

# **RAID Subsystem**

**Fibre/SAS/iSCSI to 12Gb/s SAS  
RAID Subsystem**

## **Quick Installation Guide**

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## FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

## Manufacturer's Declaration for CE Certification

We confirm ARC-92xx series 12/16/24-bays 12Gb/s SAS RAID subsystem has been tested and found compliant with the requirements in the council directive relating to the EMC Directive 2004/108/EC. Regarding to the electromagnetic compatibility, the following standards were applied:

EN 55022: 2006, Class B  
EN 61000-3-2: 2006  
EN 61000-3-3: 1995+A1: 2001+A2: 2005

EN 55024:1998+A1:2001=A2:2003  
IEC61000-4-2: 2001  
IEC61000-4-3: 2006  
IEC61000-4-4: 2004  
IEC61000-4-5: 2005  
IEC61000-4-6: 2006  
IEC61000-4-8: 2001  
IEC61000-4-11: 2004

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# INTRODUCTION

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## 1. Introduction

This section presents a brief overview of the 12/16/24 bays external Fibre/SAS/iSCSI to 12Gb/s SAS RAID subsystem.

### 1.1 Overview

The 12Gb/s SAS interface supports both 12Gb/s SAS disk drives for data-intensive applications and 6Gb/s SATA drives for low-cost bulk storage of reference data. The Fibre/SAS/iSCSI to 12Gb/s SAS RAID controllers attach directly to SATA/SAS midplanes with 3 x Z-PACK HM-Zd high speed connectors or increase capacity using one additional Min SAS HD SFF-8644 external connector. When used with 12Gb/s SAS expanders, the controller can provide up to (256) devices through one or more SAS JBODs, making it an ideal solution for enterprise class storage applications that called for maximum configuration flexibility.

The Fibre/SAS/iSCSI to 6Gb/s SAS RAID subsystem provides a 2U/3U/4U rackmount external storage chassis capable of accommodating up to 12/16/24 12.0-Gb/s, Serial-Attached SCSI (SAS) drives or 6.0-Gb/s Serial ATA (SATA) drives. It provides three kinds of host interface link to the host board on the server system. The redundant controller model provides fault-tolerant links across separate host interface, while the single controller model provides a single, straight-through data path.

### Unparalleled Performance for 12Gb/s SAS

The 12Gb/s SAS RAID subsystems raise the standard to higher performance levels with several enhancements including new high performance 1.2 GHz dual core ROC processor, a DDR3-1866 memory architecture and high performance PCIe 3.0 interface bus interconnection. The subsystem each includes one 240-pin DIMM socket with default 2GB DDR3-1866, single rank, 1Rx8, upgrade to 8GB or 8GB DDR3-1600, dual rank, 2Rx8, ECC SDRAM. The 12Gb/s SAS is designed for backward compatibility with 6Gb/s and 3Gb/s SAS and SATA hard drives. Regardless of the drive speed, 12Gb/s SAS RAID controllers will provide maximum read/write performance improvements for the most performance-hungry database and IT applica-

tions.

The subsystem includes one 12Gb/s SAS expander that incorporates the latest enhancements in SAS along with new LSI DataBolt bandwidth optimizer technology. This is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives and backplanes. Using DataBolt, the subsystem buffers 6Gb/s data and then transfers it out to the host at 12Gb/s speeds in order to match the bandwidth between faster hosts and slower SAS or SATA devices.

## **Unsurpassed Data Availability**

Designed and leveraged with Areca's existing high performance RAID solution, ARC-1883 provides superior levels performance and enterprise level data protection for the most demanding next generation server and storage environments. It supports the hardware RAID 6 engine to allow two HDDs failures without impact the existing data and performance. It allows users to hot swap drive in the event of a drive failure with zero downtime. With innovative new RAID-on-Chip 12Gb/s SAS feature and support for SATA, SAS and SSDs, the SAS RAID subsystems provides small- to mid-sized enterprises with superior levels of RAID performance and scalability for external storage. The optional flash-based backup module provides power to the cache if it contains data not yet written to the drives when power is lost. The subsystem also supports traditional Lithium-ion (Li-ion) battery backup module (BBM) to protect cached data on RAID adapters.

## **Easy RAID Management**

Configuration and monitoring can be managed either through the LCD control panel, RS232 port or LAN port. The firmware also contains an embedded terminal emulation via the RS-232 port. The firmware-embedded web browser-based RAID manager allows local or remote to access it from any standard internet browser via a LAN port. The controller also supports API library for customer to write its own monitor utility. The Single Admin Portal (SAP) monitor utility can support one application to manage multiple RAID units in the network.

# INTRODUCTION

## 1.2 Subsystem Naming Rule

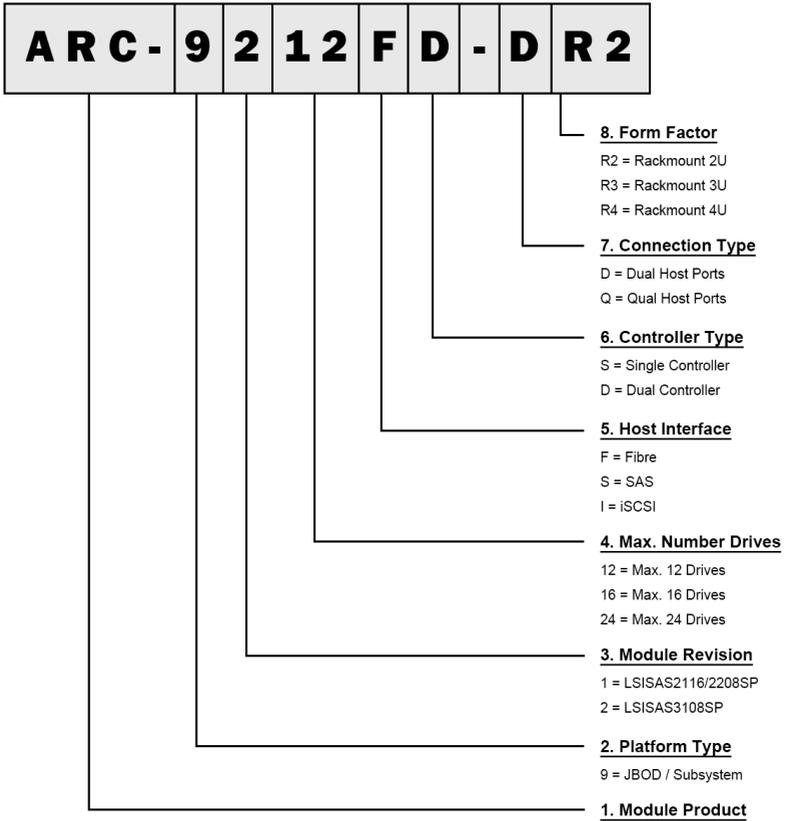


Figure 1-1. Subsystem Naming Rule

# HARDWARE INSTALLATION

## 1.3 Locations of the Subsystem Component

The main components of the Fibre/SAS/iSCSI to 12Gb/s SAS RAID subsystem are shown in the below figure.

### 1.3.1 RAID Subsystem Front View

- 2U-12 bays SAS RAID Subsystem Front View

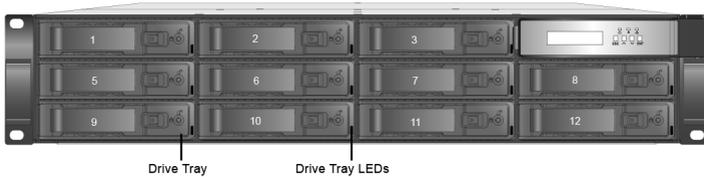


Figure 1-2. 2U-12 bays SAS RAID Subsystem Front View

- 3U-16 bays SAS RAID Subsystem Front View



Figure 1-3. 3U-16 bays SAS RAID Subsystem Front View

- 2U-24 bays SAS RAID Subsystem Front View

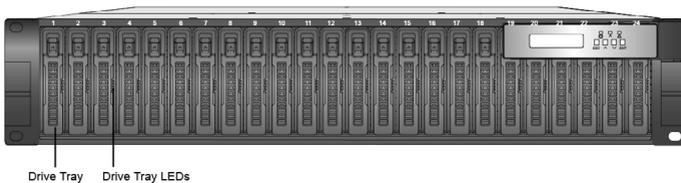


Figure 1-4. 2U-24-bays SAS RAID Subsystem Front View

# HARDWARE INSTALLATION

- 4U-24 bays SAS RAID Subsystem Front View

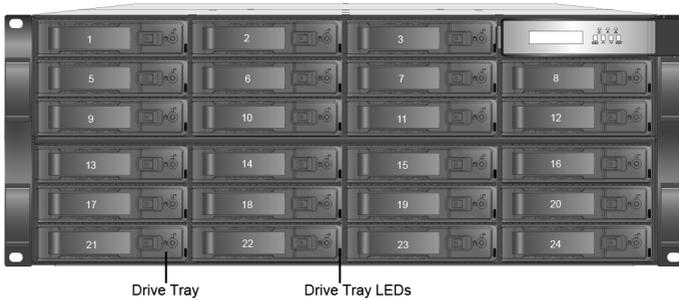


Figure 1-5. 4U-24-bays SAS RAID Subsystem Front View

- **Disk Slot Numbers**

To perform a disk hot-plug procedure, you must know the physical disk slot number for the drive that you want to install or remove. The number on the drive tray shows how RAID subsystem disk slots are numbered. Disk slot number is reflected in the RAID manager interface.

- **Drive Tray LED Indicators**

Each drive tray in your subsystem has two LEDs: an activity LED (blue) and one power/fault (two colors green/red) status LED. The activity LED flashes whenever the drive is accessed. The following table describes the SAS RAID subsystem drive tray LED status.

LED	Normal status	Problem Indication
Blue LED (Activity)	<ol style="list-style-type: none"><li>1. When the activity LED is lit, there is I/O activity on that disk drive.</li><li>2. When the LED is not lit; there is no activity on that disk drive.</li></ol>	N/A

# HARDWARE INSTALLATION

Green/Red LED (Power/Fault)	<ol style="list-style-type: none"><li>1. When the power LED (green) is lit and fault LED (red) is off, that disk is present and status normal.</li><li>2. When the fault LED is lit there is no disk present.</li></ol>	<ol style="list-style-type: none"><li>1. When the fault LED (red) is slow blinking (2 times/sec), that disk drive has failed and should be hot-swapped immediately.</li><li>2. When the activity LED (blue) is lit and fault LED (red) is fast blinking (10 times/sec) there is re-building activity on that disk drive.</li></ol>
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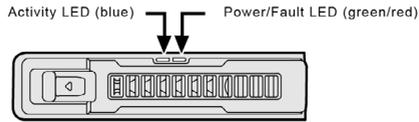


Figure 1-6. 2.5-inch SAS/SATA Drive Tray LED

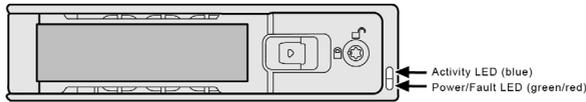


Figure 1-7. 3.5-inch SAS/SATA Drive Tray LED

## 1.3.2 RAID Subsystem Rear View

- 2U-12 bays SAS RAID Subsystem Rear View

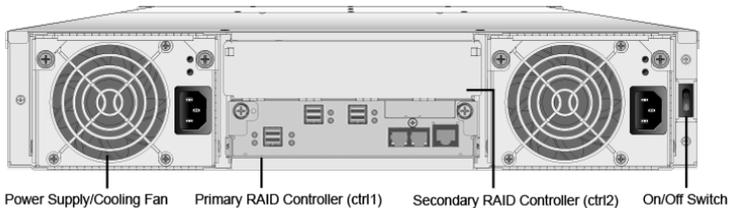


Figure 1-8. 2U-12 bays SAS RAID Subsystem Rear View

# HARDWARE INSTALLATION

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- 3U-16 bays SAS RAID Subsystem Rear View

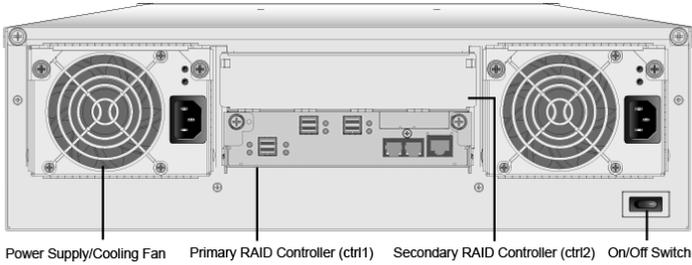


Figure 1-9. 3U-16 bays SAS RAID Subsystem Rear View

- 2U-24 bays SAS RAID Subsystem Rear View

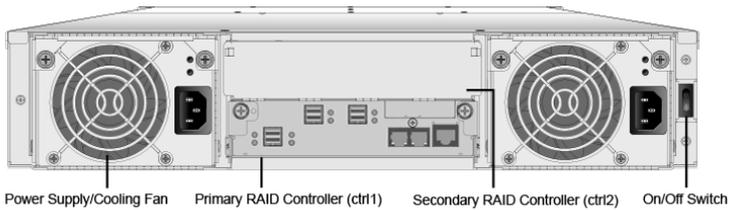


Figure 1-10. 2U-24 bays SAS RAID Subsystem Rear View

- 4U-24 bays SAS RAID Subsystem Rear View

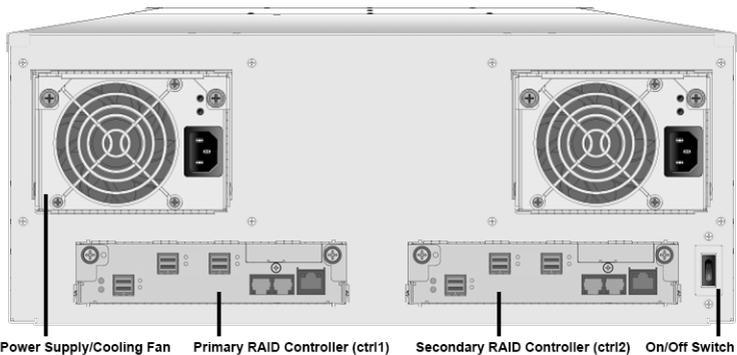


Figure 1-11. 4U-24 bays SAS RAID Subsystem Rear View

# HARDWARE INSTALLATION

## 1.3.2.1 Rear View of Fibre to SAS RAID Controller

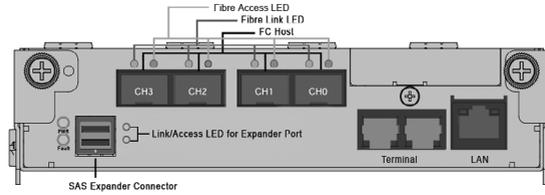


Figure 1-12. Rear View of Fibre to SAS RAID Controller

The following table describes the Fibre to SAS RAID subsystem host channel link/access LED.

Fibre Host Port LED	Status
Link LED (Green/Orange light)	Two LEDs (green/orange) are used to indicate the link speed of the operation of each Fibre Channel port. 1. On (green) when the Fibre Channel 16Gbps link speed is connected and established. 2. On (orange) when the Fibre Channel 8Gbps link speed is connected and established. 3. On (green and orange interactive flash) when the Fibre Channel 4Gbps link speed is connected and established.
Access LED (Blue light)	The Fibre channel host accesses to the Fibre to SAS RAID subsystem.

## 1.3.2.2 Rear View of SAS to SAS RAID Controller

The following table describes the SAS to SAS RAID subsystem host channel link/access LED.

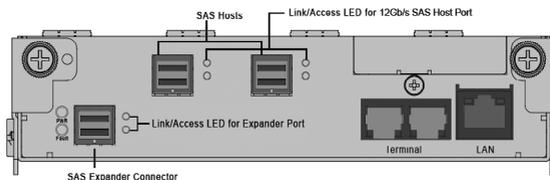


Figure 1-13. Rear View of SAS to SAS RAID Controller

# HARDWARE INSTALLATION

SAS Host Port LED	Status
Link LED (Green light)	<ol style="list-style-type: none"> <li>1. When host port link LED is lit for 1 second and turns off for 3 seconds that indicates the one link has connected.</li> <li>2. When host port link LED is lit for 2 seconds and turns off for 2 seconds that indicates the two links have connected.</li> <li>3. When host port link LED is lit for 4 seconds that indicates the four links have connected.</li> </ol>
Access LED (Blue light)	When access LED is lit that indicates the SAS host accesses to the SAS to SAS RAID subsystem.

## 1.3.2.3 Rear View of iSCSI to SAS RAID Controller

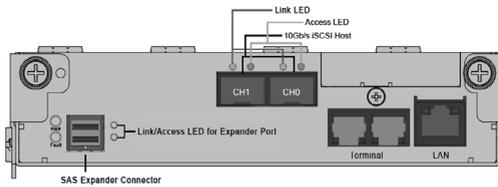


Figure 1-14. Rear View of iSCSI to SAS RAID Controller

The following table describes the iSCSI to SAS RAID subsystem host channel link and access LED.

iSCSI Host Port	Status
Link LED (Green light)	When link LED is lit that indicates the iSCSI host link has connected.
Access LED (Blue light)	When activity LED is flashed that indicates the iSCSI host accesses to the iSCSI RAID subsystem.

## 1.3.2.4 Expander Output

The following table describes the SAS RAID subsystem expander port link/access LED.

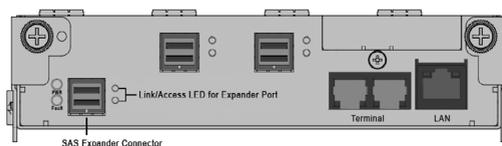


Figure 1-15. Expander Port LED

# HARDWARE INSTALLATION

Expander LED	Status
Link LED (Green light)	<ol style="list-style-type: none"> <li>1. When link LED is lit for 1 second and turns off for 3 seconds that indicates the one expander link has connected.</li> <li>2. When link LED is lit for 2 seconds and turns off for 2 seconds that indicates the two expander links have connected.</li> <li>3. When link LED is lit for 4 seconds that indicates the four expander links have connected.</li> </ol>
Access LED (Blue light)	When access LED is lit that indicates the SAS expander connector accesses to next JBOD.

## 1.3.2.5 Global Status

On the left side of expander port are two LEDs which indicate the status of the RAID controller working on dual controller mode.

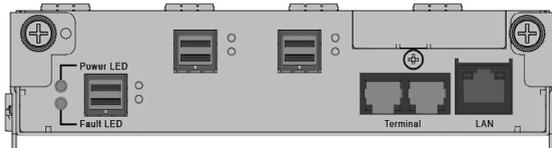


Figure 1-16. Dual Controller Global Status

Subsystem Indicators	Status
Power LED (Heartbeat/ Green light)	When power LED is lit that indicates the subsystem in working state. Flashing power LED indicates controller CPU access the subsystem resource.
Fault LED (Red light)	Flashing fault LED indicates a controller reset occurs on a controller.

## 1.3.2.6 Power Supply/Cooling Fan LED

The subsystem supports two separate power modules. Each of them contains an integrated power supply and two cooling fans. The LEDs on the RAID subsystem's power supplies indicate status of the power supply: one for AC\_OK (green) and other FAULT(red). The following figure is shown LEDs on the power supply module.

# HARDWARE INSTALLATION

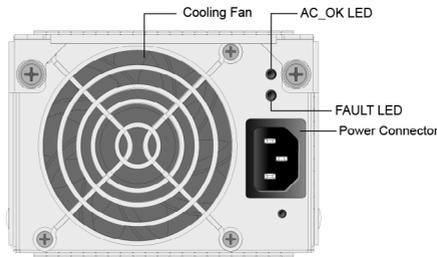


Figure 1-17. Power Supply Front View

The following table describes the power LEDs status.

Power LED Status	Indication
AC_OK (Green LED)	The AC_OK LED indicates that the AC line is present and above the minimum AC input voltage threshold
FAULT (Red LED)	The FAULT LED is driven by the microprocessor and will indicate that a power supply fault has occurred

The power supply cooling shall be provided by the internal tandem fans, powered by the common 12V rail voltage. Fan speed is controlled by PWM input signal. And the power supply firmware shall determine the fan RPM required to provide forced air cooling using data from a thermal sensor in the power supply that reflects the output loading.

The cooling fans included on the power supply run on separate control circuits from the power supply. Therefore, if one power supply fails, the failed power's fan continues to work on the power supplied from the other good power supply.

## **Note:**

A power supply/cooling fan module can be removed from a powered-on subsystem; however, the expander controller may automatically shut down the subsystem if overheating occurs.

# HARDWARE INSTALLATION

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## 1.4 RAID Subsystem Alarm

An audible alarm is activated if any of the fault conditions occur, such as Voltage, Temperature, Fan, Power Supply or from SES2. The "Alert Beeper Setting" function on the RAID System Function is used to disable or enable the RAID subsystem alarm tone generator. The "Mute The Alert Beeper" function on the "RAID System Function" is used to control the SAS RAID subsystem beeper. It turns the beeper off temporarily. The beeper will still activate on the next event.

### **Note:**

It is rare for both 12Gb/s SAS RAID controller to fail simultaneously. However, if this occurs, the RAID subsystem can not issue critical or non-critical event alarms for any subsystem component.

## 1.5 Expansion Connection

The SAS RAID subsystem is a device that contains one expander port. Expander port may support being attached to SAS initiator ports, SAS and/or SATA target ports, and to other expander ports. The SAS RAID subsystem can connect up to 7 expander enclosures to the host system. The maximum drive no. is 256 through this RAID subsystem with 7 expander enclosures. Enclosures installed with SAS disks or SATA disks can be included in the same daisy-chain. The following figure shows how to connect the external Mini SAS HD SFF-8644 cable from the 12Gb/s SAS RAID subsystem to the external SAS RAID subsystem. Daisy-chains longer than the limitation of subsystems are not supported even if it may be workable.

# HARDWARE INSTALLATION

- Single Controller Mode

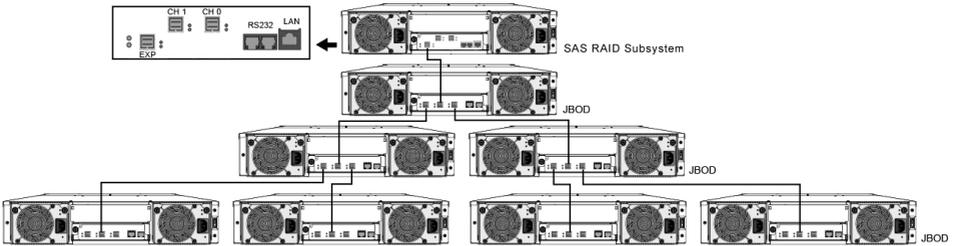


Figure 1-18. Single Module Daisy-chain

- Dual Controller Mode

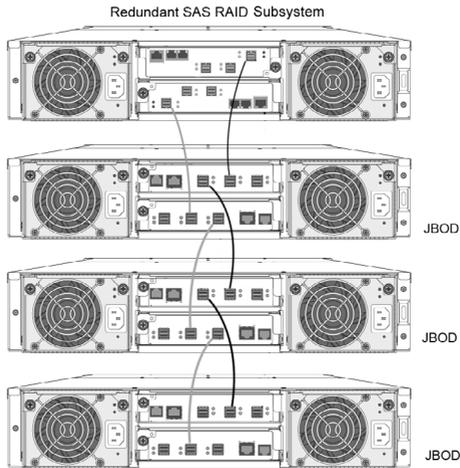


Figure 1-19. Dual Controller Daisy-chain

The following table is the max no. of SAS RAID subsystem supported:

	Disks/Subsystem	Expander	Devices/Controller	Volume
<b>Max No.</b>	128	8	256	128

# HARDWARE INSTALLATION

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**Note:**

1. Turn on the SAS RAID subsystem first to make sure the host adapter on the server recognizes the drives in the subsystem.
2. Turn on the JBOD first to make sure the SAS RAID subsystem recognizes the drives in the JBOD.

# HARDWARE INSTALLATION

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## 2. Hardware Installation

This chapter explains how to install the following components:

- Rack installation guide
- Drives and drive carriers
- SAS RAID controller boards
- Power supplies

### Unpack

Unpack and install the hardware in a static-free environment. The SAS RAID subsystem is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage. If the SAS RAID subsystem appears damaged, or if any items of the contents listed below are missing or damaged, please contact your dealer or distributor immediately.

### Checklist

The SAS RAID subsystem kit may have included the following items in the shipping package:

- SAS RAID subsystem
- RAID rack kit
- Mounting hardware (attachment rails, screws, etc.)
- SFF-8644 to SFF-8644 cable (optional)
- Power cords
- RJ11 to DB9 serial communications null-modem cable
- Installation guide (user manual in the production CD)

### Installing into a Subsystem Rack

Before you install the rack for your SAS RAID subsystem, please make sure you have these rack kit components:

- One pair of mounting-bracket rail
- One pair of length rail
- 10-32 x 0.5-inch flange-head Phillips screws (8)

# HARDWARE INSTALLATION

## 2.1 Installing an Subsystem into the Rack or Tower (Optional)

The following sections show the 2U-12 bays installation. An installation with the 2U-24, 3U-16 or 4U-24 bays is exactly the same.

1. Using supplied screws to secure the mounting-bracket rail and length rail and then secure them on the front vertical rail and rear vertical rail, as shown below. Make sure that all connections are tightened before continuing.

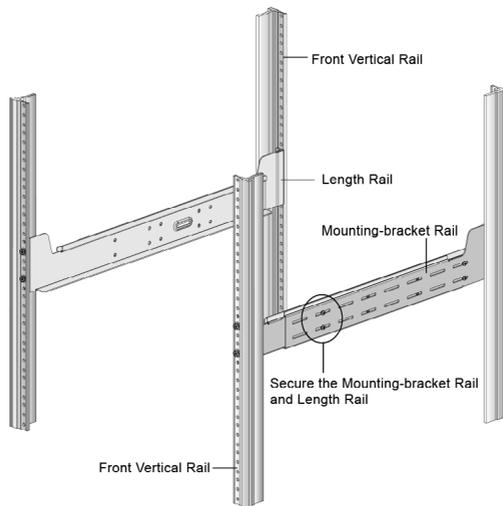


Figure 2-1. Attaching the Mounting Rails to the Cabinet

2. Slide the rear side of subsystem fully onto the rack until the subsystem front panel touched the front vertical rails. Align the mounting holes of the subsystem on the front vertical rail holes. The subsystem is too heavy; it needs some assistance from other people to lift it onto the rack together.

# HARDWARE INSTALLATION

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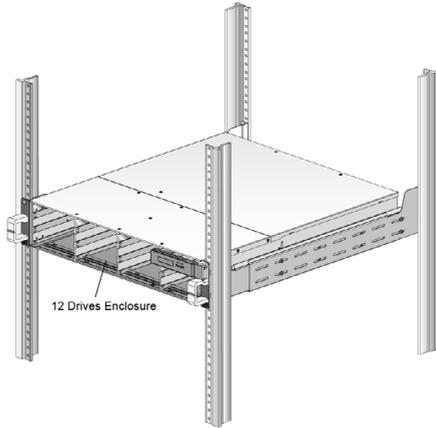


Figure 2-2. Sliding the Subsystem into the Rails

3. Secure the subsystem to the front vertical rail and mounting-bracket rail on both sides.

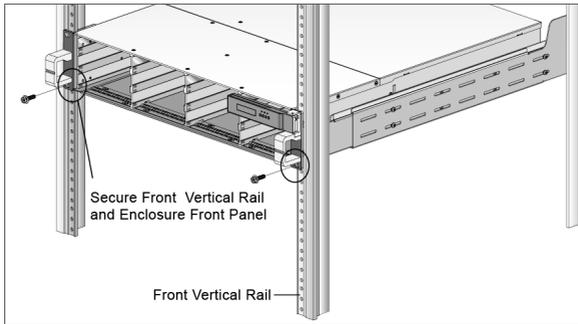


Figure 2-3. Attaching the Front of the Subsystem

## 2.2 Installing or Removing SAS/SATA Drives in the Subsystem

Your subsystem supports up to 12/16/24 3.5-inch disk drives or 12/16/24 2.5-inch 12Gb/s SAS or 6.0Gb/s SATA drives, each one contained in its individual drive carrier. Each drive is hot-pluggable, allowing you to remove and insert drives without shutting down your subsystem.

This section describes how to install or remove drives in your subsystem.

# HARDWARE INSTALLATION

## Note:

Be careful when handling and storing the drives. The tray provides some protection, but the drives and tray connectors can be damaged by rough handling. When removing the drives from the subsystem, place them on a padded surface. Do not drop the drives.

## 2.2.1 Installing SAS/SATA Drives in the Subsystem

Follow the steps below to install the drives into drive tray.

### 2.2.1.1 Installing 2.5-inch Drives into 2.5-inch or 3.5-inch Drive Tray

- 1-1. Install the drives into the drive tray and make sure the holes of the disk trays align with the holes of the drive.

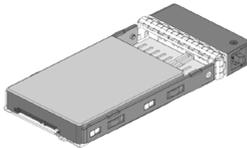


Figure 2-4. Put 2.5-inch SAS/SATA Drive into 2.5-inch Disk Tray

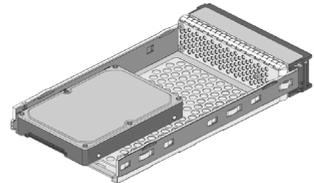


Figure 2-5. Put 2.5-inch SAS/SATA Drive into 3.5-inch Disk Tray

- 1-2. Turn the drive tray upside down and using a screwdriver to secure the drive to the drive tray by four of the mounting screws.



Figure 2-6. 2.5-inch drive Carrier with 2.5-inch SAS/SATA Drive



Figure 2-7. 2.5-inch Drive Carrier with 3.5-inch SAS/SATA Drive

# HARDWARE INSTALLATION

2. After installing the drive into the drive tray completely, make sure the drive tray latch is open, then slide the drive tray with the attached drive into the subsystem drive slot.
3. Gently slide the drive tray back of the subsystem drive slot until the bottom of the open carrier handle makes contact with the subsystem face plate.

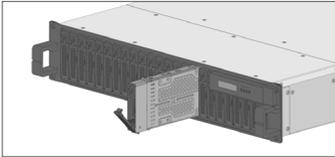


Figure 2-8. Installing 2.5-inch Drive into Enclosure

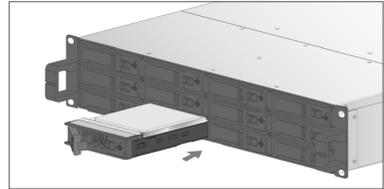


Figure 2-9. Installing 3.5-inch Drive into Enclosure

4. Click the drive tray latch into position, then continuing to slide the other drive tray into the slot.
5. Turn the key-lock to the proper position, using the "Star Wrench L-Handle" in the shipping box. The key-lock is unlock, if the dot on its face is in the unlock orientation.

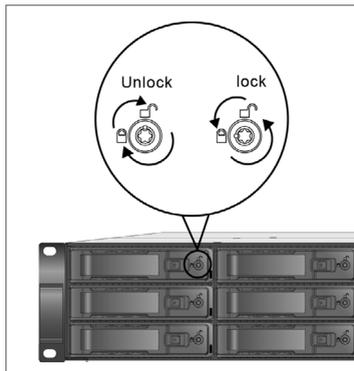


Figure 2-10. Locking Drive Tray

## **Note:**

To ensure proper airflow for subsystem cooling, each slot should contain a drive tray.

# HARDWARE INSTALLATION

## 2.2.1.2 Installing 3.5-inch Drives into 3.5-inch Drive Tray

- 1-1. Install the drives into the drive tray and make sure the holes of the drive trays align with the holes of the drive.

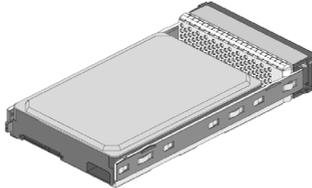


Figure 2-11. Putting Drive into Drive Tray

- 1-2. Turn the drive tray upside down and using a screwdriver to secure the drive to the drive tray by four of the mounting screws.



Figure 2-12. Securing Drive

2. After installing the drive into the drive tray completely, make sure the drive tray latch is open, then slide the drive tray with the attached drive into the subsystem drive slot.
3. Gently slide the drive tray back of the subsystem drive slot until the bottom of the open carrier handle makes contact with the subsystem face plate.

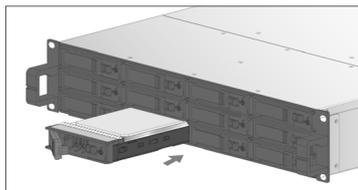


Figure 2-13. Installing Drive into Subsystem

# HARDWARE INSTALLATION

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4. Click the drive tray latch into position, then continuing to slide the other drive tray into the slot.
5. Turn the key-lock to the proper position, using the "Star Wrench L-Handle" in the shipping box. The key-lock is unlock, if the dot on its face is in the unlock orientation.

## 2.2.2 Installing SATA Drives with Interposer Board

The interposer board is for usage with SATA drives. It provides dual data path for dual controller. If your subsystem has two SAS expander module and you are installing SATA drives, an interposer board is required so that both expander modules can access the SATA drives. Follow the steps below to install the SATA drive with interposer board into the drive tray.

### 2.2.2.1 Installing 2.5-inch Drives into 3.5-inch Drive Tray

- 1-1. Prepare the interposer module.

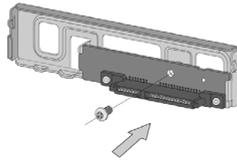


Figure 2-14. Fastening Interposer Board into Mounting Bracket

- 1-2. Clip the interposer board into the drive tray.

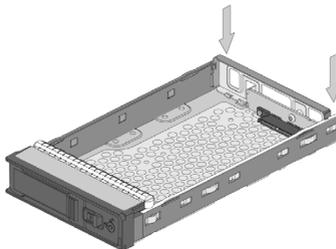


Figure 2-15. Installing Interposer Module

# HARDWARE INSTALLATION

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- 1-3. Carefully slide the 2.5-inch drive toward the interposer module.

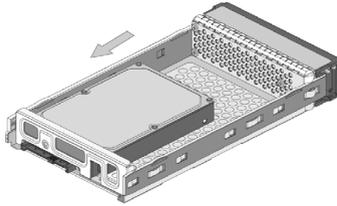


Figure 2-16. Sliding Drive into Drive Tray

- 1-4. Turn the drive tray upside down and using a screwdriver to secure the drive to the drive tray by four of the mounting screws.



Figure 2-17. Securing Drive

2. After installing the drive into the drive tray completely, make sure the drive tray latch is open, then slide the drive tray with the attached drive into the subsystem drive slot.
3. Gently slide the drive tray back of the subsystem drive slot until the bottom of the open carrier handle makes contact with the subsystem face plate.
4. Click the drive tray latch into position, then continuing to slide the other drive tray into the slot.
5. Turn the key-lock to the proper position, using the "Star Wrench L-Handle" in the shipping box. The key-lock is unlock, if the dot on its face is in the unlock orientation.

# HARDWARE INSTALLATION

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## 2.2.2.2 Installing 2.5-inch Drives into 2.5-inch Drive Tray

- a. Slide the 2.5-inch drive toward the interposer module.

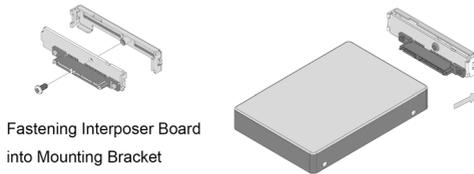


Figure 2-18.  
Preparing and  
Sliding Interposer  
Module

- b. Position interposer module with drive toward the interposer module slot with the latch point in the interposer module aligned with the interposer module slot. Gently press down the module until it snaps into place in the interposer module slot on the tray.

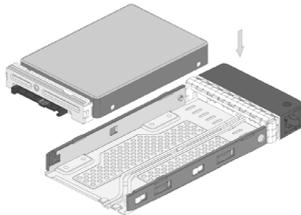


Figure 2-19.  
Installing Drive into Drive Tray

- c. Turn the drive tray upside down and using a screwdriver to secure the drive to the drive tray by four of the mounting screws.



Figure 2-20. Securing Drive

1. After installing the drive into the drive tray completely, make sure the drive tray latch is open, then slide the drive tray with the attached drive into the enclosure drive slot.
2. Gently slide the drive tray back of the enclosure drive slot until the bottom of the open carrier handle makes contact with the enclosure face plate.
3. Click the drive tray latch into position, then continuing to slide the other drive tray into the slot.

# HARDWARE INSTALLATION

## 2.2.2.3 Installing 3.5-inch Drives into 3.5-inch Drive Tray

1-1. Slide the 3.5-inch drive toward the interposer module.

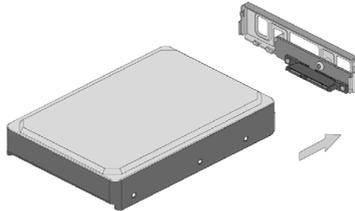


Figure 2-21. Sliding Interposer Module

1-2. Position interposer module with drive toward the interposer module slot with the latch point in the interposer module aligned with the interposer module slot. Gently press down the module until it snaps into place in the interposer module slot on the tray.

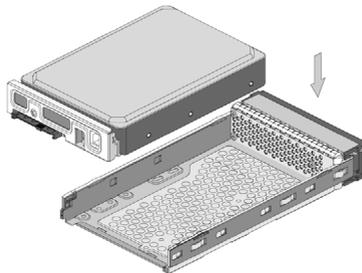


Figure 2-22. Installing Drive into Drive Tray

1-3. Turn the drive tray upside down and using a screwdriver to secure the drive to the drive tray by four of the mounting screws.

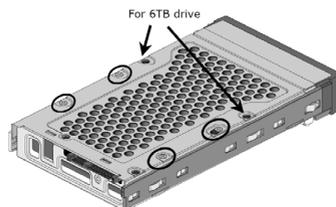


Figure 2-23. Securing Drive

# HARDWARE INSTALLATION

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2. After installing the drive into the drive tray completely, make sure the drive tray latch is open, then slide the drive tray with the attached drive into the subsystem drive slot.
3. Gently slide the drive tray back of the subsystem drive slot until the bottom of the open carrier handle makes contact with the subsystem face plate.
4. Click the drive tray latch into position, then continuing to slide the other drive tray into the slot.
5. Turn the key-lock to the proper position, using the "Star Wrench L-Handle" in the shipping box. The key-lock is unlock, if the dot on its face is in the unlock orientation.

## **2.2.3 Removing Drives from the Subsystem**

1. Don't power the system off until the LED indicator on the drive tray stop flashing.
2. For 3.5-inch drive tray, turn the key-lock to the unlock position.
3. Open the drive tray latch, then gently but firmly pull the drive tray out from the slot.

## **2.3 Installing or Removing the RAID Controller in the Subsystem**

A RAID subsystem with redundant subsystem management contains two controllers. A RAID subsystem with non-redundant subsystem management only has one controller. If only one controller is installed, it must be in the primary expander bay and a blank module cover must be installed in the secondary expander bay.

### **2.3.1 Installing the RAID Controller in the Subsystem**

Follow the steps below to install the SAS RAID controller in the subsystem:

# HARDWARE INSTALLATION

1. Carefully slide the SAS RAID controller into the empty slot.
2. Push the SAS RAID controller caddy back of the slot until it is firmly seated in the backplane connector.
3. Put the lever toward the subsystem and tighten the thumb-screw which located on the left side of lever of the SAS RAID controller caddy.

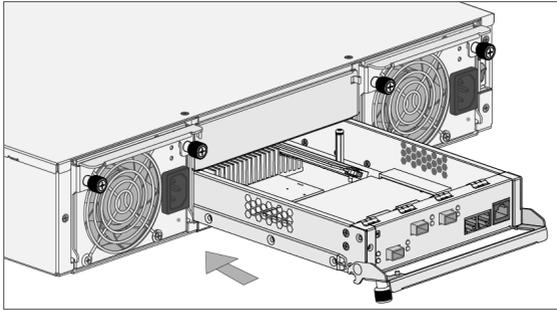


Figure 2-24. Installing Controller Module

## **Note:**

There are two slots for your SAS RAID controller. If you only installed one in your subsystem, the other empty slot must place a cover. To remove the cover, pull out on the thin tabs on each end of the cover and slide the cover out of the slot.

## **2.3.2 Removing the RAID Controller from the Subsystem**

Follow the steps below to remove the RAID controller from the subsystem:

1. Loosen the thumbscrew on left side of the lever, then gently but firmly pull the SAS RAID controller caddy out from the slot.
2. After removed the SAS RAID controller caddy from the enclosure, place the cover in the empty slot.

# HARDWARE INSTALLATION

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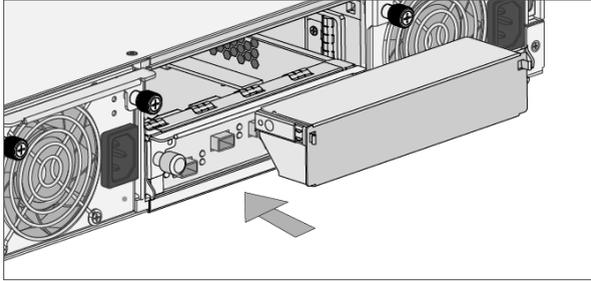


Figure 2-25. Installing the Cover

## **Note:**

At least one SAS RAID controller must be installed in the RAID subsystem. If only one SAS RAID controller is installed, it must be in the primary SAS RAID controller slot and the other one must contain a cover.

## **2.3.3 Check Controller Memory Module**

At least 2GB registered DDR3-1866 cache memory is required in each controller. Make sure the cache memory module is present and seated firmly in the DIMM socket (DDR3-1866) for series SAS RAID subsystems.

### **2.3.3.1 Installing the DDR-3 SDRAM DIMM**

1. Position the DIMM module toward the socket with the notches in the module aligned with the receptive point on the socket.
2. Gently press down the module until it snaps into place in the socket. The release tabs will hold the DIMM in place.
3. Make sure the selected registered DIMM module using x8 or x16 device on the module.

# HARDWARE INSTALLATION

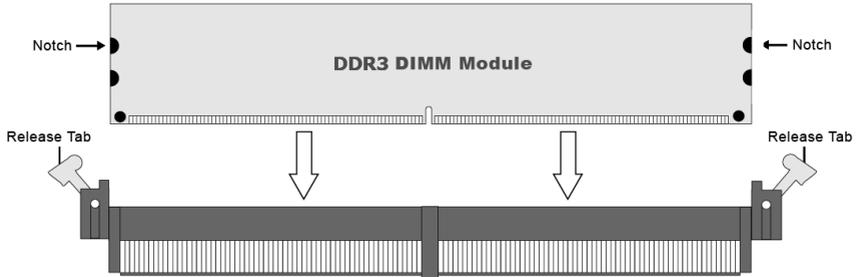


Figure 2-26, Inserting DIMM Module into Socket

## 2.3.3.2 Removing the DDR-3 SDRAM DIMM

Use your thumbs to gently push the release tabs at both ends of the socket to release it from the socket.

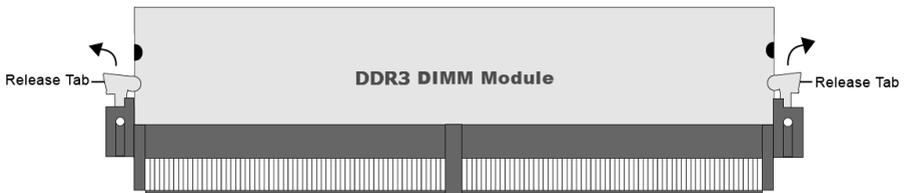


Figure 2-27, Releasing DIMM Module from Socket

## 2.3.4 Adding a Battery/Flash-based Backup Module (Optional)

Please refer to Appendix B/C for installing the BBM/FBM in your series SAS RAID subsystem.

# HARDWARE INSTALLATION

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## 2.4 Installing and Removing the Power Supply/Cooling Fan Modules

The subsystem supports two separate power modules. Each of them contains an integrated power supply and two cooling fans.

### 2.4.1 Installing the Power Supply/Cooling Fan Modules

1. Carefully slide the power supply/cooling fan modules into the empty slot.
2. Push the module back of the slot until it is firmly seated in the backplane connector.
3. Tighten the two thumbscrews to secure the power supply/cooling fan modules.
4. Connect the AC power cords to a grounded electrical outlet and to the power supply. Turn on the AC power switch from RAID subsystem. (Please refer to section 2.5 Installing the Power Cord Clamp)

**Note:**

The power supply/cooling fan modules are heavy. Be careful when you lift it up into the slot.

### 2.4.2 Removing a Power Supply/Cooling Fan Modules

1. Turn off the power supply and unplug the AC power cords.
2. Loosen the thumbscrews on power supply/cooling fan module then gently but firmly pull the power supply/cooling fan modules out from the slot.

# HARDWARE INSTALLATION

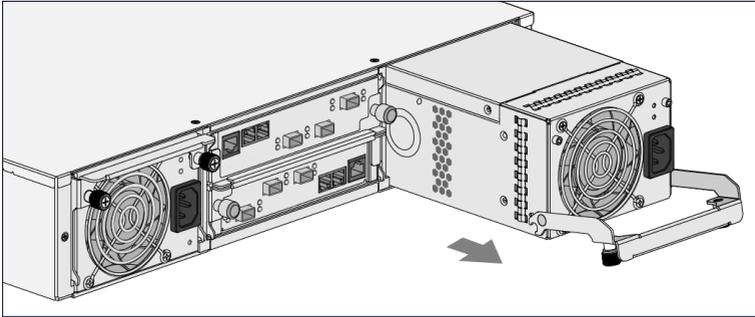


Figure 2-28, Pulling Power Module

## **Note:**

1. The power supply/cooling fan modules are hot-pluggable. If one power supply/cooling fan module is functioning normally, you can hot-swap the other one while the subsystem is powered on.
2. If you remove a power supply/cooling fan module, the fan speed on the existing module will increase significantly to provide adequate cooling. The fan speed will decrease gradually when a new power supply/cooling fan module is inserted into the subsystem.

## 2.5 Installing the Power Cord Clamp

Using the included power cords, connect each power supply and cooling fan unit to an AC power source. The cable clamp prevents the power cord from being accidentally unplugged.

1. Connect the cable clamp to the cable strap. Opening the release tab then insert the angled end of cable strap through the cable tie frame. Facing up of cable strip smooth side and the other side facing down.

# HARDWARE INSTALLATION

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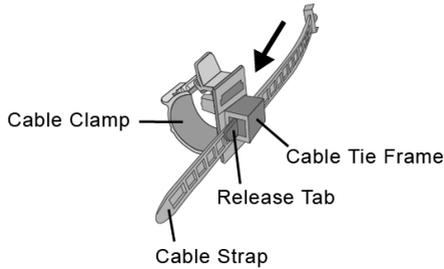


Figure 2-29, Power Cord Clamp

2. Connect the power cord and connect the cable strap with opening cable clamp to the power module. Using the release tab to adjust the cable clamp to the suitable place.

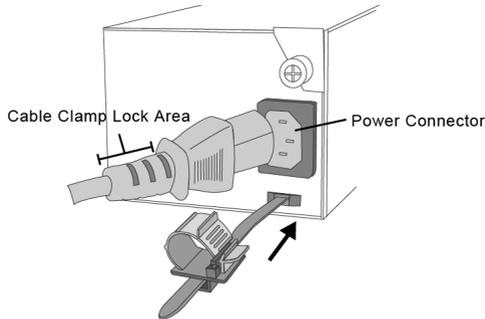


Figure 2-30, Adjusting Power Cord Clamp

3. Using cable clamp wrap the power cord and clip lock it. Repeat step 1 to 3 procedures to install the power cord clamp on the other power side.

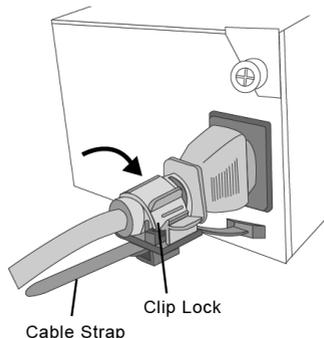


Figure 2-31, Clipping Lock

# HARDWARE INSTALLATION

## 2.6 Connecting the RAID Subsystem

Once the SAS RAID subsystem has finished the installation of hardware components, then you can connect it to a host computer. The SAS RAID subsystem can be connected to a host computer through the SAS, Fibre or iSCSI interface. User can select the right cable connected to the host controller or other SAS RAID subsystem.

### 2.6.1 Connecting to Host System

The external host connector is provided on the back of the SAS RAID subsystem for connecting the array to server host adapter. By installing host port adapter and RAID subsystem using the correct external cables which is included in your SAS RAID subsystem kits. Then connect SAS RAID subsystem and host port adapter as shown below:

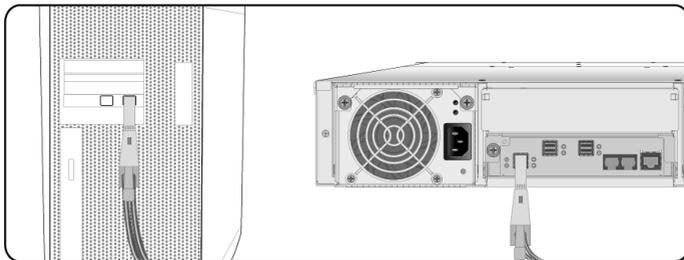


Figure 2-32, Connecting to Host Adapter

### 2.6.2 Connecting Monitor Port

The SAS RAID subsystem is normally delivered with LCD pre-installed. Your SAS RAID subsystem can be configured by using the LCD with keypad, a serial device (terminal emulation) or LAN port.



Figure 2-33, Monitor Port Location

# HARDWARE INSTALLATION

- **RS232C Port Connection**

The SAS RAID subsystem can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the SAS RAID subsystem for access to the text-based setup menu. There are two RJ11 connectors that can support multiple functions on each connector. The controller board J3 jumper is used to define each RS 232 port (VT-100 for expander/Debug and VT-100 for controller) function.

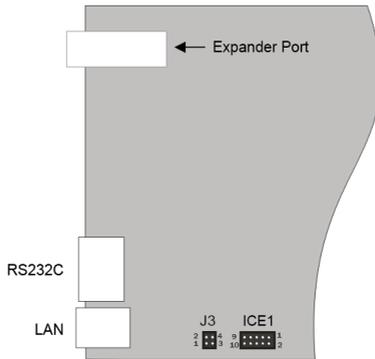


Figure 2-34, Jumper for Setting RS-232C Port

J3 jumper	Left RJ11 (Facing Connector)	Right RJ11 (Facing Connector)
1-2	Controller Debug Port	Expander Port
3-4 (Default)	Controller Debug Port	Controller VT-100 Port
No Cap	Expander Port	Controller VT-100 Port

Table 2-1, RS232C Port Function Definition

- **LAN Port Connection**

The SAS RAID subsystem has embedded the TCP/IP & web browser-based RAID manager in the firmware(method 3). User can remote manage the SAS RAID subsystem without adding any user specific software (platform independent) via standard web browsers directly connected to the RJ45 LAN port. Connect Ethernet port of the SAS RAID subsystem using the included LAN cable and then to a LAN port or LAN switch.

# HARDWARE INSTALLATION

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## 2.6.3 Power Up the RAID Subsystem

There is one main power on/off switch located on the rear side of the RAID subsystem. This on/off power switch is used to apply or remove power from the power supply to the RAID subsystem. Turning off subsystem power with this switch removes the main power but keeps standby power supplied to the RAID subsystem. Therefore, you must unplug the power cord before subsystem servicing.

The cooling fan included on the power supply run on separate control circuits from the power supply. Therefore, if one power supply fails, the failed power's fan continues to work on the power supplied from the other good power supply.

The installation is completed. You can use your SAS RAID subsystem.

### **Note:**

A power supply/cooling fan module can be removed from a powered-on subsystem; however, the subsystem should shut down if overheating occurs.

## 2.7 Configuring RAID Subsystems

There are often multiple ways to accomplish the same configuration and maintenance tasks for your SAS RAID subsystem. The SAS RAID subsystem is normally delivered with LCD preinstalled. Your SAS RAID subsystem can be configured by using the LCD with keypad, a serial device (terminal emulation) or LAN port. Turn to the relative section of RAID configuration in the user manual for information about detail configuring RAID arrays.

# HARDWARE INSTALLATION

## 2.7.1 Configuring Method

- Method 1: LCD Panel with Keypad

You can use LCD front panel and keypad function to simply create the RAID volume. The LCD status panel also informs you of the disk array's current operating status at a glance. For additional information on using the LCD to configure the RAID subsystem see the Chapter 4 of LCD Configuration.

The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information.

The initial screen is shown as below:

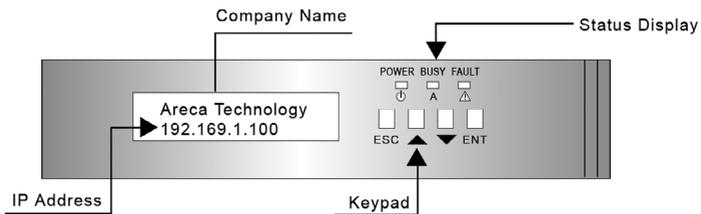


Figure 2-35, LCD Initial Screen

- Method 2: RS-232 Port Connection  
For additional information on using the RS-232 port to configure the SAS RAID subsystem see the Chapter 5 of VT-100 Utility Configuration.
- Method 3: LAN Port Connection  
For additional information on using the LAN port to configure the RAID subsystem see the Chapter 6 of Web Browser-Based Configuration.

### **Note:**

It's a good ideal to turn on your SAS RAID subsystem before turning on the host computer. This will insure that the host computer recognize the volumes and drivers in the SAS RAID subsystem.

# HARDWARE INSTALLATION

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## **2.7.2 Format, Partition and Mount the SAS RAID Subsystem Volumes**

Safety checks the installation. Connect all power cords. Turn on the AC power switch at the rear of host computer then press the power button at the front of the host computer.

After you create a unit, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, that depend on what operating system you are using (Windows, Linux, FreeBSD or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the SAS RAID subsystem can be fully used.

# APPENDIX

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## Appendix

### Technical Specifications

#### **Controller Architecture**

- Dual core RAID-on-Chip (ROC) 1.2GHz processor
- One 240-pin DIMM socket for 2GB (default) up to 8GB DDR3-1866, 1Rx8, ECC module or 8GB, DDR3-1600, 2Rx8, ECC module
- Write-through or write-back cache support
- Supports up to 256 SATA or SAS devices using SAS expanders
- DataBolt™ Bandwidth Optimizer for balance faster host and slower SAS or SATA devices.
- Redundant flash image for controller availability
- Real time clock support
- Support flash-based or battery backup module (FBM/BBM) ready (optional)

#### **RAID Features**

- RAID level 0, 1, 10(1E), 3, 5, 6, 30, 50, 60, Single Disk or JBOD
- Multiple RAID 0 and RAID 10(1E) support (RAID 00 and RAID 100)
- Multiple RAID selection
- Configurable stripe size up to 1024KB
- Support HDD firmware update
- Online array roaming
- Online RAID level/stripe size migration
- Online capacity expansion and RAID level migration simultaneously
- Online volume set growth
- Instant availability and background initialization
- Support global and dedicated hot spare
- Automatic drive insertion/removal detection and rebuilding
- Support for native 4K and 512 byte sector SAS and SATA devices
- Multiple pairs SSD/HDD disk clone function
- SSD automatic monitor clone (AMC) support
- Support intelligent power management to save energy and extend service life
- Support NTP protocol to synchronize RAID controller clock over the on-board LAN port
- Redundant controller operation with active/active and failover/

failback function

- Dual-active RAID controller with cache mirroring through dedicated high speed bus
- Automatic synchronization of firmware version in the dual-active mode
- Multi-path & load-balancing support (MPIO)
- Max 256 devices
- Max 128 LUNs (volume set) per controller
- Management port seamless take-over
- Redundant controller operation with active/active and failover/failback function

## **Monitors/Notification**

- LCD control panel for setup, alarm mute and configuration
- System status indication through LCD, LED and alarm buzzer
- SMTP support for email notification
- SNMP support for remote manager
- Subsystem management ready

## **Drive Interface**

- Up to 256 devices using SAS expander (one Min SAS HD SFF-8644 connector)
- Up to 12Gb/s per port

## **Host Interface**

- SAS-to-SAS  
2 x 12Gb/s SAS Ports
- Fibre-to-SAS  
2/4 x 16Gb/s Fibre channels
- iSCSI-to-SAS:  
2 x 10Gb/s iSCSI channels

## **RAID Management**

- Field-upgradeable firmware in flash ROM
- Firmware-embedded manager via RS-232 port
- Firmware-embedded web browser-based RAID manager access your RAID subsystem from any standard internet browser via a LAN port
- Access terminal menu by telnet via a LAN port
- API library for customer to write its own monitor utility
- SAP management utility to easily manage multiple RAID units in the network

# APPENDIX

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## **Software Drivers**

- OS Independent

## **Physical/Electrical**

SAS hard drives

- Up to 12/16/24 2.5-inch or 3.5-inch SAS hot-plug hard drives (12Gb/s) at speeds of 10K or 15K rpm

SATA hard drives

- Up to 12/16/24 2.5-inch or 3.5-inch SATA hot-plug hard drives (6Gb/s) at speeds of 7.2K or 10K rpm. Connectivity to the controller system backplane is provided through an interposer assembly for redundant controller.

## **Subsystem Controller Modules**

- Controller board 1 or 2 modules
- Sensors 2 sensor per controller Board

## **Backplane Board**

Connectors

- 12/16/24 x SAS hard-drive connectors
- 2 x power supply/cooling fan module connectors
- 2 sets of controller board connectors (3 connectors each controller board)

Sensors

- 12/16/24 x temperature sensors (one for each slot)

## **Controller Back-Panel Connectors**

Host connectors (per controller board)

- 2 x SAS CH0 and CH1 connector for connection to the host
- 2/4 x Fibre CH0, CH1, CH2 and CH3 connector for connection to the host
- 2 x iSCSI CH0 and CH1 connector for connection to the host

Expander connector (per controller board)

- 1 x SAS "EXP 0" Min SAS HD SFF-8644 connector for expansion to an additional SAS RAID subsystem

Management connector (per controller board)

- 2 x 6-pin UART RJ-11 connector
- 1 x LAN RJ-45 connector

- 2 x SAS CH0&CH1 connector for SAS to SAS RAID controller

## **LED Indicators**

Hard-drive carrier

- 1 x single-color activity LED status indicator
- 1 x two-color fault/power LED status indicator

Controller board

- 2 x single-color LED status indicators for each SAS expander port, one for link and one for the activity status

Host board

- 2 x single-color LED status indicator per SAS host
- 2 x single-color LED status indicator per Fibre host
- 2 x single-color LED status indicators per iSCSI host

Power supply/cooling fan module

- 2 x single-color LED status indicators for AC\_OK and FAULT on each power supply/cooling fan module

## **Power Supplies**

Dual hot swap and redundant with PFC, N+1 design

- Wattage 595 W maximum continuous;
- Voltage 100–240 V rated
- Frequency 50–60 Hz
- Amperage (Max) 6.18A (120 VAC), 3.23A (230 VAC)

## **Dimensions**

2U 12 bays 19-inch rackmount chassis (H x W x D)

- Without handles 88.2 x 445 x 506 mm(3.2 x 17.5 x 19.9 in)
- With handles 88.2 x 482 x 542 mm(3.2 x 22.9 x 21.3 in)

3U 16 bays 19-inch rackmount chassis (H x W x D)

- Without handles 132.6 x 445 x 506 mm(5.2 x 17.5 x 19.9 in)
- With handles 132.6 x 482 x 542 mm(5.2 x 22.9 x 21.3 in)

2U 24 bays 19-inch rackmount chassis (H x W x D)

- Without handles 88.2 x 445 x 470 mm(3.2 x 17.5 x 18.5 in)
- With handles 88.2 x 482 x 506 mm(3.2 x 22.9 x 19.9 in)

# APPENDIX

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## **Subsystem Net Weight (Without Drives)**

- Single 12/16/24 bays      26.5 kg/30.5 kg/27.5kg
- Dual 12/16/24 bays      27 kg/31 kg/28 kg

## **Environmental**

Temperature:

- Operating 0° to 40°C
- Storage -40° to 60°C

Relative humidity:

- Operating 10% to 80% (non-condensing)
- Storage 5% to 95% (non-condensing)