Areca RAID Subsystem

ARC-8040 User's Manual

(8-Bays 6Gb/s SAS to SAS RAID Subsystem)

Version: 1.0
Issue Date: May, 2010

Copyright and Trademarks

FCC Statement

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

Manufacturer's Declaration for CE Certification

We confirm ARC-8040 has been tested and found comply with the requirements set up in the council directive on the approximation of the low of member state relating to the EMC Directive2004/108/EC. For the evaluation regarding to the electromag-netic compatibility, the following standards where applied:

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

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

Contents

INTRODUCTION

1. Introduction

This section presents a brief overview of the ARC-8040 Compact Tower 6Gb/s SAS RAID subsystem.

1.1 Overview

The ARC-8040 is the most complete 8-bay subsystem with RAID control capabilities. The ARC-8040 unleashes a truly innovative 6Gb/s SAS to SAS RAID solution for both PC and Mac. SAS 2.0 is designed for backward compatibility with SAS 1.0, twice speed data transfer 6Gb/s than previous available. The SAS 2.0 interface supports both 6Gb/s SAS disk drives for data-intensive applications and 6Gb/s SATA drives for low-cost bulk storage of reference data. The ARC-8040 supports interface flexibility configuration; one 4-port 6Gb/s SAS host and one 4-port 6Gb/s SAS expander or two 4-port 6Gb/s SAS host for easy expansion and performance. When expander port used with SAS 6Gb/s expander, the ARC-8040 can provide up to (122) devices through one or more 6Gb/s SAS JBODs, making it an ideal solution for enterprise-class storage applications that call for maximum configuration flexibility.The 6Gb/s host interfaces make ARC-8040 RAID subsystem well suited for professionals who need large capacity and exceptional performance with connectivity. The intelligent cooling continuously adapts to environmental conditions by automatically controlling the speed of the cooling fans. This super silent design, optimizing balance between noise reduction and necessary cooling, makes ARC-8040 well suited for audio/video application especially the rapidly growing demand from the Mac Video Editing markets.

1.1.1 Host Interface-6Gb/s SAS

The external host connector is provided on the back of the SAS RAID subsystem for connecting the array to server host adapter. There are two SFF-8088 connector on the rear of ARC-8040. You can use two host ports (Host) or one host port(Host)/one expander port (JBOD) configuration. The ARC-8040 host interface appears to the host subsystem as a 6Gb/s SAS target device. Both channels can access to the same volume set, but user can only write through one channel each time for data consistency.

INTRODUCTION

The following diagram is the block diagram of ARC-8040.

```
┌─────────────────┐
│   ARC-8040      │      6Gb/s Host Interface
│  RAID Subsystem │
└─────────────────┘
                    ┌ ─ ─ ─ ─ ─ ─ ┐      ┌──────────────────┐
┌──────────┐        │ RAID Subsystem│     │   SAS Drives     │
│  Host    │───────▶│  Subsystem board│──▶│     (Max 8)      │
└──────────┘        │                │     └──────────────────┘
                    └ ─ ─ ─ ─ ─ ─ ┘  ──▶ ┌──────────────────┐
                                          │      JBOD        │
                                          └──────────────────┘
```
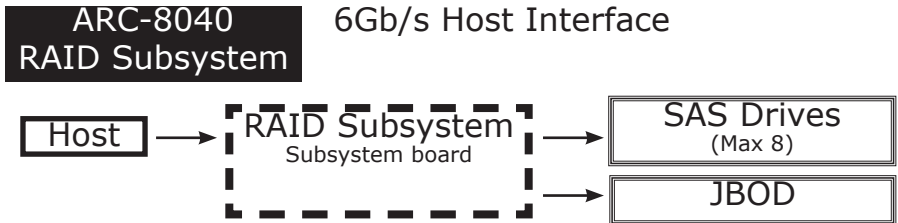
1.1.2 Disk Interface- 6Gb/s SAS

The ARC-8040 RAID subsystem communicates directly with the array's 8 SAS/SATA/SSD drives via a built-in 6 Gb/s SAS inter-face. When the host is directly controlling the drives, the RAID subsystem board translates all communications between the host and 6Gb/s and 3Gb/s SAS/SATA/SSD devices.

1.1.3 RAID Subsystem Board

The ARC-8040 RAID subsystem board incorporates onboard high performance 800MHz RAID_on_Chip storage processor and on-board DDR2-800 SDRAM memory to deliver true hardware RAID. Applications demand for higher computing power, networking bandwidth and support for virtualization applications are driving RAID subsystem for improved architecture internal bus interface and RAID performance. The powerful new ROC processors integrated 8 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.

Designed and leveraged with Areca's existing high performance solution, this subsystem delivers high-capacity performance at the best of cost/ performance value. Hardware RAID subsystem has their own local RAID processor onboard, plus dedicated onboard cache for full hardware offloading of RAID-processing functions. The ability of hardware RAID subsystems to rebuild an array in the event of a drive failure is superior to what software RAID subsystem offer. The ARC-8040 provides RAID levels 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60, Single Disk or JBOD RAID

INTRODUCTION

configurations. Its high data availability and protection derives from the section 1.2 features.

Configuration and monitoring can be managed either through the LCD control panel, RS232 port or 1Gb/s LAN port. The firmware also contains an embedded terminal emulation via the RS-232 port. The firmware-embedded Web Browser-based RAID manager allows local or remote to access it from any standard internet browser via a LAN port. The subsystem 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 Disk Stress Test (DST) utility kicks out disks meeting marginal spec before the RAID unit is actually put on-line for real business. The hardware monitor can monitor system voltage and temperature. The warning message will show in the LCD, alarm buzzer and respect LED.

1.2. Features

Adapter Architecture
- 800 MHz RAID-on-Chip for RAID core and SAS microcode
- 512MB on-board DDR2-800 SDRAM with ECC protection
- RAID 6 engine to support extreme performance RAID 6 function
- 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, 10(1E), 3, 5, 6, 30, 50, 60 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
- Instant availability and background initialization
- 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 Ethernet port
- Max 122 devices
- Max 128 LUNs (volume set) per controller

Drive Interface
- Up to 8 x 6Gb/s SAS port
- Up to 122 devices using SAS expanders (one Host/JBOD external SFF-8088 connector)
- Up to 6Gb/s per port

Host Interface
- 6Gb/s SAS-to-SAS
  One (port0) or two (port0 & port1) external SFF-8088 6Gb/s SAS ports-600MB/sec per PHY link

Monitors/Notification
- LCD Control Panel for setup, alarm mute and configuration
- System status indication through LCD, LED and alarm buzzer
- Subsystem management ready

RAID Management
- Field-upgradeable firmware in flash ROM via RS-232 and 1Gb/s LAN port
- LCD Hot-Key supports one-step creation RAID configuration
- Firmware-embedded manager via RS-232 port
- Firmware-embedded browser-based RAID manager, SMTP manager, SNMP agent and Telnet function via 1Gb/s LAN port
- Support Out-of-Band API library for customer to write its own AP

Mechanical Specifications
- Form Factor: Compact – 8 Disk Compact Tower
- Operation temperature: 0° ~ 40°C

INTRODUCTION

- Operation humidity: 5 ~ 95 %, Non-condensing
- Cooling Fan: 2 x 2700rpm/0.135A Brushless Fan
- Power Supply/In/out: 220W / 90-256V AC / +12V/16A,
  +5V/16A, +3.3V/14A
- Dimension (W x H x D):   146 x 302 x 290 mm
- Weight: 14.9 lbs / 6.8Kg (Without Disk)

2. Hardware Installation

This section describes how to install the ARC-8040 with host computer and disks.

2.1 Before You First Installing

Thanks for purchasing the ARC-8040 as your RAID data storage subsystem. The following manual gives simple step-by-step instructions for installing and configuring the ARC-8040 RAID subsystem.

Unpack
Unpack and install the hardware in a static-free environment. The ARC-8040 RAID subsystem is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage. If the ARC-8040 RAID subsystem appears damaged, or if any items of the contents listed below are missing or damaged, please contact your dealer or distributor immediately.

Checklist
• ARC-8040 8-bays RAID compact tower
• SFF-8088 to SFF-8088 cables
• Power cord
• RJ11 to DB9 serial communications null-modem cable
• RJ-45 LAN cable
• Power cord
• 32 x drive mounting screws (4 per drive tray)
• ARC-8040 user manual

HARDWARE INSTALLATION

2.2 ARC-8040 RAID Subsystem View

The following diagram is the ARC-8040 RAID subsystem front view and rear view.

Front View	Rear View
1. Disk Activity LED 2. Disk Fault/Link LED 3. LCD Panel with Keypad	4. System Fan 5. RS232 Port 6. LAN Port (For RAID Manager) 7. Link/Access (For Host Port) 8. SAS Port (Host) 9. Link/Access (For Host/JBOD Port) 10. SAS Port (Host/JBOD) 11. System Fan 12. On/Off Switch 13. Power Supply Fan 14. Power Connector

2.3 Locations of the Subsystem Component

The following describes the activity and fault LED location and function.

2.3.1 Drive Tray LED Indicators
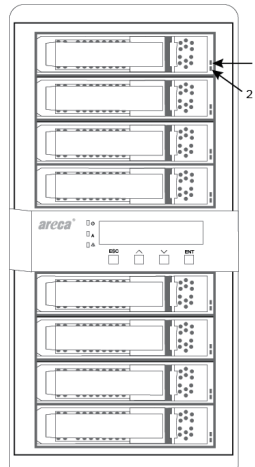
Figure 2-1, Activity/Fault LED for ARC-8040 RAID subsystem

LED	Normal Status	Problem Indication
1. Activity LED (Blue)	When the activity LED is illuminated, there is I/O activity on that disk drive. When the LED is dark; there is no activity on that disk drive.	N/A
2. Fault/Link LED (Red/ Green)	When the fault LED is solid illuminated, there is no disk present. When the link LED is solid illuminated, there is a disk present. The link LED is slow blinking (one time/2 seconds, when the host power off)	When the fault LED is off, that disk is present and status is normal. When the fault LED is slow blinking (2 times/sec.), that disk drive has failed and should be hot-swapped immediately. When the activity LED is illuminated and fault LED is fast blinking (10 times/sec.) there is rebuilding activity on that disk drive.

HARDWARE INSTALLATION

2.3.2 SAS Host/Expander LED Indicators
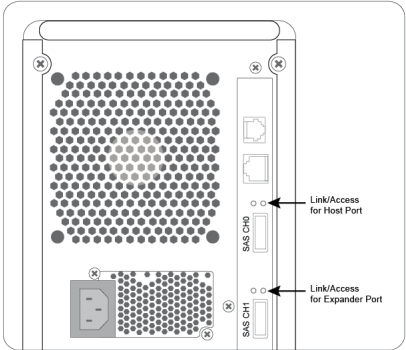
You configure the Host/JBOD port as a Host or JBOD function using the "Raid System function" on LCD/VT-100 or "System Config" on web browser configuration.

The following table describes the ARC-8040 SAS RAID subsystem Host or host/JBOD port defined as a host link/activity LED.

Host Function LED	Status
Link LED (Green light)	When host port link LED illuminate for 1 second and light off for 3 seconds that indicates one link has connected. When host port Link LED illuminate for 2 seconds and light off for 2 seconds that indicates two links have connected. When host port Link LED illuminate for 4 seconds that indicates four links have connected.
Activity LED (Blue light)	When activity LED illuminated that indicates SAS host adapter accesses to the ARC-8040 RAID subsystem.

The following table describes the ARC-8040 SAS RAID subsystem host/JBOD port defined as a JBOD link/activity LED.

JBOD Function LED	Status
Link LED (Green light)	When expander port link LED illuminate for 1 second and light off for 3 seconds that indicates one link has connected. When expander port Link LED illuminate for 2 seconds and light off for 2 seconds that indicates two links have connected. When expander port Link LED illuminate for 4 seconds that indicates four links have connected.
Activity LED (Blue light)	When activity LED illuminated that indicates ARC-8040 expander port accesses to the SAS JBOD.

2.4 Installation

Following the instructions below to install ARC-8040 RAID subsystem.

Step 1. Install the Drives in the ARC-8040 RAID Subsystem

1. Gently slide the drive tray out from the ARC-8040 RAID subsystem.
2. Install the drive into the drive tray and secure the drive to the drive tray by four of the mounting screws.
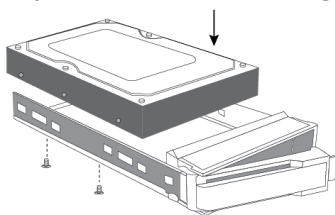
Figure 2-2, Secure the drive to the drive tray

Note:

Please secure four of the mounting screws to the tray, otherwise the ARC-8040 may produce an annoying BUZZ sound in a few environments.

3. After all drives are in the drive tray, slide all of them back into the ARC-8040 RAID subsystem and make sure you latch the drive trays.
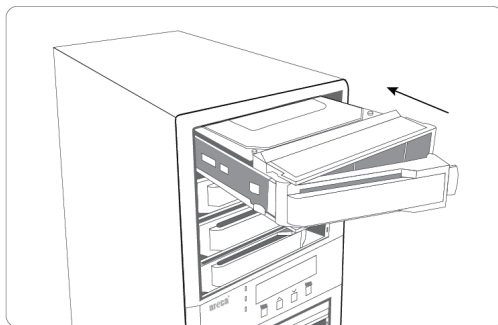
Figure 2-3, Slide drive tray back into the ARC-8040 RIAD subsystem

HARDWARE INSTALLATION

Step 2. Connecting RAID Subsystem to Host Computer

The external host connector is provided on the back of the SAS RAID subsystem for connecting the array to server host adapter. There are two SFF-8088 connectors on the rear of ARC-8040. You can configure as two host ports (Host&Host/JBOD connectors) or one host port(Host connector)/one expander port(Host/JBOD connector) configuration. The Host/JBOD port function is configured by the firmware as a Host or JBOD function using the "Raid System function" on LCD/VT-100 or "System Config" on web browser configuration. It is default configured as the JBOD port. The SAS port1 configuration screen is used to define the SAS Host/JBOD connector (For Host or JBOD function) for ARC-8040 RAID subsystem.

SAS Port1 Configuration	Host/JBOD Port Function
Host	As a host port
JBOD (default)	As an expander port

• Host Port Connection

By installing host port adapter and ARC-8040 subsystem CH0 using the correct external cables which is included in your SAS RAID subsystem kits. Then connect ARC-8040 SAS RAID subsystem and host port adapter as shown below:
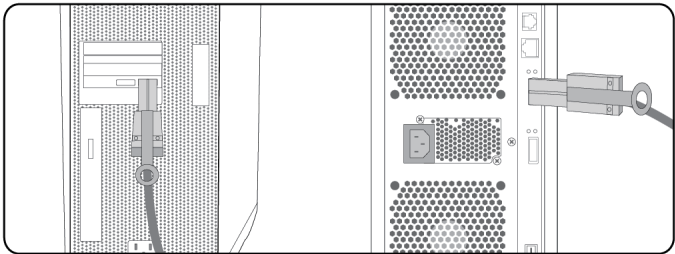
Figure 2-4 Connect ARC-8040 SAS RAID subsystem and host adapter

> ### Note:
> Turn on the ARC-8040 SAS RAID subsystem first to make sure the host adapter on the server recognizes the drives in the subsystem.

• Expander Port Connection

ARC-8040 SAS RAID subsystem is a device that contains one ex-pander port. Expander ports may support being attached to SAS initiator ports, SAS and/or SATA target ports, and to other ex-pander ports. The SAS RAID subsystem can support daisy-chain how many SAS JBOD enclosures which depend on the RAID sub-system's firmware. The SAS RAID subsystem can support daisy-chain up to 8 subsystems. The maximum drive no. is 122 through 8 subsystems. The following figure shows how to connect the external Min SAS cable from the ARC-8040 SAS RAID subsystem to the external SAS JBOD enclosure. Daisy-chains longer than the limitation of subsystems are not supported even if it may be workable.
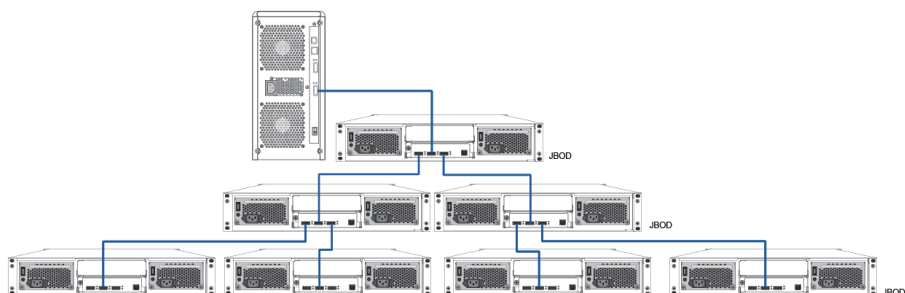
The following table is the max no. of ARC-8040 SAS RAID subsystem supported:

	Disks/ Subsystem	Expander	Devices/Controller	Volume
Max No.	32	8	122	128

Note:

Turn on the expander enclosure first to make sure the SAS RAID controller or SAS host adapter recognizes the drives in the enclosure.

HARDWARE INSTALLATION

Step 3. Connecting Monitor Port

The SAS RAID subsystem is normally delivered with LCD pre-installed. You can connect RS-232 or LAN port to the manager clinet system. It is easy to configure and manage the RAID subsystem from the clint system.

• RS232C Port Connection

The ARC-8040 RAID subsystem can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the SAS RAID subsystem for access to the text-based setup menu.

• LAN Port Connection

The ARC-8040 RAID subsystem has embedded the TCP/IP & web browser-based RAID manager in the firmware(method 3). User can remote manage the SAS RAID subsystem without adding any user specific software (platform independent) via standard web browsers directly connected to the 1Gb/s RJ45 LAN port. Connect Ethernet port of the SAS RAID subsystem using the included Ethernet cable and then to a LAN port or LAN switch.

Step 4. Power Up the RAID Subsystem

Turn on the AC power switch from power supply on the rear side of the ARC-8040 subsystem.

a. Using the included power cord, connect this power cord to a grounded electronical outlet and to the ARC-8040 RAID subsystem. (manufacture recommends that you use an uninterruptible power supply to protect your SAS RAID subsystem.)
b. Turn on the AC power switch from the back of ARC-8040 RAID subsystem.
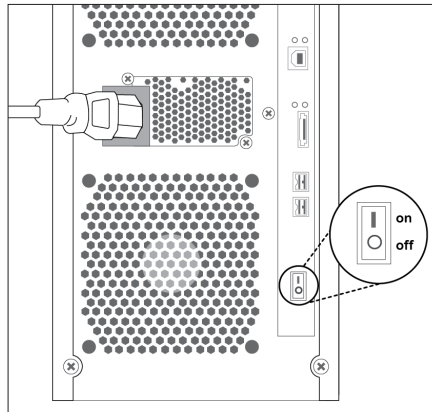
Figure 2-5, Connect the power cord to a grounded electrical outlet and to the ARC-8040 RAID subsystem.

Step 5. Configure RAID Subsystem

The ARC-8040 RAID subsystem is normally delivered with LCD pre-installed. Your ARC-8040 RAID subsystem 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. LCD Hot-Key supports one-step creation RAID configuration. For additional information on using the LCD to configure the RAID subsystem 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.

HARDWARE INSTALLATION

- Method 2: RS-232 Port Connection
  The ARC-8040 RAID subsystem can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the RAID subsystem for access to the text-based setup menu. For additional information on using the RS-232 port to configure the RAID subsystem see the Chapter 5 of VT-100 Utility Configuration.

- Method 3: LAN Port Connection
  The ARC-8040 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 1Gb/s 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 6. 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.

> **Note:**
>
> Link LED on each tray is slow blinking, when the host system power off. This indicates user's enclosure still power on.

Step 7. Format, Partition and Mount the ARC-8040 RAID Subsystem Volumes

After the volume set is ready for system accesses, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, depending on what operating system you are using (Windows, Linux, FreeBSD or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the ARC-8040 RAID subsystem can be fully used.

> **Note:**
>
> It is a good idea to turn on your ARC-8040 RAID subsystem before turning on the host computer. This will insure that the host computer recognizes the volumes and drives in the ARC-8040 RAID subsystem. If you turn on the host computer first, be sure of your host subsystem supporting hot-plug function or rescan command to recognize the ARC-8040 RAID subsystem again.

2.5 Hot-plug Drive Replacement

The ARC-8040 RAID subsystem supports the ability of performing a hot-swap drive replacement without powering down the system. A disk can be disconnected, removed, or replaced with a different disk without taking the system off-line. The ARC-8040 RAID subsystem rebuilding will be processed automatically in the background. When a disk is hot swapped, the ARC-8040 RAID subsys-

tem may no longer be fault tolerant. Fault tolerance will be lost until the hot swap drive is subsequently replaced and the rebuild operation is completed.

2.5.1 Recognizing a Drive Failure

A drive failure can be identified in one of the following ways:

1. An error status message lists failed drives in the event log.
2. Fault LED illuminates on the front of driver tray if failed drives are inside.

2.5.2 Replacing a Failed Drive

With our ARC-8040 RAID subsystem drive tray, you can replace a defective physical drive while your computer is still operating. When a new drive has been installed, data reconstruction will be automatically started to rebuild the contents of the disk drive. The capacity of the replacement drives must be at least as large as the capacity of the other drives in the RAID set.

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 1Gb/s LAN port.

Those user interfaces can access the built-in configuration and administration utility that resides in 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 as the following:
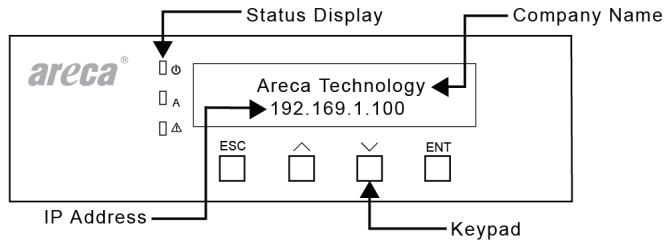
Function Key Definitions:
The four function keys at the button of the front perform the following functions:

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

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)
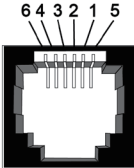
The serial port on the SAS RAID subsystem's front can be used in VT100 mode. The provided interface cable converts the RS232 signal of the 6-pin RJ11 connector on the RAID subsystem into a 9-pin D-Sub female connector. The firmware-based terminal array management interface can access the array through 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	6 4 3 2 1 5
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).
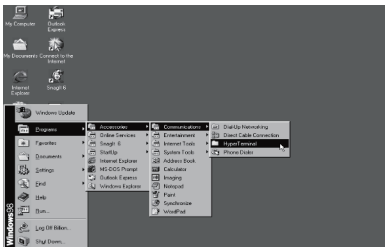
Step 2. Open **HYPERTRM.EXE** and enter a name for your Terminal. Click **OK**.

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.**
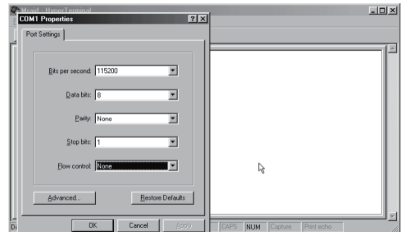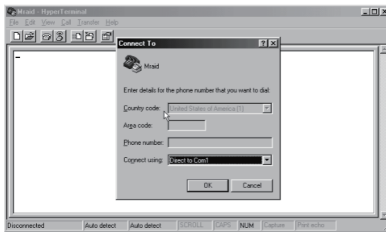
Step 4. Open the File menu, and then open Properties.
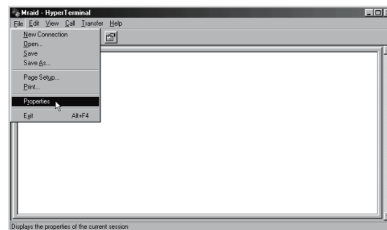
Step 5. Open the Settings Tab.
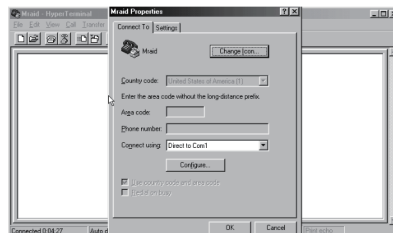
CONFIGURATION METHOD

Step 6. Open the Settings Tab. Function, arrow and ctrl keys act as: Terminal Keys, Backspace key sends: "**Crtl+H"**, Emulation: VT100, Telnet terminal: VT100, Back scroll buffer lines: 500. Click **OK**.
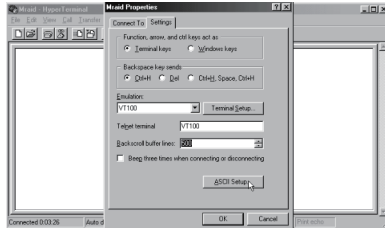
Now, the VT100 is ready to use.
After you have finished the VT100 Terminal setup, you may press " **X** " key (in your Terminal) to link the RAID subsystem and Terminal together.
Press" **X** " key to display the disk array Monitor Utility screen on your VT100 Terminal.

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 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 1Gb/s 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

Main Menu ──── Quick Volume/Raid Setup

RaidSet Function ──── Create Raid Set
Delete Raid Set
Expand Raid Set
Offline Raid Set
Active Incomplete Raid Set
Create Hot Spare
Delete Hot Spare
Display Raid Set Information

Volume Set Function ──── Create Volume Set
Create Raid 30/50/60
Delete Volume Set
Modify Volume Set
Check Volume
Stop Volume Set Check
Display Volume Set Info.

Physical Drives ──── View Drive Information
Create Pass-Through Disk
Modify Pass-Through Disk
Delete Pass-Through Disk
Identify Selected Drive
Identify Subsystem

Raid System Function ──── Mute The Alert Beeper
Alert Beeper Setting
Change Password
JBOD/RAID Function
Background Task Priority
SATA NCQ Mode Support
HDD Read Ahead Cache
Volume Data Read Ahead
Hdd Queue Depth Setting
Stagger Power On
Controller Fan Detection
SAS Port1 Configuration
Disk Write Cache Mode
Capacity Truncation
Update Firmware
Shutdown Controller
Reset Controller

HDD Power Management ──── Stagger Power On
Time to Hdd Low Power Idle
Time To Low RPM Mode
Time To Spin Down Idle Hdd

Ethernet Configuration ──── DHCP Function
Local IP Address

Show System Events ──── HTTP Port Number
Telent Port Number
SMTP Port Number
Ethernet Address

Clear All Events Buffer

Hardware Monitor Information

System Information

Note:

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

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 frontside 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
Hdd Power Management	Setting Hdd power management function
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 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.

The "Create Hot Spare" gives you the ability to define a global or dedicated hot spare. Unlike "Global Hot Spare" which can be used with any RAID sets, "Dedicated Hot Spare" can only be used with a specific RAID set or Enclosure. When a disk drive fails in the RAID set or enclosure with a dedicated Hot Spare is pre-set, data on the disk drive is rebuild automatically on the dedicated hot spare disk.

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:

LCD CONFIGURATION MENU

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.
2	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. The numbers of physical drives in a specific array determine the RAID levels that can be implemented with the array. RAID 0 requires 1 or more physical drives RAID 1 requires at least 2 physical drives RAID 1+Spare 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 + Spare requires at least 5 physical drives. Using **UP/DOWN** buttons to select RAID level for the volume set and press **ENT** to confirm it.
3	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.
4	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.
5	When you finished defining the volume set, press **ENT** to confirm the "Quick Volume And Raid Set Setup" function.
6	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.
7	Initialize the volume set you have just configured.
8	If you need to add additional volume set, using main menu "Create Volume Set" functions.

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 SATA drive connected to the ARC-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.

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	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/SAS LUN Base/SAS LUN and Tagged Queuing. All values can be changing 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.
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 Create 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.

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
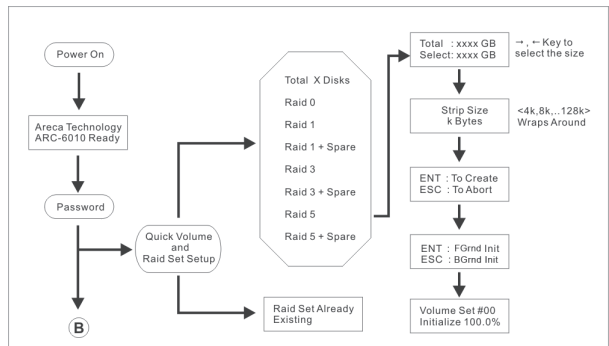
1. All of the physical disk drives are contained in a RAID set.
2. The RAID levels associated with hot spare, capacity, and stripe size are selected during the configuration process.
3. A single volume set is created and consumed all or a portion of the disk capacity available in this RAID set.
4. If 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
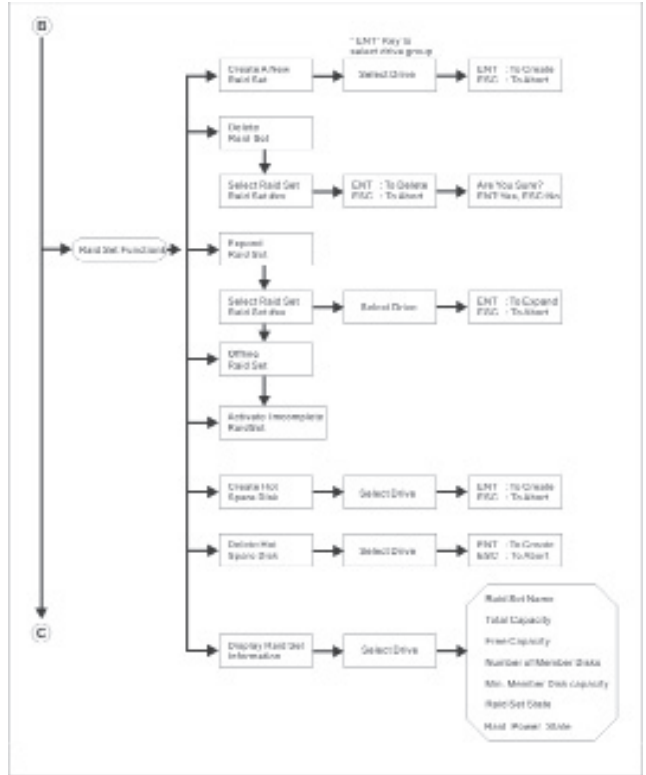
4.7.2.1 Create A New Raid Set

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 want 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

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 want 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 add capacity will be define 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 want to delete and then press **ENT** to select it. The confirmation screens appear 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.

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
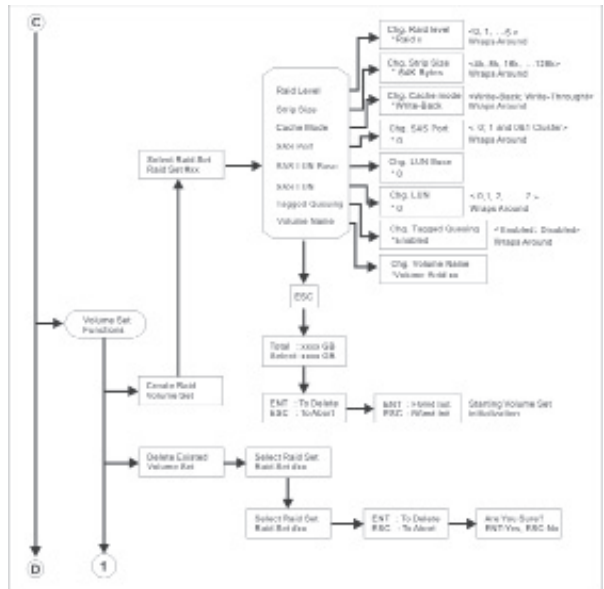
LCD CONFIGURATION MENU

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/ SAS LUN Base/ SAS LUN, Tagged Queuing and Initialization Mode, see Figure 4.7.3.1-1.

All values can be changed 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 **ENT** to accept the default value. The following is the attributes descriptions. Please refer to this chapter section 4.7 using "Raid Set Function"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 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.

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/SAS LUN Base/SAS LUN

SAS Port: Two 4-lanes SAS ports can be applied to the RAID subsystem. The RAID subsystem supports Port 0,1 and 0&1 Cluster option. If you configure the Host/JBOD port as a JBOD function on the "Raid System Function", then there will be no function on the selection of '1' and "0&1 Cluster" option.

SAS LUN base: Each SAS device attached to the SAS host adapter must be assigned a unique SAS ID number. A SAS RAId controller can connect up to 122 devices and 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 Command Tag (Drive Channel) function controls the SCSI 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.

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 want 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 volume set function.

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 want 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/SAS LUN Base/SAS LUN, 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

Figure 4.7.3.2-1
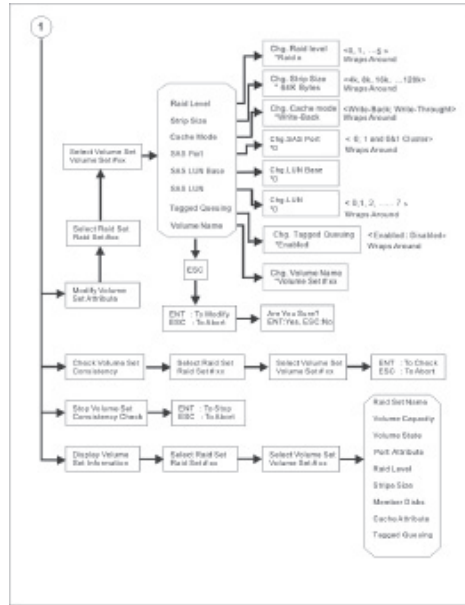
UP/DOWN buttons to choose the "Check Volume Set Consistency" option. Using **UP/DOWN** button to select the RAID set number that user want to check and press E**NT**. The confirmation screen appears, press **ENT** to start the check volume set consistency.

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

LCD CONFIGURATION MENU

Set Name, Volume Capacity, Port Attribute, Raid Level, Stripe Size,Member Disks, Cache Attribute and Tagged Queuing. All values cannot be modifying by this option.

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.

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 no controlled by the RAID subsystem's firmware and thus cannot 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/ SAS LUN Base/SAS LUN and Tagged Queuing.

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.
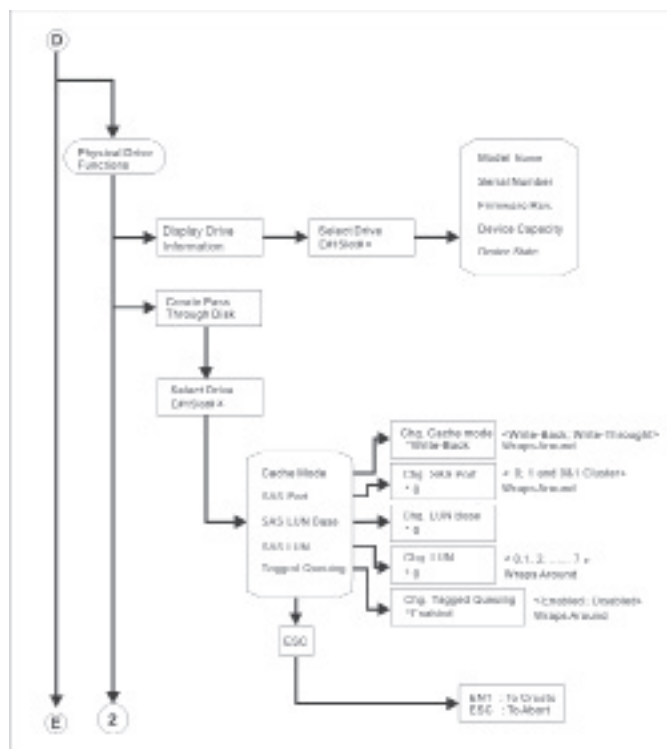
Figure 4.7.4-1

Figure 4.7.4-2
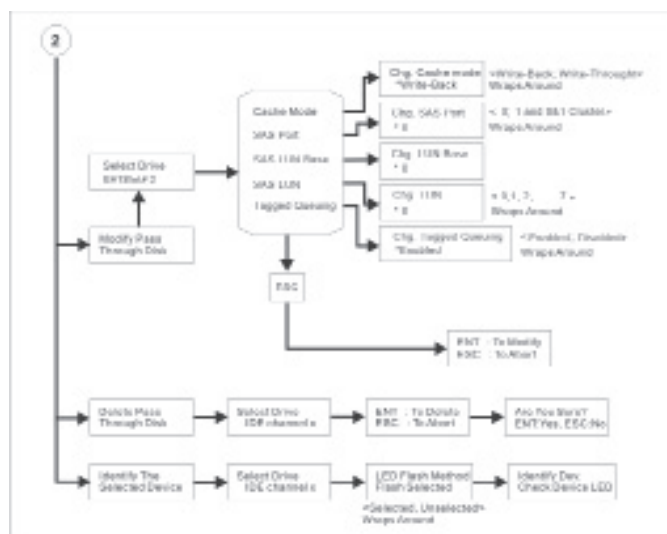
LCD CONFIGURATION MENU

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. **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 want 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.
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.

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 user 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

LCD CONFIGURATION MENU

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.

Figure 4.7.5-1
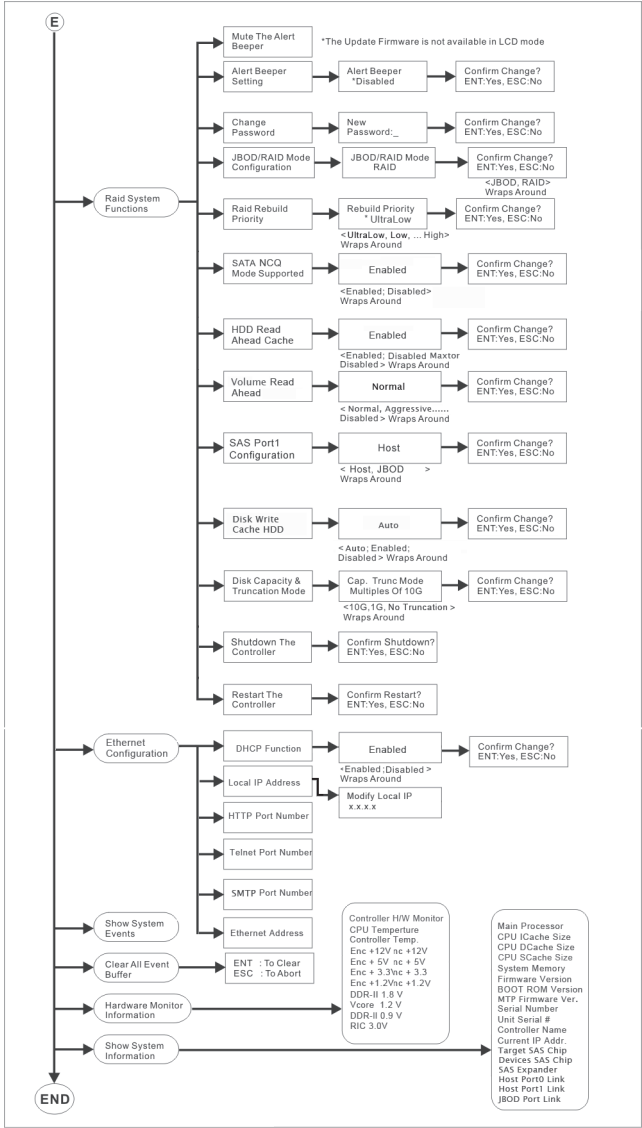
4.7.5.4 JBOD/RAID Mode Configuration

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.

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 re-build 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 Read data ahead parameter specifies the controller firmware algorithms which process the Read Ahead data blocks from the disk. The read ahead parameter is normal by default. To modify the value, you must know yuor 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.

4.7.5.9 SAS Port1 Configuration

There are two SFF-8088 connectors on the rear of ARC-8040. You can configure those two connectors as two host ports (Port0&Port1) or one host port(Port0)/one expander port(Port1) configuration. The "SAS Port1 Configuration" screen is used to define the Port1 SFF-8088 connector (Host or JBOD function) for ARC-8040 RAID subsystem. It is default configured as the JBOD port.

4.7.5.10 Disk Write Cache Mode

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

4.7.5.11 Disk Capacity Truncation Mode

The RAID subsystem use 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.

4.7.5.12 Shutdown The Controller

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

4.7.5.13 Restart Controller

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

Note:

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

4.7.6 Ethernet Configuration

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

LCD CONFIGURATION MENU

4.7.6.1 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.

4.7.6.2 Local IP Adress

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 alloc 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 Adress", 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.

4.7.6.3 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.

4.7.6.4 Telnet Port Number

To manually configure the "Telent 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 "Telent Port Number", then press **ENT**. It will show the default address setting in the RAID subsystem. You can then reassign the default "Telent Port Number" of RAID subsystem.

4.7.6.5 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.

4.7.6.6 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.

4.7.7 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.

4.7.8 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.

4.7.9 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 atatus and voltage of the RAID subsystem. All items are also unchangeable. The warning messages will indicate through the LCD, LED and alarm buzzer.

4.7.10 System Information

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

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:

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

VT-100 UTILITY CONFIGURATION

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	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. 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. Highlight the desired RAID level for the volume set and press the **Enter** key to confirm.
3	The capacity for the current volume set is entered after highlighting the desired RAID level and pressing the **Enter** key. 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.
4	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.
5	When you are finished defining the volume set, press the **Yes** key to confirm the "Quick Volume And Raid Set Setup" function.
6	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.

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	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. 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. 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.

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.

```
Areca Technology Corporation RAID Controller

    Main Menu
   ┌──────────────────────────┐
   │ Quick Volume/Raid Setup  │
   │ Raid Set Function        │
   │ Volume Set Function      │
   │ Physical Drives          │        ┌──────────────────┐
   │ Raid System Function     │        │  Verify Password │
   │ Hdd Power Management      │        │                  │
   │ In Band SAS Config       │        │ █                │
   │ Ethernet Configuration   │        └──────────────────┘
   │ View System Events       │
   │ Clear Event Buffer       │
   │ Hardware Monitor         │
   │ System information       │
   └──────────────────────────┘
 Arrow Key  Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```

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".

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
Hdd Power Management	Setting Hdd power management function
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 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.
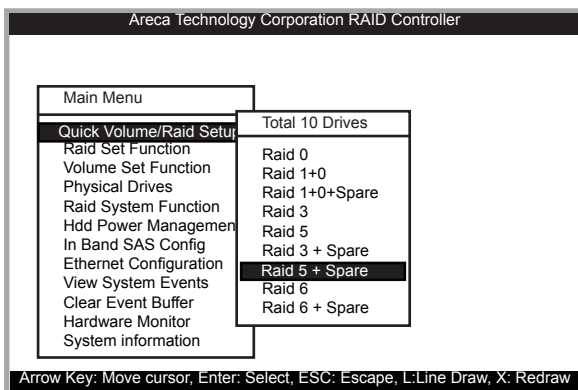
If volume capacity will exceed 2TB, controller will show the "Greater Two TB Volume Support" sub-menu.

• No
It keeps the volume size with max. 2TB limitation.

• Use 64bit LBA
This option uses 16 bytes CDB instead of 10 bytes. The maximum
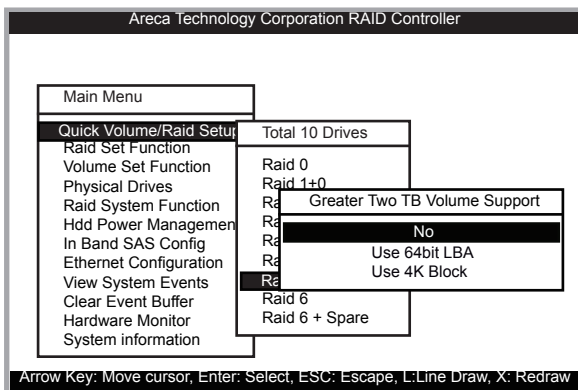
volume capacity up to 512TB.
This option works on different OS which supports 16 bytes CDB.
Such as:
Windows 2003 with SP1 or later
Linux kernel 2.6.x or later

• Use 4K Block
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.

```
            Areca Technology Corporation RAID Controller

   Main Menu
  Quick Volume/Raid Setup    Total 10 Drives
   Raid Set Function          Raid 0
   Volume Set Function        Raid 1+0
   Physical Drives            Raid      Available Capacity :   800.0GB
   Raid System Function       Raid
   Hdd Power Management       Raid      Edit The Capacity  :   800.0GB
   In Band SAS Config         Raid 3 + Spare
   Ethernet Configuration     Raid 5 + Spare
   View System Events         Raid 6
   Clear Event Buffer         Raid 6 + Spare
   Hardware Monitor
   System information
  Arrow Key: Move cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```

VT-100 UTILITY CONFIGURATION

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.

```
Areca Technology Corporation RAID Controller

  Main Menu
  Quick Volume/F        Total 10 Drives
    Raid Set Funct
    Volume Set Fu     Raid 0
    Physical Drives   Raid 1+0
    Raid System F     Raid    Available Capa    Select Strip Size
    Hdd Power Ma      Raid
    In Band SAS C     Raid    Edit The Capac         4K
    Ethernet Confi    Raid 3 + Spare                 8K
    View System E     Raid 5 + Spare                16K
    Clear Event Bu    Raid 6                         32K
    Hardware Mon      Raid 6 + Spare                 64K
    System information                              128K

  Arrow Key: Move cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
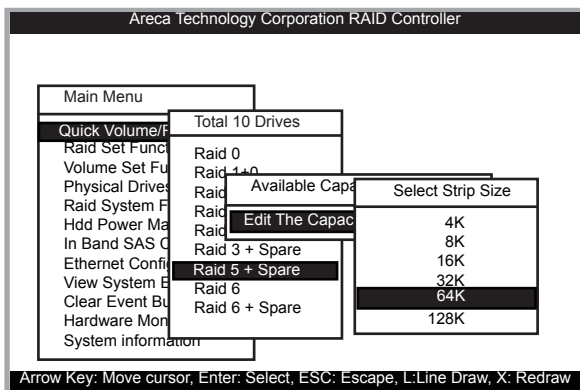
A larger stripe size produces better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer performs random reads more often, select a smaller stripe size.

Press **Yes** key 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 and "No Init (To Rescue Volume)" for recovering the missing RAID set configuration.

```
Areca Technology Corporation RAID Controller

  Main Menu
  Quick Volume/F        Total 10 Drives
    Raid Set Funct
    Volume Set Fu     Raid 0
    Physical Drives   Raid 1+0
    Raid System F     Raid    Available Capa    Select Strip Size
    Hdd Power Ma      Raid
    In Band SAS C     Raid    Edit The Capac         4K
    Ethernet Confi    Raid    Initialization Mode    8K
    View System E             Foreground Initialization  16K
    Clear Event Bu            Background Initialization  32K
    Hardware Mon              No Init (To Rescue Volume) 64K
    System information                            128K

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

VT-100 UTILITY CONFIGURATION

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.

```
┌─────────────────────────────────────────────────────────┐
│         Areca Technology Corporation RAID Controller      │
│                                                           │
│     ┌──────────────────────┐                             │
│     │ Main Menu            │                             │
│     │ Quick Volume/Raid Setup │                          │
│     │ Raid Set Function    │                             │
│     │ Volume Set Function  │  ┌──────────────────────┐  │
│     │ Physical Drives      │  │ Raid Set Function    │  │
│     │ Raid System Function │  │ Create Raid Set      │  │
│     │ Hdd Power Managem    │  │ Delete Raid Set      │  │
│     │ In Band SAS Config   │  │ Expand Raid Set      │  │
│     │ Ethernet Configuratio│  │ Offline Raid Set     │  │
│     │ View System Events   │  │ Activate Raid Set    │  │
│     │ Clear Event Buffer   │  │ Create Hot Spare     │  │
│     │ Hardware Monitor     │  │ Delete Hot Spare     │  │
│     │ System information   │  │ Rescue Raid Set      │  │
│     └──────────────────────┘  │ Raid Set Information │  │
│                                └──────────────────────┘  │
│  Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────┘
```

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.

VT-100 UTILITY CONFIGURATION

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.

```
                Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function
          Volume Set F          Select IDE Drives For Raid Set
          Physical Driv
          Raid System    [*]E1Slot#3    500.1GBST380023AS
          Hdd Power M    [ ]E1Slot#4    500.1GBST380013AS
          In Band SAS    [ ]E1Slot#5     80.1GBST980013AS
          Ethernet Con   [ ]E1Slot#6    200.1GBST350013AS
          View System    [ ]E1Slot#9    500.1GBST380013AS
          Clear Event B  [ ]E1Slot#10    80.1GBST770013AS
          Hardware Mo    [ ]E1Slot#11   200.1GBST670013AS
          System inform  [ ]E1Slot#15   250.1GBST880013AS
                            Raid Set Information

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

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 to define another RAID sets.

```
                Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function
          Volume Set Fu          Select IDE Drives For Raid Set
          Physical Drive
          Raid System R  [*]E1Slot#3    500.1GBST380023AS
          Hdd Power Ma   [ ]E1Slot#4    500.1GBST380013AS
          In Band SAS (  [ ]E1Slot#5          Create Raid Set
          Ethernet Confi [ ]E1Slot#6    2   Edit The Raid Set Name
          View System B  [ ]E1Slot#9    5
          Clear Event Bo [ ]E1Slot#10     Raid Set # 000
          Hardware Mon   [ ]E1Slot#11   200.1GBST670013AS
          System inform  [ ]E1Slot#15   250.1GBST880013AS

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

Note:

1. You only can 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 122 for RAID 30/50/60.

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.

```
Areca Technology Corporation RAID Controller

    Main Menu
    Quick Volume/Raid Setup
    Raid Set Function      Raid Set Function
    Volume Set Func
    Physical Drives        Create Raid Set
    Raid System Fu         Delete Raid Set
    Hdd Power Mana         Expa        Select Raid Set to Delete
    In Band SAS Co         Offlin
    Ethernet Configu       Activa   Raid Set # 000 : 1/1 Disk: Normal
    View System Ev         Create Hot Spa     Are you Sure?
    Clear Event Buff       Delete Hot Spa
    Hardware Monito        Rescue Raid S         Yes
    System informat        Raid Set Information   No

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

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 radio 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.

VT-100 UTILITY CONFIGURATION
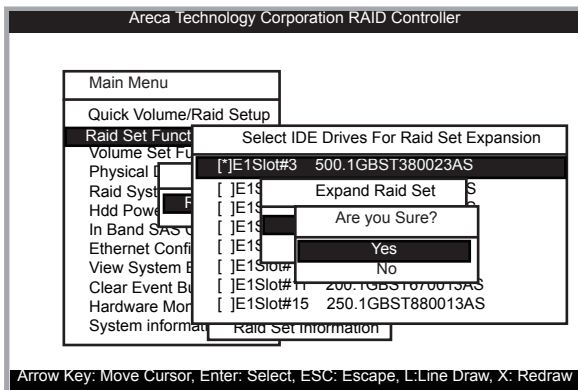
```
                Areca Technology Corporation RAID Controller

        Main Menu

        Quick Volume/Raid Setup
        Raid Set Funct          Select IDE Drives For Raid Set Expansion
        Volume Set Fu
        Physical D          [*]E1Slot#3    500.1GBST380023AS
        Raid Syst           [ ]E1S                              S
        Hdd Powe    F       [ ]E1S           Expand Raid Set
        In Band SAS         [ ]E1S           Are you Sure?
        Ethernet Confi      [ ]E1S
        View System         [ ]E1Slot#            Yes
        Clear Event B       [ ]E1Slot#11   200.1GBST0700TSAS     No
        Hardware Mor        [ ]E1Slot#15   250.1GBST880013AS
        System informat         Raid Set Information

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

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 in 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.

```
                Areca Technology Corporation RAID Controller

        Main Menu

        Quick Volume/Raid Setup
        Raid Set Function
        Volume      Raid          The Raid Set Information
        Physica
        Raid Sy     Crea       Raid Set Name        : Raid Set  # 000
        Hdd Po      Dele       Member Disks         : 2
        In Band     E          Raid State           : Migrating
        Etherne     C          Raid Power State     : Operating
        View S      /          Total Capacity       : 1000.0GB
        Clear E     Crea       Free Capacity        : 500.0GB
        Hardwa      Dele       Min Member Disk Size :  500.0GB
        System      Res        Member Disk Channels : .E1S3.E1S4.
                    Raid Set Information

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

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.
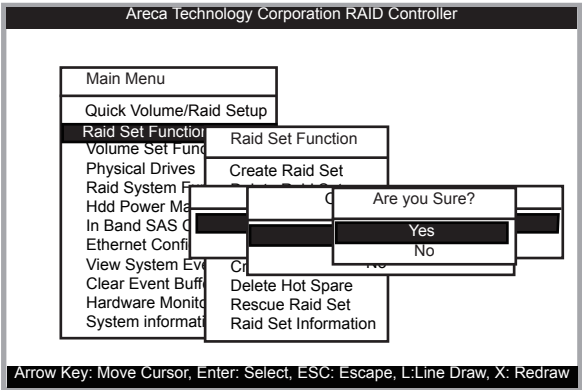
5.5.2.5 Activate Raid Set

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.
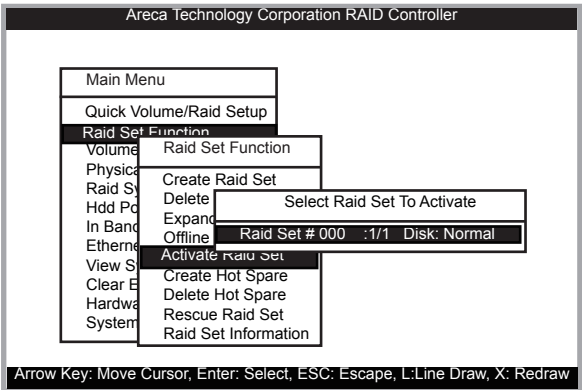
5.5.2.6 Create Hot Spare

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" gives you the ability to define a global or dedicated hot spare. Unlike "Global Hot Spare" which can be used with any RAID sets, "Dedicated Hot Spare" can only be used with a specific RAID set or Enclosure. When a disk drive fails in the RAID set or enclosure with a dedicated Hot Spare is pre-set, data on the disk drive is rebuild automatically on the dedicated hot spare disk.

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.

```
┌──────────────────────────────────────────────────────────┐
│           Areca Technology Corporation RAID Controller     │
│                                                            │
│      ┌─────────────────────┐                               │
│      │ Main Menu           │                               │
│      ├─────────────────────┤                               │
│      │ Quick Volume/Raid Setup │                           │
│      │ Raid Set Func ┌─────────────────┐                   │
│      │ Volume Set F  │ Raid Set Function │                 │
│      │ Physical Driv ├─────────────────┤                   │
│      │ Raid System   │ Create Raid Set │                   │
│      │ Hdd Pow       │ Delete Raid Set │                   │
│      │ In Band   ┌──Select Drives HotS──┐┌─Delete HotSpare?─┐
│      │ Ethernet  │ [ * ]E1Slot#6  200.1GB ││     Yes         │
│      │ View System │ Create Hot Spare  ││     No          │
│      │ Clear Event │ Delete Hot Spare  │└─────────────────┘│
│      │ Hardware Mo │ Rescue Raid Set   │                   │
│      │ System infor│ Raid Set Information│                 │
│      └─────────────└─────────────────┘                    │
│  Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────────────┘
```

5.5.2.8 Rescue Raid Set

When the system is powered off in the RAID set update/creation period, it possibly could disappear due to this abnormal condition. The "RESCUE" function can recover the missing RAID set information. The RAID controller 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.

```
┌──────────────────────────────────────────────────────────┐
│           Areca Technology Corporation RAID Controller     │
│                                                            │
│      ┌─────────────────────┐                               │
│      │ Main Menu           │                               │
│      ├─────────────────────┤                               │
│      │ Quick Volume/Raid Setup │                           │
│      │ Raid Set Func ┌─────────────────┐                   │
│      │ Volume Set F  │ Raid Set Function │                 │
│      │ Physical Driv ├─────────────────┤                   │
│      │ Raid System   │ Create Raid Set │                   │
│      │ Hdd Pow   ┌───Delete Raid Set───┐                   │
│      │ In Band   │  Enter The Operation Key │              │
│      │ Ethernet  │ ▌                    │                  │
│      │ View System │ Create Hot Spare  │                   │
│      │ Clear Event │ Delete Hot Spare  │                   │
│      │ Hardware Mo │ Rescue Raid Set   │                   │
│      │ System infor│ Raid Set Information│                 │
│      └─────────────└─────────────────┘                    │
│  Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────────────┘
```
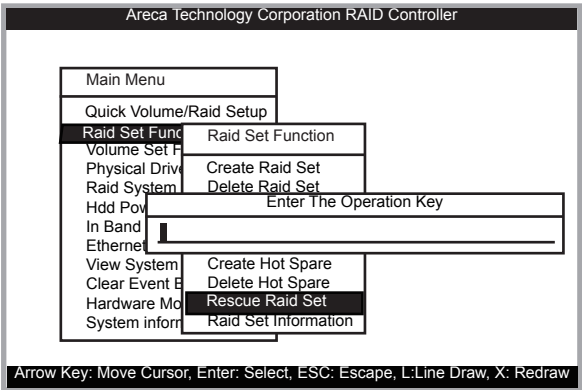
5.5.2.9 Raid Set Information

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.

```
                 Areca Technology Corporation RAID Controller

     Main Menu
     Quick Volume/Raid Setup
     Raid Set Function
     Volume    Raid S    The Raid Set Information
     Physica
     Raid Sy   Create   Raid Set Name        : Raid Set  # 000
     Hdd Po    Delete   Member Disks         : 2
     In Band   Expan    Raid State           : Normal
     Etherne            Raid Power State     :  Operating
     View S       Ra    Total Capacity       :  1000.0GB
     Clear E   Delete   Free Capacity        :  500.0GB
     Hardwa    Rescu    Min Member Disk Size :  500.0GB
     System             Member Disk Channels : .E1S3.E1S4.
              Raid Set Information

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

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 set. If multiple volume sets reside on a specified RAID set, all volume sets will reside on all 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 rather than one volume set using some of the available disks and another volume set using other disks.
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.
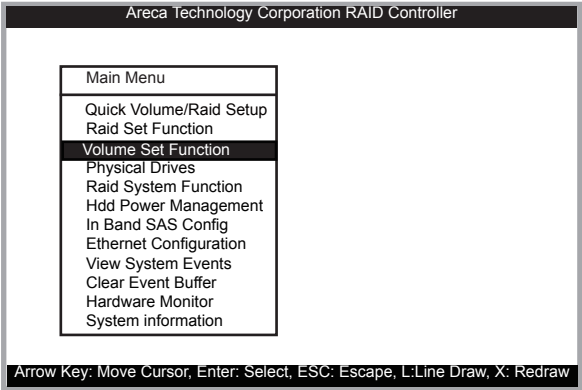
```
          Areca Technology Corporation RAID Controller

          Main Menu
          Quick Volume/Raid Setup
          Raid Set Function
          Volume Set Function
          Physical Drives
          Raid System Function
          Hdd Power Management
          In Band SAS Config
          Ethernet Configuration
          View System Events
          Clear Event Buffer
          Hardware Monitor
          System information

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

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

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

To create a volume set, following the steps:
1. Select the "Volume Set Function" from the main menu.
2. Choose the "Create Volume Set" from "Volume Set Functions" dialog box screen.
3. The "Create Volume From Raid Set" appears. This screen displays the existing arranged RAID sets. Select the RAID set number and press the Enter key. The "Volume Creation" dialog is displayed in the screen.

```
          Areca Technology Corporation RAID Controller

          Main Menu
          Quick Vo
          Raid Se        Volume Creation
          Volume S     Volume Name   : ARC-8040-VOL# 000
          Physical     Raid Level    : 5
          Raid Sys     Capacity      : 2400.0GB
          Hdd Pow      Stripe Size   : 64K
          In Band      SAS  Port#    :         Create Volume?
          Ethernet     LUN Base      :
          View Sy      SAS  LUN      :             Yes
          Clear Ev     Cache Mode    :             No
          Hardwar      Tag Queuing   : Enabled
          System information

    Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
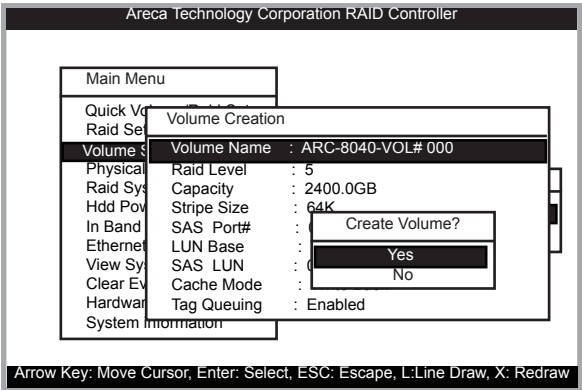
4. The new create volume set attribute allows user to select the Volume Name, Raid level, Capacity, Strip Size, SAS Port#/LUN Base/LUN, Cache Mode, Tagged Command Queuing .

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

```
                Areca Technology Corporation RAID Controller

      Main Menu
      Quick V   Raid C
      Raid Se     Volume Creation
      Volume        Volume Name   : ARC-8040-VOL# 000
      Physica       Raid Level    : 5
      Raid Sy       Capacity      : 2400.0GB
      Hdd Po        Stripe Size        Initialization Mode
      In Band       SAS  Port
      Etherne       LUN Base    Foreground (Faster Completion)
      View Sy       SAS  LUN    Background (Instant Available)
      Clear E       Cache Mo        No Init (To Rescue Volume)
      Hardwa        Tag Queuing    : Enabled
      System Information

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

•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.

5.5.3.1.1 Volume Name

The default volume name will always appear as ARC-8366-VOL #. You can rename the volume set providing it does not exceed the 15 characters limit.

```
┌──────────────────────────────────────────────────┐
│        Areca Technology Corporation RAID Controller │
│  ┌─────────────────┐                               │
│  │ Main Menu       │                               │
│  │ Quick V┌──────────────────────────────┐         │
│  │ Raid Se│ Volume Creation              │         │
│  │ Volume │ Volume Name   : ARC-8040-VOL# 000      │
│  │ Physica│ Raid Level    : 5            │         │
│  │ Raid Sy│ Capacity      : 2400.0GB     │         │
│  │ Hdd Po │ Stripe Size   : 64K          │         │
│  │ In Band│ SAS  Port#    : 0            │         │
│  │ Etherne│ LUN Base      : 0            │         │
│  │ View Sy│ SAS  LUN      : 0            │         │
│  │ Clear E│ Cache Mode    : Write Back   │         │
│  │ Hardwa │ Tag Queuing   : Enabled      │         │
│  │ System information                    │         │
│  Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────┘
```
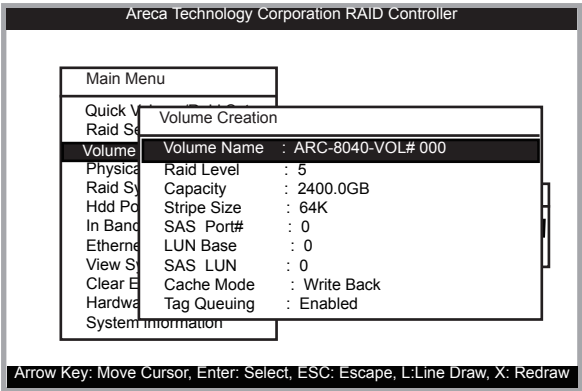
5.5.3.1.2 Raid Level

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.

```
┌──────────────────────────────────────────────────┐
│        Areca Technology Corporation RAID Controller │
│  ┌─────────────────┐                               │
│  │ Main Menu       │                               │
│  │ Quick V┌──────────────────────────────┐         │
│  │ Raid Se│ Volume Creation              │         │
│  │ Volume │ Volume Name   : ARC-8040-VOL# 000      │
│  │ Physica│ Raid Level    : 5            │         │
│  │ Raid Sy│ Capacity      : 2400.0GB     │         │
│  │ Hdd Po │ Stripe Size   : 64K          │         │
│  │ In Band│ SAS  Port#    : 0            │         │
│  │ Etherne│ LUN Base      : 0            │         │
│  │ View Sy│ SAS  LUN      : 0            │         │
│  │ Clear E│ Cache Mode    : Write Back   │         │
│  │ Hardwa │ Tag Queuing   : Enabled      │         │
│  │ System information                    │         │
│  Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────┘
```
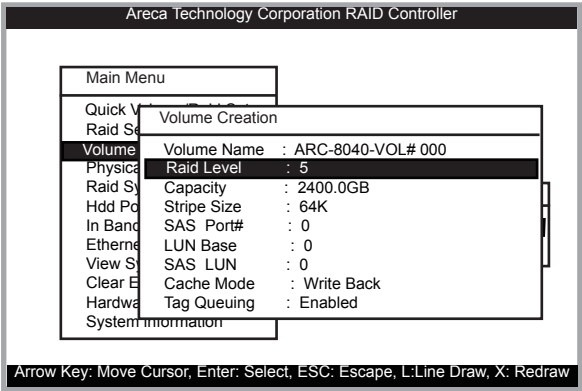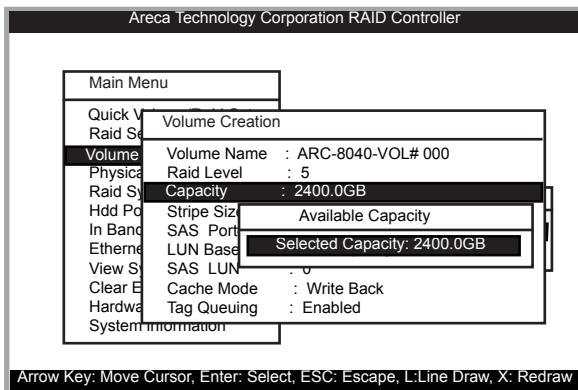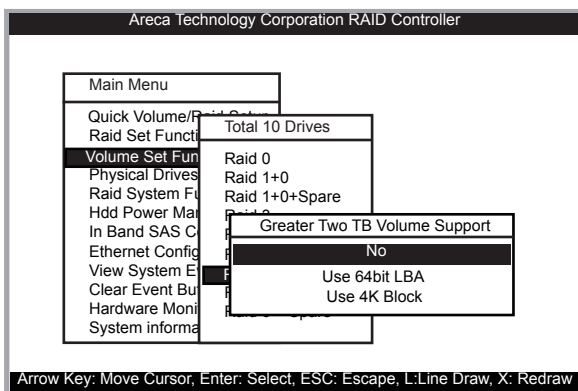
5.5.3.1.3 Capacity

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.

```
        Areca Technology Corporation RAID Controller

    Main Menu

    Quick V
    Raid Se     Volume Creation
    Volume      Volume Name    : ARC-8040-VOL# 000
    Physica     Raid Level     :  5
    Raid Sy     Capacity       :  2400.0GB
    Hdd Po      Stripe Size       Available Capacity
    In Band     SAS  Port
    Etherne     LUN Base     Selected Capacity: 2400.0GB
    View Sy     SAS  LUN        :  0
    Clear E     Cache Mode     :  Write Back
    Hardwa      Tag Queuing    :  Enabled
    System information

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

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

```
        Areca Technology Corporation RAID Controller

    Main Menu

    Quick Volume/Raid Setup
    Raid Set Functi    Total 10 Drives
    Volume Set Fun     Raid 0
    Physical Drives    Raid 1+0
    Raid System Fu     Raid 1+0+Spare
    Hdd Power Mar
    In Band SAS C      Greater Two TB Volume Support
    Ethernet Config
    View System E              No
    Clear Event Bu         Use 64bit LBA
    Hardware Moni          Use 4K Block
    System informa

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

• No
It keeps the volume size with max. 2TB limitation.

• Use 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

● Use 4K Block

It change 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**
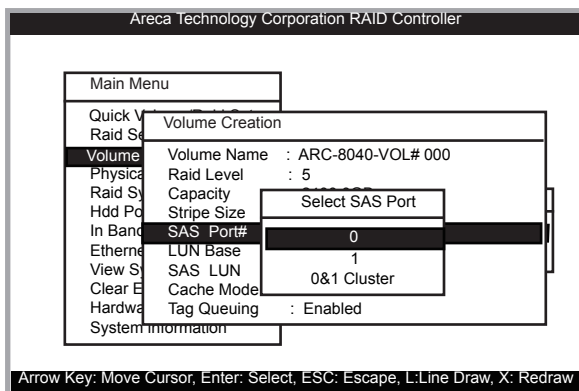
5.5.3.1.4 Stripe Size

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.
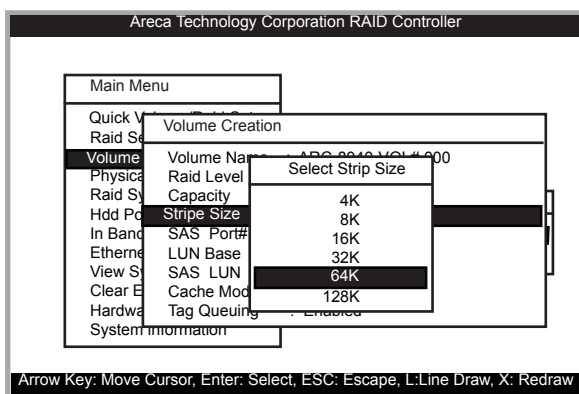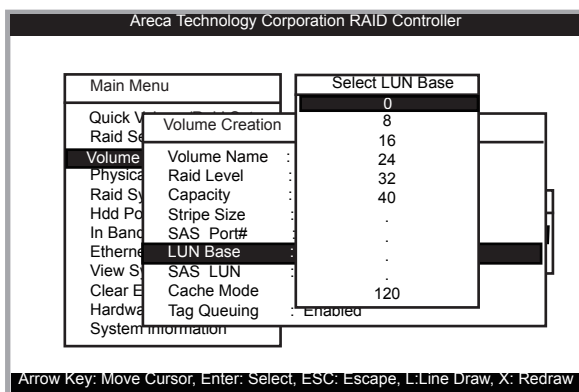

5.5.3.1.5 SAS Port

Two 4-lanes SAS ports can be applied to the RAID subsystem. Choose the SAS Port# option 0, 1 and 0&1 Cluster. If you configure the Host/JBOD port as a JBOD function on the "Raid System Function", then there will be no function on the selection of '1' and "0&1 Cluster" option.

```
┌─────────────────────────────────────────────────────────────┐
│          Areca Technology Corporation RAID Controller         │
│                                                               │
│    ┌──────────────────┐                                       │
│    │ Main Menu        │                                       │
│    ├──────────────────┤                                       │
│    │ Quick V┌──────────────────────────────────────┐          │
│    │ Raid Se│ Volume Creation                       │          │
│    │ Volume │                                       │          │
│    │ Physica│ Volume Name  : ARC-8040-VOL# 000      │          │
│    │ Raid Sy│ Raid Level   : 5                      │          │
│    │ Hdd Po │ Capacity   ┌──Select SAS Port──┐      │          │
│    │ In Band│ Stripe Size│                   │      │          │
│    │ Etherne│ SAS  Port# │        0          │      │          │
│    │ View Sy│ LUN Base   │        1          │      │          │
│    │ Clear E│ SAS  LUN   │     0&1 Cluster   │      │          │
│    │ Hardwa │ Cache Mode └───────────────────┘      │          │
│    │ System │ Tag Queuing  : Enabled                │          │
│    └────────└──────────────────────────────────────┘          │
│                                                               │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────────┘
```
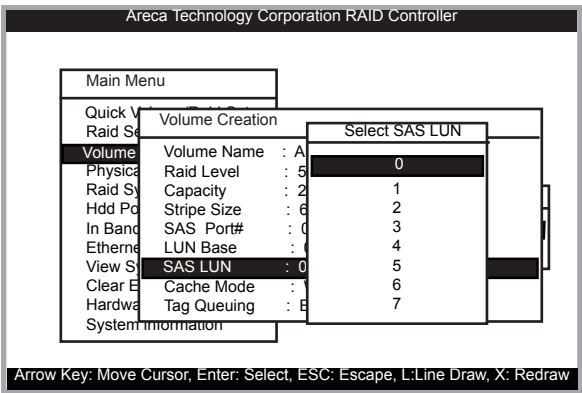
5.5.3.1.6 LUN Base

Each SAS device attached to the SAS host adapter must be assigned a unique SAS ID number. A SAS RAID controller can connect up to 122 devices and 128 (16*8) volumes. The RAID subsystem is as a large SAS device. We should assign an LUN base from a list of SAS LUNs.

```
┌─────────────────────────────────────────────────────────────┐
│          Areca Technology Corporation RAID Controller         │
│                                                               │
│    ┌──────────────────┐      ┌──Select LUN Base──┐            │
│    │ Main Menu        │      │        0          │            │
│    ├──────────────────┤      │        8          │            │
│    │ Quick V┌──────────────┐ │       16          │            │
│    │ Raid Se│ Volume Creation│       24          │            │
│    │ Volume │               ││       32          │            │
│    │ Physica│ Volume Name  : │       40          │            │
│    │ Raid Sy│ Raid Level   : │        .          │            │
│    │ Hdd Po │ Capacity     : │        .          │            │
│    │ In Band│ Stripe Size  : │        .          │            │
│    │ Etherne│ SAS  Port#   : │        .          │            │
│    │ View Sy│ LUN Base     : │      120          │            │
│    │ Clear E│ SAS  LUN     : └───────────────────┘            │
│    │ Hardwa │ Cache Mode   :                                  │
│    │ System │ Tag Queuing  : Enabled                          │
│    └────────└──────────────┘                                  │
│                                                               │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────────┘
```
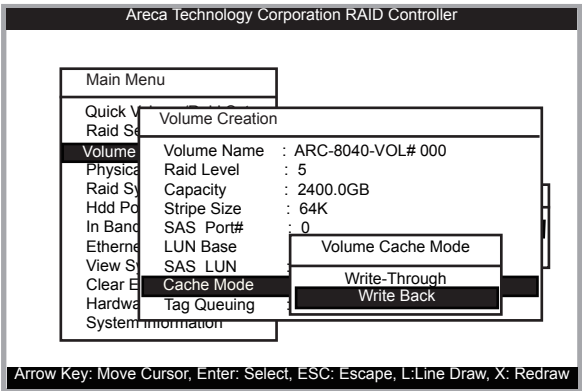
5.5.3.1.7 SAS LUN

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

```
                Areca Technology Corporation RAID Controller

        Main Menu
        Quick V                            Select SAS LUN
        Raid Se    Volume Creation
        Volume     Volume Name   : A            0
        Physica    Raid Level    : 5            1
        Raid Sy    Capacity      : 2            2
        Hdd Po     Stripe Size   : 6            3
        In Band    SAS Port#     : 0            4
        Etherne    LUN Base      : 0            5
        View Sy    SAS LUN       : 0            6
        Clear E    Cache Mode    : Y            7
        Hardwa     Tag Queuing   : E
        System Information

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

5.5.3.1.8 Cache Mode

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

```
                Areca Technology Corporation RAID Controller

        Main Menu
        Quick V    Volume Creation
        Raid Se
        Volume     Volume Name   : ARC-8040-VOL# 000
        Physica    Raid Level    : 5
        Raid Sy    Capacity      : 2400.0GB
        Hdd Po     Stripe Size   : 64K
        In Band    SAS Port#     : 0
        Etherne    LUN Base          Volume Cache Mode
        View Sy    SAS LUN
        Clear E    Cache Mode          Write-Through
        Hardwa     Tag Queuing         Write Back
        System Information

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

5.5.3.1.9 Tag Queuing

This option, when enabled, can enhance overall system performance under multi-tasking operating systems. The Command Tag (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.

VT-100 UTILITY CONFIGURATION

```
            Areca Technology Corporation RAID Controller

       Main Menu
       Quick V        R it C
       Raid Se   Volume Creation
       Volume     Volume Name   : ARC-8040-VOL# 000
       Physica    Raid Level    : 5
       Raid Sy    Capacity      : 2400.0GB
       Hdd Po     Stripe Size   : 64K
       In Band    SAS  Port#    : 0
       Etherne    LUN Base      : 0
       View Sy    SAS  LUN        Tagged Command Queuing
       Clear E    Cache Mode       Disabled
       Hardwa     Tag Queuing      Enabled
       System information

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

> **Note:**
>
> RAID level 30 50 and 60 can support up to eight RAID set.

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, Strip Size, SAS Port#/LUN Base/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.

```
            Areca Technology Corporation RAID Controller

    Main Menu
    Quick Volume/Raid Setup
    Raid Set Function
    Volume Set F        Raid 30/50/60 Creation
    Physical Driv   Volun
    Raid System     Creat   Volume Name  : ARC-8040-VOL# 000
    Hdd Power I     Creat   Raid Level   : 5
    In Band SAS             Capacity     : 2400.0GB
    Ethernet Co             Stripe Size  : 64K
    View System             SAS  Port#   : 0
    Clear Event             LUN Base     : 0
    Hardware M      Displa  SAS  LUN     : 0
    System informati        Cache Mode   : Write Back
                            Tag Queuing  : Enabled

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

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.

```
            Areca Technology Corporation RAID Controller

    Main Menu
    Quick Volume/Raid Setup
    Raid Set Function    Volume Set Function
    Volume Set Funct
    Physical Drives      Create Volume Set
    Raid System Fun      Create Raid30/50/60
    Hdd Power Mana     Delete Vol    Delete Volume Set
    In Band SAS O      Modify Vo
    Ethernet Config      Se       Are you Sure?
    View System E      ARC-8               Yes
    Clear Event Buffe   Display volume       No
    Hardware Monitor
    System information

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

VT-100 UTILITY CONFIGURATION

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.

```
┌──────────────────────────────────────────────────────────────┐
│          Areca Technology Corporation RAID Controller         │
│                                                                │
│    ┌─────────────────────┐                                     │
│    │ Main Menu           │                                     │
│    ├─────────────────────┴────┐                                │
│    │ Quick Volume/Raid Setup  │                                │
│    │ Raid Set┌────────────────────────────────────────────┐   │
│    │ Volume S│ Volume Modification                         │   │
│    │ Physical├────────────────────────────────────────────┤   │
│    │ Raid Sys│ Volume Name  : ARC-8040-VOL# 000            │   │
│    │ Hdd Pow │                                             │   │
│    │ In Band │ Raid Level    : 5                           │   │
│    │ Ether   │ Capacity      : 2400.0GB                    │   │
│    │ View    │ Stripe Size   : 64K                         │   │
│    │ Clear   │ SAS  Port#    : 0                           │   │
│    │ Hardware│ LUN Base      : 0                           │   │
│    │ System i│ SAS  LUN      : 0                           │   │
│    │         │ Cache Mode    : Write Back                  │   │
│    │         │ Tag Queuing   : Enabled                     │   │
│    └─────────┴────────────────────────────────────────────┘   │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────────────────┘
```

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 entry 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 expand 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 2TB capacity device.
● Expand over 2TB used LBA64 mode. Please make sure your OS supports LBA64 before expand it.

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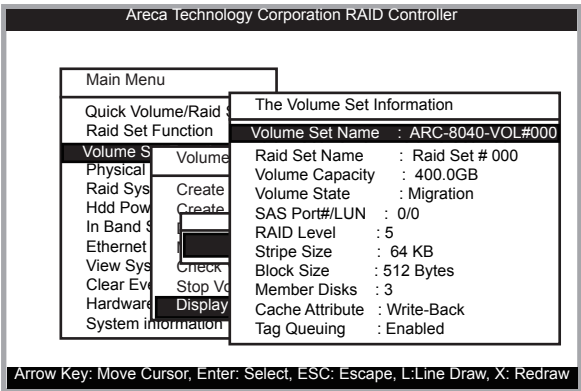
Migrating occurs when a volume set is migrating from one RAID level to another, when a volume set strip size changes, or when a disk is added to a RAID set. Migration state is displayed in the volume state area of the "Volume Set Information" screen.

5.5.3.5 Check Volume Set

Use this option to verify the correctness of the redundant data in a volume set. For example, in a system with a dedicated parity disk drive, a volume set check entails computing the parity of the data disk drives and comparing those results to the contents of the dedicated parity disk drive. To check volume set, move the cursor bar to the "Check Volume Set" item, then press the **Enter** key. The "Volume Set Functions" menu will show all RAID set number items. Move the cursor bar to an RAID set number item and then press the **Enter** key to show all volume set items. Select the volume set to be checked from the list and press **Enter** to select it. After completed the selection, the confirmation screen appears, press **Yes** to start the check.

```
          Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function

        Volume S      Volume Set Function
        Physical
        Raid Sys      Create Volume Set
        Hdd Pow       Create Raid30/50/60
        In Band       Delete Volume Set
        Etherne       ARC-8040   Check The Volume?   00)
        View Sy
        Clear Ev      Stop Volume C       Yes
        Hardware      Display Volume      No
        System information

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

5.5.3.6 Stop Volume Set Check

Use this option to stop all of the "Check Volume Set" operations.

5.5.3.7 Display Volume 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.

```
        Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function
        Volume Set Function
        Physical Drives
        Raid System Function
        Hdd Power Management
        In Band SAS Config
        Ethernet Configuration
        View System Events
        Clear Event Buffer
        Hardware Monitor
        System information

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
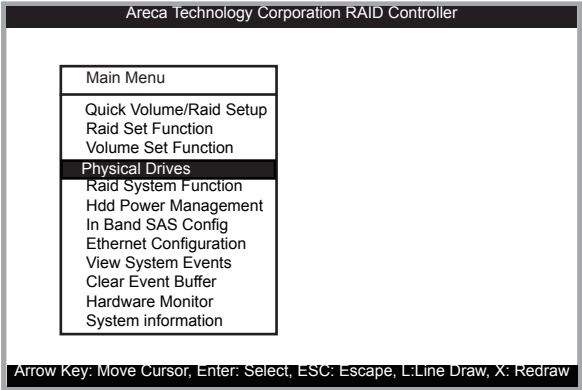
5.5.4 Physical Drives

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.

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.

```
        Areca Technology Corporation RAID Controller

        E1Solt #1   -SATA

    Ma    Model Name      : ST3750640NS
          Serial Number    : 5QD1RRT0
    Qu    Firmware Rev.    : 3.AEG
    Ra    Disk Capacity    : 700.0GB
    Vo    Current SATA     : SATA300+NCQ(Depth32)
    Phy   Supported SATA   : SATA300+NCQ(Depth32)
    Ra    APM Support      : No
    Hd    Device State     : Free
    In    Timeout Count    : 0
    EL    Media Errors     : 0
    Vi    Temperature      : 35
    C     SMART Read Errors Rate    : 100(16)
    Ha    SMART Spinup Time         : 101(24)
    Sy    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
```

VT-100 UTILITY CONFIGURATION

5.5.4.2 Create Pass-Through Disk

A pass-through disk is not controlled by the RAID subsystem firmware and thus cannot 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 firmware. The SAS Port#/SAS LUN Base/SAS LUN, Cache Mode, and Tag Queuing must be specified to create a pass-through disk.

```
              Areca Technology Corporation RAID Controller

    Main Menu
    Quick Volume/Raid Setup
    Raid Set   Physical Drive Function
    Volume     ┌──────────────────────────────────────
    Physical   │View   Pass-Through Disk Attribute
               │       SAS Port#          : 0
               │       LUN B   Create Pass-Through
      [* ]E1Slot#1     SAS L  ┌─────────────
               │       Cache  │   Yes
    View Sys   Iden        Tag Queuing   │   No
    Clear Event Buffer     Tag Queuing   : Enabled
    Hardware Monitor
    System information

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

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 them 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.
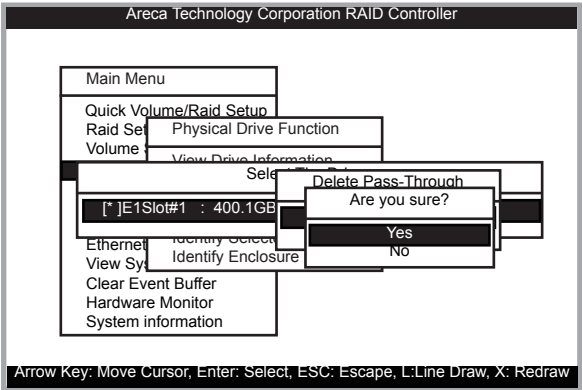
5.5.4.5 Identify Selected Drive

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.
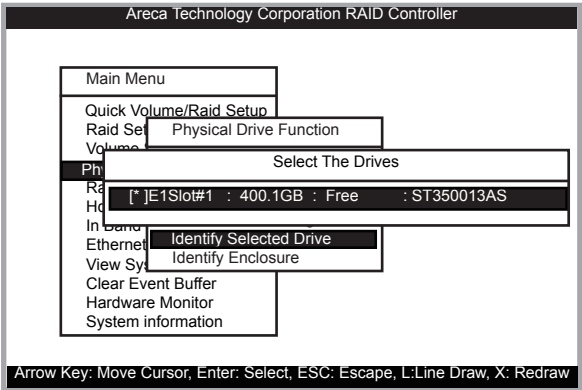
5.5.4.6 Identify Enclosure

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 Enclosure" is selected. This function will also light the subsystem LED indicator, if it is existed.

```
                Areca Technology Corporation RAID Controller


         Main Menu

         Quick Volume/Raid Setup
         Raid Se    Physical Drive Function
         Volume
         Ph                    Select The Enclosure
         Ra
         Ho        Enclosure#1  :  ARECA   RAID Subsystem  V1.0
         In Band
         Ethernet     Identify Selected Drive
         View Sy      Identify Enclosure
         Clear Event Buffer
         Hardware Monitor
         System information

     Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
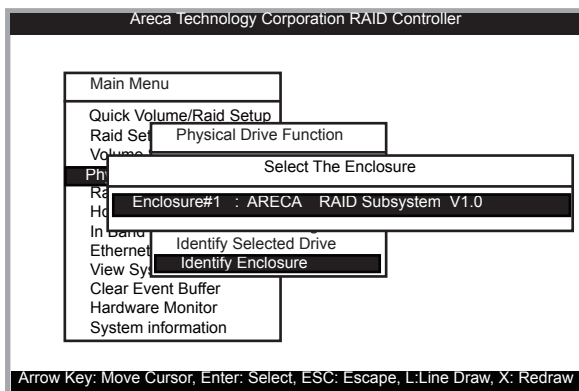
5.5.5 Raid System Function

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.

```
                Areca Technology Corporation RAID Controller


         Main Menu

         Quick Volume/Raid Setup
         Raid Set Function
         Volume Set Function
         Physical Drives
         Raid System Function
         Hdd Power Management
         In Band SAS Config
         Ethernet Configuration
         View System Events
         Clear Event Buffer
         Hardware Monitor
         System information

     Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
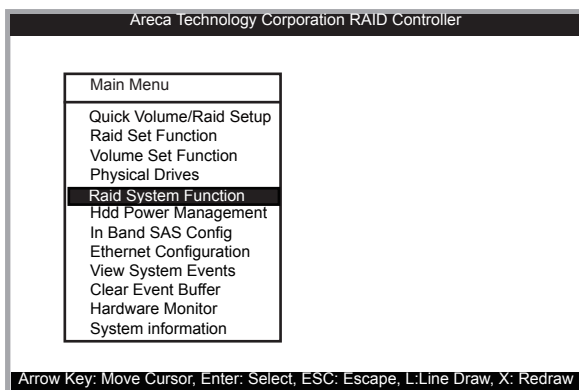
VT-100 UTILITY CONFIGURATION

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.
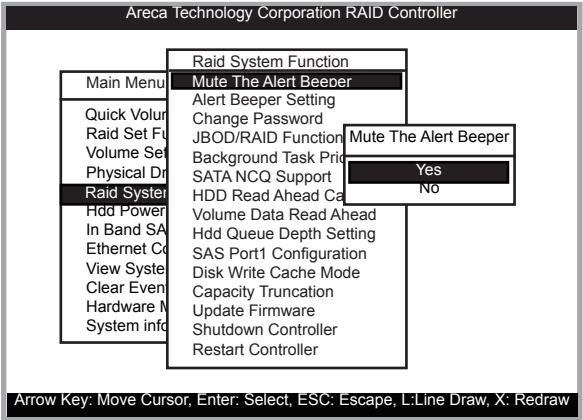
5.5.5.2 Alert Beeper Setting

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.
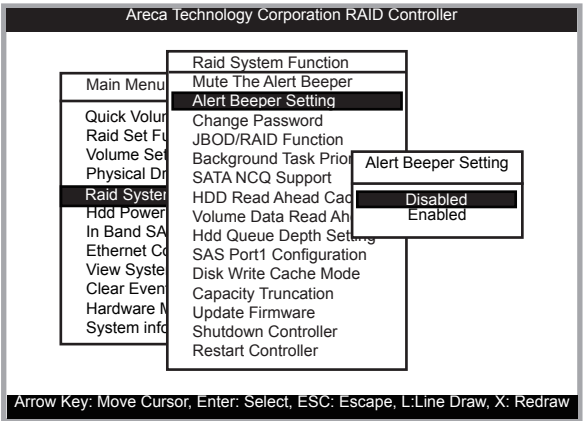
5.5.5.3 Change Password

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.
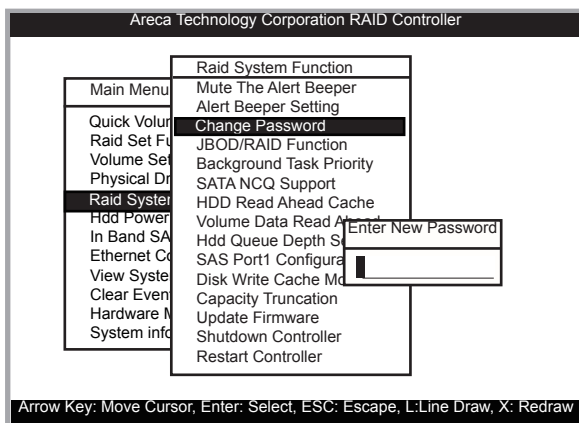
5.5.5.4 JBOD/RAID Function

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.

```
                  Areca Technology Corporation RAID Controller
                          Raid System Function
          Main Menu       Mute The Alert Beeper
                          Alert Beeper Setting
          Quick Volum     Change Password
          Raid Set Fu     JBOD/RAID Function
          Volume Set      Background Task Priority
          Physical Dr     SATA NCQ Suppo    JBOD/RAID Function
          Raid System     HDD Read Ahead
          Hdd Power       Volume Data Read        RAID
          In Band SA      Hdd Queue Depth         JBOD
          Ethernet Co     SAS Port1 Configuration
          View Syste      Disk Write Cache Mode
          Clear Even      Capacity Truncation
          Hardware        Update Firmware
          System info     Shutdown Controller
                          Restart Controller

    Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
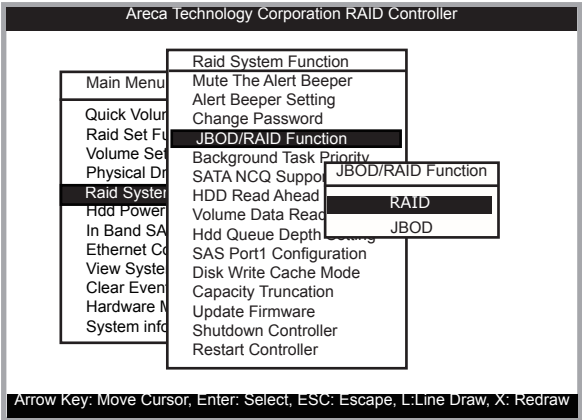
5.5.5.5 Background Task Priority

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.

```
                  Areca Technology Corporation RAID Controller
                          Raid System Function
          Main Menu       Mute The Alert Beeper
                          Alert Beeper Setting
          Quick Volum     Change Password
          Raid Set Fu     JBOD/RAID Function
          Volume Set      Background Task Priority
          Physical Dr     SATA NCQ Support
          Raid System     HDD Read Ahead Cache
          Hdd Power       Volume Data Read Ahe   Background Task Priority
          In Band SA      Hdd Queue Depth Sett
          Ethernet Co     SAS Port1 Configuratio   Ultra Low (5%)
          View Syste      Disk Write Cache Mode    Low (20%)
          Clear Even      Capacity Truncation      Medium (50%)
          Hardware        Update Firmware          High (80%)
          System info     Shutdown Controller
                          Restart Controller

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

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.
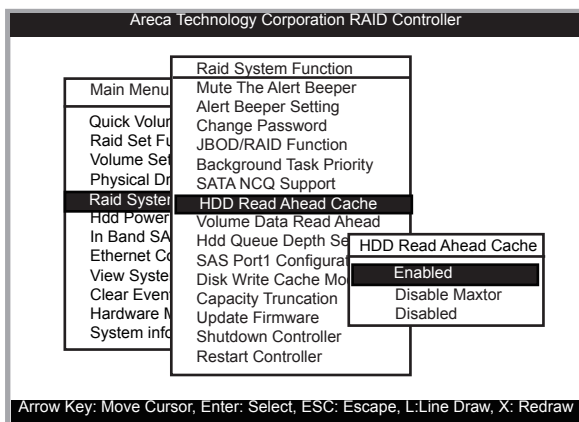
5.5.5.8 Volume Data Read Ahead

The Read data ahead parameter specifies the controller firmware algorithms which process the Read Ahead data blocks from the disk. The Read Ahead parameter is normal by default. To modify the value, you must know the application hehavior. 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.

```
                 Areca Technology Corporation RAID Controller

                       Raid System Function
        Main Menu      Mute The Alert Beeper
                       Alert Beeper Setting
        Quick Volu     Change Password
        Raid Set Fu    JBOD/RAID Function
        Volume Set     Background Task Priority
        Physical Dr    SATA NCQ Support
        Raid System    HDD Read Ahead Ca   Volume Data Read Ahead
        Hdd Power      Volume Data Read A   Normal
        In Band SA     Hdd Queue Depth Se   Aggressive
        Ethernet Co    SAS Port1 Configura  Conservative
        View Syste     Disk Write Cache Mo  Disabled
        Clear Even     Capacity Truncation
        Hardware M     Update Firmware
        System info    Shutdown Controller
                       Restart Controller

        Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
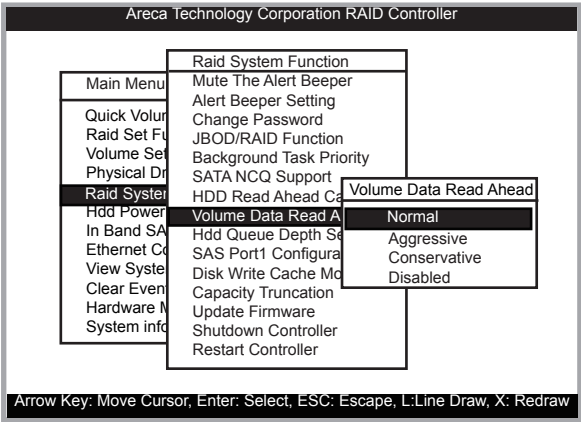
5.5.5.9 Hdd Queue Depth Setting

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

```
┌─────────────────────────────────────────────────────────┐
│       Areca Technology Corporation RAID Controller        │
├─────────────────────────────────────────────────────────┤
│              ┌───────────────────────┐                    │
│              │  Raid System Function │                    │
│  ┌───────────┤  Mute The Alert Beeper│                    │
│  │ Main Menu │  Alert Beeper Setting │                    │
│  ├───────────┤  Change Password      │                    │
│  │ Quick Volu│  JBOD/RAID Function   │                    │
│  │ Raid Set F│  Background Task Priority                  │
│  │ Volume Set│  SATA NCQ Support     │                    │
│  │ Physical Dr  HDD Read Ahead C ┌─────────────────┐      │
│  │ Raid Syste│  Volume Data Read A│ HDD Queue Depth │     │
│  │ Hdd Power │  Hdd Queue Depth S ├─────────────────┤     │
│  │ In Band SA│  SAS Port1 Configura│       1         │    │
│  │ Ethernet C│  Disk Write Cache M │       2         │    │
│  │ View Syste│  Capacity Truncation│       4         │    │
│  │ Clear Even│  Update Firmware    │       8         │    │
│  │ Hardware M│  Shutdown Controller│      16         │    │
│  │ System inf│  Restart Controller │      32         │    │
│  └───────────┤                     └─────────────────┘    │
│              └───────────────────────┘                    │
├─────────────────────────────────────────────────────────┤
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────┘
```

5.5.5.10 SAS Port1 Configuration

There are two SFF-8088 connectors on the rear of ARC-8040. You can configure those two connectors as two host ports (Port0&Port1) or one host port(Port0)/one expander port(Port1) configuration. The "SAS Port1 Configuration" screen is used to define the Port1 SFF-8088 connector (Host or JBOD function) for ARC-8040 RAID subsystem. It is default configured as the JBOD port.

```
┌─────────────────────────────────────────────────────────┐
│       Areca Technology Corporation RAID Controller        │
├─────────────────────────────────────────────────────────┤
│              ┌───────────────────────┐                    │
│              │  Raid System Function │                    │
│  ┌───────────┤  Mute The Alert Beeper│                    │
│  │ Main Menu │  Alert Beeper Setting │                    │
│  ├───────────┤  Change Password      │                    │
│  │ Quick Volu│  JBOD/RAID Function   │                    │
│  │ Raid Set F│  Background Task Priority                  │
│  │ Volume Set│  SATA NCQ Support     │                    │
│  │ Physical Dr  HDD Read Ahead Cache │                    │
│  │ Raid Syste│  Volume Data Rea┌──────────────────────┐   │
│  │ Hdd Power │  Hdd Queue Depth│ SAS Port Configuration│  │
│  │ In Band SA│  SAS Port1 Configu├────────────────────┤  │
│  │ Ethernet C│  Disk Write Cache │     JBOD Port       │  │
│  │ View Syste│  Capacity Truncation    Host Port       │  │
│  │ Clear Even│  Update Firmware  └──────────────────────┘ │
│  │ Hardware M│  Shutdown Controller│                      │
│  │ System inf│  Restart Controller │                      │
│  └───────────┤                     └────────────────┘     │
│              └───────────────────────┘                    │
├─────────────────────────────────────────────────────────┤
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────┘
```

5.5.5.11 Disk Write Cache Mode

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

5.5.5.12 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.

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.

5.5.5.13 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 management through the controller's LAN port.

5.5.5.14 Shutdown Controller

Use the "Shutdown Controller" function to flash the cache data to HDD and shutdown the 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 "Shutdown Controller" item. The shutdown controller confirmation screen appears. Select **Yes** key to flash the cache to HDD and ARC-8040 RAID controller.

5.5.5.15 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.

```
         Areca Technology Corporation RAID Controller

                    Raid System Function
       Main Menu    Mute The Alert Beeper
                    Alert Beeper Setting
       Quick Volu   Change Password
       Raid Set Fu  JBOD/RAID Function
       Volume Set   Background Task Priority
       Physical Dr  SATA NCQ Support
       Raid Syste   HDD Read Ahead Cache
       Hdd Power    Volume Data Read Ahead
       In Band SA   Hdd Queue Depth Setting
       Ethernet Co  SAS Port1 Configuration
       View Syste   Disk Write Cache Mode
       Clear Even   Capacity Truncat   Restart Controller?
       Hardware     Update Firmware        Yes
       System info  Shutdown Contro         No
                    Restart Controlle

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

> **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.

```
┌─────────────────────────────────────────────────────────┐
│         Areca Technology Corporation RAID Controller     │
│                                                          │
│                                                          │
│         ┌─────────────────────────────┐                  │
│         │ Main Menu                   │                  │
│         │ Quick Volume/Raid Setup     │                  │
│         │ Raid Set Function           │                  │
│         │ Volume Set Function         │                  │
│         │ Physical Drives             │                  │
│         │ Raid System Function        │                  │
│         │ Hdd Power Management         │                  │
│         │ In Band SAS Config          │                  │
│         │ Ethernet Configuration      │                  │
│         │ View System Events          │                  │
│         │ Clear Event Buffer          │                  │
│         │ Hardware Monitor            │                  │
│         │ System information          │                  │
│         └─────────────────────────────┘                  │
│                                                          │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────┘
```
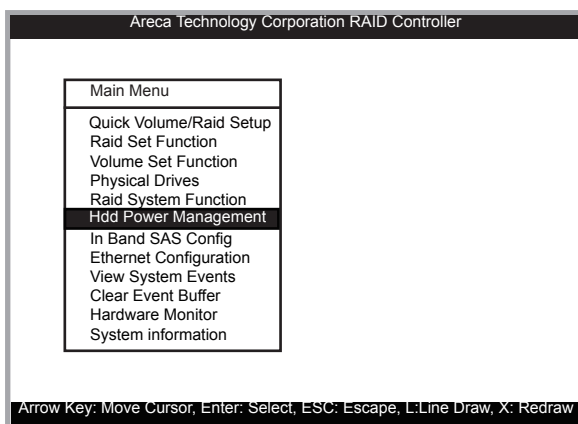
5.5.6.1 Stagger Power On

In a PC system with only one or two drives, the power can sup-
ply enough power to spin up both drives simultaneously. But in
systems 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 sys-
tem components. This damage can be avoided by allowing the
host 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 host the abil-
ity 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 from 0.4s to 6s per step which powers up
one group of drives.

```
          Areca Technology Corporation RAID Controller

     Main Menu
     Quick Volume/Raid Setup
     Raid Set Function
     Volume Set Function          Stagger Power On
     Physical Drives
     Raid System Fun  Hdd Power Ma    0.4
     Hdd Power Mana                  0.7
     In Band SAS Con  Stagger Power  1.0
     Ethernet Configu Time To Low P  1.5
     View System Eve  Time To Low R   .
     Clear Event Buffe Time To Spin D  .
     Hardware Monitor               6.0
     System information

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

5.5.6.2 Time to Hdd Low Power Idle (Minutes)

This option delivers lower power consumption by automatically unloading recording heads during the setting idle time.

```
          Areca Technology Corporation RAID Controller

     Main Menu
     Quick Volume/Raid Setup
     Raid Set Function
     Volume Set Function
     Physical Drives              Low Power Idle
     Raid System Fun  Hdd Power Ma  Disabled
     Hdd Power Mana                   2
     In Band SAS Con  Stagger Powe    3
     Ethernet Configu Time To Low F   4
     View System Eve  Time To Low F   5
     Clear Event Buffe Time To Spin   6
     Hardware Monitor               7
     System information

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

5.5.6.3 Time To Low RPM Mode (Minutes)

This function can automatically spin disks at lower RPM if there have not been used during the setting idle time.

```
┌─────────────────────────────────────────────────────────────┐
│           Areca Technology Corporation RAID Controller        │
│                                                               │
│   ┌─ Main Menu ──────────────┐                                │
│   │ Quick Volume/Raid Setup  │                                │
│   │ Raid Set Function        │                                │
│   │ Volume Set Function      │                                │
│   │ Physical Drives          │                                │
│   │ Raid System Fun┌─ Hdd Pow ─┬─ Low RPM Mode ──┐            │
│   │ Hdd Power Mana │          │    Disabled       │            │
│   │ In Band SAS Con│ Stagger  │       10          │            │
│   │ Ethernet Configu│ Time To │       20          │            │
│   │ View System Eve│ Time To  │       30          │            │
│   │ Clear Event Buffe│ Time To │      40          │            │
│   │ Hardware Monitor└──────────┘      50          │            │
│   │ System information          │     60          │            │
│   └───────────────────────────────────────────────┘          │
│                                                               │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────────┘
```

5.5.6.4 Time To Spin Down Idle Hdd (Minutes)

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.)

```
┌─────────────────────────────────────────────────────────────┐
│           Areca Technology Corporation RAID Controller        │
│                                                               │
│   ┌─ Main Menu ──────────────┐    ┌─ Spin Down Hdd ──┐        │
│   │ Quick Volume/Raid Setup  │    │    Disabled       │        │
│   │ Raid Set Function        │    │       1           │        │
│   │ Volume Set Function      │    │       3           │        │
│   │ Physical Drives          │    │       5           │        │
│   │ Raid System Fun┌─ Hdd Powe┐   │      10           │        │
│   │ Hdd Power Mana │          │   │      15           │        │
│   │ In Band SAS Con│ Stagger P│   │      20           │        │
│   │ Ethernet Configu│ Time To L│  │      30           │        │
│   │ View System Eve│ Time To L │  │      40           │        │
│   │ Clear Event Buffe│ Time To S│ │      60           │        │
│   │ Hardware Monitor└──────────┘  └───────────────────┘        │
│   │ System information       │                                │
│   └───────────────────────────┘                               │
│                                                               │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└─────────────────────────────────────────────────────────────┘
```
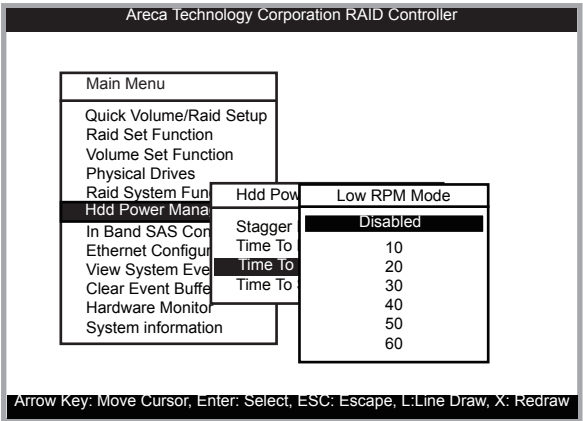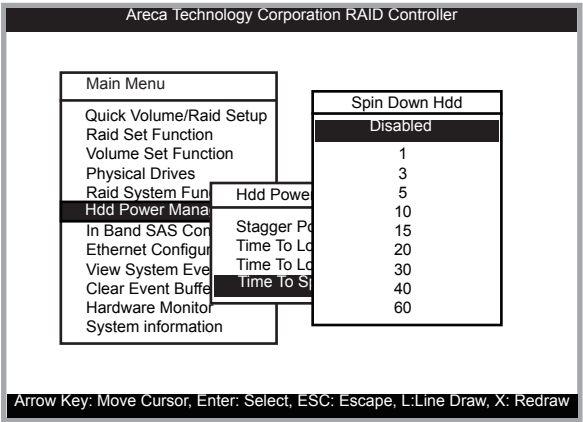
5.5.7 In Band SAS Config

The RAID manager supports both in-band and out-of-band management to control the disk array system. 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 network cable. 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.

```
                Areca Technology Corporation RAID Controller

            Main Menu
            Quick Volume/Raid Setup
            Raid Set Function
            Volume Set Function
            Physical Drives
            Raid System Function
            Hdd Power Management
            In Band SAS Config
            Ethernet Configuration
            View System Events
            Clear Event Buffer
            Hardware Monitor
            System information

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

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.

```
                    Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function
        Volume Set Function
        Physical Drives
        Raid System Function
        Hdd Pov── In Band SAS Configuration ──────────────────
        In Band   Inband SAS         │   Inband SAS Function
        Etherne   Inband SAS         │      Disabled
        View System Events           │      Enabled
        Clear Event Buffer
        Hardware Monitor
        System information

     Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
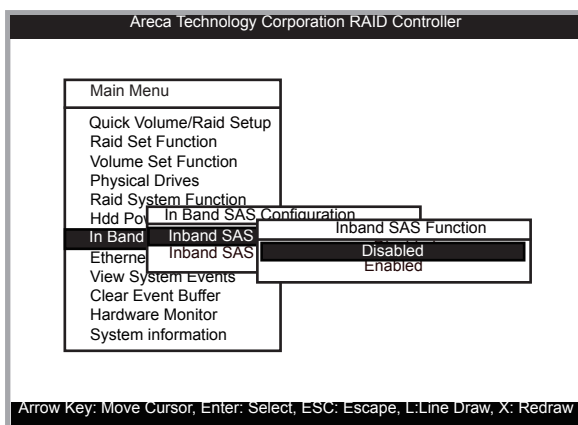
5.5.7.2 Inband SAS Port

Since the SAS RAID controller supports two SAS host ports, the In-band can through either SAS port 0 or port 1. If you config-ure the Host/JBOD port as a JBOD function on the "Raid System Function", then there will be no function on the selection of '1' option.

```
                    Areca Technology Corporation RAID Controller

        Main Menu
        Quick Volume/Raid Setup
        Raid Set Function
        Volume Set Function
        Physical Drives
        Raid System Function
        Hdd Powe── In Band SAS Configuration ──────────────
        In Band S/  Inband SAS Function    : Disabled
        Ethernet C ┌──────── Inband SAS Port ────────┐
        View System│         0                        │
        Clear Event│         1                        │
        Hardware Monitor
        System information


     Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
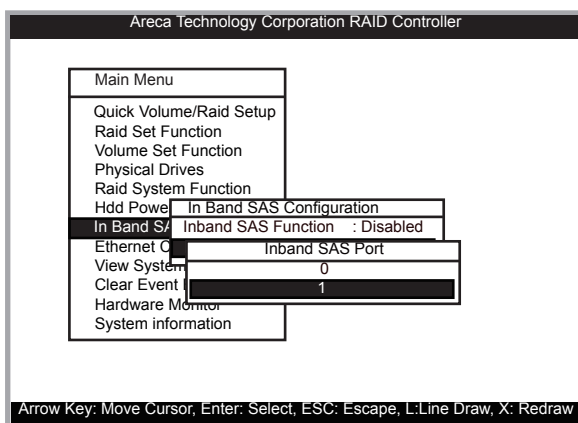
5.5.8 Ethernet Configuration

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.

```
Areca Technology Corporation RAID Controller

  Main Menu
  Quick Volume/Raid Setup
  Raid Set Function
  Volume Set Function
  Physical Drives
  Raid System Function
  Hdd Power Management
  In Band SAS Config
  Ethernet Configuration
  View System Events
  Clear Event Buffer
  Hardware Monitor
  System information

Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
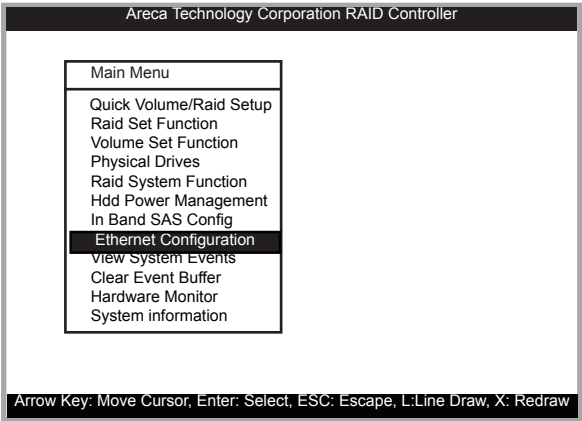
5.5.8.1 DHCP Function

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" 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.
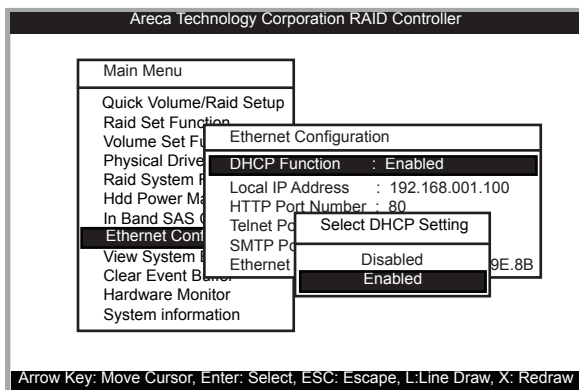
5.5.8.2 Local IP Address

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.
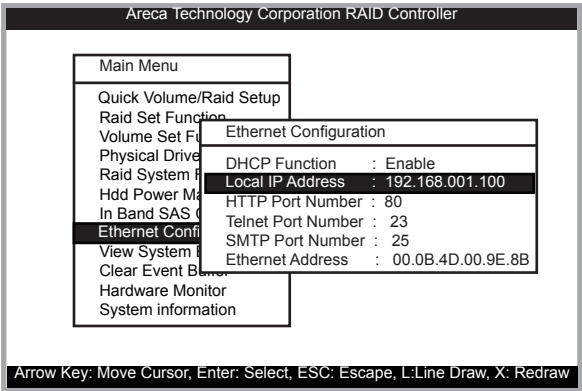
5.5.8.3 HTTP Port Number

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.
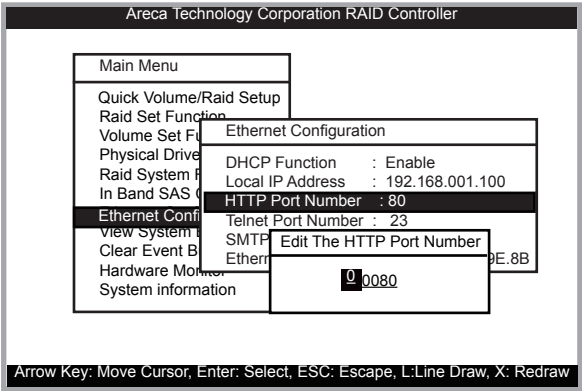
5.5.8.4 Telnet Port Number

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.
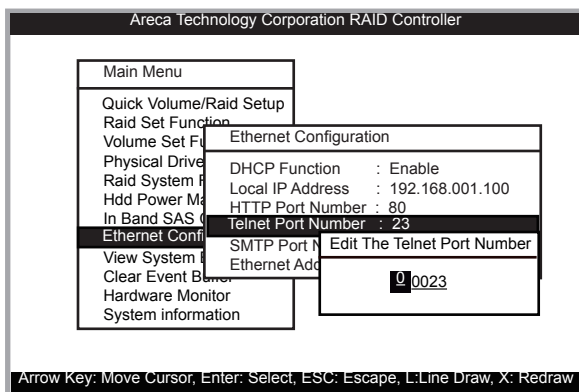
5.5.8.5 SMTP Port Number

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.

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.

```
         Areca Technology Corporation RAID Controller

      Main Menu
      Quick Volume/Raid Setup
      Raid Set Function
      Volume Set Fu    Ethernet Configuration
      Physical Drive
      Raid System      DHCP Function      : Enable
      Hdd Power Ma     Local IP Address   : 192.168.001.100
      In Band SAS      HTTP Port Number  :  80
      Ethernet Confi   Telnet Port Number :  23
      View System      SMTP Port Number  :  25
      Clear Event B    Ethernet Address   :  00.0B.4D.00.9E.8B
      Hardware Monitor
      System information

 Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw
```
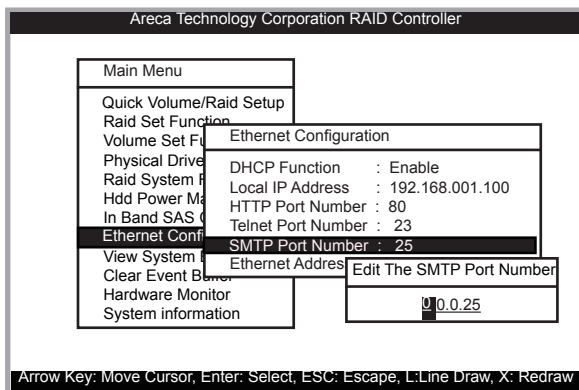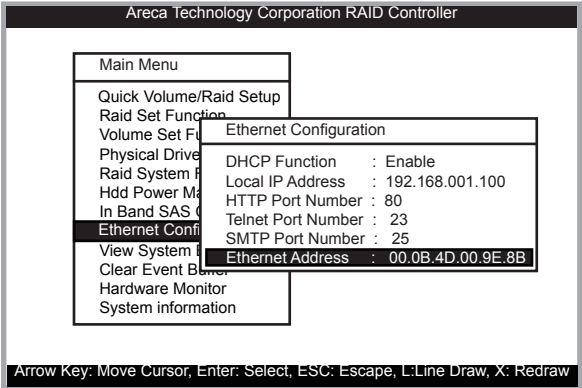
5.5.9 View System Events

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.

```
         Areca Technology Corporation RAID Controller

      Main Menu
      Quick Volume/Raid Setup

   Time            Device              Event Type      ElapseTime Errors

   2010-04-1 12:01:00  ARC-8040-VOL# 000 Start Initialize
   2010-04-1 12:05:00  Raid Set  # 001       Create RaidSet
   2010-04-1 12:10:02  Raid Set  # 001       Delete RaidSet
   2010-04-1 12:01:00  ARC-8040-VOL# 003 Start Initialize
   2010-04-1 12:05:00  Raid Set  # 002       Create RaidSet
   2010-04-1 12:10:02  Raid Set  # 003       Delete RaidSet

          Hardware Monitor
          System information

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

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.

```
┌──────────────────────────────────────────────────────────────┐
│          Areca Technology Corporation RAID Controller          │
│                                                                │
│   ┌──────────────────────┐                                     │
│   │ Main Menu            │                                     │
│   │ Quick Volume/Raid Setup                                    │
│   │ Raid Set Functio │ Controller H/W Monitor │               │
│   │ Volume Set Fun   │                        │               │
│   │ Physical Drives  │ CPU Temperature    39  │               │
│   │ Raid System Fu   │ Controller Temp.   27  │               │
│   │ Hdd Power Man    │ 12V            12.220  │               │
│   │ In Band SAS Co   │ 5V              4.999  │               │
│   │ Ethernet Config  │ 3.3V            3.376  │               │
│   │ View System Ev   │ DDR-II 1.8V     1.872  │               │
│   │ Clear Event Buff │ VCore  1.2V     1.248  │               │
│   │ Hardware Monito  │ DDR-II 0.9V     0.912  │               │
│   │ System informat  │ RTC  3.0        3.328  │               │
│   └──────────────────│ Battery Status  Not Installed │        │
│                      └────────────────────────┘               │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────────────────┘
```

5.5.12 System Information

Choose this option to display the controller's hardware firmware information. The controller provides two four-link connector for the Host and one four-link connector for Host or JBOD. It may has problem between the host/JBOD and controller. The 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

1x600 → Single-link for use

2x600 → Two-link for use

4x600 → Four-link for use

```
┌──────────────────────────────────────────────────────────────┐
│           Areca Technology Corporation RAID Controller         │
│                                                                │
│   ┌─────────────────────┐                                      │
│   │  Main Menu          │                                      │
│   ├─────────────────┬────┴──────────────────────────────────┐ │
│   │ Quick Volu      │  The System Information                │ │
│   │ Raid Set F      ├───────────────────────────────────────┤ │
│   │ Volume Se       │ Main Processor    : 800MHz PPC400      │ │
│   │ Physical D      │ CPU ICache Size   : 32KB               │ │
│   │ Raid Syste      │ CPU DCache Size   : 32KB/Write Back    │ │
│   │ Hdd Power       │ System Memory     : 512MB/800MHzECC    │ │
│   │ In Band SA      │ Firmware Version  : V1.48 2010-04-15   │ │
│   │ Ethernet C      │ BOOT ROM Version  : V1.48 2010-04-08   │ │
│   │ View Syste      │ PL Firmware Ver   : 5.0.4.0            │ │
│   │ Clear Even      │ Serial Number     : 1100-2116-6633     │ │
│   │ Hardware        │ Unit Serial #     :                    │ │
│   │ System Inf      │ Controller Name   : ARC-8040           │ │
│   │                 │ Current IP Addr.  : 192.168.001.100    │ │
│   │                 │ SAS Port0  Link   : Not Linked         │ │
│   │                 │ SAS Port1  Link   : Not Linked         │ │
│   │                 └───────────────────────────────────────┘ │
│                                                                │
│ Arrow Key: Move Cursor, Enter: Select, ESC: Escape, L:Line Draw, X: Redraw │
└──────────────────────────────────────────────────────────────┘
```

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 Ether-net LAN port.

6.1 Firmware-embedded TCP/IP & Web Browser-based RAID Manager (using the controller's 1Gb/s 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 (plat-form independent) via standard web browsers directly connected to the 1Gb/s RJ45 LAN port.
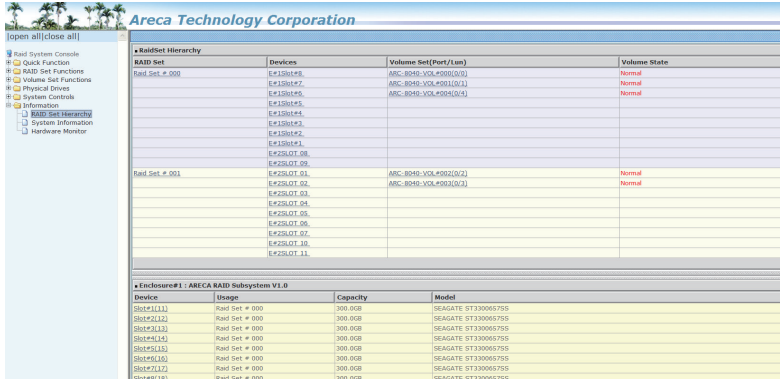
To configure RAID subsystem on a local or remote machine, you need to know its IP Address. The IP address will default show in the LCD screen. Launch your firmware-embedded TCP/IP & web browser-based RAID manager by entering http://[IP Address] in the web browser.

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.

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.

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

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.

WEB BROWSER-BASED CONFIGURATION
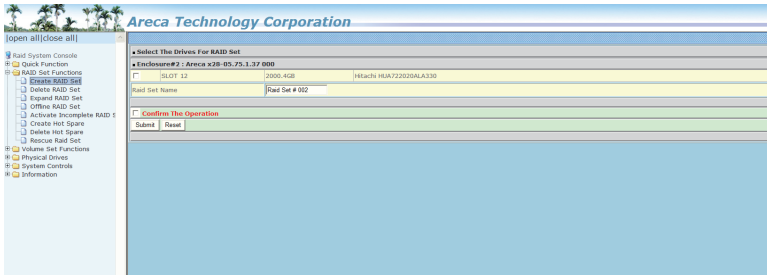
> ## Note:
>
> To create RAID 30/50/60 volume, you need create multiple RAID sets first with the same disk members on each RAID set. The max no. disk drives per volume set:
> 32 for RAID 0/1/10(1E)/3/50/60 and 122 for RAID 30/50/60.

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". It will be deleted by this action. But for the Raid 30/50/60, you need to delete the volumes belonging to those RAID sets.
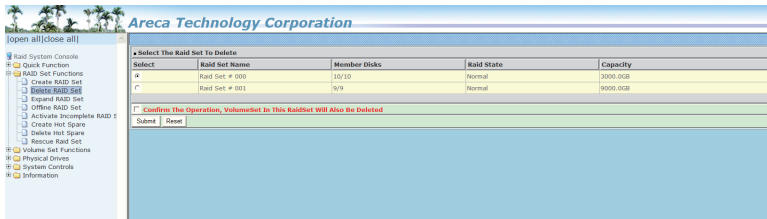
6.5.3 Expand Raid Set

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
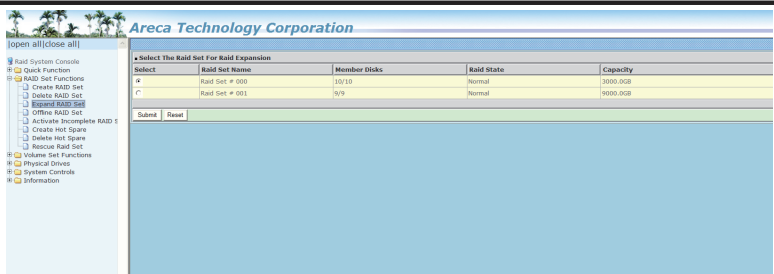
Click on the "Sumbit" button to start.

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.
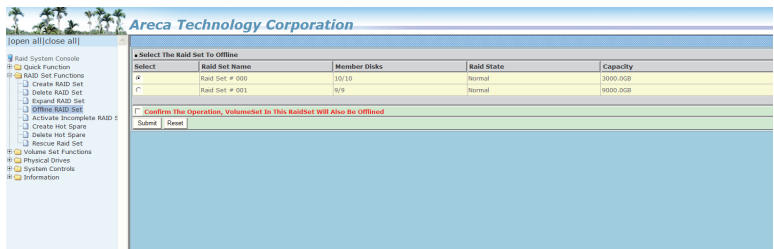
6.5.5 Activate Incomplete Raid Set

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.

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.
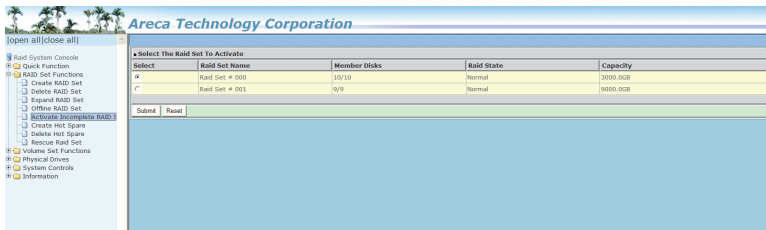
6.5.6 Create Hot Spare

When you choose the "Create Hot Spare" option in the "Raid Set Function", all unused physical devices connected to the current controller 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" gives you the ability to define a global or dedicated hot spare. Unlike "Global Hot Spare" which can be used with any RAID sets, "Dedicated Hot Spare" can only be used with a specific RAID set or Enclosure. When a disk drive fails in the RAID set or enclosure with a dedicated Hot Spare is pre-set, data on the disk drive is rebuild automatically on the dedicated hot spare disk.
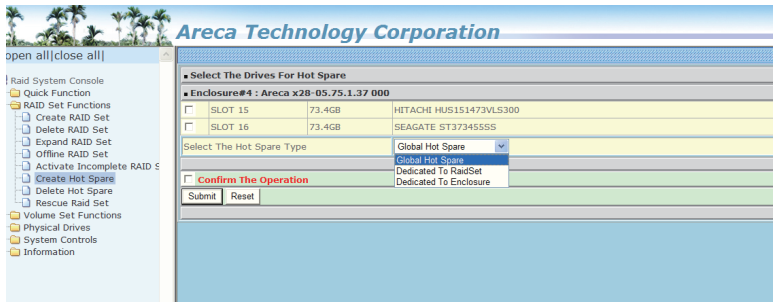
6.5.7 Delete Hot Spare

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.
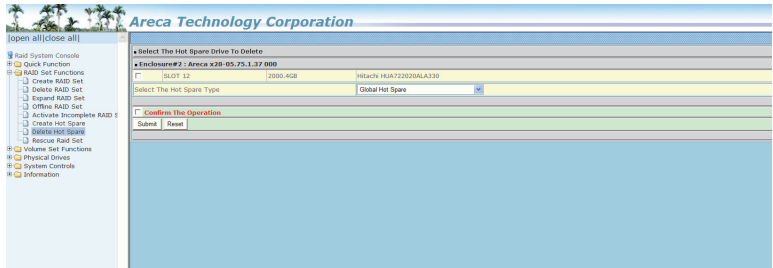
6.5.8 Rescue Raid Set

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.
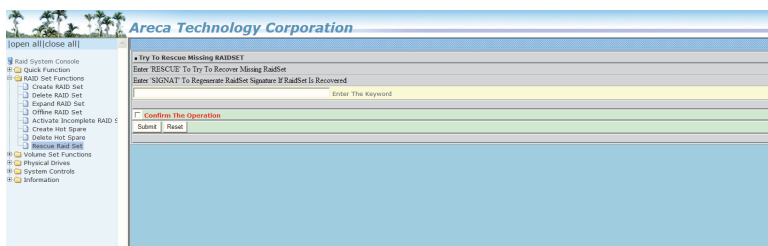
6.6 Volume Set Functions

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 two TB, because the controller is capable of 64-bit LBA mode. However the operating system itself may not be capable of addressing more than two TB.

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

WEB BROWSER-BASED CONFIGURATION

Command Queuing, SAS Port/LUN Base/LUN and Volumes To Be Created.

● **Volume Name**
The default volume name will always appear as "ARC-8040-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 from the available levels option.

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

● **Greater Two TB Volume Support**
If volume capacity will exceed 2TB, controller will show the "Greater Two TB Volume Support" sub-menu. Greater Two TB Volume Support option: "No", "64bit LBA" and "4K Block".

　• **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 change 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**

● Initialization Mode
This option 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 happed 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 Command Tag (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 SAS drives that do not support command tag queuing.

● **SAS Port/LUN Base/LUN**
SAS Port: Two 4-port SAS ports can be applied to the RAID subsystem. The RAID subsystem supports Port 0,1 and 0&1 cluster option. If you configure the Host/JBOD port as a JBOD function on the "System Config", then there will be no function on the selection of '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 RAID controller can connect up to 122 devices and 128 (16*8) volumes. The RAID subsystem is as a large SAS device. We should assign an LUN base from a list of SAS LUNs.

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.

● **Volume To Be Created**
The controller 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, Strip 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.

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.

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 modification, 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.
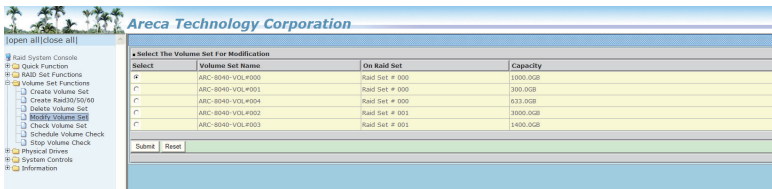
6.6.4.1 Volume Growth

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 entry 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 expand 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 2TB capacity device.
- Expand over 2TB used LBA64 mode. Please make sure your OS supports LBA64 before expand it.

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.
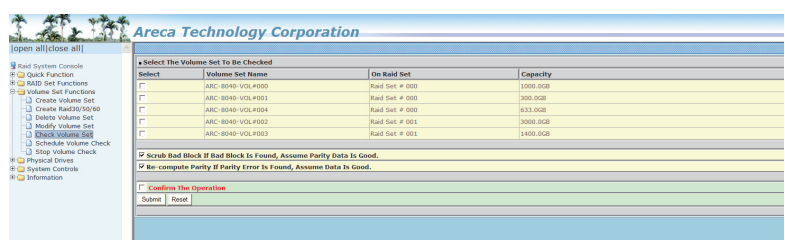
> **Note:**
>
> Please make sure of the inconsistency source generated by parity error or bad block before you click the recovery method. Otherwise, you will lose the recovery data.

6.6.7 Stop Volume Check

Use this option to stop the "Check Volume Set" function
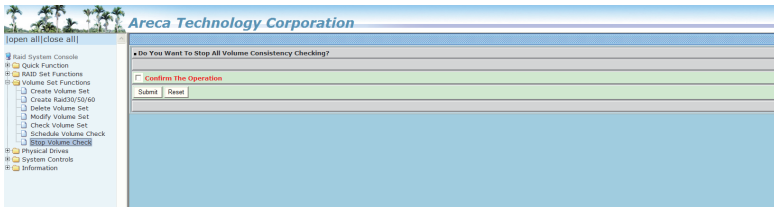
6.7 Physical Drive

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.
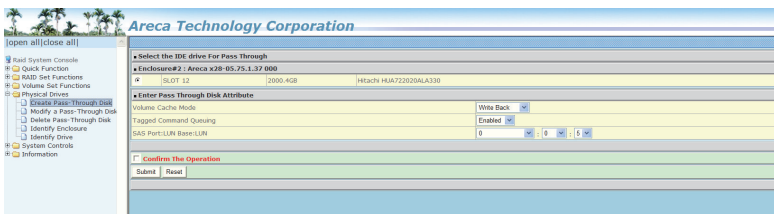
6.7.2 Modify a Pass-Through Disk

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 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.
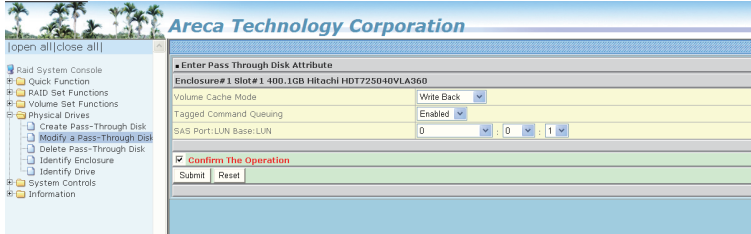
6.7.3 Delete Pass-Through Disk

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.
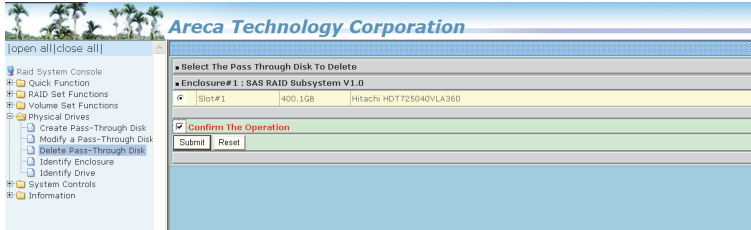
6.7.4 Identify Enclosure

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.
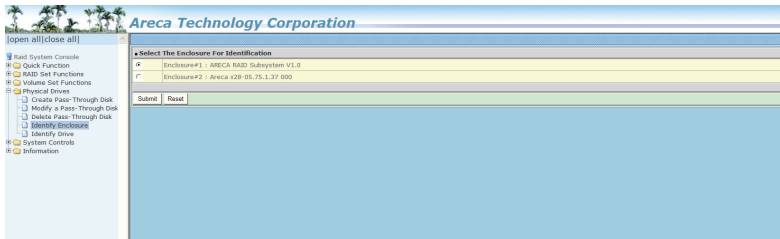
6.7.5 Identify Drive

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.
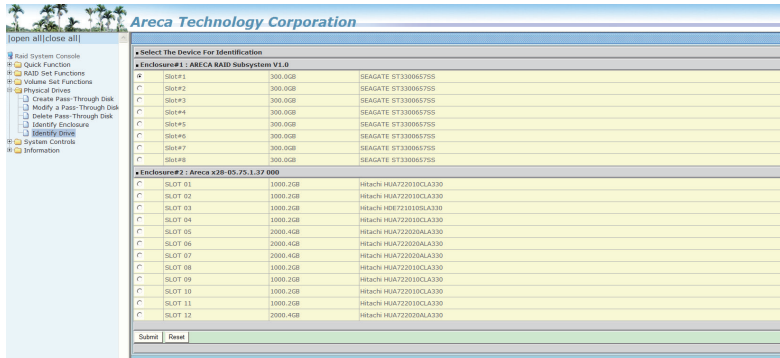
6.8 System Controls

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.

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

WEB BROWSER-BASED CONFIGURATION

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

WEB BROWSER-BASED CONFIGURATION

● 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.

● SAS Phy0-15 Max Speed

Some disk towers are an external solution with Min SAS (MS) host connectivity. It has integrated the 3Gb/s re-driver chip on its backplane for better signal quality. This can guarantee the signal from external connector on the external RAID adapter or host adapter to the disk tower backplane connector. Since the SAS RAID adapter can not negotiate the re-driver chip speed, you need to set this option to 3G for 3Gb/s re-driver chip.

● SAS Port1 Configuration

There are two SFF-8088 connectors on the rear of ARC-8040. You can configure those two connectors as two host ports (Port0 & Port1) or one host port (Port0)/one expander port (Port1) configuration. The "SAS Port1 Configuration" screen is used to define the Port1 SFF-8088 connector (Host or JBOD function) for ARC-8040 RAID subsystem. It is default configured as the JBOD port."

● 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.
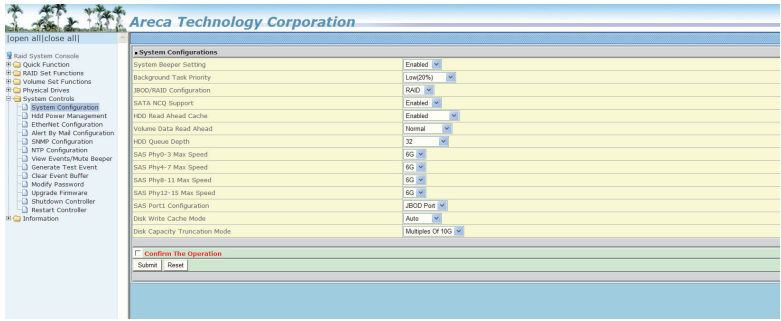
6.8.2 Hdd Power Management

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.
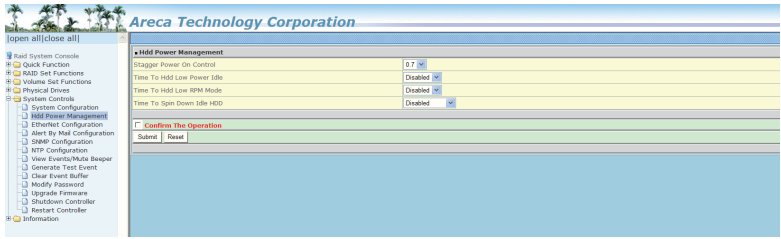
6.8.2.1 Stagger Power On Control

In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But in systems 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 system components. This damage can be avoided by allowing the host 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 host 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 from 0.4s to 6s per step which powers up one drive.

6.8.2.2 Time to Hdd Low Power Idle (Minutes)

This option delivers lower power consumption by automatically unloading recording heads during the setting idle time.

6.8.2.3 Time To Hdd Low RPM Mode (Minutes)

This function can automatically spin disks at lower RPM if there have not been used during the setting idle time.

6.8.2.4 Time To Spin Down Idle HDD (Minutes)

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.)

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.

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.
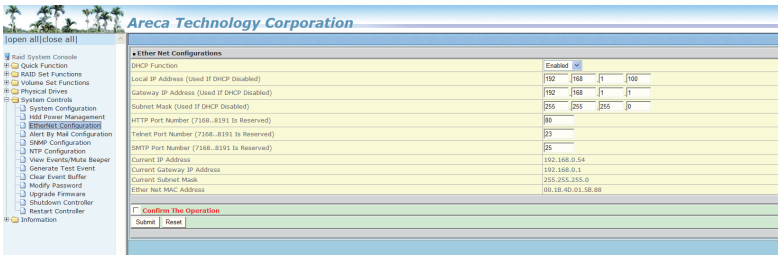
6.8.4 Alert By Mail Configuration

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.

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 press **Enter** key to 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.

● **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.
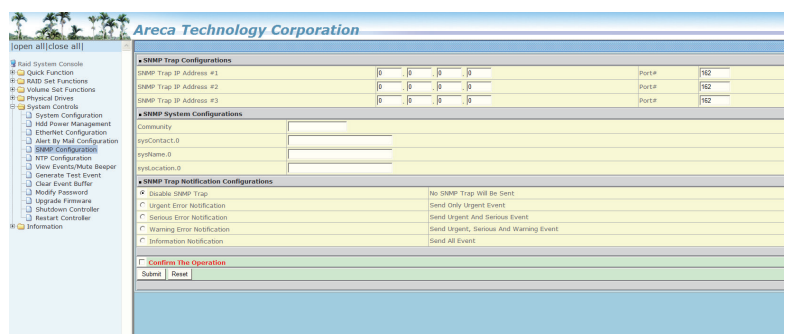
6.8.6 NTP Configuration

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:

● NTP Sever 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 re-

liability. 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.
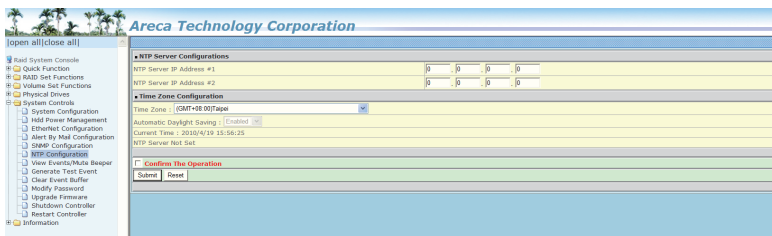
> **Note:**
>
> NTP feature works through onboard Ethernet port. So you must make sure that you have connected onboard Ethernet port.

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.

WEB BROWSER-BASED CONFIGURATION

6.8.8 Generate Test Event

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

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.
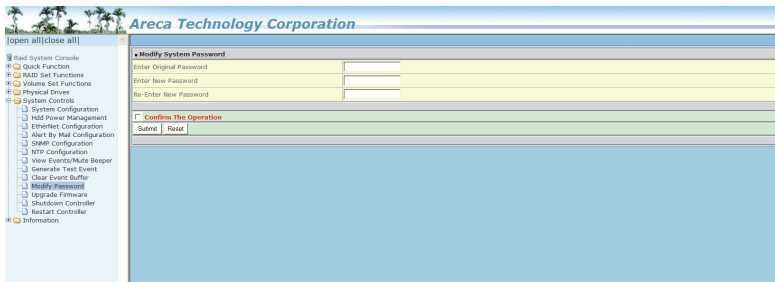
6.8.11 Update Firmware

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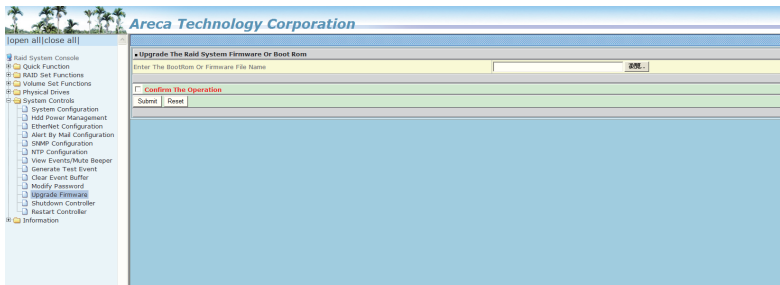
6.8.12 Shutdown Controller

Use the "Shutdown Controller" function to flash the cache data to HDD and shutdown the RAID controller.

6.8.13 Restart Controller

Use the Restart Controller Function to restart the RAID controller.
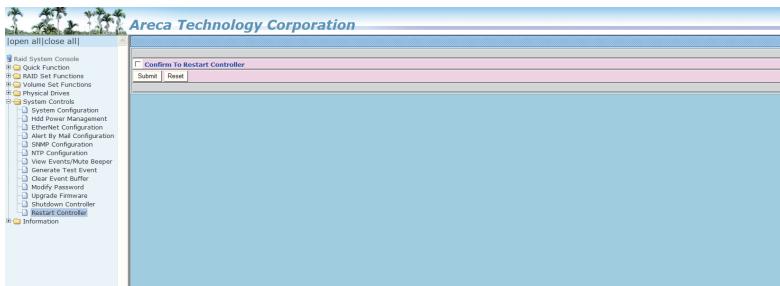
6.9 Information

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.

6.9.2 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 firmware version, serial number, main processor, CPU data/instruction cache size, system memory size/speed and current IP address appear in below screen.

WEB BROWSER-BASED CONFIGURATION

6.9.3 Hardware Monitor

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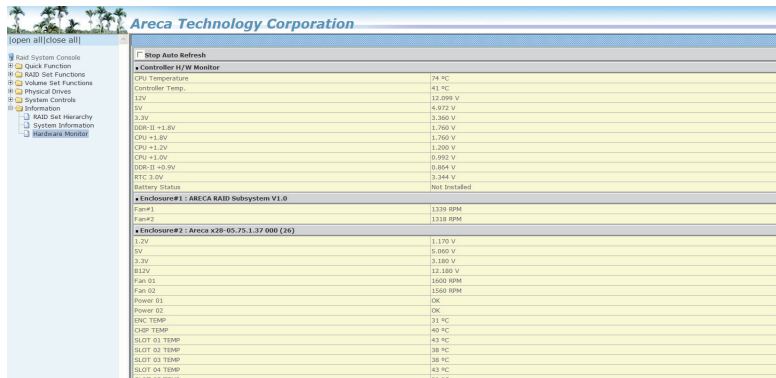
Appendix A

Upgrading Flash ROM Update Process

Since the RAID subsystem 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-8040XXXX.BIN Firmware Binary ("XXXX" refers to the function name:BOOT, FIRM and MBR0)
ARC-8040BOOT.BIN:→ RAID subsystem hardware initialization.
ARC-8040FIRM.BIN:→ RAID kernal program
ARC-8040MBR0.BIN:→ Master Boot Record for supporting Dual Flash Image in the RAID subsystem.

Readme.txt 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 subsystem controller 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 subsystem 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.
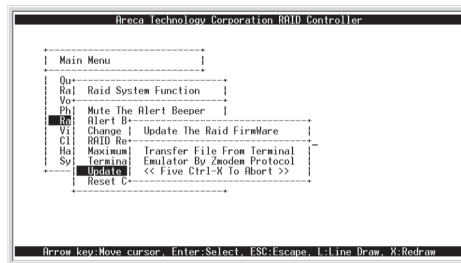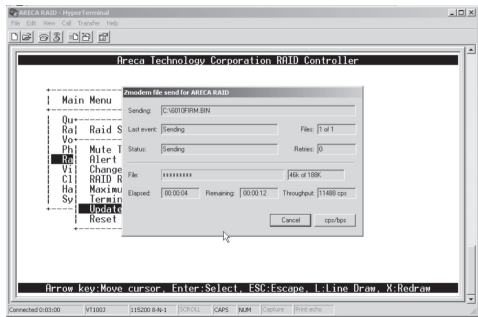

3. Go to the tool bar and select "Transfer". Open "Send File".
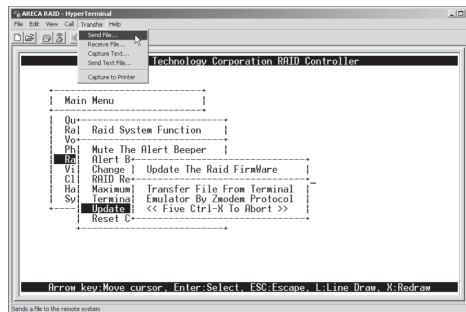
4. Select "ZMODEM modem" under Protocol. ZMODEM as the file transfer protocol of your terminal emulation software.
5. Click "Browse". Look in the location where the firmware upgrade software is located. Select the File name:
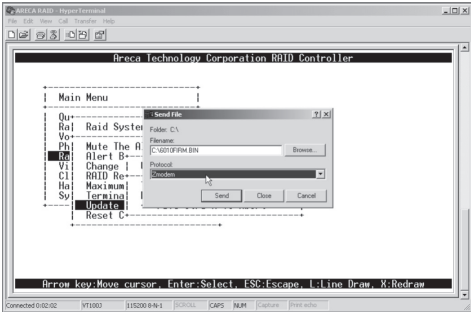
6. Click "Send", to send the firmware binary to the controller.

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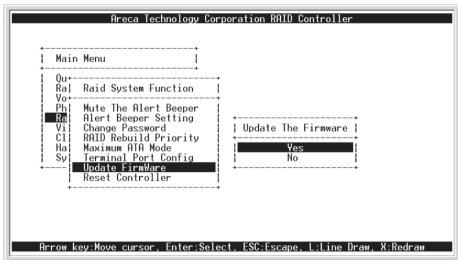
APPENDIX

8. When the Flash programming starts, a bar indicator will show "Start Updating Firmware. Please Wait".
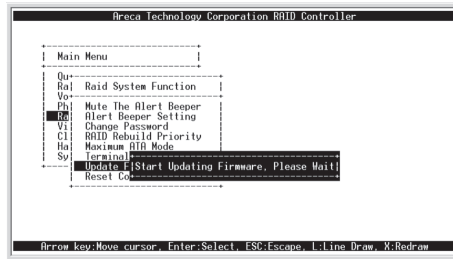
9. The Firmware upgrade will take approximately thirty seconds to complete.
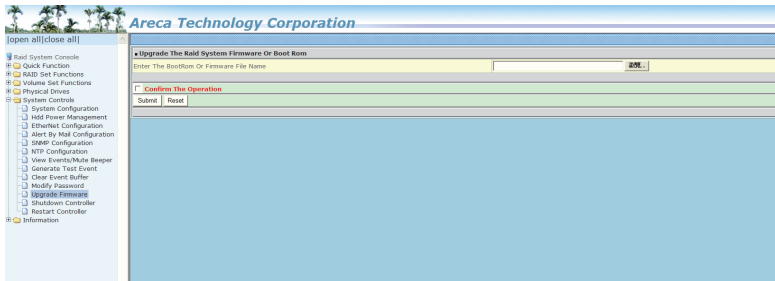10. After the Firmware upgrade is complete, a bar indicator will show "Firmware Has Been Updated Successfully".
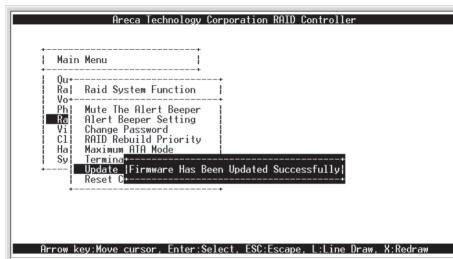
Note:

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 us the vaules before upgrade.
2. Please update all binary code (BOOT, FIRM and MBR0) before you reboot the RAID subsystem. Otherwise, a mixed firmware package may hang the RAID subsystem.

Upgrade Firmware Through Web Browser Manager (LAN Port)

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

1. To upgrade the RAID subsystem 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-8040FIRM.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 subsystem. Otherwise, a mixed firmware package may hang the RAID subsystem.

APPENDIX

Appendix B

Battery Backup Module (ARC-6120-BAT-TXX)

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

BBM Connector and Components

This section provides the board layout and connector/jumper for the BBM.
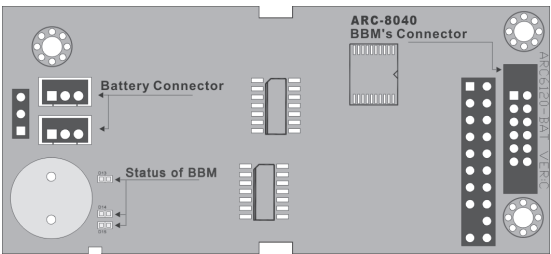
- D13 (Green) : light when BBM activated
- D14 (Red) : light when BBM charging
- D15 (Green) : light when BBM normal

Status of BBM

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

Installation

1. Make sure all power to the RAID subsystem is disconnected.
2. Install the "six eaves copper pillars" on the three mounting position (NH1,NH2 and NH3) and secures it using round head screws.

Six eaves copper pillars:3-M3x15mm

Round head screws:3-M3x6mm
(included split washer)
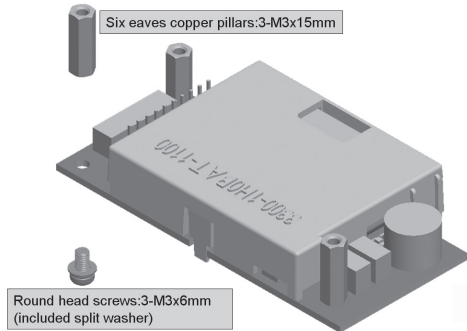
3. Connector J2 is available for the optional battery backup module. Connect the BBM cable to the 12-pin(J5) battery connector on the controller.
4. Integrators provides pre-drilled holes in their cabinet for securing the three "six eaves copper pillars" on the BBM using round head screws.

Round head screws:3-M3x6mm
(included split washer)
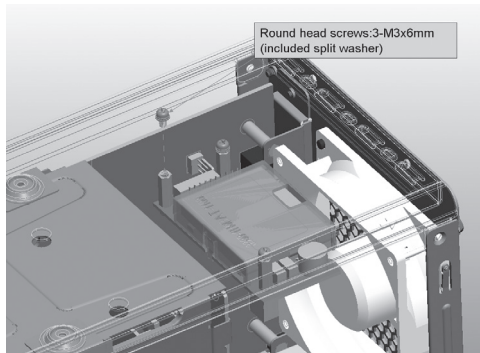
APPENDIX

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 RAID subsystem.

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.
3. Set the "Disk Write Cache Mode": Auto, if "Disk Write Cache" option does not set on the "Auto".
4. Set the volume set "Cache Mode": Write-Back Cache.

Battery Functionality Test Procedure

1. Write 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, battery beeps every few seconds.
4. Power on system, and login in the SAS RAID subsystem.
5. Check the controller event log, make sure the event shows controller boot up with power recovered.

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. Power down the SAS RAID subsystem properly. Make sure that cache memory has been flushed.
2. Remove all "Round head screws" from the cabinet.
3. Disconnect the BBM cable from J5 on the 6Gb/s SAS RAID controller.

4. Disconnect the battery pack cable from JP2 on the BBM.
5. Install a new battery pack and connect the new battery pack to JP2.
6. Connect the BBM to J5 on the 6Gb/s SAS RAID controller.
7. Secure the "Round head screws" into the BBM.
8. Disable the write-back function from the VT-100 or McRAID storage manager.

BBM Specifications

Mechanical
• Module Dimension (W x H x D)
37.3 x 13 x 81.6 mm

Environmental
• Operating Temperature
Temperature: -25° C to +75° C
Humidity: 45-85%, non-condensing

• Storage Temperature
Temperature: -40° C to 85° C
Humidity: 45-85%, non-condensing
• Electrical
Input Voltage
+3.6VDC

• On Board Battery Capacity
1100mAH (1*1100mAH)
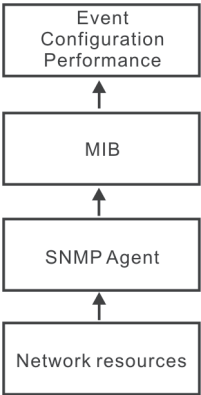
APPENDIX

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 an SNMP manager) can monitor the disk array. An example of An SNMP management application is Hewlett-Packard's Open View. The firmware-embedded SNMP agent ca 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.

```
┌─────────────────┐
│     Event       │
│  Configuration  │
│  Performance    │
└─────────────────┘
         ↑
┌─────────────────┐
│      MIB        │
└─────────────────┘
         ↑
┌─────────────────┐
│   SNMP Agent    │
└─────────────────┘
         ↑
┌─────────────────┐
│Network resources│
└─────────────────┘
```

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.

APPENDIX

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	

APPENDIX

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 subsystem, and contact us.
Hdd Over Temperature	Urgent	Abnormally high temperature detected on Hdd (over 55 degree)	Check air flow and cooling fan of the subsystem.
Fan Failed	Urgent	Cooling Fan # failure or speed below 1700RPM	Check cooling fan of the subsystem and replace with a new one if required.
Controller Temp. Recovered	Serious	Controller temperature back tonormal 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 backuped	
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	

|			
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 incompleted rebuilding/migration.

APPENDIX

Appendix E

RAID Concept

RAID Set

A RAID set is a group of disk containing one or more volume sets. It has the following features in the RAID subsystem. A volume Set must be created either on an existing RAID set or on a group of available individual disks (disks that are not yet a part of an RAID set). If there are pre-existing RAID sets with available capacity and enough disks for specified RAID level desired, then the volume set will be created in the existing RAID set of the user's choice. If physical disk of different capacity 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

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 disk capacity available in a RAID set. Multiple volume sets can exist on a group of disks in a RAID set.

In the illustration below, volume 1 can be assigned a RAID 5 level of operation while volume 0 might be assigned a RAID 0+1 level of operation.

RAID Set 1 (3 Individual Disks)

Free Space
Volume 1 (RAID 5)
Volume 0 (10)

Disk 0   Disk 1   Disk 2
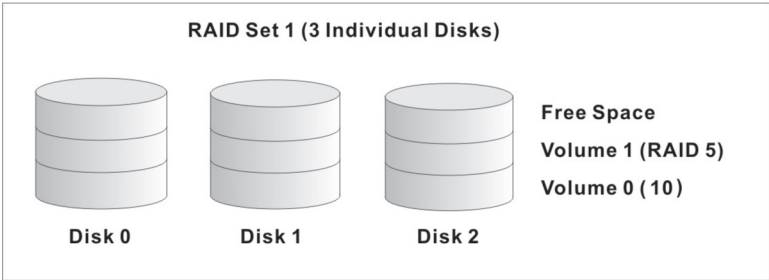
Easy of Use Features

• Instant Availability/Background

Initialization RAID 0 and RAID 1 volume set can be used immediately after the creation. But the RAID 3 and 5 volume sets must be initialized to generate the parity. In the Normal 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. Furthermore, the RAID volume set is also protected against a single disk failure while initialing. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses.

• Online Array Roaming/Offline RAID set

The RAID subsystem stores configuration information on the disk drives It can protect the configuration settings in the case of a disk drive or controller failure. Array roaming allows the administrators the ability to move a completely RAID set to another system without losing RAID configuration and data on that RAID set. If a server fails to work, the RAID set disk drives can be moved to another server and inserted in any order.
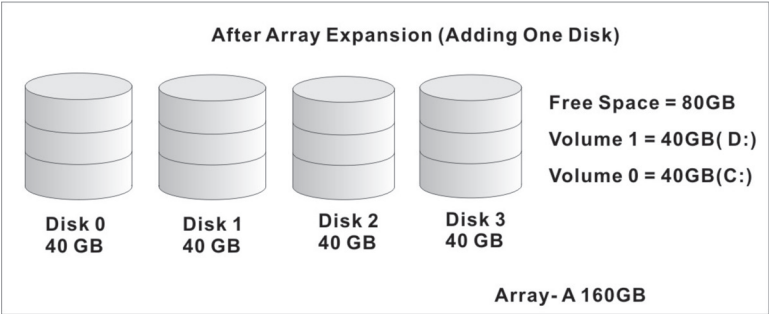
• Online Capacity Expansion

Online Capacity Expansion makes it possible to add one or more physical drive to a volume set, while the server is in operation, eliminating the need to store and restore after reconfigured the RAID set. When disks are added to a RAID set, unused capacity is added to the end of the RAID set. Data on the existing volume sets residing on that 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 create additional volume set. The expansion process is illustrated as following figure.

APPENDIX

Before Array Expansion

Free Space = 40GB
Volume 1 = 40GB(D:)
Volume 0 = 40GB(C:)

Disk 0   Disk 1   Disk 2
40 GB   40 GB   40 GB

Array- A 120GB
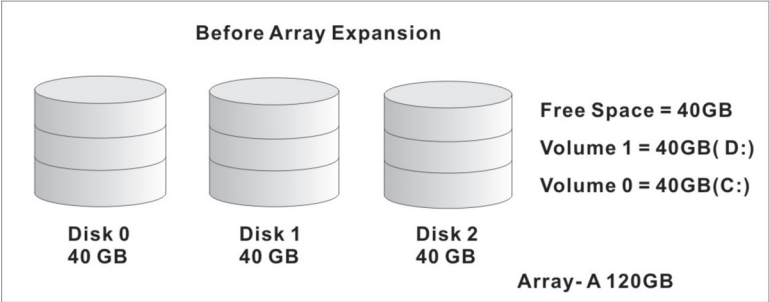
The RAID subsystem redistributes the original volume set over the original and newly added disks, using the same fault-tolerance configuration. The unused capacity on the expand RAID set can then be used to create an additional volume sets, with a different fault tolerance setting if user need to change.

After Array Expansion (Adding One Disk)

Free Space = 80GB
Volume 1 = 40GB(D:)
Volume 0 = 40GB(C:)

Disk 0   Disk 1   Disk 2   Disk 3
40 GB   40 GB   40 GB   40 GB

Array- A 160GB

• Online RAID Level and Stripe Size Migration

User can migrate both the RAID level and stripe size of an existing volume set, while the server is online and the volume set is in use. Online RAID level/stripe size migration can prove helpful during performance tuning activities as well as in the event that additional physical disks are added to the RAID subsystem. For example, in a system using two drives in RAID level 1, you could add capacity and retain fault tolerance by adding one drive. With the addition of third disk, you have the option of adding this disk to your existing RAID logical drive and migrating from RAID level 1 to 5. The result would be parity fault tolerance and double the available capacity without taking the system off.

High availability

● Global/Dedicated Hot Spares

A hot spare is an unused online available drive, which is ready for replacing the failure disk. The hot spare is one of the most important features that RAID controllers provide to deliver a high degree of fault-tolerance. A hot spare is a spare physical drive that has been marked as a hot spare and therefore is not a member of any RAID set. If a disk drive used in a volume set fails, then the hot spare will automatically take its place and he data previously located on the failed drive is reconstructed on the hot spare.

Dedicated hot spare is assigned to serve one specified RAID set. Global hot spare is assigned to serve all RAID set on the RAID controller. Dedicated hot spare has higher priority than the global hot spare. For this feature to work properly, the hot spare must have at least the same capacity as the drive it re places. The host spare function only works with RAID level 1, 1E, 3, 5, 6, 10, 30, 50, or 60 volume set.

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

> **Important:**
>
> The hot spare must have at least the same capacity as the drive it replaces.

● Hot-Swap Disk Drive Support

The RAID subsystem has built the protection circuit to support the replacement of SAS/SATA ll hard disk drives without having to shut down or reboot the system. The removable hard drive tray can de-liver "hot swappable," fault-tolerant RAID solutions at prices much less than the cost of conventional SCSI hard disk RAID subsystems. We provide this feature for controllers to provide the advanced fault tolerant RAID protection and "on-

line" drive replacement.

● Hot-Swap Disk Rebuild

A Hot-Swap function can be used to rebuild disk drives in arrays with data redundancy such as RAID level 1, 10, 3, 5 and 6. 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 rebuilt. If a hot spare is available, the rebuild starts automatically when a drive fails. The RAID subsystem automatically and transparently rebuilds failed drives in the background with user-definable rebuild rates. The RAID subsystem will automatically restart the system and the rebuild if the system is shut down or powered off abnormally during a reconstruction procedure condition. When a disk is Hot Swap, 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.

Understanding RAID

RAID is an acronym for Redundant Array of Independent Disks. It is an array of multiple independent hard disk drives that provide high performance and fault tolerance. The RAID subsystem implements several levels of the Berkeley RAID technology. An appropriate RAID level is selected when the volume sets are defined or created. This decision is based on disk capacity, data availability (fault tolerance or redundancy), and disk performance. The following is the RAID level, which support in the RAID subsystem. The RAID subsystem 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 in-stallation of the disk array and the controller requires a proper understanding of RAID technology and the concepts.
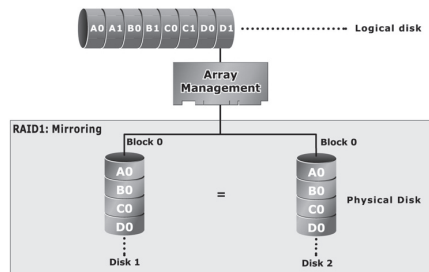
● RAID 0

RAID 0, also referred to as striping, writes stripping 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 en-hances performance because multiple drives are accessed simul-taneously; but the reliability of RAID Level 0 is less than any of its member disk drives due to its lack of redundancy.
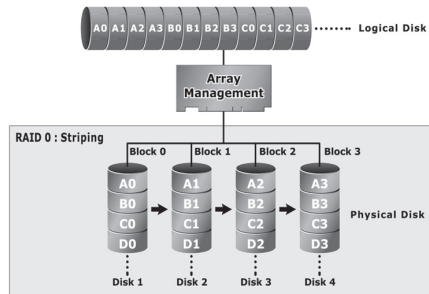
● RAID 1

RAID 1 also known as "disk mirroring", data written to one disk drive is simultaneously written to another disk drive. Read performance may be enhanced if the array controller can paral-lel accesses 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.

APPENDIX

● RAID 10(1E)

RAID 10(1E) is a combination of RAID 0 and RAID 1, combining stripping with disk mirroring. RAID Level 10(1E) combines the fast performance of Level 0 with the data redundancy of Level 1. In this configura-tion, data is distributed across several disk drives, similar to Level 0, which are a stripe across a number of mirrored sets for data protection. RAID 10(1E) provides the highest read/write performance of any of the Hybrid RAID lev-els, but at the cost of doubling the required data storage capac-ity.
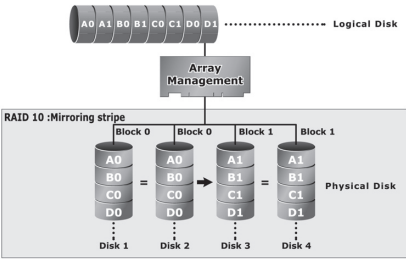

● RAID 3

RAID 3 provides disk striping and complete data redundancy though 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 com-puting the exclusive-or of the con-tents corresponding strips of the surviving member disk. RAID 3 is best for applications that require very fast data- transfer rates or long data blocks.
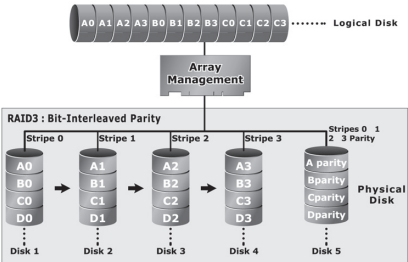
● RAID 5

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 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 to seek operation at the same time, greatly increasing the performance of the RAID system This relieves the write bottle-neck that characterizes RAID 4, and is the primary reason that RAID 5 is more often implemented in RAID arrays.
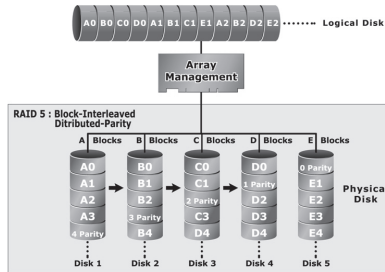
● RAID 6

RAID 6 provides highest reliability, but not widely used. Similar to RAID 5, but does two different parity computations or the same computation on overlapping subsets of the data. The RAID 6 can offer fault tolerance greater that RAID 1 or RAID 5 but only con-sumes the capacity of 2 disk drives for distributed parity data. RAID 6 is an extension of RAID 5 that 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 writ-ten across all of the drives.
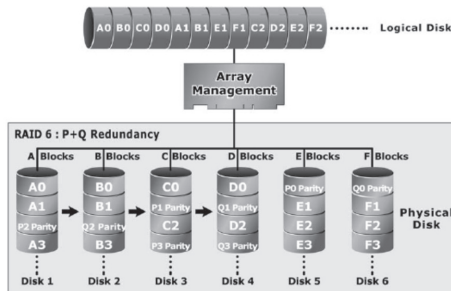
APPENDIX

● 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.
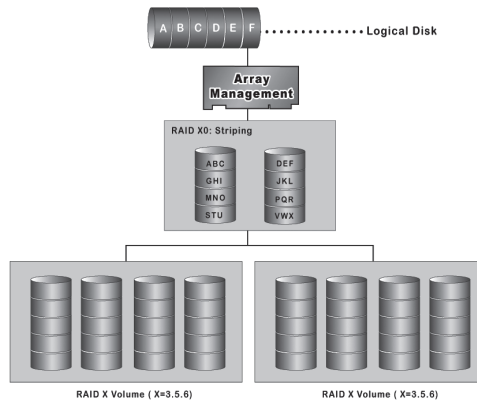
Important:

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, 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 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.

● **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.

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	Disks requirement (Cost)	Data Reliability	Data Transfer Rate	I/O Request Rates
0	Also known as stripping. Data distributed across multiple drives in the array. There is no data protection	N	No data Protection	Very High	Very High for Both Reads and Writes
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	Lower than RAID 6; Higher than RAID 3,5	Reads are higher Than a single disk; Writes similar to a single disk	Reads are twice faster than a single disk; Write are similar to a single disk.
10(1E)	Also known Block-Interleaved Parity. Data and parity information is subdivided 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.	N (N>2)	Lower than RAID 6; Higher than RAID 3,5	Transfer rates more similar to RAID 1 than RAID 0	Reads are twice faster than a single disk; Writes are similar to a single disk.

3	Also known Bit-Interleaved Parity. Data and parity information is subdivided 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.	N+1	Lower than RAID 1, (10), 6; Higher than a single drive	Reads are similar to RAID 0; Writes are slower than a single disk	Reads are similar twice faster than a single disk; Writes are similar to a single disk.
5	Also known Block-Interleaved Distributed Parity. Data and parity information is subdivided 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.	N+1	Lower than RAID 1, (10), 6; Higher than a single drive	Reads are similar to RAID 0; Writes are slower than a single disk	Reads are similar to RAID 0; Writes are slower than a single disk.
6	RAID 6 provides highest reliability, but not widely used. Similar to RAID 5, but does two different parity computations or the same computation on overlapping subsets of the data. The RAID 6 can offer fault tolerance greater that RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed parity data.	N+2	highest reliability	Reads are similar to RAID 0; Writes are slower than RAID 5	Reads are similar to RAID 0; Writes are slower than a RAID 5
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		