Nexsan BEAST BT60 and BT60X Storage Systems

FRU Removal and Replacement Guide

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Electromagnetic Emissions: FCC Class A, EN 55022 Class A, EN 61000-3-2/-3-3, CISPR 22 Class A

Electromagnetic Immunity: EN 55024/CISPR 24, (EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11)

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Contents

Contents
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About this manual

This FRU removal and replacement guide provides detailed procedures for installing, removing, and replacing field-replaceable units (FRUs) in Nexsan BEASTBT60 Storage Systems and the Nexsan BEASTBT60X Storage Expansions.

Note While Nexsan makes every effort to ensure the accuracy of technical documentation, screen images and procedures may change after publication. In case of discrepancy, please check for the latest updates on the E-Series and BEAST Documents and Downloads page. Also, refer to the latest Release Notes.

Conventions

Here is a list of text conventions used in this document:

Convention	Description
underlined blue	Cross-references, hyperlinks, URLs, and email addresses.
boldface	Labels on the physical Nexsan Storage System or interactive items in the graphical user interface (GUI).
italics	System messages and non-interactive items in the GUI. References to software user guides.
`monospace`	Command-line interface (CLI) text or text that refers to file or directory names.
`monospace bold`	Text strings that must be entered by the user in the CLI or in text fields in the GUI.

Notes, tips, cautions, and warnings

Note Notes contain important information, present alternative procedures, or call attention to certain items.

Tip Tips contain handy information for end-users, such as other ways to perform an action.

⚠ **CAUTION:** In hardware manuals, cautions alert the user to items or situations which may cause damage to the Nexsan Storage System or result in mild injury to the user, or both. In software manuals, cautions alerts the user to situations which may cause data corruption or data loss.

✋ **WARNING: Warnings alert the user to items or situations which may result in severe injury or death to the user.**

Contacting Nexsan

For questions about Nexsan products, please visit the Nexsan support Web page, and the E-Series and BEAST Documents and Downloads page. If you are unable to find the answer to your question there, please see our contact information below.

Service and support

Nexsan's Technical Services Group provides worldwide assistance with installation, configuration, software support, warranty, and repair for all Nexsan products. A variety of service and support programs are available to provide you with the level of coverage and availability your operation requires.

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E-Series and BEAST support:

https://helper.nexsansupport.com/esr_support

Contact:

https://helper.nexsansupport.com/contact

Related Documents

The following Nexsan product manuals contain related information:

- *Nexsan BEAST BT60 and BT60X Storage System Installation Guide*

- *Nexsan High-Density Storage User Guide*

- *Nexsan E-Series and BEAST Storage Snapshots and Replication User Guide*

- *Nexsan E-Series and BEAST Multipathing Best Practices Guide*

Safety notices

This guide covers the Nexsan BEAST Storage Systems only. Refer to the relevant product manuals for information on other Nexsan Storage Systems or Storage Expansions and other Nexsan products mentioned in this guide.

Always observe the following precautions to reduce the risk of injury and equipment damage:

> **WARNING:** There is a risk of ELECTRIC SHOCK if Nexsan BEAST components are removed or tampered with when a Nexsan Storage System power is on. Only a trained operator may remove certain FRUs. The Nexsan BEAST Storage System include the following FRUs:
>
> - Power Supply modules
> - RAID Controller and Expansion modules
> - Disk drives
> - Fan modules

- The storage system should only be installed in a clean, dry environment. The operating temperature is 5º to 35º C (41º to 95º F), with operating relative humidity at 20 to 80%, non-condensing.

- The cordset specification for the Nexsan BEAST in North America is USA IEC C13 to IEC C14, rated 250V/15A. When applying power to the storage system, use ONLY the IEC power cords originally supplied with it. Do NOT use other power cords, even if they appear identical to the supplied cords.

- Only a fully-trained Service Engineer is authorized to disassemble any other part of the storage system, and then only when the storage system is powered off.

- The Nexsan BEAST Storage System has multiple power connections; as a result, you must remove all power leads to completely remove power from the storage system.

Revision history

This section lists updates and new material added to the *Nexsan BEAST FRU Removal and Replacement Guide*.

P0450132, Rev. B, March 2022

Updated for technical accuracy, applied new Nexsan template and branding.

P0450132 Rev A, June 2016

Changed to new part numbering system.

NXS-SSBT-MG Rev 02, May 2016

Updated warnings and requirements for 110V operation.

NXS-SSBT-MG Rev 01, November 2015

First release of the *Nexsan Nexsan BEAST FRU Removal and Replacement Guide*.

Chapter 1

Overview

Nexsan BEAST BT60 and Nexsan BEAST BT60X 4U, rack-mountable Storage Systems and Expansions can hold up to 60 SATA data disks.
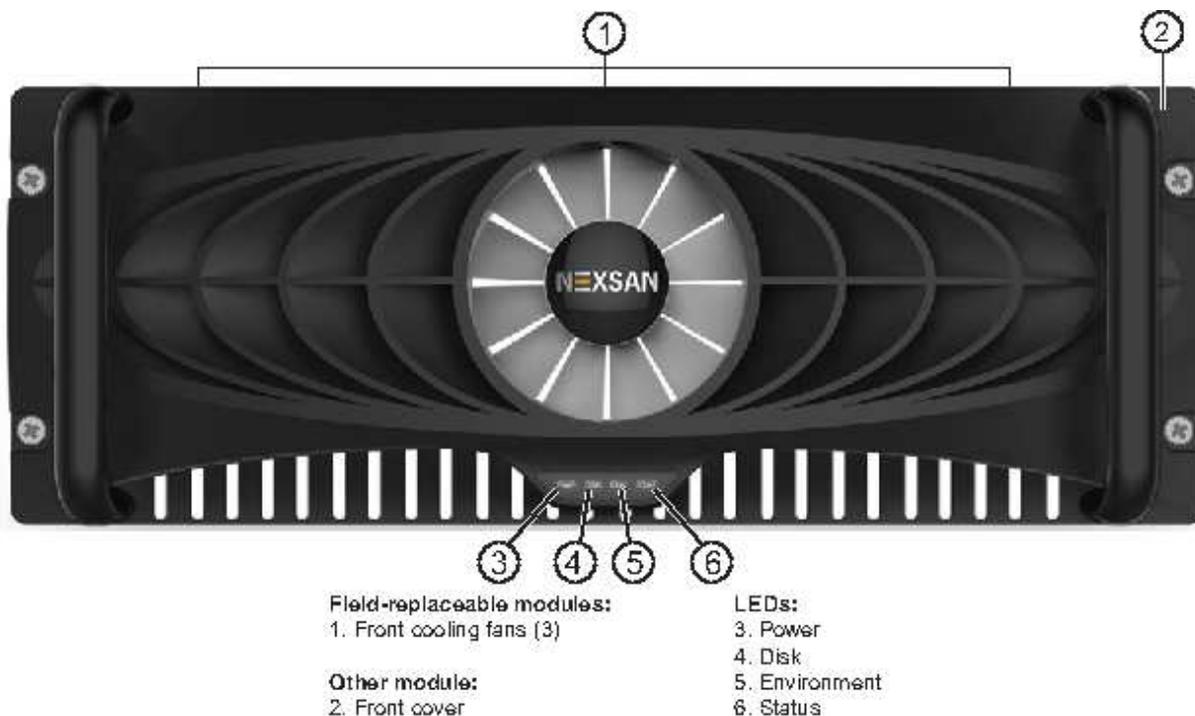
This chapter contains the following sections:

1

Front panel

Use this section to understand front panel components.

Figure 1-1: Nexsan BEAST front panel

Field-replaceable modules:
1. Front cooling fans (3)

Other module:
2. Front cover

LEDs:
3. Power
4. Disk
5. Environment
6. Status

Legend

Use the following tables as a legend for the front panel diagram.

Table 1-2: Field-replaceable modules

Number	Component	Description
1.	Front Cooling Fans Central Fan Tube	The front cover can be opened and the fans inside can be field-replaced in the event of failure (see Front fans on page 44).

Table 1-3: Other modules

Number	Component	Description
2.	Active Drive Drawers ()	

Table 1-4: LEDs

Number	Component	Description
3.	Power LED (**PWR**)	Indicates the status of power to the components in the system. Green indicates that all power levels are within specifications. Red indicates that one or more power levels are outside of specifications. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) displays details (see the *Nexsan High-Density Storage User Guide*). If the **PWR** LED on the left drive drawer is amber and all other front panel LEDs are off, this means that the Nexsan Storage System has been powered down through the GUI. It can be powered back up using the **SW0** switch (see <u>Switches</u> on page 15).
4.	Disk LED (**DSK**)	Indicates the status of the disk drives in the system. Green indicates that all disk drives are operating within specifications. Red indicates that one or more disk faults have been detected. The **Disk Drives** page (under *RAID Information*) in the graphical user interface (GUI) displays details (see the *Nexsan High-Density Storage User Guide*).
5.	Environment LED (**ENV**)	Indicates the temperature and fan status for the system. Green indicates that the system temperature is within specifications and that all fans are operating properly. Red indicates that the temperature exceeds specifications or that one or more fans are not operating properly. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) displays details (see the *Nexsan High-Density Storage User Guide*).
6.	Status LED (**STAT**)	Indicates overall status. Green indicates that the Nexsan Storage System is operating within specification. Red indicates a fault in the Nexsan Storage System, which could be any of the following: • A Power Supply Unit issue with the fan, temperature, or voltage • A RAID Controller issue with the temperature, voltage, battery, firmware, or other hardware The **Environmental Information** page (under *System Information*) in the graphical user interface) displays details (see the *Nexsan High-Density Storage User Guide*).

Number	Component	Description
7.	Drawer Lock:	Secures the drive drawer in place. When this lock is disengaged, the **STAT** LED turns amber.

Rear panel, BT60

Use this section to help identify rear panel components.

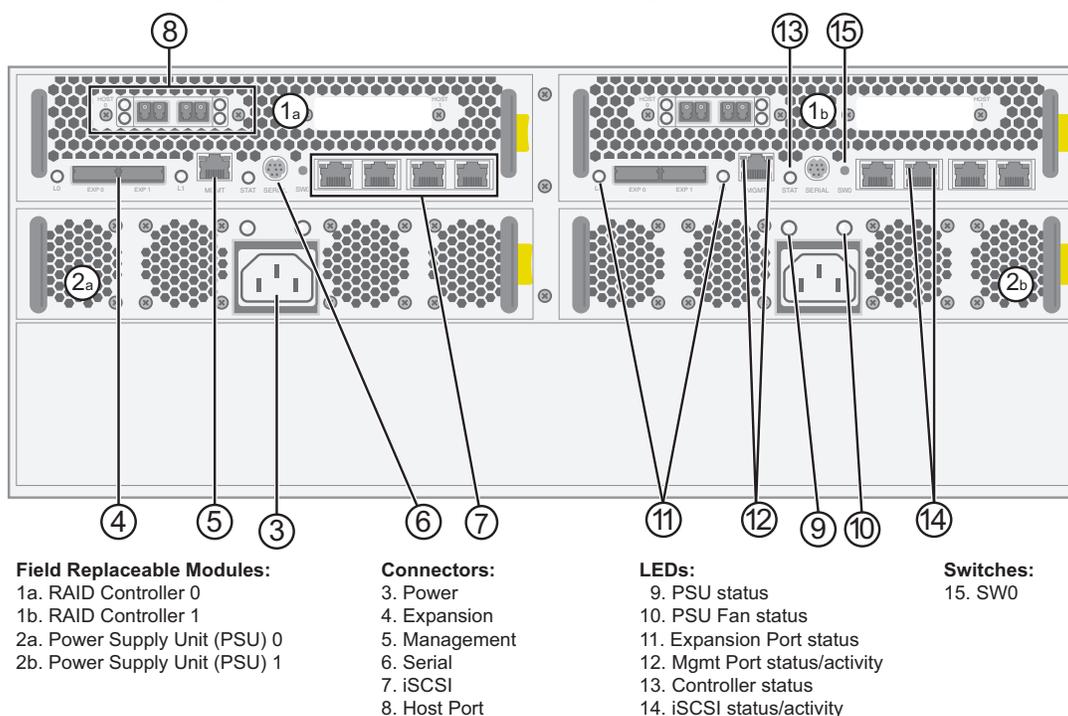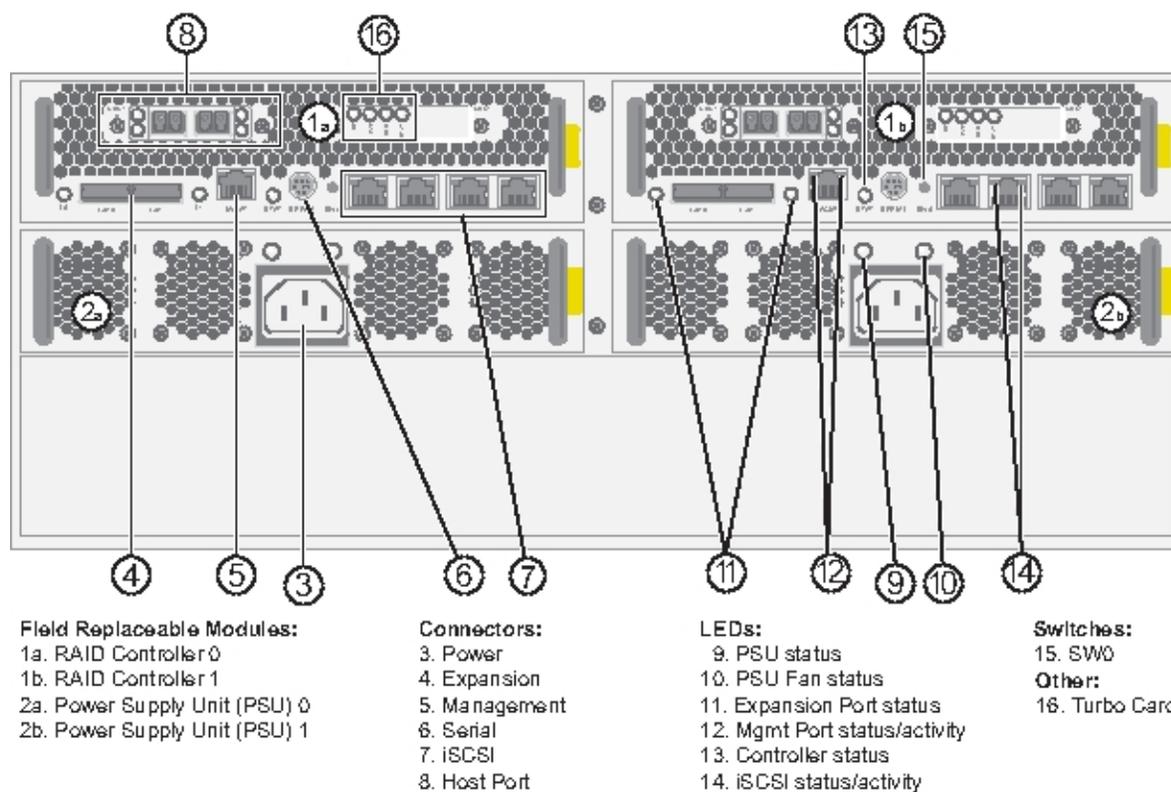Figure 1-5: Nexsan BEAST BT60 Storage System rear panel

Field Replaceable Modules:
1a. RAID Controller 0
1b. RAID Controller 1
2a. Power Supply Unit (PSU) 0
2b. Power Supply Unit (PSU) 1

Connectors:
3. Power
4. Expansion
5. Management
6. Serial
7. iSCSI
8. Host Port

LEDs:
9. PSU status
10. PSU Fan status
11. Expansion Port status
12. Mgmt Port status/activity
13. Controller status
14. iSCSI status/activity

Switches:
15. SW0

Figure 1-6: Nexsan BEASTBT60 Storage System rear panel

Field Replaceable Modules:
1a. RAID Controller 0
1b. RAID Controller 1
2a. Power Supply Unit (PSU) 0
2b. Power Supply Unit (PSU) 1

Connectors:
3. Power
4. Expansion
5. Management
6. Serial
7. iSCSI
8. Host Port

LEDs:
9. PSU status
10. PSU Fan status
11. Expansion Port status
12. Mgmt Port status/activity
13. Controller status
14. iSCSI status/activity

Switches:
15. SW0
Other:
16. Turbo Card

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Nexsan BEAST™ and E-Series™

Legend

Use the following tables as a legend for the Drive bay interior components diagram.

Field-replaceable modules

Table 1-7: Field-replaceable modules

Number	Component	Description
1.	RAID Controller(s) (1 or 2)	Each controller can be field-replaced in the event of failure (see RAID Controllers (BT60 only) on page 34). RAID Controllers are designated Controller 0 (left) and Controller 1 (right) in the graphical user interface (GUI) (see the *Nexsan High-Density Storage User Guide*).
2.	Power Supply Units (PSUs) (2)	Each PSU can be field-replaced in the event of a PSU or PSU fan failure (see Power Supply Units (PSUs) on page 31).

Connectors

Table 1-8: Connectors

Number	Component	Description
3.	Power (2): 100–240VAC, 47–63Hz.	⚠ **CAUTION**: The cordset specification for the Nexsan BEAST in North America is IEC C13 to IEC C14 rated 250V/15A. When applying power to the system, use ONLY the IEC power cords originally supplied with the Nexsan Storage System. Do NOT use other power cords, even if they appear identical to the supplied cords.
4.	Two expansion ports (**EXP 0** and **EXP 1**) per RAID Controller:	Mini-SAS 26 pin I-Pass (8088) expansion connectors, each with four 6Gb/s SAS links.
5.	One Management port (**MGMT**) per RAID Controller:	Ethernet 10/100 dedicated management port (RJ45) for Web-based configuration.
6.	One **SERIAL** port per RAID Controller	Mini-DIN serial port for low-level reporting (Support use only)

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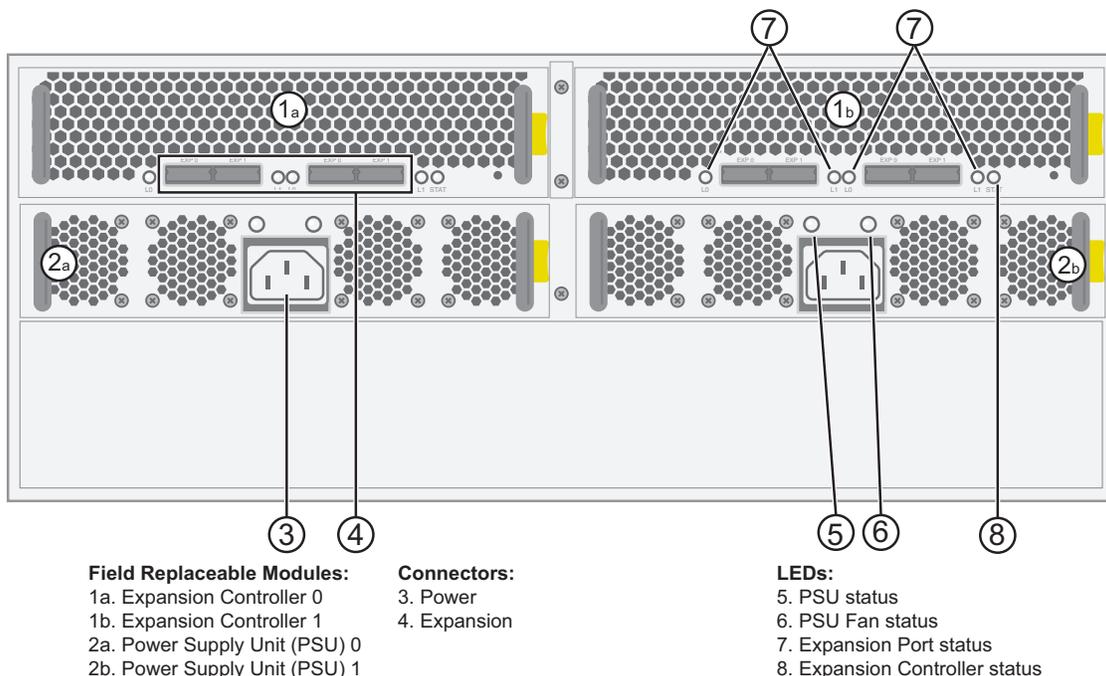| Number	Component	Description
7.	Four iSCSI ports (**0** through **3**) per RAID Controller	1Gb/s Ethernet ports (RJ45s) for iSCSI. If a Fibre Channel or 10Gb/s Ethernet card is installed, only ports **0** and **1** are usable.
8.	Host ports	Depending on the RAID Controller configuration, the host port connectors are one of the following: ● Two Fibre Channel ports (**0** and **1**) per HBA card; The upper LED is orange when there is a 2Gb/s connection and green when there is a 4Gb/s connection. The lower LED flashes yellow for data activity, but also lights up yellow when there is an 8Gb/s connection. When there is an 8Gb/s connection, the upper LED is off. During the power-up sequence, both Fibre Channel port LEDs are solid yellow. If both LEDs are flashing yellow, the Fibre Channel connection has been lost. ● Two 1Gb iSCSI (1GbE) ports (0 and 1) per HBA card; 1Gb/s Ethernet optical SFPs or copper SFP sockets for iSCSI. The left LED illuminates green when the power is connected, and both LEDs flash green when there is activity. ● Two 10Gb iSCSI (10GbE) ports (**0** and **1**) per HBA card: 10Gb/s Ethernet optical SFPs or copper SFP sockets for iSCSI. The bottom LED illuminates green when the power is connected, and the top LED flashes green when there is activity.

LEDs

Table 1-9: LEDs

Number	Component	Description
9.	PSU status LED	Indicates the status of power. Green indicates that the 12V and 3V3 outputs are within specification. Red indicates that one or the other, or both, are outside of specified limits. Orange indicates that the PSU is in standby mode. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) has more information. See the *Nexsan High-Density Storage User Guide*.
10.	PSU fan LED	Indicates the status of the PSU fans. Green indicates that all fans are operating within specifications. Red indicates that one or more fans are either running too slowly or have failed. When the PSU is in standby mode, this LED is off. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) has more information. See the *Nexsan High-Density Storage User Guide*

Number	Component	Description
11.	Expansion port LEDs (**L0** and **L1**)	Indicate the connection status for each expansion port. Green indicates that the SAS cable is properly connected. Flashing amber indicates that the cable is improperly connected. If no cable is connected, this LED is off.
12.	Management port LEDs (activity and speed)	The left LED flashes green when there is port activity. The right LED lights up green when there is a 100Mb/s connection. When there is only a 10Mb/s connection, the right LED is off.
13.	Controller status LED (**STAT**)	Indicates the status of the RAID Controller: ● Solid blue indicates that the controller is operating within specifications and that there is no user data in the cache. ● Solid green indicates that the controller is operating within specifications and that there is user data in the cache, which will be retained in flash memory upon power-down and then restored when the Nexsan Storage System is powered up again. ● Flashing red (once per second) indicates that the controller is offline due to a fault being detected. ● Flashing green (twice per second) indicates that the controller is operating in battery-backup mode and is backing up cached data to flash memory. This can take several minutes. ● Alternating blue and red indicates that the controller is booting in Emergency mode (see Switches on the next page).
14.	iSCSI port LEDs (activity and status)	The left LED illuminates green when the power is connected, and both LEDs flash green when there is activity.

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Switches

Table 1-10: Switches

15.	**SW0** Switch	This switch can be used to turn the RAID Controller off or on, boot the controller in Emergency mode, or silence an audible alarm.
		With the Nexsan Storage System powered on:
		• Briefly press the **SW0** switch to silence the audible alarm. This can also be done via the graphical user interface (GUI) (see the *Nexsan High-Density Storage User Guide*).
		• Press and hold both **SW0** switches for approximately 8 seconds to power down the RAID Controllers. If there is data in the cache, it will be stored in flash memory. This is the same as performing a System Shutdown via the graphical user interface (GUI) (see the *Nexsan High-Density Storage User Guide*).
		With the Nexsan Storage System powered off:
		• Press and hold the **SW0** switch on either RAID Controller for approximately 4 seconds to power up the Nexsan Storage System. Release the **SW0** switch to boot normally.
		• Continue pressing the **SW0** switch after the Nexsan Storage System powers up to put the RAID Controllers into Emergency mode (see the *Nexsan High-Density Storage User Guide*). Emergency mode is indicated by the controller status LED alternating between blue and red (see LEDs on page 13).

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Rear panel, BT60X

Use this section to help identify rear panel components.

Figure 1-11: Nexsan BEAST BT60XStorage Expansion rear panel

Field Replaceable Modules:
1a. Expansion Controller 0
1b. Expansion Controller 1
2a. Power Supply Unit (PSU) 0
2b. Power Supply Unit (PSU) 1

Connectors:
3. Power
4. Expansion

LEDs:
5. PSU status
6. PSU Fan status
7. Expansion Port status
8. Expansion Controller status

Legend

Use the following tables as a legend for the Drive bay interior components diagram.

Field-replaceable modules

Table 1-12:

Number	Component	Description
1.	Expansion Controllers (2)	Each unit can be field-replaced in the event of failure (see Expansion Controllers (BT60X only) on page 37).
2.	Power Supply Units (PSUs) (2)	Each unit can be field-replaced in the event of a PSU or PSU fan failure (see Power Supply Units (PSUs) on page 31)

Connectors

Table 1-13: Connectors

Number	Component	Description	
3.	Power (2): 100–240VAC, 47–63Hz.	⚠️	**CAUTION**: The cordset specification for the Nexsan BEAST in North America is IEC C13 to IEC C14 rated 250V/15A. When applying power to the Nexsan Storage System, use ONLY the IEC power cords originally supplied with the storage system. Do NOT use other power cords, even if they appear identical to the supplied cords.
4.	Four expansion ports (**EXP IN 0 and 1**	**EXP OUT 0** and **1**) per Expansion Controller: Mini-SAS 26 pin I-Pass (8088) expansion connectors, each with four 6Gb/s SAS links.	

LEDs

Table 1-14: LEDs

Number	Component	Description
5.	PSU status LED: Indicates the status of power	Green indicates that the 12V and 3V3 outputs are within specification. Red indicates that one or the other, or both, are outside of specified limits. Orange indicates that the PSU is in standby mode. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) has more information. See the *Nexsan High-Density Storage User Guide*.
6.	PSU fan LED: Indicates the status of the PSU fans	Green indicates that all fans are operating within specifications. Red indicates that one or more fans are either running too slowly or have failed. When the PSU is in standby mode, this LED is off. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) has more information. See the *Nexsan High-Density Storage User Guide*.
7.	Expansion port LEDs (**EXP IN L0** and **L1**,	**EXP OUT L0** and **L1**): Indicate the connection status for each expansion port. Green indicates that the SAS cable is properly connected. Flashing amber indicates that the cable is improperly connected. If no cable is connected, this LED is off.
8.	Controller status LED (**STAT**):	Indicates the status of the Expansion Controller: • Flashing green indicates that the controller is operating within specifications. • Flashing red indicates that the controller is restarting. • Solid red indicates that there is an issue with the Expansion Controller. The **Environmental Information** page (under *System Information*) in the graphical user interface (GUI) displays details (see the *Nexsan High-Density Storage User Guide*).

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Drive bay interior

Use this section to understand Drive bay interior components.

Figure 1-15: BEAST drive bay interior

1. Disk Drives   3. Drive Rails
2. Rear Fan Assemblies 4. Drive Status LEDs

Legend

Use the following tables as a legend for the Drive bay interior components diagram.

Table 1-16: Field-replaceable modules

Number	Module	Description
1.	Disk Drives	Up to 60 3.5" disk drives. Disk drives can be field-replaced in the event of failure (see Disk drives on page 39).
3.	Rear Fan Assembly	Dual-fan assemblies located at the rear of the drive bay. Can be field-replaced in the event of failure (see Rear fans on page 47).

Physical characteristics

Use this section as a reference for the physical characteristics of Nexsan Storage Systems or Nexsan Storage Expansions.

Dimensions, Nexsan BEAST

Measurement	Value
Chassis height	4U: 176mm (6.93")
Chassis length	864mm (34.02")
Chassis length, including fascia and handles	916.5mm (36.08") (a 1,070mm rack is recommended)
Chassis width, body	441.5mm (17.38")
Chassis width, overall	482.6mm (19")
Storage System weight, no drives, controllers, or PSUs	30 kg (66 lbs.)
Storage System weight, no drives	39.4 kg (86.7 lbs.)
Storage System weight, with drives	93.4 kg (205.5 lbs.)
Rack mount kit length	660mm to 813mm (26" to 32")
Rack mount kit weight	3.5 kg (7.7 lbs.)
Cable management arm weight	0.5 kg (1.1 lbs.)

Power

- Two 1,600W load-sharing, hot-pluggable, redundant PSUs.
- Nominal input voltage is 100–240VAC, 47–63Hz. Cordset specification in North America is IEC C13 to IEC C14 rated 250V/15A.
- Typical power consumption is approximately 800W (3.6A). Peak current is up to 12A.

Cooling

- Front panel: Three 120mm 12V axial fans (life 40,000 hrs).
- Internal: Six double-gang 12V axial fans (life 40,000 hrs).
- PSUs: Four 12V axial fans (life 40,000 hrs) per PSU, for a total of eight.

Materials

- Chassis, external: Galvanized sheet steel
- Chassis, internal: Galvanized sheet steel divider plates and sub-assemblies
- Fascia: ABS (blend) Thermoplastic UL 94 V.0

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Environment

- Ambient operating temperature: 5°C–35°C (41°F–95°F)

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Chapter 2

Adding Modules

Nexsan BEAST Storage are designed so that adding data disks can be performed while the system is powered on and operating normally.

> ⚠ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on the next page for detailed instructions.

This chapter contains the following sections:

2

Take proper ESD precautions

⚠️ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each storage system) while installing or performing maintenance on any Nexsan Storage System.

► **To protect the storage system from electrostatic discharge:**

1. Ground any electrostatic charge from your person by touching a metal part of the rack or any properly grounded conductive object (such as the ground point at an anti-static workstation).

2. Attach the clip end of the anti-static wrist strap to the rack's ESD grounding pin or to any bare metal part of the rack (for a racked storage system) or to any proper grounding point (for an unracked storage system). Secure the loop end around your wrist.

Figure 2-1: Attaching and putting on the anti-static wrist strap
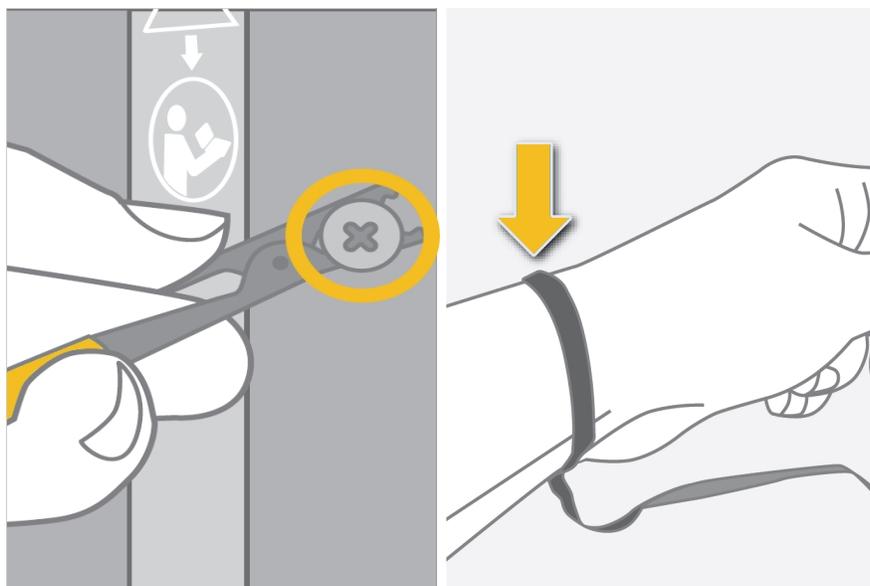
⚠️ **CAUTION**: Do not attach the anti-static wrist strap to any powder-coated part of the equipment rack or storage system. The powder coating can interfere with the transmission of current, resulting in improper grounding which can allow a static charge to build.

3. When working on unracked storage systems or components, place the storage system or component on an anti-static surface.

Adding disk drives

⚠ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on the previous page for detailed instructions.

Systems that are not fully populated with disk drives can have disk drives added to them at a later time.

Note The Spare Mode that the Nexsan Storage System is set to determines whether or not newly-inserted disks are automatically assigned as pool spares. To check or set the spare mode, go to **Configure RAID > Spare Mode** in the graphical user interface (GUI). See the *Nexsan High-Density Storage User Guide* for more information.

► **To add disk drives to the Nexsan Storage System:**

1. Unbolt the front of the Nexsan Storage System from the rack.

Figure 2-2: Front face bolt locations
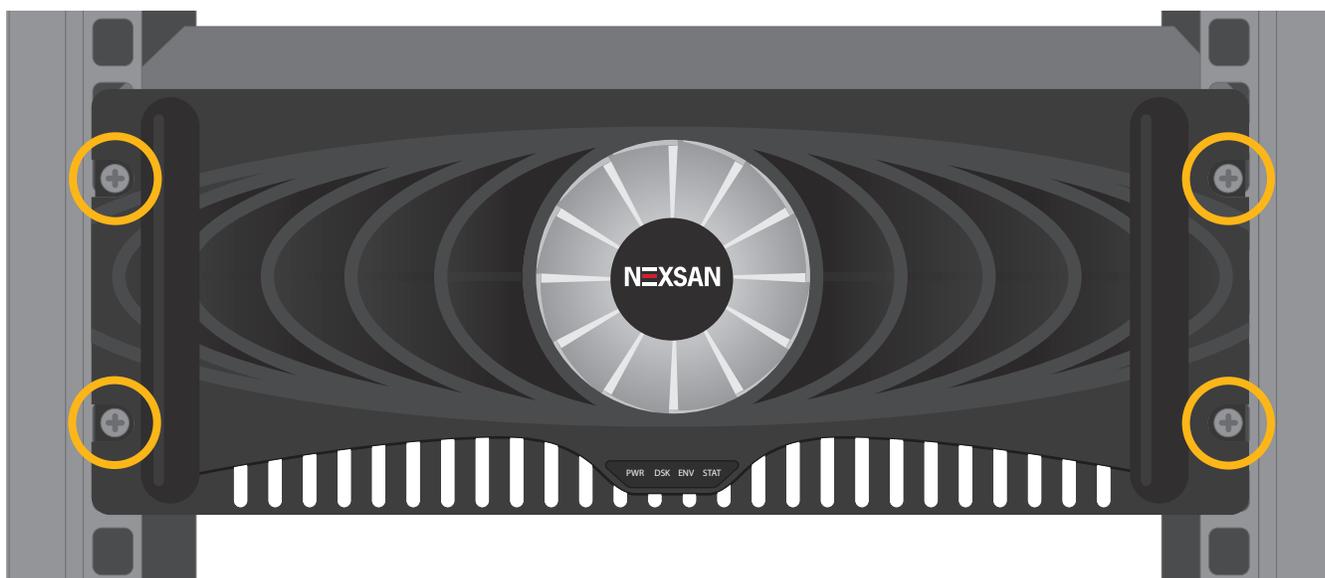
2. Carefully slide the Nexsan Storage System for ward on the rails until the side rail latches click into place.

Figure 2-3: Sliding the Nexsan Storage System forward
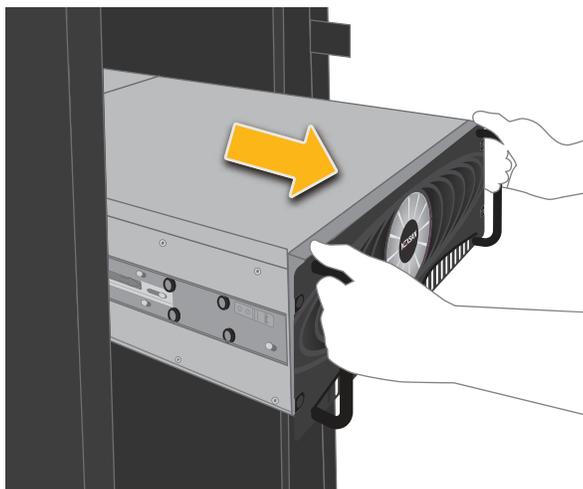
⚠️ **CAUTION**: Do not lean on or place any heavy object on the Nexsan Storage System while it is extended forward. Doing so may damage the drawer slide mechanism or overbalance the rack.

3. Unbolt and lower the front panel of the Nexsan Beast Storage System.

Figure 2-4: Unbolting the Beast front panel (one bolt on each side) and lowering it
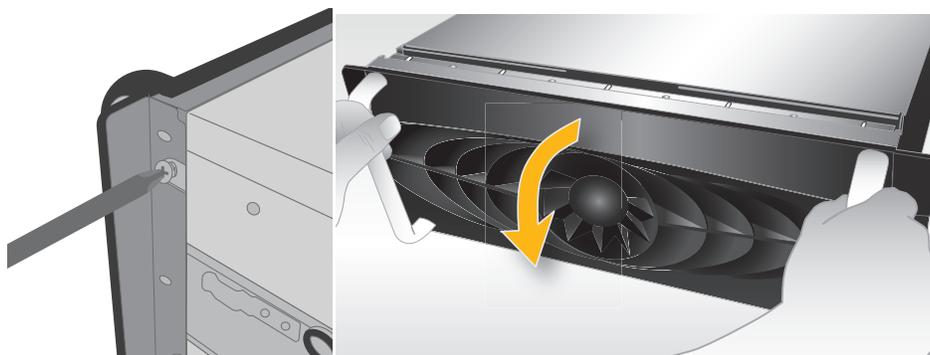
4. Remove the chassis lid by pulling it forward, then lifting up.

Figure 2-5: Removing the drive bay lid
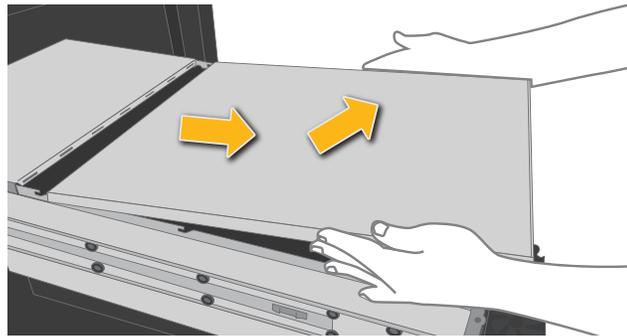
⚠ **CAUTION**: Disk drives are shock sensitive. Perform all actions involving disk drives carefully to avoid damage and data loss.

5. Remove the disk(s) from the disk box(es), gripping them by the guides on the sides of each disk.

   Note Do not remove disks from their boxes by pulling on the ejection handles.

6. Using the drive guides to help you orient the disks, carefully load the new disk drive(s) into a drive slot. Make sure that each disk is fully seated and that the drive ejection handles are flat against each drive.

Figure 2-6: Loading a new disk drive
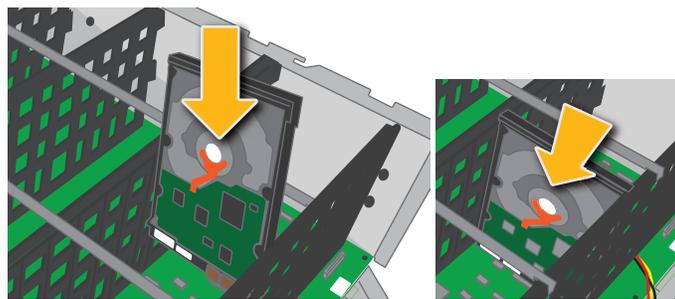
The drive status LED lights up green to inform you that the disk is connected and functioning properly.

⚠ **CAUTION**: Be sure that you load all drives so that their connectors line up with the connectors on the PCB and with their labels facing left. The drive holders are keyed so that inserting them in their correct orientation is easy. Do NOT force a drive into its slot if you encounter significant resistance.

⚠ **CAUTION**: Do NOT allow disks to drop freely onto the connectors on the PCB. Doing so can cause significant damage to the disk or to the connectors, or both.

⚠ **CAUTION**: Wherever possible, always load disk drives in rows of 15 across the width of the drive drawer, starting in the front. Leaving gaps between disk drives decreases cooling efficiency and may result in some disk drives overheating.

7. Replace the drive bay lid.

8. Release the front panel retainer arms by pressing down on the hinges.

Figure 2-7: Releasing the retainer arms
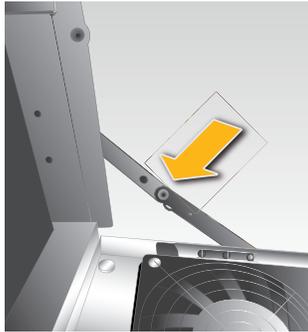
9. Raise the front panel and bolt it back into place.

10. Pull the side rail latch tabs to disengage the latches.

Figure 2-8: Disengaging the side rail latches
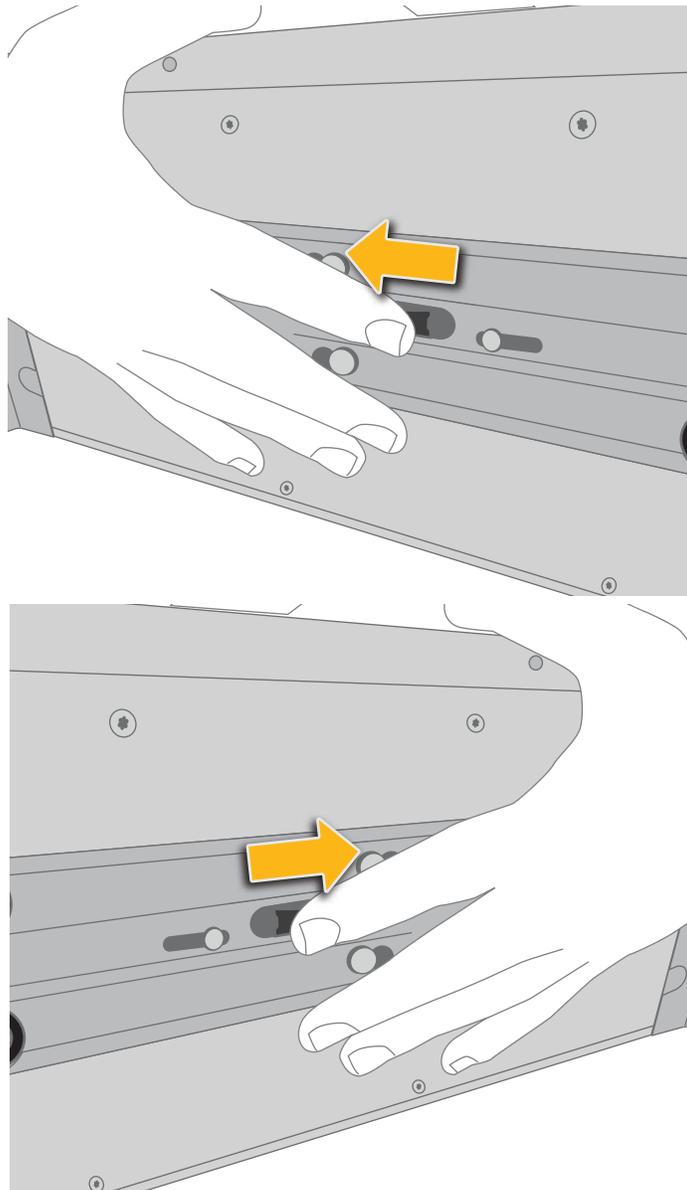
11. Carefully slide the Nexsan Storage System back into the rack.

12. Bolt the Storage System to the rack front.

13. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new drive is either blue or gray, meaning that it has been automatically detected and assigned as a pool spare or that it is unassigned and ready to be used in a new array or assigned as a spare. See *Home Page* in *Chapter 3* of the *Nexsan High-Density Storage User Guide* for more information.

2

Chapter 3

Replacing Modules

Nexsan BEAST are designed so that some components can be replaced without turning off the system or interrupting its functioning. This chapter describes how to replace each of these modules in the field while the unit is running.

> ⚠️ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

This chapter contains the following sections:

3

Power Supply Units (PSUs)

In the event of a power supply or PSU fan failure, replace the PSU using the following procedure.

CAUTION: DO NOT REMOVE THE FAILED PSU until the new PSU has arrived and is ready to be installed. Removing a PSU reduces air flow and cooling and can result in the system overheating.

CAUTION: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

► **To replace a PSU:**

1. Determine which PSU or PSU fan has failed by examining the PSU status LEDs on each module. A red LED indicates the failed module (see Rear panel, BT60 on page 10). The **Home** page of the GUI also tells you which module has failed (see the *Nexsan High-Density Storage User Guide*).

2. Remove the power cable from the power socket on the PSU where the failure has occurred.

3. Unbolt the front of the unit from the rack.

Figure 3-1: Front face bolt locations
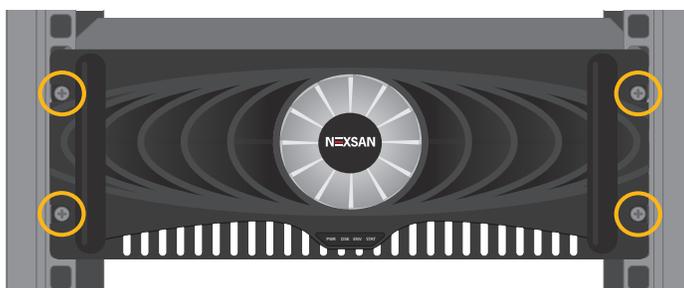
4. Carefully slide the unit for ward on the rails until the side rail latches click into place.

Figure 3-2: Sliding the unit forward
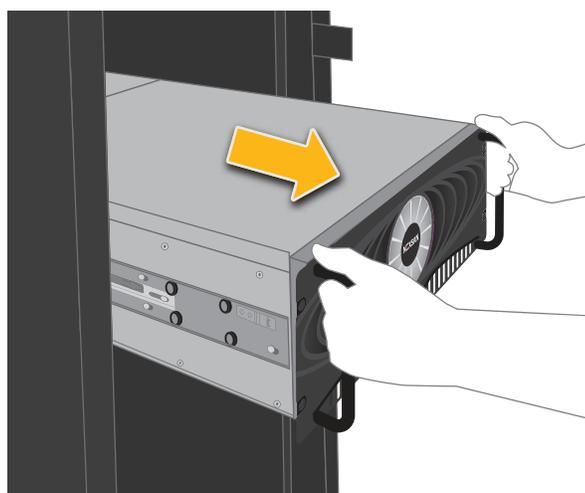
Note You may also need to disconnect the cable management arm from the chassis rail.

⚠ **CAUTION**: Do not lean on or place any heavy object on the unit while it is extended forward. Doing so may damage the drawer slide mechanism or overbalance the rack.

5. Press the spring lock tab away from the edge of the PSU, then carefully remove the PSU from the unit. Support the weight of the PSU with your free hand while removing it.
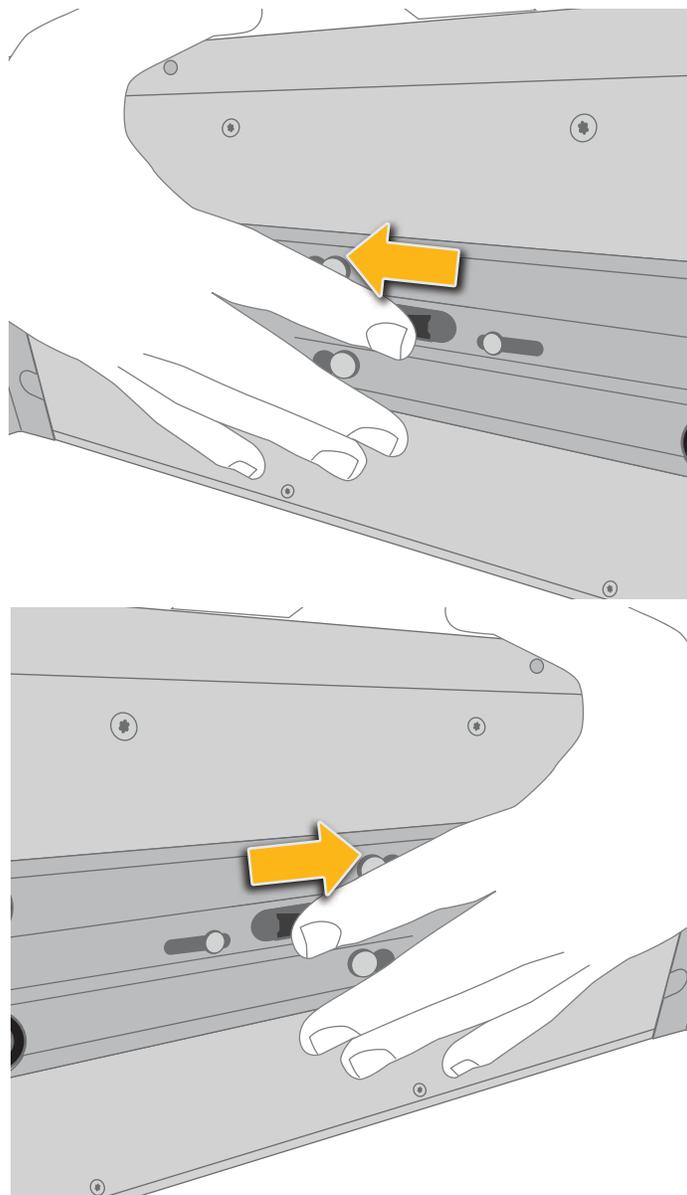
Figure 3-3: Removing the PSU
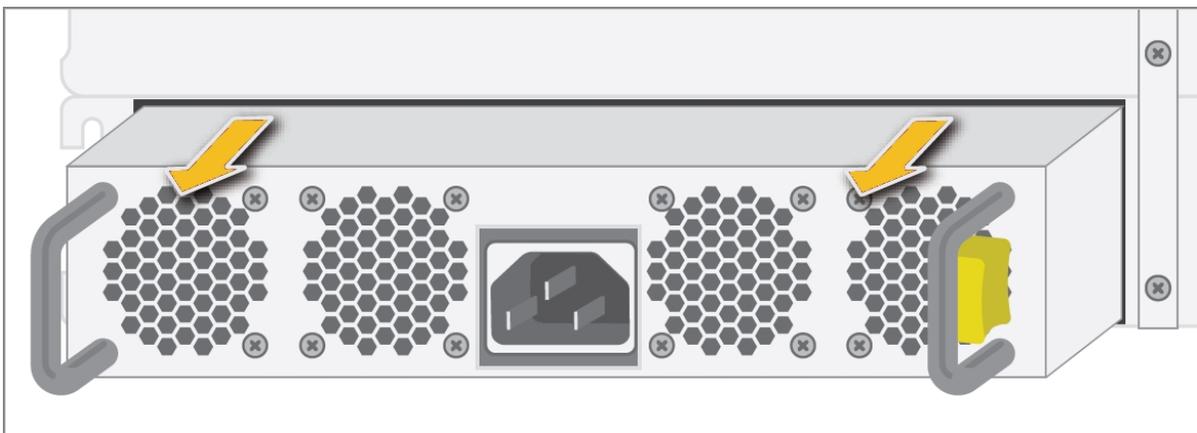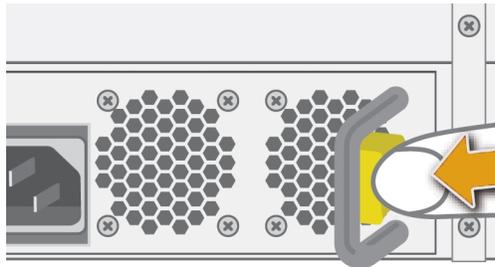
6. Make sure that the replacement PSU is right side up. The spring lock tab should be on the right.

7. Insert the replacement PSU into the slot and carefully slide it back until the spring lock tab clicks.

Figure 3-4: Sliding the PSU into place
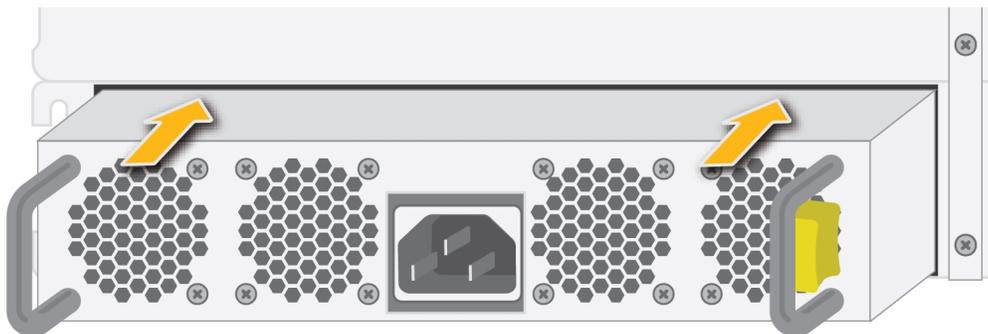
8. Pull the side rail latch tabs to disengage the latches.

Figure 3-5: Disengaging the side rail latches

9. Carefully slide the unit back into the rack.

10. Bolt the Nexsan BEAST Storage System to the rack front.

11. Plug the power cable into the power cable socket on the replacement PSU.

    The two PSU status LEDs light up green to indicate that the unit is functioning properly and supplying power to the unit.

12. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new Power Supply Unit is green. See the *Nexsan High-Density Storage User Guide* for more information.

RAID Controllers (BT60 only)

In the event of a RAID Controller failure, replace the Controller using the following procedure:

> ⚠ **CAUTION**: DO NOT REMOVE THE FAILED RAID CONTROLLER until the new RAID Controller has arrived and is ready to be installed. Removing a RAID Controller reduces air flow and cooling and can result in the system overheating.

> ⚠ **CAUTION**: Single RAID Controller replacement in a dual-Controller system should always be carried out as a hot-swap operation. This ensures that firmware versions match and enables RAID Controller settings to be automatically applied to the new RAID Controller.

> ⚠ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

Notes:

- If you are running in **Dual-Controller Non-Redundant** mode (see *System Mode* in the *Nexsan High-Density Storage User Guide*) or if you have hosts that do not have multipathing configured but have paths available to each RAID Controller, shut down or disconnect all hosts prior to beginning this procedure.

- For a single-Controller system or when changing both Controllers, you will need to use a serial connection or the Nexsan IP Config tool. Refer to the *Nexsan High-Density Storage User Guide* and Nexsan Storage Tools.

► **To replace a RAID Controller:**

1. Determine which RAID Controller has failed by examining the **STAT** LED on each module (see). A flashing red LED indicates the failed module. The **Home** page of the graphical user interface (GUI) also tells you which module has failed (see the *Nexsan High-Density Storage User Guide*).

   Note In some cases, a RAID Controller needs to be replaced even if it has not failed outright. In this case, you must determine which RAID Controller to replace by following the troubleshooting procedures in *Chapter 4* of the *Nexsan High-Density Storage User Guide*.

   Note If you are replacing a single *failed* RAID Controller, skip to step 3.

2. If necessary, do one of the following:

   - If you need to replace a RAID Controller *that has not yet failed*, navigate to **System Admin > Reboot** in the graphical user interface (GUI). Under *Controller Maintenance*, select the RAID Controller that you need to replace, select the confirmation check box, and click **Execute NOW**.

   - If you must replace both RAID Controllers, navigate to **System Admin > Reboot** in the graphical user interface (GUI), select **System Shutdown**, select the confirmation check box, and click **Execute NOW**.

3. Carefully note communication cable locations, then remove all cables from the failed RAID Controller.

   Note Cables should only be reconnected to the same ports from which they were removed in order to ensure proper communication between the Nexsan Storage System and connected hosts.

4. Press the spring lock tab away from the edge of the RAID Controller, then carefully remove the RAID Controller from the Nexsan Storage System . Support the weight of the RAID Controller with your free hand while removing it.

Figure 3-6: Removing the RAID Controller
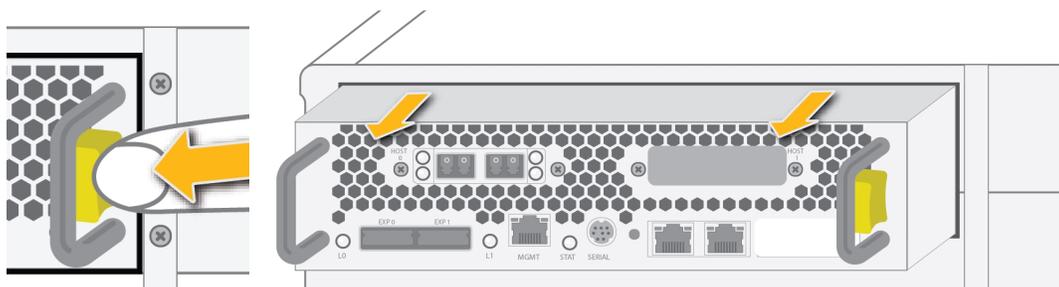
5. Make sure that the battery switch on the back of the replacement RAID Controller is in the on (|) position (does not apply to E-Series P models).

6. Make sure that the replacement RAID Controller is right side up. The host ports should be at the top.

   Note If you have a Nexsan Storage Expansion attached to your Nexsan Storage System, plug the SAS cables from the Nexsan Storage Expansion into the expansion ports on the replacement RAID Controller BEFORE you insert the RAID Controller into its slot.

7. Insert the replacement RAID Controller into the slot and carefully slide it back until the spring lock tab clicks.

Figure 3-7: Sliding the RAID Controller into place
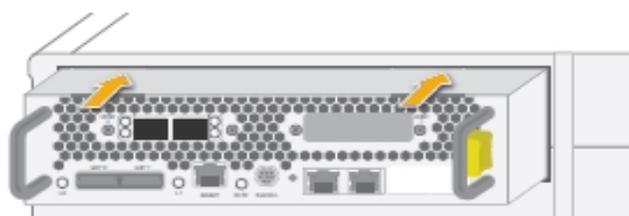
   Note If the Nexsan Storage System was not shut down in step 2, the **STAT** LED lights up blue or green to let you know that the Nexsan Storage System is functioning properly.

8. Reconnect all communication cables (Fibre Channel/iSCSI, management, serial) to the appropriate connectors on the replaced RAID Controller.

   Note If you have replaced only one RAID Controller, skip to step 11.

9. If you have replaced both RAID Controllers, press and hold the **SW0** switch for approximately 4 seconds to power the Nexsan Storage System on.

10. If you have replaced both RAID Controllers, clone the RAID Controller settings from a disk by doing one of the following:

    ● On a computer attached to the same Ethernet network as the RAID Controller, launch the Nexsan IP Configuration utility (included with Nexsan Storage Tools). Select the storage system and choose the option to clone RAID Controller settings from disk.

    ● Connect a serial cable to your device and log in with a telnet program (115200 baud, 8 data bits, 1

stop bit, no parity, no flow control). At the prompt, choose the option to clone RAID Controller settings from disk

11. Wait 1–2 minutes for the new RAID Controller to boot.

12. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new RAID Controller is green. See the *Nexsan High-Density Storage User Guide* for more information.

13. If necessary, restart or reconnect your hosts and verify that all volumes are working as expected.

3

Expansion Controllers (BT60X only)

⚠️ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

Note If an Expansion Controller fails or is removed, the RAID Controller on the main unit that it is connected to passes control of the expansion units to the other RAID Controller. *This is normal behavior.* After the Expansion Controller is replaced, you can re-establish the proper control paths through the graphical user interface (GUI).

In the event of an Expansion Controller failure, replace the controller using the following procedure:

⚠️ **CAUTION**: DO NOT REMOVE THE FAILED EXPANSION CONTROLLER until the new Expansion Controller has arrived and is ready to be installed. Removing a Controller reduces air flow and cooling and can result in the system overheating.

1. Determine which RAID Controller has failed by examining the **STAT** LED on each module (see Rear panel, BT60 on page 10). A flashing red LED indicates the failed unit. The **Home** page of the graphical user interface (GUI) also tells you which unit has failed (see the *Nexsan High-Density Storage User Guide*).

   Note In some cases, an Expansion Controller needs to be replaced even if it has not failed outright. In this case, you must determine which Expansion Controller to replace by following the troubleshooting procedures in *Chapter 4* of the *Nexsan High-Density Storage User Manual*.

2. Remove the SAS cables from the failed Expansion Controller.

3. Press the spring lock tab away from the edge of the controller, then carefully remove the controller from the unit. Support the weight of the controller with your free hand while removing it.
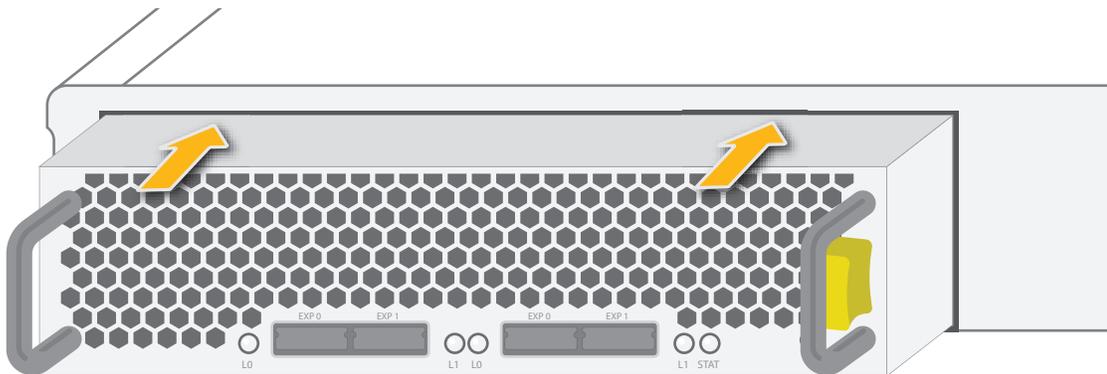
Figure 3-8: Removing the Expansion Controller
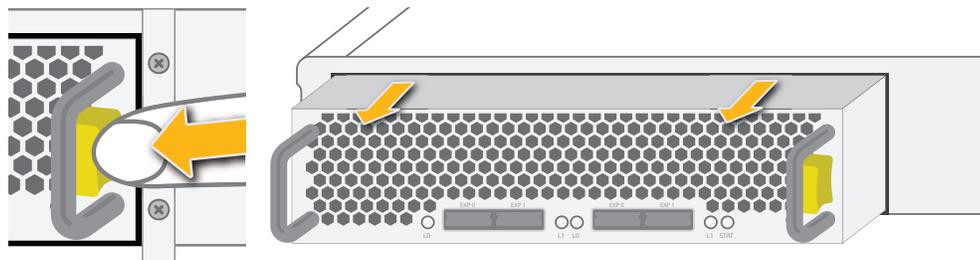
4. Make sure that the replacement Expansion Controller is right side up. The spring lock tab should be on the right.

5. Insert the replacement Expansion Controller into the slot and carefully slide it back until the spring lock tab clicks.

Figure 3-9: Sliding the Expansion Controller into place

The STAT LED lights up green to let you know that the unit is functioning properly.

6. Attach the SAS cables to the **EXP IN 0** and **1** connectors on the replaced Expansion Controller.

7. In the graphical user interface (GUI), do the following:

   a. Go to **System Admin > Reboot**.

   b. Scroll down to the Controller Maintenance section.

   c. Click the **Re-enable controller *X*** button.

   d. Check the confirmation check box.

   e. Click **Execute NOW**.

   The RAID Controller is brought back online and connects to the replaced Expansion Controller.

Disk drives

In the event of a disk drive failure, replace the drive using the following procedure.

Note The Spare Mode that the unit is set to determines whether or not newly-inserted disks are automatically assigned as pool spares. To check or set the spare mode, go to **Configure RAID > Spare Mode** in the graphical user interface (GUI). See the *Nexsan High-Density Storage User Guide* for more information.

> ⚠ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

► **To replace disk drives in the unit:**

1. Unbolt the front of the unit from the rack.

Figure 3-10: Front face bolt locations
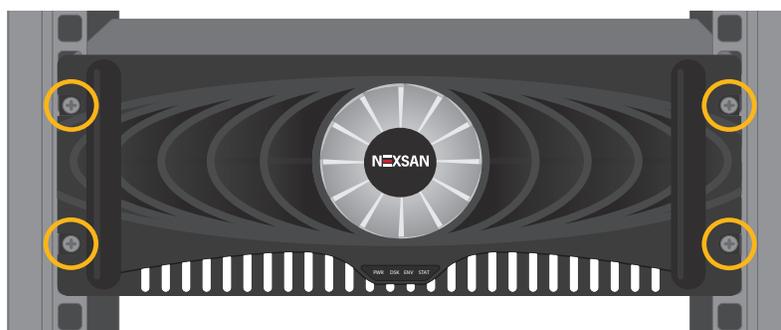
2. Carefully slide the unit for ward on the rails until the side rail latches click into place.

Figure 3-11: Sliding the unit forward
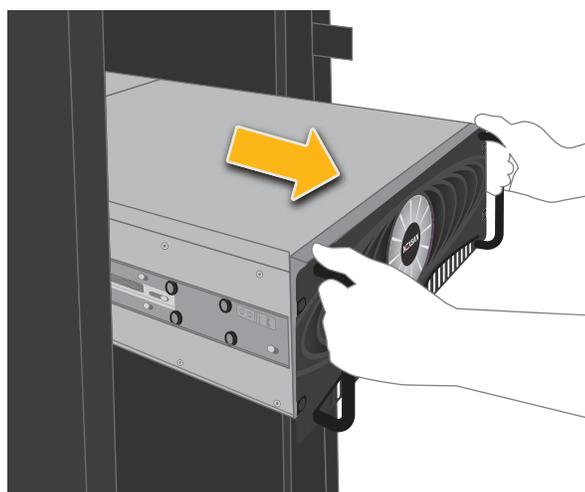
> ⚠ **CAUTION**: Do not lean on or place any heavy object the unit while it is extended forward. Doing so may damage the drawer slide mechanism or overbalance the rack.
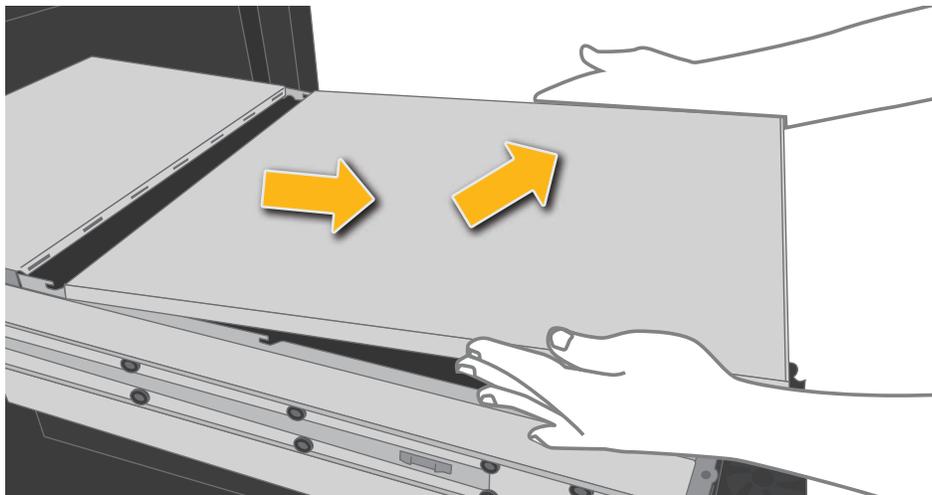
3. Unbolt and lower the front panel of the Beast RAID storage unit.

Figure 3-12: Unbolting the Beast front panel (one bolt on each side) and lowering it
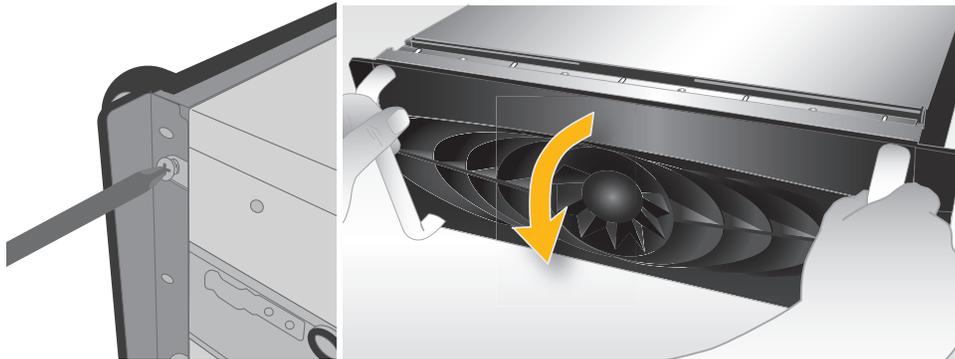
4. Remove the drive bay lid by pulling it forward, then lifting up.

Figure 3-13: Removing the drive bay lid

⚠ **CAUTION**: Disk drives are shock sensitive. Perform all actions involving disk drives carefully to avoid damage and data loss.

5. Determine which drive has failed by examining the arrow-shaped drive status LEDs next to each drive (see Drive bay interior on page 18). A red LED indicates the failed drive.

6. Carefully lift the drive's ejection handle to disengage the drive, then remove the drive from the drive slot. Support the weight of the drive with your free hand while removing it.

Figure 3-14: Removing a disk drive
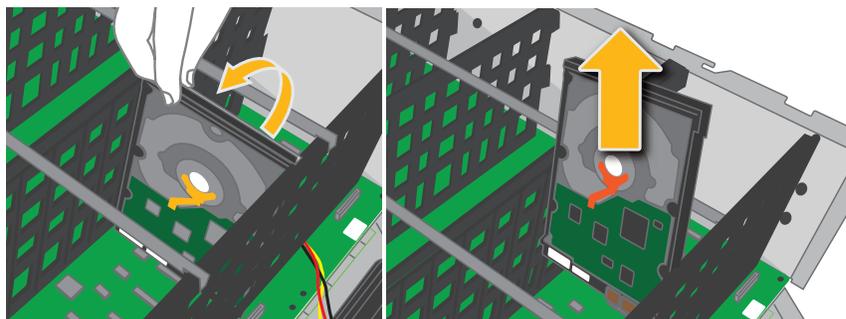
7. Using the drive guides to help you orient the disks, carefully load the new disk drive into the drive slot. Make sure that the disk is fully seated and that the drive ejection handle is flat against the drive.

Figure 3-15: Loading a new disk drive
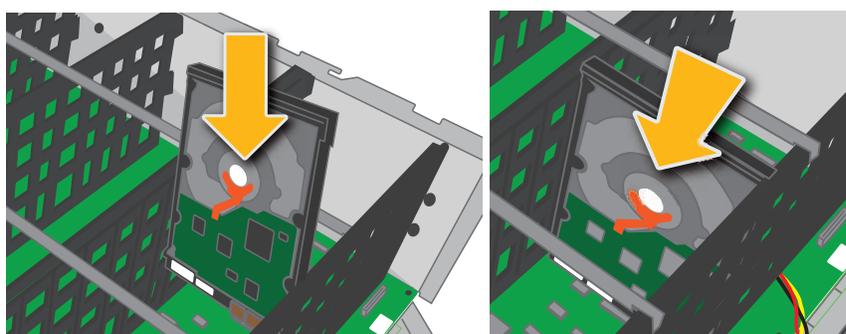
The drive status LED lights up green to inform you that the disk is connected and functioning properly.

CAUTION: Be sure that you load drives so that their connectors line up with the connectors on the PCB and with their labels facing left. The drive holders are keyed so that inserting them in their correct orientation is easy. Do NOT force a drive into its slot if you encounter significant resistance.

CAUTION: Do NOT allow disks to drop freely onto the connectors on the PCB. Doing so can cause significant damage to the disk or to the connectors, or both.

8. Replace the drive bay lid.

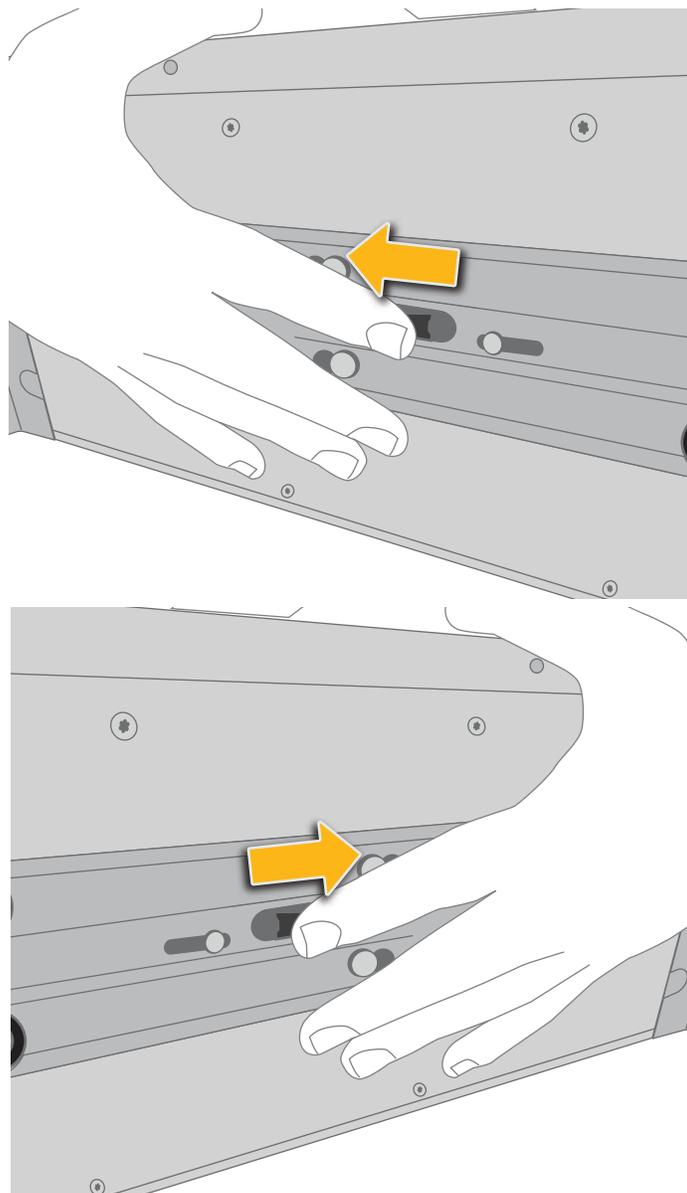9. Release the front panel retainer arms by pressing down on the hinges.

Figure 3-16: Releasing the retainer arms

10. Raise the front panel and bolt it back into place.

11. Pull the side rail latch tabs to disengage the latches.

Figure 3-17: Disengaging the side rail latches

12. Carefully slide the unit back into the rack.

13. Bolt the BEAST RAID storage unit to the rack front.

14. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new drive is either blue or gray, meaning that it has been automatically detected and assigned as a pool spare or that it is unassigned and ready to be used in a new array or assigned as a spare. See *Home Page* in *Chapter 3* of the *Nexsan High-Density Storage User Guide* for more information.

Front fans

Each of the three front fans can be individually replaced in case of failure.

> ⚠ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

▶ **To replace a front fan**

1. Unbolt the front of the unit from the rack.

Figure 3-18: Front face bolt locations
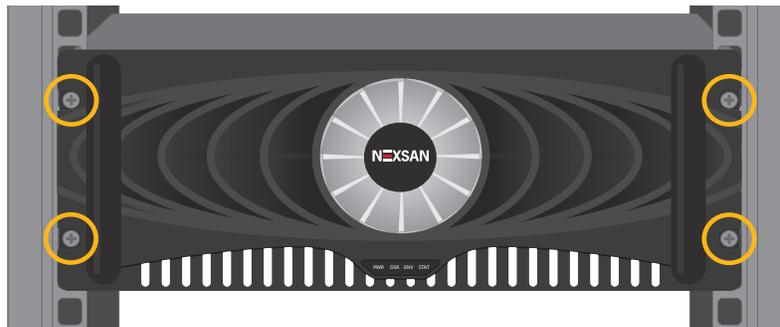
2. Carefully slide the unit for ward on the rails until the bolts securing the front panel to the unit are visible.
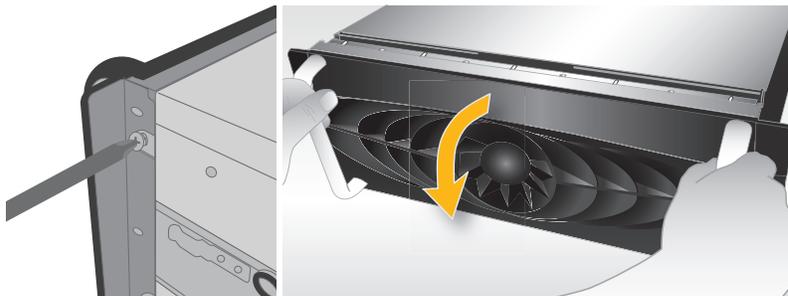
Figure 3-19: Sliding the unit forward
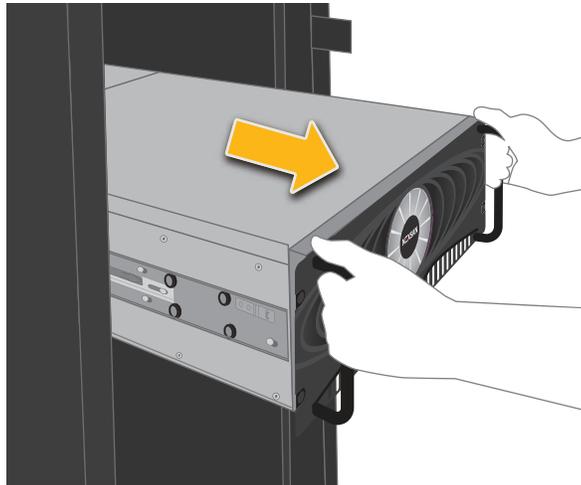
> ⚠ **CAUTION**: Do not lean on or place any heavy object the unit while it is extended forward. Doing so may damage the drawer slide mechanism or overbalance the rack.
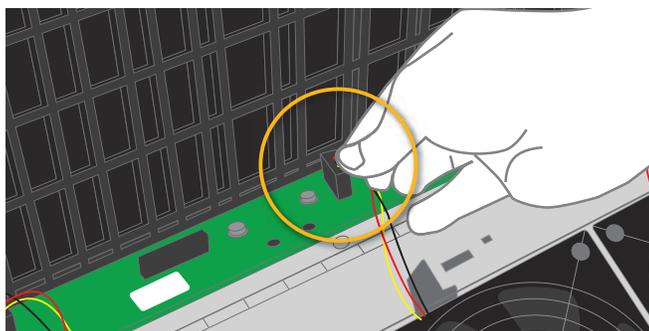
3. Unbolt and lower the front panel of the Nexsan BEAST Storage System.

Figure 3-20: Unbolting the Beast front panel (one bolt on each side) and lowering it

4. Unclip the faulty fan's power cord from the printed circuit board.

Figure 3-21: Unclipping the fan's power cord

5. Press the latches on the four clips that hold the fan to the front panel to release them.

Figure 3-22: Detaching the fan

6. Snap the new fan in place and connect its power cord to the printed circuit board.

7. Release the front panel retainer arms by pressing down on the hinges.

Figure 3-23: Releasing the retainer arms

8. Raise the front panel and bolt it back into place.

9. Carefully slide the unit back into the rack.

10. Bolt the Nexsan BEAST Storage System to the rack front.

11. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new fan assembly is green. See *Home Page* in *Chapter 3* of the *Nexsan High-Density Storage User Manual* for more information.

3

Rear fans

The fan assemblies at the back of the drive bay can easily be replaced in case of fan failure.

⚠️ **CAUTION**: Computer components and disk drives are sensitive to electrostatic discharge (ESD). Always ground any electrostatic charge from your person before touching components with your hands or with any tools. Always use an anti-static wrist strap (one ships with each Nexsan Storage System) while installing or performing maintenance on any Nexsan Storage System. See Take proper ESD precautions on page 23 for detailed instructions.

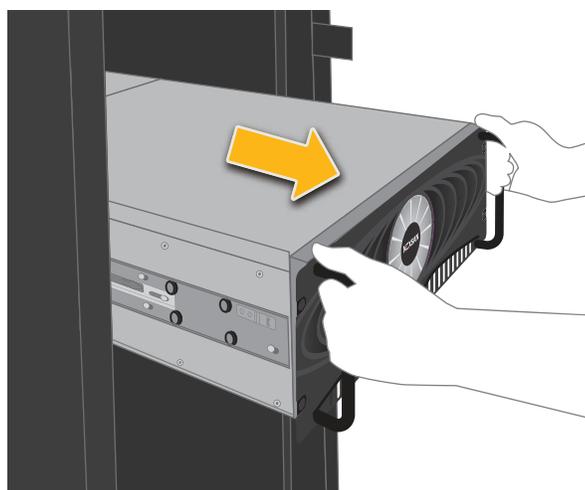► **To replace a rear fan assembly**

1. Unbolt the front of the unit from the rack.

Figure 3-24: Front face bolt locations
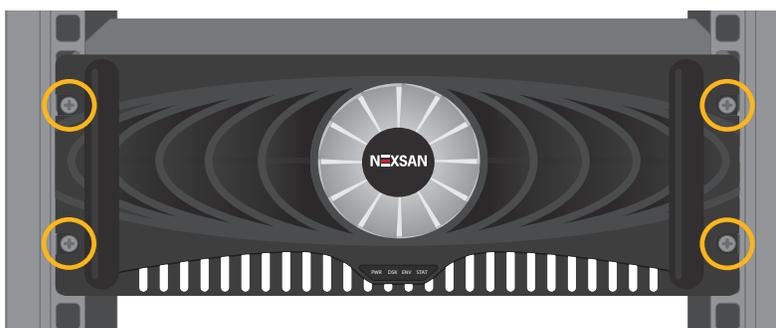
2. Carefully slide the unit for ward on the rails until the side rail latches click into place.
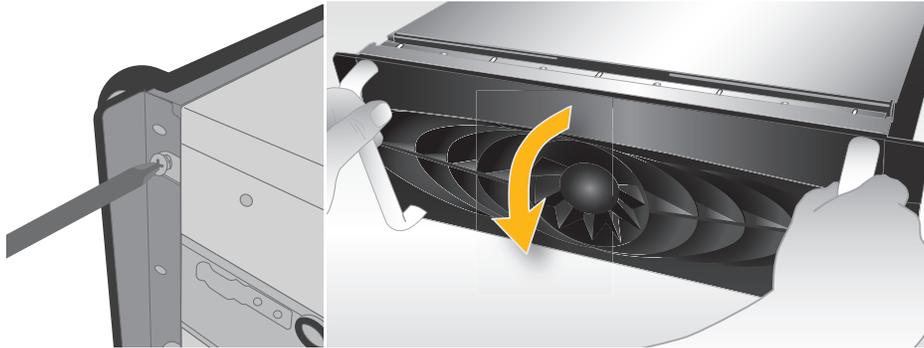
Figure 3-25: Sliding the unit forward

⚠️ **CAUTION**: Do not lean on or place any heavy object the unit while it is extended forward. Doing so may damage the drawer slide mechanism or overbalance the rack.
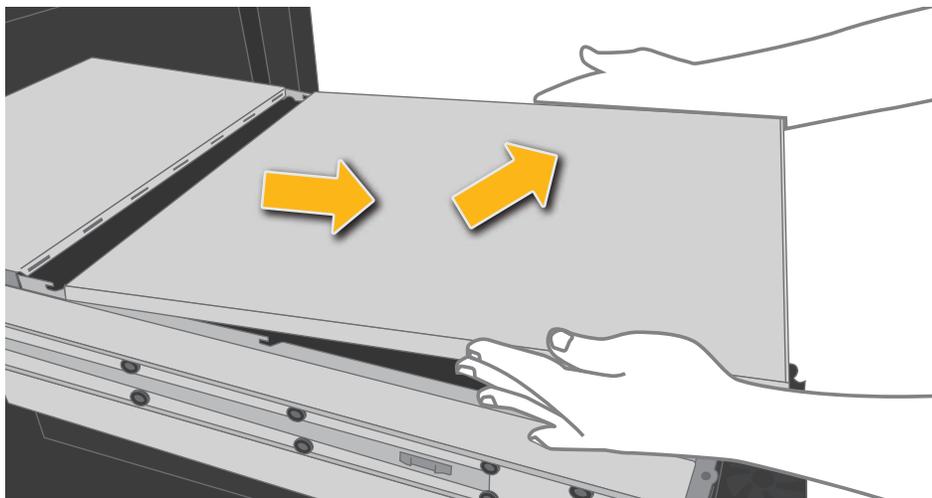
3. Unbolt and lower the front panel of the Beast RAID storage unit.

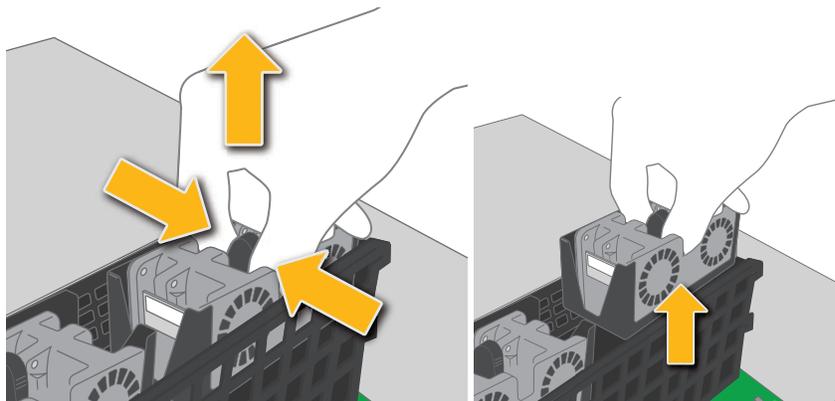Figure 3-26: Unbolting the Beast front panel (one bolt on each side) and lowering it

4. Remove the drive bay lid by pulling it forward, then lifting up.
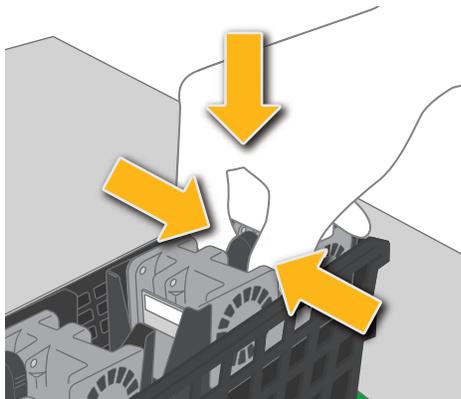
Figure 3-27: Removing the drive bay lid

5. Locate the faulty fan assembly, pinch its latches inward, and pull the assembly out of the socket.

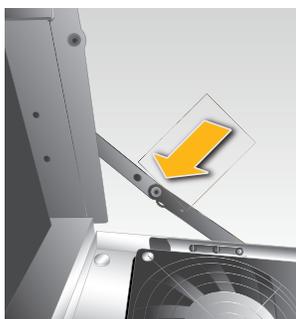Figure 3-28: Removing rear fan assembly

6. Pinch the new fan assembly's latches inward, seat the fan in the socket, and release the latches to lock it in place.

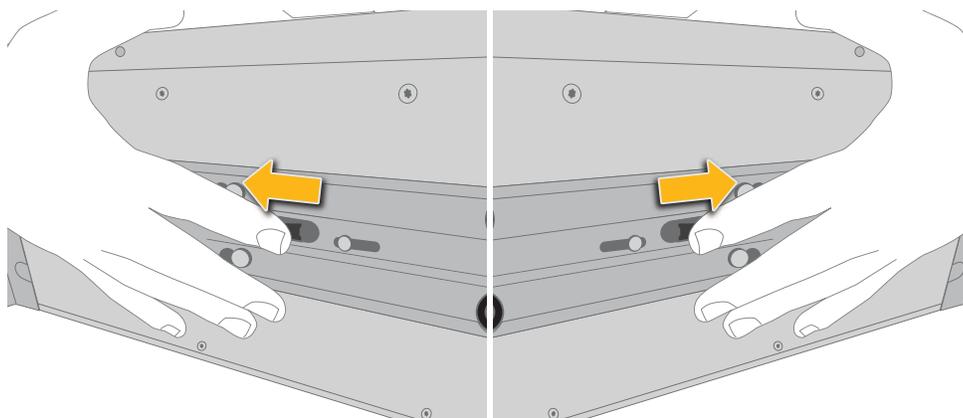Figure 3-29: Inserting the new fan assembly

7. Raise the front panel and bolt it back into place.

8. Release the front panel retainer arms by pressing down on the hinges.

Figure 3-30: Releasing the retainer arms

9. Replace the chassis lid.

10. Pull the side rail latch tabs to disengage the latches.

Figure 3-31: Disengaging the side rail latches

11. Carefully slide the unit back into the rack.

12. Bolt the Beast RAID storage unit to the rack front.

13. In the graphical user interface (GUI), go to the **Home** page and verify that the status bar for the new fan assembly is green. See *Home Page* in *Chapter 3* of the *Nexsan High-Density Storage User Manual* for more information.

3

Glossary

A

antistatic wrist strap

An anti-static device used to prevent electrostatic discharge (ESD) by safely grounding a person working on electronic equipment. Also called an ESD strap or a grounding bracelet.

array

A linked group of one or more physical, independent hard disk drives. See also RAID.

B

bit

The smallest unit of digital data, representing a 0 or a 1. Abbreviated "b".

byte

A unit of data that is 8 bits long. Often used for alphanumeric characters. Abbreviated "B".

C

cache

Reserved areas of memory that are used to speed up instruction execution, data retrieval, and data updating. In Nexsan Storage Systems, a memory unit in the RAID controller that temporarily holds user data.

D

daisy-chain

The attachment of hardware to a computing system by connecting each component to another similar component rather than directly to the computing system that uses the component. Only the last component in the chain directly connects to the computing system. For example, up to two Nexsan E-Series expansion units can be daisy-chained to the back of one Nexsan E-Series main storage unit.

E

electrostatic discharge

The sudden and momentary electric current that flows between two objects at different electrical potentials caused by direct contact or induced by an electrostatic field. Potentially harmful to electronic components.

ESD

See electrostatic discharge.

ESD strap

See anti-static wrist strap.

Ethernet

A system for connecting a number of computer systems to form a local area network (LAN), with protocols to control the passing of

information and to avoid simultaneous transmission by two or more systems. Supports data transfer rates of 10, 100, 1,000, and 10,000 megabits per second (Mb/s). 10, 100, and 1,000Mb/s networks are often referred to as 10BASE-T, 100BASE-T, and 1000BASE-T, respectively. 10,000Mb/s networks are usually referred to as 10Gb Ethernet or 10GbE.

Expansion Controller

A module of Nexsan E-Series expansion units (Nexsan E18X/XV, E32XV, E48X/XV, and E60X/XV) that connects via SAS to a Nexsan Storage System's RAID controller.

F

FC port

See Fibre Channel port.

FCC

The Federal Communications Commission; the United States federal agency that regulates electromagnetic emissions.

Fibre Channel

A gigabit (Gb) speed network technology primarily used for storage networking and the current standard connection type for storage area networks (SANs). Despite its name, Fibre Channel signaling can run on both twisted-pair copper wire and fibre-optic cables.

Fibre Channel port

Any entity that actively communicates over a Fibre Channel network. Usually implemented in a device such as disk storage or a Fibre Channel switch. Depending on the system, the Fibre Channel ports on Nexsan Storage Systems can support 2Gb/s, 4Gb/s, 8Gb/s, or 16Gb/s connections.

Fibre Channel switch

A network switch compatible with the Fibre Channel protocol. Enables the creation of a Fibre Channel network, which is currently the core component of most storage area networks (SANs).

FRU (Field Replaceable Unit)

A module within a Nexsan Storage System or Nexsan Storage Expansion that can be replaced on site. Consult Nexsan Support for details.

G

Gb

Gigabit. Approximately one billion (1,000,000,000) bits.

GB

Gigabyte. Approximately one billion (1,000,000,000) bytes. Used to describe the storage capacity of hard disk drives. A gigabyte is usually computed as 109 (1,000,000,000) bytes, but can also be computed as 230 (1,073,741,824) bytes (often called a "binary gigabyte" and abbreviated GiB).

Gb/s

Gigabits (Gb) per second. Used to describe the speed of network data transmission.

GB/s

Gigabytes (GB) per second. Used to describe the speed of network data transmission. 1 GB/s is eight times faster than 1Gb/s.

gigabit interface converter

A standard for transceivers, commonly used with Gigabit (Gb) Ethernet and Fibre Channel, with a hot-swappable electrical interface. Gigabit interface converter ports can support a wide range of physical media, from copper to optical fibre, at lengths of up to hundreds of kilometers.

graphical user interface

A type of user interface that enables users to interact with electronic devices using images rather than text commands. Nexsan Storage Systems use a graphical user interface for system configuration.

grounding bracelet

See anti-static wrist strap.

GUI

See graphical user interface.

H

hot-plug

To insert a new piece of hardware into a computerized system while the system is running. See also hot-swap.

hot-swap

To replace a failed or faulty component of a computerized system while the system is running. See also hot-plug.

I

I/O

Input/Output. The communication between an information processing system (such as a computer or a Nexsan Storage System RAID controller), and the outside world (either an operator or another information processing system). Inputs are the signals or data received by the system, and outputs are the signals or data sent from it.

IEC

The International Electrotechnical Commission. Prepares and publishes international standards for all electrical, electronic, and related technologies.

interconnect service module

A module of the Nexsan E-Series storage units that provides connectivity between all modules in the chassis.

IP address

Internet Protocol address. A numerical label assigned to each device (such as a computer, printer, or Nexsan Storage System) on a computer network that uses TCP/IP for communication.

iSCSI

Internet Small Computer System Interface. A transport protocol that provides for the SCSI protocol to be carried over a TCP/IP network.

ISM

See Interconnect Service Module.

L

LAN

See local area network.

LED

Light Emitting Diode. LEDs are used for indicator lights on the front and back of Nexsan Storage Systems.

local area network

A computer network that links devices within a small geographic area, such as a building or group of adjacent buildings.

M

Mb

Megabit. Approximately one million (1,000,000) bits.

Mb/s

Megabits (Mb) per second. Used to describe the speed of network data transmission.

P

PCIe

Peripheral Component Interconnect Express. A computer expansion card standard designed to replace the older Peripheral Component Interconnect (PCI), PCI-eXtended (PCI-X), and Accelerated Graphics Port (AGP) standards.

power supply unit

A module that regulates electrical power to the components of Nexsan Storage Systems.

PSU

See power supply unit.

R

rack

A metal frame designed to hold hardware devices.

rack-mounted

Attached to a rack.

rack mount

Hardware for attaching devices to a rack.

RAID

Redundant Array of Independent Disks. A system using multiple hard drives organized into a single logical unit for the sharing or replication of data in order to increase data integrity, fault-tolerance, and throughput. Also referred to as a RAID set. RAIDs are organized into RAID levels, which describe their architecture and configuration.

RAID Controller

A hardware device, software program, or combination of the two which manages the physical disk drives in a RAID and presents them as a single logical unit to attached devices. The RAID Controllers in Nexsan Storage Systems are hardware modules. Nexsan RAID Controllers also provide connections for system administration and configuration.

RAID level

A numeric indicator of the architecture used by a RAID. RAIDs can be built using any combination of striping, mirroring, and parity. The levels are numbered from 0 through 6. Some RAID levels can also be combined, and these configurations are usually referred to with a two-digit number. For example, RAID 10 = RAID 1 + RAID 0.

rail

A type of rack mount that enables a device to be easily slid into and back out of a rack.

S

SAN

See storage area network.

SAS

Serial Attached SCSI. A serial version of the SCSI interface. A point-to-point architecture that uses a disk controller with four or more channels that operate simultaneously. Each full-duplex channel, known as a SAS port, transfers data at 1.5Gb/s, 3Gb/s, or 6Gb/s in each direction. SAS also supports Serial ATA (SATA) drives, which can be mixed with SAS drives in a variety of configurations.

SATA

Serial Advanced Technology Attachment. A connection standard for fixed and removable hard disk drives.

SCSI

Small Computer System Interface. A collection of standards and proposed standards for input/output (I/O) communication, primarily intended for connecting storage subsystems or devices to hosts.

SFP

Small Form-factor Pluggable. A type of gigabit interface converter (GBIC) in a compact form factor. The Fibre Channel ports or 10Gb iSCSI ports on Nexsan storage devices are SFPs.

SSD

Solid State Disk. A high-performance storage device that contains no moving parts.

storage area network

An architecture that provides for attachment of remote computer storage devices to servers in such a way that the devices appear as locally attached to the operating system.

T

TB

Terabyte. Approximately one trillion (1,000,000,000,000) bytes. Used to describe the storage capacity of hard disk drives. A terabyte is usually computed as 1012 (1,000,000,000,000) bytes, but can also be computed as 240 (1,099,511,627,776) bytes (often called a "binary terabyte" and abbreviated TiB).

TCP/IP

Transmission Control Protocol/Internet Protocol. The set of communications protocols used for the Internet and other similar networks. TCP provides reliable delivery of messages between networked computers. IP uses numeric IP addresses to join network segments.

U

U

Unit. The standard unit of measure for designating the vertical usable space, or height, of racks. 1U is equal to 1.75 inches. A device that is described as being 1U in height may be shorter than 1.75 inches, but, due to the design of most racks, will still take up 1.75 inches of rack space.

W

WAN

See wide area network.

wide area network

A telecommunication network that covers a broad area or that links across metropolitan, regional, or national boundaries. Wide area networks are used to connect local area networks and other types of networks together, so that users and computers in one location can communicate with users and computers in other locations.

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