

RAID Controller

ARC-8068 SAS to SAS 6Gb/s RAID Controller

Installation Manual

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FCC Statement

This equipment has been tested and found to comply with the limits for a Class A 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-8068 series 12/16/24-bays 6Gb/s SAS RAID controller module have been tested and found comply with the requirements set up in the council directive on the approximation of the law of member state relating to the EMC Directive 2004/108/EC. For the evaluation regarding to the electromagnetic compatibility, the following standards where applied:

EN 55022: 2006, Class A
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

1. Introduction

This section presents a brief overview of the 12/16/24 bays external SAS to SAS 6Gb/s RAID controller.

1.1 Overview

SAS 2.0 builds on parallel SCSI by providing higher performance, improving data availability, and simplifying system design. The SAS 2.0 interface supports both 6Gb/s SAS disk drives for data-intensive applications and 6Gb/s Serial ATA (SATA) drives for low-cost bulk storage of reference data. The SAS to 6Gb/s SAS RAID controllers attach directly to SATA/SAS midplanes with 3/4/6 x SFF-8087 internal connectors or increase capacity using one additional SFF-8088 external connector. When used with SAS expanders, the controller can provide up to (128) devices through one or more SAS JBODs, making it an ideal solution for enterprise-class storage applications that called for maximum configuration flexibility.

The SAS to SAS 6Gb/s RAID controller provides three kinds of host interface link to the host board on the server system. This subsystem utilizes the same RAID kernel that has been field-proven in existing internal/external SATA/SAS RAID controller products, allowing to bring stable and reliable SAS RAID external subsystem. The SAS to SAS 6Gb/s RAID controller provides for 2U/3U/4U rack-mounted external storage chassis capable of accommodating up to 12/16/24 6.0-Gb/s, Serial-Attached SCSI (SAS) drives or 6.0-Gb/s Serial ATA (SATA) drives.

Unparalleled Performance

The high speed host interfaces make SAS to SAS 6Gb/s RAID controller well suited for professionals who need large capacity and exceptional performance with connectivity. The SAS to SAS 6Gb/s RAID controller incorporates onboard high performance 800MHz RAID-on-Chip storage processor and DDR2-800 SDRAM memory to deliver true hardware RAID. The RAID controller each includes default 2GB of ECC DDR2-800 SDRAM with optional battery backup module. The test result is against overall performance compared to other external SAS RAID subsystems. Applications demand for

higher computing power, networking bandwidth and support for virtualization applications are driving RAID controller for improved architecture internal bus interface and RAID performance. The powerful new ROC processors integrated 16 x 6Gb/s SAS ports on chip delivers high performance for NAS, server RAID solutions, supercomputing, near-line backup, security systems, streaming and cloud computing applications.

Unsurpassed Data Availability

Designed and leveraged with Areca's existing high performance solution, this controller delivers high-capacity at the best of cost/performance value. It supports the hardware RAID 6 engine to allow two HDDs failures without impact the existing data and performance. Its high data availability and protection derives from the many advanced RAID features.

The SAS to SAS 6Gb/s RAID controller allows easy scalability from JBOD to RAID. It can be configured to RAID levels 0, 1, 1E, 3, 5, 6, 10, 00, 100, 30, 50, 60, Single Disk or JBOD. With innovative new ROC 6Gb/s SAS feature and support for SATA, SAS and SSDs, the SAS to SAS 6Gb/s RAID subsystems provides small- to mid-sized enterprises with superior levels of RAID performance and scalability for external storage. Using cost-effective SATA disk drive and completely integrated high-performance and data-protection capabilities, it can meet the performance and features of a midrange storage product at an entry-level price.

Easy RAID Management

Configuration and monitoring can be managed either through the LCD control panel, RS232 port or Ethernet 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 1Gb/s LAN port. The firmware contains SMTP manager monitors all system events and user can select either single or multiple user notifications to be sent via "Plain English" e-mails. The firmware-embedded SNMP agent allows remote to monitor events via LAN with no SNMP agent required. The controller also supports API library for customer to write its own monitor utility.

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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. The hardware monitor can monitor subsystem environment and show the warning message.

The firmware and EPLD have implemented the SES-2 protocol and disk activity map to SGPIO based indicator LEDs. For backplane without SGPIO supporting, the expander box also provides one kind of alternative LED cable header to support the individual fault status indicator for those backplanes. In addition to meet different enclosure, ARC-8068 RAID controller box has implemented autonomous enclosure management of two power supplies status connectors and four fan monitor/speed control connectors through the SES-2 protocol.

1.2 Features

Controller Architecture

- 800 MHz PowerPC RAID-on-Chip for RAID core and SAS microcode
- 2GB DDR2-800 SDRAM with ECC protection on-board
- NVRAM for RAID event log & transaction log
- Write-through or write-back cache support
- Redundant flash image for adapter availability
- Real time clock support
- Battery Backup Module ready (Option)

RAID Features

- RAID level 0, 1, 1E, 3, 5, 6, 10, 00, 100, 30, 50, 60, Single Disk or JBOD
- Multiple RAID selection
- Online array roaming
- Offline RAID set
- Online RAID level/stripe size migration
- Online capacity expansion and RAID level migration simultaneously
- Online volume set growth
- Support global hot spare and dedicated hot spare
- Instant availability and background initialization

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- Automatic drive insertion/removal detection and rebuilding
- Greater than 2TB per volume set (64-bit LBA support)
- Greater than 2TB per disk drive
- Disk scrubbing/array verify scheduling for automatic repair of all configured RAID sets
- Login record in the event log with IP address and service (http, telnet and serial)
- 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
- Max 128 devices
- Max 128 LUNs (volume set) per controller

Monitors/Notification

- LCD Control Panel for setup, alarm mute and configuration
- System status indication through LCD, LED and alarm buzzer
- Autonomous chassis management of two power supplies status connectors and four fan monitor/speed control connectors
- Subsystem management ready

Drive Interface

- Up to 128 devices using SAS expanders (one external Mini SAS 4x connector)
- Up to 6Gb/s per port
- 12/16/24 SAS internal hard-drive connectors

Host Interface

- 6Gb/s SAS-to-SAS
Two Mini SAS 4x 6Gb/s SAS Ports - 600MB/sec per PHY link

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 10/100/1000 LAN port
- Firmware-embedded SMTP manager monitors all system events and user can select either single or multiple user notifications to be sent via "Plain English" e-mails
- Firmware-embedded SNMP agent allows remote to monitor events via 10/100/1000 LAN with no SNMP agent required

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- Access terminal menu by telnet via 10/100/1000 LAN port
- API library for customer to write its own monitor utility
- SAP management utility to easily manage multiple RAID units in the network

Software Drivers

- OS Independent

Physical

- 41(H) x 145(W) x 168(D) mm

Environmental

- Temperature

Operating	10° to 40°C
Storage	-40° to 70°C

Relative Humidity

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

2. Hardware Installation

This section describes the procedures for installing the cable solution external ARC-8068 SAS to SAS 6Gb/s RAID controllers.

2.1 Before Your Begin Installation

Thanks for purchasing the cable solution external ARC-8068 series 6Gb/s SAS RAID controller as your RAID data storage subsystem. This user manual gives simple step-by-step instructions for installing and configuring the 6Gb/s SAS RAID controller. To ensure personal safety and to protect your equipment and data, reading the following information package list carefully before you begin installing.

Package Contents

If your package is missing any of the items listed below, contact your local dealers before you install. **(Disk drives and disk mounting brackets are not included)**

- 1 x ARC-8068 RAID controller module in an ESD-protective bag
- 1 x Software Installation CD – containing driver, relative software, an electronic version of this manual and other related manual
- 1 x User Manual
- Mounting hardware (attachment rails, screws, etc.)
- RJ11 to DB9 serial communications null-modem cable
- Adapter convert two 4 pin peripheral power cables into a PCI-E power cable

Unpack

Unpack and install the hardware in a static-free environment. The 6Gb/s SAS RAID controller module is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage.

HARDWARE INSTALLATION

2.2 Board Layout & Box Outline

The ARC-8068 RAID controller housed in a 5¼-inch half-height canister with a removable LCD module, 2 x 6Gb/s SAS host ports, one 6Gb/s SAS expander port, a RJ-45 LAN port and a RS-232 port controller. The RAID controller is provided for customers who want to use the exiting 6Gb/s SAS enclosure. It is designed to fit into one 5¼-inch half-height drive bays located in a server chassis or storage case. Standard mounting holes are located on both sides of the controller canister. These mounting holes accept commonly available No. 6-32 coarse-thread screws. Use the following instructions below to install the ARC-8068 RAID controller.

2.2.1 SAS RAID Controller Board Layout

The SAS RAID controller can support a family included 12/16/24 internal ports using SFF-8087 connectors with an additional 4x external SFF-8088 ports. This section provides the board layout and connector/jumper for the 6Gb/s SAS RAID controller.

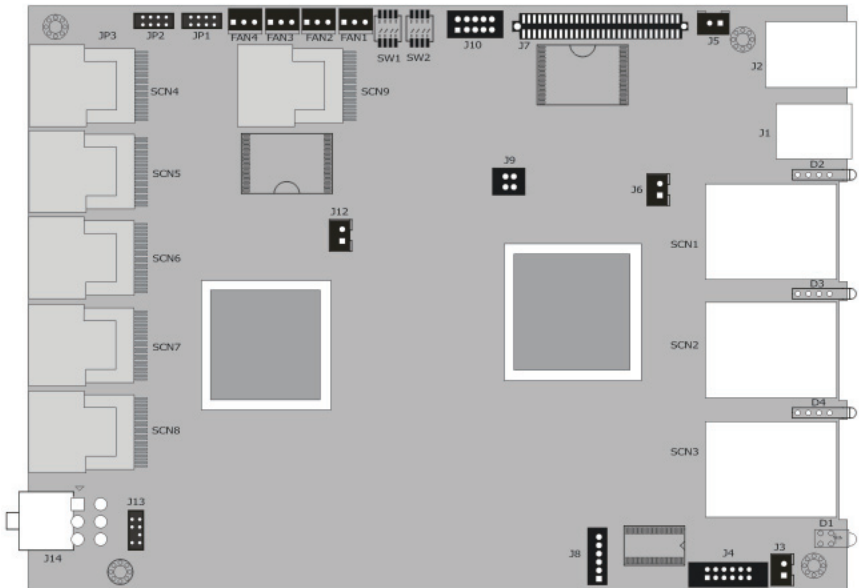


Figure 2-1, ARC-8068 series external 6Gb/s SAS RAID controller

HARDWARE INSTALLATION

Connector	Description	Type																		
1. (JP1)	Individual Fault LED for SAS 1-8 Ports	8-Pin header																		
2. (JP2)	Individual Fault LED for SAS 9-16 Ports	8-Pin header																		
3. (JP3)	Individual Fault LED for SAS 17-24 Ports	8-Pin header																		
4. (FAN1)	FAN1 with RPM Sense	3-Pin connector																		
5. (FAN2)	FAN2 with RPM Sense	3-Pin connector																		
6. (FAN3)	FAN3 with RPM Sense	3-Pin connector																		
7. (FAN4)	FAN4 with RPM Sense	3-Pin connector																		
8. (SW1)	<div>Fan1-Fan4 Definition</div> <table><tr><td>SW1(1-3)</td><td>FAN_NO.</td></tr><tr><td>OFF OFF OFF</td><td>NO</td></tr><tr><td>ON OFF OFF</td><td>1(FAN1)</td></tr><tr><td>OFF ON OFF</td><td>2(FAN1~FAN2)</td></tr><tr><td>ON ON OFF</td><td>3(FAN1~FAN3)</td></tr><tr><td>OFF OFF ON</td><td>4(FAN1~FAN4)</td></tr></table> <div><table><tr><td>SW1(4)</td><td>FAN CONTROL</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table></div>	SW1(1-3)	FAN_NO.	OFF OFF OFF	NO	ON OFF OFF	1(FAN1)	OFF ON OFF	2(FAN1~FAN2)	ON ON OFF	3(FAN1~FAN3)	OFF OFF ON	4(FAN1~FAN4)	SW1(4)	FAN CONTROL	ON	ENABLE	OFF	DISABLE	Micro DIP-Switch
SW1(1-3)	FAN_NO.																			
OFF OFF OFF	NO																			
ON OFF OFF	1(FAN1)																			
OFF ON OFF	2(FAN1~FAN2)																			
ON ON OFF	3(FAN1~FAN3)																			
OFF OFF ON	4(FAN1~FAN4)																			
SW1(4)	FAN CONTROL																			
ON	ENABLE																			
OFF	DISABLE																			
9. (SW2)	<div>Power Fail Definition</div> <table><tr><td>SW2(2)</td><td>PW_FLT1 DETECTION (J5)</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table> <div><table><tr><td>SW2(3)</td><td>PW_FLT2 DETECTION (J3)</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table></div> <div><table><tr><td>SW2(4)</td><td>ON Board CHIP FAN CONTROL</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table></div>	SW2(2)	PW_FLT1 DETECTION (J5)	ON	ENABLE	OFF	DISABLE	SW2(3)	PW_FLT2 DETECTION (J3)	ON	ENABLE	OFF	DISABLE	SW2(4)	ON Board CHIP FAN CONTROL	ON	ENABLE	OFF	DISABLE	Micro DIP-Switch
SW2(2)	PW_FLT1 DETECTION (J5)																			
ON	ENABLE																			
OFF	DISABLE																			
SW2(3)	PW_FLT2 DETECTION (J3)																			
ON	ENABLE																			
OFF	DISABLE																			
SW2(4)	ON Board CHIP FAN CONTROL																			
ON	ENABLE																			
OFF	DISABLE																			
10. (SCN1)	6Gb/s SAS Host (CH0)	SFF-8088																		
11. (SCN2)	6Gb/s SAS Host (CH1)	SFF-8088																		
12. (SCN3)	6Gb/s SAS Expander Out	SFF-8088																		
13. (D1)	Controller active/fault status LED	Bi-color DIP																		
14. (D2)	Link/access LED for host port 1	Bi-color DIP																		

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15. (D3)	Link/access LED for host port 2	Bi-color DIP
16. (D4)	Link/access LED for expander port	Bi-color DIP
17. (J1)	Ethernet port for RAID manager	RJ45 connector
18. (J2)	Terminal (RS232) port for RAID manager	RJ11 connector
19. (J3)	Power fault2 detective connector	2-Pin connector
20. (J4)	Battery backup connector	12-Pin connector
21. (J5)	Power fault1 detective connector	2-Pin connector
22. (J6)	ROC fan connector	2-Pin connector
23. (J7)	Manufacture purpose	Reserved
24. (J8)	LCD Connector	6-Pin controller header
25. (J9)	For terminal port function definition (Please see table 2-2)	2x2-pin header
26. (J10)	Debug port connector	10-pin connector
27. (J12)	Expander controller fan connector	2-pin Connector
28. (J13)	Manufacture purpose	Reserved
29. (J14)	Power connector	6-Pin PCI Express power connector
30. (SCN4)	SAS 1-4 Ports (Internal)	SFF-8087
31. (SCN5)	SAS 5-8 Ports (Internal)	SFF-8087
32. (SCN6)	SAS 9-12 Ports (Internal)	SFF-8087
33. (SCN7)	SAS 13-16 Ports (Internal)	SFF-8087
34. (SCN8)	SAS 17-20 Ports (Internal)	SFF-8087
35. (SCN9)	SAS 21-24 Ports (Internal)	SFF-8087

Table 2-1, ARC-8068 series external 6Gb/s SAS RAID connectors

Terminal Port Function Definition

Please configure the J9 jumper settings to define the terminal port (J2) connector function: VT-100 for expander controller, RAID controller debug port & VT-100 for RAID manager.

J9 Jumper	Terminal Port Function
Cap on 1-2	Controller VT-100 Port
Cap on 3-4	Expander Port
No Cap	Controller Debug Port

Table 2-2, Terminal port function definition

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Note:

- Fan Headers (FAN1~FAN4)

The controller has four 4 3-pin fan headers which can control and detect the fan speed, Each header can only connect to one fan. You can directly connect the enclosure cooling fan to those 3-pin header. Controller hardware monitor can check the RPM status of the cooling fans and show those fan status on the controller's hardware information based on the SW1(1~3) micro switch definition (FAN1~FAN4). SW1(4) micro dip-switch is used to enable the (FAN1~FAN4) fan monitor function. SW2(4) micro dip-switch is used to enable the ROC & expander controller fan (J6 & J12) monitor function.

- Power Fail Header (J3&J5)

Power fail header monitors enclosure power supply fail output pin status based on the SW2 (2~3) micro switch definition (Power Fail).

Pin definition for J5 and J6.

Pin 1: GND

Pin 2: Single input-->Low: power fail, High: power ok

HARDWARE INSTALLATION

2.2.2 SAS RAID Controller Module Outline

The SAS RAID controller can support two SAS host ports (CH0 & CH1) additional one external SFF-8088 port (EXP) for expansion. This section provides the 6Gb/s SAS RAID controller box outline.

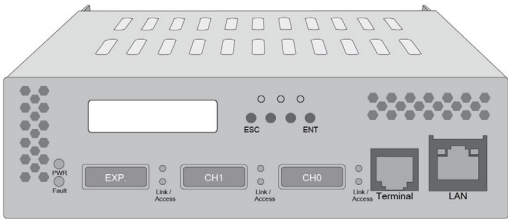
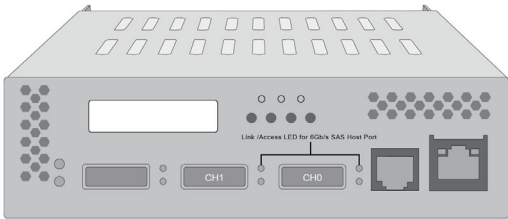


Figure 2-3, Front view of ARC-8068 6Gb/s SAS RAID controller

2.2.3 SAS RAID LED Indicators

2.2.3.1 Host Ports Status

The following table describes the SAS to SAS 6Gb/s RAID controller host channel link/access LED.

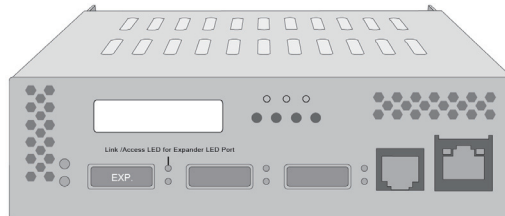


Host Port LED	Status
Link LED (Green light)	When host port link LED is illuminated for 1 second and turns off for 3 seconds that indicates the one link has connected. When host port Link LED is illuminated for 2 seconds and turns off for 2 seconds that indicates the two links have connected. When host port Link LED is illuminated for 4 seconds that indicates the four links have connected.
Access LED (Blue light)	When access LED is illuminated that indicates the SAS host accesses to the SAS to SAS RAID controller.

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2.2.3.2 Expander Output Status

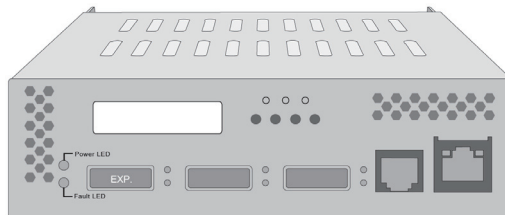
The following table describes the SAS to SAS 6Gb/s RAID controller expander port link/access LED.



Expander LED	Status
Link LED (Green light)	When link LED is illuminated for 1 second and turns off for 3 seconds that indicates the one expander link has connected. When Link LED is illuminated for 2 seconds and turns off for 2 seconds that indicates the two expander links have connected. When Link LED is illuminated for 4 seconds that indicates the four expander links have connected.
Access LED (Blue light)	When access LED is illuminated that indicates the SAS expander connector accesses to next JBOD.

2.2.3.3 Global Status

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

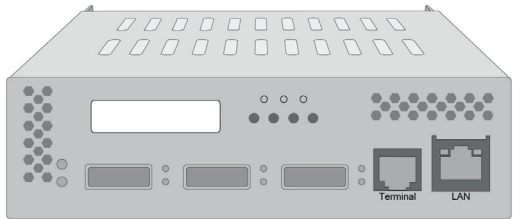


Subsystem Indicators	Status
Power LED (Heart-beat/Green light)	When power LED is illuminated that indicates the subsystem in working state. Flashing power LED indicates controller CPU access the controller resource.
Fault LED (Red light)	Flashing fault LED indicates a controller reset occurs on a controller.

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2.2.3 SAS RAID Monitor Port

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



- **RS232C Port (Terminal) Connection**

The SAS RAID controller 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 controller for access to the text-based setup menu.

- **Terminal Port Function Definition:**

Please configure the J9 jumper settings to define the Terminal connector function: VT-100 for expander controller, RAID debug port and VT-100 for RAID manager.

J9 Jumper	Terminal Port Function
Cap on 1-2	Controller VT-100 Port
Cap on 3-4	Expander Port
No Cap	Controller Debug Port

- **LAN Port Connection**

The SAS RAID controller module has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the SAS RAID controller without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100/1000 Ethernet RJ45 LAN port. Connect Ethernet port of the SAS RAID controller using the included Ethernet cable and then to a LAN port or LAN switch.

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2.3 Begin Installation

Use the following instructions below to install the ARC-8068 series RAID controller.

Step 1. Power the Enclosure Off

Turn off the enclosure and remove the AC power cord. Remove the enclosure's cover. For the instructions, please see the enclosure documentation.

Step 2. Unpack RAID Controller Module

Unpack and remove the ARC-8068 series RAID controller from the package. Inspect it carefully, if anything is missing or damaged, contact your local dealer.

Step 3. Open the Controller Canister Top Cover

If you don't want to attach the BBM and individual fault LED cable, you can skip this step to step 7. Loosening the four of mounting screws on the sides of controller box, then open the controller canister top cover.

Step 4. Adding a Battery Backup Module (optional)

Please refer to Appendix B for installing the BBM in your ARC-8068 series RAID controller.

Step 5. Re-check Individual Fault LED Cable Connections (optional)

Make sure that the proper failed drive channel information is displayed by the fault LEDs. An improper fault LED cable connection will tell the user to "Hot Swap" the wrong drive. This can result in removing the wrong disk (one that is functioning properly) from the controller. This can result in failure and loss of system data.

Step 6. Install the Controller Canister Top Cover

Fasten the four of mounting screws on the sides of controller.

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Step 7. Mounting RAID Controller Module into the Enclosure

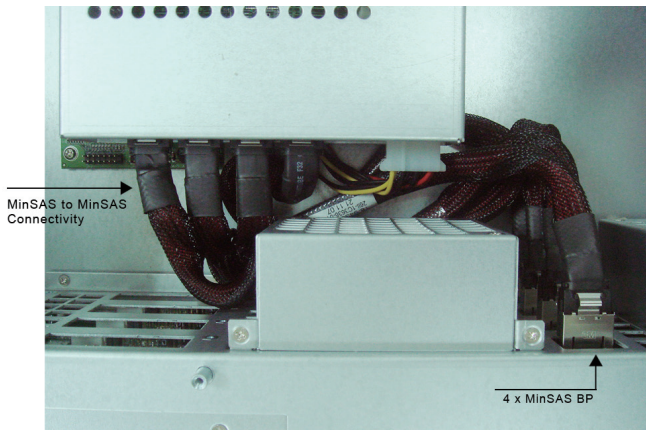
Remove the enclosure cover and find a 5.25 inch CD-ROM wide place to fasten the ARC-8068 series RAID controller in the external enclosure. The RAID controller requires one 5.25" half-height drive bay.

Step 8. Connect Power to RAID Controller

The ARC-8068 series RAID controller supports 6 pin PCI-E power connector. If your power supply doesn't have a 6 pin PCI-E power cable then you can use the adapter to convert two 4 pin peripheral power cables into a PCI-E power cable. If you use an adapter then be sure to plug the 4 pin peripheral power connectors into separate power cables coming from the power supply.

Step 9. Connecting Cable to Backplane

The ARC-8068 series supports 6 SFF-8087 connectors on the back side. User uses suitable cable (depends on the backplane) to connect the RAID controller connector to the enclosure backplane. Please refer to section 2.4 SAS cable to find the suitable cable.



Step 10. Loading Drive to the Drive Tray

You can connect the SAS/SATA drives to the controller through direct cable and backplane solutions. In the direct connection, SAS/SATA drives are directly connected to SAS RAID controller PHY port

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with SAS/SATA cables. The SAS RAID controller can support up to 24 PHY internal ports and 4 PHY external ports. Remove the front bezel from the computer chassis and install the cages or SAS/SATA drives in the computer chassis. Loading drives to the drive tray if cages are installed. Be sure that the power is connected to the individual drives or cage.

In the backplane solution, SAS/SATA drives are directly connected to SAS system backplane. The number of SAS/SATA drives is limited to the number of slots available on the backplane. Your ARC-8068 series RAID controller supports up to 24 SAS or SATA 6.0-Gbps 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 ARC-8068 series RAID enclosure. Install the drives to 12-bays ARC-8068 series RAID enclosure as shown in figure 2-5.

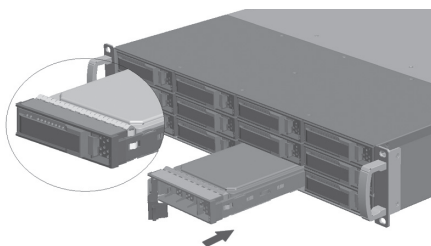


Figure 2-5, Install the drives to 12-bays ARC-8068 series RAID controller enclosure.

Step 11. Install the Enclosure Top Cover

Check the installation thoroughly, reinstall the enclosure cover, and reconnect the power cord cables.

Step 12. Connecting to Host System

The external host connector is provided on the back of the SAS RAID controller 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 ARC-8068 series SAS RAID subsystem and host port adapter as shown below:

HARDWARE INSTALLATION

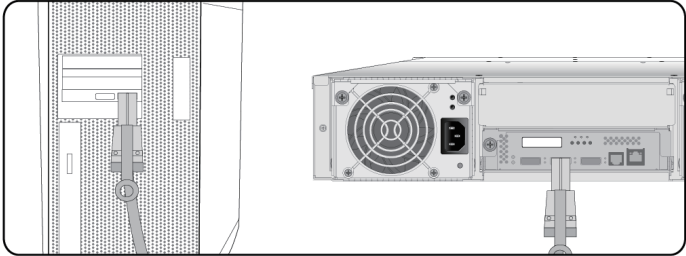


Figure 2-10. Connect SAS RAID subsystem and host adapter

Step 13. Connecting RAID Controller’s Ethernet and RS232 Port

Connect Ethernet port of the RAID controller using the included Ethernet cable and then to a LAN port or LAN switch.

Step 14. Add More JBODs (Option)

SAS RAID controller expander port supports daisy chain expansion to the next JBOD. The SAS RAID controller can support daisy-chain up to 8 enclosures. The maximum drive no. is 128 devices through 8 enclosures. The following figure shows how to connect the external Min SAS cable from the SAS RAID controller that has external connectors to the external drive boxes or drive enclosures.

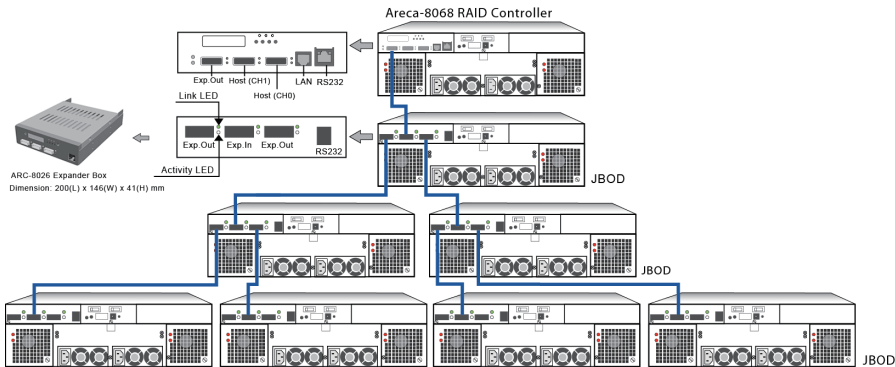


Figure 2-6, SAS expander connect to a drive box or drive enclosure

The following table is the max no. of ARC-8068 SAS RAID subsystem supported:

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	Disks/ Subsystem	Expander	Devices/Controller	Volume
Max No.	32	8	128	128

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.

Step 15. Connect the RAID Subsystem Power

Turn on the power switch at the rear of the enclosure (if equipped) and then press the power button at the front of the RAID controller enclosure. The installation is complete. You can use your SAS RAID subsystem.

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.

Step 16. Configure RAID Subsystem

The ARC-8068 series RAID controller is normally delivered with LCD pre-installed. Your ARC-8068 series RAID controller can be configured by using the LCD with keypad, a serial device (terminal emulation) or LAN port.

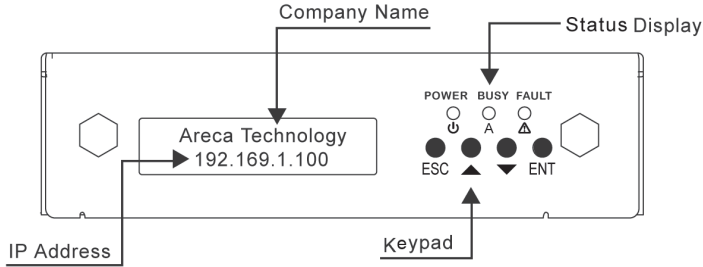
- **Method 1: LCD Panel with Keypad**

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 box see the Chapter 4 of LCD Configuration Menu.

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 as following:

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- **Method 2: RS-232 Port Connection**

The ARC-8068 series RAID controller 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 RAID controller for access to the text-based setup menu. For additional information on using the RS-232 port to configure the RAID box see the Chapter 5 of VT-100 Utility Configuration.

- **Method 3: LAN Port Connection**

The ARC-8068 series RAID controller has embedded the TCP/IP & web browser-based RAID manager in the .firmware(method 3). User can remote manage the ARC-8068 series RAID subsystem without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100/1000 Ethernet RJ45 LAN port. For additional information on using the LAN port to configure the RAID subsystem see the Chapter 6 of Web Browser-Based Configuration.

Step 17. Turn on Host Computer Power

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

Step 18. Format, Partition and Mount the ARC-8068 series RAID controller Volumes

After you create a unit, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, that is depend on what operating system you are using (Windows, Linux,

HARDWARE INSTALLATION

FreeBSD or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the ARC-8060 series RAID controller can be fully used.

2.4 SAS Cables

You can connect the end devices to each other through direct cables or through the backplane connections. The SAS RAID controller external port supports daisy-chain expansion up to 7 enclosures. The following is an example of some internal SAS/SATA cables and an external SAS cable.

2.4.1 Internal Min SAS 4i to SATA Cable

The Min SAS 4i to SATA cables are used for connection between the SAS RAID controller internal connectors and connectors on the SAS/SATA disk drives or SAS/SATA connector backplane. The SAS controllers has 5 Min SAS 4i (SFF-8087) internal connectors, each of them can support up to four SAS/SATA drives. These adapters can be installed in a server RAID enclosure with standard SATA connectors backplane. The following diagram shows the picture of Min SAS 4i to 4*SATA cables. Backplane supports SGPIO header can leverage the SGPIO function on the SAS RAID controller through the sideband cable.

The sideband cable is reserved for the backplane with header on it.

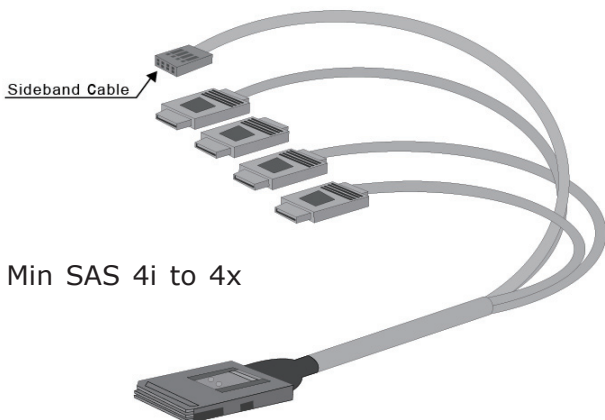


Figure 2-7, Internal Min SAS 4i to 4x SATA Cable

HARDWARE INSTALLATION

2.4.2 Internal Min SAS 4i to 4xSFF-8482 Cable

These controllers can be installed in a server RAID enclosure with out a backplane. The kind of cable will attach directly to the SAS disk drives. The following diagram shows the picture of Min SAS 4i to 4xSFF-8482 cables.

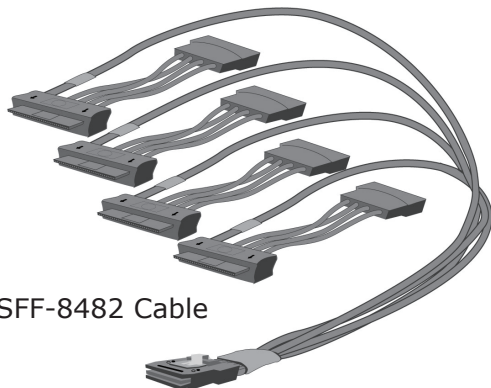


Figure 2-8, Min SAS 4i to 4xSFF-8482 Cable

2.4.3 Internal Min SAS 4i to Internal Min SAS 4i Cable

The SAS 6Gb/s RAID controllers have 6 Min SAS 4i internal connectors (SFF-8087), each of them can support up to four SAS/SATA signals. These adapters can be installed in a server RAID enclosure with Min SAS 4i internal connectors backplane. This Min SAS 4i cable has eight signal pins to support four SAS/SATA drives and six pins for the SGPIO (Serial General Purpose Input/Output) side-band signals. The SGPIO bus is used for efficient LED management and for sensing drive Locate status.

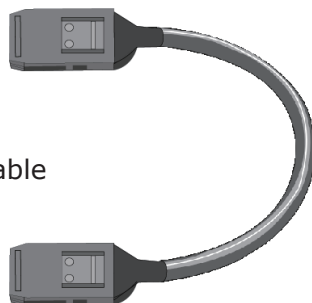


Figure 2-9, Min SAS 4i to Min SAS 4i Cable

HARDWARE INSTALLATION

2.4.4 External Min SAS 4x Drive Boxes and Drive Expanders

The external cables are used for connection between the SAS 6Gb/s RAID controller external connectors and connectors on the external drive boxes or drive expanders (JBOD). The SAS controller has Min SAS 4x (SFF-8088) external connector, each of them can support up to four SAS/SATA signals.

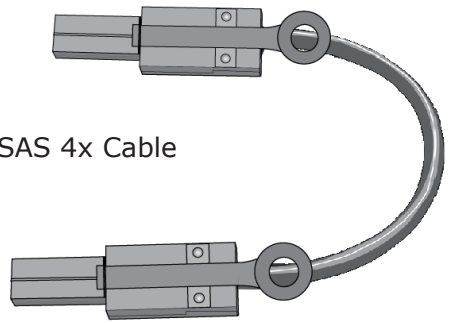


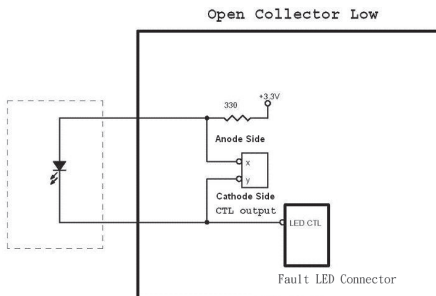
Figure 2-10, Min SAS 4x to Min SAS 4x Cable

2.5 LED Cables

There is no SGPIO supported in the most of old version SATA backplane. The SAS controller also provides one kind of alternative LED cable header to support the fault status for those backplanes.

The following electronics schematic is the SAS 6Gb/s RAID controller logical of fault header. The signal for each pin is cathode (-) side.

The following diagrams and descriptions describe each type of connector.



Note:

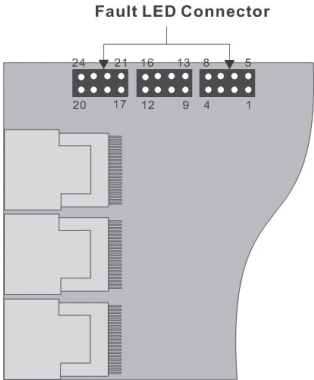
Cables for the individual drive LEDs may come with a drive cage, or you may need to purchase them.

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Connect the cables for the drive fault LEDs between the backplane of the cage and the respective connector on the ARC-8068 series RAID controller header . The following describes the fault LED.

LED	Normal Status	Problem Indication
Fault LED	<p>When the fault LED is solid illuminated, there is no disk present and When the fault LED is off, that disk is present and status is normal.</p> <p>When the "Identify Drive" is selected, the selected drive fault LED will blank.</p>	<p>When the fault LED is slow blinking (2 times/sec), that indicate disk drive has failed and should be hot-swapped immediately.</p> <p>When the activity LED is illuminated and fault LED is fast blinking (10 times/sec) that indicate there is rebuilding activity on the disk drive.</p>

Figure 2-11, ARC-8068 Series RAID Controller Fault LED Connector



3. Configuration Methods

After the hardware installation, the SAS/SATA disk drives connected to the SAS RAID subsystem must be configured and the volume set units initialized before they are ready to use. This can be accomplished by one of the following methods:

- Front panel touch-control keypad.
- VT100 terminal connected through the controller's serial port.
- Firmware-embedded & web browser-based RAID manager/SNMP agent/SMTP via the controller's 10/100/1000 LAN port.

Those user interfaces can access the built-in configuration and administration utility that resides on the controller's firmware. They provide complete control and management of the controller and disk arrays, eliminating the need for additional hardware or software.

Note:

The SAS RAID subsystem allows only one method to access menus at a time.

3.1 Using Local Front Panel Touch-control Keypad

The front panel keypad and liquid crystal display (LCD) is the primary user interface for the SAS RAID subsystem. All configuration and management of the controller and its properly connected disk arrays can be performed from this interface.

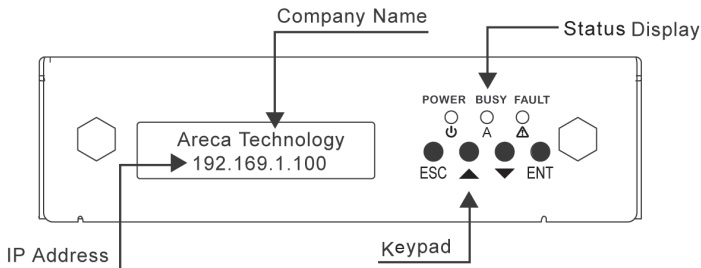
The front panel keypad and LCD are connected to the RAID subsystem to access the built-in configuration and administration utility that resides in the controller's firmware. Complete control and management of the array's physical drives and logical units can be performed from the front panel, requiring no additional hardware or software drivers for that purpose.

CONFIGURATION METHOD

A touch-control keypad and a liquid crystal display (LCD) mounted on the front of the RAID subsystem is the primary operational interface and monitor display for the disk array controller. This user interface controls all configuration and management functions for the RAID subsystem it is properly connected.

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 the following:



Function Key Definitions:

The four function keys at the bottom of the front perform the following functions:

Key	Function
Up Arrow	Use to scroll the cursor Upward/Rightward
Down Arrow	Use to scroll the cursor Downward/Leftward
ENT Key	Submit select ion function (Confirm a selected item)
ESC Key	Return to previous screen (Exit a selection configuration)

There are a variety of failure conditions that cause the SAS RAID subsystem monitoring LED to light. Following table provides a summary of the front panel LED.

Panel LED	Normal Status	Problem Indication
Power LED	Solid green, when power on	Unlit, when power on
Busy LED	Blinking amber during host accesses SAS RAID subsystem	Unlit or never flicker
Fault LED	Unlit	Solid red

CONFIGURATION METHOD

For additional information on using the LCD panel and keypad to configure the SAS RAID subsystem see "LCD Configuration Menu" on Chapter 4.

3.2 VT100 Terminal (Using the controller's serial port)

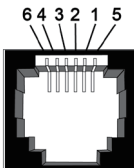
The serial port on the SAS RAID subsystem's front can be used in VT100 mode. The provided interface cable converts the RS232 signal of the 6-pin RJ11 connector on the RAID subsystem into a 9-pin D-Sub female connector. The firmware-based terminal array management interface can access the array through this RS-232 port. You can attach a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program to the serial port for accessing the text-based setup menu.

3.2.1 RAID Subsystem RS-232C Port Pin Assignment

To ensure proper communications between the RAID subsystem and the VT-100 Terminal Emulation, Please configure the VT100 terminal emulation settings to the values shown below:

Terminal requirment	
Connection	Null-modem cable
Baud Rate	115,200
Data bits	8
Stop	1
Flow Control	None

The VT-100 port for the SAS RAID configuration, please refer to table 2-2 in chapter 2. The controller VT-100 RJ11 connector pin assignments are defined as below.

Pin Assignment				
Pin	Definition	Pin	Definition	
1	RTS (RS232)	4	GND	
2	RXD (RS232)	5	GND	
3	TXD (RS232)	6	GND	

CONFIGURATION METHOD

Keyboard Navigation

The following definition is the VT-100 RAID configuration utility keyboard navigation.

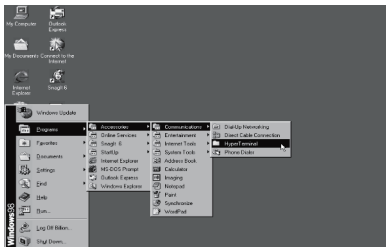
Key	Function
Arrow Key	Move cursor
Enter Key	Submit selection function
ESC Key	Return to previous screen
L Key	Line draw
X Key	Redraw

3.2.2 Start-up VT100 Screen

By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all SAS RAID subsystem monitoring, configuration and administration functions can be exercised from the VT100 terminal.

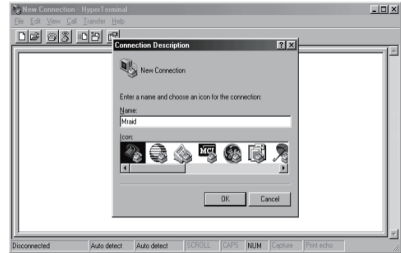
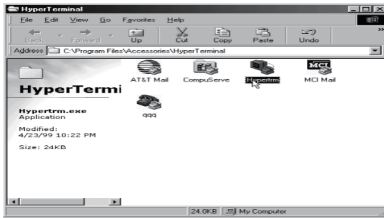
There are a wide variety of Terminal Emulation packages, but for the most part they should be very similar. The following setup procedure is an example setup VT100 Terminal in Windows system using Hyper Terminal use Version 3.0 or higher.

Step 1. From the Desktop open the start menu. Pick Programs, Accessories, Communications and Hyper Terminal. Open Hyper Terminal (requires version 3.0 or higher)

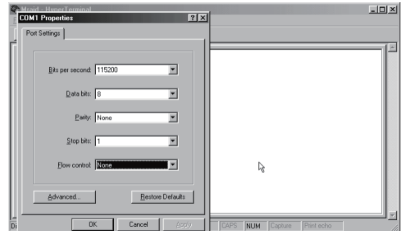
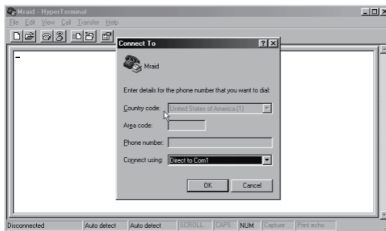


Step 2. Open **HYPERTRM.EXE** and enter a name for your Terminal. Click **OK**.

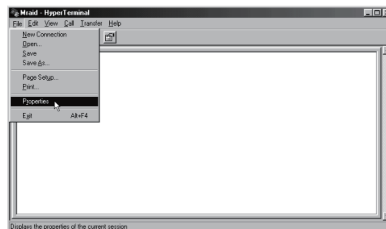
CONFIGURATION METHOD



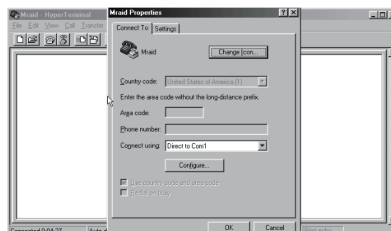
Step 3. Select an appropriate connecting port in your Terminal. Click OK. Configure the port parameter settings. Bits per second: **"115200"**, Data bits: **"8"**, Parity: **"None"**, Stop bits: **"1"**, Flow control: **"None"**. Click **"OK"**



Step 4. Open the File menu, and then open Properties.

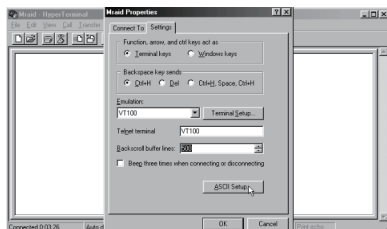


Step 5. Open the Settings Tab.



CONFIGURATION METHOD

Step 6. Open the Settings Tab. Function, arrow and ctrl keys act as: Terminal Keys, Backspace key sends: "**Ctrl+H**", Emulation: VT100, Telnet terminal: VT100, Back scroll buffer lines: 500. Click **OK**.



Now, the VT100 is ready to use.

After you have finished the VT100 Terminal setup, you may press "**X**" key (in your Terminal) to link the RAID subsystem and Terminal together.

Press "**X**" key to display the disk array Monitor Utility screen on your VT100 Terminal.

3.3 Web Browser-based RAID Manager

To configure SAS RAID subsystem on a local or remote machine, you need to know its IP Address. The IP address will default show in the "LCD" screen or "Ethernet Configuration" option on the VT100 utility configuration. Launch your firmware-embedded TCP/IP & web browser-based RAID manager by entering `http://[IP Address]` in the web browser.

The provided LAN interface cable connects the SAS RAID subsystem LAN port into a LAN port from your local network. Use only shield cable to avoid radiated emission that may cause interruptions. To ensure proper communications between the RAID subsystem and web browser-based RAID management, Please connect the SAS RAID subsystem LAN port to any LAN switch port.

The SAS RAID subsystem has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the SAS RAID subsystem without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100/1000 RJ45 LAN port.

The storage console current configuration screen displays the current configuration of your SAS RAID subsystem. Detail procedures please refer to the Chapter 6 Web Browser-based Configuration method.

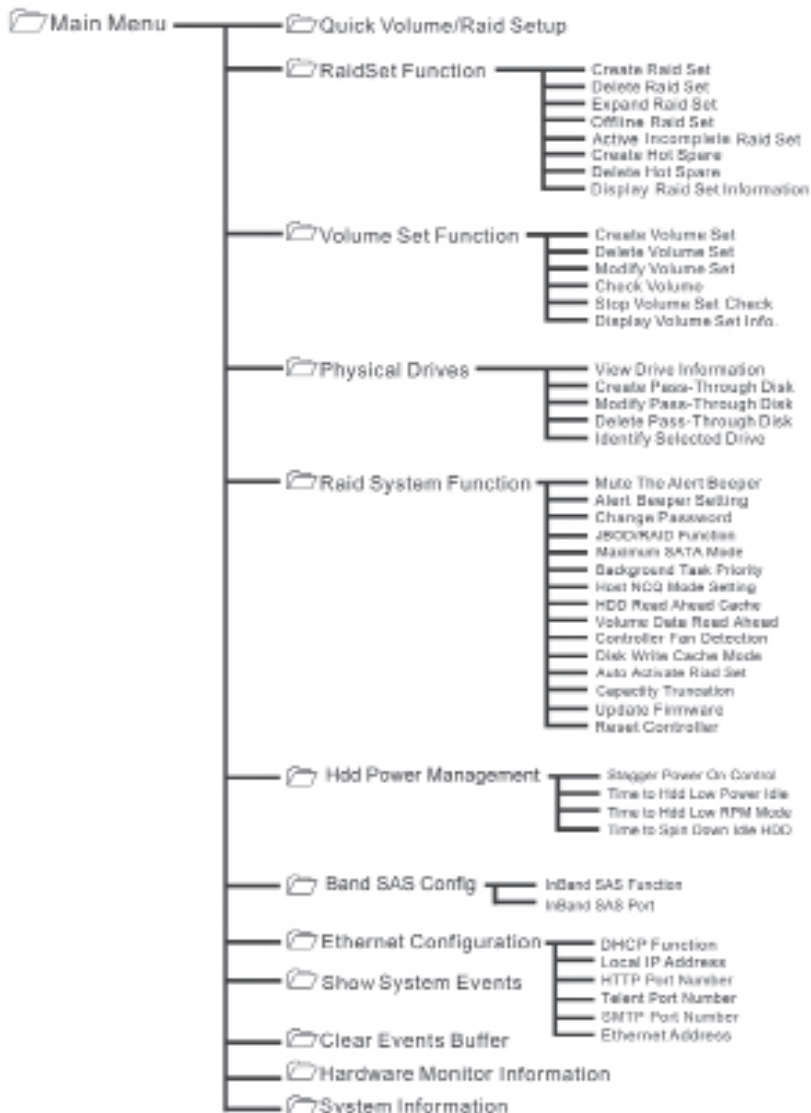
Note:

You must be logged in as administrator with local admin rights on the remote machine to remotely configure it.
The SAS RAID subsystem default user name is "admin" and the password is "0000".

3.4 Configuration Menu Tree

The following is an expansion of the menus in configuration utility that can be accessed through the LCD panel, RS-232 serial port and LAN port.

CONFIGURATION METHOD



Note:

Ethernet Configuration, Alert By Mail Config, and SNMP Config can only be set in the web-based configuration.

LCD CONFIGURATION MENU

4. LCD Configuration Menu

After the hardware installation, the disk drives connected to the RAID subsystem must be configured and the volume set units initialized before they are ready to use. This can be also accomplished by the front panel touch-control keypad.

The LCD module on the front side can access the built-in configuration and administration utility that resides in the controller's firmware. To complete control and management of the array's physical drives and logical units can be performed from the front panel, requiring no additional hardware or software drivers for that purpose.

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 LCD display front panel function keys are the primary user interface for the RAID subsystem. Except for the "Firmware update", all configurations can be performed through this interface.

Function Key Definitions

The four function keys at the front panel of the button perform the following functions:

Key	Function
Up Arrow	Use to scroll the cursor Upward/Rightward
Down Arrow	Use to scroll the cursor Downward/Leftward
ENT Key	Submit select ion function (Confirm a selected item)
ESC Key	Return to previous screen (Exit a selection configuration)

4.1 Starting LCD Configuration Utility

After power on the SAS RAID subsystem, press **ENT** to verify password for entering the main menu from LCD panel. Using the **UP/DOWN** buttons to select the menu item, then press **ENT** to confirm it. Press **ESC** to return to the previous screen.

LCD CONFIGURATION MENU

4.2 LCD Configuration Utility Main Menu Options

Select an option, related information or submenu items to display beneath it. The submenus for each item are explained on the section 4.7.2. The configuration utility main menu options are:

Option	Description
Quick Volume And Raid Set Setup	Create a default configurations which are based on the number of physical disk installed
Raid Set Functions	Create a customized RAID set
Volume Set Functions	Create a customized volume set
Physical Drive Functions	View individual disk information
Raid System Functions	Setting the raid system configurations
Ethernet Configuration	LAN port setting
Show System Events	Record all system events in the buffer
Clear All Event Buffers	Clear all event buffer information
Hardware Monitor Information	Show all system environment status
Show System information	View the controller information

4.3 Configuring Raid Sets and Volume Sets

You can use "Quick Volume And Raid Set Setup" or "Raid Set Functions" and "Volume Set Functions" to configure RAID sets and volume sets from LCD panel. Each configuration method requires a different level of user input. The general flow of operations for RAID set and volume set configuration is:

Step	Action
1	Designate hot spares/pass-through (optional)
2	Choose a configuration method
3	Create RAID set using the available physical drives
4	Define volume set using the space in the RAID set
5	Initialize the volume set and use volume set in the host OS

LCD CONFIGURATION MENU

4.4 Designating Drives as Hot Spares

To designate drives as hot spares, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Raid Set Functions" option and then press **ENT**. All RAID set functions will be displayed. Press **UP/DOWN** buttons to select the "Create Hot Spare Disk" option and then press **ENT**. The first unused physical device connected to the current RAID subsystem appears. Press **UP/DOWN** buttons to scroll the unused physical devices and select the target disk to assign as a hot spare and press **ENT** to designate it as a hot spare.

4.5 Using Easy RAID Configuration

In "Quick Volume And Raid Setup" configuration, the RAID set you create is associated with exactly one volume set, and you can modify the Raid Level, Stripe Size, and Capacity. Designating drives as hot spares will also combine with RAID level in this setup. The volume set default settings will be:

Parameter	Setting
Volume Name	Volume Set # 00
SAS Port#/LUN Base/LUN	0/0/0
Cache Mode	Write-Back
Tag Queuing	Yes

The default setting values can be changed after configuration is completed.

Follow the steps below to create RAID set using "Quick Volume And Raid Setup" configuration:

Step	Action
1	Choose "Quick Volume And Raid Setup" from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed.

LCD CONFIGURATION MENU

2	<p>It is recommended to use drives have same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.</p> <p>The numbers of physical drives in a specific array determine the RAID levels that can be implemented with the array.</p> <p>RAID 0 requires 1 or more physical drives</p> <p>RAID 1 requires at least 2 physical drives</p> <p>RAID 1+Spare requires at least 3 physical drives</p> <p>RAID 3 requires at least 3 physical drives</p> <p>RAID 5 requires at least 3 physical drives</p> <p>RAID 3 +Spare requires at least 4 physical drives</p> <p>RAID 5 + Spare requires at least 4 physical drives</p> <p>RAID 6 + Spare requires at least 5 physical drives.</p> <p>Using UP/DOWN buttons to select RAID level for the volume set and press ENT to confirm it.</p>
3	<p>Using UP/DOWN buttons to create the current volume set capacity size and press ENT to confirm it. The available stripe sizes for the current volume set are displayed.</p>
4	<p>Using UP/DOWN buttons to select the current volume set stripe size and press ENT key to confirm it. This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 10(1E), 5 or 6 volume set. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size provides better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random read requests more often, choose a small stripe size.</p>
5	<p>When you finished defining the volume set, press ENT to confirm the "Quick Volume And Raid Set Setup" function.</p>
6	<p>Press ENT to define "FGrnd Init (Foreground initialization)" or press ESC to define "BGrnd Init (Background initialization)". When "FGrnd Init", the initialization proceeds must be completed before the volume set ready for system accesses. When "BGrnd Init", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete.</p>
7	<p>Initialize the volume set you have just configured.</p>
8	<p>If you need to add additional volume set, using main menu "Create Volume Set" functions.</p>

LCD CONFIGURATION MENU

4.6 Using Raid Set and Volume Set Functions

In "Raid Set Function", you can use the create RAID set function to generate the new RAID set. In "Volume Set Function", you can use the create volume set function to generate its associated volume set and parameters. If the current SAS RAID subsystem has unused physical devices connected, you can choose the "Create Hot Spare" option in the "Raid Set Function" to define a global hot spare.

Select this method to configure new RAID sets and volume sets. This configuration option allows you to associate volume set with partial and full RAID set.

Step	Action
1	To setup the hot spare (option), choose "Raid Set Function" from the main menu. Select the "Create Hot Spare" and press ENT to set the hot spare.
2	Choose "Raid Set Function" from the main menu. Select the "Create Raid Set" and press ENT .
3	Select a drive for RAID set from the SAS/SASA/SSD drive connected to the SAS RAID subsystem.
4	Press UP/DOWN buttons to select specific physical drives. Press the ENT key to associate the selected physical drive with the current RAID set. Recommend use drives has same capacity in a specific RAID set. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set. The numbers of physical drives in a specific RAID set determine the RAID levels that can be implemented with the RAID set. RAID 0 requires 1 or more physical drives per RAID set. RAID 1 requires at least 2 physical drives per RAID set. RAID 1 + Spare requires at least 3 physical drives per RAID set. RAID 3 requires at least 3 physical drives per RAID set. RAID 5 requires at least 3 physical drives per RAID set. RAID 3 + Spare requires at least 4 physical drives per RAID set. RAID 5 + Spare requires at least 4 physical drives per RAID set. RAID 6 + Spare requires at least 5 physical drives per RAID set.
5	After adding physical drives to the current RAID set as desired, press ENT to confirm the "Create Raid Set" function.
6	An edit the RAID set name screen appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as Raid Set. #. Press ENT to finish the name editing.

LCD CONFIGURATION MENU

7	Press ENT when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8.
8	Choose "Volume Set Functions" from the main menu. Select the "Create Volume Set" and press ENT .
9	Choose one RAID set from the screen. Press ENT to confirm it.
10	<p>The volume set attributes screen appears: The volume set attributes screen shows the volume set default configuration value that is currently being configured. The volume set attributes are: Volume Name, Raid Level, Stripe Size, Cache Mode, SAS Port/LUN Base/SAS LUN and Tagged Queuing.</p> <p>All values can be changed by the user. Press the UP/DOWN buttons to select the attributes. Press the ENT to modify each attribute of the default value. Using UP/DOWN buttons to select attribute value and press the ENT to accept the default value.</p>
11	After user completed modifying the attribute, press ESC to enter the select capacity for the volume set. Using the UP/DOWN buttons to set the volume set capacity and press ENT to confirm it.
12	When you finished defining the volume set, press ENT to confirm the creation function.
13	Press ENT to define "FGrnd Init (Foreground initialization)" or press ESC to define "BGrnd Init (Background initialization)". The controller will begin to initialize the volume set, you have just configured. If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 13 to configure another volume set.

4.7 Navigation Map of the LCD

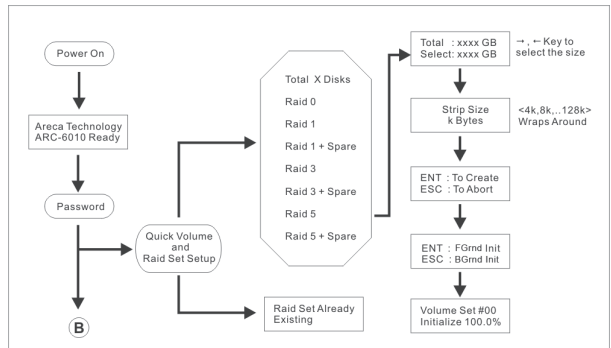
The password option allows user to set or clear the RAID subsystem's password protection feature. Once the password has been set, the user can only monitor and configure the RAID subsystem by providing the correct password. The password is used to protect the RAID subsystem from unauthorized entry. The RAID subsystem will check the password only when entering the main menu from the initial screen. The RAID subsystem will automatically go back to the initial screen when it does not receive any command in five minutes. The RAID subsystem's password is default setting at "0000" by the manufacture.

LCD CONFIGURATION MENU

4.7.1 Quick Volume And Raid Setup

"Quick Volume And Raid Setup" is the fastest way to prepare a RAID set and volume set. It only needs a few keystrokes to complete it. Although disk drives of different capacity may be used in the RAID set, it will use the smallest capacity of the disk drive as the capacity of all disk drives in the RAID set. The "Quick Volume And Raid Setup" option creates a RAID set with the following properties:

Figure 4.7.1-1



1. All of the physical disk drives are contained in a RAID set.
2. The RAID levels associated with hot spare, capacity, and stripe size are selected during the configuration process.
3. A single volume set is created and consumed all or a portion of the disk capacity available in this RAID set.
4. If you need to add additional volume set, using main menu "Volume Set Functions". Detailed procedure refer to this chapter section 4.7.3.

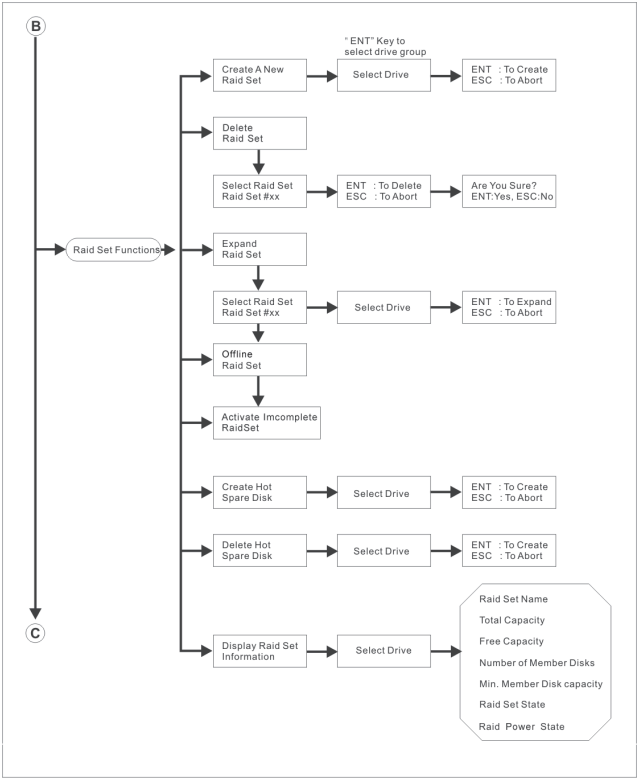
4.7.2 Raid Set Functions

User manual configuration can complete control of the RAID set setting, but it will take longer time to complete than the "Quick Volume And Raid Setup" configuration. Select the "Raid Set Functions" to manually configure the RAID set for the first time or deletes existing RAID set and reconfigures the RAID set.

To enter a "Raid Set Functions", press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Raid Set Functions" option and then press **ENT** to enter further submenus. All RAID set submenus will be displayed.

LCD CONFIGURATION MENU

Figure 4.7.2-1



4.7.2.1 Create A New Raid Set

For detailed procedure please refer to chapter section 4.6.

4.7.2.2 Delete Raid Set

Press **UP/DOWN** buttons to choose the "Delete Raid Set" option. Using **UP/DOWN** buttons to select the RAID set number that user wants to delete and then press **ENT** to accept the RAID set number. The confirmation screen appears, then press **ENT** to accept the delete RAID set function. The double confirmation screen appears, then press **ENT** to make sure of the delete existed RAID set function

LCD CONFIGURATION MENU

4.7.2.3 Expand Raid Set

Instead of deleting a RAID set and recreating it with additional disk drives, the "Expand Existed Raid Set" function allows the user to add disk drives to the RAID set that was created.

To expand existed RAID set, press **UP/DOWN** buttons to choose the "Expand Raid Set" option. Using **UP/DOWN** buttons to select the RAID set number that user wants to expand and then press **ENT** to accept the RAID set number. If there is an available disk, then the "Select Drive" appears. Using **UP/DOWN** buttons to select the target disk and then press **ENT** to select it. Press **ENT** to start expanding the existed RAID set. The new added capacity can defined one or more volume sets. Follow the instruction presented in the "Volume Set Function" to create the volume sets.

Migrating occurs when a disk is added to a RAID set. Migration status is displayed in the RAID status area of the "Raid Set information" when a disk is added to a RAID set. Migrating status is also displayed in the associated volume status area of the volume set information when a disk is added to a RAID set.

Note:

1. Once the "Expand Raid Set" process has started, user can not stop it. The process must be completed.
2. If a disk drive fails during RAID set expansion and a hot spare is available, an auto rebuild operation will occur after the RAID set expansion completes.

4.7.2.4 Offline Raid Set

Press **UP/DOWN** buttons to choose the "Offline Raid Set" option. This function is for customer being able to unmount and remount a multi-disk volume. All hdds of the selected RAID set will be put into offline state, spun down and fault LED will be in fast blinking mode.

LCD CONFIGURATION MENU

4.7.2.5 Activate Incomplete RaidSet

When one of the disk drive is removed or loosed connection in power off state, the RAID set state will change to "Incomplete State". If user wants to continue to work, when the RAID subsystem is power on. User can use the "Activate Incomplete RaidSet" option to active the RAID set. After user completed the function, the "Raid State" will change to "Degraded Mode".

4.7.2.6 Create Hot Spare Disk

Please refer to this chapter section 4.4. Designating drives as hot spares.

4.7.2.7 Delete Hot Spare Disk

To delete hot spare, press **UP/DOWN** buttons to choose the "Delete Hot Spare Disk" option. Using **UP/DOWN** buttons to select the hot spare number that user wants to delete and then press **ENT** to select it. The confirmation screen appears and press **ENT** to delete the hot spare.

4.7.2.8 Display Raid Set Information

Choose the "Display Raid Set Information" option and press **ENT**. Using **UP/DOWN** buttons to select the RAID set number. Then the RAID set information will be displayed.

Using **UP/DOWN** buttons to see the RAID set information, it will show Raid Set Name, Total Capacity, Free Capacity, Number of Member Disks, Min. Member Disk Capacity, Raid Set State and Raid Power Status.

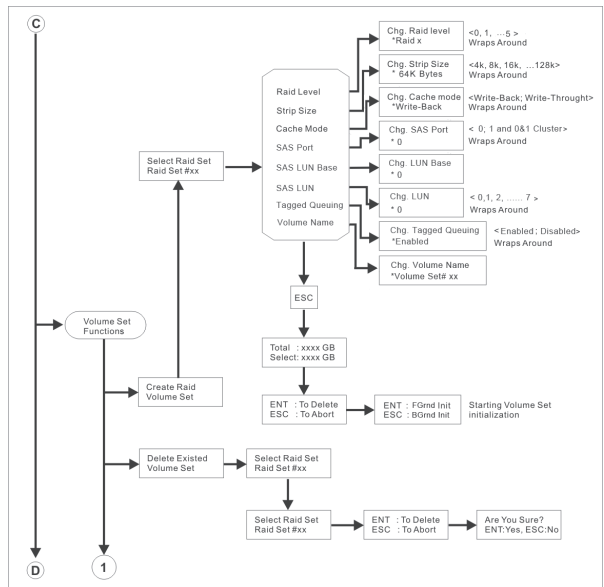
LCD CONFIGURATION MENU

4.7.3 Volume Set Functions

A volume set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a volume set. A volume set capacity can consume all or a portion of the disk capacity available in a RAID set. Multiple volume sets can exist on a group of disks in a RAID set. Additional volume sets created in a specified RAID set will reside on all the physical disks in the RAID set. Thus each volume set on the RAID set will have its data spread evenly across all the disks in the RAID set.

To enter the "Volume Set Functions", press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Volume Set Functions" option and then press **ENT** to enter further submenus. All volume set submenus will be displayed.

Figure 4.7.3.1-1



LCD CONFIGURATION MENU

4.7.3.1 Create Raid Volume Set

To create a volume set, please refer to this chapter section 4.7, using "Raid Set Functions" and "Volume Set Functions". The volume set attributes screen shows the volume set default configuration values that have currently being configured.

The attributes for RAID subsystem series are Volume Name, Raid Level, Stripe Size, Cache Mode, SAS Port/LUN Base/SAS LUN and Tagged Queuing. See Figure 4.7.3.1-1

All values can be changed by user. Press the **UP/DOWN** buttons to select attributes. Press **ENT** to modify the default value. Using the **UP/DOWN** buttons to select attribute value and press **ENT** to accept the default value. The following is the attributes descriptions. Please refer to this chapter section 4.7 using "Raid Set Functions" and "Volume Set Functions" to complete the create volume set function.

4.7.3.1.1 Volume Name

The default volume name will always appear as volume set #. You can rename the volume set name providing it does not exceed the 15 characters limit.

4.7.3.1.2 Raid Level

The RAID subsystem can only set the RAID level 0, 1, 10(1E), 3, 5 and 6 on the LCD configuration.

4.7.3.1.3 Stripe Size

This parameter sets the size of the segment written to each disk in a RAID 0, 1, 10(1E), 5 or 6 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.

A larger stripe size produces better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random reads more often, select a small stripe size.

LCD CONFIGURATION MENU

4.7.3.1.4 Cache Mode

User can set the cache mode as "Write-Through" or "Write-Back".

4.7.3.1.5 SAS Port/LUN Base/SAS LUN

SAS Port: Two 4-PHY links SAS ports can be applied to the RAID subsystem. The RAID subsystem supports Port 0,1 and 0&1 Cluster option.

LUN Base: Each SAS device attached to the SAS host adapter must be assigned a unique SAS ID number. A SAS port can connect up to 128(16*8) volume sets. The RAID subsystem is as a large SAS device. We should assign an LUN base from a list of SAS LUN Base.

SAS LUN: Each LUN Base can support up to 8 SAS LUNs. Most SAS port host adapter treats each SAS LUN like a SAS disk.

4.7.3.1.6 Tagged Queuing

The "Enabled" option is useful for enhancing overall system performance under multi-tasking operating systems. The Tagged Command Queuing (TCQ) function controls the SAS command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using older SAS drives that do not support command tag queuing.

4.7.3.1.7 Initialization Mode

Press **ENT** to define "FGrnd Init (Foreground initialization)" or press **ESC** to define "BGrnd Init (Background initialization)". When "FGrnd Init", the initialization proceeds must be completed before the volume set ready for system accesses. When "BGrnd Init", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete.

LCD CONFIGURATION MENU

4.7.3.2 Delete Existed Volume Set

Choose the "Delete Existed Volume Set" option. Using **UP/DOWN** buttons to select the RAID set number that user wants to delete and press **ENT**. The confirmation screen appears, and then press **ENT** to accept the delete volume set function. The double confirmation screen appears, then press **ENT** to make sure of the delete existed volume set.

4.7.3.3 Modify Volume Set Attribute

Use this option to modify volume set configuration. To modify volume set attributes from RAID set system function, press **UP/DOWN** buttons to choose the "Modify Volume Set Attribute" option. Using **UP/DOWN** buttons to select the RAID set number that user wants to modify and press **ENT**.

Press **ENT** to select the existed volume set attribute. The volume set attributes screen shows the volume set setting configuration attributes that were currently being configured. The attributes are Raid Level, Stripe Size, Cache Mode, SAS Port/LUN Base/SAS LUN and Tagged Queuing and Volume Name (number). All values can be modified by user. Press the **UP/DOWN** buttons to select attribute. Press **ENT** to modify the default value. Using the **UP/DOWN** buttons to select attribute value and press the **ENT** to accept the selection value. Choose this option to display the properties of the selected volume set.

4.7.3.3.1 Volume Set Migration

Migrating occurs when a volume set is migrating from one RAID level to another, a volume set strip size changes, or when a disk is added to a RAID set. Migration status is displayed in the volume state area of the "Display Volume Set" Information.

4.7.3.4 Check Volume Set Consistency

Use this option to check volume set consistency. To check volume set consistency from volume set system function, press **UP/DOWN** buttons to choose the "Check Volume Set Consistency" option. Using **UP/DOWN** button to select the RAID set number that user wants to check and press **ENT**. The confirma-

LCD CONFIGURATION MENU

tion screen appears, press **ENT** to start the check volume set consistency.

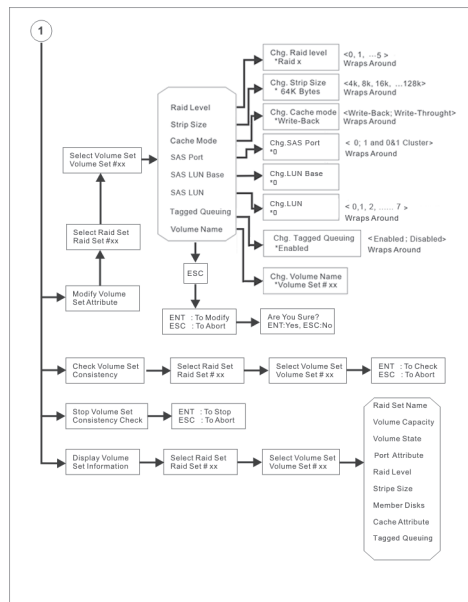
4.7.3.5 Stop Volume Set Consistency Check

Use this option to stop volume set consistency check. To stop volume set consistency check from volume set system function, press **UP/DOWN** buttons to choose the "Stop Volume Set Consistency Check" option and then press **ENT** to stop the check volume set consistency.

4.7.3.6 Display Volume Set Information

To display volume set information from volume set function, press **UP/DOWN** buttons to choose the "Display Volume Set Information" option. Using **UP/DOWN** buttons to select the RAID set number that user wants to show and press **ENT**. The volume set information will show Volume Set Name, Raid Set Name, Volume Capacity, Port Attribute, RAID Level, Stripe Size, Member Disks, Cache Attribute and Tagged Queuing. All values can not be modified by this option.

Figure 4.7.3.2-1

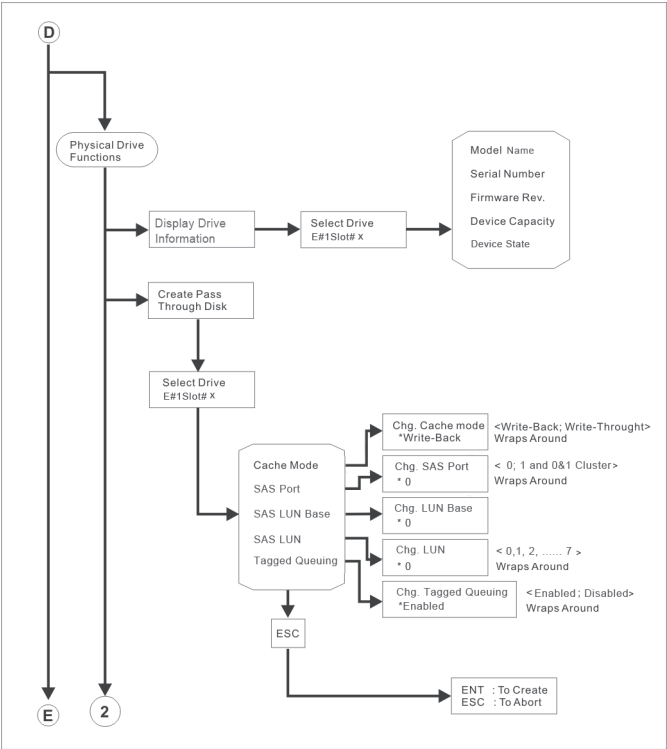


LCD CONFIGURATION MENU

4.7.4 Physical Drive Functions

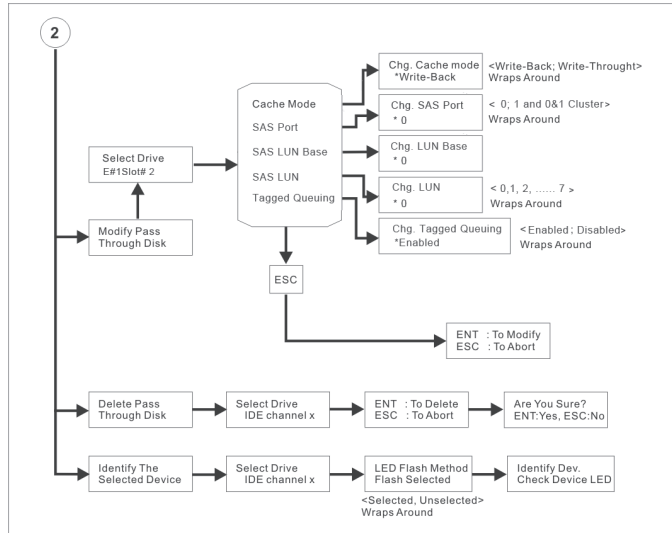
Choose this option from the main menu to select a physical disk and to perform the operations listed below. To enter a physical drive functions, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Physical Drive Functions" option and then press **ENT** to enter further submenus. All physical drive submenus will be displayed.

Figure 4.7.4-1



LCD CONFIGURATION MENU

Figure 4.7.4-2



4.7.4.1 Display Drive Information

Using **UP/DOWN** buttons to choose the “Display Drive Information” option and press **ENT**. Using **UP/DOWN** buttons to select the drive SAS/SATA number that user want to display. The drive information will be displayed. The SATA drive information screen shows the Model Name, Serial Number, Firmware Rev., Device Capacity, Current SATA, Supported SATA, and Device State.

4.7.4.2 Create Pass-Through Disk

Disk is not controlled by the RAID subsystem’s firmware and thus can not be a part of a RAID set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem’s firmware. Using **UP/DOWN** buttons to choose the “Create Pass-Through Disk” option and press **ENT**. Using **UP/DOWN** buttons to select the drive SAS/SATA number that user want to create. The drive attributes will be displayed.

The attributes for pass-through disk show the Volume Cache Mode, SAS Port/ LUN Base/SAS LUN and Tagged Queuing .

LCD CONFIGURATION MENU

All values can be changed by user. Press the **UP/DOWN** buttons to attribute and then press **ENT** to modify the default value. Using the **UP/DOWN** buttons to select attribute value and press **ENT** to accept the selection value.

4.7.4.3 Modify Pass-Through Disk

To modify pass-through disk attributes from pass-through drive pool, press **UP/DOWN** buttons to choose the "Modify Pass-Through Disk" option, and then press **ENT**. The select drive function menu will show all pass-through disk number items. Using **UP/DOWN** buttons to select the pass-through disk that user wants to modify and press **ENT**. The attributes screen shows the pass through disk setting values that were currently being configured.

The attributes for pass-through disk are the Volume Cache Mode, Tagged Command Queuing and SAS Port/ SAS LUN Base/ SAS LUN. All values can be modified by user. Using **UP/DOWN** buttons to select attribute. Press **ENT** to modify the default value. Using the **UP/DOWN** buttons to select attribute value and press **ENT** to accept the selection value. After completing the modification, press **ESC** to enter the confirmation screen and then press **ENT** to accept the "Modify Pass-Through Disk" function.

4.7.4.4 Delete Pass-Through Disk

To delete pass through disk from the pass-through drive pool, press **UP/DOWN** buttons to choose the "Delete Pass-Through Disk" option, and then press **ENT**. The "Select Drive Function" menu will show all pass-through disk number items. Using **UP/DOWN** buttons to select the pass-through disk that user wants to delete and press **ENT**. The delete pass-through confirmation screen will appear, press **ENT** to delete it.

4.7.4.5 Identify The Selected Drive

To prevent removing the wrong drive, the selected disk fault LED indicator will light for physically locating the selected disk when the "Identify The Selected Drive" function is selected.

LCD CONFIGURATION MENU

To identify selected drive from the physical drive pool, press **UP/DOWN** buttons to choose the "Identify The Selected Drive" option, then press **ENT** key. The "Select Drive function" menu will show all physical drive number items. Using **UP/DOWN** buttons to select the disk that user want to identify and press **ENT**. The selected disk fault LED indicator will flash.

4.7.5 Raid System Functions

To enter a "Raid System Functions", press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Raid System Functions" option and then press **ENT** to enter further submenus. All RAID system submenus will be displayed. Using **UP/DOWN** buttons to select the submenus option and then press **ENT** to enter the selection function.

LCD CONFIGURATION MENU

4.7.5.1 Mute The Alert Beeper

The “Mute The Alert Beeper” function item is used to control the RAID subsystem beeper. Select **No** and press **ENT** button to turn the beeper off temporarily. The beeper will still activate on the next event.

4.7.5.2 Alert Beeper Setting

The “Alert Beeper Setting” function item is used to disable or enable the RAID subsystem’s alarm tone generator. Using the **UP/DOWN** buttons to select “Alert beeper Setting” and press **ENT** to accept the selection. After completed the selection, the confirmation screen will be displayed and then press **ENT** to accept the function. Select the “Disabled” and press **ENT** key in the dialog box to turn the beeper off.

4.7.5.3 Change Password

To set or change the RAID subsystem’s password, press the **UP/DOWN** buttons to select “Change Password” option and then press **ENT** to accept the selection. The “New Password:” screen appears and enter new password that users want to change. Using **UP/DOWN** buttons to set the password value. After completed the modification, the confirmation screen will be displayed and then press **ENT** to accept the function. To disable the password, press **ENT** only in the “New Password:” column. The existing password will be cleared. No password checking will occur when entering the main menu from the starting screen. The RAID subsystem will automatically go back to the initial screen when it does not receive any command in 5 minutes. Do not use spaces when you enter the password, If spaces are used, it will lock out the user.

4.7.5.4 JBOD/RAID Mode Configuration

JBOD is an acronym for “Just a Bunch Of Disk”. A group of hard disks in a RAID subsystem are not set up as any type of RAID configuration. All drives are available to the operating system as an individual disk. JBOD does not provide data redundancy. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

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4.7.5.5 Raid Rebuild Priority

The "Raid Rebuild Priority" is a relative indication of how much time the controller devotes to a rebuild operation. The RAID subsystem allows user to choose the rebuild priority (UltraLow, Low, ... High) to balance volume set access and rebuild tasks appropriately. To set or change the RAID subsystem's RAID rebuild priority, press the **UP/DOWN** buttons to select "RAID Rebuild Priority" and press **ENT** to accept the selection. The rebuild priority selection screen appears and uses the **UP/DOWN** buttons to set the rebuild value. After completing the modification, the confirmation screen will be displayed and then press **ENT** to accept the function.

4.7.5.6 SATA NCQ Mode Support

The controller supports both SAS and SATA disk drives. The SATA NCQ allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows the user to select the SATA NCQ support: "Enabled" or "Disabled".

4.7.5.7 HDD Read Ahead Cache

Allow Read Ahead (Default: Enabled)—When "Enabled", the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.

4.7.5.8 Volume Data Read Ahead

The data read ahead parameter specifies the controller firmware algorithms which process the "Data Read Ahead" blocks from the disk. The read ahead parameter is normal by default. To modify the value, you must know your application behavior. The default "Normal" option satisfies the performance requirements for a typical volume. The "Disabled" value implies no read ahead. The most efficient value for the controllers depends on your

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application. "Aggressive" read ahead is optimal for sequential access but it degrades random access.

4.7.5.9 Disk Write Cache HDD

User can set the "Disk Write Cache Mode" to "Auto", "Enabled", or "Disabled". "Enabled" increases speed, "Disabled" increases reliability.

4.7.5.10 Disk Capacity Truncation Mode

The RAID subsystem uses drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units. The RAID subsystem provides three truncation modes in the system configuration: Multiples Of 10G, Multiples Of 1G and Disabled.

Multiples Of 10G: If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. "Multiples Of 10G" truncates the number under tens. This makes the same capacity for both of these drives so that one could replace the other.

Multiples Of 1G: If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. "Multiples Of 1G" truncates the fractional part. This makes the same capacity for both of these drives so that one could replace the other.

Disabled: It does not truncate the capacity.

4.7.5.11 Restart Controller

To restart the RAID controller, press **UP/DOWN** buttons to select "Restart Controller" and then press **ENT** to accept the selection. The confirmation screen will be displayed and then press **ENT** to accept the function.

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Note:

It can only work properly at host and drive without any activity.

4.7.6 Hdd Power Management

Areca has automated the ability to manage HDD power based on usage patterns. The "HDD Power Management" allows you to choose a "Stagger Power On Control", "Low Power Idle", "Low RPM" and completely "Spins Down Idle HDD". It is designed to reduce power consumption and heat generation on idle drives.

4.7.6.1 Stagger Power On Control

In a RAID subsystems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other subsystem components. This damage can be avoided by allowing the RAID controller to stagger the spin-up of the drives. The SAS/SATA drives have support stagger spin-up capabilities to boost reliability. Stagger spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the RAID controller the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

SAS RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected within the range 0.4 to 6 seconds per step which powers up one drive groups.

4.7.6.2 Time to Hdd Low Power Idle

This option delivers lower power consumption by automatically unloading recording heads during the setting idle time. The values can be selected "Disabled" or within the range 2 to 7 minutes.

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4.7.6.3 Time To Hdd Low RPM Mode

This function can automatically spin disks at lower RPM if there have not been used during the setting idle time. The values can be selected "Disabled" or within the range 10 to 60 minutes.

4.7.6.4 Time To Spin Down Idle HDD

This function can automatically spin down the drive if it hasn't been accessed for a certain amount of time. This value is used by the drive to determine how long to wait (with no disk activity, before turning off the spindle motor to save power). The values can be selected "Disabled" or within the range 1 to 60 minutes.

4.7.7 In Band SAS Config

The RAID manager supports both in-band and out-of-band management to control the disk array subsystem. In-band management refers to management of the SAS disk array from a SAS host management transactions traverse the SAS bus. Out-of-band management refers to management of the disk array from a remote station connected to the controller either via a RS-232 or through a LAN port. In-band management is simpler than out-of-band management for it requires less hardware in its configuration.

Since the host adapter is already installed in the host system, no extra connection is necessary. Just load the necessary in-band driver for the controller and then combine the API with user's RAID manager from the local host to start management of the disk array system.

4.7.7.1 InBand SAS Function

The RAID subsystem reserves one LUN for In-band management transactions. This option is for user to release the LUN when In-band management is not enabled.

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4.7.7.2 InBand SAS Port

Since the SAS RAID controller supports two SAS host ports, the In-band can through either SAS port 0 or port 1.

4.7.8 Ethernet Configuration

To configuration Ethernet function, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the option.

4.7.8.1 DHCP

DHCP (Dynamic Host Configuration Protocol) allows network administrators centrally manage and automate the assignment of IP (Internet Protocol) addresses on a computer network. When using the TCP/IP protocol (Internet protocol), it is necessary for a computer to have a unique IP address in order to communicate to other computer systems. Without DHCP, the IP address must be entered manually at each computer system. DHCP lets a network administrator supervise and distribute IP addresses from a central point. The purpose of DHCP is to provide the automatic (dynamic) allocation of IP client configurations for a specific time period (called a lease period) and to minimize the work necessary to administer a large IP network. To manually configure the IP address of the RAID subsystem, press the **UP/DOWN** buttons to select "Ethernet Configuration" function and press **ENT**. Using **UP/DOWN** buttons to select DHCP, then press **ENT**.

Select the "Disabled" or "Enabled" option to enable or disable the DHCP function. If DHCP is disabled, it will be necessary to manually enter a static IP address that does not conflict with other devices on the network.

4.7.8.2 Local IP Address

If you intend to set up your client computers manually (no DHCP), make sure that the assigned IP address is in the same range as the default router address and that it is unique to your private network. However, it is highly recommend to use DHCP if that option is available on your network. An IP address alloca

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tion scheme will reduce the time it takes to set-up client computers and eliminate the possibilities of administrative errors and duplicate addresses. To manually configure the IP address of the RAID subsystem, press the **UP/DOWN** buttons to select "Ethernet Configuration" function and press **ENT**. Using **UP/DOWN** buttons to select "Local IP Address", then press **ENT**. It will show the default address setting in the RAID subsystem. You can then reassign the static IP address of the RAID subsystem.

4.7.8.3 HTTP Port Number

To manually configure the "HTTP Port Number" of the RAID subsystem, press **UP/DOWN** buttons to select "Ethernet Configuration" function and press **ENT**. Using **UP/DOWN** buttons to select "HTTP Port Number", then press **ENT**. It will show the default address setting in the RAID subsystem. Then You can reassign the default "HTTP Port Number" of the controller.

4.7.8.4 Telnet Port Number

To manually configure the "Telnet Port Number" of the RAID subsystem, press the **UP/DOWN** buttons to select "Ethernet Configuration" function and press **ENT**. Using **UP/DOWN** buttons to select "Telnet Port Number", then press **ENT**. It will show the default address setting in the RAID subsystem. You can then reassign the default "Telnet Port Number" of RAID subsystem.

4.7.8.5 SMTP Port Number

To manually configure the "SMTP Port Number" of the RAID subsystem, press the **UP/DOWN** buttons to select "Ethernet Configuration" function and press **ENT**. Using **UP/DOWN** buttons to select "SMTP Port Number", then press **ENT**. It will show the default address setting in the RAID subsystem. You can then reassign the default "SMTP Port Number" of RAID subsystem.

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4.7.8.6 Ethernet Address

Each Ethernet port has its unique Mac address, which is also factory assigned. Usually, Ethernet Address is used to uniquely identify a port in the Ethernet network.

4.7.9 Show System Events

To view the RAID subsystem events, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Show System Events" option, and then press **ENT**. The system events will be displayed. Press **UP/DOWN** buttons to browse all the system events.

4.7.10 Clear all Event Buffers

Use this feature to clear the entire events buffer information. To clear all event buffers, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Clear all Event Buffers" option, and then press **ENT**. The confirmation message will be displayed and press **ENT** to clear all event buffers or **ESC** to abort the action.

4.7.11 Hardware Monitor Information

To view the RAID subsystem monitor information, press **ENT** to enter the main menu. Press **UP/DOWN** buttons to select the "Hardware Information" option, and then press **ENT**. All hardware monitor information will be displayed. Press **UP/DOWN** buttons to browse all the hardware information. The hardware information provides the CPU temperature, controller temperature, fan speed (chassis fan), battery status and voltage of the RAID subsystem. All items are also unchangeable. The warning messages will indicate through the LCD, LED and alarm buzzer.

4.7.12 System Information

Choose this option to display Main processor, CPU instruction cache size, CPU data cache size, system memory, firmware version, BOOT ROM version, PL firmware, serial number, unit serial,

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controller name, current IP, target SAS chip, devices chip, SAS expander, host port link and JBOD port link. To check the system information, press **ENT** to enter the main menu. Press **UP/DOWN** button to select the "Show System Information" option, and then press **ENT**. All major controller system information will be displayed. Press **UP/DOWN** buttons to browse all the system information.

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5. VT-100 Utility Configuration

The RAID subsystem configuration utility is firmware-based and uses to configure RAID sets and volume sets. Because the utility resides in the RAID subsystem's firmware, its operation is independent of the operating systems on your computer. Use this utility to:

- Create RAID set,
- Expand RAID set,
- Define volume set,
- Add physical drive,
- Modify volume set,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Update firmware,
- Modify system function and
- Designate drives as hot spares.

Keyboard Navigation

The following definition is the VT-100 RAID configuration utility keyboard navigation

Key	Function
Arrow Key	Move Cursor
Enter Key	Submit selection function
ESC Key	Return to previous screen
L Key	Line Draw
X Key	Redraw

5.1 Configuring Raid Sets/Volume Sets

You can configure RAID sets and volume sets with VT-100 utility configuration automatically. Using "Quick Volume/Raid Setup" or manually using "Raid Set/Volume Set Function". Each configuration method requires a different level of user input. The general flow of operations for RAID set and volume set configuration is:

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Step	Action
1	Designate hot spares/pass-through (optional).
2	Choose a configuration method.
3	Create RAID sets using the available physical drives.
4	Define volume sets using the space in the RAID set.
5	Initialize the volume sets (logical drives) and use volume sets in the host OS.

5.2 Designating Drives as Hot Spares

Any unused disk drive that is not part of a RAID set can be designated as a hot spare. The "Quick Volume/Raid Setup" configuration will add the spare disk drive and automatically display the appropriate RAID level from which the user can select. For the "Raid Set Function" configuration option, the user can use the "Create Hot Spare" option to define the hot spare disk drive.

When a hot spare disk drive is being created using the "Create Hot Spare" option (in the "Raid Set Function"), all unused physical devices connected to the current controller appear:

Choose the target disk by selecting the appropriate check box. Press **Enter** key to select a disk drive, and press **Yes** in the "Create Hot Spare" to designate it as a hot spare.

5.3 Using Quick Volume /Raid Setup Configuration

"Quick Volume / Raid Setup configuration" collects all available drives and includes them in a RAID set. The RAID set you created is associated with exactly one volume set. You will only be able to modify the default RAID level, stripe size and capacity of the new volume set. Designating drives as hot spares is also possible in the "Raid Level" selection option. The volume set default settings will be:

Parameter	Setting
Volume Name	Volume Set # 00
SAS Port#/LUN Base/LUN	0/0/0
Cache Mode	Write-Back
Tag Queuing	Yes

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The default setting values can be changed after configuration is complete. Follow the steps below to create arrays using "Quick Volume / Raid Setup" configuration:

Step	Action
1	Choose "Quick Volume /Raid Setup" from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed.
2	<p>It is recommended that you use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will be set to the capacity of the smallest drive in the RAID set. The numbers of physical drives in a specific array determines which RAID levels that can be implemented in the array.</p> <p>RAID 0 requires 1 or more physical drives. RAID 1 requires at least 2 physical drives. RAID 10(1E) requires at least 3 physical drives. RAID 3 requires at least 3 physical drives. RAID 5 requires at least 3 physical drives. RAID 3 +Spare requires at least 4 physical drives. RAID 5 + Spare requires at least 4 physical drives. RAID 6 requires at least 4 physical drives. RAID 6 + Spare requires at least 5 physical drives.</p> <p>Highlight the desired RAID level for the volume set and press the Enter key to confirm.</p>
3	<p>The capacity for the current volume set is entered after highlighting the desired RAID level and pressing the Enter key.</p> <p>The capacity for the current volume set is displayed. Use the UP and DOWN arrow keys to set the capacity of the volume set and press the Enter key to confirm. The available stripe sizes for the current volume set are then displayed.</p>
4	<p>Use the UP and DOWN arrow keys to select the current volume set stripe size and press the Enter key to confirm. This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 10(1E), 5 or 6 volume set. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size provides better read performance, especially when the computer performs mostly sequential reads. However, if the computer performs random read requests more often, choose a smaller stripe size.</p>
5	<p>When you are finished defining the volume set, press the Yes key to confirm the "Quick Volume And Raid Set Setup" function.</p>
6	<p>Foreground (Fast Completion) Press Enter key to define fast initialization or selected the Background (Instant Available) or No Init (To Rescue Volume). In the "Background Initialization", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In "Foreground Initialization", the initialization proceeds must be completed before the volume set ready for system accesses. In "No Init", there is no initialization on this volume.</p>

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7	Initialize the volume set you have just configured
8	If you need to add additional volume set, using main menu "Create Volume Set" function.

5.4 Using Raid Set/Volume Set Function Method

In "Raid Set Function", you can use the "Create Raid Set" function to generate a new RAID set. In "Volume Set Function", you can use the "Create Volume Set" function to generate an associated volume set and configuration parameters.

If the current controller has unused physical devices connected, you can choose the "Create Hot Spare" option in the "Raid Set Function" to define a global hot spare. Select this method to configure new RAID sets and volume sets. The "Raid Set/Volume Set Function" configuration option allows you to associate volume sets with partial and full RAID sets.

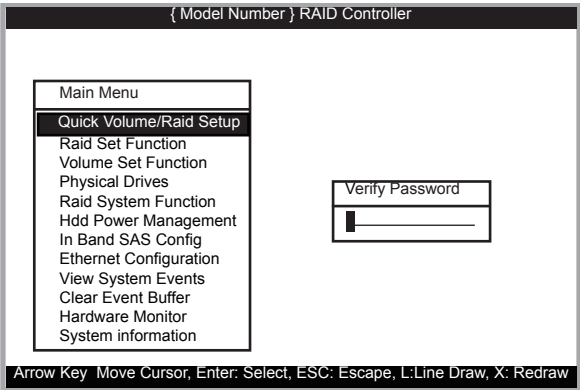
Step	Action
1	To setup the hot spare (option), choose "Raid Set Function" from the main menu. Select the "Create Hot Spare" and press the Enter key to define the hot spare.
2	Choose "RAID Set Function" from the main menu. Select "Create Raid Set" and press the Enter key.
3	The "Select a Drive For Raid Set" window is displayed showing the SAS/SATA drives connected to the RAID subsystem.
4	<p>Press the UP and DOWN arrow keys to select specific physical drives. Press the Enter key to associate the selected physical drive with the current RAID set.</p> <p>It is recommended that you use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will be set to the capacity of the smallest drive in the RAID set. The numbers of physical drives in a specific array determines which RAID levels that can be implemented in the array.</p> <p>RAID 0 requires 1 or more physical drives. RAID 1 requires at least 2 physical drives. RAID 10(1E) requires at least 3 physical drives. RAID 3 requires at least 3 physical drives. RAID 5 requires at least 3 physical drives. RAID 6 requires at least 4 physical drives. RAID 30 requires at least 6 physical drives. RAID 50 requires at least 6 physical drives. RAID 60 requires at least 8 physical drives.</p>

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5	After adding the desired physical drives to the current RAID set, press the Enter to confirm the "Create Raid Set" function.
6	An "Edit The Raid Set Name" dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for this new RAID set. The default RAID set name will always appear as Raid Set. #. Press Enter to finish the name editing.
7	Press the Enter key when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8.
8	Choose the "Volume Set Function" from the main menu. Select "Create Volume Set" and press the Enter key.
9	Choose a RAID set from the "Create Volume From Raid Set" window. Press the Yes key to confirm the selection.
10	Choosing Foreground (Fast Completion) Press Enter key to define fast initialization or selected the Background (Instant Available) or No Init (To Rescue Volume). In the "Background Initialization", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In "Foreground Initialization", the initialization proceeds must be completed before the volume set ready for system accesses. In "No Init", there is no initialization on this volume.
11	If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 10 to configure another volume set.

5.5 Main Menu

The main menu shows all functions that are available for executing actions, which is accomplished by clicking on the appropriate link.



Note:

The manufacture default password is set to 0000, this password can be selected by the "Change Password" in the section of "Raid System Function".

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Option	Description
Quick Volume/Raid Setup	Create a default configuration which based on numbers of physical disk installed
Raid Set Function	Create a customized RAID set
Volume Set Function	Create a customized volume set
Physical Drives	View individual disk information
Raid System Function	Setting the RAID system configuration
In Band SAS Config	In Band management configuration
Ethernet Configuration	LAN port setting
View System Events	Record all system events in the buffer
Clear Event Buffer	Clear all event buffer information
Hardware Monitor	Show all system environment status
System Information	View the controller information

This password option allows user to set or clear the RAID subsystem's password protection feature. Once the password has been set, the user can only monitor and configure the RAID subsystem by providing the correct password. The password is used to protect the internal RAID subsystem from unauthorized entry. The controller will prompt for the password only when entering the main menu from the initial screen. The RAID subsystem will automatically return to the initial screen when it does not receive any command in five minutes.

5.5.1 Quick Volume/Raid Setup

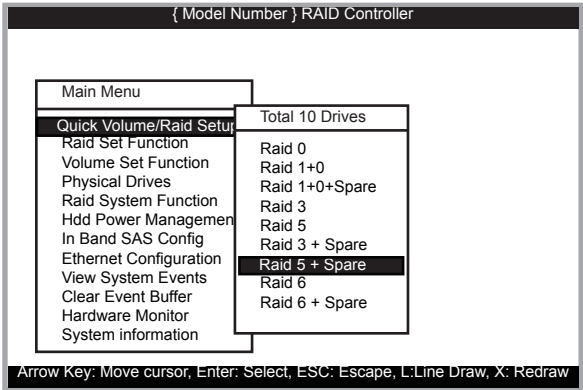
"Quick Volume/RAID Setup" is the fastest way to prepare a RAID set and volume set. It requires only a few keystrokes to complete. Although disk drives of different capacity may be used in the RAID Set, it will use the capacity of the smallest disk drive as the capacity of all disk drives in the RAID Set. The "Quick Volume/RAID Setup" option creates a RAID set with the following properties:

1. All of the physical drives are contained in one RAID set.
2. The RAID level, hot spare, capacity, and stripe size options are selected during the configuration process.
3. When a single volume set is created, it can consume all or

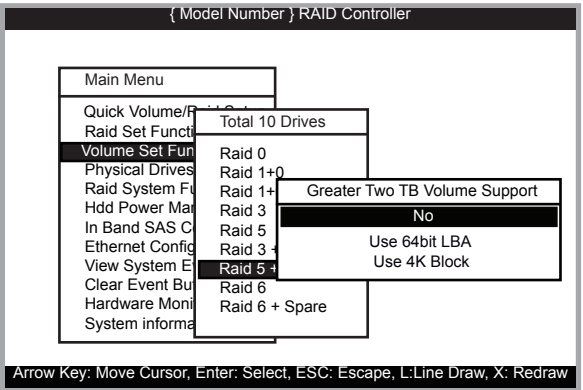
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a portion of the available disk capacity in this RAID set.
4. If you need to add an additional volume set, use the main menu "Create Volume Set" function.

The total number of physical drives in a specific RAID set determine the RAID levels that can be implemented within the RAID set. Select "Quick Volume/Raid Setup" from the main menu; all possible RAID level will be displayed on the screen.



If volume capacity will exceed 2TB, controller will show the "Greater Two TB Volume Support" sub-menu.



- **No**

It keeps the volume size with max. 2TB limitation.

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● 64bit LBA

This option uses 16 bytes CDB instead of 10 bytes. The maximum volume capacity up to 512TB.

This option works on different OS which supports 16 bytes CDB.

Such as:

Windows 2003 with SP1 or later

Linux kernel 2.6.x or later

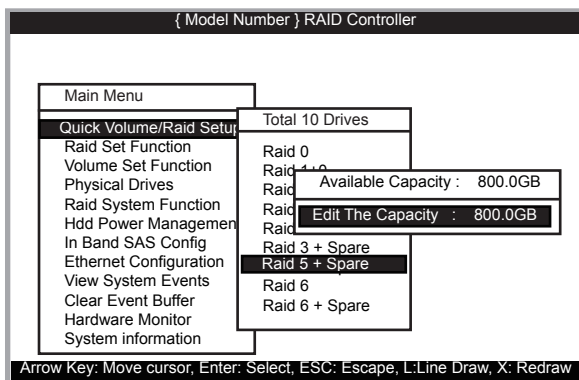
● 4K Block

It changes the sector size from default 512 Bytes to 4k Bytes. The maximum volume capacity up to 16TB.

This option works under Windows platform only. And it can not be converted to "Dynamic Disk", because 4k sector size is not a standard format.

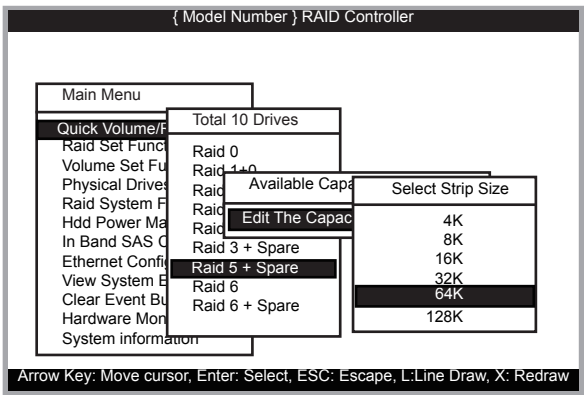
For more details, please download pdf file from **ftp://ftp.areca.com.tw/RaidCards/Documents/Manual_Spec/Over2TB_050721.zip**

A single volume set is created and consumes all or a portion of the disk capacity available in this RAID set. Define the capacity of volume set in the "Available Capacity" popup. The default value for the volume set, which is 100% of the available capacity, is displayed in the selected capacity. use the **UP** and **DOWN** arrow key to set capacity of the volume set and press **Enter** key to accept this value. If the volume set uses only part of the RAID set capacity, you can use the "Create Volume Set" option in the main menu to define additional volume sets.



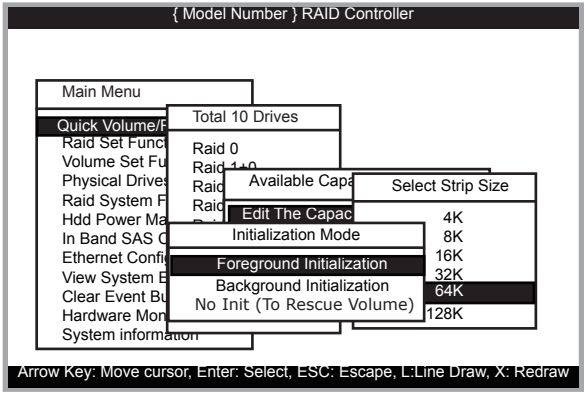
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Stripe Size This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 10(1E), 5, or 6 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.



A larger stripe size produces better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer performs random reads more often, select a smaller stripe size.

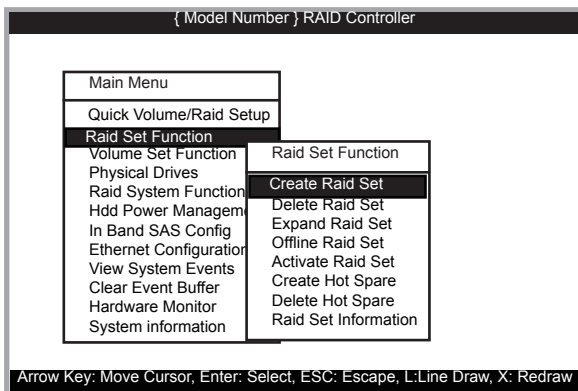
Press **Yes** option in the "Create Vol/Raid Set" dialog box, the RAID set and volume set will start to initialize it. Select "Foreground (Faster Completion)" or "Background (Instant Available)" for initialization or "No Init (To Rescue Volume)" for recovering the missing RAID set configuration.



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5.5.2 Raid Set Function

Manual configuration gives complete control of the RAID set setting, but it will take longer to configure than “Quick Volume/Raid Setup” configuration. Select “Raid Set Function” to manually configure the RAID set for the first time or delete existing RAID sets and reconfigure the RAID set.



5.5.2.1 Create Raid Set

The following is the RAID set features for the RAID subsystem.

1. Up to 32 disk drives can be included in a single RAID set.
2. Up to 128 RAID sets can be created per controller. RAID level 30 50 and 60 can support up to eight sub-volumes (RAID set).

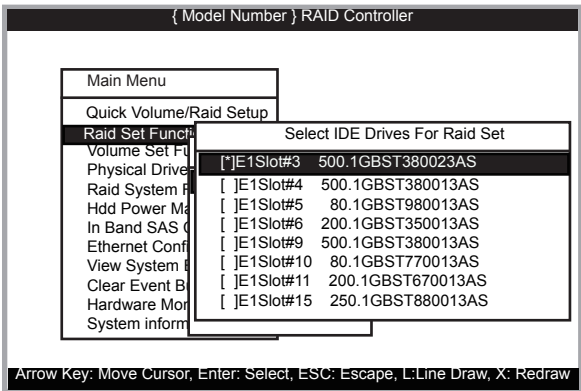
To define a RAID set, follow the procedures below:

1. Select “Raid Set Function” from the main menu.
2. Select “Create Raid Set ” from the “Raid Set Function” dialog box.
3. A “Select IDE Drive For Raid Set” window is displayed showing the SAS/SATA drives connected to the current controller. Press the **UP** and **DOWN** arrow keys to select specific physical drives. Press the **Enter** key to associate the selected physical drive with the current RAID set. Repeat this step; the user can add as many disk drives as are available to a single RAID set.

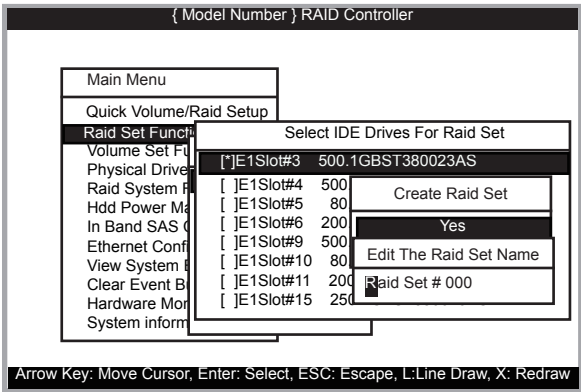
When finished selecting SAS/SATA drives for RAID set, press **Esc** key. A “Create Raid Set Confirmation” screen will appear, select the **Yes** option to confirm it.

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4. An "Edit The Raid Set Name" dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for the RAID set. The default RAID set name will always appear as Raid Set. #.



5. Repeat steps 3 and 4 to define another RAID set.



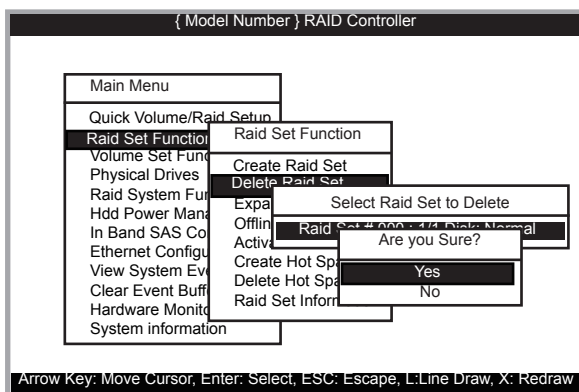
Note:

1. You can only edit the Raid set name in "Create Raid Set".
2. To create RAID 30/50/60 volume, you need to create multiple RAID sets first with the same disk members on each RAID set. The max no. disk drives per volume set: 32 for RAID 0/1/10(1E)/3/5/6 and 128 for RAID 30/50/60.

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5.5.2.2 Delete Raid Set

To completely erase and reconfigure a RAID set, you must first delete it and re-create the RAID set. To delete a RAID set, select the RAID set number that you want to delete in the "Select Raid Set To Delete" screen. Then "Delete Raid Set" dialog box will appear, press the **Yes** to delete it. Warning, data on RAID set will be lost if this option is used. But for deleting RAID set with the Raid 30/50/60 volume, firstly, you need to delete the volumes belonging those RAID sets.



5.5.2.3 Expand Raid Set

Instead of deleting a RAID set and recreating it with additional disk drives, the "Expand Raid Set" function allows the users to add disk drives to the RAID set that have already been created. To expand a RAID set:

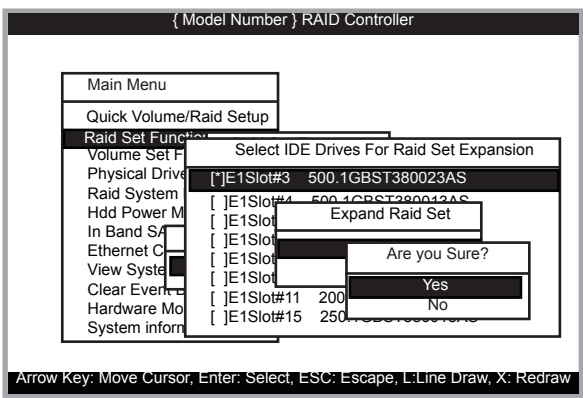
Select the "Expand Raid Set" option. If there is an available disk, then the "Select SATA Drives For Raid Set Expansion" screen appears.

Select the target RAID set by clicking on the appropriate radius button. Select the target disk by clicking on the appropriate check box.

Press the **Yes** key to start the expansion on the RAID set.

The new additional capacity can be utilized by one or more volume sets. The volume sets associated with this RAID set appear for you to have chance to modify RAID level or stripe size. Follow the instruction presented in the "Modify Volume Set" to modify the volume sets; operation system specific utilities may be required to expand operating system partitions.

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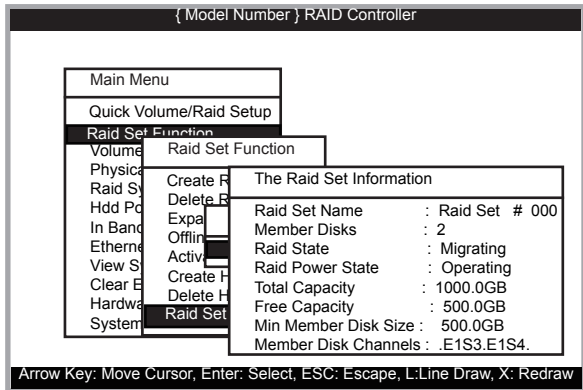


Note:

1. Once the "Expand Raid Set" process has started, user can not stop it. The process must be completed.
2. If a disk drive fails during RAID set expansion and a hot spare is available, an auto rebuild operation will occur after the RAID set expansion completes.
3. RAID 30/50/60 doesn't support the "Expand Raid Set".

• Migrating

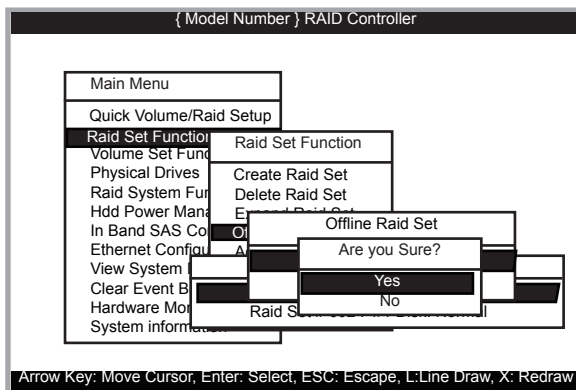
Migration occurs when a disk is added to a RAID set. Migrating state is displayed on the RAID state area of "The Raid Set Information" screen when a disk is being added to a RAID set. Migrating state is also displayed in the associated volume state area of the "Volume Set Information" which belongs this RAID set.



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5.5.2.4 Offline Raid Set

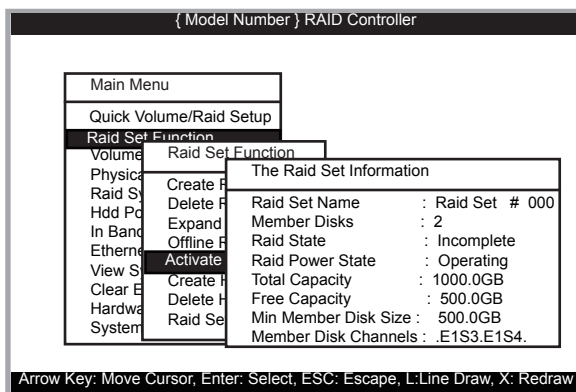
This function is for customer being able to unmount and remount a multi-disk volume. All Hdds of the selected RAID set will be put into offline state and spun down and fault LED will be in fast blinking mode.



5.5.2.5 Activate Raid Set

The following screen is used to activate the RAID set after one of its disk drive was removed in the power off state.

When one of the disk drives is removed in power off state, the RAID set state will change to "Incomplete State". If user wants to continue to work while the RAID subsystem is powered on, the user can use the "Activate Incomplete Raid Set" option to active the RAID set. After user selects this function, the RAID state will change to "Degraded Mode" and start to work.



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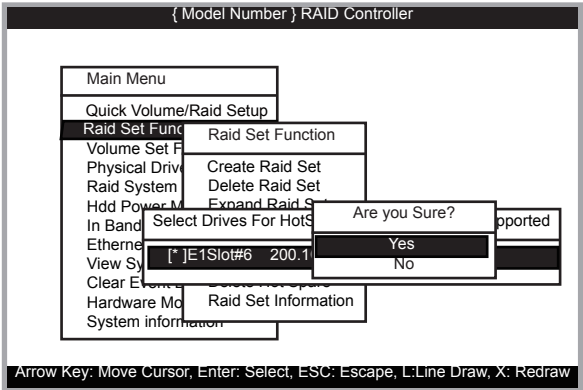
5.5.2.6 Create Hot Spare

When you choose the “Create Hot Spare” option in the “Raid Set Function”, all unused physical devices connected to the current controller will result in the screen.

Select the target disk by clicking on the appropriate check box.

Press the **Enter** key to select a disk drive and press **Yes** in the “Create Hot Spare” to designate it as a hot spare.

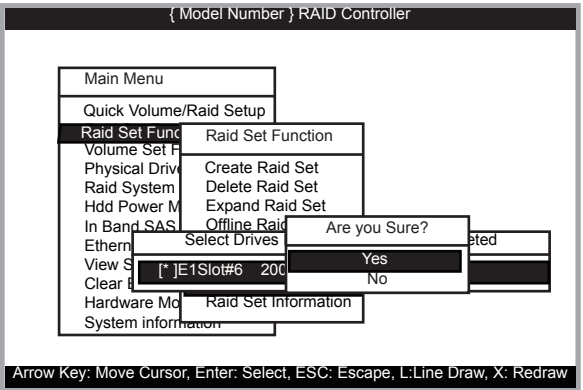
The “Create Hot Spare” option gives you the ability to define a global hot spare.



5.5.2.7 Delete Hot Spare

Select the target hot spare disk to delete by clicking on the appropriate check box.

Press the **Enter** key to select a hot spare disk drive, and press **Yes** in the “Delete Hot Spare” screen to delete the hot spare.

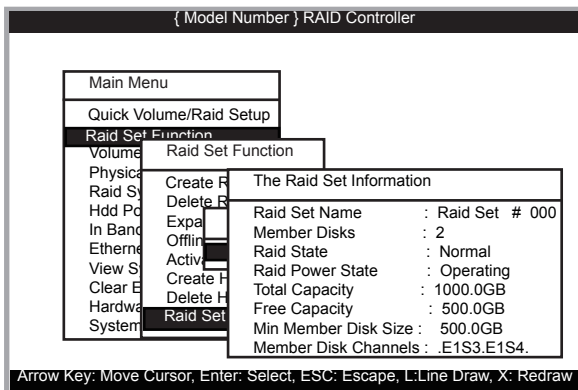


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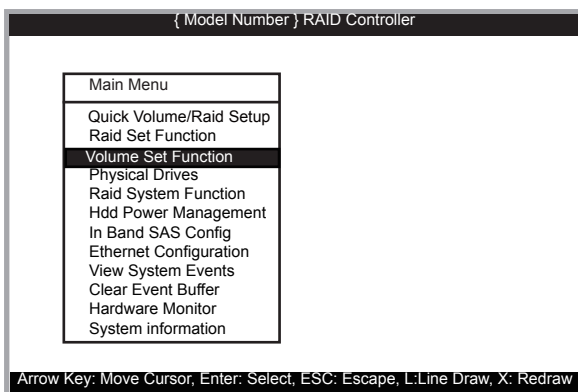
5.5.2.8 Raid Set Information

To display RAID set information, move the cursor bar to the desired RAID set number, then press the **Enter** key. The "Raid Set Information" will appear.

You can only view information for the RAID set in this screen.



5.5.3 Volume Set Function



A volume set is seen by the host system as a single logical device; it is organized in a RAID level within the controller utilizing one or more physical disks. RAID level refers to the level of data performance and protection of a volume set. A volume set can consume all of the capacity or a portion of the available disk capacity of a RAID set. Multiple volume sets can exist on a RAID

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4. The new create volume set attribute allows user to select the Volume Name, Raid level, Capacity, Strip Size, SAS Port#/LUN Base/SAS LUN, Cache Mode, Tagged Command Queuing.

{ Model Number } RAID Controller

Main Menu	
Quick Volume/Raid Setup	
Raid Set Function	
Volume Set Function	Volume Creation
Physical Drives	Volume Name : ARC-8066-VOL # 000
Raid System Function	Raid Level : 5
Hdd Power Management	Capacity : 400.0GB
In Band SAS Configuration	Stripe Size : 64K
Ethernet Configuration	SAS Port # : 0
View System Event Log	LUN Base : 0
Clear Event Buffer	SAS LUN : 0
Hardware Monitor	Cache Mode : Write-Back
System information	Tag Queuing : Enabled

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw

5. After completed the modification of the volume set, press the **Esc** key to confirm it. An "Initialization Mode" screen appears.

- Select "Foreground (Faster Completion)" for faster initialization of the selected volume set.
- Select "Background (Instant Available)" for normal initialization of the selected volume set.
- Select "No Init (To Rescue Volume)" for no initialization of the selected volume.

6. Repeat steps 3 to 5 to create additional volume sets.

7. The initialization percentage of volume set will be displayed at the button line.

{ Model Number } RAID Controller

Main Menu	
Quick Volume/Raid Setup	
Raid Set Function	
Volume Set Function	Volume Creation
Physical Drives	Volume Name : ARC-8066-VOL # 00
Raid System Function	Raid Level : 1
Hdd Power Management	Capacity : 400.0GB
In Band SAS Configuration	Stripe Size : 64K
Ethernet Configuration	SAS Port # : 0
View System Event Log	LUN Base : 0
Clear Event Buffer	SAS LUN : 0
Hardware Monitor	Cache Mode : Write-Back
System information	Tag Queuing : Enabled

Initialization Mode

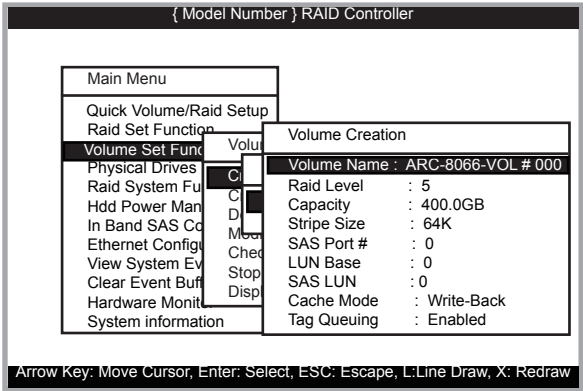
- Foreground (Faster Completion)
- Background (Instant Available)
- No Init (To Rescue Volume)

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw

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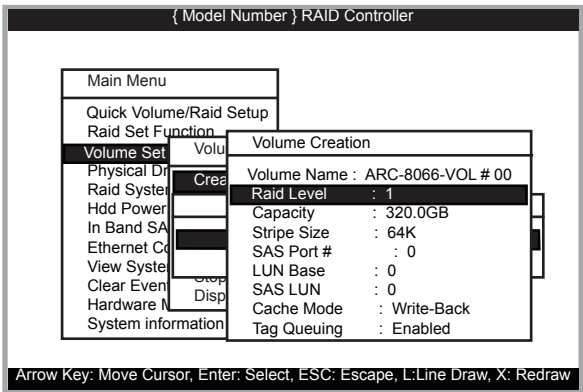
5.5.3.1.1 Volume Name

The default volume name will always appear as ARC-8066-VOL #. You can rename the volume set providing it does not exceed the 15 characters limit.



5.5.3.1.2 Raid Level

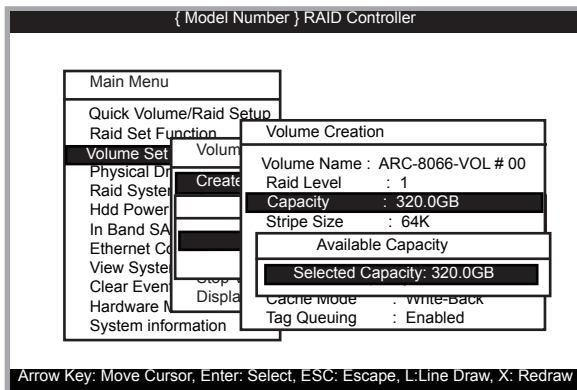
Set the RAID level for the volume set. Highlight "Raid Level" and press the **Enter** key. The available RAID levels for the current volume set are displayed. Select a RAID level and press the **Enter** key to confirm.



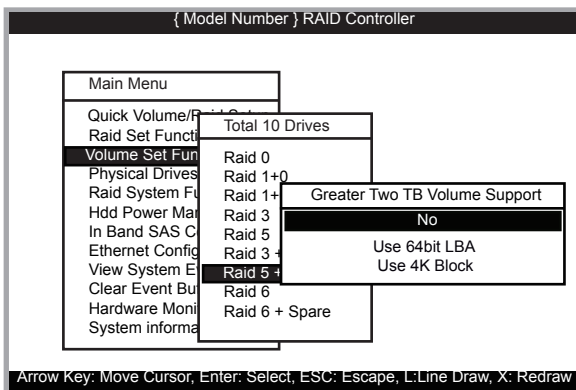
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5.5.3.1.3 Capacity

The maximum available volume size is the default value for the first setting. Enter the appropriate volume size to fit your application. The capacity value can be increased or decreased by the **UP** and **DOWN** arrow keys. The capacity of each volume set must be less than or equal to the total capacity of the RAID set on which it resides.



If volume capacity will exceed 2TB, controller will show the "Greater Two TB Volume Support" sub-menu.



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- **No**

It keeps the volume size with max. 2TB limitation.

- **64bit LBA**

This option uses 16 bytes CDB instead of 10 bytes. The maximum volume capacity up to 512TB.

This option works on different OS which supports 16 bytes CDB.

Such as:

Windows 2003 with SP1 or later

Linux kernel 2.6.x or later

- **4K Block**

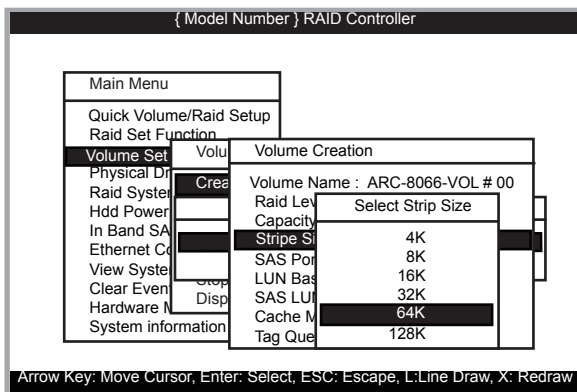
It changes the sector size from default 512 Bytes to 4k Bytes. the maximum volume capacity up to 16TB.

This option works under Windows platform only. And it can not be converted to "Dynamic Disk", because 4k sector size is not a standard format.

For more details, please download pdf file from **ftp://ftp.areca.com.tw/RaidCards/Documents/Manual_Spec/Over2TB_050721.zip**

5.5.3.1.4 Stripe Size

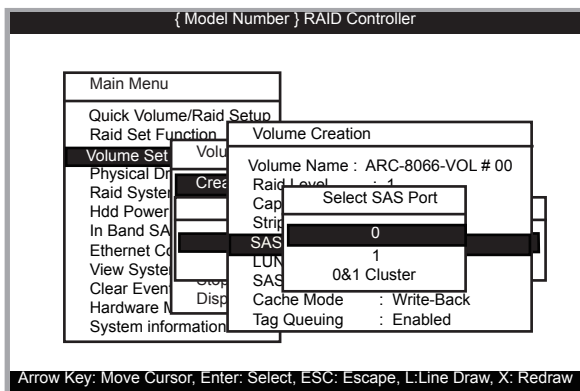
This parameter sets the size of segment written to each disk in a RAID 0, 1, 10(1E), 5, 6, 50 or 60 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.



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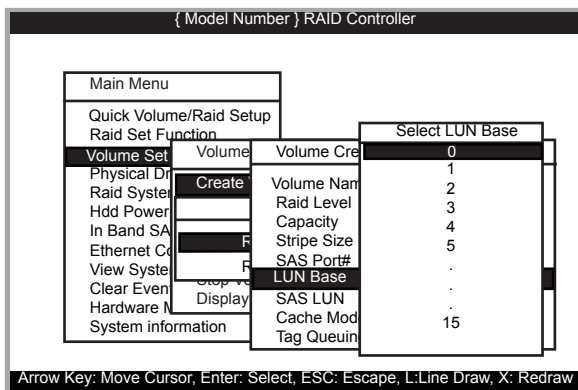
5.5.3.1.5 SAS Port

Two 4-PHY links SAS ports can be applied to the RAID subsystem. Choose the SAS Port# option 0, 1 and 0&1 cluster



5.5.3.1.6 LUN Base

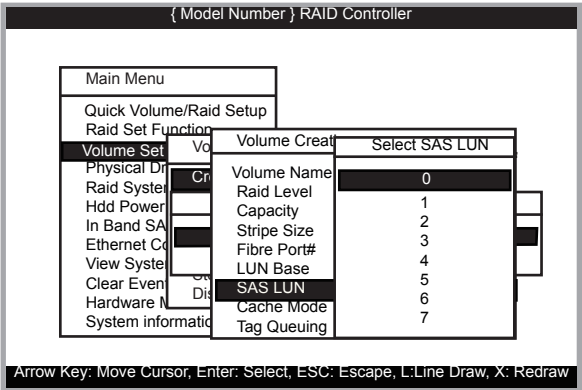
LUN Base: Each SAS device attached to the SAS host adapter must be assigned a unique SAS ID number. A SAS port can connect up to 128 (16*8) volume sets. The RAID subsystem is as a large SAS device. We should assign an LUN base from a list of SAS LUNs.



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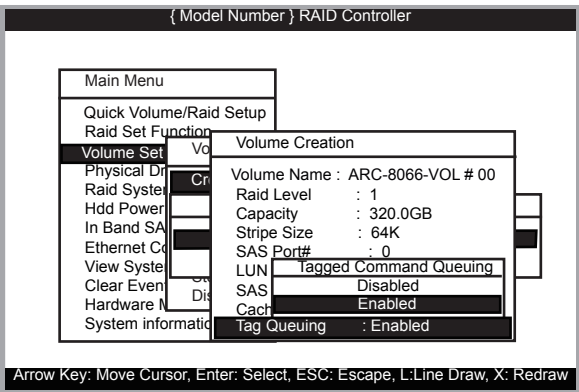
5.5.3.1.7 SAS LUN

SAS LUN: Each LUN Base can support up to 8 SAS LUNs. Most SAS port host adapter treats each SAS LUN like a SAS disk.



5.5.3.1.8 Tag Queuing

This option, when enabled, can enhance overall system performance under multi-tasking operating systems. The Command Tag Queuing (Drive Channel) function controls the SAS command tag queuing support for each drive channel. This function should normally remain enabled. Disabled this function only when using older drives that do not support Command Tag Queuing.

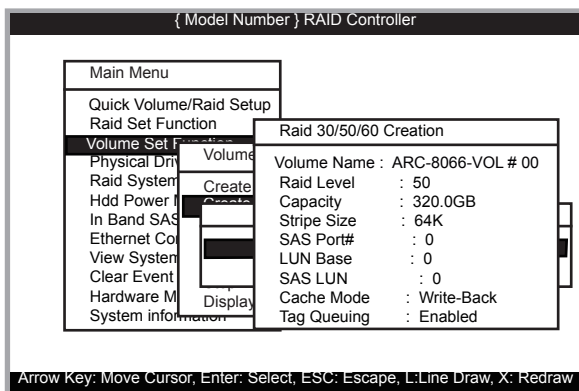


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5.5.3.2 Create Raid30/50/60

To create 30/50/60 volume set from RAID set group, move the cursor bar to the main menu and click on the "Create Raid30/50/60" link. The "Select The Raid Set To Create Volume On It" screen will show all RAID set number. Tick on the RAID set numbers (same disk No per RAID set) that you want to create and then click on it.

The created new volume set attribute option allows users to select the Volume Name, Capacity, Raid Level, Stripe Size, SAS Port#/LUN Base/SAS LUN, Cache Mode, and Tagged Command Queuing. The detailed description of those parameters can refer to section 5.5.3.1. User can modify the default values in this screen; the modification procedures are in section 5.5.3.4



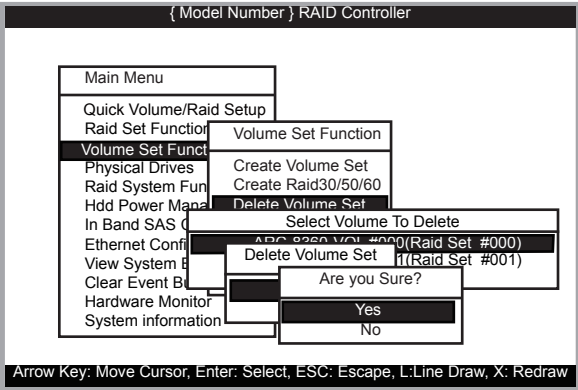
Note:

RAID level 30 50 and 60 can support up to eight RAID set.

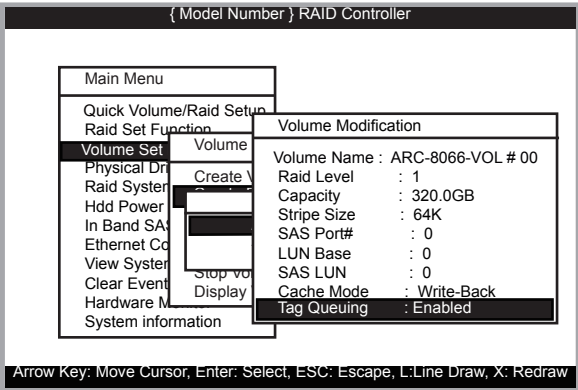
5.5.3.3 Delete Volume Set

To delete volume set from a RAID set, move the cursor bar to the "Volume Set Functions" menu and select the "Delete Volume Set" item, then press the **Enter** key. The "Volume Set Functions" menu will show all Raid Set # items. Move the cursor bar to a RAID set number, then press the **Enter** key to show all volume sets within that RAID set. Move the cursor to the volume set number that is to be deleted and press the **Enter** to delete it.

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5.5.3.4 Modify Volume Set



Use this option to modify volume set configuration. To modify volume set values from RAID set system function, move the cursor bar to the "Modify Volume Set" item, then press the **Enter** key. The "Volume Set Functions" menu will show all RAID set items. Move the cursor bar to a RAID set number item, then press the **Enter** key to show all volume set items. Select the volume set from the list to be changed, press the **Enter** key to modify it.

As shown, volume information can be modified at this screen. Choose this option to display the properties of the selected volume set. But user can only modify the last volume set capacity.

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5.5.3.4.1 Volume Growth

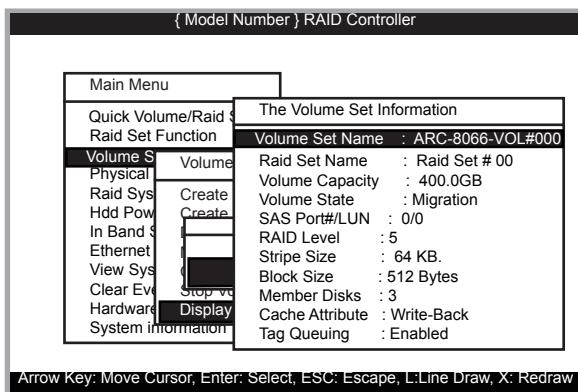
Use "Expand RAID Set" function to add disk to a RAID set. The additional capacity can be used to enlarge the last volume set size or to create another volume set. The "Modify Volume Set" function can support the "Volume Modification" function. To expand the last volume set capacity, move the cursor bar to the "Capacity" item and enter the capacity size. When finished the above action, press the **ESC** key and select the **Yes** option to complete the action. The last volume set starts to expand its capacity.

To expand an existing volume noticed:

- Only the last volume can expand capacity.
- When expanding volume capacity, you can't modify stripe size or modify RAID level simultaneously.
- You can expand volume capacity, but can't shrink volume capacity size.
- After volume expansion, the volume capacity can't be decreased.

For greater 2TB expansion:

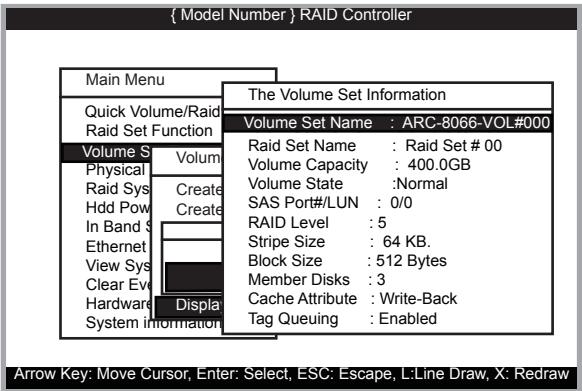
- If your system installed in the volume, don't expand the volume capacity greater 2TB, currently OS can't support boot up from a greater than 2TB capacity device.
- Expand over 2TB used LBA64 mode. Please make sure your OS supports LBA64 before expand it.



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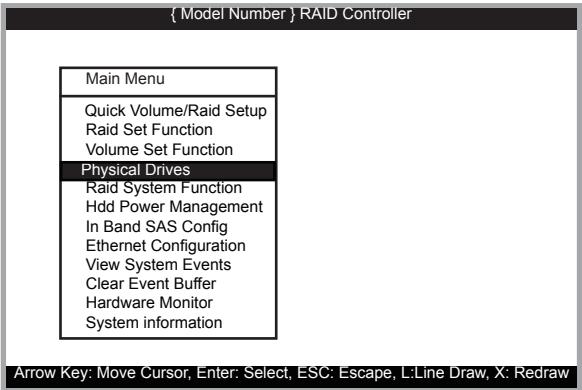
5.5.3.7 Display Volume Set Info.

To display volume set information, move the cursor bar to the desired volume set number and then press the **Enter** key. The "Volume Set Information" screen will be shown. You can only view the information of this volume set in this screen, but can not modify it.



5.5.4 Physical Drives

Choose this option from the main menu to select a physical disk and perform the operations listed above. Move the cursor bar to an item, then press **Enter** key to select the desired function.



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5.5.4.1 View Drive Information

When you choose this option, the physical disks connected to the RAID subsystem are listed. Move the cursor to the desired drive and press **Enter** key to view drive information.

{ Model Number } RAID Controller

E1Solt #1 -SATA

Main	Model Name	: ST3750640NS
Quick	Serial Number	: 5QD1RRT0
Raid	Firmware Rev.	: 3.AEG
Volume	Disk Capacity	: 700.0GB
Physical	Current SATA	: SATA300+NCQ(Depth32)
Raid	Supported SATA	: SATA300+NCQ(Depth32)
Hard	Device State	: Free
In B	Timeout Count	: 0
Eth	Media Errors	: 0
View	Temperature	: 35
Clear	SMART Read Errors Rate	: 100(16)
Hard	SMART Spinup Time	: 101(24)
System	SMART Reallocation Count	: 100(5)
	SMART Seek Errors Rate	: 100(67)
	SMART Spinup Retries	: 100(60)
	SMART Calibration Retries	: N.A. (N. A.)

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw

5.5.4.2 Create Pass-Through Disk

A pass-through disk is not controlled by the RAID subsystem's firmware and thus can not be a part of a volume set. The disk is available directly to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem's firmware. The SAS Port#/LUN Base/SAS LUN, Cache Mode, and Tag Queuing must be specified to create a pass-through disk.

{ Model Number } RAID Controller

Main Menu

Quick Volume/Raid Setup

Raid Set Function

Volume Set Function

Physical Drive Function

Pass-Through Disk Attribute

SAS Port #	: 0
LUN Base	: 0
SAS LUN	: 0
Cache Mod	
Tag Queuin	

Create Pass-Through

Yes

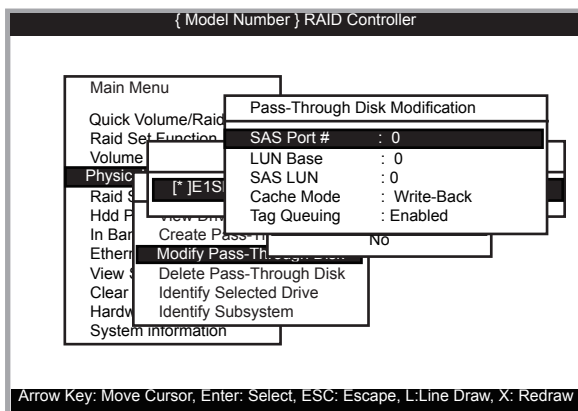
No

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw

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5.5.4.3 Modify Pass-Through Disk

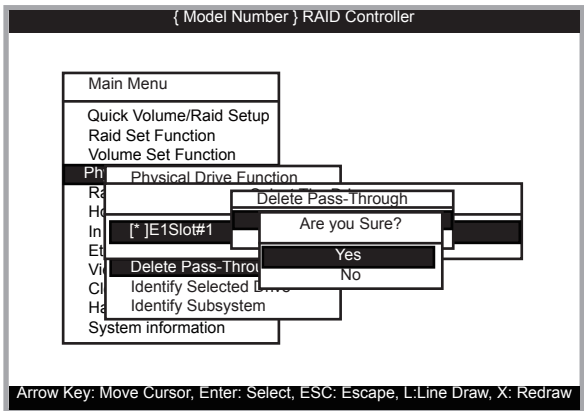
Use this option to modify "Pass-Through Disk Attributes". To select and modify a pass-through disk from the pool of pass-through disks, move the "Modify Pass-Through Drive" option and then press the **Enter** key. The "Physical Drive Function" menu will show all pass-through drive number options. Move the cursor bar to the desired number and then press the **Enter** key to show all pass-through disk attributes. Select the parameter from the list to be changed and then press the **Enter** key to modify it.



5.5.4.4 Delete Pass-Through Disk

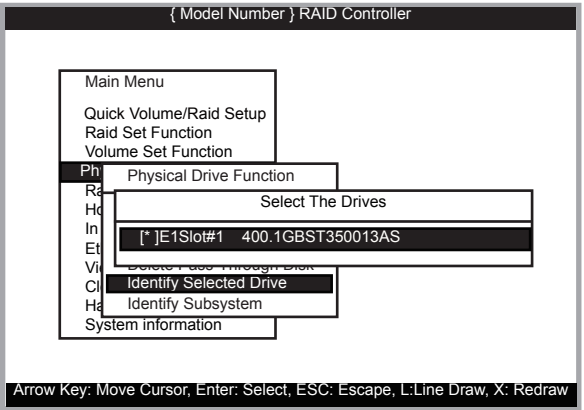
To delete a pass-through drive from the pass-through drive pool, move the cursor bar to the "Delete Pass-Through Drive" item, then press the **Enter** key. The "Delete Pass-Through confirmation" screen will appear; select **Yes** to delete it.

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5.5.4.5 Identify Selected Drive

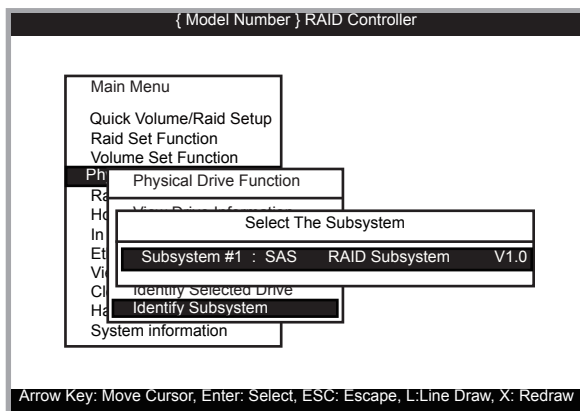
To prevent removing the wrong drive, the selected disk fault LED indicator will light for physically locating the selected disk when the "Identify Selected Device" is selected.



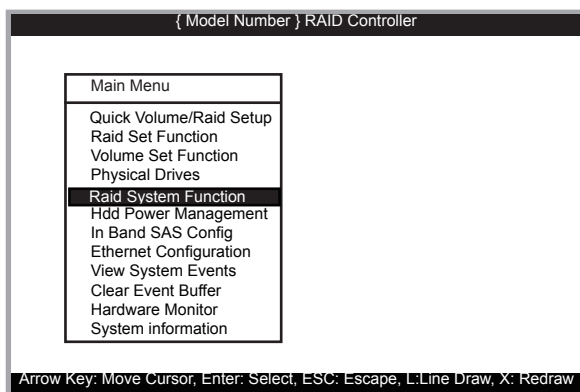
5.5.4.6 Identify Subsystem

To prevent removing the wrong subsystem, the selected Areca expander subsystem all disks fault LED Indicator will light for physically locating the selected subsystem when the "Identify Subsystem" is selected. This function will also light the subsystem LED indicator, if it existed.

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5.5.5 Raid System Function

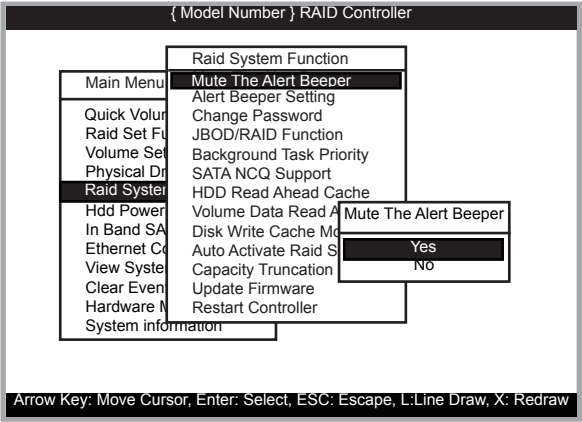


To set the "Raid System Function", move the cursor bar to the main menu and select the "Raid System Function" item and then press **Enter** key. The "Raid System Function" menu will show multiple items. Move the cursor bar to an item, then press **Enter** key to select the desired function.

5.5.5.1 Mute The Alert Beeper

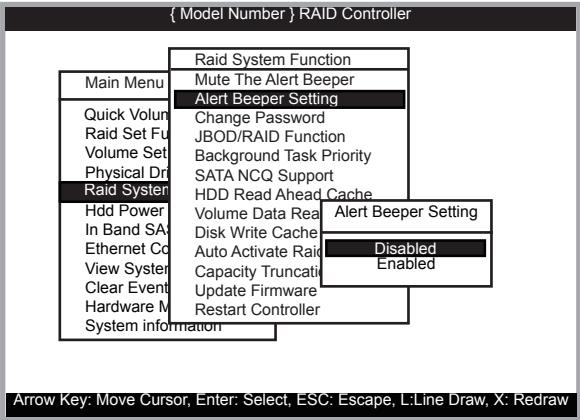
The "Mute The Alert Beeper" function item is used to control the RAID subsystem beeper. Select **Yes** and press the **Enter** key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

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5.5.5.2 Alert Beeper Setting

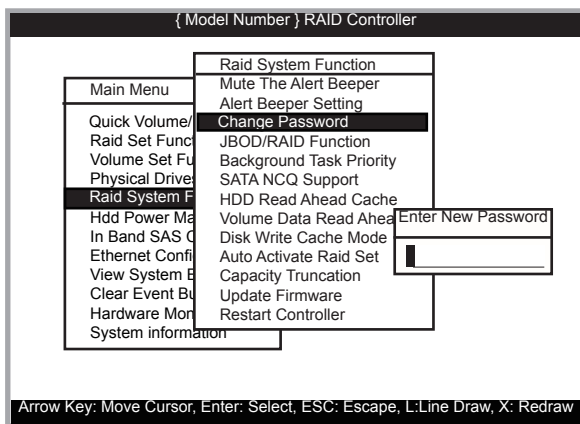
The "Alert Beeper Setting" function item is used to "Disabled" or "Enabled" the RAID subsystem alarm tone generator. Select "Disabled" and press the **Enter** key in the dialog box to turn the beeper off.



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5.5.5.3 Change Password

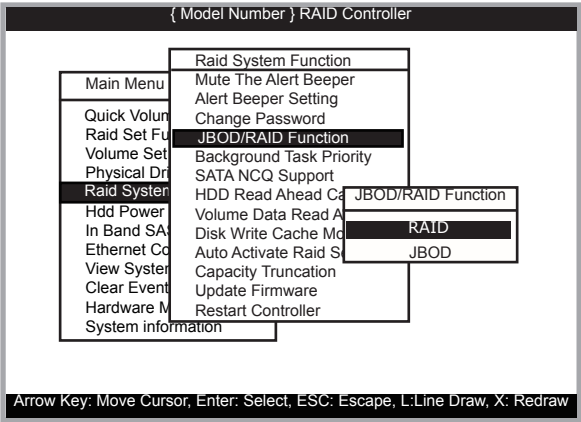
The manufacture default password is set to 0000. The password option allows user to set or clear the password protection feature. Once the password has been set, the user can monitor and configure the controller only by providing the correct password. This feature is used to protect the internal RAID system from unauthorized access. The controller will check the password only when entering the main menu from the initial screen. The system will automatically go back to the initial screen if it does not receive any command in 5 minutes. To set or change the password, move the cursor to "Raid System Function" screen, press the "Change Password" item. The "Enter New Password" screen will appear. Do not use spaces when you enter the password, If spaces are used, it will lock out the user. To disable the password, only press **Enter** key in both the "Enter New Password" and "Re-Enter New Password" column. The existing password will be cleared. No password checking will occur when entering the main menu.



5.5.5.4 JBOD/RAID Function

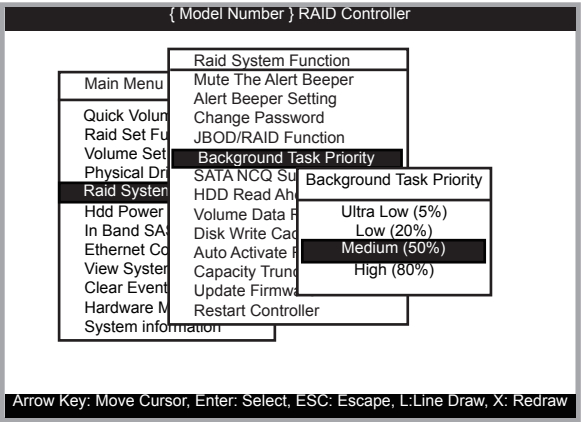
JBOD is an acronym for "Just a Bunch Of Disk". A group of hard disks in a RAID subsystem are not set up as any type of RAID configuration. All drives are available to the operating system as an individual disk. JBOD does not provide data redundancy. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

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5.5.5.5 Background Task Priority

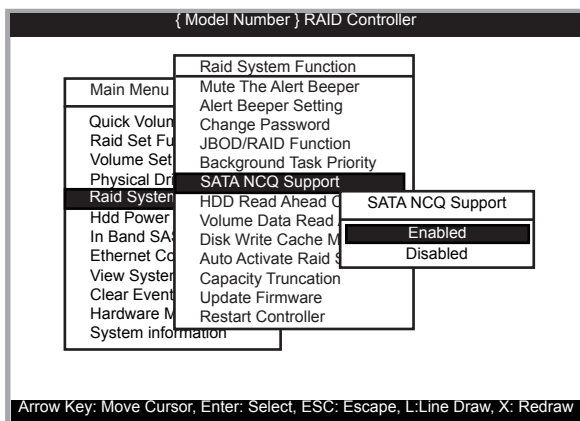
The “Background Task Priority” is a relative indication of how much time the controller devotes to a rebuild operation. The RAID subsystem allows the user to choose the rebuild priority (UltraLow, Low, Normal, High) to balance volume set access and rebuild tasks appropriately.



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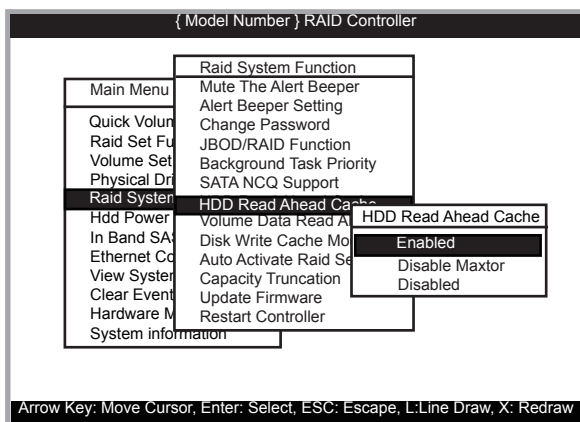
5.5.5.6 SATA NCQ Support

The controller supports both SAS and SATA disk drives. The SATA NCQ allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows the user to select the SATA NCQ support: "Enabled" or "Disabled".



5.5.5.7 HDD Read Ahead Cache

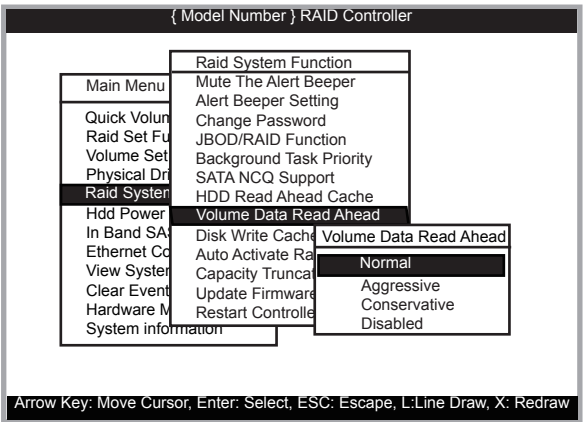
Allow Read Ahead (Default: Enabled)—When "Enabled", the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.



VT-100 UTILITY CONFIGURATION

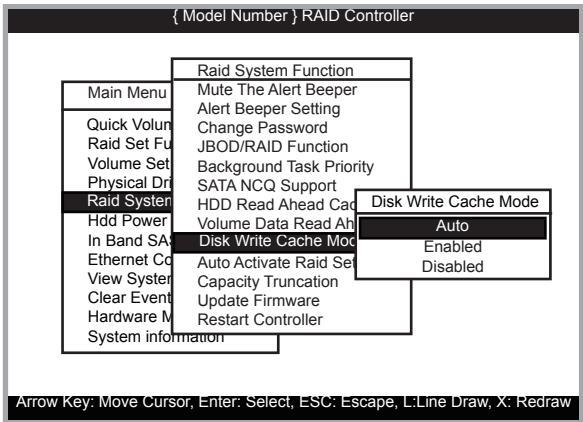
5.5.5.8 Volume Data Read Ahead

The "Data Read Ahead" parameter specifies the controller firmware algorithms which process the read ahead data blocks from the disk. The "Data Read Ahead" parameter is normal by default. To modify the value, you must know the application behavior. The default "Normal" option satisfies the performance requirements for a typical volume. The "Disabled" value implies no read ahead. The most efficient value for the controllers depends on your application. "Aggressive" read ahead is optimal for sequential access but it degrades random access.



5.5.5.9 Disk Write Cache Mode

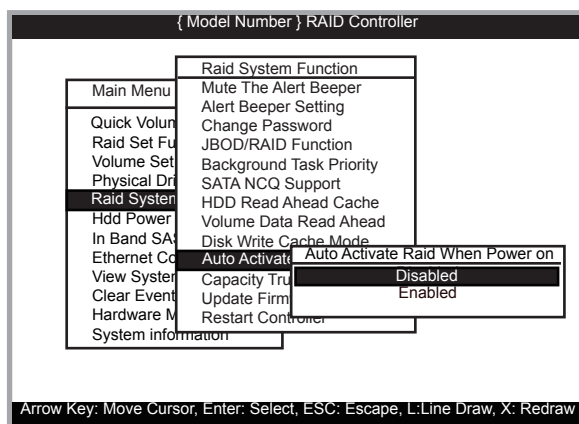
A user can set the "Disk Write Cache Mode": Auto, Enabled, or Disabled.



VT-100 UTILITY CONFIGURATION

5.5.5.10 Auto Activate Raid Set

When some of the disk drives are removed in power off state or boot up stage, the RAID set state will change to "Incomplete State". But if a user wants to automatically continue to work while the RAID subsystem is powered on, then user can set the "Auto Activate Raid Set" option to "Enabled". The RAID state will change to "Degraded Mode" while it powers on.



5.5.5.11 Capacity Truncation

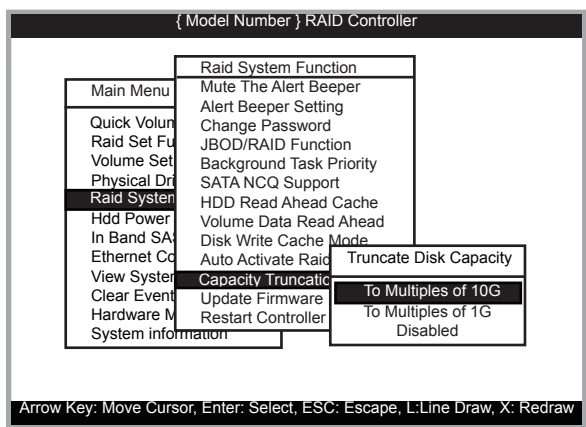
The RAID subsystem uses drive truncation so that drives from different vendors are more likely to be usable as spares for one another. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units. The controller provides three truncation modes in the system configuration: Multiples Of 10G, Multiples Of 1G and Disabled.

Multiples Of 10G: If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. "Multiples Of 10G" truncates the number under tens. This makes the same capacity for both of these drives so that one could replace the other.

VT-100 UTILITY CONFIGURATION

Multiples Of 1G: If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. "Multiples Of 1G" truncates the fractional part. This makes the same capacity for both of these drives so that one could replace the other. Example, one drive might be 123.5 GB, and the other 123.4 GB. "Multiples Of 1G" truncates the fractional part. This makes the same capacity for both of these drives so that one could replace the other.

Disabled: It does not truncate the capacity.



5.5.5.12 Update Firmware

Please refer to the appendix A Upgrading Flash ROM Update Process.

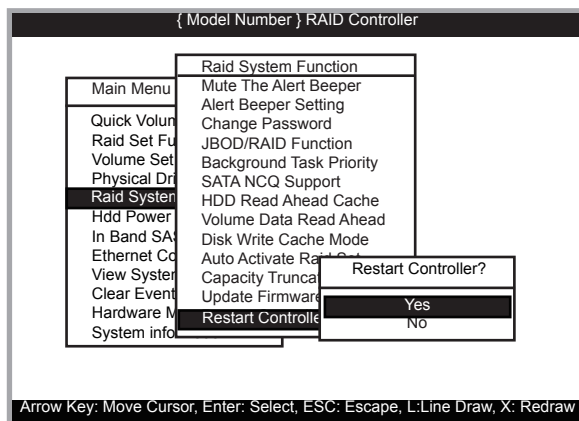
Note:

1. User can only update the firmware through the VT-100 Terminal or web browser-based RAID manager through the controller's LAN port.

VT-100 UTILITY CONFIGURATION

5.5.5.13 Restart Controller

Use the "Restart Controller" function to restart the RAID controller, move the cursor bar to the main menu "Raid System Function" item and then press the **Enter** key. The "Raid system Function" menu appears on the screen. Press **Enter** key to select "Restart Controller" item. The restart controller confirmation screen appears. Select **Yes** key to restart entire RAID controller.



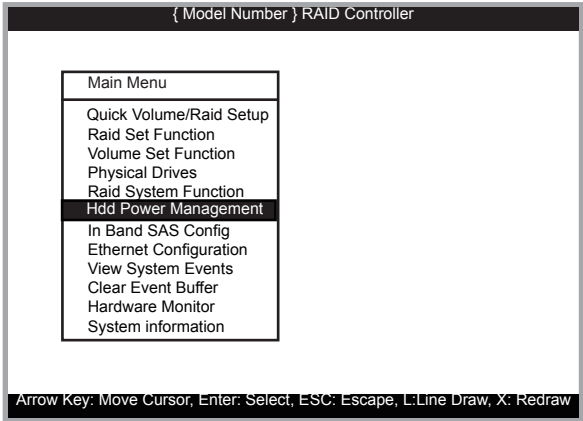
Note:

It can only work properly at Host and Drive without any activity.

5.5.6 Hdd Power Management

Areca has automated the ability to manage HDD power based on usage patterns. The "HDD Power Management" allows you to choose a "Stagger Power On Control", "Low Power Idle", "Low RPM" and completely "Spins Down Idle HDD". It is designed to reduce power consumption and heat generation on idle drives.

VT-100 UTILITY CONFIGURATION

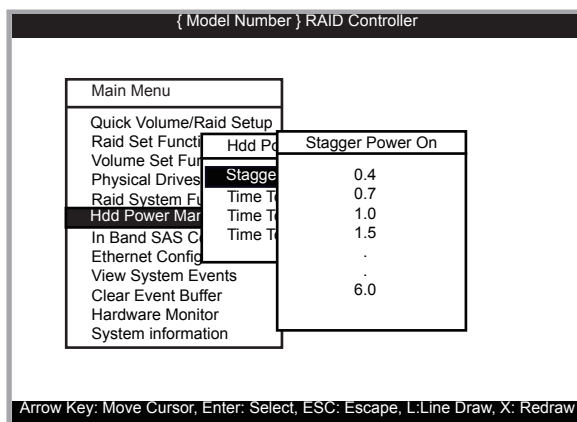


5.5.6.1 Stagger Power On Control

In a RAID subsystems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other subsystem components. This damage can be avoided by allowing the RAID controller to stagger the spin-up of the drives. The SAS/SATA drives have support stagger spin-up capabilities to boost reliability. Stagger spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the RAID controller the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

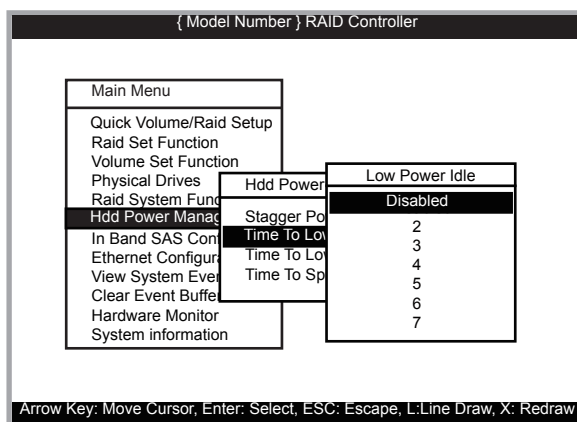
Areca RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected within the range 0.4 to 6 seconds per step which powers up one drive groups.

VT-100 UTILITY CONFIGURATION



5.5.6.2 Time to Hdd Low Power Idle

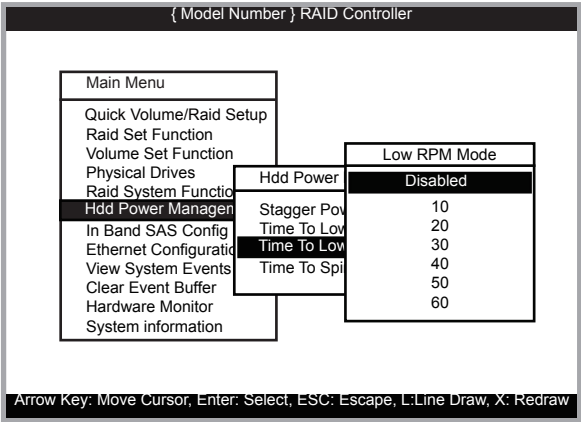
This option delivers lower power consumption by automatically unloading recording heads during the setting idle time. The values can be selected "Disabled" or within the range 2 to 7 minutes.



5.5.6.3 Time To Hdd Low RPM Mode

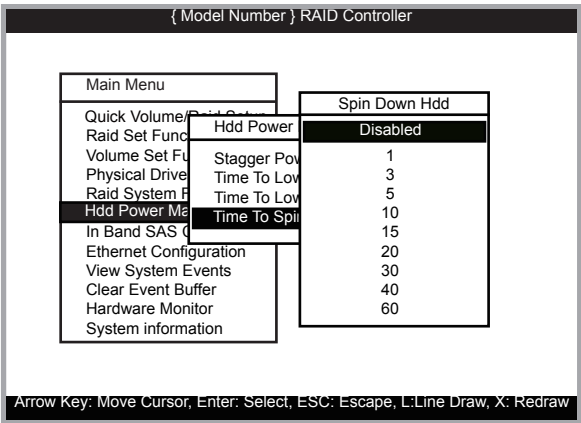
This function can automatically spin disks at lower RPM if there have not been used during the setting idle time. The values can be selected "Disabled" or within the range 10 to 60 minutes.

VT-100 UTILITY CONFIGURATION



5.5.6.4 Time To Spin Down Idle HDD

This function can automatically spin down the drive if it hasn't been accessed for a certain amount of time. This value is used by the drive to determine how long to wait (with no disk activity, before turning off the spindle motor to save power). The values can be selected "Disabled" or within the range 1 to 60 minutes.

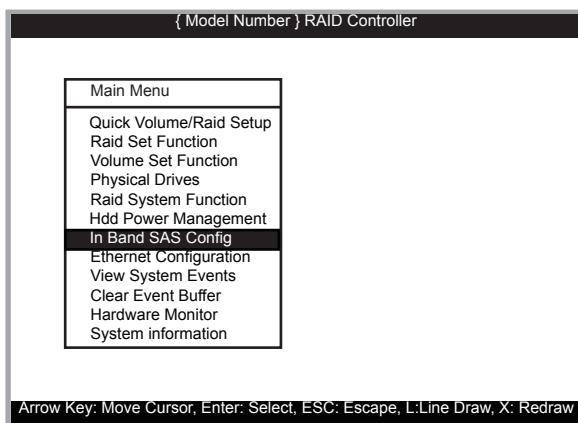


VT-100 UTILITY CONFIGURATION

5.5.7 In Band SAS Config

The RAID manager supports both in-band and out-of-band management to control the disk array subsystem. In-band management refers to management of the SAS disk array from a SAS host management transactions traverse the SAS bus. Out-of-band management refers to management of the disk array from a remote station connected to the controller either via a RS-232 or through a LAN port. In-band management is simpler than out-of-band management for it requires less hardware in its configuration.

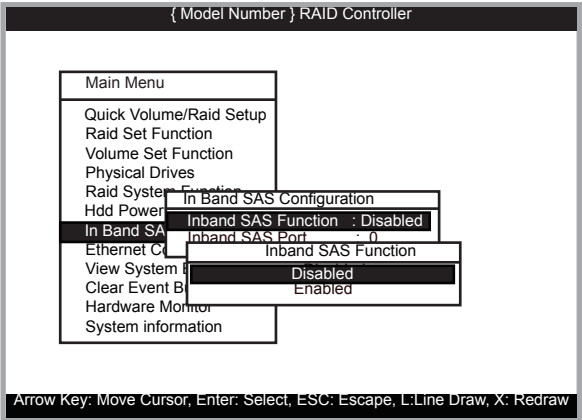
Since the host adapter is already installed in the host system, no extra connection is necessary. Just load the necessary in-band driver for the controller and then combine the API with user's RAID manager from the local host to start management of the disk array system.



5.5.7.1 InBand SAS Function

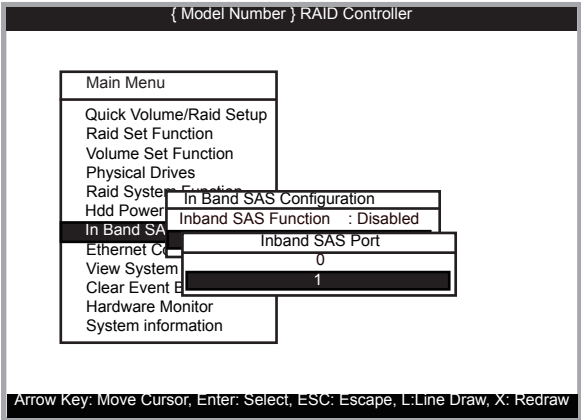
The RAID subsystem reserves one LUN for In-band management transactions. This option is for user to release the LUN when In-band management is not enabled.

VT-100 UTILITY CONFIGURATION



5.5.7.2 InBand SAS Port

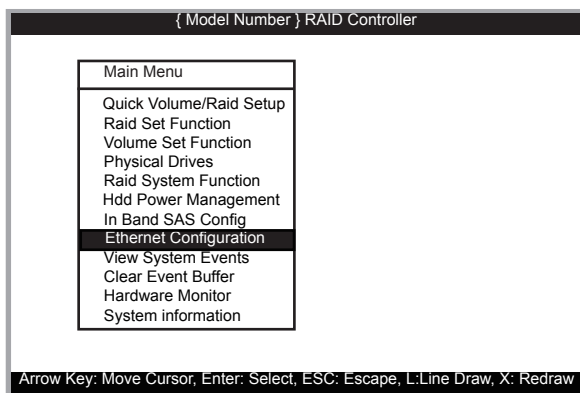
Since the SAS RAID controller supports two SAS host ports, the In-band can through either SAS port 0 or port 1.



VT-100 UTILITY CONFIGURATION

5.5.8 Ethernet Configuration

Use this feature to set the controller Ethernet port configuration. It is not necessary to create reserved disk space on any hard disk for the Ethernet port and HTTP service to function; these functions are built into the controller firmware. move the cursor bar to the main menu "Ethernet Configuration Function" item and then press the **Enter** key. The "Ethernet Configuration" menu appears on the screen. Move the cursor bar to an item, then press **Enter** key to select the desired function.

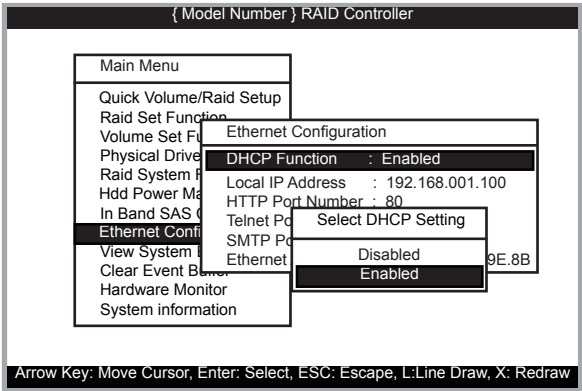


5.5.8.1 DHCP Function

DHCP (Dynamic Host Configuration Protocol) allows network administrators centrally manage and automate the assignment of IP (Internet Protocol) addresses on a computer network. When using the TCP/IP protocol (Internet protocol), it is necessary for a computer to have a unique IP address in order to communicate to other computer systems. Without DHCP, the IP address must be entered manually at each computer system. DHCP lets a network administrator supervise and distribute IP addresses from a central point. The purpose of DHCP is to provide the automatic (dynamic) allocation of IP client configurations for a specific time period (called a lease period) and to minimize the work necessary to administer a large IP network. To manually configure the IP address of the controller, move the cursor bar to DHCP Function item, then press **Enter** key to show the DHCP setting. Select the "Disabled"

VT-100 UTILITY CONFIGURATION

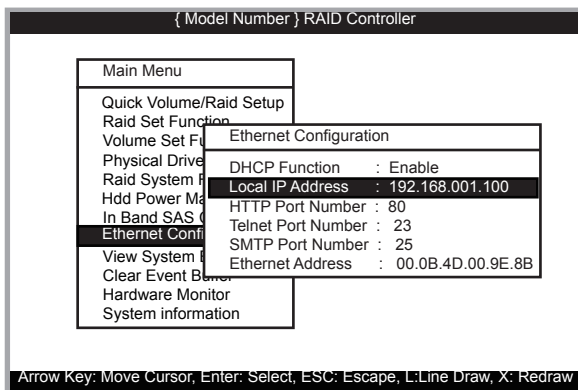
or “Enabled” option to enable or disable the DHCP function. If DHCP is disabled, it will be necessary to manually enter a static IP address that does not conflict with other devices on the network.



5.5.8.2 Local IP Address

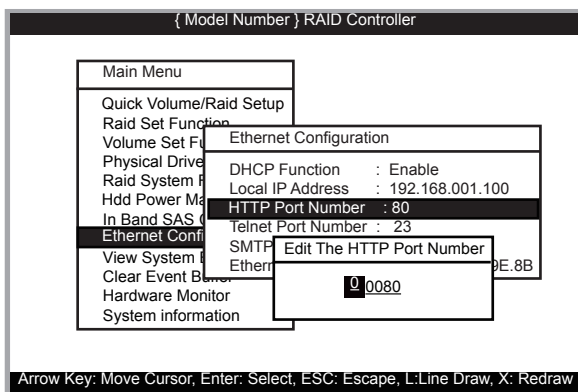
If you intend to set up your client computers manually (no DHCP), make sure that the assigned IP address is in the same range as the default router address and that it is unique to your private network. However, it is highly recommend to use DHCP if that option is available on your network. An IP address allocation scheme will reduce the time it takes to set-up client computers and eliminate the possibilities of administrative errors and duplicate addresses. To manually configure the IP address of the controller, move the cursor bar to Local IP address item, then press the **Enter** key to show the default address setting in the RAID subsystem. You can then reassign the static IP address of the controller.

VT-100 UTILITY CONFIGURATION



5.5.8.3 HTTP Port Number

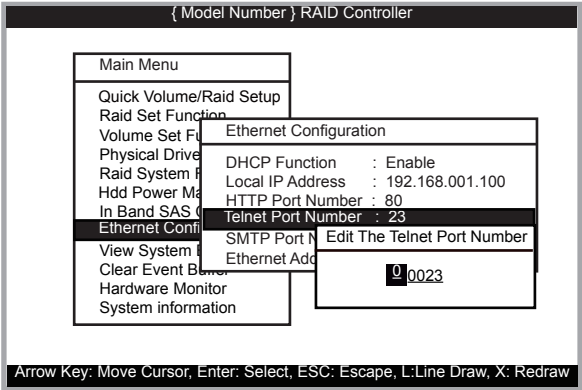
To manually configure the "HTTP Port Number" of the controller, move the cursor bar to "HTTP Port Number" item, then press the **Enter** key to show the default address setting in the RAID subsystem. Then You can reassign the default "HTTP Port Number" of the controller.



VT-100 UTILITY CONFIGURATION

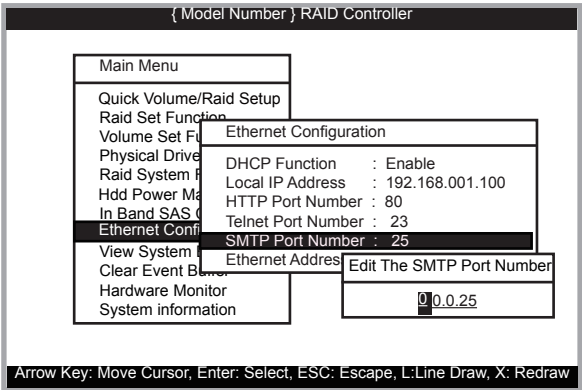
5.5.8.4 Telnet Port Number

To manually configure the “Telnet Port Number” of the controller, move the cursor bar to “Telnet Port Number” item, then press the **Enter** key to show the default address setting in the RAID subsystem. You can then reassign the default “Telnet Port Number” of the controller.



5.5.8.5 SMTP Port Number

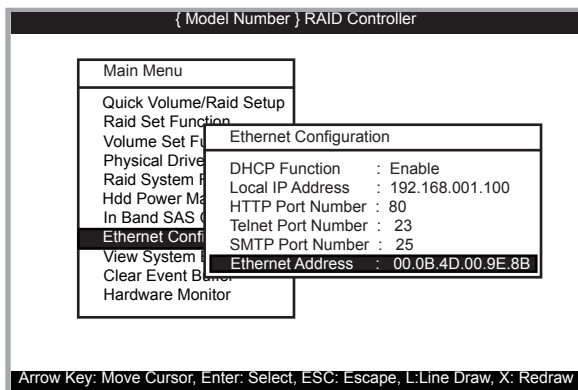
To manually configure the “SMTP Port Number” of the controller, move the cursor bar to the main menu “Ethernet Configuration” function item and then press **Enter** key. The “Ethernet Configuration” menu appears on the screen. Move the cursor bar to “SMTP Port Number” item, then press **Enter** key to show the default address setting in the RAID subsystem. You can then reassign the default “SMTP Port Number” of the controller.



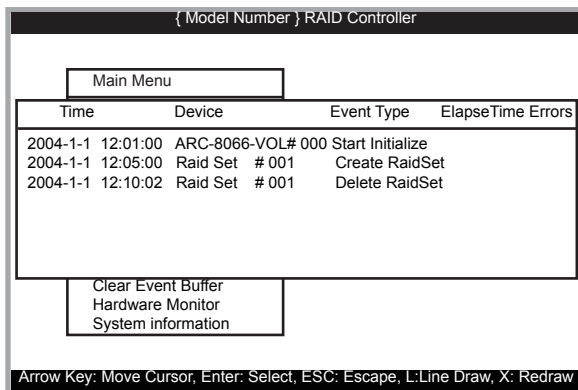
VT-100 UTILITY CONFIGURATION

5.5.8.6 Ethernet Address

Each Ethernet port has its unique Mac address, which is also factory assigned. Usually, Ethernet address is used to uniquely identify a port in the Ethernet network.



5.5.9 View System Events



To view the RAID subsystem's system events information, move the cursor bar to the main menu and select the "View System Events" link, then press the **Enter** key. The RAID subsystem's events screen appear.

Choose this option to view the system events information: Timer, Device, Event type, Elapsed Time, and Errors. The RAID system does not have a build-in real time clock. The time information is the relative time from the RAID subsystem powered on.

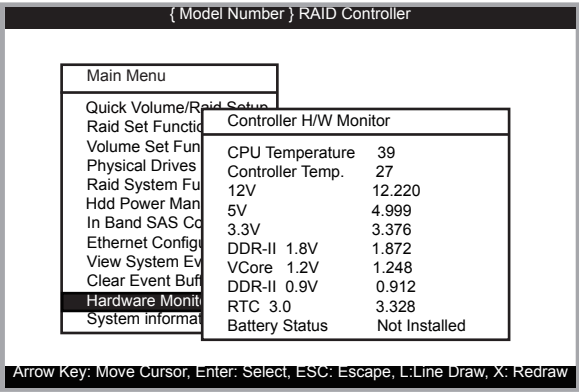
VT-100 UTILITY CONFIGURATION

5.5.10 Clear Events Buffer

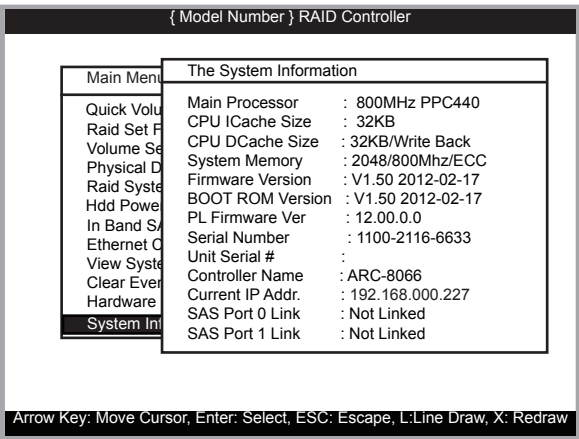
Use this feature to clear the entire events buffer.

5.5.11 Hardware Monitor Information

To view the RAID subsystem’s hardware monitor information, move the cursor bar to the main menu and click the “Hardware Monitor” link. The “Controller H/W Monitor” screen appears. The “Controller H/W Monitor” provides the CPU temperature, controller temperature, voltage and battery status of the RAID subsystem.



5.5.12 System Information



VT-100 UTILITY CONFIGURATION

Choose this option to display the controller's hardware firmware information. The controller provides two four-link SFF-8088 connector for the host and one four-link connector SFF-8088 for JBOD. It may have problem between the host/JBOD and controller. The "Host Port# Link" provides current working port link status. The option for port link is defined below.

Not Linked → Fail or no link to host/JBOD

1x600MB/Sec → Single-link for use

2x600MB/sec → Two-link for use

4x600MB/Sec → Four-link for use

6. Web Browser-based Configuration

The RAID subsystem web browser-based configuration utility is firm-ware-based and uses to configure RAID sets and volume sets. Use this utility to:

- Create RAID set,
- Expand RAID set,
- Define volume set,
- Add physical drive,
- Modify volume set,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Modify system function,
- Update firmware and,
- Designate drives as hot spares.

If you need to boot the operating system from a RAID subsystem, you must first create a RAID volume by using LCD panel, RS232 or LAN port.

6.1 Firmware-embedded TCP/IP & web browser-based RAID manager (using the controller's 10/100/1000 LAN port)

To ensure proper communications between the RAID subsystem and web browser-based RAID management, Please connect the RAID system LAN port to any LAN switch port.

The RAID subsystem has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the RAID subsystem without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100/1000 RJ45 LAN port.

To configure RAID subsystem on a local or remote machine, you need to know its IP Address. The IP address will default show in the LCD screen. Launch your firmware-embedded TCP/IP & Web Browser-based RAID manager by entering `http://[IP Address]` in the web browser.

WEB BROWSER-BASED CONFIGURATION

You must be logged in as administrator with local admin rights on the remote machine to remotely configure it. The RAID subsystem default User Name is “admin” and the Password is “0000”.

6.2 Web Browser Start-up Screen

The web browser start-up screen will display the current configuration of your RAID subsystem. It displays the Raid Set List, Volume Set List and Physical Disk List. The RAID set information, volume set information and drive information can also be viewed by clicking on the “RaidSet Hierarchy” screen. The current configuration can also be viewed by clicking on “RaidSet Hierarchy” in the menu.

RAID Set	Devices	Volume Set(Port/Lun)	Volume State	Capacity
Enclosure#1: SAS RAID Subsystem V1.0				
Device	Usage	Capacity	Model	
Slot#1(0:0)	Free	400.1GB	Hitachi HD725040VLA360	
Slot#2(0:0)	Free	400.1GB	ST3400832AS	
Slot#3(0:0)	Free	80.0GB	ST380013AS	
Slot#4(0:0)	Free	80.0GB	ST380013AS	
Slot#5(0:0)	Free	250.1GB	ST3250620NS	
Slot#6(0:0)	Free	500.1GB	HDS725050HLA360	
Slot#7	N.A.	N.A.	N.A.	
Slot#8	N.A.	N.A.	N.A.	
Slot#9(0:0)	Free	500.1GB	WDC WD5000YS-01MPB0	
Slot#10(0:1)	Free	80.0GB	ST380013AS	
Slot#11(0:0)	Free	80.0GB	ST380013AS	
Slot#12	N.A.	N.A.	N.A.	
Slot#13	N.A.	N.A.	N.A.	
Slot#14(0:7)	Free	500.1GB	WDC WD5000YS-01MPB0	
Slot#15(0:5)	Free	500.1GB	ST3500630NS	
Slot#16(0:6)	Free	500.1GB	ST3500630NS	

To display RAID set information, move the mouse cursor to the desired RAID set number, then click it. The RAID set information will show in the screen.

To display volume set information, move the mouse cursor to the desired volume set number, then click it. The volume set information will show in the screen.

To display drive information, move the mouse cursor to the desired physical drive number, then click it. The drive information will show in the screen.

WEB BROWSER-BASED CONFIGURATION

6.3 Main Menu

The main menu shows all available functions, accessible by clicking on the appropriate link.

Individual Category	Description
Quick Function	Create a default configuration, which is based on the number of physical disks installed; it can modify the volume set Capacity, Raid Level, and Stripe Size.
Raid Set Functions	Create a customized RAID set.
Volume Set Functions	Create customized volume sets and modify the existed volume sets parameter.
Physical Drives	Create pass through disks and modify the existing pass through drives parameters. Also provides the function to identify disk drives (blinking fault LED).
System Controls	Setting the RAID system configuration.
Information	Viewing the controller information. The Raid Set Hierarchy can be viewed through the "Raid Set Hierarchy" item.

6.4 Quick Function

Areca Technology Corporation

open all | close all

- Raid System Console
- Quick Function
- RAID Set Functions
- Volume Set Functions
- Physical Drives
- System Controls
- Information

Quick Create Raid/Volume Set

Total Number Of Disks: 12

Select Raid Level: Raid 5 + Spare

Maximum Capacity Allowed: 800 GB

Select Capacity: 800 GB

Volume Initialization Mode: Foreground Initialization

Select Stripe Size: 64 KBytes

☐ Confirm The Operation

Submit Reset

The number of physical drives in the RAID subsystem determines the RAID levels that can be implemented with the RAID set. You can create a RAID set associated with exactly one volume set. The user can change the Raid Level, Capacity, Initialization Mode and Stripe Size. A hot spare option is also created, depending on the exist configuration. Click the "Confirm The Operation" check box and click on the "Submit" button in the "Quick Create" screen, the RAID set and volume set will start to initialize.

Note:

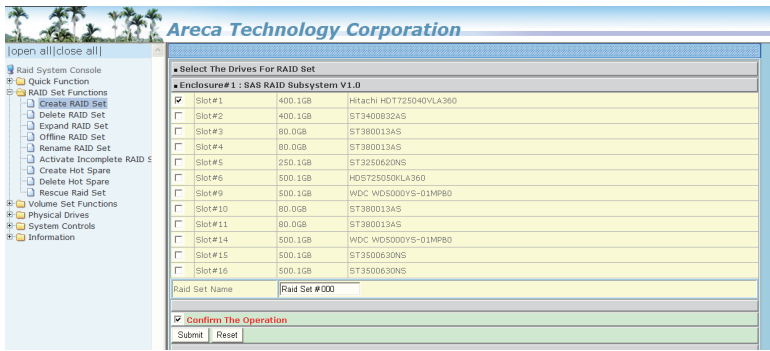
In “Quick Create”, your volume set is automatically configured based on the number of disks in your system. Use the “Raid Set Functions” and “Volume Set Functions” if you prefer to customize your volume set, or RAID 30/50/60 volume set.

6.5 Raid Set Functions

Use the “Raid Set Function” and “Volume Set Function” if you prefer to customize your volume set. Manual configuration can provide full control of the RAID set settings, but it will take longer to complete than the “Quick Volume/Raid Setup” configuration. Select the “Raid Set Function” to manually configure the RAID set for the first time or delete and reconfigure existing RAID sets. (A RAID set is a group of disks containing one or more volume sets.)

6.5.1 Create a New Raid Set

To create a RAID set, click on the “Create Raid Set” link. A “Select The Drive For RAID Set” screen is displayed showing the drive(s) connected to the current controller and subsystems. Click on the selected physical drives within the current RAID set. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as “Raid Set #”. Click the “Confirm The Operation” check box and click on the “Submit” button on the screen; the RAID set will start to initialize. If you have available disk member, you can repeat above procedures to define another RAID sets.

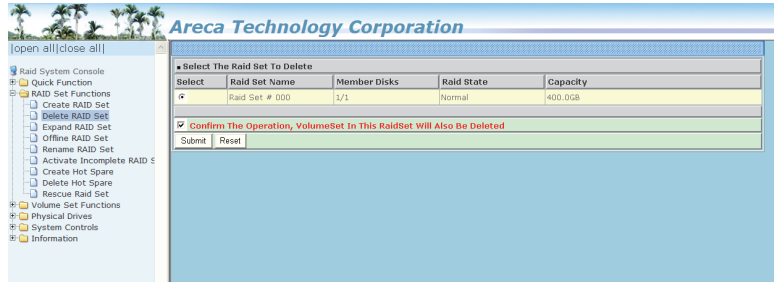


Note:

To create RAID 30/50/60 volume, you need create multiple RAID sets first with the same disk members on each RAID set. The max no. disk drives per volume set:
32 for RAID 0/1/10(1E)/3/5/6 and 128 for RAID 30/50/60.

6.5.2 Delete Raid Set

To delete a RAID set, click on the "Deleted Raid Set" link. A "Select The RAID Set To Delete" screen is displayed showing all exist RAID sets in the current controller. Click the RAID set number which you want to delete in the select column on the delete screen. Then, click the "Confirm The Operation" check box and click on the "Submit" button in the screen to delete it. The volume sets included in the "Delete RAID Set" will be deleted by this action. But for the Raid 30/50/60, you need to delete the volumes belonging to those RAID sets.



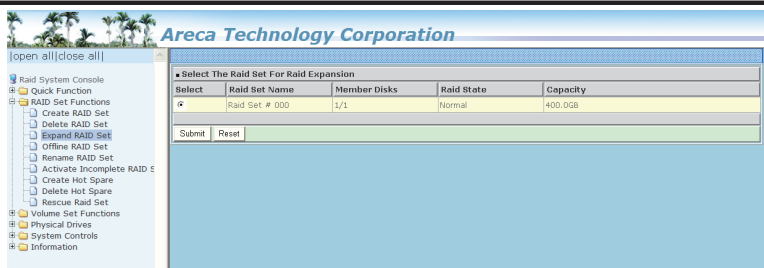
6.5.3 Expand Raid Set

Instead of deleting a RAID set and recreating it with additional disk drives, the "Expand Raid Set" function allows the users to add disk drives to the RAID set that have already been created. To expand a RAID set:

Select the "Expand Raid Set" option. If there is an available disk, then the "Select SATA Drives For Raid Set Expansion" screen appears.

Select the target RAID set by clicking on the appropriate radio button. Select the target disk by clicking on the appropriate check box.

WEB BROWSER-BASED CONFIGURATION



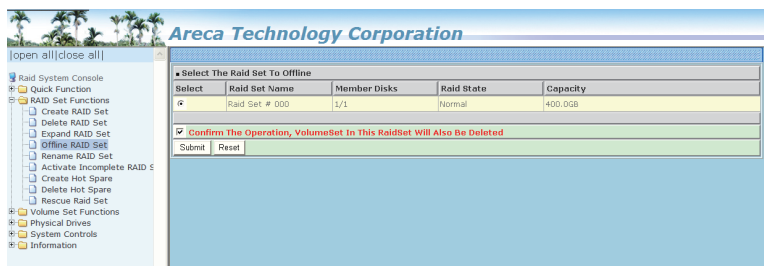
Click the "Submit" button to start the expansion on the RAID set. The new additional capacity can be utilized by one or more volume sets. The volume sets associated with this RAID set appear for you to have chance to modify RAID level or stripe size. Follow the instruction presented in the "Modify Volume Set" to modify the volume sets; operation system specific utilities may be required to expand operating system partitions.

Note:

1. Once the "Expand Raid Set" process has started, user can not stop it. The process must be completed.
2. If a disk drive fails during RAID set expansion and a hot spare is available, an auto rebuild operation will occur after the RAID set expansion completes.
3. RAID 30/50/60 does not support the "Expand Raid set".

6.5.4 Offline Raid Set

This function is for customer being able to unmount and remount a multi-disk volume. All Hdds of the selected RAID set will be put into offline state, spun down and fault LED in fast blinking mode. User can remove those Hdds and insert new Hdds on those empty slots without needing power down the controller.



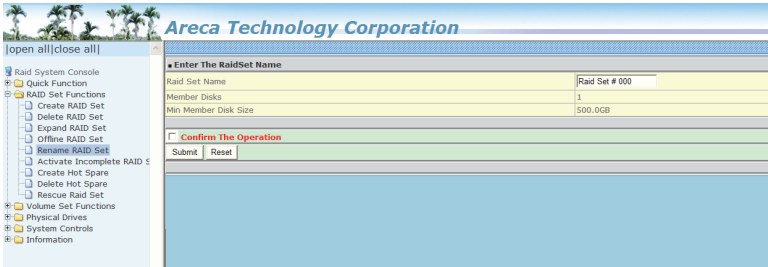
WEB BROWSER-BASED CONFIGURATION

6.5.5 Rename Raid Set

The default RAID set name will always appear as "Raid Set #" when it is firstly created by the controller. The "Rename Raid Set" function is for customer to rename the default RAID set name.

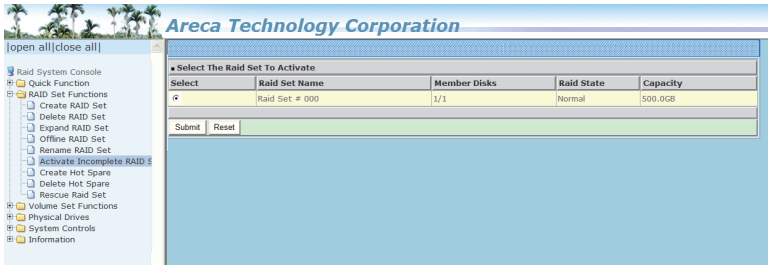
To rename a RAID set from a group of RAID sets:

- (1). Click on the "Rename Raid Set" link.
- (2). Click the RAID set check box from the list that you wish to rename. Click the "Submit" button. The following screen appears. Use this option to rename the RAID set name.



6.5.6 Activate Incomplete Raid Set

If one of the disk drives is removed in power off state, the RAID set state will change to "Incomplete State". If the user wants to continue to operate the controller without power-off the RAID subsystem, the user can use the "Activate Incomplete Raid Set" option to active the RAID set. After the user completes this function, the Raid State will change to "Degraded Mode" and start to work.



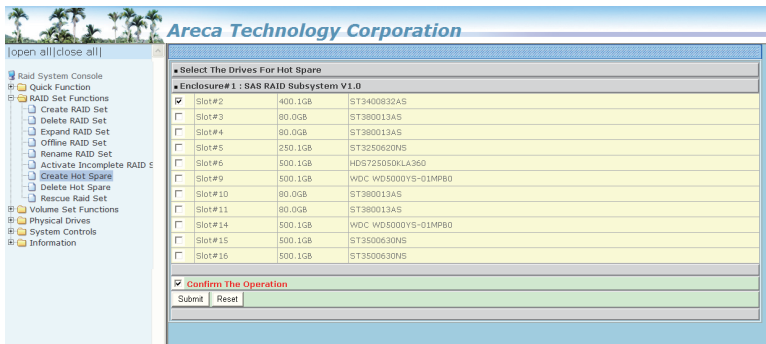
To activate the incomplete the RAID set, click on the "Activate Raid Set" link. A "Select The RAID Set To Activate" screen is displayed showing all RAID sets existing on the current controller. Click the RAID set number to activate in the select column.

WEB BROWSER-BASED CONFIGURATION

Click on the "Submit" button on the screen to activate the RAID set that had a disk removed (or failed) in the power off state. The RAID subsystem will continue to work in degraded mode.

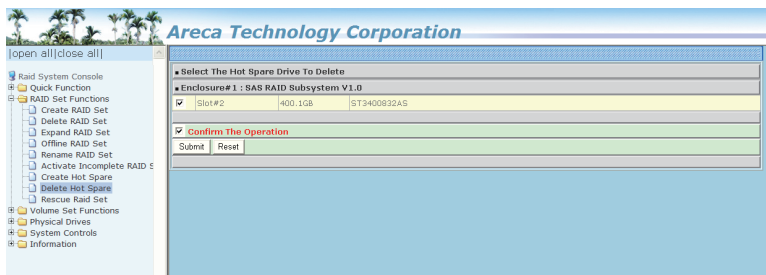
6.5.7 Create Hot Spare

When you choose the "Create Hot Spare" option in the "Raid Set Function", all unused physical devices connected to the current controller appear. Select the target disk by clicking on the appropriate check box. Click the "Confirm The Operation" check box and click the "Submit" button in the screen to create the hot spares. The "Create Hot Spare" option gives you the ability to define a global hot spare.



6.5.8 Delete Hot Spare

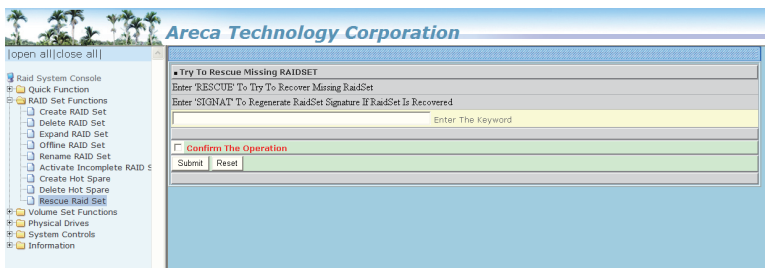
Select the target hot spare disk to delete by clicking on the appropriate check box. Click the "Confirm The Operation" check box and click the "Submit" button on the screen to delete the hot spares.



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6.5.9 Rescue Raid Set

When the system is powered off in the RAID set update/creation period, the configuration possibly could disappear due to this abnormal condition. The "RESCUE" function can recover the missing RAID set information. The RAID subsystem uses the time as the RAID set signature. The RAID set may have different time after the RAID set is recovered. The "SIGANT" function can regenerate the signature for the RAID set. Please contact with manufacture's technical support before you use this configuration.



6.6 Volume Set Functions

A volume set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a volume set. A volume set capacity can consume all or a portion of the disk capacity available in a RAID set. Multiple volume sets can exist on a group of disks in a RAID set. Additional volume sets created in a specified RAID set will reside on all the physical disks in the RAID set. Thus each volume set on the RAID set will have its data spread evenly across all the disks in the RAID set.

The following is the volume set features for the RAID subsystem.

1. Volume sets of different RAID levels may coexist on the same RAID set.
2. Up to 128 volume sets can be created in a RAID set.
3. The maximum addressable size of a single volume set is not limited to 2TB, because the controller is capable of 64-bit LBA mode. However the operating system itself may not be capable of addressing more than 2TB.

See Areca website ftp://ftp.areca.com.tw/RaidCards/Documents/Manual_Spec/Over2TB_050721.ZIP file for details.

6.6.1 Create Volume Set (0/1/10/3/5/6)

To create volume set from RAID set system, move the cursor bar to the main menu and click on the "Create Volume Set" link. The "Select The Raid Set To Create On It" screen will show all RAID set number. Tick on a RAID set number that you want to create and then click on the "Submit" button.

The new create volume set attribute allows user to select the Volume Name, RAID Level, Capacity, Greater Two TB Volume Support, Initialization Mode, Strip Size, Cache Mode, Tagged Command Queuing, SAS Port/LUN Base/LUN and Volumes To Be Created.

The screenshot shows the "Areca Technology Corporation" web interface. On the left is a navigation menu with options like "Raid System Console", "Quick Function", "RAID Set Functions", "Volume Set Functions", "Physical Drives", "System Controls", and "Information". The "Create Volume Set" option is selected. The main area is titled "Enter The Volume Attribute" and contains a form with the following fields:

Enter The Volume Attribute	
Volume Name	ARC-8066-VOL000
Member Disks	5
Volume Raid Level	Raid 5
Max Capacity Allowed	2000 GB
Select Volume Capacity	2000 GB
Greater Two TB Volume Support	No
Volume Initialization Mode	Foreground Initialization
Volume Stripe Size	64 Kbytes
Volume Cache Mode	Write Back
Tagged Command Queuing	Enabled
SAS Port: LUN Base: LUN	0 : 0 : 0
Volumes To Be Created	1

At the bottom of the form, there is a "Confirm The Operation" checkbox and two buttons: "Submit" and "Reset".

• Volume Name

The default volume name will always appear as "ARC-8066-VOL#". You can rename the volume set providing it does not exceed the 15 characters limit.

• Volume Raid Level

Set the RAID level for the volume set. Highlight the desired RAID Level.

The available RAID levels for the current volume set are displayed. Select a RAID level for the current volume set .

• Capacity

The maximum volume size is the default initial setting. Enter the appropriate volume size to fit your application.

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• Greater Two TB Volume Support

If volume capacity will exceed Two TB, controller will show the "Greater Two TB Volume Support" sub-menu. Greater Two TB Volume Support option: No and Yes.

For more details please download PDF file from **ftp://ftp.areca.com.tw/RaidCards/Documents/Manual_Spec/Over2TB_050721.zip**

• Initialization Mode

This parameter is used to define "Background Initialization", "Foreground Initialization" or "No Init (To Rescue Volume)". When "Background Initialization", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. When "Foreground Initialization", the initialization proceeds must be completed before the volume set ready for system accesses. There is no initialization happened when you select "No Init" option. "No Init" is for customer to rescue volume without losing data in the disk.

• Stripe Size

This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 10(1E), 5, 6, 50 or 60 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random reads more often, select a smaller stripe size.

Note:

RAID level 3 can't modify the cache stripe size.

• Cache Mode

The RAID subsystem supports "Write-Through" and "Write-Back" cache.

• Tagged Command Queuing

The "Enabled" option is useful for enhancing overall system performance under multi-tasking operating systems. The Tag Command Queuing (Drive Channel) function controls the SAS

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command tag queuing support for each drive channel. This function should normally remain "Enabled". "Disabled" this function only when using SAS drives that do not support Tag Command Queuing.

● **SAS Port/LUN Base/LUN**

SAS Port: Two 4-PHY links SAS ports can be applied to the RAID subsystem. The RAID subsystem supports Port 0,1 and 0&1 cluster option.

LUN Base: Each SAS device attached to the SAS host adapter must be assigned a unique SAS ID number. A SAS port can connect up to 128 (16*8) volume sets. The RAID subsystem is as a large SAS device. We should assign a LUN base from a list of SAS LUNs.

LUN: Each LUN Base can support up to 8 SAS LUNs. Most SAS port host adapter treats each SAS LUN like a SAS disk.

● **Volume To Be Created**

The RAID subsystem can support up to 128 volume sets. This option is defined volume number using the same volume set attribute here.

6.6.2 Create Raid30/50/60 (Volume Set 30/50/60)

To create 30/50/60 volume set from RAID set group, move the cursor bar to the main menu and click on the "Create Raid30/50/60" link. The "Select The Raid Set To Create Volume On It" screen will show all RAID set number. Tick on the RAID set numbers (same disk No per RAID set) that you want to create and then click on the "Submit" button.

The new create volume set attribute allows user to select the Volume Name, RAID Level, Capacity, Greater Two TB Volume Support, Initialization Mode, Stripe Size, Cache Mode, Tagged Command Queuing, SAS Port/LUN Base/LUN and Volumes To Be Created. Please refer to above section for details description of each item.

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open all | close all |

- Raid System Console
- Quick Function
- RAID Set Functions
- Volume Set Functions
 - Create Volume Set
 - Create Raid30/50/60
 - Delete Volume Set
 - Modify Volume Set
 - Check Volume Set
 - Schedule Volume Check
 - Stop Volume Check
- Physical Drives
- System Controls
- Information

Enter The Volume Attribute

Volume Name	ARC-6360-VOL#000
Member Disks	2x3
Volume Raid Level	50
Max Capacity Allowed	1600.0 GB
Select Volume Capacity	1600.0 GB
Greater Two TB Volume Support	No
Volume Initialization Mode	Foreground Initialization
Volume Stripe Size	64 Kbytes
Volume Cache Mode	Write Back
Tagged Command Queuing	Enabled
SAS Port:LUN Base:LUN	0 : 0 : 0
Volumes To Be Created	1

☐ Confirm The Operation

Submit Reset

6.6.3 Delete Volume Set

To delete a volume from RAID set, move the cursor bar to the main menu and click on the "Delete Volume Set" link. The "Select The Raid Set To Delete" screen will show all RAID set numbers. Click a RAID set number and the "Confirm The Operation" check box and then click the "Submit" button to show all volume set items in the selected RAID set. Click a volume set number and the "Confirm The Operation" check box and then click the "Submit" button to delete the volume set.

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open all | close all |

- Raid System Console
- Quick Function
- RAID Set Functions
- Volume Set Functions
 - Create Volume Set
 - Create Raid30/50/60
 - Delete Volume Set
 - Modify Volume Set
 - Check Volume Set
 - Schedule Volume Check
 - Stop Volume Check
- Physical Drives
- System Controls
- Information

Select The Volume Set To Delete

Select	Volume Set Name	On Raid Set	Capacity
<input checked="" type="checkbox"/>	ARC-6360-VOL#000	Raid Set # 001	800.0GB

☒ Confirm The Operation

Submit Reset

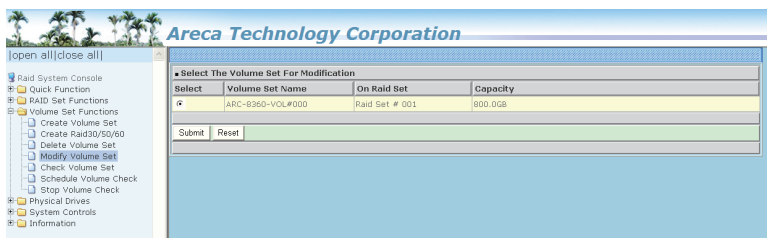
6.6.4 Modify Volume Set

To modify a volume set from a RAID set:

- (1). Click on the "Modify Volume Set" link.
- (2). Click the volume set check box from the list that you wish to modify. Click the "Submit" button. The following screen appears. Use this option to modify the volume set configuration. To modify volume set attributes, move the cursor bar to the volume set attribute menu and click it. The "Enter The Volume Attribute" screen appears. Move the cursor to an attribute item and then click the attribute to modify the value. After you complete the modifica-

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tion, click the "Confirm The Operation" check box and click the "Submit" button to complete the action. The user can only modify the last volume set capacity.



6.6.4.1 Volume Growth

Use "Expand RAID Set" function to add disk to a RAID set. The additional capacity can be used to enlarge the last volume set size or to create another volume set. The "Modify Volume Set" function can support the "Volume Modification" function. To expand the last volume set capacity, move the cursor bar to the "Capacity" item and enter the capacity size. When finished the above action, click the "Confirm The Operation" check box and click the "Submit" button to complete the action. The last volume set starts to expand its capacity.

To expand an existing volume noticed:

- Only the last volume can expand capacity.
- When expanding volume capacity, you can't modify stripe size or modify RAID level simultaneously.
- You can expand volume capacity, but can't shrink volume capacity size.
- After volume expansion, the volume capacity can't be decreased.

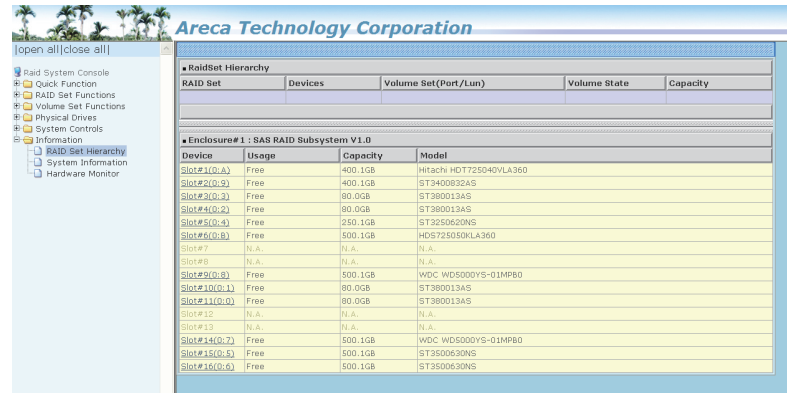
For greater 2TB expansion:

- If your system installed in the volume, don't expand the volume capacity greater than 2TB, currently OS can't support boot up from a greater than 2TB capacity device.
- Expand over 2TB used LBA64 mode. Please make sure your OS supports LBA64 before expand it.

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6.6.4.2 Volume Set Migration

Migrating occurs when a volume set is migrating from one RAID level to another, when a volume set strip size changes, or when a disk is added to a RAID set. Migration state is displayed in the volume state area of the “Volume Set Information” screen.



Note:

1. If the volume is RAID level 30, 50, or 60, you can not change the volume to another RAID level. If the volume is RAID level 0, 1, 10(1E), 3, 5, or 6, you can not change the volume to RAID level 30, 50, or 60.
2. RAID level 30 50 and 60 can support up to eight sub-volumes, but it can not support expansion and migration.

6.6.5 Check Volume Set

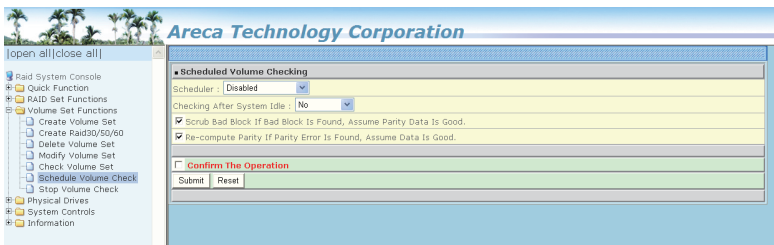
To check a volume set from a RAID set:

- (1). Click on the “Check Volume Set” link.
- (2). Click on the volume set from the list that you wish to check.

Tick on “Confirm The Operation” and click on the “Submit” button. Use this option to verify the correctness of the redundant data in a volume set. For example, in a system with dedicated parity, volume set check means computing the parity of the data disk drives and comparing the results to the contents of the dedicated parity disk drive. The checking percentage can also be viewed by clicking on “Raid Set Hierarchy” in the main menu.

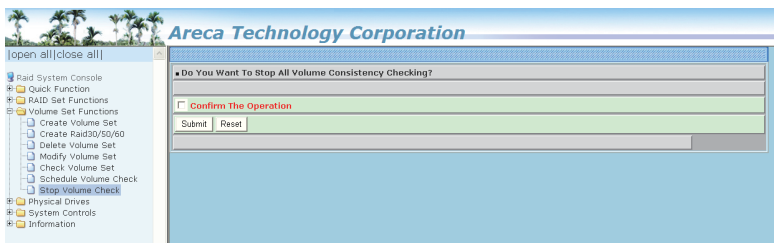
6.6.6 Schedule Volume Check

This function can setup a schedule so consistency checks are run automatically at regularly scheduled intervals. If there is a discrepancy found, it will log the error on the system event log. The controller will base on the user selection scrub bad block or re-compute parity to recovery the data. The recommended interval for checking consistency in RAID drives can set on "Scheduler" option. User can specify parameters to "Scheduler" to change the scheduled run time. The "Checking After System Idle" is defined the default time to start the automated consistency check scheduling.



6.6.7 Stop Volume Check

Use this option to stop the "Check Volume Set" function.

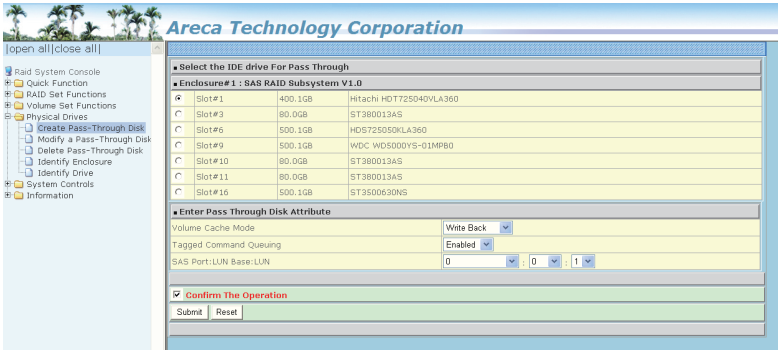


6.7 Physical Drive

Choose this option to select a physical disk from the main menu and then perform the operations listed below.

6.7.1 Create Pass-Through Disk

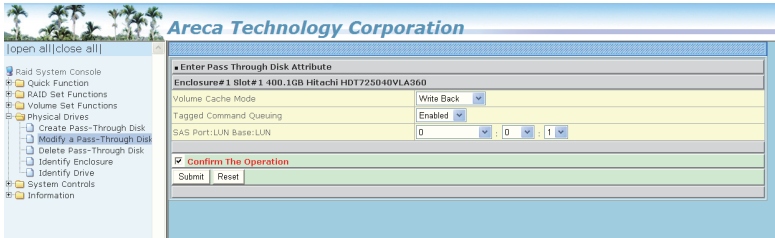
To create pass-through disk, move the mouse cursor to the main menu and click on the "Create Pass-Through" link. The relative setting function screen appears. A pass-through disk is not controlled by the RAID subsystem firmware, it can not be a part of a volume set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID firmware. The user can also select the Cache Mode, Tagged Command Queuing, SAS Port/LUN Base/LUN for this pass-through disk.



6.7.2 Modify a Pass-Through Disk

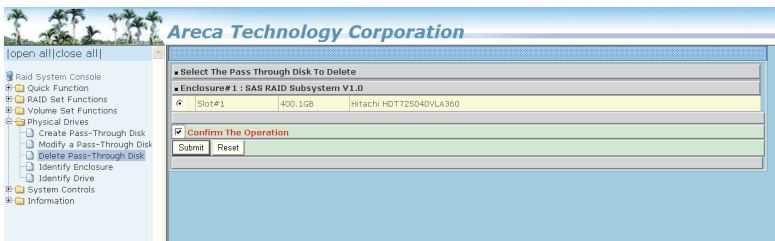
Use this option to modify the pass-through disk attribute. The user can modify the Cache Mode, Tagged Command Queuing, and SAS Port/LUN Base/LUN on an existing pass-through disk. To modify the pass-through drive attribute from the pass-through drive pool, move the mouse cursor bar and click on the "Modify a Pass-Through" link. The "Select The Pass Through Disk For Modification" screen appears. Mark the check box for the pass-through disk from the pass-through drive pool and click on the "Submit" button to select the drive. When the "Enter Pass-Through Disk Attribute" screen appears, modify the drive attribute values, as you want. After you complete the selection, mark the check box for "Confirm The Operation" and click on the "Submit" button to complete the selection action.

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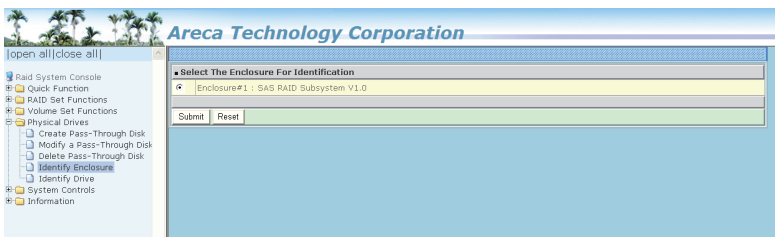
6.7.3 Delete Pass-Through Disk

To delete a pass-through drive from the pass-through drive pool, move the mouse cursor bar to the main menus and click the “Delete Pass Through” link. After you complete the selection, mark the check box for “Confirm The Operation” and click the “Submit” button to complete the delete action.



6.7.4 Identify Enclosure

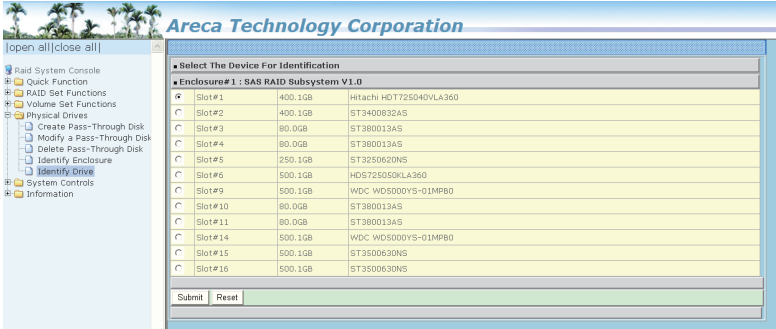
To prevent removing the wrong subsystem, the selected JBOD expander enclosure all disks fault LED indicator will light for physically locating the selected subsystem when the “Identify Subsystem” is selected. This function will also light the subsystem LED indicator, if it is existed.



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6.7.5 Identify Drive

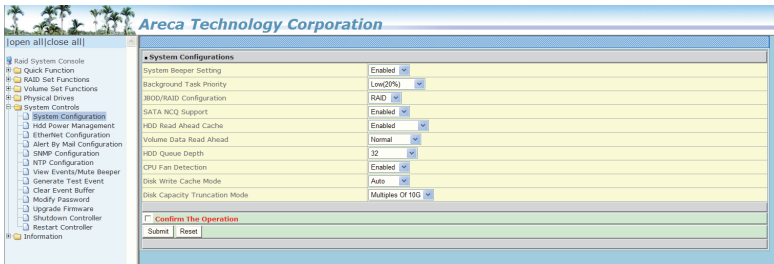
To prevent removing the wrong drive, the selected disk fault LED indicator will light for physically locating the selected disk when the “Identify Selected Device” is selected.



6.8 System Controls

6.8.1 System Config

To set the RAID system function, move the cursor to the main menu and click the “System Controls” link. The “Raid System Function” menu will show all items, then select the desired function.



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- **System Beeper Setting**

The "System Beeper Setting" function is used to "Disabled" or "Enabled" the RAID subsystem alarm tone generator.

- **Background Task Priority**

The "Background Task Priority" is a relative indication of how much time the controller devotes to a rebuild operation. The RAID subsystem allows the user to choose the rebuild priority (UltraLow, Low, Normal and High) to balance volume set access and rebuild tasks appropriately. For high array performance, specify a "Low" value.

- **JBOD/RAID Configuration**

JBOD is an acronym for "Just a Bunch Of Disk". A group of hard disks in a RAID subsystem are not set up as any type of RAID configuration. All drives are available to the operating system as an individual disk. JBOD does not provide data redundancy. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

- **SATA NCQ Support**

The controller supports both SAS and SATA disk drives. The SATA NCQ allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows the user to select the SATA NCQ support: "Enabled" or "Disabled".

- **HDD Read Ahead Cache**

Allow Read Ahead (Default: Enabled)—When "Enabled", the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.

- **Volume Data Read Ahead**

The "Data Read Ahead" parameter specifies the controller firmware algorithms which process the read ahead data blocks from the disk. The "Data Read Ahead" parameter is normal by default. To modify the value, you must set it from the command line using the "Data Read Ahead" option. The default "Normal"

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volume. The “Disabled” value implies no data read ahead. The most efficient value for the controllers depends on your application. “Aggressive” read ahead is optimal for sequential access but it degrades random access.

● **HDD Queue Depth**

This parameter is adjusted the queue depth capacity of NCQ (SATA HDD) or Tagged Command Queuing (SAS) which transmits multiple commands to a single target without waiting for the initial command to complete.

● **Disk Write Cache Mode**

A user can set the “Disk Write Cache Mode”: Auto, Enabled, or Disabled.

● **Disk Capacity Truncation Mode**

The RAID subsystem uses drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units.

The controller provides three truncation modes in the system configuration: **Multiples Of 10G**, **Multiples Of 1G**, and **Disabled**.

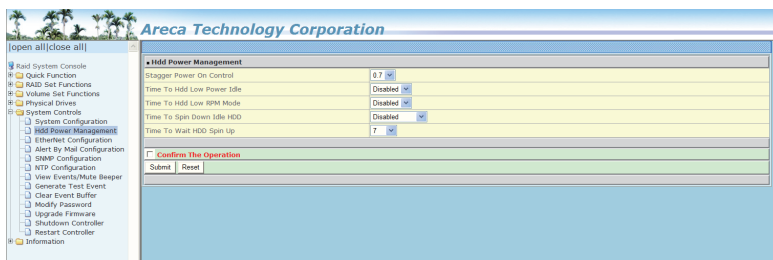
Multiples Of 10G: If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. Multiples Of 10G truncates the number under tens. This makes same capacity for both of these drives so that one could replace the other.

Multiples Of 1G: If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. Multiples Of 1G truncates the fractional part. This makes capacity for both of these drives so that one could replace the other.

Disabled: It does not truncate the capacity.

6.8.2 Hdd Power Management

Areca has automated the ability to manage HDD power based on usage patterns. The "HDD Power Management" allows you to choose a "Stagger Power On Control", "Low Power Idle", "Low RPM" and completely "Spins Down Idle HDD". It is designed to reduce power consumption and heat generation on idle drives.



6.8.2.1 Stagger Power On Control

In a RAID subsystems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other subsystem components. This damage can be avoided by allowing the RAID controller to stagger the spin-up of the drives. The SAS/SATA drives have support stagger spin-up capabilities to boost reliability. Stagger spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the RAID controller the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions. Areca RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected within the range 0.4 to 6 seconds per step which powers up one drive groups.

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6.8.2.2 Time to Hdd Low Power Idle

This option delivers lower power consumption by automatically unloading recording heads during the setting idle time. The values can be selected "Disabled" or within the range 2 to 7 minutes.

6.8.2.3 Time To Hdd Low RPM Mode

This function can automatically spin disks at lower RPM if there have not been used during the setting idle time. The values can be selected "Disabled" or within the range 10 to 60 minutes.

6.8.2.4 Time To Spin Down Idle HDD

This function can automatically spin down the drive if it hasn't been accessed for a certain amount of time. This value is used by the drive to determine how long to wait (with no disk activity, before turning off the spindle motor to save power). The values can be selected "Disabled" or within the range 1 to 60 minutes.

6.8.3 Ethernet Configuration

Use this feature to set the controller Ethernet port configuration. A customer doesn't need to create a reserved space on the arrays before the Ethernet port and HTTP service are working. The firmware-embedded web browser-based RAID manager can access it from any standard internet browser or from any host computer either directly connected or via a LAN or WAN with no software or patches required.

The screenshot shows the web interface of the Areca Technology Corporation RAID manager. The left sidebar contains a navigation menu with options like 'Raid System Console', 'Quick Function', 'RAID Set Functions', 'Volume Set Functions', 'Physical Drives', 'System Controls', 'System Configuration', 'Hdd Power Management', 'Ethernet Configuration', 'Alert by Mail Configuration', 'SNMP Configuration', 'HTTP Configuration', 'View Events/Mute Beeper', 'Generate Test Event', 'Clear Event Buffer', 'Modify Password', 'Upgrade Firmware', 'Shutdown Controller', 'Assistant Controller', and 'Information'. The main content area is titled 'Ethernet Net Configurations' and contains a table of settings. The 'DHCP Function' is set to 'Disabled'. Other settings include 'Local IP Address', 'Gateway IP Address', 'Subnet Mask', 'HTTP Port Number', 'Telnet Port Number', 'SMTP Port Number', 'Current IP Address', 'Current Gateway IP Address', 'Current Subnet Mask', and 'Ether Net MAC Address'. At the bottom, there is a 'Confirm The Operation' section with 'Submit' and 'Reset' buttons.

Ethernet Net Configurations			
DHCP Function	Disabled		
Local IP Address (Used If DHCP Disabled)	192	168	0 227
Gateway IP Address (Used If DHCP Disabled)	192	168	1 1
Subnet Mask (Used If DHCP Disabled)	255	255	255 0
HTTP Port Number (7168..8191 Is Reserved)	80		
Telnet Port Number (7168..8191 Is Reserved)	23		
SMTP Port Number (7168..8191 Is Reserved)	25		
Current IP Address	192.168.0.227		
Current Gateway IP Address	192.168.1.1		
Current Subnet Mask	255.255.255.0		
Ether Net MAC Address	00.04.00.7F.FF.FF		
<input type="checkbox"/> Confirm The Operation			
Submit Reset			

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DHCP (Dynamic Host Configuration Protocol) is a protocol that lets network administrators manage centrally and automate the assignment of IP (Internet Protocol) configurations on a computer network. When using the internet's set of protocols (TCP/IP), in order for a computer system to communicate to another computer system, it needs a unique IP address. Without DHCP, the IP address must be entered manually at each computer system. DHCP lets a network administrator supervise and distribute IP addresses from a central point. The purpose of DHCP is to provide the automatic (dynamic) allocation of IP client configurations for a specific time period (called a lease period) and to eliminate the work necessary to administer a large IP network.

To configure the RAID subsystem's Ethernet port, move the cursor bar to the main menu and click on the "System Controls" link. The "System Controls" menu will show all items. Move the cursor bar to the "Ethernet Configuration" item, then press **Enter** key to select the desired function.

6.8.4 Alert By Mail Configuration

To configure the RAID subsystem's e-mail function, move the cursor bar to the main menu and click on the "System Controls" link. The "System Controls" menu will show all items. Move the cursor bar to the "Alert By Mail Configuration" item, then select the desired function. This function can only be set via web-based configuration.

The firmware contains a SMTP manager monitoring all system events. Single or multiple user notifications can be sent via "Plain English" e-mails with no software required.

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- Raid System Console
- Quick Function
- RAID Set Functions
- Volume Set Functions
- Physical Drives
- System Controls
 - System Configuration
 - Hdd Power Management
 - Fibre Channel Config
 - Ethernet Configuration
 - Alert By Mail Configuration
 - SNMP Configuration
 - NTP Configuration
 - View Events/Mute Beeper
 - Generate Test Event
 - Clear Event Buffer
 - Modify Password
 - Upgrade Firmware
 - Shutdown Controller
 - Restart Controller
- Information

SNMP Server Configuration

SMTP Server IP Address: 0.0.0.0

Mail Address Configurations

Sender Name: Mail Address: Account: Password:

Event Notification Configurations

MailTo Name1	Mail Address
<input checked="" type="radio"/> Disable Event Notification	No Event Notification Will Be Sent
<input type="radio"/> Urgent Error Notification	Send Only Urgent Event
<input type="radio"/> Serious Error Notification	Send Urgent And Serious Event
<input type="radio"/> Warning Error Notification	Send Urgent, Serious And Warning Event
<input type="radio"/> Information Notification	Send All Event
<input type="checkbox"/> Notification For No Event	Notify User If No Event Occurs Within 24 Hours

MailTo Name2	Mail Address
<input checked="" type="radio"/> Disable Event Notification	No Event Notification Will Be Sent
<input type="radio"/> Urgent Error Notification	Send Only Urgent Event
<input type="radio"/> Serious Error Notification	Send Urgent And Serious Event
<input type="radio"/> Warning Error Notification	Send Urgent, Serious And Warning Event
<input type="radio"/> Information Notification	Send All Event
<input type="checkbox"/> Notification For No Event	Notify User If No Event Occurs Within 24 Hours

MailTo Name3	Mail Address
<input checked="" type="radio"/> Disable Event Notification	No Event Notification Will Be Sent
<input type="radio"/> Urgent Error Notification	Send Only Urgent Event
<input type="radio"/> Serious Error Notification	Send Urgent And Serious Event
<input type="radio"/> Warning Error Notification	Send Urgent, Serious And Warning Event
<input type="radio"/> Information Notification	Send All Event
<input type="checkbox"/> Notification For No Event	Notify User If No Event Occurs Within 24 Hours

☐ Confirm The Operation

Submit Reset

6.8.5 SNMP Configuration

To configure the RAID subsystem's SNMP function, move the cursor bar to the main menu and click on the "System Controls" link. The "System Controls" menu will show all items. Move the cursor bar to the "SNMP Configuration" item, then select the desired function. This function can only set by the web-based configuration.

The firmware contains SNMP agent manager monitors all system events and user can use the SNMP function from the web setting with no agent software required. Please refer to Appendix C SNMP Operation & Definition for more detail information about the SNMP trap and definition.

WEB BROWSER-BASED CONFIGURATION

Areca Technology Corporation

SNMP Trap Configurations

SNMP Trap IP Address	Port#
SNMP Trap IP Address #1	162
SNMP Trap IP Address #2	162
SNMP Trap IP Address #3	162

SNMP System Configurations

Community:

sysContact.O:

sysName.O:

sysLocation.O:

SNMP Trap Notification Configurations

Disable SNMP Trap	Urgent Error Notification	Serious Error Notification	Warning Error Notification	Information Notification	Send
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No SNMP Trap Will Be Sent
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Send Only Urgent Event
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Send Urgent And Serious Event
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Send Urgent, Serious And Warning Event
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Send All Event

Confirms The Operation

Submit Reset

● SNMP Trap Configurations

Enter the SNMP Trap IP Address.

● SNMP System Configurations

About community, Community name acts as a password to screen accesses to the SNMP agent of a particular network device. Type in the community names of the SNMP agent. Before access is granted to a request station, this station must incorporate a valid community name into its request; otherwise, the SNMP agent will deny access to the system.

Most network devices use “public” as default of their community names. This value is case-sensitive.

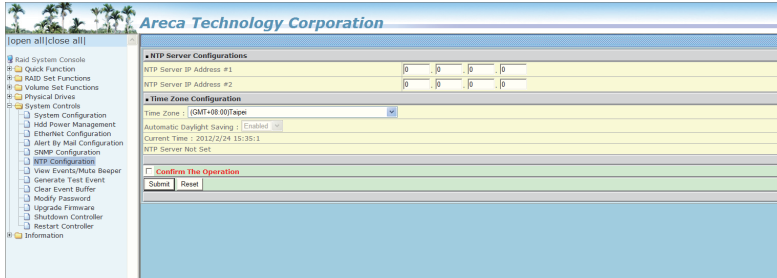
● SNMP Trap Notification Configurations

Please refer to Appendix D of Event Notification Table.

6.8.6 NTP Configuration

The Network Time Protocol (NTP) is used to synchronize the time of a computer client or server to another server or reference time source, such as a radio or satellite receiver or modem. It provides accuracies typically within a millisecond on LANs and up to a few tens of milliseconds on WANs relative to Coordinated Universal Time (UTC) via a Global Positioning Service (GPS) receiver, for example:

WEB BROWSER-BASED CONFIGURATION



Note:

NTP feature works through onboard Ethernet port. So you must make sure that you have connected onboard Ethernet port.

● **NTP Server Address**

The most important factor in providing accurate, reliable time is the selection of NTP servers to be used in the configuration file. Typical NTP configurations utilize multiple redundant servers and diverse network paths in order to achieve high accuracy and reliability. Our NTP configuration supports two existing public NTP synchronization subnets.

● **Time Zone**

Time Zone conveniently runs in the system tray and allows you to easily view the date and time in various locations around the world. You can also quickly and easily add your own personal locations to customize time zone the way you want. • Automatic Daylight Saving

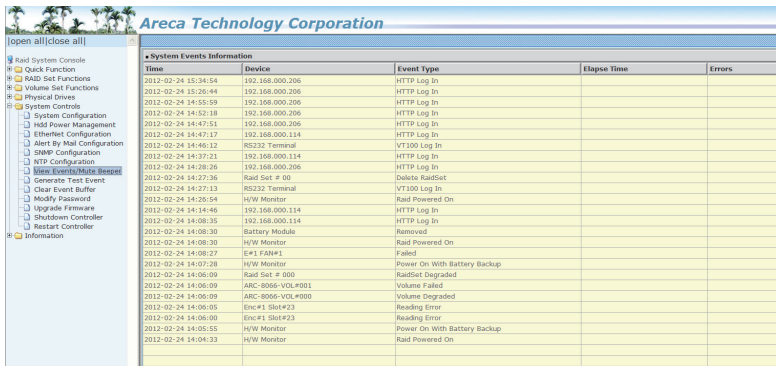
Automatic Daylight Saving will normally attempt to automatically adjust the system clock for daylight saving changes based on the computer time zone. This tweak allows you to disable the automatic adjustment.

WEB BROWSER-BASED CONFIGURATION

6.8.7 View Events/Mute Beeper

To view the RAID subsystem's event information, click on the "View Event/Mute Beeper" link. The RAID subsystem's "System events Information" screen appears. The mute beeper function automatically enable by clicking on "View Events/Mute Beeper".

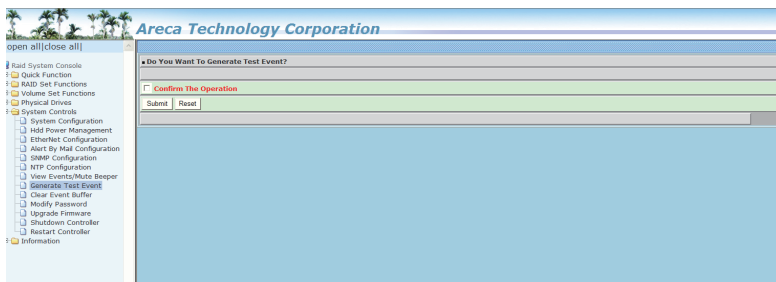
Select this option to view the system events information: Timer, Device, Event Type, Elapse Time and Errors. The RAID subsystem does not have a built-in real time clock. The time information is the relative time from the system time setting. The maximum event no. is 256 per controller.



System Events Information				
Time	Device	Event Type	Elapse Time	Errors
2012-02-24 15:34:54	192.168.0.000.206	HTTP Log In		
2012-02-24 15:26:44	192.168.0.000.206	HTTP Log In		
2012-02-24 14:55:59	192.168.0.000.206	HTTP Log In		
2012-02-24 14:52:18	192.168.0.000.206	HTTP Log In		
2012-02-24 14:47:51	192.168.0.000.206	HTTP Log In		
2012-02-24 14:47:17	192.168.0.000.114	HTTP Log In		
2012-02-24 14:40:12	RS232 Terminal	VT100 Log In		
2012-02-24 14:37:21	192.168.0.000.114	HTTP Log In		
2012-02-24 14:28:26	192.168.0.000.206	HTTP Log In		
2012-02-24 14:27:36	Raid Set # 00	Quanta RaidSet		
2012-02-24 14:27:13	RS232 Terminal	VT100 Log In		
2012-02-24 14:26:54	H/W Monitor	Raid Powered On		
2012-02-24 14:14:46	192.168.0.000.114	HTTP Log In		
2012-02-24 14:08:35	192.168.0.000.114	HTTP Log In		
2012-02-24 14:08:30	Battery Module	Removed		
2012-02-24 14:08:30	H/W Monitor	Raid Powered On		
2012-02-24 14:08:27	E*1 FAN#1	Failed		
2012-02-24 14:07:28	H/W Monitor	Power On With Battery Backup		
2012-02-24 14:06:09	Raid Set # 000	RaidSet Degraded		
2012-02-24 14:06:09	ARC-8066-VOL#001	Volume Failed		
2012-02-24 14:06:09	ARC-8066-VOL#000	Volume Degraded		
2012-02-24 14:06:06	Enc#1 Slot#P23	Reading Error		
2012-02-24 14:06:00	Enc#4 Slot#P23	Reading Error		
2012-02-24 14:05:55	H/W Monitor	Power On With Battery Backup		
2012-02-24 14:04:33	H/W Monitor	Raid Powered On		

6.8.8 Generate Test Event

Use this feature to generate events for testing purposes. Such as test mail or SNMP trap settings.



Areca Technology Corporation

open all|close all|

- Raid System Console
 - Quick Function
 - RAID Set Functions
 - Volume Set Functions
 - Physical Drive
 - System Configuration
 - System Controls
 - Hold Power Management
 - Ethernet Configuration
 - Alert By Mail Configuration
 - SNMP Configuration
 - NTP Configuration
 - View Events/Mute Beeper
 - Generate Test Event**
 - Clear Event Buffer
 - Modify Password
 - Upgrade Firmware
 - Shutdown Controller
 - Restart Controller
- Information

Do You Want To Generate Test Event?

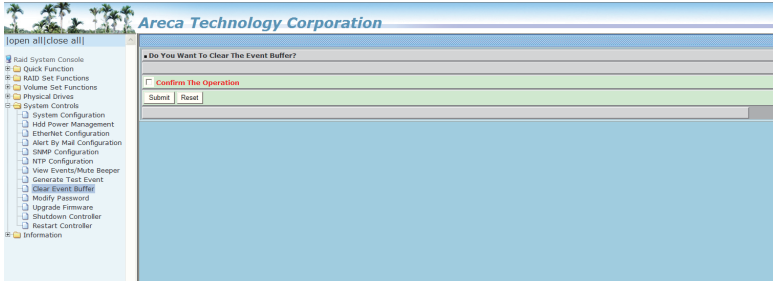
☐ Confirm This Operation

Submit Reset

WEB BROWSER-BASED CONFIGURATION

6.8.9 Clear Events Buffer

Use this feature to clear the entire events buffer information.



6.8.10 Modify Password

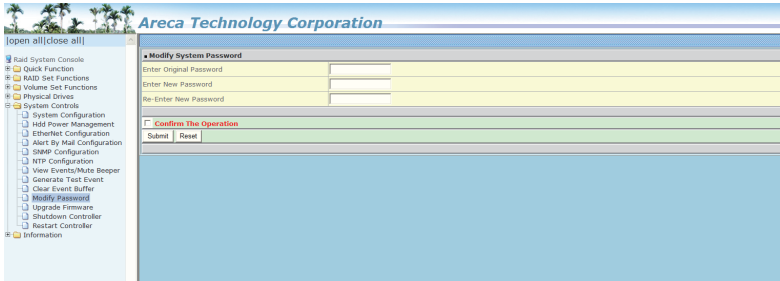
To set or change the RAID subsystem's password, select "System Controls" from the menu and click on the "Modify Password" link. The "Modify System Password" screen appears.

The manufacture default password is set to 0000.

The password option allows user to set or clear the RAID subsystem's password protection feature. Once the password has been set, the user can only monitor and configure the RAID subsystem by providing the correct password. The password is used to protect the RAID subsystem from unauthorized entry. The controller will check the password only when entering the main menu from the initial screen. The RAID subsystem will automatically go back to the initial screen when it does not receive any command in 5 minutes. Do not use spaces when you enter the password, if spaces are used, it will lock out the user.

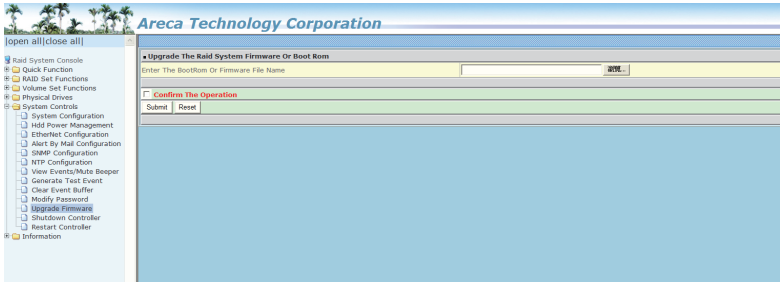
To disable the password, leave the fields blank. Once the user confirms the operation and clicks the "Submit" button, the existing password will be cleared. Then, no password checking will occur when entering the main menu from the starting screen.

WEB BROWSER-BASED CONFIGURATION



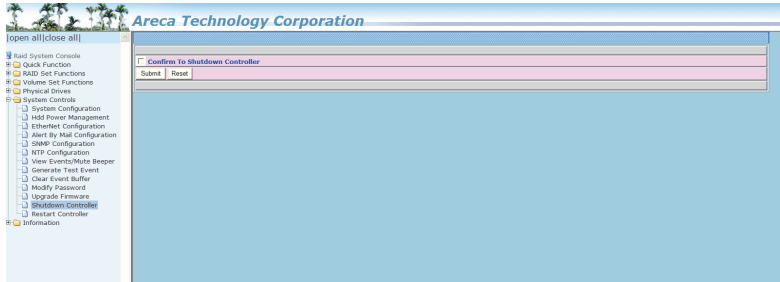
6.8.11 Update Firmware

Please refer to the Appendix A Upgrading Flash ROM Update Process.



6.8.12 Restart Controller

Use the "Restart Controller" function to restart the RAID controller. Without powering off the subsystem.



WEB BROWSER-BASED CONFIGURATION

6.9 Information

6.9.1 Raid Set Hierarchy

Use this feature to view the RAID subsystem current RAID set, current volume set and physical disk information. The volume state and capacity are also shown in this screen.

open allclose all

Raid System Console

Quick Function

RAID Set Functions

Volume Set Functions

Physical Drives

System Controls

Information

RAID Set Hierarchy

SAS Chip Information

System Information

Hardware Monitor

Areca Technology Corporation

RAID Set

Devices

Volume Set(Port/Lun)

Volume State

Capacity

Enclosure#1 : SAS RAID Subsystem V1.0

Device	Usage	Capacity	Model
Slot#1(L1)	Free	500.1GB	H0172500GLA360
Slot#2(L1)	Free	500.1GB	H0172500GLA360
Slot#3(L1)	Free	1000.2GB	WDC WD1001FALS-001700
Slot#4(L1)	Free	750.2GB	WDC WD7500AVPS-017000
Slot#5	N.A.	N.A.	N.A.
Slot#6	N.A.	N.A.	N.A.
Slot#7	N.A.	N.A.	N.A.
Slot#8	N.A.	N.A.	N.A.
Slot#9	N.A.	N.A.	N.A.
Slot#10	N.A.	N.A.	N.A.
Slot#11	N.A.	N.A.	N.A.
Slot#12	N.A.	N.A.	N.A.
Slot#13	N.A.	N.A.	N.A.
Slot#14	N.A.	N.A.	N.A.
Slot#15	N.A.	N.A.	N.A.
Slot#16	N.A.	N.A.	N.A.
Slot#17	N.A.	N.A.	N.A.
Slot#18	N.A.	N.A.	N.A.
Slot#19	N.A.	N.A.	N.A.
Slot#20	N.A.	N.A.	N.A.
Slot#21	N.A.	N.A.	N.A.
Slot#22	N.A.	N.A.	N.A.
Slot#23	N.A.	N.A.	N.A.
Slot#24	N.A.	N.A.	N.A.

6.9.2 SAS Chip Information

open allclose all

Raid System Console

Quick Function

RAID Set Functions

Volume Set Functions

Physical Drives

System Controls

Information

RAID Set Hierarchy

SAS Chip Information

System Information

Hardware Monitor

Areca Technology Corporation

Controller:Areca ARC-8060-1.50

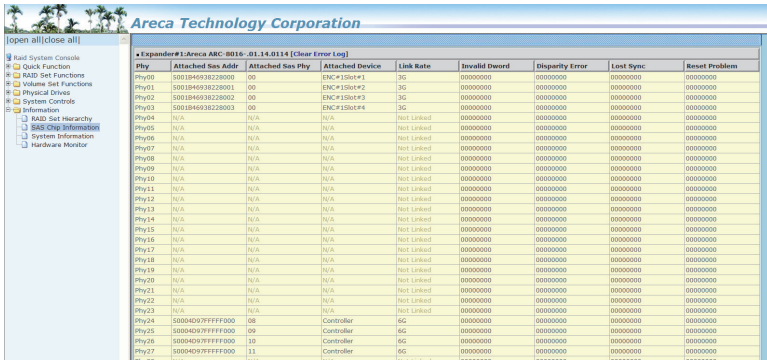
SAS Address	50004017FFFFFF000
Enclosure	
Number Of Ports	15
Attached Expander	Expander #1[50018A693822803F][64G]

Expander#1:Areca ARC-8016-01.14.0114

SAS Address	50018A693822803F
Component Vendor	LSI
Component ID	8023
Enclosure	[ENC#1]
Number Of Ports	16
Attached Expander	Controller[50004017FFFFFF000][64G]

To view the 6Gb/s SAS RAID controller’s SAS controller and attached expander chip information, move the mouse cursor to the main menu and click on the “SAS Chip Information” link. The 6Gb/s SAS RAID controller “SAS Chip Information” screen appears. User can click on ROC controller and SAS expander # item on the “SAS Chip Information” screen. It will show statistic page for ports on the ROC controller and SAS expander#. Click on the “Clear Error Log” to refresh the fully statistic page.

WEB BROWSER-BASED CONFIGURATION



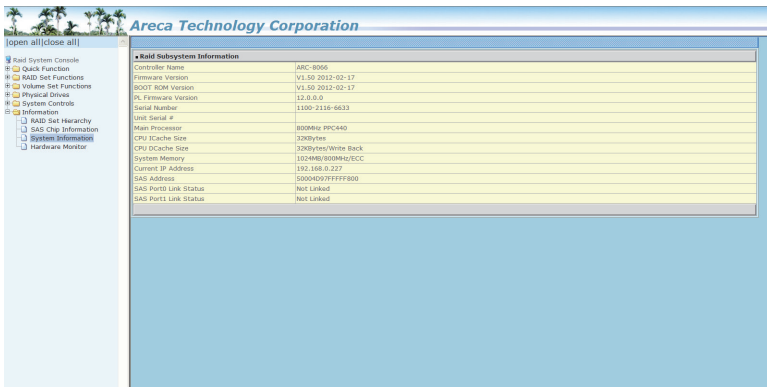
The screenshot shows the Areca Technology Corporation web browser-based configuration interface. The left sidebar contains a navigation menu with the following items: **Rad System Console**, **Quick Function**, **RAID Set Functions**, **Volume Set Functions**, **Physical Drives**, **System Controls**, **Information**, **RAID Set Hierarchy**, **SAS Chg Information**, **System Information**, and **Hardware Monitor**. The main content area displays the **RAID Subsystem Information** screen, which includes a table with the following columns: **Phy**, **Attached Sas Addr**, **Attached Sas Phy**, **Attached Device**, **Link Rate**, **Invalid Dword**, **Disparity Error**, **Lost Sync**, and **Reset Problem**. The table lists 24 physical drives (Phy00 to Phy23) and 3 controllers (Phy24 to Phy27). The RAID subsystem information is also displayed below the table.

Phy	Attached Sas Addr	Attached Sas Phy	Attached Device	Link Rate	Invalid Dword	Disparity Error	Lost Sync	Reset Problem
Phy00	5001846938228000	00	ENC#1Slot#1	3G	00000000	00000000	00000000	00000000
Phy01	5001846938228001	00	ENC#1Slot#2	3G	00000000	00000000	00000000	00000000
Phy02	5001846938228002	00	ENC#1Slot#3	3G	00000000	00000000	00000000	00000000
Phy03	5001846938228003	00	ENC#1Slot#4	3G	00000000	00000000	00000000	00000000
Phy04	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy05	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy06	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy07	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy08	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy09	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy10	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy11	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy12	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy13	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy14	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy15	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy16	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy17	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy18	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy19	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy20	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy21	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy22	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy23	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000
Phy24	50004007FFFF00	08	Controller	6G	00000000	00000000	00000000	00000000
Phy25	50004007FFFF00	09	Controller	6G	00000000	00000000	00000000	00000000
Phy26	50004007FFFF00	10	Controller	6G	00000000	00000000	00000000	00000000
Phy27	50004007FFFF00	11	Controller	6G	00000000	00000000	00000000	00000000
Phy28	N/A	N/A	N/A	Not Linked	00000000	00000000	00000000	00000000

6.9.3 System Information

To view the RAID subsystem's system information, move the mouse cursor to the main menu and click on the "System Information" link. The RAID subsystem's "RAID Subsystem Information" screen appears.

Use this feature to view the RAID subsystem's system information. The controller name, controller firmware version, Boot ROM version, SAS PL firmware version, serial number, main processor, CPU data/instruction cache size, system memory size/speed and current IP address appear in below screen.



The screenshot shows the Areca Technology Corporation web browser-based configuration interface. The left sidebar contains a navigation menu with the following items: **Rad System Console**, **Quick Function**, **RAID Set Functions**, **Volume Set Functions**, **Physical Drives**, **System Controls**, **Information**, **RAID Set Hierarchy**, **SAS Chg Information**, **System Information**, and **Hardware Monitor**. The main content area displays the **RAID Subsystem Information** screen, which includes a table with the following columns: **Item**, **Value**, and **Unit**. The table lists the following information: **Controller Name** (ARC-9006), **Firmware Version** (V1.50 2012-02-17), **BOOT ROM Version** (V1.50 2012-02-17), **SAS PL Firmware Version** (12.6.0.0), **Serial Number** (1100-2116-6633), **Unit Serial #** (1100-2116-6633), **Main Processor** (800MHz PRC40), **CPU Cache Size** (3200bytes), **CPU Cache Size** (3200bytes/Write Back), **System Memory** (1024MB/800MHz/DDR3), **Current IP Address** (192.168.0.227), **SAS Address** (50004007FFFF00), **SAS Port Link Status** (Not Linked), and **SAS Port Link Status** (Not Linked).

Item	Value	Unit
Controller Name	ARC-9006	
Firmware Version	V1.50 2012-02-17	
BOOT ROM Version	V1.50 2012-02-17	
SAS PL Firmware Version	12.6.0.0	
Serial Number	1100-2116-6633	
Unit Serial #	1100-2116-6633	
Main Processor	800MHz PRC40	
CPU Cache Size	3200bytes	
CPU Cache Size	3200bytes/Write Back	
System Memory	1024MB/800MHz/DDR3	
Current IP Address	192.168.0.227	
SAS Address	50004007FFFF00	
SAS Port Link Status	Not Linked	
SAS Port Link Status	Not Linked	

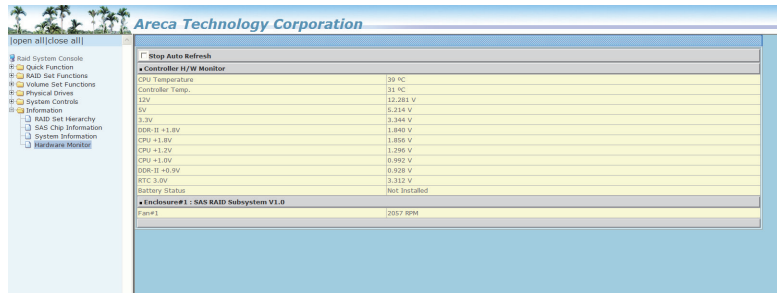
WEB BROWSER-BASED CONFIGURATION

The controller provides two four-link SFF-8088 connector for the host and one four-link connector SFF-8088 for JBOD. It may has problem between the host/JBOD and controller. The "Host Port# Link" provides current working port link status. The option for port link is defined below.

Not Linked → Fail or no link to host/JBOD
1x600MB/Sec → Single-link for use
2x600MB/Sec → Two-link for use
4x600MB/Sec → Four-link for use

6.9.4 Hardware Monitor

The hardware monitor information of the subsystem attached in this controller is also shown on this screen.



Appendix A

Upgrading Flash ROM Update Process

Since the RAID controller features flash firmware, it is not necessary to change the hardware flash chip in order to upgrade the RAID firmware. The user can simply re-program the old firmware through the RS-232 port or LAN Port. New releases of the firmware are available in the form of a DOS file at OEM's FTP. The file available at the FTP site is usually a self-extracting file that contains the following:

ARC-NNNNXXXX.BIN Firmware Binary (where NNNN refers to the model name and "XXXX" refers to the function name:BOOT, FIRM and MBR0)

ARC-8066BOOT.BIN:→ RAID subsystem hardware initialization.

ARC-8066FIRM.BIN:→ RAID kernel program

ARC-8066MBR0.BIN:→ Master Boot Record for supporting Dual Flash Image in the RAID subsystem.

Release_note.txt file contains the history information of the firmware change. Read this file first before upgrading the firmware. These files must be extracted from the compressed file and copied to one directory in drive A: or C:.

Establishing the Connection for the RS-232

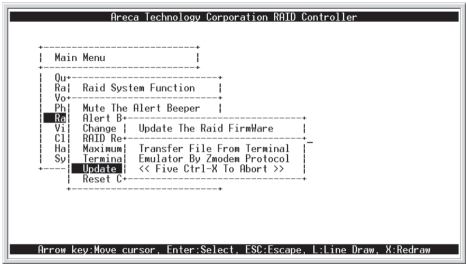
The firmware can be downloaded to the RAID controller module by using an ANSI/VT-100 compatible terminal emulation program or HTTP web browser management. You must complete the appropriate installation procedure before proceeding with this firmware upgrade. Please refer to chapter 4.3, "VT100 terminal (Using the controller's serial port)" for details on establishing the connection. Whichever terminal emulation program is used must support the ZMODEM file transfer protocol.

APPENDIX

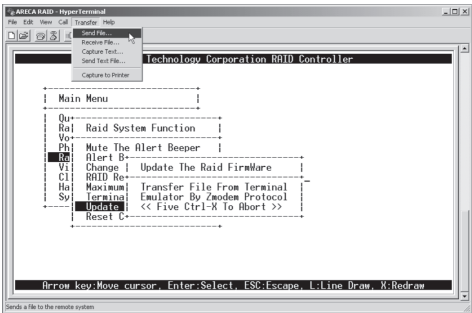
Upgrade Firmware Through ANSI/VT-100 Terminal Emulation

Get the new version firmware for your RAID controller. For example, download the bin file from your OEM's web site onto the c:

1. From the main menu, scroll down to "Raid System Function"
2. Choose the "Update Firmware", The "Update The Raid Firmware" dialog box appears.
3. Go to the tool bar and select "Transfer". Open "Send File".

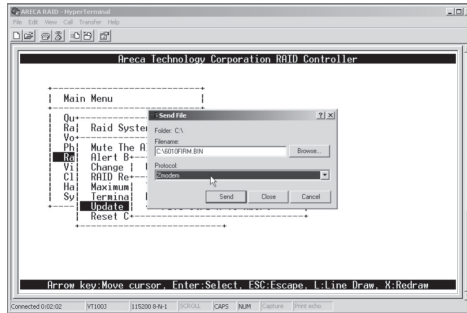


4. Select "ZMODEM modem" under Protocol. ZMODEM as the file

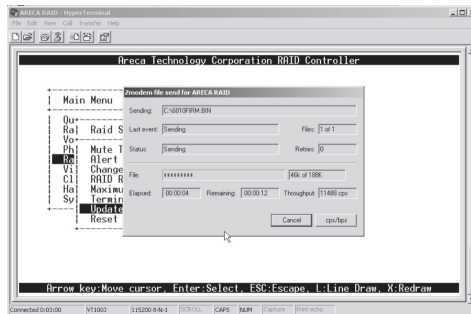


transfer protocol of your terminal emulation software.

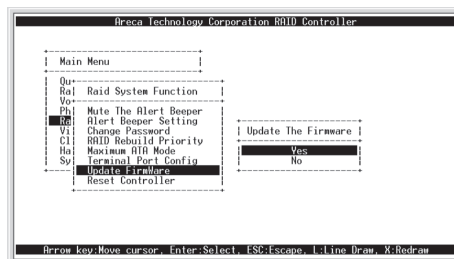
5. Click "Browse". Look in the location where the firmware upgrade software is located. Select the file name:



6. Click "Send", to send the firmware binary to the controller.

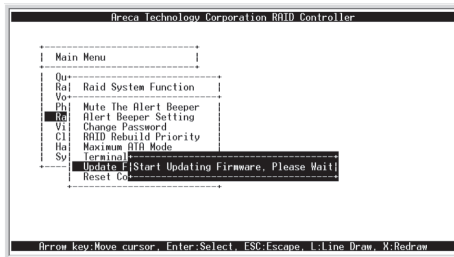


7. When the Firmware completes downloading, the confirmation screen appears. Press **Yes** to start program the flash ROM.



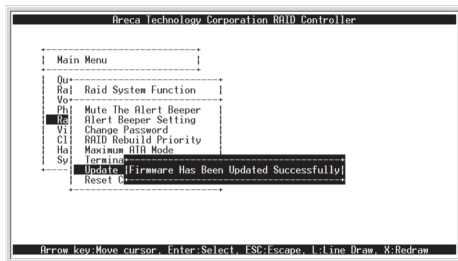
8. When the Flash programming starts, a bar indicator will show "Start Updating Firmware. Please Wait".

APPENDIX



9. The Firmware upgrade will take approximately thirty seconds to complete.

10. After the Firmware upgrade is complete, a bar indicator will show "Firmware Has Been Updated Successfully".



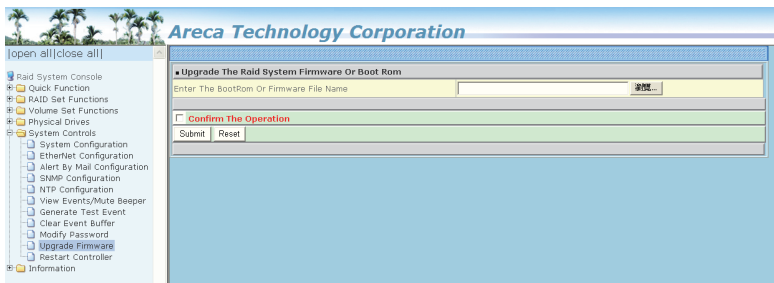
Note:

1. The user doesn't need to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will keep the values before upgrade.
2. Please update all binary code (BOOT, FIRM and MBR0) before you reboot the RAID controller. Otherwise, a mixed firmware package may hang the RAID controller.

Upgrade Firmware Through Web Browser Manager (LAN Port)

Get the new version firmware for your RAID controller. For example, download the bin file from your OEM's web site onto the c:

1. To upgrade the RAID controller firmware, move the mouse cursor to "Upgrade Firmware" link. The "Upgrade The Raid System Firmware" screen appears.
2. Click "Browse". Look in the location where the firmware upgrade file is located. Select the file name: "ARC-NNNNXXXX.BIN" and click open.
3. Click the "Confirm The Operation" and press the "Submit" button.



4. The Web Browser begins to download the firmware binary to the controller and start to update the flash ROM.
5. After the firmware upgrade is complete, a bar indicator will show "Firmware has Been Updated Successfully"

Note:

1. The user doesn't need to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will keep us the vaules before upgrade.
2. Please update all binary code (BOOT, FIRM and MBR0) before you reboot the RAID controller. Otherwise, a mixed firmware package may hang the RAID controller.

APPENDIX

Appendix B

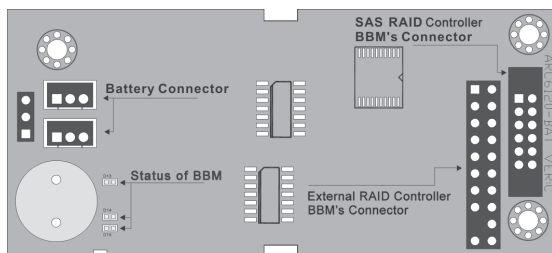
Battery Backup Module (ARC-6120BA-T113)

B-1 Overview

The 6Gb/s SAS RAID controller module operates using cache memory. The Battery Backup Module is an add-on module that provides power to the 6Gb/s SAS RAID controller module cache memory in the event of a power failure. The Battery Backup Module monitors the write back cache on the 6Gb/s SAS RAID controller, and provides power to the cache memory if it contains data not yet written to the hard drives when power failure occurs.

B-2 BBM Components

This section provides the board layout and connector/jumper for the BBM.



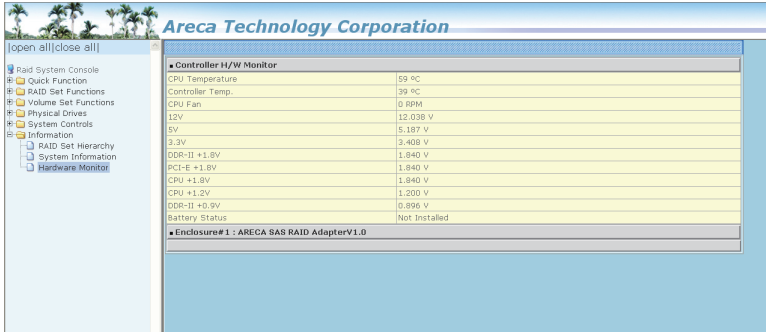
B-3 Status of BBM

- D13 (Green) : light when BBM activated
- D14 (Red) : light when BBM charging
- D15 (Green) : light when BBM normal

Note:

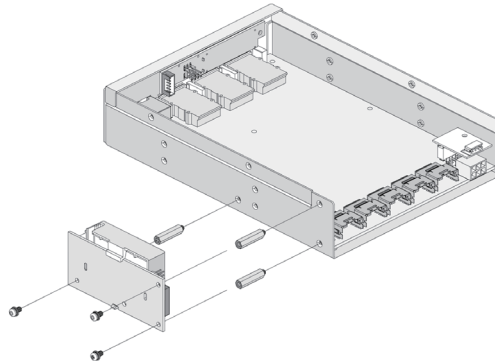
The BBM status will be shown on the web browser of "Hardware Monitor Information" screen.

The BBM status will be shown on the web browser of "Hardware Monitor Information" screen.



B-4 Installation

1. Make sure all power to the system is disconnected.
2. Integrators provide pre-drilled holes in the controller module cabinet for securing the BBM using its three mounting positions.
3. Connector J4 on the SAS RAID controller module is available for the optional battery backup module. Connect the BBM cable to the 12-pin battery connector on the controller.



B-5 Battery Backup Capacity

Battery backup capacity is defined as the maximum duration of a power failure for which data in the cache memory can be maintained by the battery. The BBM's backup capacity varied with the memory chips that installed on the 6Gb/s SAS RAID controller.

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B-6 Operation

1. Battery conditioning is automatic. There are no manual procedures for battery conditioning or preconditioning to be performed by the user.
2. In order to make sure of all the capacity is available for your battery cells, allow the battery cell to be fully charged when installed for the first time. The first time charge of a battery cell takes about 24 hours to complete.

B-7 Changing the Battery Backup Module

At some point, the LI-ION battery will no longer accept a charge properly. LI-ION battery life expectancy is anywhere from approximately 1 to 5 years.

1. Shutdown the operating system properly. Make sure that cache memory has been flushed.
2. Disconnect the BBM cable from J4 on the 6Gb/s SAS RAID controller.
3. Disconnect the battery pack cable from JP2 on the BBM.
4. Install a new battery pack and connect the new battery pack to JP2.
5. Connect the BBM to J4 on the 6Gb/s SAS RAID controller.
6. Disable the write-back function from the McBIOS RAID manager or McRAID storage manager.

Note:

Do not remove BBM while system is running.

B-8 Battery Functionality Test Procedure:

1. Writing amount of data into controller volume, about 5GB or bigger.
2. Waiting for few seconds, power failed system by remove the power cable.
3. Check the battery status, make sure the D13 is bright light, and battery beeps every few seconds.
4. Power on system, and press Tab/F6 to login controller.
5. Check the controller event log, make sure the event shows controller boot up with power recovered.

B-9 BBM Specifications

Mechanical

- Module Dimension (W x H x D): 37.3 x 13 x 81.6 mm
- BBM Connector: 2 x 6 box header

Environmental

- Operating Temperature
Temperature: -0° C to +40° C
- Humidity: 45-85%, non-condensing
- Storage Temperature
Temperature: -40° C to 60° C
- Humidity: 45-85%, non-condensing

Electrical

- Input Voltage
+3.6VDC
- On Board Battery Capacity
1880mAH (1 x 1880mAH) for ARC-8068 series board

Appendix C

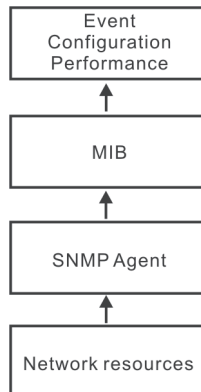
SNMP Operation & Definition

Overview

The external RAID subsystem firmware-embedded Simple Network Management Protocol (SNMP) agent for the connect array. An SNMP-based management application (also known as a SNMP manager) can monitor the disk array. An example of a SNMP management application is Hewlett-Packard's Open View. The firmware-embedded SNMP agent can be used to augment the RAID subsystem if you are already running a SNMP management application at your site.

SNMP Definition

SNMP, an IP-based protocol, has a set of commands for getting the status of target devices. The SNMP management platform is called the SNMP manager, and the managed devices have the SNMP agent loaded. Management data is organized in a hierarchical data structure called the management Information Base (MIB). These MIBs are defined and sanctioned by various industry associations. The objective is for all vendors to create products in compliance with these MIBs so that inter-vendor interoperability can be achieved. If a vendor wishes to include additional device information that is not specified in a standard MIB, then that is usually done through MIB extensions.



SNMP Installation

The installation of the SNMP manager is accomplished in several phases:

- Installing the SNMP manager software on the client
- Placing a copy of the management information base (MIB) in a directory which is accessible to the management application
- Compiling the MIB description file with the management application

MIB Compilation and Definition File creation

Before the manager application accesses the RAID subsystem, user needs to integrate the MIB into the management application's database of events and status indicator codes. This process is known as compiling the MIB into the application. This process is highly vendor-specific and should be well-covered in the User's Guide of your SNMP application. Ensure the compilation process successfully integrates the contents of the `areca_sas.mib` file into the traps database.

Location for MIB

Depending upon the SNMP management application used, the MIB must be placed in a specific directory on the network management station running the management application. The MIB file must be manually copied to this directory. For example:

SNMP Management Application	MIB Location
HP OpenView	\OV\MIBS
Netware NMS	\NMS\SNMPMIBS\CURRENT

Your management application may have a different target directory. Consult the management application's user manual for the correct location.

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Appendix D

Event Notification Configurations

The controller classifies disk array events into four levels depending on their severity. These include level 1: Urgent, level 2: Serious, level 3: Warning and level 4: Information. The level 4 covers notification events such as initialization of the controller and initiation of the rebuilding process; Level 2 covers notification events which once have happen; Level 3 includes events which require the issuance of warning messages; Level 1 is the highest level, and covers events the need immediate attention (and action) from the administrator. The following lists sample events for each level:

A. Device Event

Event	Level	Meaning	Action
Device Inserted	Warning	HDD inserted	
Device Removed	Warning	HDD removed	
Reading Error	Warning	HDD reading error	Keep Watching HDD status, may be it caused by noise or HDD unstable.
Writing Error	Warning	HDD writing error	Keep Watching HDD status, may be it caused by noise or HDD unstable.
ATA Ecc Error	Warning	HDD ECC error	Keep Watching HDD status, may be it caused by noise or HDD unstable.
Change ATA Mode	Warning	HDD change ATA mode	Check HDD connection
Time Out Error	Warning	HDD time out	Keep Watching HDD status, may be it caused by noise or HDD unstable.
Device Failed	Urgent	HDD failure	Replace HDD
PCI Parity Error	Serious	PCI parity error	If only happen once, it may be caused by noise. If always happen, please check power supply or contact to us.
Device Failed(SMART)	Urgent	HDD SMART failure	Replace HDD

PassThrough Disk Created	Inform	Pass Through Disk created	
PassThrough Disk Modified	Inform	Pass Through Disk modified	
PassThrough Disk Deleted	Inform	Pass Through Disk deleted	

B. Volume Event

Event	Level	Meaning	Action
Start Initialize	Warning	Volume initialization has started	
Start Rebuilding	Warning	Volume rebuilding has started	
Start Migrating	Warning	Volume migration has started	
Start Checking	Warning	Volume parity checking has started	
Complete Init	Warning	Volume initialization completed	
Complete Rebuild	Warning	Volume rebuilding completed	
Complete Migrate	Warning	Volume migration completed	
Complete Check	Warning	Volume parity checking completed	
Create Volume	Warning	New volume created	
Delete Volume	Warning	Volume deleted	
Modify Volume	Warning	Volume modified	
Volume Degraded	Urgent	Volume degraded	Replace HDD
Volume Failed	Urgent	Volume failure	
Failed Volume Revived	Urgent	Failed volume revived	
Abort Initialization	Warning	Initialization been abort	
Abort Rebuilding	Warning	Rebuilding aborted	
Abort Migration	Warning	Migration aborted	
Abort Checking	Warning	Parity check aborted	
Stop Initialization	Warning	Initialization stopped	
Stop Rebuilding	Warning	Rebuilding stopped	
Stop Migration	Warning	Migration stopped	
Stop Checking	Warning	Parity check stopped	

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C. RAID Set Event

Event	Level	Meaning	Action
Create RaidSet	Warning	New RAID set created	
Delete RaidSet	Warning	Raidset deleted	
Expand RaidSet	Warning	Raidset expanded	
Rebuild RaidSet	Warning	Raidset rebuilding	
RaidSet Degraded	Urgent	Raidset degraded	Replace HDD

D. Hardware Monitor Event

Event	Level	Meaning	Action
DRAM 1-Bit ECC	Urgent	DRAM 1-Bit ECC error	Check DRAM
DRAM Fatal Error	Urgent	DRAM fatal error encountered	Check the DRAM module and replace with new one if required.
Controller Over Temperature	Urgent	Abnormally high temperature detected on controller (over 60 degree)	Check air flow and cooling fan of the enclosure, and contact us.
Hdd Over Temperature	Urgent	Abnormally high temperature detected on Hdd (over 55 degree)	Check air flow and cooling fan of the enclosure.
Fan Failed	Urgent	Cooling Fan # failure or speed below 1700RPM	Check cooling fan of the enclosure and replace with a new one if required.
Controller Temp. Recovered	Serious	Controller temperature back to normal level	
Hdd Temp. Recovered			
Raid Powered On	Warning	RAID power on	
Test Event	Urgent	Test event	
Power On With Battery Backup	Warning	RAID power on with battery backup	
Incomplete RAID Discovered	Serious	Some RAID set member disks missing before power on	Check disk information to find out which channel missing.
HTTP Log In	Serious	a HTTP login detected	

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Telnet Log	Serious	a Telnet login detected	
InVT100 Log In	Serious	a VT100 login detected	
API Log In	Serious	a API login detected	
Lost Rebuilding/ MigrationLBA	Urgent	Some rebuilding/ migration raidset member disks missing before power on.	Reinserted the missing member disk back, controller will continued the incompleated rebuilding/migration.

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Appendix E

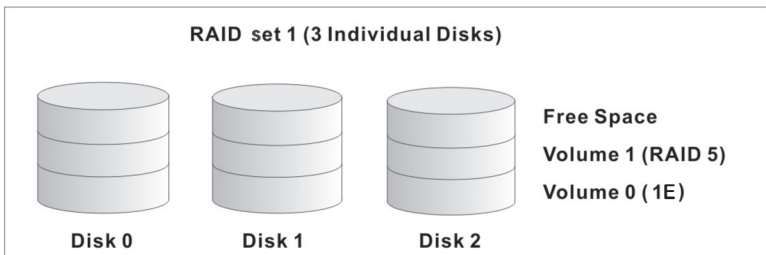
RAID Concept

RAID Set

A RAID set is a group of disks connected to a SAS RAID controller. A RAID set contains one or more volume sets. The RAID set itself does not define the RAID level (0, 1, 10, 3, 5, 6, 30, 50 60, etc); the RAID level is defined within each volume set. Therefore, volume sets are contained within RAID sets and RAID Level is defined within the volume set. If physical disks of different capacities are grouped together in a RAID set, then the capacity of the smallest disk will become the effective capacity of all the disks in the RAID set.

Volume Set

Each volume set is seen by the host system as a single logical device (in other words, a single large virtual hard disk). A volume set will use a specific RAID level, which will require one or more physical disks (depending on the RAID level used). RAID level refers to the level of performance and data protection of a volume set. The capacity of a volume set can consume all or a portion of the available disk capacity in a RAID set. Multiple volume sets can exist in a RAID set. For the SAS RAID controller, a volume set must be created either on an existing RAID set or on a group of available individual disks (disks that are about to become part of a RAID set). If there are pre-existing RAID sets with available capacity and enough disks for the desired RAID level, then the volume set can be created in the existing RAID set of the user's choice.



In the illustration, volume 1 can be assigned a RAID level 5 of operation while volume 0 might be assigned a RAID level 1E of operation. Alternatively, the free space can be used to create volume 2, which could then be set to use RAID level 5.

Ease of Use Features

• Foreground Availability/Background Initialization

RAID 0 and RAID 1 volume sets can be used immediately after creation because they do not create parity data. However, RAID 3, 5, 6, 30, 50 or 60 volume sets must be initialized to generate parity information. In Background Initialization, the initialization proceeds as a background task, and the volume set is fully accessible for system reads and writes. The operating system can instantly access the newly created arrays without requiring a reboot and without waiting for initialization to complete. Furthermore, the volume set is protected against disk failures while initialing. If using Foreground Initialization, the initialization process must be completed before the volume set is ready for system accesses.

• Online Array Roaming

The SAS RAID controllers store RAID configuration information on the disk drives. The controller therefore protects the configuration settings in the event of controller failure. Online array roaming allows the administrators the ability to move a complete RAID set to another system without losing RAID configuration information or data on that RAID set. Therefore, if a server fails, the RAID set disk drives can be moved to another server with an Areca SAS/SATA RAID controllers and the disks can be inserted in any order.

• Online Capacity Expansion

Online Capacity Expansion makes it possible to add one or more physical drives to a volume set without interrupting server operation, eliminating the need to backup and restore after reconfiguration of the RAID set. When disks are added to a RAID set, unused capacity is added to the end of the RAID set. Then, data

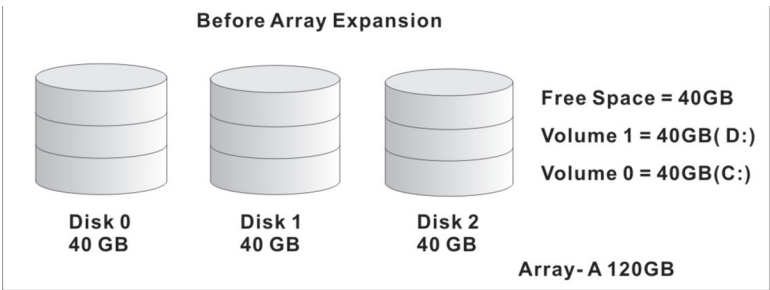
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on the existing volume sets (residing on the newly expanded RAID set) is redistributed evenly across all the disks. A contiguous block of unused capacity is made available on the RAID set. The unused capacity can be used to create additional volume sets.

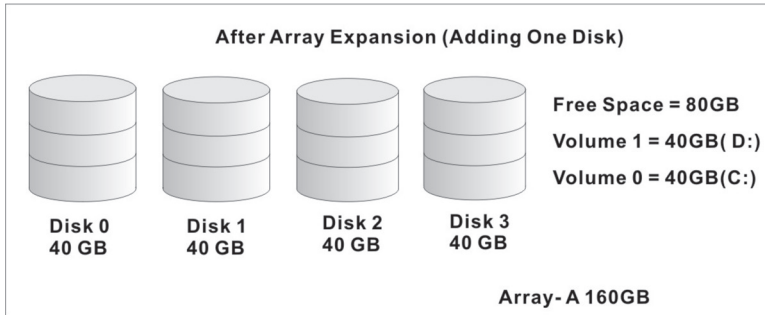
A disk, to be added to a RAID set, must be in normal mode (not failed), free (not spare, in a RAID set, or passed through to host) and must have at least the same capacity as the smallest disk capacity already in the RAID set.

Capacity expansion is only permitted to proceed if all volumes on the RAID set are in the normal status. During the expansion process, the volume sets being expanded can be accessed by the host system. In addition, the volume sets with RAID level 1, 10, 3, 5 or 6 are protected against data loss in the event of disk failure(s). In the case of disk failure, the volume set changes from "migrating" state to "migrating+degraded" state. When the expansion is completed, the volume set would then transition to "degraded" mode. If a global hot spare is present, then it further changes to the "rebuilding" state.

The expansion process is illustrated as following figure.



The SAS RAID controller redistributes the original volume set over the original and newly added disks, using the same fault-tolerance configuration. The unused capacity on the expand RAID set can then be used to create an additional volume set, with a different fault tolerance setting (if required by the user.)



● Online RAID Level and Stripe Size Migration

For those who wish to later upgrade to any RAID capabilities, a system with Areca online RAID level/stripe size migration allows a simplified upgrade to any supported RAID level without having to reinstall the operating system.

The SAS RAID controllers can migrate both the RAID level and stripe size of an existing volume set, while the server is on-line and the volume set is in use. Online RAID level/stripe size migration can prove helpful during performance tuning activities as well as when additional physical disks are added to the SAS RAID controller. For example, in a system using two drives in RAID level 1, it is possible to add a single drive and add capacity and retain fault tolerance. (Normally, expanding a RAID level 1 array would require the addition of two disks). A third disk can be added to the existing RAID logical drive and the volume set can then be migrated from RAID level 1 to 5. The result would be parity fault tolerance and double the available capacity without taking the system down. A fourth disk could be added to migrate to RAID level 6. It is only possible to migrate to a higher RAID level by adding a disk; disks in an existing array can't be reconfigured for a higher RAID level without adding a disk. Online migration is only permitted to begin, if all volumes to be migrated are in the normal mode. During the migration process, the volume sets being migrated are accessed by the host system. In addition, the volume sets with RAID level 1, 10, 3, 5 or 6 are protected against data loss in the event of disk failure(s). In the case of disk failure, the volume set transitions from migrating state to (migrating+degraded) state. When the migra

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tion is completed, the volume set transitions to degraded mode. If a global hot spare is present, then it further transitions to rebuilding state.

• Online Volume Expansion

Performing a volume expansion on the controller is the process of growing only the size of the latest volume. A more flexible option is for the array to concatenate an additional drive into the RAID set and then expand the volumes on the fly. This happens transparently while the volumes are online, but, at the end of the process, the operating system will detect free space at after the existing volume.

Windows, NetWare and other advanced operating systems support volume expansion, which enables you to incorporate the additional free space within the volume into the operating system partition. The operating system partition is extended to incorporate the free space so it can be used by the operating system without creating a new operating system partition.

You can use the Diskpart.exe command line utility, included with Windows Server 2003 or the Windows 2000 Resource Kit, to extend an existing partition into free space in the dynamic disk.

Third-party software vendors have created utilities that can be used to repartition disks without data loss. Most of these utilities work offline. Partition Magic is one such utility.

High availability

• Global Hot Spares

A Global Hot Spare is an unused online available drive, which is ready for replacing the failure disk. The Global Hot Spare is one of the most important features that SAS RAID controllers provide to deliver a high degree of fault-tolerance. A Global Hot Spare is a spare physical drive that has been marked as a global hot spare and therefore is not a member of any RAID set. If a disk drive used in a volume set fails, then the Global Hot Spare will

automatically take its place and the data previously located on the failed drive is reconstructed on the Global Hot Spare.

For this feature to work properly, the global hot spare must have at least the same capacity as the drive it replaces. Global Hot Spares only work with RAID level 1, 10(1E), 3, 5, 6, 30, 50, or 60 volume set. You can configure up to three global hot spares with SAS RAID controller.

The "Create Hot Spare" option gives you the ability to define a global hot spare disk drive. To effectively use the global hot spare feature, you must always maintain at least one drive that is marked as a global spare.

Important:

The hot spare must have at least the same capacity as the drive it replaces.

• Hot-Swap Disk Drive Support

The SAS RAID controller chip includes a protection circuit that supports the replacement of SAS/SATA hard disk drives without having to shut down or reboot the system. A removable hard drive tray can deliver "hot swappable" fault-tolerant RAID solutions. This feature provides advanced fault tolerant RAID protection and "online" drive replacement.

• Auto Declare Hot-Spare

If a disk drive is brought online into a system operating in degraded mode, the SAS RAID controllers will automatically declare the new disk as a spare and begin rebuilding the degraded volume. The Auto Declare Hot-Spare function requires that the smallest drive contained within the volume set in which the failure occurred.

In the normal status, the newly installed drive will be reconfigured an online free disk. But, the newly-installed drive is automatically assigned as a hot spare if any hot spare disk was used to rebuild and without new installed drive replaced it. In this condition, the Auto Declare Hot-Spare status will be disappeared if the RAID subsystem has since powered off/on.

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The Hot-Swap function can be used to rebuild disk drives in arrays with data redundancy such as RAID level 1, 10(1E), 3, 5, 6, 30, 50 and 60.

● Auto Rebuilding

If a hot spare is available, the rebuild starts automatically when a drive fails. The SAS RAID controllers automatically and transparently rebuild failed drives in the background at user-definable rebuild rates.

If a hot spare is not available, the failed disk drive must be replaced with a new disk drive so that the data on the failed drive can be automatically rebuilt and so that fault tolerance can be maintained.

The SAS RAID controllers will automatically restart the system and rebuilding process if the system is shut down or powered off abnormally during a reconstruction procedure condition.

When a disk is hot swapped, although the system is functionally operational, the system may no longer be fault tolerant. Fault tolerance will be lost until the removed drive is replaced and the rebuild operation is completed.

During the automatic rebuild process, system activity will continue as normal, however, the system performance and fault tolerance will be affected.

● Adjustable Rebuild Priority

Rebuilding a degraded volume incurs a load on the RAID subsystem. The SAS RAID controllers allow the user to select the rebuild priority to balance volume access and rebuild tasks appropriately. The Background Task Priority is a relative indication of how much time the controller devotes to a background operation, such as rebuilding or migrating.

The SAS RAID controller allows user to choose the task priority (Ultra Low (5%), Low (20%), Medium (50%), High (80%)) to balance volume set access and background tasks appropriately. For

high array performance, specify an Ultra Low value. Like volume initialization, after a volume rebuilds, it does not require a system reboot.

High Reliability

• Hard Drive Failure Prediction

In an effort to help users avoid data loss, disk manufacturers are now incorporating logic into their drives that acts as an "early warning system" for pending drive problems. This system is called SMART. The disk integrated controller works with multiple sensors to monitor various aspects of the drive's performance, determines from this information if the drive is behaving normally or not, and makes available status information to SAS RAID controller firmware that probes the drive and look at it.

The SMART can often predict a problem before failure occurs. The controllers will recognize a SMART error code and notify the administer of an impending hard drive failure.

• Auto Reassign Sector

Under normal operation, even initially defect-free drive media can develop defects. This is a common phenomenon. The bit density and rotational speed of disks is increasing every year, and so are the potential of problems. Usually a drive can internally remap bad sectors without external help using cyclic redundancy check (CRC) checksums stored at the end of each sector.

SAS RAID controller drives perform automatic defect re-assignment for both read and write errors. Writes are always completed - if a location to be written is found to be defective, the drive will automatically relocate that write command to a new location and map out the defective location. If there is a recoverable read error, the correct data will be transferred to the host and that location will be tested by the drive to be certain the location is not defective. If it is found to have a defect, data will be automatically relocated, and the defective location is mapped out to prevent future write attempts.

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In the event of an unrecoverable read error, the error will be reported to the host and the location will be flagged as being potentially defective. A subsequent write to that location will initiate a sector test and relocation should that location prove to have a defect. Auto Reassign Sector does not affect disk subsystem performance because it runs as a background task. Auto Reassign Sector discontinues when the operating system makes a request.

• Consistency Check

A consistency check is a process that verifies the integrity of redundant data. To verify RAID 3, 5, 6, 30, 50 or 60 redundancy, a consistency check reads all associated data blocks, computes parity, reads parity, and verifies that the computed parity matches the read parity.

Consistency checks are very important because they detect and correct parity errors or bad disk blocks in the drive. A consistency check forces every block on a volume to be read, and any bad blocks are marked; those blocks are not used again. This is critical and important because a bad disk block can prevent a disk rebuild from completing. We strongly recommend that you run consistency checks on a regular basis—at least once per week. Note that consistency checks degrade performance, so you should run them when the system load can tolerate it.

Data Protection

• Battery Backup

The SAS RAID controllers are armed with a Battery Backup Module (BBM). While a Uninterruptible Power Supply (UPS) protects most servers from power fluctuations or failures, a BBM provides an additional level of protection. In the event of a power failure, a BBM supplies power to retain data in the SAS RAID controller's cache, thereby permitting any potentially dirty data in the cache to be flushed out to secondary storage when power is restored.

The batteries in the BBM are recharged continuously through a trickle-charging process whenever the system power is on. The batteries protect data in a failed server for up to three or four

days, depending on the size of the memory module. Under normal operating conditions, the batteries last for three years before replacement is necessary.

• **Recovery ROM**

The SAS RAID controller firmware is stored on the flash ROM and is executed by the I/O processor. The firmware can also be updated through the SAS RAID controllers terminal port or Ethernet port without the need to replace any hardware chips. During the controller firmware upgrade flash process, it is possible for a problem to occur resulting in corruption of the controller firmware. With our Redundant Flash Image feature, the controller will revert back to the last known version of firmware and continue operating. This reduces the risk of system failure due to firmware crash.

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Appendix G

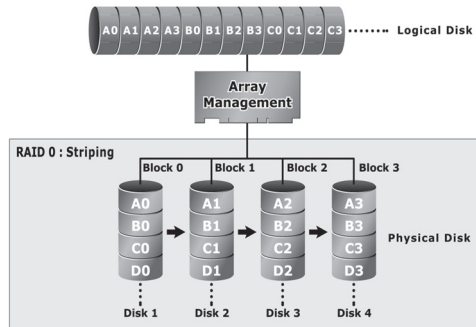
Understanding RAID

RAID is an acronym for Redundant Array of Independent Disks. It is an array of multiple independent hard disk drives that provides high performance and fault tolerance. The SAS RAID controller implements several levels of the Berkeley RAID technology. An appropriate RAID level is selected when the volume sets are defined or created. This decision should be based on the desired disk capacity, data availability (fault tolerance or redundancy), and disk performance. The following section discusses the RAID levels supported by the SAS RAID controllers.

The SAS RAID controllers makes the RAID implementation and the disks' physical configuration transparent to the host operating system. This means that the host operating system drivers and software utilities are not affected, regardless of the RAID level selected. Correct installation of the disk array and the controller requires a proper understanding of RAID technology and the concepts.

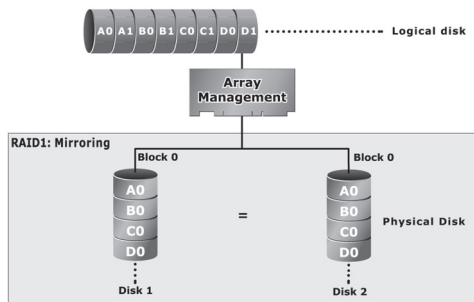
RAID 0

RAID 0, also referred to as striping, writes stripes of data across multiple disk drives instead of just one disk drive. RAID 0 does not provide any data redundancy, but does offer the best High-speed data throughput. RAID 0 breaks up data into smaller blocks and then writes a block to each drive in the array. Disk striping enhances performance because multiple drives are accessed simultaneously; the reliability of RAID level 0 is less because the entire array will fail if any one disk drive fails.



RAID 1

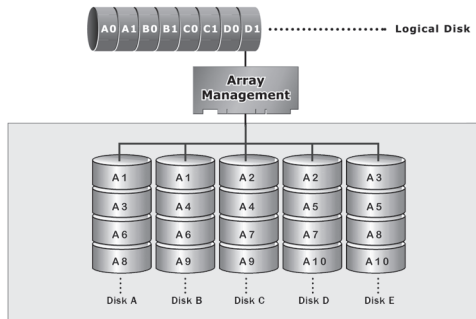
RAID 1 is also known as “disk mirroring”; data written on one disk drive is simultaneously written to another disk drive. Read performance will be enhanced if the array controller can, in parallel, access both members of a mirrored pair. During writes, there will be a minor performance penalty when compared to writing to a single disk. If one drive fails, all data (and software applications) are preserved on the other drive. RAID 1 offers extremely high data reliability, but at the cost of doubling the required data storage capacity.



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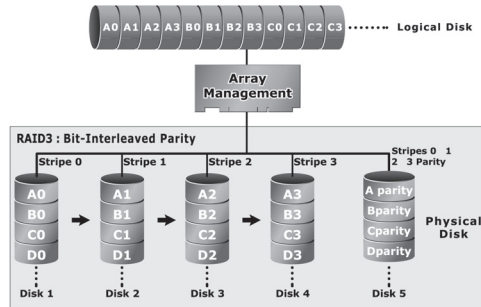
RAID 10(1E)

RAID 10 is a combination of RAID 0 and RAID 1, combining striping with disk mirroring. RAID Level 10 combines the fast performance of Level 0 with the data redundancy of level 1. In this configuration, data is distributed across several disk drives, similar to Level 0, which are then duplicated to another set of drive for data protection. RAID 10 has been traditionally implemented using an even number of disks, some hybrids can use an odd number of disks as well. Illustration is an example of a hybrid RAID 10 array comprised of five disks; A, B, C, D and E. In this configuration, each strip is mirrored on an adjacent disk with wrap-around. Areca RAID 10 offers a little more flexibility in choosing the number of disks that can be used to constitute an array. The number can be even or odd.



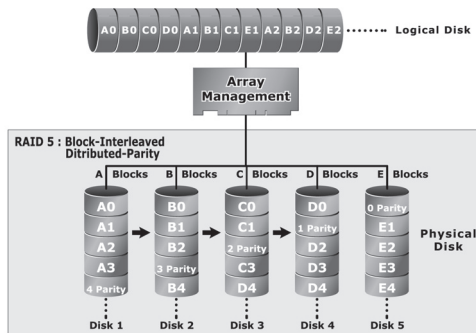
RAID 3

RAID 3 provides disk striping and complete data redundancy through a dedicated parity drive. RAID 3 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks, and then writes the blocks to all but one drive in the array. The parity data created during the exclusive-or is then written to the last drive in the array. If a single drive fails, data is still available by computing the exclusive-or of the contents corresponding strips of the surviving member disk. RAID 3 is best for applications that require very fast data- transfer rates or long data blocks.



RAID 5

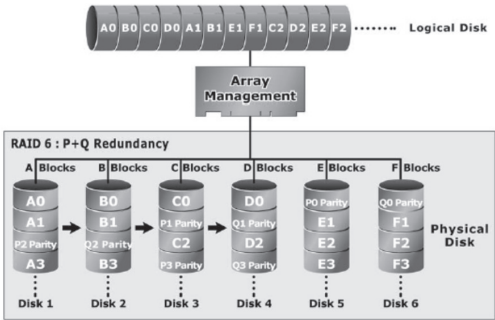
RAID 5 is sometimes called striping with parity at byte level. In RAID 5, the parity information is written to all of the drives in the controllers rather than being concentrated on a dedicated parity disk. If one drive in the system fails, the parity information can be used to reconstruct the data from that drive. All drives in the array system can be used for seek operations at the same time, greatly increasing the performance of the RAID system. This relieves the write bottleneck that characterizes RAID 4, and is the primary reason that RAID 5 is more often implemented in RAID arrays.



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RAID 6

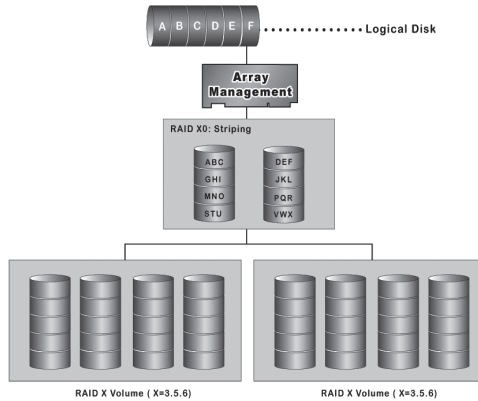
RAID 6 provides the highest reliability. It is similar to RAID 5, but it performs two different parity computations or the same computation on overlapping subsets of the data. RAID 6 can offer fault tolerance greater than RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed parity data. RAID 6 is an extension of RAID 5 but uses a second, independent distributed parity scheme. Data is striped on a block level across a set of drives, and then a second set of parity is calculated and written across all of the drives.



RAID x0

RAID level-x0 refers to RAID level 30, 50 and 60. RAID x0 is a combination multiple RAID x volume sets with RAID 0 (striping). Striping helps to increase capacity and performance without adding disks to each RAID x array. The operating system uses the spanned volume in the same way as a regular volume. Up to one drive in each sub-volume (RAID 3 or 5) may fail without loss of data. Up to two drives in each sub-volume (RAID 6) may fail without loss of data.

RAID level x0 allows more physical drives in an array. The benefits of doing so are larger volume sets, increased performance, and increased reliability. The following illustration is an example of a RAID level x0 logical drive.



Important:

RAID level 30, 50 and 60 can support up to eight sub-Volumes (RAID set). If the volume is RAID level 30, 50, or 60, you cannot change the volume to another RAID level. If the volume is RAID level 0, 1, 10(1E), 3, 5, or 6, you cannot change the volume to RAID level 30, 50, or 60.

JBOD

(Just a Bunch Of Disks) A group of hard disks in a RAID box are not set up as any type of RAID configuration. All drives are available to the operating system as an individual disk. JBOD does not provide data redundancy.

Single Disk (Pass-Through Disk)

Pass through disk refers to a drive that is not controlled by the RAID firmware and thus can not be a part of a RAID volume. The drive is available to the operating system as an individual disk.

APPENDIX

Summary of RAID Levels

RAID subsystem supports RAID Level 0, 1, 10(1E), 3, 5, 6, 30, 50 and 60. The following table provides a summary of RAID levels.

Features and Performance			
RAID Level	Description	Min. Disks requirement	Data Reliability
0	Also known as striping Data distributed across multiple drives in the array. There is no data protection.	1	No data Protection
1	Also known as mirroring All data replicated on N Separated disks. N is almost always 2. This is a high availability Solution, but due to the 100% duplication, it is also a costly solution.	2	Single-disk failure
10	Also known Block-Interleaved Parity. Data and parity information is sub-divided and distributed across all disks. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk.	3	single-disk failure
3	Also known Bit-Interleaved Parity. Data and parity information is sub-divided and distributed across all disk. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk.	3	single-disk failure
5	Also known Block-Interleaved Distributed Parity. Data and parity information is sub-divided and distributed across all disk. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk.	3	single-disk failure
6	As RAID level 5, but with additional independently computed redundant information	4	Two-disk failure

APPENDIX

30	RAID 30 is a combination multiple RAID 3 volume sets with RAID 0 (striping)	6	Up to one disk failure in each sub-volume
50	RAID 50 is a combination multiple RAID 5 volume sets with RAID 0 (striping)	6	Up to one disk failure in each sub-volume
60	RAID 60 is a combination multiple RAID 6 volume sets with RAID 0 (striping)	8	Up to two disk failure in each sub-volume