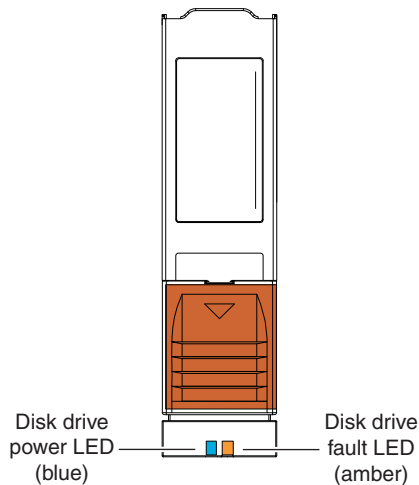


Figure 105 Disk drive power LED and fault LED

Disk drive layout

Looking at the 4U, 60 (2.5- or 3.5-inch) DAE from the front and above (Figure 106), 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**.

Rules for disk drive population

The required order of loading the disk drives into a 4U DAE is (Figure 106):

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 you partially fill a row, fill the remaining empty slots with filler panel modules. Rows with no or zero (0) drives do not require filler panel modules.

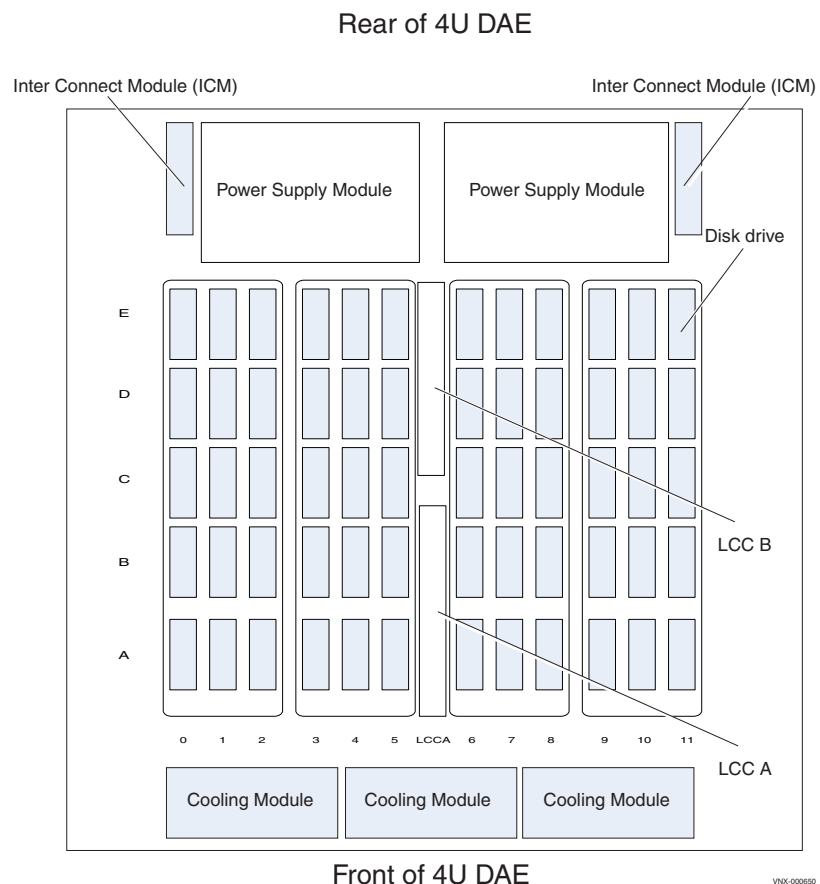


Figure 106 4U, 60 (2.5- or 3.5-inch) DAE disk drive layout and notation (top-down interior view)

Note: The labels for the banks, slots, and LCCA shown in Figure 106 are the actual labels in the 4U, 60 (2.5- or 3.5-inch) DAE.

Fan control module (cooling module)

Each 4U, 60 (2.5- or 3.5-inch) DAE includes three fan control modules (cooling modules) located on the front of the DAE. The fan control module includes a fan, fuse, and microcontroller with an I²C interface inside a rugged enclosure.

The fan control module augments the cooling capacity of each 4U, 60 (2.5- or 3.5-inch) 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 107 shows the location of the status (fan fault) LED on the 4U, 60 (2.5- or 3.5-inch) DAE fan control module.

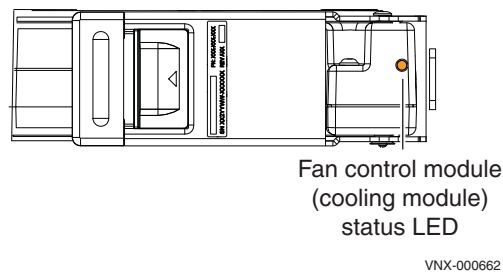


Figure 107 Example of a 4U, 60 (2.5-3.5-inch) DAE fan control module showing the fan fault LED

Table 55 describes the 4U, 60 (2.5- or 3.5-inch) DAE fan fault LED.

Table 55 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

LCC

Each 4U, 60 (2.5- or 3.5-inch) 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 (2.5- or 3.5-inch) 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 108 shows the location of the status LEDs on the 4U, 60 (2.5- or 3.5-inch) DAE LCC.

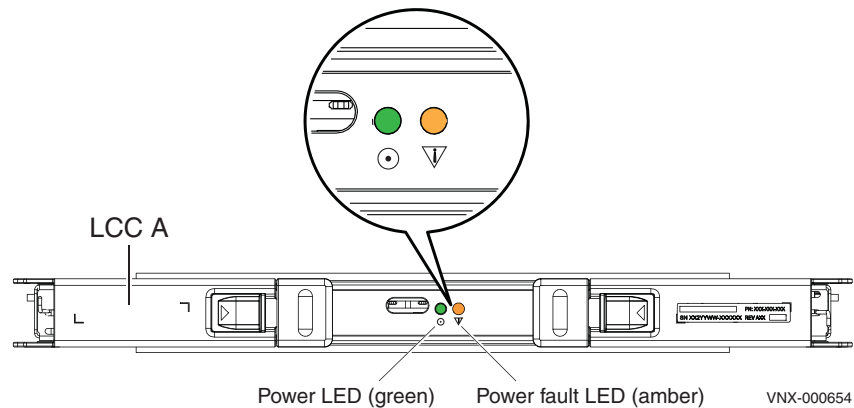


Figure 108 Example of a 4U, 60 (2.5- or 3.5-inch) DAE LCC A showing the status LEDs

Table 56 describes the 4U, 60 (2.5- or 3.5-inch) DAE LCC status LEDs.

Table 56 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

Appendix A: Cabling

This section describes examples of the types of cabling you will need 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 components for the VNX5600 platform.

IMPORTANT

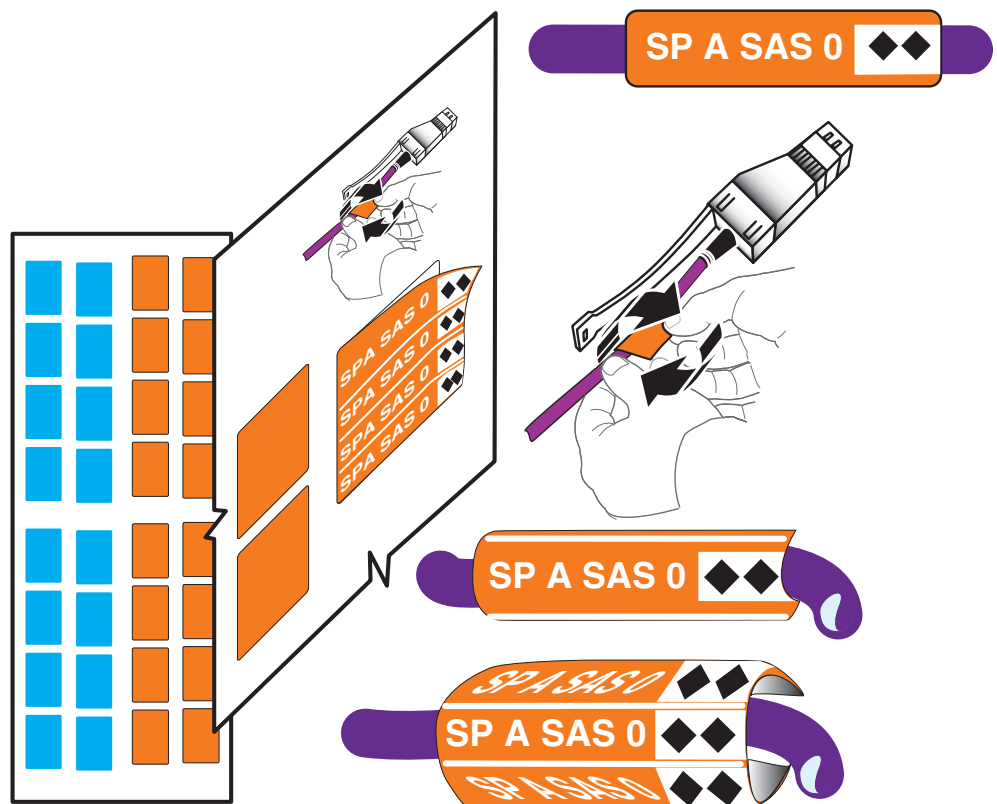
The following sections only discuss the DAE cabling of the VNX5600 platform with either the 3U, 15 disk drive DAE or the 2U, 25 disk drive DAE.

For all other cabling of your VNX5600 platform, the *VNX5600 Installation Guide* provides information about the DPE 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 109 on page 128](#) 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.



VNX-000529

Figure 109 Example of a cable label wrap

VNX5600 DAE cabling

IMPORTANT

The DAE (s) that are to be directly connected to the DPE need to be located close enough to the DPE so that the DPE-to-DAE interconnect cables (that are provided with every DAE) can be routed and connected to the DPE easily.

Shown in the upcoming figures ([Figure 110 on page 130](#) through [Figure 115 on page 138](#)) are examples of two-bus SAS cabling in a DPE-based VNX storage platform, the VNX5600. 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.

Note: The following instructions and illustrations are very basic. Your system will probably have a four- or eight-bus system. By following the instructions in the next paragraphs, you will be able to cable your system for interleaved or stacked environments.

The DPE is automatically Enclosure 0 (EA0). The DAE connected to SAS output port 0 is Enclosure 1 (EA1).

The first DAE connected to the Storage Processor mini-SAS HD output port 1 is designated Enclosure 0 (EA0). Each DAE connected after the first DAE increments the enclosure number by one. All enclosures connected to mini-SAS HD Port 0 will show an ID of 0, but the addresses will increment.

[Figure 110 on page 130](#) shows the first example of a VNX5600 platform with two DAEs (one 3U, 15 disk drive DAE and the other a 2U, 25 disk drive DAE) or a VNX5600 platform with a total of 65 disk drives (as the DPE is a 3U, 25 disk drive device).

The mini-SAS HD ports on the VNX5600 platform DPE are labeled **0** and **1**. SAS 0 is connected internally to the SAS expander that connects the internal DPE disks. Since SAS 0 is already connected internally to the DPE disks, the first DAE is connected to SAS 1 to balance the load on the SAS ports. The second DAE is connected to SAS 0, the third DAE is connected to SAS 1, and so on.

In [Figure 110 on page 130](#), 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 (EA0), Bus 1 is EA0, and so on. In the case of the VNX5600 platform, Bus 0 EA0 is the DPE (SP A and B). So, to balance the load, Bus 1 EA0 becomes the first DAE (LCC A and B) in the cabinet with the next DAE (LCC A and LCC B) as Bus 0 EA1, and so on. If you have several DAEs in your VNX5600 platform, you can daisy chain them within that 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 DPE and 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.

Cabling with two DAEs in a VNX5600 Block platform

The cables shown in [Figure 110 on page 130](#) are:

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

- ◆ Cable 1, orange, DPE to 2nd DAE (labels SP A SAS 0 to LCC A)
- ◆ Cable 2, orange, DPE to 2nd DAE (labels SP B SAS 0 to LCC B)
- ◆ Cable 3, blue, DPE to 1st DAE (labels SP A SAS 1 to LCC A)
- ◆ Cable 4, blue, DPE to 1st DAE (labels SP B SAS 1 to LCC B)

Note: If your VNX5600 platform was not cabled at the factory, refer to the cable wrap guide ([“Example of a cable label wrap” on page 128](#)) that came with your VNX5600 platform for the correct cable labels.

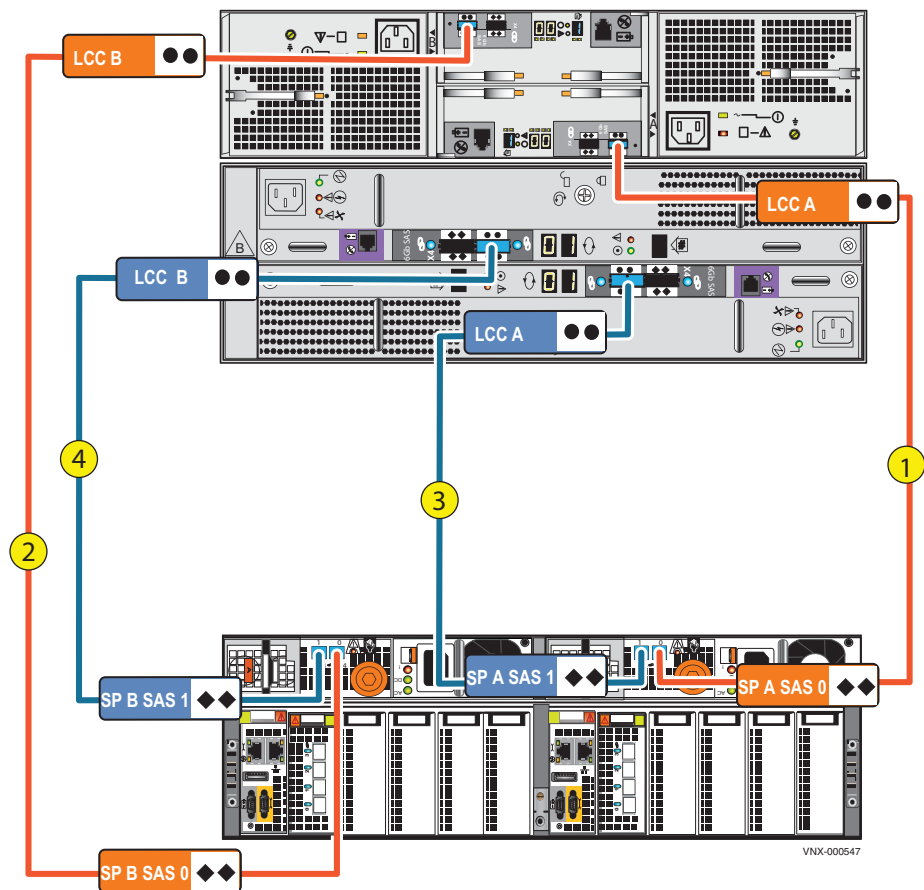


Figure 110 Example of the VNX5600 Block platform with two DAEs (3U, 15 disks and 2U, 25 disks) cabling

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 nineteen DAEs in a VNX5600 Block platform

[Figure 111 on page 132](#) and [Figure 112 on page 133](#) show a second example of a VNX5600 platform with nineteen DAEs (all are 2U, 25 disk drive DAEs) or a VNX5600 platform with a total of 500 disk drives (including the DPE a 3U, 25 disk drive device). This example shows the interleaved cabling with two 40U racks, the first rack having fifteen DAEs and the second and final rack having four DAEs.

In the example ([Figure 111 on page 132](#) and [Figure 112 on page 133](#)), the first rack accommodates fifteen DAEs (seven DAEs for Bus 0 and eight DAEs for Bus 1) along with the VNX5600 block system for a later upgrade to a VNX5600 File/Unified system having from 3U to 6U of space to be reserved for one to two Control Stations and one to two Data Mover enclosures with one to four two Data Movers.

As described previously, the mini-SAS HD ports on the VNX5600 platform DPE are labeled **0** and **1**. SAS 0 is connected internally to the SAS expander that connects to the internal DPE disks. However, since nineteen DAEs are available for a maximum of 475 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 111 on page 132](#), two buses (Bus 0 and Bus 1) are available with the first DAE on Bus 1 designated as EA0/Bus 1 (blue DAE). The second DAE continues Bus 0 and is designated as EA1/Bus 0 (orange DAE). Then, the rest of the DAEs are intertwined where they are daisy-chained. So, the first DAE is daisy-chained to the third DAE designated as EA1/Bus 1, the second DAE is daisy-chained to the fourth DAE designated as EA2/Bus 0, and so on.

The DAEs shown in [Figure 111 on page 132](#) are:

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

- ◆ EA1/Bus 0, orange DAE, DPE to 2nd DAE (labels SP A SAS 0 to LCC A)
- ◆ EA1/Bus 0, orange DAE, DPE to 2nd DAE (labels SP B SAS 0 to LCC B)
- ◆ EA0/Bus 1, blue DAE, DPE to 1st DAE (labels SP A SAS 1 to LCC A)
- ◆ EA0/Bus 1, blue DAE, DPE to 1st DAE (labels SP B SAS 1 to LCC B)

While the cabling for Bus 0 is interleaved and daisy-chained through the remaining DAEs starting with:

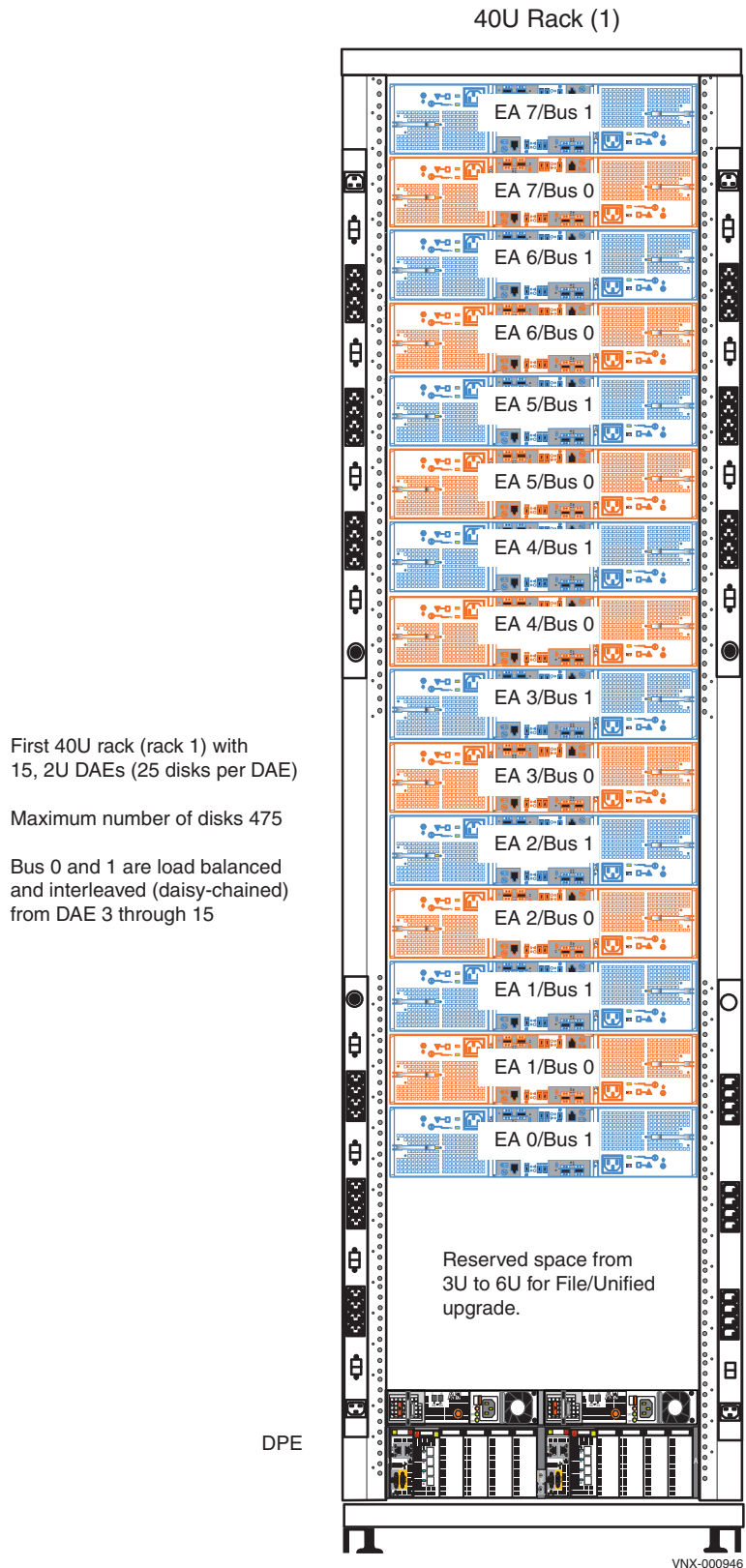
- ◆ EA2/Bus 0

The remaining cabling is daisy-chained for load balancing.

So, the cabling for Bus 1 is interleaved and daisy-chained through the remaining DAEs starting with:

- ◆ EA1/Bus 1

Note: In this example, Bus 0 is indicated with orange DAEs and Bus 1 is indicated with blue DAEs.



First 40U rack (rack 1) with
15, 2U DAEs (25 disks per DAE)

Maximum number of disks 475

Bus 0 and 1 are load balanced
and interleaved (daisy-chained)
from DAE 3 through 15

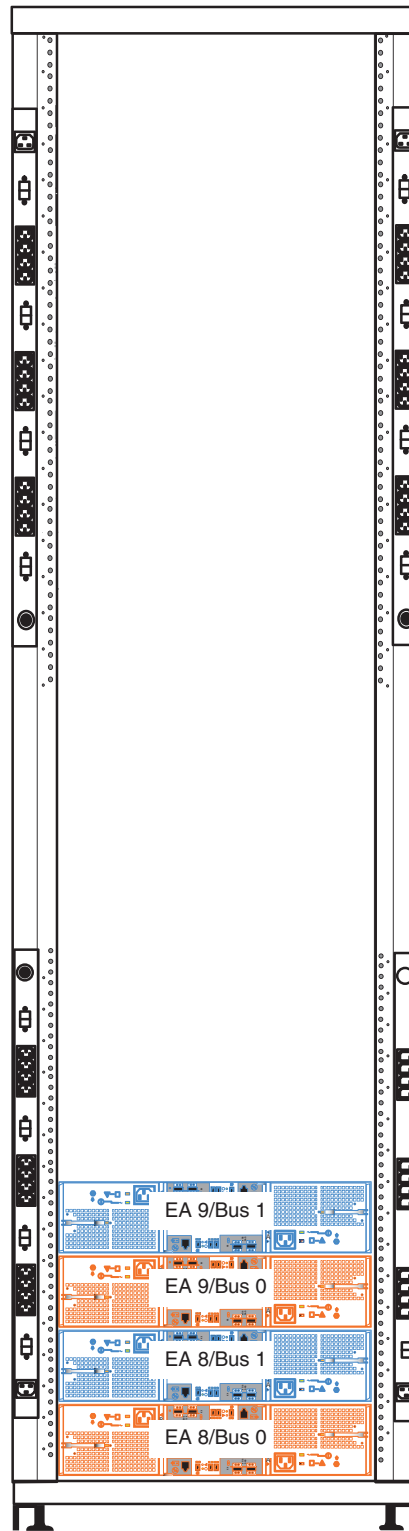
Figure 111 Example of the VNX5600 block platform with fifteen DAEs (2U, 25 disks) interleaved cabling for a 40U rack 1

40U Rack (2)

Second 40U rack with 4, 2U DAEs
(25 disks per DAE)

Maximum number of disks 475

Bus 0 and 1 are load balanced
and interleaved (daisy-chained)
from DAE 1 through 4



VNX-000535

Figure 112 Example of the VNX5600 block platform with four DAEs (2U, 25 disks) interleaved cabling for a 40U rack 2 (continued)

Stacked cabling with nineteen DAEs in a VNX5600 Block platform

[Figure 113 on page 135](#) and [Figure 114 on page 136](#) show a third example of a VNX5600 platform with nineteen DAEs (all are 2U, 25 disk drive DAEs) or a VNX5600 platform with a total of 500 disk drives (including the DPE a 3U, 25 disk drive device). This example shows the stacked cabling with two 40U racks, the first rack having fifteen DAEs and the second and final rack having four DAEs.

In the example ([Figure 113 on page 135](#) and [Figure 114 on page 136](#)), the first rack accommodates fifteen DAEs (ten DAEs for Bus 1 and five DAEs for Bus 0) along with the VNX5600 block system for a later upgrade to a VNX5600 File/Unified system having from 3U to 6U of space to be reserved for one to two Control Stations and one to two Data Mover enclosures with one to four Data Movers. The second and final rack accommodates four DAEs for Bus 0.

As described previously, the mini-SAS HD ports on the VNX5600 platform DPE are labeled **0** and **1**. SAS 0 is connected internally to the SAS expander that connects to the internal DPE disks. However, since nineteen DAEs are available for a maximum of 475 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 113 on page 135](#), two buses (Bus 0 and Bus 1) are available with the tenth DAE on Bus 1 designated as EA0/Bus 1 (blue DAE). The first DAE continues Bus 0 and is designated as EA1/Bus 0 (orange DAE). Then, the rest of the DAEs are stacked where they are daisy-chained. So, the first DAE is daisy-chained to the second DAE designated as EA2/Bus 0, the tenth DAE is daisy-chained to the eleventh DAE designated as EA1/Bus 1, and so on.

The cables shown in [Figure 113 on page 135](#) are:

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

- ◆ EA0/Bus 1, blue DAE, DPE to 1st DAE (labels SP A SAS 1 to LCC A)
- ◆ EA0/Bus 1, blue DAE, DPE to 1st DAE (labels SP B SAS 1 to LCC B)
- ◆ EA1/Bus 0, orange DAE, DPE to 10th DAE (labels SP A SAS 0 to LCC A)
- ◆ EA1/Bus 0, orange DAE, DPE to 10th DAE (labels SP B SAS 0 to LCC B)

So, the cabling for Bus 1 is stacked and daisy-chained through the remaining DAEs starting with:

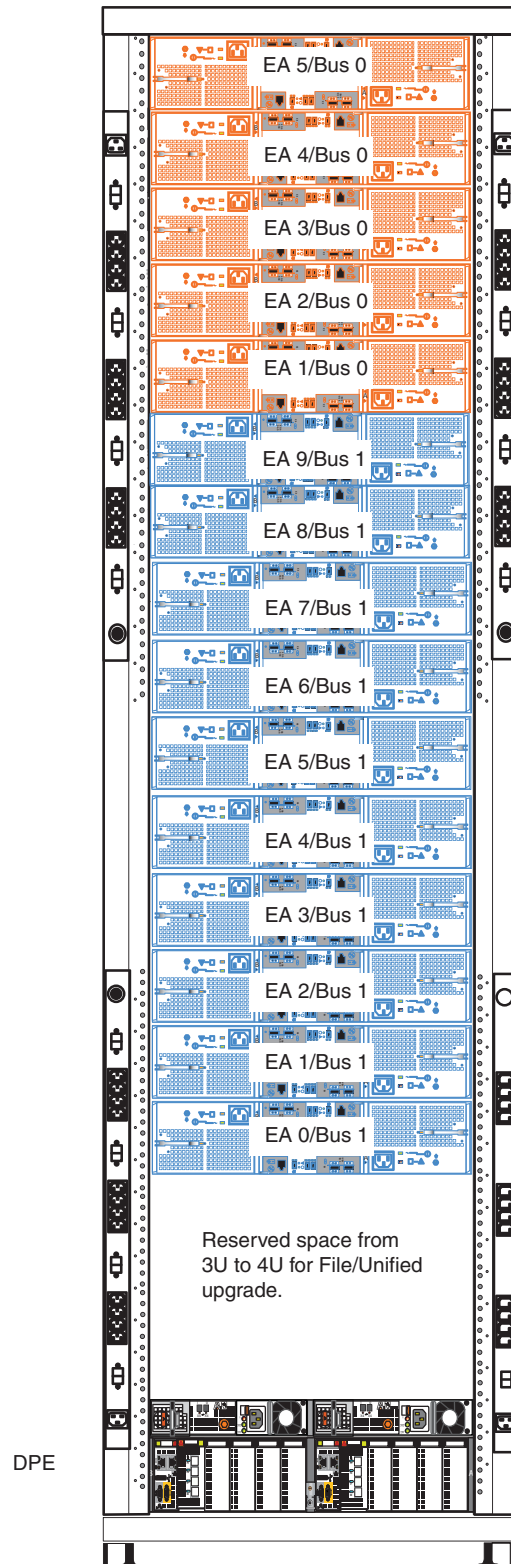
- ◆ EA1/Bus 1

While the cabling for Bus 0 is stacked and daisy-chained through the remaining DAEs:

- ◆ EA2/Bus 0

Note: In this example, Bus 0 is indicated with the orange DAEs and Bus 1 is indicated with the blue DAEs.

40U Rack (1)



First 40U rack (rack 1) with
15, 2U DAEs
(25 disks per DAE)

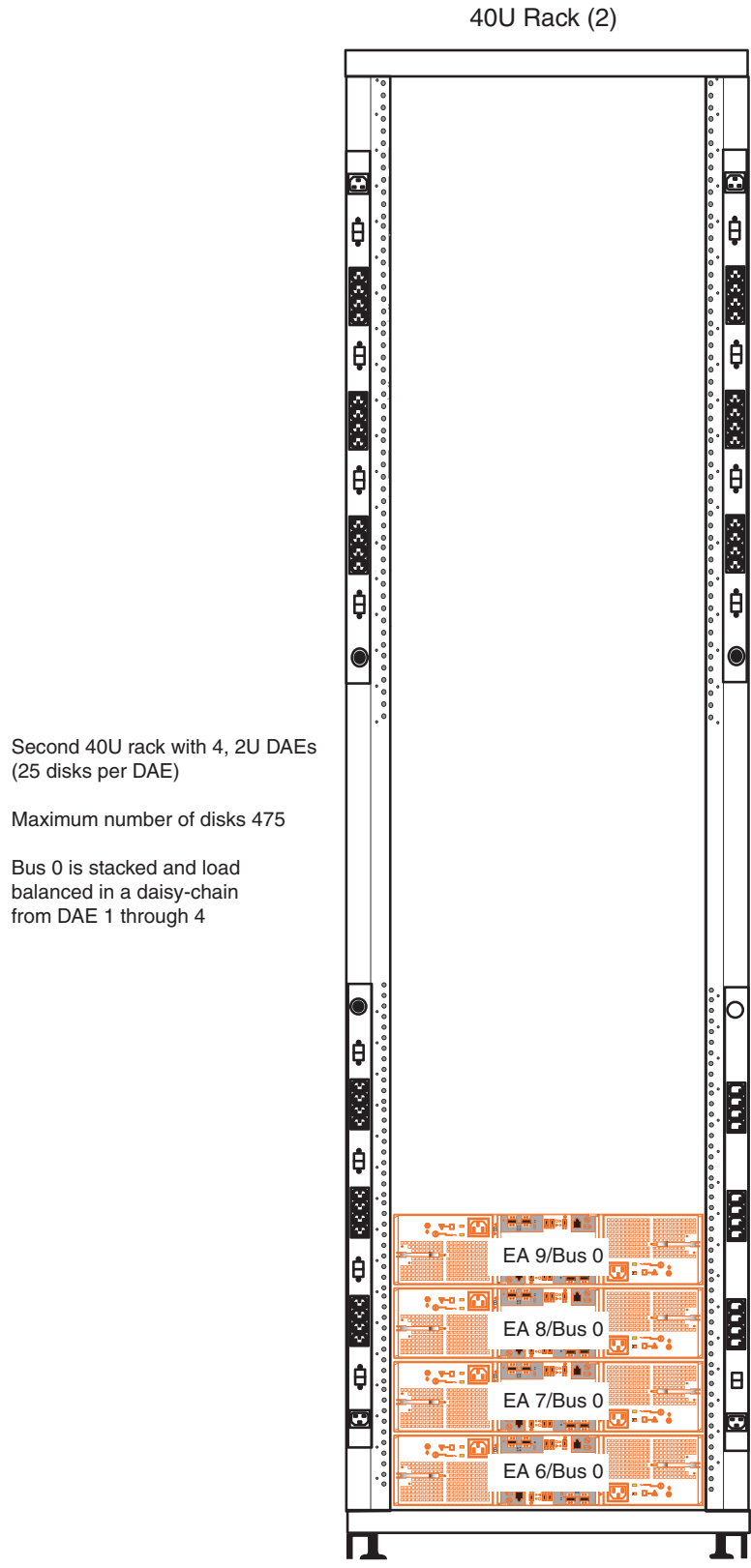
Maximum number of disks 475

Bus 0 and 1 are load balanced
and (daisy-chained)
from DAE 1 through 10 (bus 1)
with DAE 11 to 15 (bus 0)

Reserved space from
3U to 4U for File/Unified
upgrade.

VNX-000536

Figure 113 Example of the VNX5600 Block platform with nineteen DAEs (2U, 25 disks) stacked cabling rack 1



VNX-000537

Figure 114 Example of the VNX5600 Block platform with nineteen DAEs (2U, 25 disks) stacked cabling rack 2 (continued)

Cabling with two DAEs in a VNX5600 File/Unified platform

IMPORTANT

The examples for the File/Unified systems described in this guide are only examples of how you can cable your VNX5600 system.

Shown in the upcoming figure ([Figure 115 on page 138](#)) is a graphical representation of two-bus SAS cabling in a DPE-based VNX storage platform, the VNX5600 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 DPE is automatically Enclosure 0 (EA 0). The DAE connected to SAS output port 0 is Enclosure 1 (EA1).

The first DAE connected to the Storage Processor mini-SAS HD output port 1 is designated Enclosure 0 (EA0). Each DAE connected after the first DAE increments the enclosure number by one. All enclosures connected to mini-SAS HD Port 0 will show an ID of 0.

[Figure 115 on page 138](#) shows the first example of a VNX5600 File platform with two DAEs (one 3U, 15 disk drive DAE and the other a 2U, 25 disk drive DAE) or a VNX5600 platform with a total of from 65 disk drives (the DPE is a 3U, 25 disk drive device).

The SAS ports on the VNX5600 platform 3U DPE are labeled **0** and **1**. SAS 0 is connected internally to the SAS expander that connects the internal DPE disks. Since SAS 0 is already connected internally to the DPE disks, the first DAE is connected to SAS 1 to balance the load on the SAS ports. The second DAE is connected to SAS 0, the third DAE is connected to SAS 1, and so on.

In [Figure 115 on page 138](#), 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 (EA0), Bus 1 is EA0, and so on. In the case of the VNX5600 platform, Bus 0 EA0 is the DPE (SP A and B). So, to balance the load, Bus 1 EA0 becomes the first DAE (LCC A and B) in the cabinet with the next DAE (LCC A and LCC B) as Bus 0 EA1, and so on. If you have several DAEs in your VNX5600 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 DAEs shown in Figure 115 are:

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

- ◆ DAE 2, orange, DPE to 2nd DAE (labels SP A SAS 0 to LCC A)
- ◆ DAE 2, orange, DPE to 2nd DAE (labels SP B SAS 0 to LCC B)
- ◆ DAE 1, blue, DPE to 1st DAE (labels SP A SAS 1 to LCC A)
- ◆ DAE 1, blue, DPE to 1st DAE (labels SP B SAS 1 to LCC B)

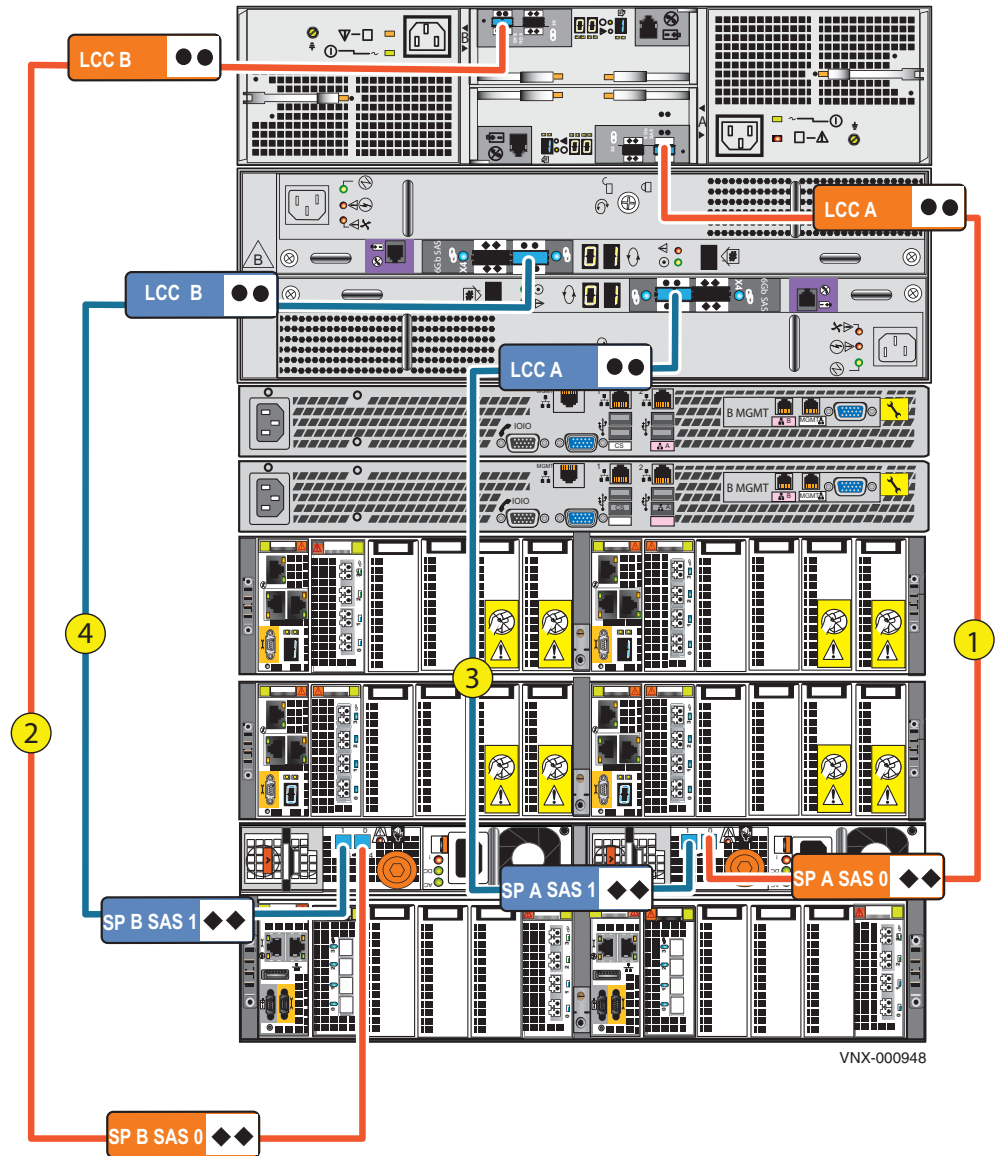


Figure 115 Example of the VNX5600 File platform with two DAEs (2U, 25 disks and 3U, 15 disks) cabling

Note: In Figure 115 the VNX5600 File platform shows a DPE (with two SPs), a CS (with an optional CS available), two DMEs (with four DMs), and a 3U 15 DAE and a 2U 25 DAE.

Interleaved or stacked cabling with nineteen DAEs in a VNX5600 File/Unified platform

The cabling for a VNX5600 File/Unified platform is the same as the block system. The only difference is that the File/Unified components (CS0, CS1 (optional), and any DMEs) would have to be accounted for. In other words, if you are upgrading from an existing Block system, from 3U to 4U of space should have been made available in your first rack. If you are installing a new VNX5600 File/Unified system, then the connections for Bus 0 and Bus 1 in an interleaved or stacked system would be the same as described for the VNX5600 Block from [page 131](#) to [page 134](#) of this guide.

Note: It is recommended that for load balancing purposes that you use as many buses across your DAEs as possible.

IMPORTANT

The examples for the Block and File/Unified systems described in this guide are only examples of how you can cable you VNX5600 system whether it is a Block or File/Unified system.

Appendix B: Field lift tool and accessory kit

IMPORTANT

The portable (mechanical) lift tool described in this appendix is recommended as a safety precaution when lifting EMC components into an EMC or customer-provided rack. As described in this Appendix, many of the EMC components are too heavy to be lifted by one person or in some cases by two persons. As a result, this portable (mechanical) lift tool is a necessary safety requirement, especially when lifting EMC components like the 3U, 120 and the 4U, 60 DAEs.

A portable (mechanical) lift (called the Trav-a-Lift Field Lift Tool, manufactured by Alum-a-Lift Corp of Winston, GA) is a portable, lightweight aluminum lift for field use. This lift tool is used to rack mount heavy EMC hardware in an EMC or customer-provided rack. It can be operated either manually, or with the included cordless drill. Lift assembly is aided by color coded and lettered alignment labels for safe, accurate, and quick assembly. Each kit contains assembly instructions.

IMPORTANT

It is recommended that All EMC support/partners review the *Field Lift Tool and Accessory Kit* guides available within the SOLVE desktop application.

The Lift Tool can support up to 400 pounds (181 Kg) from the floor to a height of up to 49 inches (124 cm). If access to the top of a rack is needed a second mast can be mounted to the first mast to lift heavy components to the top of the rack. The trade-off is the second mast can only support 115 pounds (52 Kg). As of this writing, the lift tool alone can support all but the heaviest enclosures, such as the 60-drive DAE. An accessory kit is needed to lift the heaviest enclosures higher in the rack.

Generally, a portable (mechanical) lift ([Figure 116 on page 142](#)) is needed when one person is mounting a component weighing more than 40 pounds (88 kg), or two persons mounting a component weighing more than 80 pounds (176.3 kg). The capacity of the lift varies by mounting height as previously described. [Table 57](#) describes when a portable (mechanical) lift alone is needed. In some cases an accessory kit is also needed. There is no case where only the accessory kit is needed.

Table 57 Portable lift and accessory kit requirements

Height	Weight	Portable lift	Accessory kit
0 to 28U 0 to 4.08 ft 0 to 1.24 m	Less than 400 pounds (181 kg)	Required	Not required
28 to 40U 4.08 ft to 5.83 ft 1.25 m to 1.78 m	Less than 225 pounds (102 kg)	Required	Required
28 to 40U 4.08 ft to 5.83 ft 1.25 m to 1.78 m	Less than 115 pounds (52 kg)	Required	Not required

Table 58 describes the approximate weight of the VNX-series enclosures used in the VNX storage systems (including all FRUs installed).

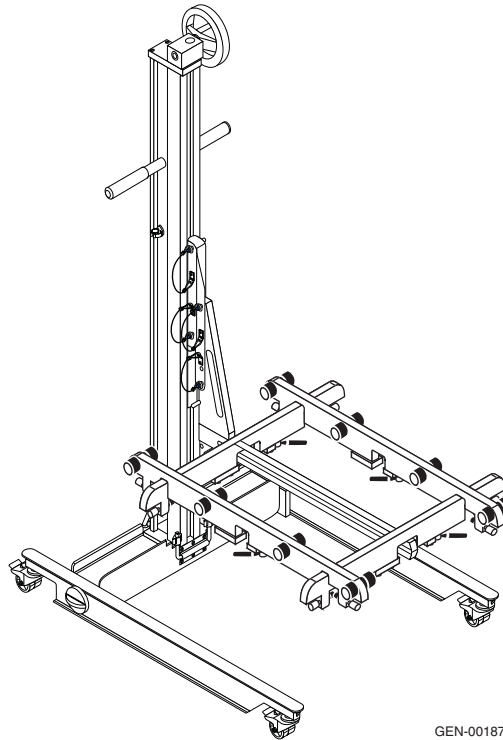
Table 58 VNX-series enclosure weight comparisons (lb vs. kg)

VNX-series enclosure	Weight (lb)	Weight (kg)
Disk processor enclosure (DPE), 15-drive	97	44
Disk processor enclosure (DPE), 25-drive	75	34
Storage processor Enclosure (SPE)	53	24
Data Mover enclosure (DME)	53	24
Control Station (CS)	18	8
Standby power supply (SPS) 1U 1.2 kW	47	22
Standby power supply (SPS) 2U 2.2 kW	79	36
Disk-array enclosure (DAE) 3U, 15-drive	68	31
Disk-array enclosure (DAE) 2U, 25-drive	45	20
Disk-array enclosure (DAE) 4U, 60-drive	215	98
Disk-array enclosure (DAE) 3U, 120-drive	165	74.8

⚠ CAUTION

The portable lift commonly used by EMC service personnel has two configurations—one with the lower mast only and one with both the lower and upper masts. The lower mast configuration is rated for 400 pounds (181 kg) and is for raising or lowering objects 28U (4.08 ft, 1.25 m) or less above the floor. The dual mast configuration is rated well under 200 pounds (90.7 kg) and is for raising objects more than 28U (4.08 ft, 1.25 m) above the floor.

- For installations at or below 4.08 ft (1.25 m), you must use the lower mast configuration.
- For installations above 4.08 ft (1.25 m), use the accessory kit, rated for 225 pounds (102 kg), and a support table with the lower mast configuration. This accessory kit and support table are available from the lift provider.



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Figure 116 Example of a Alum-A-Lift with the accessory kit applied

For more information, refer to *EMC® DAE8S (120 disk Disk-Array Enclosure) Installation Notes* document or the *Field Lift Tool and Accessory Kit* procedure.

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