



# AssuredSAN 2333 Setup Guide

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Adobe PostScript

# Contents

About this guide . . . . .	11
Intended audience . . . . .	11
Prerequisites . . . . .	11
Related documentation . . . . .	11
Document conventions and symbols . . . . .	12
1 Components . . . . .	13
12-drive enclosure front panel components . . . . .	13
Controller enclosure — rear panel layout . . . . .	13
2333 controller module — rear panel components . . . . .	14
3130 drive enclosure rear panel components . . . . .	14
Component installation and replacement . . . . .	15
Cache . . . . .	15
CompactFlash . . . . .	15
Super-capacitor pack . . . . .	16
2 Installing the enclosures . . . . .	17
Installation checklist . . . . .	17
Network Equipment-Building System (NEBS) Level 3 compliance . . . . .	17
Generic Requirements (GRs) . . . . .	17
Exceptions to GRs . . . . .	18
Product documentation requirements . . . . .	18
Connecting the controller enclosure and drive enclosures . . . . .	18
Cable requirements for drive enclosures . . . . .	19
Summary of drive enclosure cabling illustrations . . . . .	20
Testing enclosure connections . . . . .	23
Powering on/powering off . . . . .	23
Power Cords . . . . .	23
AC PSU . . . . .	24
3 Connecting hosts . . . . .	25
Host system requirements . . . . .	25
Cabling considerations . . . . .	25
Connecting the enclosure to hosts . . . . .	25
iSCSI host ports (1Gb) . . . . .	26
Connecting direct attach configurations . . . . .	26
Single-controller configurations . . . . .	26
Dual-controller configurations . . . . .	27
Connecting switch attach configurations . . . . .	27
Connecting a management host on the network . . . . .	28
Updating firmware . . . . .	28
Obtaining IP values . . . . .	29
Setting network port IP addresses using DHCP . . . . .	29
Setting network port IP addresses using the CLI . . . . .	29
4 Basic operation . . . . .	33
Accessing RAIDar . . . . .	33
Configuring and provisioning the storage system . . . . .	33
5 Troubleshooting . . . . .	35
USB CLI port connection . . . . .	35
Fault isolation methodology . . . . .	35
Basic steps . . . . .	35
Options available for performing basic steps . . . . .	35
Use RAIDar . . . . .	35

Use the CLI . . . . .	36
Monitor event notification . . . . .	36
View the enclosure LEDs . . . . .	36
Performing basic steps . . . . .	36
Gather fault information. . . . .	36
Determine where the fault is occurring. . . . .	36
Review the event logs . . . . .	36
Isolate the fault . . . . .	37
If the enclosure does not initialize . . . . .	37
Correcting enclosure IDs. . . . .	37
Stopping I/O. . . . .	37
Diagnostic steps . . . . .	38
Is the enclosure front panel Fault/Service Required LED amber? . . . . .	38
Is the controller back panel FRU OK LED off? . . . . .	39
Is the controller back panel Fault/Service Required LED amber? . . . . .	39
Are both disk drive module LEDs off? . . . . .	39
Is the disk drive module Fault LED amber? . . . . .	39
Is a connected host port's Host Link Status LED off? . . . . .	40
Is a connected port's Expansion Port Status LED off? . . . . .	40
Is a connected port's Network Port link status LED off? . . . . .	40
Is the power supply's Input Power Source LED off? . . . . .	41
Is the Voltage/Fan Fault/Service Required LED amber? . . . . .	41
Isolating a host-side connection fault . . . . .	41
Isolating a controller module expansion port connection fault . . . . .	42
Resolving voltage and temperature warnings . . . . .	43
Sensor locations . . . . .	43
Power supply sensors . . . . .	43
Cooling fan sensors . . . . .	44
Temperature sensors . . . . .	44
Power supply module voltage sensors. . . . .	45
<b>A LED descriptions . . . . .</b>	<b>47</b>
12-drive enclosure front panel LEDs . . . . .	47
Disk drive LEDs. . . . .	48
Controller enclosure — rear panel layout. . . . .	50
2333 controller module — rear panel LEDs . . . . .	51
Cache Status LED details . . . . .	52
Power supply LEDs. . . . .	52
3130 drive enclosure rear panel LEDs. . . . .	53
<b>B Environmental requirements and specifications . . . . .</b>	<b>55</b>
Safety requirements . . . . .	55
Site requirements and guidelines . . . . .	55
Site wiring and AC power requirements . . . . .	55
Weight and placement guidelines . . . . .	56
Electrical guidelines . . . . .	56
Ventilation requirements . . . . .	56
Cabling requirements. . . . .	56
Management host requirements . . . . .	57
Physical requirements . . . . .	57
Environmental requirements . . . . .	58
Electrical requirements . . . . .	59
Site wiring and power requirements. . . . .	59
Power cable requirements. . . . .	59
<b>C Electrostatic discharge . . . . .</b>	<b>61</b>
Preventing electrostatic discharge . . . . .	61
Grounding methods to prevent electrostatic discharge. . . . .	61

D USB device connection . . . . .	63
Rear panel USB ports . . . . .	63
USB CLI port . . . . .	63
Emulated serial port . . . . .	63
Supported host applications . . . . .	64
Command-line Interface . . . . .	64
Device driver/special operation mode . . . . .	64
Microsoft Windows . . . . .	64
Obtaining the software download . . . . .	64
Linux . . . . .	65
Setting parameters for the device driver . . . . .	65
Index . . . . .	67



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# Figures

1	CompactFlash	15
2	Cabling connections between a controller enclosure and one drive enclosure	20
3	Fault-tolerant cabling between a dual-controller enclosure and four drive enclosures	21
4	Reverse cabling between a dual-controller enclosure and seven drive enclosures	22
5	AC PSU	24
6	AC power cord	24
7	Connecting hosts — one server/one HBA/dual path	27
8	Connecting hosts — two servers/one HBA per server/dual path	27
9	Connecting hosts — switch attach: multiple servers/switches	28
10	Connecting a USB cable to the CLI port	30
11	USB device connection — CLI port	63





# Tables

1	Related documents	11
2	Document conventions	12
3	Installation checklist	17
4	Summary of SAS cabling to attach drive enclosures to the controller enclosure	19
5	Terminal emulator display settings	30
6	Terminal emulator connection settings	30
7	Diagnostics LED status — Front panel “Fault/Service Required”	38
8	Diagnostics LED status — Rear panel “FRU OK”	39
9	Diagnostics LED status — Rear panel “Fault/Service Required”	39
10	Diagnostics LED status — Disk drives (LFF and SFF modules)	39
11	Diagnostics LED status — Disk drive fault status (LFF and SFF modules)	39
12	Diagnostics LED status — Rear panel “Host Link Status”	40
13	Diagnostics LED status — Rear panel “Expansion Port Status”	40
14	Diagnostics LED status — Rear panel “Network Port Link Status”	40
15	Diagnostics LED status — Rear panel power supply “Input Power Source”	41
16	Diagnostics LED status — Rear panel power supply “Voltage/Fan Fault/Service Required”	41
17	Power supply sensor descriptions	43
18	Cooling fan sensor descriptions	44
19	Controller module temperature sensor descriptions	44
20	Power supply temperature sensor descriptions	44
21	Voltage sensor descriptions	45
22	LEDs — 2U12 enclosure front panel	47
23	LEDs — Disk with a dongle	48
24	LEDs — Disks in LFF enclosures	49
25	LEDs — Vdisks in LFF enclosures	49
26	LEDs — 2333 controller module — rear panel	51
27	LEDs — Power supply units — rear panel	52
28	LEDs — 3130 rear panel	53
29	Power requirements - AC Input	55
30	Rackmount enclosure dimensions	57
31	Rackmount controller enclosure weights	57
32	Rackmount compatible drive enclosure weights (ordered separately)	58
33	Operating environmental specifications	58
34	Non-operating environmental specifications	58
35	Supported terminal emulator applications	64
36	USB vendor and product identification codes	64



# About this guide

This guide provides information about initial hardware setup for the AssuredSAN™ 2333 storage product shown below:

Internet SCSI (1Gb) Controller Enclosure: 2333

AssuredSAN 2333 enclosures are designed to meet NEBS Level 3, MIL-STD-810G (storage requirements), and European Telco requirements. The 2333 is a large form factor (LFF 12-disk) 2U controller enclosure equipped with two controller modules and two AC power supplies.

The 2333 can optionally be cabled to 3130 drive enclosures for adding storage. The 3130 is an LFF 12-disk 2U expansion enclosure equipped with two expansion modules and two AC power supplies.

See the Dot Hill web site for more information about specific storage product models and uses: <http://www.dothill.com>.

## Intended audience

This guide is intended for storage system administrators.

## Prerequisites

Prerequisites for installing and using this product include knowledge of:

- Servers and computer networks
- Network administration
- Storage system installation and configuration
- Storage area network (SAN) management and direct attach storage (DAS)
- Internet SCSI (iSCSI), Serial Attached SCSI (SAS), and Ethernet protocols

## Related documentation

This guide refers to related documentation as shown in [Table 1](#) below. Many of the related documents are from AssuredSAN 3000 Series.

**Table 1** Related documents

For information about	See
Enhancements, known issues, and late-breaking information not included in product documentation	Release Notes
Overview of product shipkit contents and setup tasks	Getting Started*
Installing and using optional host-based software components (CAPI Proxy, MPIO DSM, VDS Provider, VSS Provider, SES Driver)	AssuredSAN Installing Optional Software for Microsoft Windows® Server
Using a rackmount bracket kit to install an enclosure into a rack	AssuredSAN Rackmount Bracket Kit Installation* or AssuredSAN 2-Post Rackmount Bracket Kit Installation*
Obtaining and installing a license to use licensed features	AssuredSAN 3000 Obtaining and Installing a License Certificate File
Using the web interface to configure and manage the product	AssuredSAN 3000 Series RAIDar User Guide
Using the command-line interface (CLI) to configure and manage the product	AssuredSAN 3000 Series CLI Reference Guide

**Table 1** Related documents (continued)

For information about	See
Event codes and recommended actions	AssuredSAN Event Descriptions Reference Guide
Identifying and installing or replacing field-replaceable units (FRUs)	AssuredSAN 3000 Series FRU Installation and Replacement Guide

\* Printed document included in product shipkit.


For additional information, see Dot Hill's Customer Resource Center web site: <http://crc.dothill.com>.

## Document conventions and symbols

**Table 2** Document conventions

Convention	Element
Blue text	Cross-reference links and e-mail addresses
Blue, underlined text	Web site addresses
<b>Bold</b> text	<ul style="list-style-type: none"><li>• Key names</li><li>• Text typed into a GUI element, such as into a box</li><li>• GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes</li></ul>
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none"><li>• File and directory names</li><li>• System output</li><li>• Code</li><li>• Text typed at the command-line</li></ul>
<i>Monospace, italic</i> text	<ul style="list-style-type: none"><li>• Code variables</li><li>• Command-line variables</li></ul>
<b>Monospace, bold</b> text	Emphasis of file and directory names, system output, code, and text typed at the command-line

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 **WARNING!** Indicates that failure to follow directions could result in bodily harm or death.


---

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 **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.


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 **IMPORTANT:** Provides clarifying information or specific instructions.

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 **NOTE:** Provides additional information.

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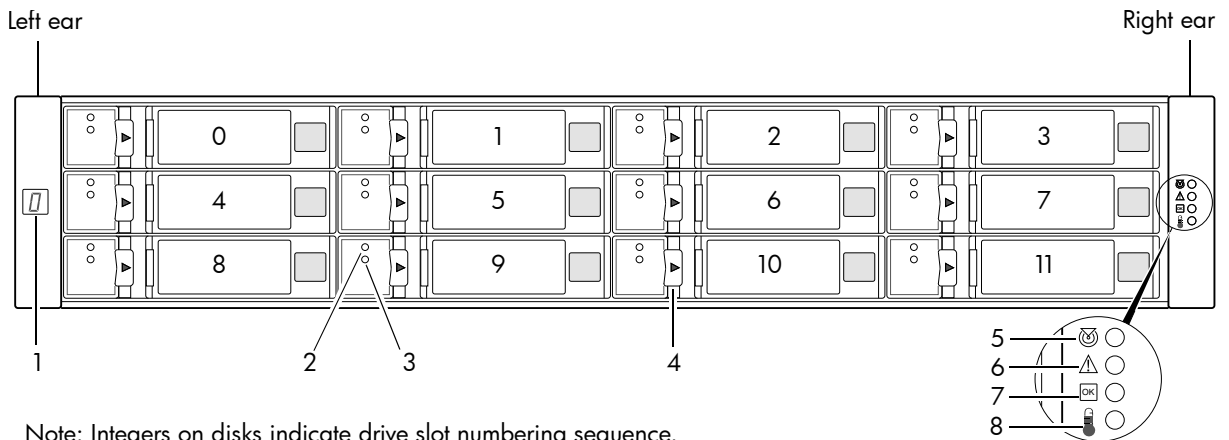
 **TIP:** Provides helpful hints and shortcuts.

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# 1 Components

## 12-drive enclosure front panel components



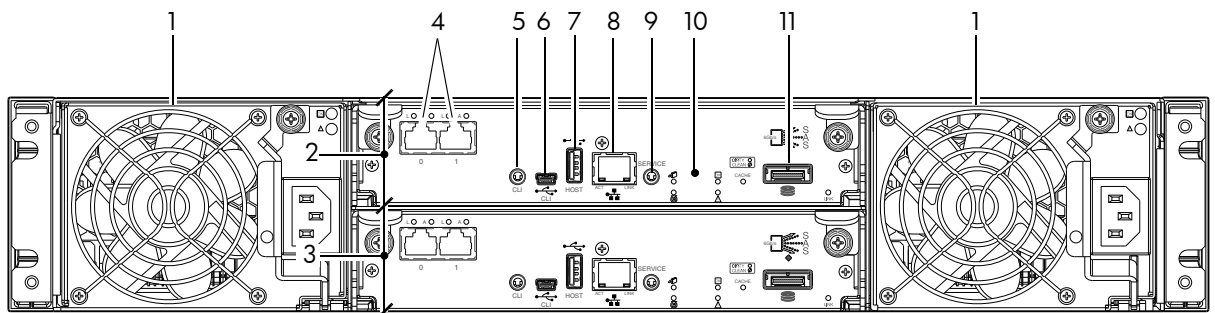
Note: Integers on disks indicate drive slot numbering sequence.

- |   |  |
|---|--|
| 1 Enclosure ID LED                            | 5 Enclosure status LED: Unit Locator           |
| 2 Disk drive status LED: OK to Remove         | 6 Enclosure status LED: Fault/Service Required |
| 3 Disk drive status LED: Power/Activity/Fault | 7 Enclosure status LED: FRU OK                 |
| 4 3.5" disk or drive blank (typical 12 slots) | 8 Enclosure status LED: Temperature Fault      |

**NOTE:** Front panel LEDs and rear panel LEDs for controller enclosures are described in [LED descriptions](#).

## Controller enclosure — rear panel layout

The diagram and table below display and identify important component items that comprise the rear panel layout of an AssuredSAN 2333 controller enclosure.



2333 model is shown as a locator

- |  |   |
|--|---|
| 1 AC power supplies                        | 7 Host port (USB - Type A; reserved for future use)   |
| 2 Controller module A                      | 8 Network port  |
| 3 Controller module B                      | 9 Service port (used by service personnel only)   |
| 4 1Gb iSCSI ports: host interface          | 10 Disabled button (used by engineering/test only)<br>[Not present on newer controller module versions] |
| 5 Reserved for future use                  | 11 Expansion port   |
| 6 CLI port (USB - Type B) [see Appendix D] |   |

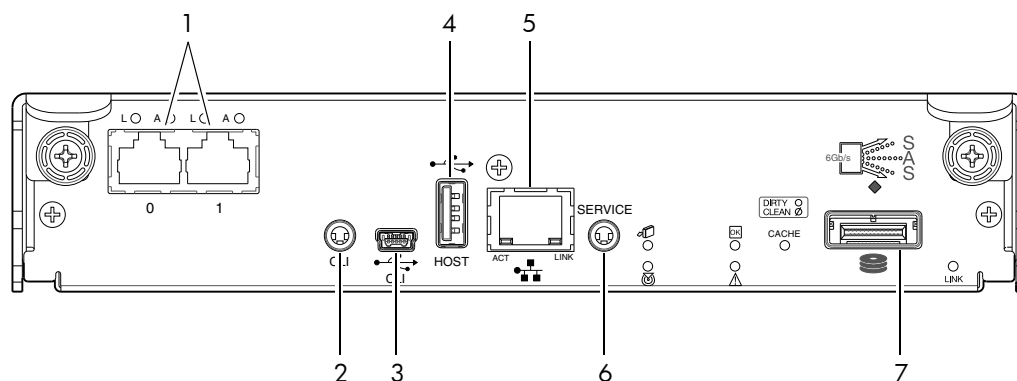
A controller enclosure accommodates an AC power supply FRU in each of the two power supply slots (see two instances of callout No.1 above). The controller enclosure accommodates two controller module FRUs of the same type within the I/O module (IOM) slots (see callouts No.2 and No.3 above).

**IMPORTANT:** The 2333 controller enclosures support dual-controller configuration only. Single-controller support is provided only when a controller fails over to its partner controller (also see the “About data protection in a single-controller storage system” topic in the RAIDar User Guide. A controller module must be installed in each I/O module slot to ensure sufficient airflow through the enclosure during operation.

The diagrams with tables that immediately follow provide descriptions for the different controller modules and power supply modules that can be installed into the rear panel of a 2333 controller enclosure. Showing controller modules and power supply modules separately from the enclosure enables improved clarity in identifying the component items called out in the diagrams and described in the tables.

A description of the optional 3130 drive enclosure — supported by 2333 controller enclosures — is also provided. When used with a 2333, the 3130 is equipped with dual-IOMs.

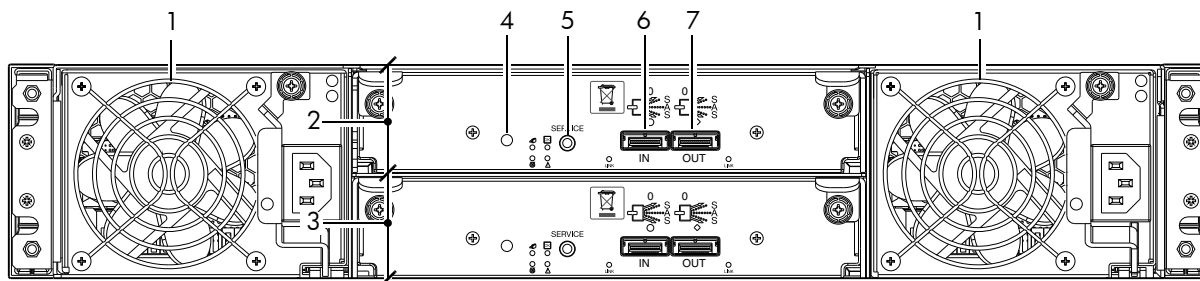
## 2333 controller module — rear panel components



- |   |   |
|---|---|
| 1 1Gb iSCSI ports: host interface                   | 5 Network port                                  |
| 2 Reserved for future use                           | 6 Service port (used by service personnel only) |
| 3 CLI port (USB - Type B) [see Appendix D]          | 7 Expansion port                                |
| 4 Host port (USB - Type A; reserved for future use) |   |

## 3130 drive enclosure rear panel components

AssuredSAN 2333 controller enclosures support 3130 drive enclosures for expansion of storage capacity. These drive enclosures use mini-SAS (SFF-8088) connectors to facilitate backend SAS expansion. See [Cable requirements for drive enclosures](#) on page 19 for cabling information.



- |   |   |
|---|---|
| 1 Power supplies (AC shown)                       | 5 Service port (used by service personnel only) |
| 2 Expansion module A                              | 6 SAS In port                                   |
| 3 Expansion module B                              | 7 SAS Out port                                  |
| 4 Disabled button (used by engineering/test only) |   |

## Component installation and replacement

Installation and replacement of 2333 FRUs (field-replaceable units) is addressed in the *AssuredSAN 3000 Series FRU Installation and Replacement Guide* within the “Procedures” chapter.

FRU procedures facilitate replacement of a damaged chassis or chassis component:

- Replacing a controller or expansion module
- Replacing a disk drive module
- Replacing a power supply unit (AC and DC units with integrated cooling fans)  
(DC power supplies are not applicable to the 2333; however, they apply to 3000 Series)
- Replacing ear bezels
- Replacing a Fibre Channel transceiver (applies to 3000 Series only)
- Replacing a 10GbE SFP+ transceiver (applies to 3000 Series only)
- Replacing a controller enclosure chassis

See Dot Hill’s Customer Resource Center web site for additional information: <http://crc.dothill.com>.

Select **AssuredSAN & R/Evolution Products > 3000 Series** to download the FRU I&R guide.

## Cache

To enable faster data access from disk storage, the following types of caching are performed:

- Write-back or write-through caching. The controller writes user data into the cache memory in the controller module rather than directly to the disks. Later, when the storage system is either idle or aging — and continuing to receive new I/O data — the controller writes the data to the disks.
- Read-ahead caching. The controller detects sequential data access, reads ahead into the next sequence of data — based upon settings — and stores the data in the read-ahead cache. Then, if the next read access is for cached data, the controller immediately loads the data into the system memory, avoiding the latency of a disk access.

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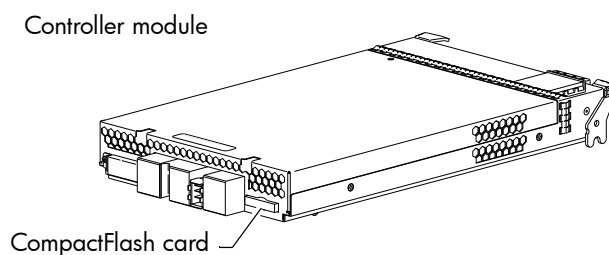
**TIP:** See the “About volume cache options” and “Changing system cache settings” topics in the RAIDar User Guide for setting options.

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## CompactFlash

During a power loss or controller failure, data stored in cache is saved off to non-volatile memory (CompactFlash). The data is restored to cache, and then written to disk after the issue is corrected. CompactFlash provides unlimited cache memory backup time. To protect against writing incomplete data to disk, the image stored on the CompactFlash is verified before committing to disk.

The CompactFlash card is located at the midplane-facing end of the controller module as shown below. Do not remove the card; it is used for cache recovery only.



**Figure 1** CompactFlash

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**IMPORTANT:** Customer removal of CompactFlash will void the product warranty.

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## Super-capacitor pack

To protect controller module cache in case of power failure, each controller enclosure model is equipped with super-capacitor technology, in conjunction with CompactFlash memory, built into each controller module to provide unlimited cache memory backup time. The super-capacitor pack provides energy for backing up unwritten data in the write cache to the CompactFlash, in the event of a power failure. Unwritten data in CompactFlash memory is automatically committed to disk media when power is restored. In the event of power failure, while cache is maintained by the super-capacitor pack, the Cache Status LED flashes at a rate of 1/10 second on and 9/10 second off.



## 2 Installing the enclosures

### Installation checklist

The following table outlines the steps required to install the enclosures, and initially configure and provision the storage system. To ensure successful installation, perform the tasks in the order presented.

**Table 3** Installation checklist

Step	Task	Where to find procedure
1.	Install the controller enclosure and optional drive enclosures in the rack, and attach ear caps or enclosure bezel. <sup>1</sup>	See the rack-mount bracket kit installation instructions pertaining to your enclosure. If your product uses a bezel, see its bezel kit installation instructions.
2.	Connect controller enclosure and optional drive enclosures.	See <a href="#">Connecting the controller enclosure and drive enclosures</a> on page 18.
3.	Connect power cords.	See <a href="#">Powering on/powering off</a> on page 23.
4.	Test enclosure connectivity.	See <a href="#">Testing enclosure connections</a> on page 23.
5.	Install required host software.	See <a href="#">Host system requirements</a> on page 25.
6.	Connect hosts. <sup>2</sup>	See <a href="#">Connecting the enclosure to hosts</a> on page 25.
7.	Connect remote management hosts. <sup>2</sup>	See <a href="#">Connecting a management host on the network</a> , page 28.
8.	Obtain IP values and set network port IP properties on the controller enclosure.	See <a href="#">Obtaining IP values</a> on page 29. For USB CLI port and cable use, see Appendix D. Also see the ship kit CD.
9.	Perform initial configuration tasks <sup>3</sup> : <ul style="list-style-type: none"><li>• Sign-in to the web-based storage management application (RAIDar).</li><li>• Initially configure and provision the system using RAIDar.</li></ul>	Topics below correspond to bullets at left:  See "Getting Started" in the web-posted <i>AssuredSAN 3000 Series RAIDar User Guide</i> .  See "Configuring the System" and "Provisioning the System" topics in the RAIDar User Guide or online help.

<sup>1</sup>Also see *AssuredSAN 3000 Series FRU Installation and Replacement Guide* for illustrations showing installation of enclosure ear caps (some enclosure models use an enclosure bezel instead of ear caps).

<sup>2</sup>For more about hosts, see the "About hosts" topic in the *AssuredSAN 3000 Series RAIDar User Guide*.

<sup>3</sup>RAIDar is introduced in [Accessing RAIDar](#) on page 33. See the RAIDar User Guide or online help for additional information.

---

 **NOTE:** Additional installation notes:

- Controller modules within the same enclosure must be of the same type.
  - For optimal performance, do not mix 6Gb and 3Gb disk drives within the same enclosure.
- 


## Network Equipment-Building System (NEBS) Level 3 compliance

### Generic Requirements (GRs)

Meets the NEBS requirement of GR-1089-CORE Issue 5, port types 2, 7 & 8.

Meets the NEBS requirements of GR-63-CORE Issue 3, for the product's intended use.

---

 **NOTE:** [Table 4](#) on page 19 shows NEBS-compliance for individual storage enclosures.

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## Exceptions to GRs

Exceptions to the overall NEBS GR-63-CORE Issue 3 requirements include:

- Heat Dissipation: Environmental Criteria Section 4.1.6, Operational Requirement O4-20. This product exceeds the Optional Requirements shown in Table 4-5 for Forced-Air Fan Shelf equipment.
- Airborne Contaminants: This product is designed for indoor use only, and has not been tested for Outdoor Contaminant Levels (Table 4-11); per Requirement R4-86 (Environmental Criteria section 4.5.2.2).
- Equipment — Fan Filters: Environmental Criteria Section 4.5.4. This product does not have a fan filter, and has not been tested by any requirements in section 4.5.4. The following requirements have not been tested: R4-87 [138]; R4-88 [139]; R4-89 [176]; R4-90 [140]; R4-91 [141]; R4-92 [142]; R4-93 [143]; O4-94 [144] and O4-95 [145].
- This product does not meet the requirements of Spatial Requirements, Section 2.

Exceptions to the overall NEBS GR-1089-CORE Issue 5 requirements include:

- None reported

## Product documentation requirements

NEBS product documentation requirements applying to AssuredSAN 2333 controller and drive enclosures are listed beneath “NEBS (Level 3)” in the Index — under either GR-1089-CORE Issue 5 or GR-63-CORE Issue 3 — together with adjacent page locations. NEBS topics are *integrated* within the overall content of this setup guide. The requirement designators in the Index have been codified for use within index marker tags according to the following example:

NEBS generic requirement number “R2-7 [7]” appears as “R2-7.7” within the Index.

Each codified string (e.g., R2-7.7) is followed by a hyphen and brief description of the requirement. Within the Index, click on the [blue page number](#) link to navigate to the corresponding NEBS topic.

## Connecting the controller enclosure and drive enclosures

AssuredSAN 2333 controller enclosures — available in 12-drive (3.5") chassis — support up to eight enclosures (including the controller enclosure), or a maximum of 96 disk drives. 2333 enclosures support both *straight-through* and *reverse* SAS cabling. Reverse cabling allows any drive enclosure to fail — or be removed — while maintaining access to other enclosures. Fault tolerance and performance requirements determine whether to optimize the configuration for high availability or high performance when cabling. AssuredSAN 2333 controller modules support both 3-Gbps and 6-Gbps internal disk drive speeds together with 3-Gbps and 6-Gbps expander link speeds.


---

△ **CAUTION:** Some 6-Gbps disks might not consistently support a 6-Gbps transfer rate. If this happens, the system automatically adjusts transfers to those disks to 3 Gbps, increasing reliability and reducing error messages with little impact on system performance. This rate adjustment persists until the controller is restarted or power-cycled.

---

Cabling diagrams in this section show fault-tolerant cabling patterns. Controller and expansion modules are identified by <enclosure-ID><controller-ID>. When connecting multiple drive enclosures, use reverse cabling to ensure the highest level of fault tolerance, enabling controllers to access remaining drive enclosures if a drive enclosure fails.


For example, the illustration on the left in [Figure 3](#) on page 21 shows reverse cabling, wherein controller 0A (i.e., enclosure-ID = 0; controller-ID = Able) is connected to expansion module 1A, with a chain of connections cascading down (blue). Controller 0B is connected to the lower expansion module (B) of the last drive enclosure in the chain, with connections moving in the opposite direction (green). Several cabling examples are provided on the following pages.

 **NOTE:** AssuredSAN 2333 controller enclosures support hot-plug replacement of redundant controller modules, fans, power supplies, and I/O modules. Hot-add of drive enclosures is also supported.

## Cable requirements for drive enclosures

2333 enclosures support 6-Gbps or 3-Gbps expansion port data rates. Observe the following guidelines when installing SAS cables (see [Table 4](#) below):

- Use only AssuredSAN or OEM-qualified SAS cables appropriate for connecting the drive enclosure:
  - For 6-Gbps drive enclosures, use cables providing 6-Gbps data rate per lane with four lanes (4x) per SAS connector:
    - When connecting a controller enclosure to a drive enclosure, the cable length should not exceed 2.0 meters
    - When connecting drive enclosures to one another, cable lengths should not exceed 2.0 meters
  - Qualified cables of 0.6 meter length may be used for cabling stacked components in cascaded fashion
  - Mini-SAS to mini-SAS cables denote SFF-8088 to SFF-8088 connectors
- You may need to order additional or longer cables when reverse-cabling a fault-tolerant configuration (see [Figure 4](#) on page 22).

 **TIP:** Requirements for cabling 2333 controller enclosures and supported drive enclosures are summarized in [Table 4](#) on page 19.

[Table 4](#) summarizes key characteristics of controller enclosures and compatible drive (expansion) enclosures relative to cabling, including: the cable type needed for attaching one specific enclosure model to another specific enclosure model; internal disk drive speeds; number of disks of given size (SFF or LFF) supported per enclosure model; and SAS expander data rates. Enclosure form factor (2U24/2U12) and NEBS compliance information are also provided.

**Table 4** Summary of SAS cabling to attach drive enclosures to the controller enclosure

Enclosure models	2U12 controller enclosure	2U24 drive enclosure	2U12 drive enclosure
2333 — 1Gb iSCSI	Not applicable	Not applicable	mini-SAS to mini-SAS
3130 (LFF 12-drive)	mini-SAS to mini-SAS		mini-SAS to mini-SAS
<u>Enclosure chassis designators:</u>			
2U24: Enclosure measuring two rack units high, providing 24 SFF (2.5") disks (Not used with 2333).			
2U12: Enclosure measuring two rack units high, providing 12 LFF (3.5") disks.			
<u>Compatible product models featuring 6 Gbit/s internal disk and SAS expander link speeds:</u>			
2333: 1 Gb iSCSI dual-IOM controller enclosure (3.5" disks in 2U12 chassis) [NEBS]			
3130 dual-IOM drive enclosure: 12-drive expansion enclosure (3.5" disks in 2U12 chassis) [NEBS]			
See <a href="#">Physical requirements</a> on page 57 for more information about 2U24 and 2U12 enclosures.			

 **NOTE:** Additional cabling notes:

- Cables required, if not included, must be separately purchased.
- Spanning a single drive enclosure requires a 0.6 m (1.97') cable.
- When adding more than two drive enclosures, you may need to purchase additional 1 m or 2 m cables:
  - Spanning 3, 4, or 5 drive enclosures requires 1 m (3.28') cables.
  - Spanning 6, 7, 8, or 9 drive enclosures requires 2 m (6.56') cables.

---

**NOTE:** For clarity, the schematic diagrams show only relevant details such as face plate outlines and expansion ports. For detailed illustrations, see [Controller enclosure — rear panel layout](#) on page 13. Also see the controller module face plate illustration that follows the rear panel layout.

---

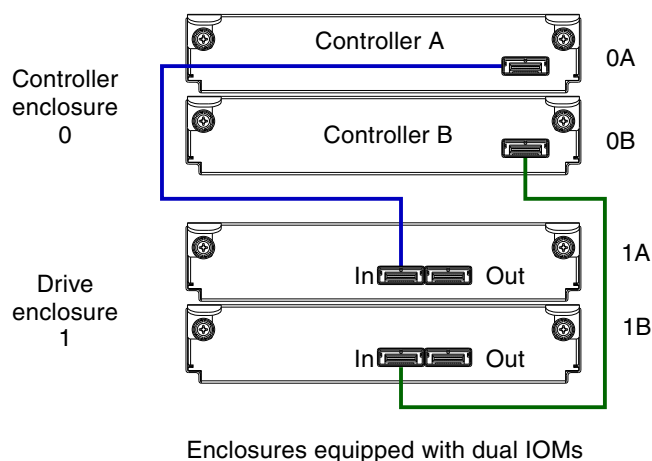
## Summary of drive enclosure cabling illustrations

The following illustrations show both *straight-through* and *reverse* cabling examples featuring 2333 controller enclosures and 3130 (2U12) drive enclosures. All enclosures use mini-SAS connectors.

---

**NOTE:** 2333 controller enclosures and compatible 3130 drive enclosures support mini-SAS SFF-8088 connectors for adding storage. See [Table 4](#) on page 19 for SAS cable requirements.

---



**Figure 2** Cabling connections between a controller enclosure and one drive enclosure

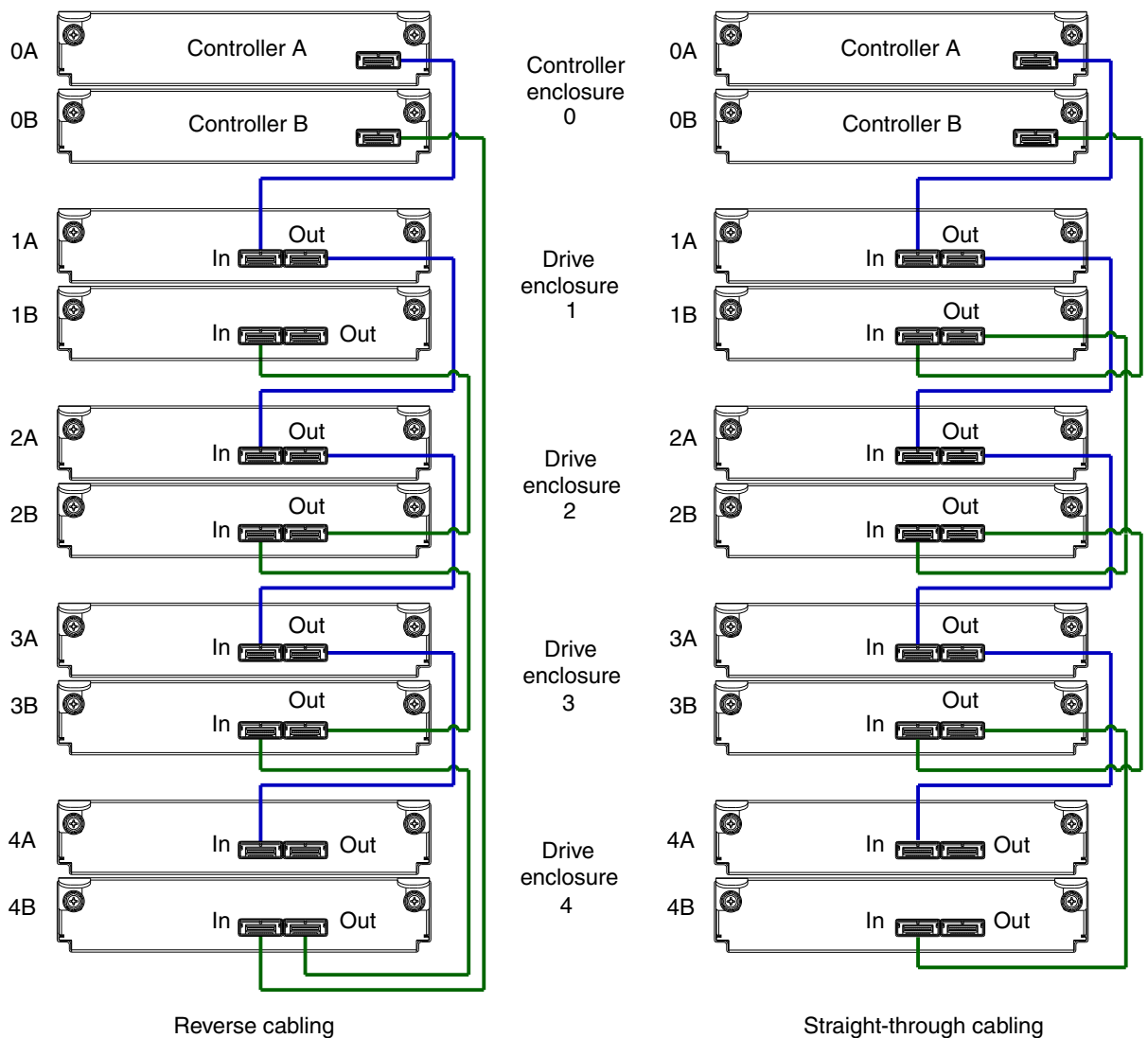
The diagram above shows a 2333 controller enclosure equipped with dual-controller modules cabled to a 3130 drive enclosure equipped with dual-expansion modules.

---

**IMPORTANT:** The 2333 controller enclosures support dual-controller configuration only. Single-controller support is provided only when a controller fails over to its partner controller. A controller module must be installed in each I/O module slot to ensure sufficient airflow through the enclosure during operation.

---

See “Replacing a controller or expansion module” within the *AssuredSAN 3000 Series FRU Installation and Replacement Guide* for additional information.

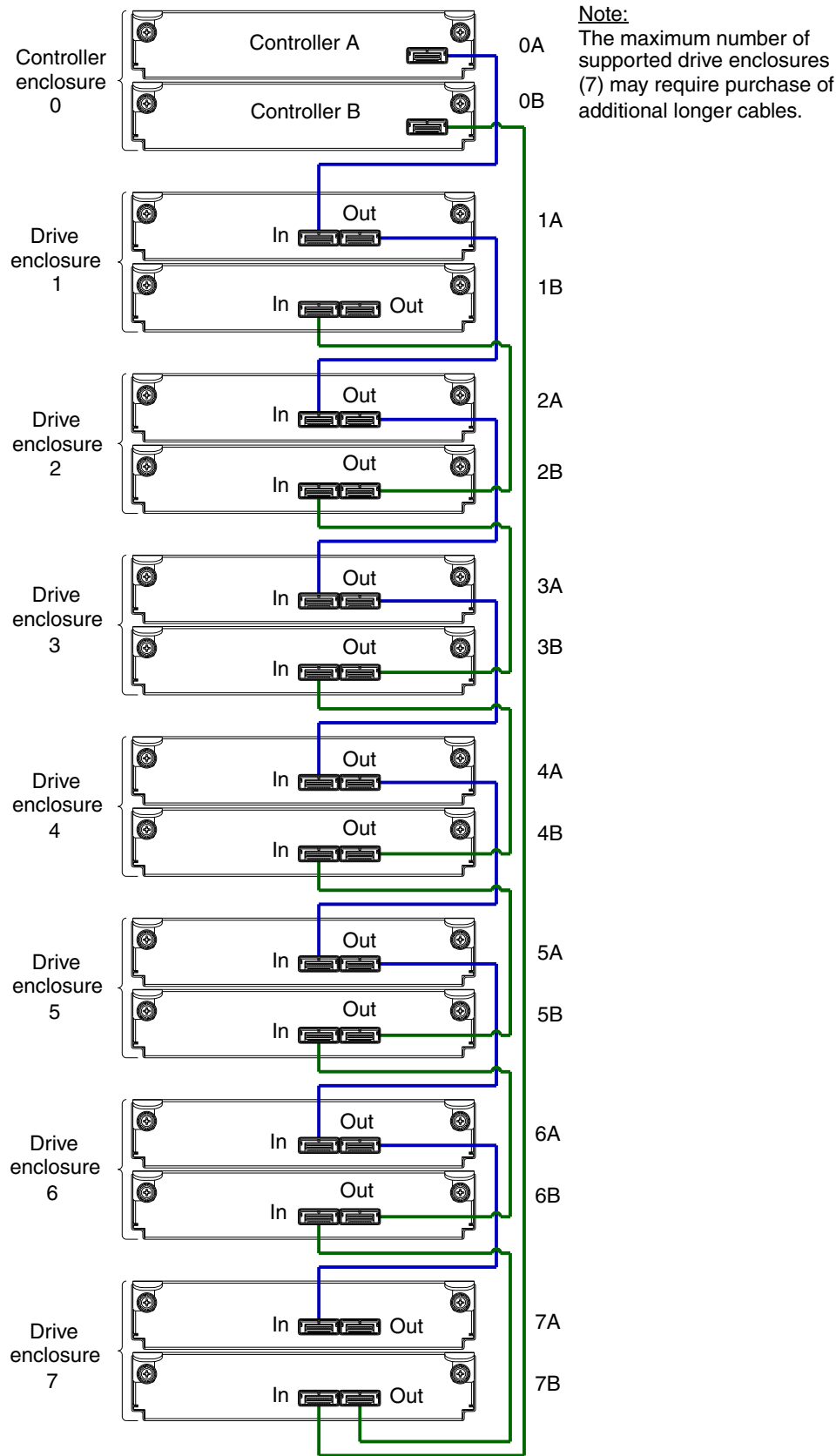


**Figure 3** Fault-tolerant cabling between a dual-controller enclosure and four drive enclosures

The diagram at left (above) shows reverse cabling of a 2333 dual-controller enclosure and 3130 drive enclosures configured with dual-expansion modules. Controller module 0A is connected to expansion module 1A, with a chain of connections cascading down (blue). Controller module 0B is connected to the lower expansion module (4B), of the last expansion enclosure, with connections moving in the opposite direction (green). Reverse cabling allows any expansion enclosure to fail—or be removed—while maintaining access to other enclosures.

The diagram at right (above) shows the same storage components connected using straight-through cabling. Using this method, if an expansion enclosure fails, the enclosures that follow the failed enclosure in the chain are no longer accessible until the failed enclosure is repaired or replaced.

Refer to these diagrams when cabling multiple compatible drive enclosures together with the 2333 controller enclosure.




**Figure 4** Reverse cabling between a dual-controller enclosure and seven drive enclosures

The diagram above shows a dual-controller 2333 enclosure cabled to 3130 drive enclosures featuring dual-expansion modules. Controller module 0A is connected to expansion module 1A, with a chain of connections cascading down (blue). Controller module 0B is connected to the lower expansion module (7B), of the last drive enclosure, with connections moving in the opposite direction (green).

## Testing enclosure connections

Power cycling procedures vary according to the type of power supply unit (PSU) provided with the enclosure. Some enclosure models are equipped with PSUs possessing power switches; whereas 2333 controller enclosures use PSUs that have no power switch.

---

 **NOTE:** For NEBS applications, verify that you are using compatible PSUs and drive enclosures.

---


The following section, [Powering on/powering off](#), describes power cycling procedures relative to PSUs installed within enclosures. Once the power-on sequence succeeds, the storage system is ready to be connected to hosts as described in [Connecting the enclosure to hosts](#) on page 25.

## Powering on/powering off

Before powering on the enclosure for the *first* time:

- Install all disk drives in the enclosure so the controller can identify and configure them at power-up.
- Connect the cables and power cords to the enclosure as described herein.


---

 **NOTE:** Newer AC PSUs do not have power switches. *Switchless* PSUs power on when connected to a power source, and power off when disconnected.

---

- Generally, when powering up, make sure to power up the enclosures and associated data host in the following order:
  - Drive enclosures *first*  
This ensures that the disks in the drive enclosure have enough time to completely spin up before being scanned by the controller modules within the controller enclosure.  
While enclosures power up, their LEDs blink. After the LEDs stop blinking — if no LEDs on the front and back of the enclosure are amber — the power-on sequence is complete, and no faults have been detected. See [LED descriptions](#) on page 47 for descriptions of LED behavior.
  - Controller enclosure *next*  
Depending upon the number and type of disks in the system, it may take several minutes for the system to become ready.
  - Data host *last* (if powered down for maintenance purposes).

---

 **TIP:** Generally, when powering off, you will reverse the order of steps used for powering on.

---

## Power Cords

See [Power cable requirements](#) on page 59 for additional information.

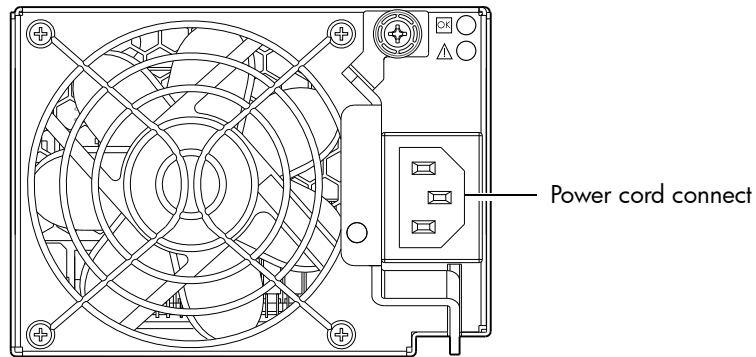
---

 **IMPORTANT:** See [Environmental requirements and specifications](#) for additional information.

---

## AC PSU

Controller and drive enclosures configured with switchless PSUs rely on the power cord for power cycling. Connecting the cord from the PSU power cord connector to the appropriate power source facilitates power on; whereas disconnecting the cord from the power source facilitates power off.

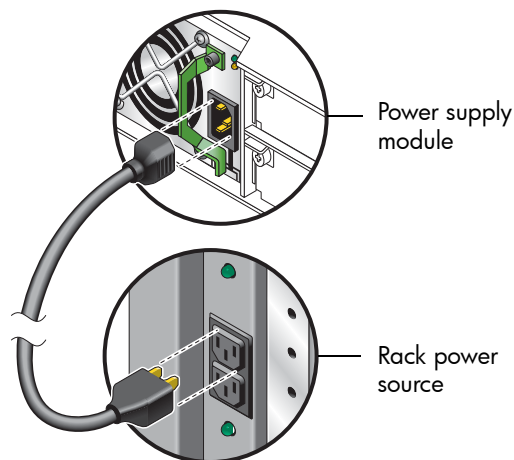


**Figure 5** AC PSU

### To power on the system:

1. Plug the power cord into the power cord connector on the back of the drive enclosure. Plug the other end of the power cord into the rack power source (see [Figure 5](#) and [Figure 6](#)). Wait several seconds to allow the disks to spin up.  
Repeat this sequence for each switchless PSU within each drive enclosure.
2. Plug the power cord into the power cord connector on the back of the controller enclosure. Plug the other end of the power cord into the rack power source (see [Figure 5](#) and [Figure 6](#)).  
Repeat the sequence for the controller enclosure's other switchless PSU.

Power cord facilitates power on/power off



**Figure 6** AC power cord

### To power off the system:

1. Stop all I/O from hosts to the system (see [Stopping I/O](#) on page 37).
2. Shut down both controllers using *either* method described below:
  - Use RAIDar to shut down both controllers, as described in the online help and *AssuredSAN 3000 Series RAIDar User Guide*.  
Proceed to [step 3](#).
  - Use the command-line interface (CLI) to shut down both controllers, as described in the *AssuredSAN 3000 Series CLI Reference Guide*.
3. Disconnect the power cord's male plug from the power source.
4. Disconnect the power cord's female plug from the power cord connector on the PSU.



---


## 3 Connecting hosts

### Host system requirements

Hosts connected to an AssuredSAN 2333 controller enclosure must meet the following requirements:

- Depending on your system configuration, host operating systems may require that multipathing is supported.

---

 **TIP:** See the web-posted *AssuredSAN Installing Optional Software for Microsoft Windows® Server* to aid in planning and implementing your MPIO DSM installation.

---

If fault tolerance is required, then multipathing software may be required. Host-based multipath software should be used in any configuration where two logical paths between the host and any storage volume may exist at the same time. This would include most configurations where there are multiple connections to the host or multiple connections between a switch and the storage.

- Use R/Evolution MPIO DSM with Windows Server 2003. Download the software from <http://crc.dothill.com>.
- Use native Microsoft MPIO DSM support with Windows Server 2008. Use either the Server Manager or the command-line interface (*mpclaim* CLI tool) to perform the installation. See *AssuredSAN Installing Optional Software for Microsoft Windows® Server* and the following web sites for information about using native Microsoft MPIO DSM:  
<http://support.microsoft.com/gp/assistsupport>  
<http://technet.microsoft.com> (search the site for “multipath I/O overview”)
- To prevent Microsoft Windows 2003 hosts from displaying the Found New Hardware Wizard when the storage system is discovered, install the R/Evolution SCSI Enclosure Services driver from <http://crc.dothill.com>.

---

 **NOTE:** The R/Evolution SCSI Enclosure Services driver is *required* for Windows Server 2003.

---


### Cabling considerations

Common cabling configurations address hosts, controller enclosures, drive enclosures, and switches. Host interface ports on 2333 controller enclosures can connect to respective hosts via direct-attach or switch-attach.

### Connecting the enclosure to hosts

A *host* identifies an external port to which the storage system is attached. Cable connections vary depending on configuration. This section describes host interface protocols supported by 2333 controller enclosures, while showing a few common cabling configurations.

---

 **NOTE:** 2333 controllers use Unified LUN Presentation (ULP) — a controller feature enabling a host to access mapped volumes through any controller host port.

---

ULP can show all LUNs through all host ports on both controllers, and the interconnect information is managed by the controller firmware. ULP appears to the host as an active-active storage system, allowing the host to select any available path to access the LUN, regardless of vdisk ownership.

---

**TIP:** See “Configuring the system > Using the Configuration Wizard” in the *AssuredSAN 3000 Series RAIDar User Guide* to initially configure the system or change system configuration settings (e.g., Configuring host ports).

---

## iSCSI host ports (1 Gb)

A 2333 provides two iSCSI ports per controller module—each supporting data rates up to 1-Gbps—using either one-way or mutual CHAP (Challenge-Handshake Authentication Protocol). The 2333 is configured with two controller modules, providing four iSCSI ports per enclosure.

---

**TIP:** See the “Configuring CHAP” topic within the *AssuredSAN 3000 Series RAIDar User Guide*. Also see the admonition about CHAP preceding the “Using the Replication Setup Wizard” procedure within that guide.

---

A 2333 employs iSCSI ports for attachment to iSCSI hosts directly —or through a switch used for the iSCSI traffic — requiring that the host computer supports Ethernet, iSCSI, and optionally, multipath I/O.

---

**TIP:** Use RAIDar’s Configuration Wizard to set iSCSI port options (within the RAIDar User Guide, see “Configuring the system > Using the Configuration Wizard > Configuring host ports,” and scroll to iSCSI port options).

---

Also see [2333 controller enclosure iSCSI considerations](#) on page 28.

## Connecting direct attach configurations

The 2333 supports up to four direct-connect server connections, two per controller module. Connect appropriate cables from the server’s HBAs to the controller module’s host ports as described below, and shown in the following illustrations.

To connect 2333 controller modules supporting 1Gb iSCSI host interface ports to a server HBA or switch — using the controller’s iSCSI ports — select (CAT5-E minimum) Ethernet cables supporting the 1 Gb RJ-45 copper host port iSCSI connector. Minimum cable length is 0.5 meters; maximum cable length is 7 meters.

## Single-controller configurations

A single-controller configuration provides no redundancy in the event of controller failure. If the controller fails, the host loses access to the storage data. This configuration is suitable only in environments where high availability is not required, and loss of access to data can be tolerated until failure recovery actions are completed.

---

**IMPORTANT:** The 2333 controller enclosures support dual-controller configuration only. Single-controller support is provided only when a controller fails over to its partner controller (also see the “About data protection in a single-controller storage system” topic in the RAIDar User Guide. A controller module must be installed in each I/O module slot to ensure sufficient airflow through the enclosure during operation.

---

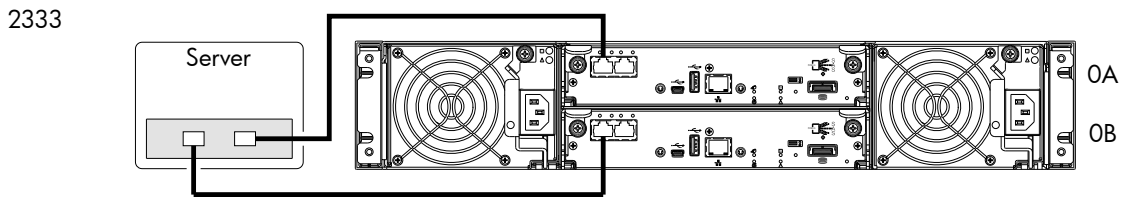
## Dual-controller configurations

A dual-controller configuration improves application availability because in the event of a controller failure, the affected controller fails over to the partner controller with little interruption to data flow. A failed controller can be replaced without the need to shut down the storage system.

In a dual-controller system, hosts use LUN-identifying information from both controllers to determine that up to four paths are available to a given storage volume. Assuming MPIO software is installed, a host can use any available data path to access a volume owned by either controller. The path providing the best performance is through host ports on the volume's owning controller. Both controllers share one set of 512 LUNs (0-511) for use in mapping volumes to hosts (see "ULP" in the *AssuredSAN 3000 Series RAIDar User Guide*).

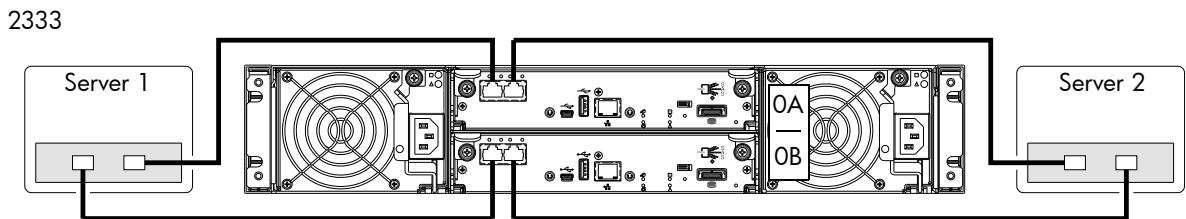
The illustrations below show dual-controller configurations for 2333 controller enclosures supporting 1Gb iSCSI host interface protocol.

### One server/one HBA/dual path



**Figure 7** Connecting hosts — one server/one HBA/dual path

### Two servers/one HBA per server/dual path



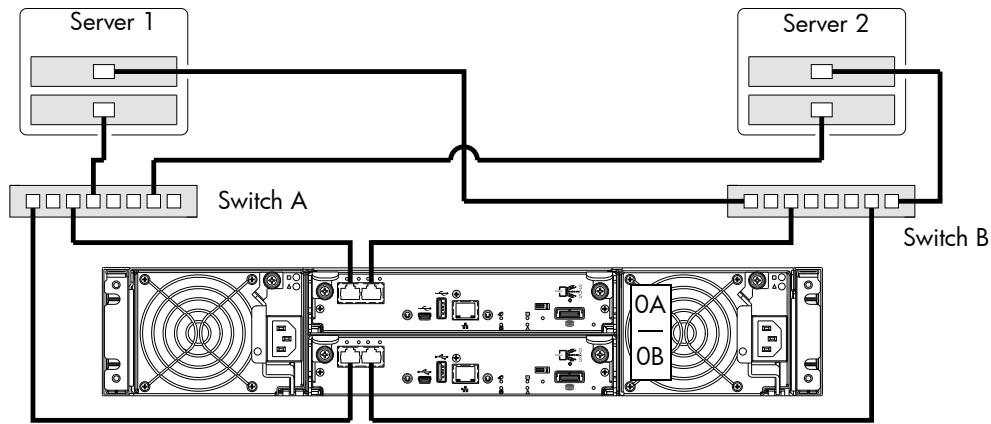
**Figure 8** Connecting hosts — two servers/one HBA per server/dual path

## Connecting switch attach configurations

A switch attach solution — or SAN — places a switch between the servers and the controller enclosures. Using switches, a SAN shares a storage system among multiple servers, reducing the number of storage systems required for a particular environment. Using switches increases the number of servers that can be connected to the storage system. A 2333 controller enclosure supports 64 hosts.

### Multiple servers/multiple switches

The dual-controller illustration below shows a switch-connect configuration for a 2333 controller enclosure supporting 1Gb iSCSI host interface protocol. Connect appropriate cables from controller host ports to switch ports, and from switch ports to hosts. It is important to have a least one port connected from each switch to each controller module to provide redundancy.



**Figure 9** Connecting hosts — switch attach: multiple servers/switches

### 2333 controller enclosure iSCSI considerations

When installing a 2333 iSCSI controller enclosure, use at least three ports per server — two for the storage LAN, and one or more for the public LAN(s) — to ensure that the storage network is isolated from the other networks. The storage LAN is the network connecting the servers — via switch attach — to the controller enclosure (see the 2333 diagram in [Figure 9](#) on page 28).

### IP address scheme for the controller pair — two iSCSI ports per controller

The 2333 uses port 0 of each controller as one failover pair, and port 1 of each controller as a second failover pair. Port 0 of each controller must be in the same subnet, and port 1 of each controller must be in second subnet. See [Controller enclosure — rear panel layout](#) on page 13 for iSCSI port numbering.

For example (with a netmask of 255.255.255.0):

- Controller A port 0: 10.10.10.100
- Controller A port 1: 10.11.10.120
- Controller B port 0: 10.10.10.110
- Controller B port 1: 10.11.10.130

## Connecting a management host on the network

The management host directly manages storage systems out-of-band over an Ethernet network.

1. Connect an RJ-45 Ethernet cable to the network port on each controller.
2. Connect the other end of each Ethernet cable to a network that your management host can access (preferably on the same subnet).

---

**NOTE:** Connections to this device must be made with shielded cables — grounded at both ends — with metallic RFI/EMI connector hoods, in order to maintain compliance with NEBS and FCC Rules and Regulations. See *AssuredSAN Product Regulatory Compliance and Safety* (included in your product's ship kit).

---

Alternatively, you can access the document online. See Dot Hill's customer resource center (CRC) web site for additional information: <http://crc.dothill.com>.


Select **AssuredSAN & R/Evolution Products > 3000 Series** to download the PRC&S document.

## Updating firmware

After installing the hardware and powering on the storage system components for the first time, verify that the controller modules, expansion modules, and disk drives are using the current firmware release. Using RAIDar, right-click the system in the Configuration View panel, and select **Tools > Update Firmware**. The Update Firmware panel displays the currently installed firmware versions, and allows you to update them.

Optionally, you can update firmware using FTP (File Transfer Protocol) as described in the *AssuredSAN 3000 Series RAIDar User Guide*.

---


 **IMPORTANT:** See the “Updating firmware” topic in the *AssuredSAN 3000 Series RAIDar User Guide* before performing a firmware update.

---

## Obtaining IP values

You can configure addressing parameters for each controller module’s network port. You can set static IP values or use DHCP.

---

 **TIP:** See the “Configuring network ports” topic in the *AssuredSAN 3000 Series RAIDar User Guide*.

---

## Setting network port IP addresses using DHCP

In DHCP mode, network port IP address, subnet mask, and gateway values are obtained from a DHCP server if one is available. If a DHCP server is unavailable, current addressing is unchanged. You must have some means of determining what addresses have been assigned, such as the list of bindings on the DHCP server.

Because DHCP is disabled by default in 2333 systems, you must either use the CLI (Command-line Interface) to change controller IP address settings, or use RAIDar’s Configuration Wizard as described in the Using the Configuration Wizard topic in the RAIDar User Guide or online help.

## Setting network port IP addresses using the CLI


If you did not use DHCP to set network port IP values, set them manually (default method) as described below. If you are using the USB CLI port and cable, you will need to enable the port for communication.

Network ports on controller module A and controller module B are configured with the following default values:

- **Network port IP address:** 10.0.0.2 (controller A), 10.0.0.3 (controller B)
- **IP subnet mask:** 255.255.255.0
- **Gateway IP address:** 10.0.0.1

If the default IP addresses are not compatible with your network, you must set an IP address for each network port using the CLI embedded in each controller module. The CLI enables you to access the system using the USB (Universal Serial Bus) communication interface and terminal emulation software.

---

 **NOTE:** If you are using the mini USB CLI port and cable, see Appendix D - [USB device connection](#):

- Windows customers should download and install the device driver as described in [Obtaining the software download](#) on page 64.
  - Linux customers should prepare the USB port as described in [Setting parameters for the device driver](#) on page 65.
- 

Use the CLI commands described in the steps below to set the IP address for the network port on each controller module.

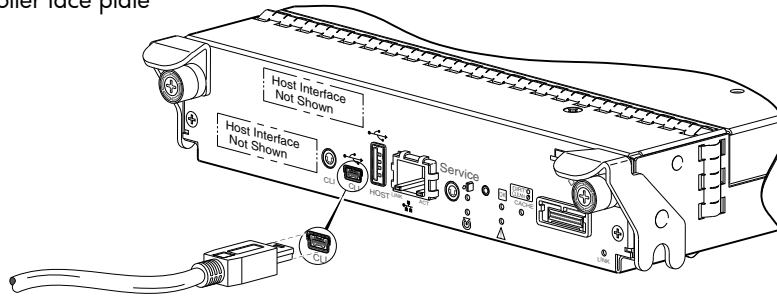
Once new IP addresses are set, you can change them as needed using RAIDar. Be sure to change the IP address via RAIDar before changing the network configuration. See [Accessing RAIDar](#) on page 33 for more information concerning the web-based storage management application.

1. From your network administrator, obtain an IP address, subnet mask, and gateway address for controller A and another for controller B.

Record these IP addresses so you can specify them whenever you manage the controllers using RAIDar or the CLI.

2. Use the provided USB cable to connect controller A to a USB port on a host computer. The USB mini 5 male connector plugs into the CLI port as shown in [Figure 10](#) (generic 2333 controller module shown).

Connect USB cable to CLI port on controller face plate



**Figure 10** Connecting a USB cable to the CLI port

3. Enable the CLI port for subsequent communication:
  - Linux customers should enter the command syntax provided in [Setting parameters for the device driver](#) on page 65.
  - Windows customers should locate the downloaded device driver described in [Obtaining the software download](#) on page 64, and follow the instructions provided for proper installation.
4. Start and configure a terminal emulator, such as HyperTerminal or VT-100, using the display settings in [Table 5](#) and the connection settings in [Table 6](#) (also, see the note following this procedure).

**Table 5** Terminal emulator display settings

Parameter	Value
Terminal emulation mode	VT-100 or ANSI (for color support)
Font	Terminal
Translations	None
Columns	80

**Table 6** Terminal emulator connection settings

Parameter	Value
Connector	COM3 (for example) <sup>1,2</sup>
Baud rate	115,200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

<sup>1</sup>Your server or laptop configuration determines which COM port is used for Disk Array USB Port.

<sup>2</sup>Verify the appropriate COM port for use with the CLI.

5. In the terminal emulator, connect to controller A.
6. Press Enter to display the CLI prompt (#).

The CLI displays the system version, MC version, and login prompt:

- a. At the login prompt, enter the default user `manage`.
- b. Enter the default password `!manage`.

If the default user or password — or both — have been changed for security reasons, enter the secure login credentials instead of the defaults shown above.

7. At the prompt, enter the following command to set the values you obtained in [step 1](#) for each Network port, first for controller A, and then for controller B:

```
set network-parameters ip address netmask netmask gateway gateway controller a|b  
where:
```

- *address* is the IP address of the controller
- *netmask* is the subnet mask
- *gateway* is the IP address of the subnet router
- a|b specifies the controller whose network parameters you are setting

For example:

```
# set network-parameters ip 192.168.0.10 netmask 255.255.255.0 gateway  
192.168.0.1 controller a  
  
# set network-parameters ip 192.168.0.11 netmask 255.255.255.0 gateway  
192.168.0.1 controller b
```

8. Enter the following command to verify the new IP addresses:

```
show network-parameters
```

Network parameters, including the IP address, subnet mask, and gateway address are displayed for each controller.

9. Use the `ping` command to verify connectivity to the gateway address.

For example:

```
# ping 192.168.0.1  
Info: Pinging 192.168.0.1 with 4 packets.  
Success: Command completed successfully. - The remote computer responded with 4  
packets. (2011-12-19 10:20:37)
```

10. In the host computer's command window, type the following command to verify connectivity, first for controller A and then for controller B:

```
ping controller-IP-address
```

**If you cannot access your system for at least three minutes after changing the IP address**, you might need to restart the Management Controller(s) using the serial CLI.

When you restart a Management Controller, communication with it is temporarily lost until it successfully restarts.


Enter the following command to restart the Management Controller in both controllers:

```
restart mc both
```

11. When you are done using the CLI, exit the emulator.

12. Retain the IP addresses (recorded in step 1) for accessing and managing the controllers using either RAIDar or the CLI.

---

 **NOTE:** Using HyperTerminal with the CLI on a **Microsoft Windows** host:

On a host computer connected to a controller module's mini-USB CLI port, incorrect command syntax in a HyperTerminal session can cause the CLI to hang. To avoid this problem, use correct syntax, use a different terminal emulator, or connect to the CLI using telnet rather than the mini-USB cable.

Be sure to close the HyperTerminal session before shutting down the controller or restarting its Management Controller. Otherwise, the host's CPU cycles may rise unacceptably.

---

If communication with the CLI is disrupted when using an out-of-band cable connection, communication can sometimes be restored by disconnecting and reattaching the mini-USB CLI cable as described in [step 2](#) and [Figure 10](#) on page 30.





---


## 4 Basic operation

Verify that you have successfully completed the sequential “Installation Checklist” instructions in [Table 3](#) on page 17. Once you have successfully completed steps 1 through 8 therein, you can access the management interfaces using your web-browser, to complete the system setup.

### Accessing RAIDar

Upon completing the hardware installation, you can access the controller module’s web-based management interface, RAIDar, to configure, monitor, and manage the storage system. Invoke your web browser, and enter the IP address of the controller module’s network port in the address field (obtained during completion of “Installation Checklist” step 8), then press Enter. To sign-in to RAIDar, use the default user name **manage** and password **!manage**. If the default user or password — or both — have been changed for security reasons, enter the secure login credentials instead of the defaults shown above. *This brief Sign In discussion assumes proper web browser setup.*


---

 **IMPORTANT:** For detailed information on accessing and using RAIDar, see the “Getting Started” section in the web-posted *AssuredSAN 3000 Series RAIDar User Guide*.

---

In addition to summarizing the processes to configure and provision a new system for the first time — using the wizards — the Getting Started section provides instructions for signing in to RAIDar, introduces key system concepts, addresses browser setup, and provides tips for using the main window and the help window.

---

 **TIP:** After signing-in to RAIDar, you can use online help as an alternative to consulting the user guide.


---

### Configuring and provisioning the storage system

Once you have familiarized yourself with RAIDar, use it to configure and provision the storage system. Refer to the following chapters within the RAIDar user guide or online help:


- Getting started
- Configuring the system
- Provisioning the system

---

 **NOTE:** See the “Installing a license” topic within the RAIDar User Guide for instructions about creating a temporary license, or installing a permanent license.

---

---

 **IMPORTANT:** If the system is used in a VMware environment, set the system’s Missing LUN Response option to use its Illegal Request setting. To do so, see either the configuration topic “Changing the missing LUN response” in the RAIDar user guide or the command topic “set-advanced-settings” in the CLI Reference Guide.

---



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# 5 Troubleshooting

## USB CLI port connection

AssuredSAN 2333 controllers feature a CLI port employing a mini-USB Type B form factor. If you encounter problems communicating with the port after cabling your computer to the USB device, you may need to either download a device driver (Windows), or set appropriate parameters via an operating system command (Linux). See Appendix D for more information.

## Fault isolation methodology

AssuredSAN 2333 storage systems provide many ways to isolate faults. This section presents the basic methodology used to locate faults within a storage system, and to identify the pertinent FRUs (Field Replaceable Units) affected.

As noted in [Basic operation](#) on page 33, use RAIDar to configure and provision the system upon completing the hardware installation. As part of this process, configure and enable event notification so the system will notify you when a problem occurs that is at or above the configured severity (see “Using the Configuration Wizard > Configuring event notification” within the *AssuredSAN 3000 Series RAIDar User Guide*). With event notification configured and enabled, you can follow the recommended actions in the notification message to resolve the problem, as further discussed in the options presented below.

### Basic steps

The basic fault isolation steps are listed below:

- Gather fault information, including using system LEDs (see [Gather fault information](#) on page 36)
- Determine where in the system the fault is occurring (see [Determine where the fault is occurring](#) on page 36)
- Review event logs (see [Review the event logs](#) on page 36)
- If required, isolate the fault to a data path component or configuration (see [Isolate the fault](#) on page 37)

### Options available for performing basic steps

When performing fault isolation and troubleshooting steps, select the option or options that best suit your site environment. Use of any option (four options are described below) is not mutually-exclusive to the use of another option. You can use RAIDar to check the health icons/values for the system and its components to ensure that everything is okay, or to drill down to a problem component. If you discover a problem, both RAIDar and the CLI provide recommended-action text online. Options for performing basic steps are listed according to frequency of use:

- Use RAIDar
- Use the CLI
- Monitor event notification
- View the enclosure LEDs

### Use RAIDar

RAIDar uses health icons to show OK, Degraded, Fault, or Unknown status for the system and its components. RAIDar enables you to monitor the health of the system and its components. If any component has a problem, the system health will be Degraded, Fault, or Unknown. Use RAIDar’s GUI to drill down to find each component that has a problem, and follow actions in the component Health Recommendations field to resolve the problem.

## Use the CLI

As an alternative to using RAIDar, you can run the `show system` command in the CLI to view the health of the system and its components. If any component has a problem, the system health will be Degraded, Fault, or Unknown, and those components will be listed as Unhealthy Components. Follow the recommended actions in the component Health Recommendation field to resolve the problem.

## Monitor event notification

With event notification configured and enabled, you can view event logs to monitor the health of the system and its components. If a message tells you to check whether an event has been logged, or to view information about an event in the log, you can do so using either RAIDar or the CLI. Using RAIDar, you would view the event log and then click on the event message to see detail about that event. Using the CLI, you would run the `show events detail` command (with additional parameters to filter the output) to see the detail for an event.

## View the enclosure LEDs

You can view the LEDs on the hardware (while referring to [LED descriptions](#) for your enclosure model) to identify component status. If a problem prevents access to either RAIDar or the CLI, this is the only option available. However, monitoring/management is often done at a management console using storage management interfaces, rather than relying on line-of-sight to LEDs of racked hardware components.

## Performing basic steps

You can use any of the available options described above in performing the basic steps comprising the fault isolation methodology.

## Gather fault information

When a fault occurs, it is important to gather as much information as possible. Doing so will help you determine the correct action needed to remedy the fault.

Begin by reviewing the reported fault:

- *Is the fault related to an internal data path or an external data path?*
- *Is the fault related to a hardware component such as a disk drive module, controller module, or power supply unit?*

By isolating the fault to *one* of the components within the storage system, you will be able to determine the necessary corrective action more quickly.

## Determine where the fault is occurring

Once you have an understanding of the reported fault, review the enclosure LEDs. The enclosure LEDs are designed to immediately alert users of any system faults, and might be what alerted the user to a fault in the first place.

When a fault occurs, the Fault ID status LED on an enclosure's right ear illuminates (see the diagram pertaining to your product's front panel components on [page 13](#)). Check the LEDs on the back of the enclosure to narrow the fault to a FRU, connection, or both. The LEDs also help you identify the location of a FRU reporting a fault.

Use RAIDar to verify any faults found while viewing the LEDs. RAIDar is also a good tool to use in determining where the fault is occurring, if the LEDs cannot be viewed due to the location of the system. RAIDar provides you with a visual representation of the system and where the fault is occurring. It can also provide more detailed information about FRUs, data, and faults.

## Review the event logs

The event logs record all system events. Each event has a numeric code that identifies the type of event that occurred, and has one of the following severities:

- **Critical.** A failure occurred that may cause a controller to shut down. Correct the problem *immediately*.
- **Error.** A failure occurred that may affect data integrity or system stability. Correct the problem as soon as possible.

- Warning. A problem occurred that may affect system stability, but not data integrity. Evaluate the problem and correct it if necessary.
- Informational. A configuration or state change occurred, or a problem occurred that the system corrected. No immediate action is required.

See the *AssuredSAN Event Descriptions Reference Guide* for information about specific events.

See Dot Hill's Customer Resource Center web site for additional information: <http://crc.dothill.com>. Select **AssuredSAN & R/Evolution Products > 3000 Series** to download the Event Descriptions guide.

It is very important to review the logs, not only to identify the fault, but also to search for events that might have caused the fault to occur. For example, a host could lose connectivity to a virtual disk if a user changes channel settings without taking the storage resources assigned to it into consideration. In addition, the type of fault can help you isolate the problem to either hardware or software.

## Isolate the fault

Occasionally, it might become necessary to isolate a fault. This is particularly true with data paths, due to the number of components comprising the data path. For example, if a host-side data error occurs, it could be caused by any of the components in the data path: controller module, cable, or data host.

## If the enclosure does not initialize

It may take up to two minutes for all enclosures to initialize. If an enclosure does not initialize:

- Perform a rescan
- Power cycle the system
- Make sure the power cord is properly connected, and check the power source to which it is connected
- Check the event log for errors

## Correcting enclosure IDs

When installing a system with drive enclosures attached, the enclosure IDs might not agree with the physical cabling order. This is because the controller might have been previously attached to enclosures in a different configuration, and it attempts to preserve the previous enclosure IDs if possible. To correct this condition, make sure that both controllers are up, and perform a rescan using RAIDar or the CLI. This will reorder the enclosures, but can take up to two minutes for the enclosure IDs to be corrected.


To perform a rescan using the CLI, type the following command:

```
rescan
```

To rescan using RAIDar:

1. Verify that controllers are operating normally
2. In the Configuration View panel, right-click the system and select **Tools > Rescan Disk Channels**
3. Click **Rescan**

---


 **NOTE:** The reordering enclosure IDs action only applies to Dual Controller mode. If only one controller is available, due to either Single Controller configuration or controller failure, a manual rescan will not reorder the drive enclosure IDs.

---

## Stopping I/O

When troubleshooting drive and connectivity faults, ensure you have a current full backup. As an additional data protection precaution, stop all I/O to the affected vdisks.

---

 **IMPORTANT:** Stopping I/O to a vdisk is a host-side task, and falls outside the scope of this document.

---

When on-site, you can verify that there is no I/O activity by briefly monitoring the system LEDs; however, when accessing the storage system remotely, this is not possible. Remotely, you can use the `show vdisk-statistics` command to determine if input and output has stopped. Perform the steps below:

1. Using the CLI, run the `show vdisk-statistics` command.  
The `Number of Reads` and `Number of Writes` outputs show the number of these operations that have occurred since the statistic was last requested.
2. Run the `show vdisk-statistics` command a second time.  
This provides you a specific window of time (the interval between requesting the statistics) to determine if data is being written to or read from the disk.
3. If any reads or writes occur during this interval, a host is still reading from or writing to this vdisk.  
Continue to stop IOPS from hosts, and repeat [step 1](#) until the `Number of Reads` and `Number of Writes` statistics are zero.

---


 **NOTE:** See *AssuredSAN 3000 Series CLI Reference Guide* for additional information.

---

## Diagnostic steps

This section describes possible reasons and actions to take when an LED indicates a fault condition during initial system setup. See [Appendix A – LED descriptions](#) for descriptions of all LED statuses.

---

 **NOTE:** Once event notification is configured and enabled using RAIDar, you can view event logs to monitor the health of the system and its components using the GUI.

---

In addition to monitoring LEDs via line-of-sight observation of the racked hardware components when performing diagnostic steps, you can also monitor the health of the system and its components using the management interfaces previously discussed. Bear this in mind when reviewing the **Actions** column in the following diagnostics tables, and when reviewing the step procedures provided later in this chapter.

Is the enclosure front panel Fault/Service Required LED amber?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes	A fault condition exists/occurred. A fault occurred. If installing an I/O module FRU, the module has gone online and likely failed its self-test.	<ul style="list-style-type: none"> <li>• Check the LEDs on the back of the controller to narrow the fault to a FRU, connection, or both.</li> <li>• Check the event log for specific information regarding the fault; follow any Recommended Actions.</li> <li>• If installing an IOM FRU, try removing and reinstalling the new IOM, and check the event log for errors.</li> <li>• If the above actions do not resolve the fault, isolate the fault, and contact an authorized service provider for assistance. Replacement may be necessary.</li> </ul>

**Table 7** Diagnostics LED status — Front panel “Fault/Service Required”

Is the controller back panel FRU OK LED off?

Answer	Possible reasons	Actions
No (blinking)	System functioning properly. System is booting.	No action required. Wait for system to boot.
Yes	The controller module is not powered on. The controller module has failed.	<ul style="list-style-type: none"> <li>Check that the controller module is fully inserted and latched in place, and that the enclosure is powered on.</li> <li>Check the event log for specific information regarding the failure.</li> </ul>

**Table 8** Diagnostics LED status — Rear panel “FRU OK”

Is the controller back panel Fault/Service Required LED amber?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes (blinking)	One of the following errors occurred: <ul style="list-style-type: none"> <li>Hardware-controlled power-up error</li> <li>Cache flush error</li> <li>Cache self-refresh error</li> </ul>	<ul style="list-style-type: none"> <li>Restart this controller from the other controller using RAIDar or the CLI.</li> <li>If the above action does not resolve the fault, remove the controller module and reinsert it.</li> <li>If the above action does not resolve the fault, contact an authorized service provider for assistance. It may be necessary to replace the controller module.</li> </ul>

**Table 9** Diagnostics LED status — Rear panel “Fault/Service Required”

Are both disk drive module LEDs off?

Answer	Possible reasons	Actions
Yes	<ul style="list-style-type: none"> <li>There is no power</li> <li>The drive is offline</li> <li>The drive is not configured</li> </ul>	Check that the drive is fully inserted and latched in place, and that the enclosure is powered on.

**Table 10** Diagnostics LED status — Disk drives (LFF and SFF modules)

Is the disk drive module Fault LED amber?

Answer	Possible reasons	Actions
Yes, and the online/activity LED is <b>off</b> .	The drive is offline. An event message may have been received for this device.	<ul style="list-style-type: none"> <li>Check the event log for specific information regarding the fault.</li> <li>Isolate the fault.</li> <li>Contact an authorized service provider for assistance.</li> </ul>
Yes, and the online/activity LED is <b>blinking</b> .	The drive is active, but an event message may have been received for this device.	<ul style="list-style-type: none"> <li>Check the event log for specific information regarding the fault.</li> <li>Isolate the fault.</li> <li>Contact an authorized service provider for assistance.</li> </ul>

**Table 11** Diagnostics LED status — Disk drive fault status (LFF and SFF modules)

## Is a connected host port's Host Link Status LED off?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required (see Link LED note: <a href="#">page 51</a> ).
Yes	The link is down.	<ul style="list-style-type: none"> <li>• Check cable connections and reseal if necessary.</li> <li>• Inspect cable for damage.</li> <li>• Swap cables to determine if fault is caused by a defective cable. Replace cable if necessary.</li> <li>• Verify that the switch, if any, is operating properly. If possible, test with another port.</li> <li>• Verify that the HBA is fully seated, and that the PCI slot is powered on and operational.</li> <li>• In RAIDar, review event logs for indicators of a specific fault in a host data path component.</li> <li>• Contact an authorized service provider for assistance.</li> <li>• See <a href="#">Isolating a host-side connection fault</a> on page 41.</li> </ul>

**Table 12** Diagnostics LED status — Rear panel “Host Link Status”

## Is a connected port's Expansion Port Status LED off?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes	The link is down.	<ul style="list-style-type: none"> <li>• Check cable connections and reseal if necessary.</li> <li>• Inspect cable for damage.</li> <li>• Swap cables to determine if fault is caused by a defective cable. Replace cable if necessary.</li> <li>• In RAIDar, review the event logs for indicators of a specific fault in a host data path component.</li> <li>• Contact an authorized service provider for assistance.</li> <li>• See <a href="#">Isolating a controller module expansion port connection fault</a> on page 42.</li> </ul>

**Table 13** Diagnostics LED status — Rear panel “Expansion Port Status”

## Is a connected port's Network Port link status LED off?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes	The link is down.	Use standard networking troubleshooting procedures to isolate faults on the network.

**Table 14** Diagnostics LED status — Rear panel “Network Port Link Status”



## Is the power supply's Input Power Source LED off?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes	The power supply is not receiving adequate power.	<ul style="list-style-type: none"> <li>Verify that the power cord is properly connected, and check the power source to which it connects.</li> <li>Check that the power supply FRU is firmly locked into position.</li> <li>Check the event log for specific information regarding the fault.</li> <li>If the above action does not resolve the fault, isolate the fault, and contact an authorized service provider for assistance.</li> </ul>

**Table 15** Diagnostics LED status — Rear panel power supply “Input Power Source”

## Is the Voltage/Fan Fault/Service Required LED amber?

Answer	Possible reasons	Actions
No	System functioning properly.	No action required.
Yes	The power supply unit or a fan is operating at an unacceptable voltage/RPM level, or has failed.	<p>When isolating faults in the power supply, remember that the fans in both modules receive power through a common bus on the midplane, so if a power supply unit fails, the fans continue to operate normally.</p> <ul style="list-style-type: none"> <li>Verify that the power supply FRU is firmly locked into position.</li> <li>Verify that the power cable is connected to a power source.</li> <li>Verify that the power cable is connected to the enclosure's power supply unit.</li> </ul>


**Table 16** Diagnostics LED status — Rear panel power supply “Voltage/Fan Fault/Service Required”

## Isolating a host-side connection fault

During normal operation, when a controller module host port is connected to a data host, the port's host link status LED and host link activity LED are green. If there is I/O activity, the host activity LED blinks green. If data hosts are having trouble accessing the storage system, and you cannot locate a specific fault or cannot access the event logs, use the following procedure.

This procedure requires scheduled downtime.

---

 **IMPORTANT:** Do not perform more than one step at a time. Changing more than one variable at a time can complicate the troubleshooting process.

---

The procedure below applies to AssuredSAN 2333 controller enclosures configured with 1Gb iSCSI host interface ports.

1. Halt all I/O to the storage system (see [Stopping I/O](#) on page 37).
2. Check the host activity LED.  
If there is activity, halt all applications that access the storage system.
3. Check the Cache Status LED to verify that the controller's cached data is flushed to the disk drives.
  - Blinking – Data is still being written to disk.
  - Off – Cache is clean (no unwritten data).
4. Inspect the cable for damage.
5. Reseat the cable.

Is the host link status LED on?

- Yes – Monitor the status to ensure that there is no intermittent error present. If the fault occurs again, clean the connections to ensure that a dirty connector is not interfering with the data path.
- No – Proceed to the next step.

**6.** Move the cable to a port with a known good link status.

This step isolates the problem to the external data path (host cable and host-side devices) or to the controller module port.

Is the host link status LED on?

- Yes – You now know that the host cable and host-side devices are functioning properly. Return the cable to the original port. If the link status LED remains off, you have isolated the fault to the controller module's port. Replace the controller module.
- No – Proceed to the next step.

**7.** Verify that the switch, if any, is operating properly. If possible, test with another port.

**8.** Verify that the HBA is fully seated, and that the PCI slot is powered on and operational.

**9.** Replace the HBA with a known good HBA, or move the host side cable to a known good HBA.

Is the host link status LED on?

- Yes – You have isolated the fault to the HBA. Replace the HBA.
- No – It is likely that the controller module needs to be replaced.

**10.** Move the cable back to its original port.

Is the host link status LED on?


- No – The controller module's port has failed. Replace the controller module.
- Yes – Monitor the connection for a period of time. It may be an intermittent problem, which can occur with damaged cables and HBAs.

## Isolating a controller module expansion port connection fault

During normal operation, when a controller module's expansion port is connected to a drive enclosure, the expansion port status LED is green. If the connected port's expansion port LED is off, the link is down. Use the following procedure to isolate the fault.

This procedure requires scheduled downtime.

---

 **NOTE:** Do not perform more than one step at a time. Changing more than one variable at a time can complicate the troubleshooting process.

---

**1.** Halt all I/O to the storage system (see [Stopping I/O](#) on page 37).

**2.** Check the host activity LED.

If there is activity, halt all applications that access the storage system.

**3.** Check the Cache Status LED to verify that the controller's cached data is flushed to the disk drives.

- Blinking – Data is still being written to disk.
- Off – Cache is clean (no unwritten data).

**4.** Reseat the expansion cable, and inspect it for damage.

Is the expansion port status LED on?

- Yes – Monitor the status to ensure there is no intermittent error present. If the fault occurs again, clean the connections to ensure that a dirty connector is not interfering with the data path.
- No – Proceed to the next step.

**5.** Move the expansion cable to a port on the controller enclosure with a known good link status.

This step isolates the problem to the expansion cable or to the controller module's expansion port.

Is the expansion port status LED on?

- Yes – You now know that the expansion cable is good. Return the cable to the original port. If the expansion port status LED remains off, you have isolated the fault to the controller module’s expansion port. Replace the controller module.
  - No – Proceed to the next step.
6. Move the expansion cable back to the original port on the controller enclosure.
  7. Move the expansion cable on the drive enclosure to a known good expansion port on the drive enclosure.  
Is the expansion port status LED on?
    - Yes – You have isolated the problem to the drive enclosure’s port. Replace the expansion module.
    - No – Proceed to the next step.
  8. Replace the cable with a known good cable, ensuring the cable is attached to the original ports used by the previous cable.  
Is the host link status LED on?
    - Yes – Replace the original cable. The fault has been isolated.
    - No – It is likely that the controller module must be replaced.

## Resolving voltage and temperature warnings

1. Check that all of the fans are working by making sure the Voltage/Fan Fault/Service Required LED on each power supply module is off, or by using RAIDar to check enclosure health status. In the Configuration View panel, right click the enclosure and click **View > Overview** to view the health status of the enclosure and its components.  
See [Options available for performing basic steps](#) on page 35 for a description of health status icons and alternatives for monitoring enclosure health.
2. Make sure that all modules are fully seated in their slots and that their latches are locked.
3. Make sure that no slots are left open for more than two minutes.  
If you need to replace a module, leave the old module in place until you have the replacement or use a blank module to fill the slot. Leaving a slot open negatively affects the airflow and can cause the enclosure to overheat.
4. Try replacing each power supply one at a time.
5. Replace the controller modules one at a time.

## Sensor locations

The storage system monitors conditions at different points within each enclosure to alert you to problems. Power, cooling fan, temperature, and voltage sensors are located at key points in the enclosure. In each controller module and expansion module, the enclosure management processor (EMP) monitors the status of these sensors to perform SCSI enclosure services (SES) functions.

The following sections describe each element and its sensors.

## Power supply sensors

Each enclosure has two fully redundant power supplies with load-sharing capabilities. The power supply sensors described in the following table monitor the voltage, current, temperature, and fans in each power supply. If the power supply sensors report a voltage that is under or over the threshold, check the input voltage.

**Table 17** Power supply sensor descriptions

Description	Event/Fault ID LED condition
Power supply 1	Voltage, current, temperature, or fan fault
Power supply 2	Voltage, current, temperature, or fan fault

## Cooling fan sensors

Each power supply includes two fans. The normal range for fan speed is 4,000 to 6,000 RPM. When a fan speed drops below 4,000 RPM, the EMP considers it a failure and posts an alarm in the storage system's event log. The following table lists the description, location, and alarm condition for each fan. If the fan speed remains under the 4,000 RPM threshold, the internal enclosure temperature may continue to rise. Replace the power supply reporting the fault.

**Table 18** Cooling fan sensor descriptions

Description	Location	Event/Fault ID LED condition
Fan 1	Power supply 1	< 4,000 RPM
Fan 2	Power supply 1	< 4,000 RPM
Fan 3	Power supply 2	< 4,000 RPM
Fan 4	Power supply 2	< 4,000 RPM

During a shutdown, the cooling fans do not shut off. This allows the enclosure to continue cooling.

## Temperature sensors

Extreme high and low temperatures can cause significant damage if they go unnoticed. Each controller module has six temperature sensors. Of these, if the CPU or FPGA (Field-programmable Gate Array) temperature reaches a shutdown value, the controller module is automatically shut down. Each power supply has one temperature sensor.

When a temperature fault is reported, it must be remedied as quickly as possible to avoid system damage. This can be done by warming or cooling the installation location.

**Table 19** Controller module temperature sensor descriptions

Description	Normal operating range	Warning operating range	Critical operating range	Shutdown values
CPU temperature	3°C–88°C	0°C–3°C, 88°C–90°C	> 90°C	0°C 100°C
FPGA temperature	3°C–97°C	0°C–3°C, 97°C–100°C	None	0°C 105°C
Onboard temperature 1	0°C–70°C	None	None	None
Onboard temperature 2	0°C–70°C	None	None	None
Onboard temperature 3 (Capacitor temperature)	0°C–70°C	None	None	None
CM temperature	5°C–50°C	≤ 5°C, ≥ 50°C	≤ 0°C, ≥ 55°C	None

When a power supply sensor goes out of range, the Fault/ID LED illuminates amber and an event is logged to the event log.

**Table 20** Power supply temperature sensor descriptions

Description	Normal operating range
Power supply 1 temperature	–10°C–80°C
Power supply 2 temperature	–10°C–80°C

## Power supply module voltage sensors

Power supply voltage sensors ensure that an enclosure's power supply voltage is within normal ranges. There are three voltage sensors per power supply.

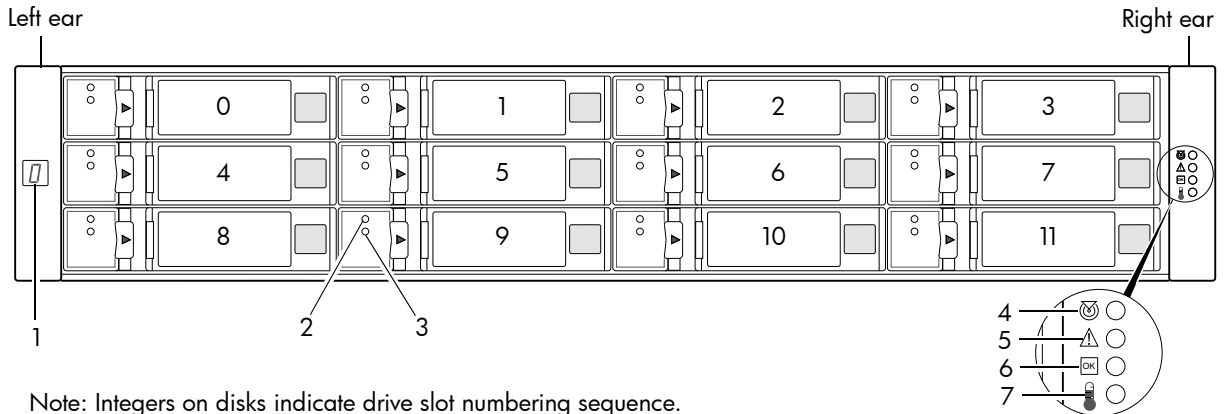
**Table 21** Voltage sensor descriptions

Sensor	Event/Fault LED condition
Power supply 1 voltage, 12V	< 11.00V > 13.00V
Power supply 1 voltage, 5V	< 4.00V > 6.00V
Power supply 1 voltage, 3.3V	< 3.00V > 3.80V



# A LED descriptions

## 12-drive enclosure front panel LEDs

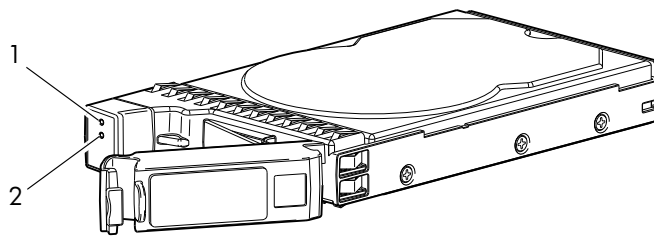


Note: Integers on disks indicate drive slot numbering sequence.

**Table 22** LEDs — 2U12 enclosure front panel

LED	Description	Definition
1	Enclosure ID	Green — On Enables you to correlate the enclosure with logical views presented by management software. Sequential enclosure ID numbering of controller enclosures begins with the integer 0. The enclosure ID for an attached drive enclosure is nonzero.
2	Disk drive — Upper LED	See <a href="#">Disk drive LEDs</a> on page 48.
3	Disk drive — Lower LED	See <a href="#">Disk drive LEDs</a> on page 48.
4	Unit Locator	White blink — Enclosure is identified Off — Normal operation
5	Fault/Service Required	Amber — On Enclosure-level fault condition exists. The event has been acknowledged but the problem needs attention. Off — No fault condition exists.
6	FRU OK	Green — On The enclosure is powered on with at least one power supply operating normally. Off — Both power supplies are off; the system is powered off.
7	Temperature Fault	Green — On The enclosure temperature is normal. Amber — On The enclosure temperature is above threshold.

## Disk drive LEDs



3.5" LFF disk drive  
(see Disk with a dangle)

**Table 23** LEDs — Disk with a dangle

LED No./Description	Color	State	Definition
1— OK to Remove	Blue	On	The disk has been removed from any active vdisk, spun down, and prepared for removal.
		Off	The disk drive module is not prepared for removal.
2— Power/Activity/Fault	Green	On	The disk drive module is operating normally.
		Blink	The disk drive module is initializing; active and processing I/O; performing a media scan; or the vdisk is initializing or reconstructing.
		Off	If not green or amber, the disk is not powered on.
	Amber	On	The disk has failed; experienced a fault; is a leftover; or the vdisk that it is associated with is down or critical.
		Blink	Physically identifies the disk drive module.
		Off	If not green or amber, the disk is not powered on.

Additional information pertaining to dangle-based 3.5" LFF disk drive behavior is provided in the two tables on the facing page.

For information about replacing a disk drive module in a 2333 controller enclosure or 3130 drive enclosure, refer to the "Replacing a disk drive module" topic in the *AssuredSAN 3000 Series FRU Installation and Replacement Guide*.

For information about creating a vdisk with volumes, and mapping the volumes to hosts, see the "Provisioning the system" topic within the *AssuredSAN 3000 Series RAIDar User Guide*.



**Table 24** LEDs — Disks in LFF enclosures

Disk drive module LED behavior		LFF — 12-drive	
Description	State	Color	Action
Disk drive OK, FTOL	Off	None	None
	On (operating normally)	Green	On
	OK to remove	Green	Blink
		Blue	On
	Identifying self — offline/online	Amber	Blink
Disk drive I/O	Initializing	Green	Blink
	Active and processing I/O	Green	Blink
	Performing a media scan	Green	Blink
Disk drive leftover	Disk drive is a leftover	Amber	On
	Identifying a leftover	Amber <sup>2</sup>	Blink
		Blue <sup>1</sup>	On
Disk drive failed	Fault or failure	Amber	On
		Amber	On
	Fault and remove disk drive	Blue	On
		Amber	Blink
	Fault, identify, and remove disk drive	Amber	Blink
		Blue	On

<sup>1</sup>This color may or may not illuminate.

<sup>2</sup>Bitonal LED blinks amber/green.

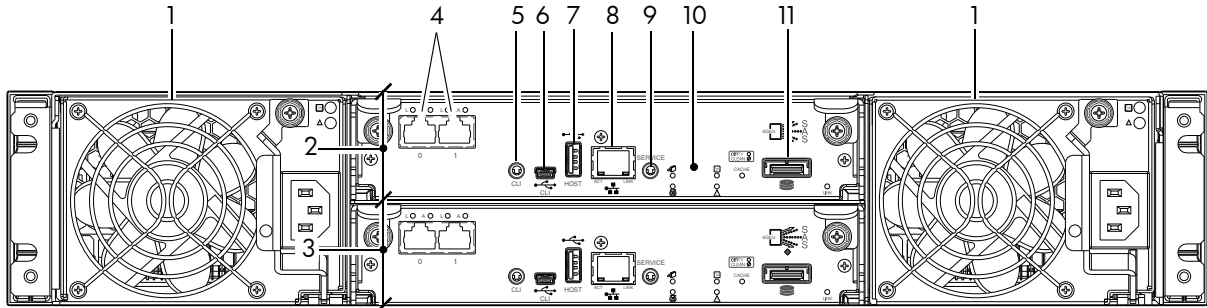
**Table 25** LEDs — Vdisks in LFF enclosures

Vdisk LED behavior		LFF — 12-drive	
Description	State	Color	Action
FTOL	On (operating normally)	Green	Blink
Vdisk activity	Vdisk is reconstructing	Green	Blink
	Vdisk is initializing	Green	Blink
Vdisk degraded	Vdisk is critical/down	See note 1 below	

<sup>1</sup>Individual disks will display fault LEDs

# Controller enclosure — rear panel layout

The diagram and table below display and identify important component items that comprise the rear panel layout of an AssuredSAN 2333 controller enclosure.



2333 model is shown as a locator

- |  |   |
|--|---|
| 1 AC power supplies                        | 7 Host port (USB - Type A; reserved for future use)   |
| 2 Controller module A                      | 8 Network port  |
| 3 Controller module B                      | 9 Service port (used by service personnel only)   |
| 4 1Gb iSCSI ports: host interface          | 10 Disabled button (used by engineering/test only)<br>[Not present on newer controller module versions] |
| 5 Reserved for future use                  | 11 Expansion port   |
| 6 CLI port (USB - Type B) [see Appendix D] |   |

A controller enclosure accommodates an AC power supply FRU in each of the two power supply slots (see two instances of callout No.1 above). The controller enclosure accommodates two controller module FRUs of the same type within the I/O module (IOM) slots (see callouts No.2 and No.3 above).

---

**IMPORTANT:** The 2333 controller enclosures support dual-controller configuration only. Single-controller support is provided only when a controller fails over to its partner controller. A controller module must be installed in each I/O module slot to ensure sufficient airflow through the enclosure during operation.

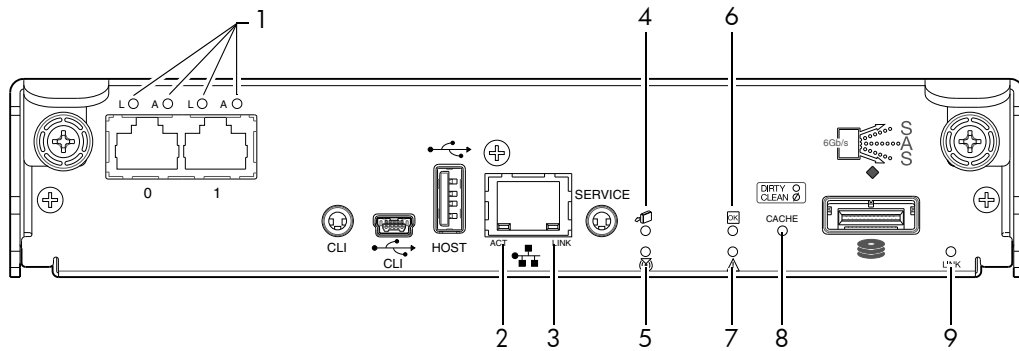
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The diagrams with tables that immediately follow provide descriptions for the different controller modules and power supply modules that can be installed into the rear panel of a 2333 controller enclosure. Showing controller modules and power supply modules separately from the enclosure enables improved clarity in identifying the component items called out in the diagrams and described in the tables.

LED descriptions are also provided for optional drive enclosures supported by the 2333 controller enclosures.

For information about replacing 2333 controller enclosure FRUs, refer to the appropriate FRU replacement procedure in the *AssuredSAN 3000 Series FRU Installation and Replacement Guide*.

## 2333 controller module — rear panel LEDs



**Table 26** LEDs — 2333 controller module — rear panel

LED No./Description	Color	State	Definition
1 — 1Gb iSCSI Link Status  1Gb iSCSI Link Activity	Green	On	The port is connected and the link is up.
		Off	The port is empty or the link is down.
2 — Network Port Activity	Green	Blink	Link has I/O activity.
		Off	Link is idle.
3 — Network Port Link Status	Green	On	Ethernet link is up.
		Off	Ethernet port is not connected or the link is down.
4 — OK to Remove	Blue	On	The controller module can be removed.
		Off	The controller module is not prepared for removal.
5 — Unit Locator	White	Off	Normal operation.
		Blink	Physically identifies the controller module.
6 — FRU OK	Green	On	Controller module is operating normally.
		Off	Controller module is not OK.
		Blink	System is booting.
7 — Fault/Service Required	Amber	On	A fault is detected or a service action is required.
		Blink	Hardware-controlled power-up, or a cache flush or restore error.
8 — Cache Status	Green	On	Cache is dirty (contains unwritten data) and operation is normal. The unwritten data can be log or debug data that remains in cache, so a Green cache status LED does not, by itself, indicate that any user data is at risk or that any action is necessary.
		Off	Cache is clean (contains no unwritten data).
		Blink	CompactFlash flush or cache self-refresh is in progress, indicating cache activity. (See <a href="#">Cache Status LED details</a> on page 52)
9 — Expansion Port Status	Green	On	The port is connected and the link is up.
		Off	The port is empty or the link is down.

**NOTE:** Once a Link Status LED is lit, it remains so, even if the controller is shut down via RAIDar or CLI.

When a controller is shut down or otherwise rendered inactive — its Link Status LED remains illuminated — falsely indicating that the controller can communicate with the host. Though a link exists between the host and the chip on the controller, the controller is not communicating with the chip. To reset the LED, the controller must be power-cycled (see [Powering on/powering off](#) on page 23).

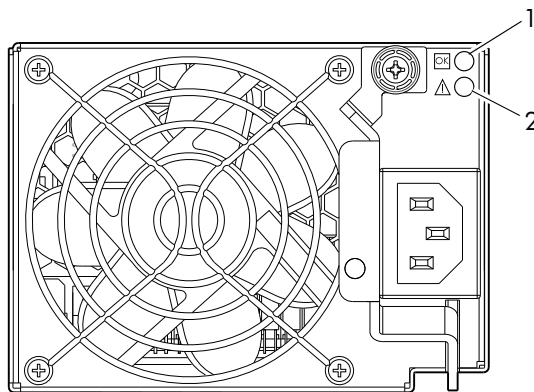
## Cache Status LED details

If the LED is blinking evenly, a cache flush is in progress. When a controller module loses power and write cache is dirty (contains data that has not been written to disk), the super-capacitor pack provides backup power to flush (copy) data from write cache to CompactFlash memory. When cache flush is complete, the cache transitions into self-refresh mode.

If the LED is blinking momentarily slowly, the cache is in a self-refresh mode. In self-refresh mode, if primary power is restored before the backup power is depleted (3–30 minutes, depending on various factors), the system boots, finds data preserved in cache, and writes it to disk. This means the system can be operational within 30 seconds, and before the typical host I/O time-out of 60 seconds, at which point system failure would cause host-application failure. If primary power is restored after the backup power is depleted, the system boots and restores data to cache from CompactFlash, which can take about 90 seconds. The cache flush and self-refresh mechanism is an important data protection feature; essentially four copies of user data are preserved: one in controller cache and one in CompactFlash of each controller.

## Power supply LEDs

Power redundancy is achieved through two independent load-sharing power supplies. In the event of a power supply failure, or the failure of the power source, the storage system can operate continuously on a single power supply. Greater redundancy can be achieved by connecting the power supplies to separate circuits. AC power supplies may or may not have a power switch (the newer model shown below has no power switch). Whether a power supply has a power switch is significant to powering on/off.



AC PSU model

**Table 27** LEDs — Power supply units — rear panel

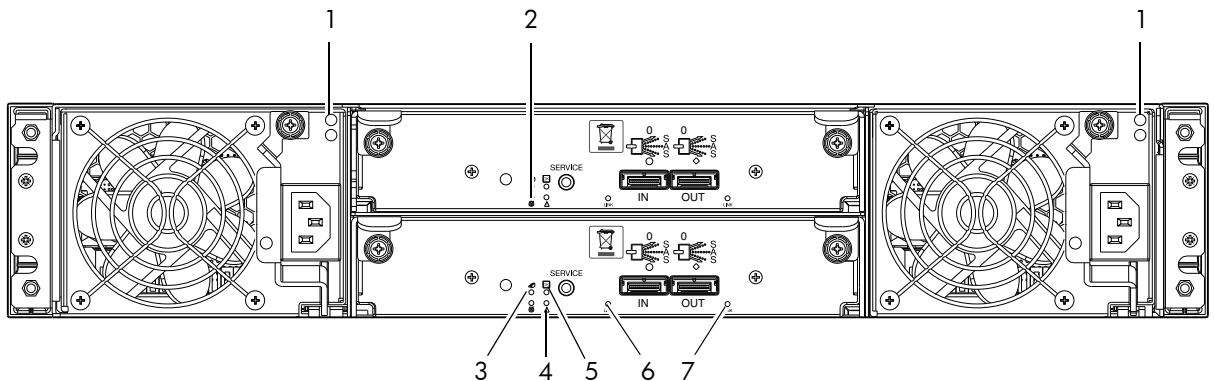
LED No./Description	Color	State	Definition
1 — Input Source Power Good	Green	On	Power is on and input voltage is normal.
		Off	Power is off, or input voltage is below the minimum threshold.
2 — Voltage/Fan Fault/Service Required	Amber	On	Output voltage is out of range, or a fan is operating below the minimum required RPM.
		Off	Output voltage is normal.

**NOTE:** See [Powering on/powering off](#) on page 23 for information on power-cycling enclosures.

## 3130 drive enclosure rear panel LEDs

The rear panel layout of the 3130 drive enclosure is shown below. Using mini-SAS (SFF-8088) external connectors, the 3130 supports a 6-Gbps data rate for backend SAS expansion.

Newer models of these drive enclosures feature AC power supplies without power switches, as per the system shown. See [Powering on/powering off](#) on page 23 for more information.



Note: Callouts do not tag multiple instances of an identified LED.

**Table 28** LEDs — 3130 rear panel

LED No./Description	Color	State	Definition
1 — Power Supply	—	—	See <a href="#">Power supply LEDs</a> on page 52.
2 — Unit Locator	White	Off Blink	Normal operation. Physically identifies the expansion module.
3 — OK to Remove	Blue	Off	Not implemented.
4 — Fault/Service Required	Amber	On Blink	A fault is detected or a service action is required. Hardware-controlled power-up.
5 — FRU OK	Green	On Off Blink	Expansion module is operating normally. Expansion module is not OK. System is booting.
6 — SAS In Port Status	Green	On Off	Port is connected and the link is up. Port is empty or link is down.
7 — SAS Out Port Status	Green	On Off	Port is connected and the link is up. Port is empty or link is down.



# B Environmental requirements and specifications

## Safety requirements

Install the system in accordance with the local safety codes and regulations at the facility site. Follow all cautions and instructions marked on the equipment.

 **IMPORTANT:** Also see the hard copy *AssuredSAN Product Regulatory Compliance and Safety* document (included in your product ship kit).

Alternatively, you can access the document online. See Dot Hill’s customer resource center (CRC) web site for additional information: <http://crc.dothill.com>.

Select **AssuredSAN & R/Evolution Products > 3000 Series** to download the PRC&S document.

## Site requirements and guidelines

The following sections provide requirements and guidelines that you must address when preparing your site for the installation.

When selecting an installation site for the system, choose a location not subject to excessive heat, direct sunlight, dust, or chemical exposure. These conditions greatly reduce the system’s longevity and might void your warranty.

## Site wiring and AC power requirements

The following are required for all installations using AC power supplies:

**Table 29** Power requirements - AC Input

Measurement	Rating
Input power requirements	100-240VAC, 50/60Hz
Maximum input power	436W maximum continuous
Heat dissipation	1,488 BTUs/hour

- All AC mains and supply conductors to power distribution boxes for the rack-mounted system must be enclosed in a metal conduit or raceway when specified by local, national, or other applicable government codes and regulations.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment’s electrical rating label.
- To ensure redundancy, provide two separate power sources for the enclosures. These power sources must be independent of each other, and each must be controlled by a separate circuit breaker at the power distribution point.
- The system requires voltages within minimum fluctuation. The customer-supplied facilities’ voltage must maintain a voltage with not more than  $\pm 5$  percent fluctuation. The customer facilities must also provide suitable surge protection.
- Site wiring must include an earth ground connection to the AC power source. The supply conductors and power distribution boxes (or equivalent metal enclosure) must be grounded at both ends.
- Power circuits and associated circuit breakers must provide sufficient power and overload protection. To prevent possible damage to the AC power distribution boxes and other components in the rack, use an external, independent power source that is isolated from large switching loads (such as air conditioning motors, elevator motors, and factory loads).

## Weight and placement guidelines

Refer to [Physical requirements](#) on page 57 for detailed size and weight specifications.

- The weight of an enclosure depends on the number and type of modules installed.
- Ideally, use two people to lift an enclosure. However, one person can safely lift an enclosure if its weight is reduced by removing the power supply modules and disk drive modules.
- Do not place enclosures in a vertical position. Always install and operate the enclosures in a horizontal orientation.
- When installing enclosures in a rack, make sure that any surfaces over which you might move the rack can support the weight. To prevent accidents when moving equipment, especially on sloped loading docks and up ramps to raised floors, ensure you have a sufficient number of helpers. Remove obstacles such as cables and other objects from the floor.
- To prevent the rack from tipping, and to minimize personnel injury in the event of a seismic occurrence, securely anchor the rack to a wall or other rigid structure that is attached to both the floor and to the ceiling of the room.

## Electrical guidelines

- These enclosures work with single-phase power systems having an earth ground connection. To reduce the risk of electric shock, do not plug an enclosure into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.
- Enclosures are shipped with a grounding-type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.
- Do not use household extension cords with the enclosures. Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems.

## Ventilation requirements

Refer to [Environmental requirements](#) on page 58 for detailed environmental requirements.

- Do not block or cover ventilation openings at the front and rear of an enclosure. Never place an enclosure near a radiator or heating vent. Failure to follow these guidelines can cause overheating and affect the reliability and warranty of your enclosure.
- Leave a minimum of 15.2 cm (6 inches) at the front and back of each enclosure to ensure adequate airflow for cooling. No cooling clearance is required on the sides, top, or bottom of enclosures.
- Leave enough space in front and in back of an enclosure to allow access to enclosure components for servicing. Removing a component requires a clearance of at least 38.1 cm (15 inches) in front of and behind the enclosure.

## Cabling requirements


- Keep power and interface cables clear of foot traffic. Route cables in locations that protect the cables from damage.
- Route interface cables away from motors and other sources of magnetic or radio frequency interference.
- Stay within the cable length limitations.
- 2333 controller and drive enclosures are suitable for connection to intra-building or non-exposed wiring or cabling only.
- 2333 controller and drive enclosures are suitable for installation in Network Telecommunication Facilities and locations where the NEC applies. 2333 enclosures are not suitable for Outside Plant (OSP) installations.



# Management host requirements

A local management host with at least one mini-USB connection is recommended for the initial installation and configuration of a controller enclosure. After you configure one or both of the controller modules with an IP address, you then use a remote management host on an Ethernet network to manage and monitor.

---

 **NOTE:** Connections to this device must be made with shielded cables – grounded at both ends – with metallic RFI/EMI connector hoods, in order to maintain compliance with NEBS and FCC Rules and Regulations.

---

## Physical requirements

The floor space at the installation site must be strong enough to support the combined weight of the rack, controller enclosures, drive enclosures, and any additional equipment. The site also requires sufficient space for installation, operation, and servicing of the enclosures, together with sufficient ventilation to allow a free flow of air to all enclosures.

The chassis of a 2333 controller or drive enclosure is comprised of sheet steel that is bonded together using rivets, welding, and other forced contact methods. The metal surfaces are free from non-conductive coatings and paint.

[Table 30](#) and [Table 31](#) on page 57 show enclosure dimensions and weights. Enclosure designators are described below. Enclosure weights assume the following configuration characteristics:

- 2U12 enclosure (LFF – also see [Table 4](#) on page 19):
  - “2U12” denotes the 3.5" 12-drive enclosure (with controller or expansion modules)
  - The 2U12 chassis is equipped with a disk in each disk drive slot
- Two controller modules or two expansion modules per enclosure
- Two power supply modules per enclosure

**Table 30** Rackmount enclosure dimensions

Specifications	Rackmount
2U Height (y-axis):	8.9 cm (3.5 inches)
Width (x-axis): <ul style="list-style-type: none"><li>• Chassis-only</li><li>• Chassis with ear caps or enclosure bezel</li></ul>	44.7 cm (17.6 inches) 47.9 cm (18.9 inches)
LFF enclosure (2U12 ) depth (z-axis): <ul style="list-style-type: none"><li>• Back of chassis ear to controller latch</li><li>• Front of chassis ear to back of cable bend</li></ul>	59.7 cm (23.5 inches) 67.1 cm (26.4 inches)

**Table 31** Rackmount controller enclosure weights


Specifications	Rackmount
LFF controller enclosure (2U12)	9.3 kg (20.6 lb) [chassis]
<ul style="list-style-type: none"><li>• Chassis with FRUs (no disks)<sup>1-3</sup></li><li>• Chassis with FRUs (including disks)<sup>1-4</sup></li></ul>	18.1 kg (40.0 lb) 27.7 kg (61.0 lb)

<sup>1</sup>Weights shown are nominal, and subject to variances.

<sup>2</sup>Rail kits add between 2.8 kg (6.2 lb) and 3.4 kg (7.4 lb) to the aggregate enclosure weight.

<sup>3</sup>Weights may vary due to different power supplies, IOMs, and differing calibrations between scales.

<sup>4</sup>Weights may vary due to actual number and type of disk drives (SAS, SATA, SSD) and air management modules installed.

 **NOTE:** The table below provides information about the optional drive enclosure that is compatible with the 2333 controller enclosure.

**Table 32** Rackmount compatible drive enclosure weights (ordered separately)

Specifications	Rackmount
3130 (LFF 3.5" 12-drive enclosure)	9.3 kg (20.6 lb) [chassis]
<ul style="list-style-type: none"> <li>Chassis with FRUs (no disks)<sup>1-3</sup></li> </ul>	17.0 kg (37.4 lb)
<ul style="list-style-type: none"> <li>Chassis with FRUs (including disks)<sup>1-4</sup></li> </ul>	26.5 kg (58.4 lb)

<sup>1</sup>Weights shown are nominal, and subject to variances.

<sup>2</sup>Rail kits add between 2.8 kg (6.2 lb) and 3.4 kg (7.4 lb) to the aggregate enclosure weight.

<sup>3</sup>Weights may vary due to different power supplies and differing calibrations between scales.

<sup>4</sup>Weights may vary due to actual number and type of disk drives (SAS, SATA, SSD) and air management modules installed.

## Environmental requirements

**Table 33** Operating environmental specifications

Specification	Range
Altitude	To 3,000 meters (10,000 feet )
Temperature*	5°C to 40°C (41°F to 104°F)
Humidity	10% to 90% RH up to 40°C (104°F) non-condensing
Shock	5.0 g, 11 ms, ½ sine pulses, X, Y, Z
Vibration	(Shaped-spectrum) 5 Hz to 500 Hz, 0.114 G <sub>rms</sub> total X, Y, Z

\*Temperature is de-rated by 2°C (3.6°F) for every 1 km (3,281) feet above sea level.

**Table 34** Non-operating environmental specifications

Specification	Range
Altitude	To 12,000 meters (39,370 feet)
Temperature	-40°C to 70°C (-40°F to 158°F)
Humidity	Up to 93% RH @ 104°F (40°C) non-condensing
Shock	15.0 g, 11 ms, ½ sine pulses, X, Y, Z
Vibration	(Shaped-spectrum) 2.8 Hz to 365.4 Hz, 0.852 G <sub>rms</sub> total (horizontal) 2.8 Hz to 365.4 Hz, 1.222 G <sub>rms</sub> total (vertical)

 **NOTE:** For additional information about Telco and ruggedized products, see Dot Hill's web site: <http://www.dothill.com>.

# Electrical requirements

## Site wiring and power requirements

Each enclosure has two power supply modules for redundancy. If full redundancy is required, use a separate power source for each module. The AC power supply unit in each power supply module is auto-ranging and is automatically configured to an input voltage range from 88–264 VAC with an input frequency of 47–63 Hz. The power supply modules meet standard voltage requirements for both U.S. and international operation. The power supply modules use standard industrial wiring with line-to-neutral or line-to-line power connections.

## Power cable requirements

Each enclosure ships with two power cables designed for use with the enclosure power supply module. AC power cords ship with enclosures equipped with AC power supply modules. Each power cable connects one of the power supply modules to an independent, external power source. To ensure power redundancy, connect the two power cables to two separate circuits; for example, to one commercial circuit and one uninterruptible power source (UPS).



---

## C Electrostatic discharge

### Preventing electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-protected workstations.
- Place parts in a static-protected area before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

### Grounding methods to prevent electrostatic discharge

Several methods are used for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ( $\pm 10$  percent) resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part. For more information about static electricity or assistance with product installation, contact an authorized reseller.

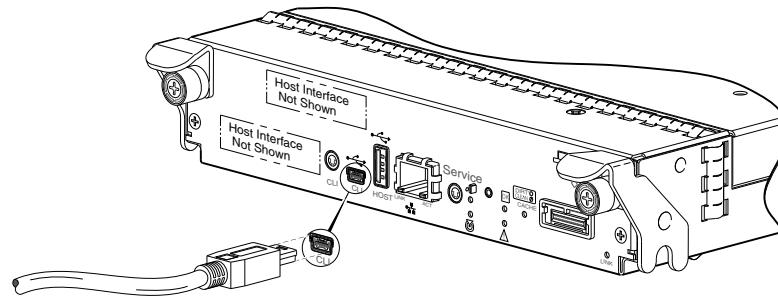


## D USB device connection

### Rear panel USB ports

AssuredSAN 2333 controllers contain two different USB (universal serial bus) management interfaces: a *Host* interface and a *Device* interface. Both interfaces pertain to the Management Controller (MC), and each interface is accessed via its port on the controller module face plate. The port labeled Host (USB Type A) is reserved for future use, and its discussion is deferred. This appendix describes the port labeled CLI (USB Type B), which enables direct connection between a management computer and the controller, using the command-line interface and appropriate cable (see [Figure 11](#) for USB port locations).

### USB CLI port



Connect USB cable to CLI port on controller face plate

**Figure 11** USB device connection — CLI port

AssuredSAN 2333 controllers feature a USB CLI port used to cable directly to the controller and initially set IP addresses, or perform other configuration tasks. The USB CLI port employs a mini-USB Type B form factor, and requires a specific cable and additional support, so that a server or other computer running a Linux or Windows operating system can recognize the controller enclosure as a connected device. Without this support, the computer might not recognize that a new device is connected, or might not be able to communicate with it.

For Linux computers, no new driver files are needed, but a Linux configuration file must be created or modified (see [Linux](#) on page 65). For Windows computers a special device driver file, `gserial.inf`, must be downloaded from a CD or web site, and installed on the computer that will be cabled directly to the controller's CLI port (see [Microsoft Windows](#) on page 64).

### Emulated serial port

Once attached to the controller module, the management computer should detect a new USB device. Using the Emulated Serial Port interface, the 2333 controller presents a single serial port using a *customer vendor ID* and *product ID*. Effective presentation of the emulated serial port assumes the management computer previously had terminal emulator installed (see [Supported host applications](#)). Serial port configuration is unnecessary.

---

**IMPORTANT:** Certain operating systems require a device driver or special mode of operation to enable proper functioning of the USB CLI port (see [Device driver/special operation mode](#)).

---

## Supported host applications

2333 controllers support the following applications to facilitate connection.


**Table 35** Supported terminal emulator applications

Application	Operating system
HyperTerminal and TeraTerm	Microsoft Windows (all versions)
Minicom	Linux (all versions)
	Solaris
	HP-UX

## Command-line Interface

Once the management computer detects connection to the USB-capable device, the Management Controller awaits input of characters from the host computer via the command-line. To see the command-line prompt, you must press *Enter*. The MC provides direct access to the CLI.

---

 **NOTE:** Directly cabling to the CLI port is an out-of-band connection, because it communicates outside of the data paths used to transfer information from a computer or network to the controller enclosure.

---

## Device driver/special operation mode

Certain operating systems require a device driver or special mode of operation. Product and vendor identification information required for such setup is provided below.

**Table 36** USB vendor and product identification codes

USB Identification code type	Code
Dot Hill Systems, Inc. vendor ID code	0x210C
AssuredSAN 2333 product ID code	0xa4a7

## Microsoft Windows

Microsoft Windows operating systems provide a USB serial port driver. However, the USB driver requires details for connecting to AssuredSAN 2333 controller enclosures. Dot Hill provides a device driver for use in the Windows environment. The USB device driver and installation instructions are provided on the ship kit CD. Alternatively, you can download this data.

### Obtaining the software download

1. Verify that the management computer has Internet access.
2. See Dot Hill's customer resource center (CRC) web site <http://crc.dothill.com>.
  - a. Select **AssuredSAN & R/Evolution Products > Software Downloads**.  
Peruse the list of articles for an entry pertaining to USB device driver.
  - b. Click on the underscored article title to view its content.  
The screen reformats to display article content together with a supporting pane to the right of the article. This pane provides optional actions and attachments.
  - c. Click on the zip file icon under Attachments in the right pane adjacent to the article.  
The File Download dialog displays.
  - d. From the File Download dialog, save the zip file locally to the management computer.
  - e. Follow the instructions accompanying the device driver, within the zip file or on the CD, to install the USB device driver.



## Linux

Although Linux operating systems do not require installation of a device driver, certain parameters must be provided during driver loading to enable recognition of the AssuredSAN 2333 controller enclosures.

### Setting parameters for the device driver


1. Enter the following command:

```
modprobe usbserial vendor=0x210c product=0xa4a7 use_acm=1
```

2. Press Enter to execute the command.

The Linux device driver is loaded with the parameters required to recognize the controllers.

---

 **NOTE:** Optionally, this information can be incorporated into the `/etc/modules.conf` file.

---



# Index

## Numerics

2U12

3.5" 12-drive enclosure 57

2U24

2.5" 24-drive enclosure 57

## A

accessing

RAIDar (web-based management GUI) 33

audience 11

## C

cables

FCC compliance statement 28, 57

shielded 28, 57

cabling

cable routing requirements 56

connecting controller and drive enclosures 18

considerations 25

direct attach configurations 26

switch attach configurations 27

cache

post-write 15

read-ahead 15

clearance requirements

service 56

ventilation 56

command-line interface

using to set controller IP addresses 29

components

12-drive enclosure front panel 13

2333 rear panel

1Gb iSCSI ports (host interface) 14

CLI port (USB) 14

expansion port 14

network port 14

service port 14

USB Type A (reserved for future use) 14

3130 rear panel 14

Power Supply Unit (PSU)

AC 13, 50

connecting

controller enclosures to hosts 25

to remote management hosts 28

connections

test 23

verify 23

console requirement 57

controller enclosures

connecting to hosts 25

connecting to remote management hosts 28

conventions

document 12

## D

DHCP

obtaining IP addresses 29

server 29

direct attach configurations 25

disk drive

LEDs

general 48

specific states 49

document

conventions 12

prerequisite knowledge 11

related documentation 11

## E

electrostatic discharge

grounding methods 61

precautions 61

enclosure

cabling 18

dimensions 57

IDs, correcting 37

initial configuration 17

input frequency requirement 59

input voltage requirement 59

installation checklist 17

site requirements 57

troubleshooting 37

weight 57, 58

Ethernet cables

requirements 26, 28

## F

faults

isolating

a host-side connection 41

expansion port connection fault 42

methodology 35

## H

host ports

iSCSI (1Gb) 26

hosts

defined 25

optional software 25

stopping I/O 37

system requirements 25

humidity non-operating range 58

humidity operating range 58

## I

IDs, correcting for enclosure 37

Installing a license

- permanent [33](#)
- temporary [33](#)
- IP addresses
  - setting using DHCP [29](#)
  - setting using the CLI [29](#)

## L

- LEDs
  - 2333 face plate
    - Cache Status [51](#)
    - Expansion Port Status [51](#)
    - Fault/Service Required [51](#)
    - FRU OK [51](#)
    - Link Activity [51](#)
    - Link Status [51](#)
    - Network Port Activity [51](#)
    - Network Port Link Status [51](#)
    - OK to Remove [51](#)
    - Unit Locator [51](#)
  - 2333 Series controller enclosure rear panel [50](#)
  - 2U12 front panel
    - Disk drive [47](#)
    - Enclosure ID [47](#)
    - Fault/Service Required [47](#)
    - FRU OK [47](#)
    - Temperature Fault [47](#)
    - Unit Locator [47](#)
  - 3130 face plate
    - Fault/Service Required [53](#)
    - FRU OK [53](#)
    - OK to Remove [53](#)
    - SAS In Port Status [53](#)
    - SAS Out Port Status [53](#)
    - Unit Locator [53](#)
  - Disk with dongle
    - OK to Remove [48](#)
    - Power/Activity/Fault [48](#)
  - Power Supply Unit (PSU)
    - AC [52](#)
    - DC [52](#)
  - using to diagnose fault conditions [38](#)
- local management host requirement [57](#)

## M

- MPIO DSM
  - Dot Hill MPIO DSM installation [25](#)
  - native Microsoft installation [25](#)
  - see related documentation [25](#)

## N

- NEBS (Level 3)
  - Exceptions to GR-63-CORE [18](#)
    - Airborne Contaminants [18](#)
    - Equipment - Fan Filters [18](#)
    - Heat Dissipation [18](#)
    - Spatial Requirements [18](#)
  - GR-1089-CORE Issue 5 [17](#)
    - R1-3.155 - hard copy Cautions and Warnings [55](#)

- R2-5.5 - documented ESD sensitivity [61](#)
- R2-6.6 - operating environmental specs [55](#), [58](#)
- R2-7.7 - grounding to prevent ESD [61](#)
- R3-1.159 - emission and immunity criteria [28](#)
- R4-16.171 - suitable for intra-building cabling [56](#)
- R4-89.210 - surge protective device [55](#)
- R9-10.79 - electrical continuity [57](#)
- R9-6.213 - suitable installation sites [56](#)
- GR-63-CORE Issue 3 [17](#)
  - R4-17.157 - fans and cooling units [15](#)
- NEBS (Network Equipment-Building System) [17](#)
- non-operating ranges, environmental [58](#)

## O

- operating ranges, environmental [58](#)
- optional software [25](#)

## P

- physical requirements [57](#)
- power cord requirements [59](#)
- power cycle
  - power on [24](#)
- power supply
  - AC power requirements [55](#)
  - site wiring requirements [55](#)
- prerequisite knowledge [11](#)

## R

- RAIDar
  - web-based storage management interface [33](#)
- regulatory compliance
  - notices
    - shielded cables [28](#), [57](#)
    - see related document [55](#)
  - related documentation [11](#)
  - remote management [28](#)
- requirements
  - cabling [56](#)
  - clearance [56](#)
  - Ethernet cables [28](#)
  - host system [25](#)
  - physical [57](#)
  - ventilation [56](#)
- RFI/EMI connector hoods [28](#), [57](#)
- rugged chassis
  - European Telco compliant [11](#)
  - MIL-STD-810G (storage requirements) compliant [11](#)
  - NEBS Level 3 compliant [11](#)

## S

- safety precautions [55](#)
- SCSI Enclosure Services (SES) driver [25](#)
- sensors
  - locating [43](#)
  - power supply [43](#)
  - temperature [44](#)
  - voltage [45](#)
- shock non-operating range [58](#)

- shock operating range [58](#)
- site planning
  - local management host requirement [57](#)
  - physical requirements [57](#)
  - safety precautions [55](#)
- storage system setup
  - configuring [33](#)
  - getting started [33](#)
  - provisioning [33](#)
- super-capacitor pack [16](#)
- switch attach configurations [27](#)

## T

- temperature non-operating range [58](#)
- temperature operating range [58](#)
- troubleshooting [35](#)
  - correcting enclosure IDs [37](#)
  - enclosure does not initialize [37](#)
  - expansion port connection fault [42](#)
  - host-side connection fault [41](#)
  - using system LEDs [38](#)

## U

- Unified LUN Presentation [25](#)
- USB device connection
  - command line interface (CLI) [64](#)
  - device driver [64](#)
  - emulated serial port [63](#)
  - rear panel USB ports [63](#)
  - supported host applications [64](#)
  - vendor and product ID codes [64](#)

## V

- ventilation requirements [56](#)
- vibration non-operating range [58](#)
- vibration operating range [58](#)

## W

- warnings
  - temperature [43](#)
  - voltage [43](#)
- web site
  - Dot Hill Systems Customer Resource Center [12](#), [15](#), [37](#)

