AN-712E8N/AN-716E8N/
AN-724E8N
PCI-E Gen3 x 8 to 6Gb SAS/SATA Series RAID Subsystem
Software Operation Manual
V1.0

8/10/2014

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About This Software Operation Manual

This manual contains all the information you need to initially configuring and monitoring the Alnico RAID.

Task Map

1. Prepare

Refer to Software Operation Manual and Hardware Installation Guide, let yourself know the features, capabilities of Alnico RAID and make sure you have everything on hand.

2. Install Hardware

Install the Alnico RAID Subsystem. Refer to:

Hardware Installation Guide

3. Configuration

To create a RAID set and define a volume set via LCD display front panel, remote utility or 10/100 base-T Ethernet.

4. Make a Record

Be sure to clearly write down every items of the configuration, it will help you to rescue the data back in case of RAID fail up.

Symbols in Text

These symbols may be found throughout this guide. They have the following meanings.

Caution

This icons indicates that failure to follow directions could result in personal injury, damage to your equipment or loss of information.

Note

This icon presents commentary, sidelights, or interesting points of information. .

Important terms, commands and programs are put in **Boldface** font.

Screen text is given in **`screen`** font.

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Chapter 1. INTRODUCTION

This chapter provides a brief introduction of Array Definition and RAID concept.

1.1 Array Definition

1.1.1 Raid Set

A Raid Set is a group of disks containing one or more volume sets. It has the following features in the RAID subsystem:

1. Up to **sixteen** Raid Sets are supported per RAID subsystem controller.

2. From one to twelve/sixteen/twenty four (depend on Model) drives can be included in an individual Raid Set.

3. It is impossible to have multiple Raid Sets on the same disks.

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 a 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 disks 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.

1.1.2 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 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.

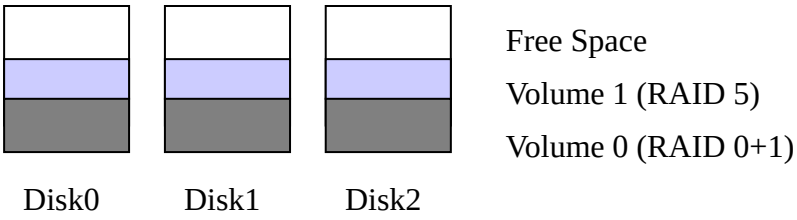
1. Volume Sets of different RAID levels may coexist on the same Raid Set.

2. The maximum addressable size of a single volume set can be exceeded than 2 TB (64-bit LBA, firmware define support up to 512TB, for Windows block size set to 4KB can support up to 16TB).

3. Up to **sixteen** volume sets can be created 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)



1.1.3 Instant Availability/Background Initialization

RAID 0 and RAID 1 volume set can be used immediately after the creation. But the RAID 3, 5, 6, and X0 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 initializing. In Fast initialization, the initialization process must be completed before the volume set is ready for system accesses.

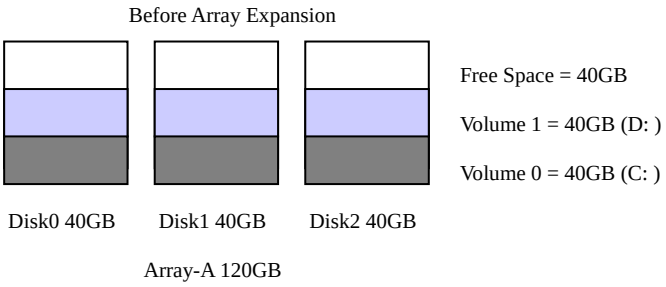
1.1.4 Array Roaming

The RAID subsystem stores configuration information both in NVRAM and on the disk drives. This way it can protect the configuration settings in 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.

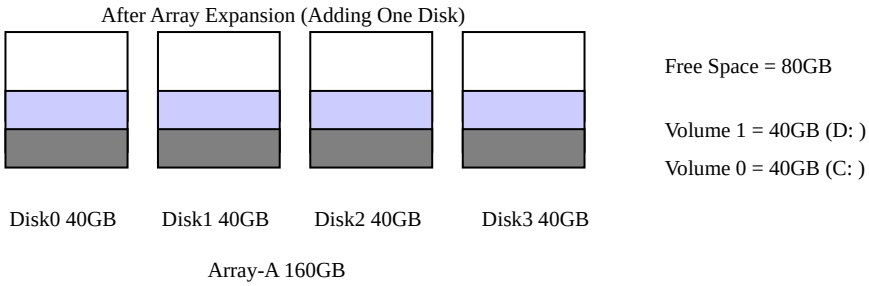
1.1.5 Online Capacity Expansion

Online Capacity Expansion makes it possible to add one or more physical drives to a volume set, while the server is in operation, eliminating the need to store and restore after reconfiguring 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 in the following figure.



The RAID subsystem controller redistributes the original volume set over the original and newly added disks, using the same fault-tolerance configuration. The unused capacity on the expanded raid set can then be used to create an additional volume set, with a different fault tolerance setting if user needs to change.



1.1.6 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 where those additional physical disks are added to the RAID subsystem. Before the invention of RAID level and stripe size migration, changing the RAID level and stripe size of a RAID system meant backing up all data in the disk array, re-creating disk array configuration with new RAID level and stripe size, and then restoring data back into RAID system. 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.

1.1.7 Hot Spares

A hot spare drive is an unused online available drive, which is prepared for

replacing the failure disk drive. In a RAID level 1, 1E, 3, 5, 6, X0 RAID set, any unused online available drive installed but not belonging to a RAID set can define as a hot spare drive. Hot spares permit you to replace failed drives without powering down the system. When RAID subsystem detects a SAS (or SATA) drive failure, the system will automatically and transparently rebuild using the hot spare drives. The raid set will be reconfigured and rebuilt in the background, while the RAID subsystem continues to handle system request. During the automatic rebuild process, system activity will continue as normal, however, the system performance and fault tolerance will be affected.

NOTE

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

1.1.8 Hot-Swap Disk Drive Support

The RAID subsystem is built with the protection circuit to support the replacement of SAS (or SATA) hard disk drives without having to shut down or reboot the system. The removable hard drive tray can deliver “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 subsystems to provide the advanced fault tolerant RAID protection and “online” drive replacement.

1.1.9 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, 1E, 3, 5, 6, and X0. 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.

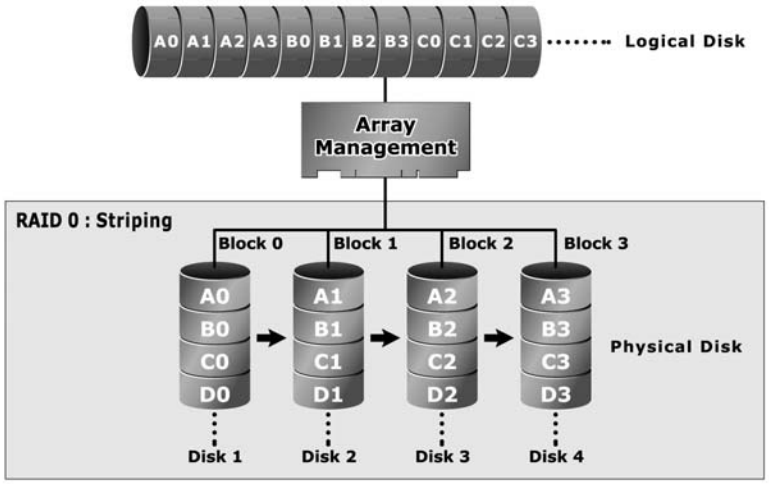
1.2 RAID Concept

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 controller implements several levels of the Berkeley RAID technology. An appropriate RAID level is selected when the volume sets are defined or created. This decision is based on disk capacity, data availability (fault tolerance or redundancy), and disk performance. The following are the RAID levels which are supported in the RAID subsystem.

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

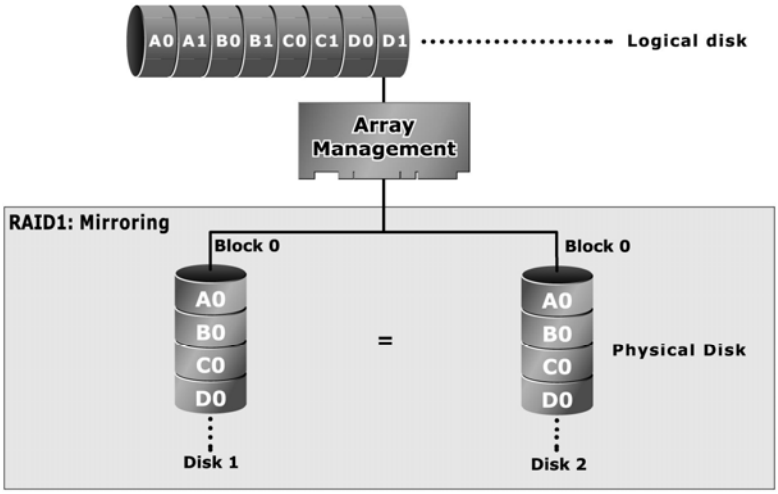
1.2.1 RAID 0

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 enhances performance because multiple drives are accessed simultaneously; but the reliability of RAID Level 0 is less than any of its member disk drives due to its lack of redundancy.



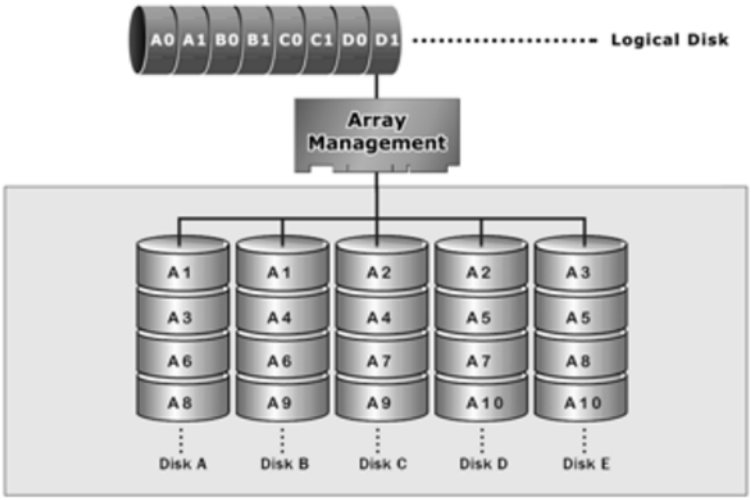
1.2.2 RAID 1

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 parallel 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 is doubling the required data storage capacity.



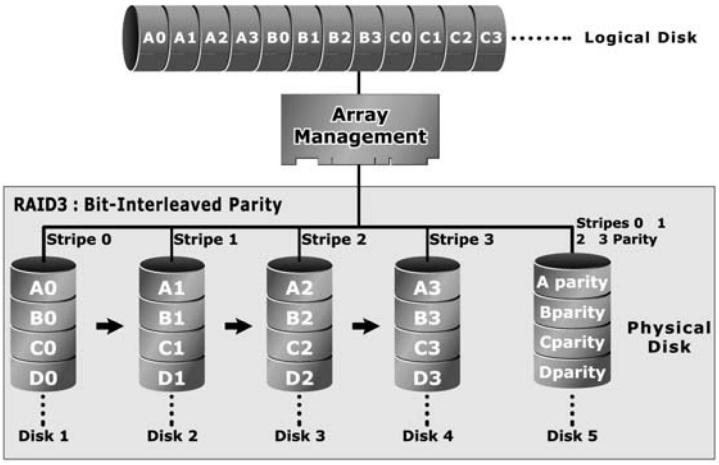
1.2.3 RAID 1E

RAID 1E (available only on Alnico 8 Series) has been traditionally implemented using an even number of disks; some hybrids can use an odd number of disks as well. Illustration is an example of a hybrid RAID 1E array comprised of five disks; A, B, C, D and E. In this configuration, each strip is mirrored on an adjacent disk with wrap-around. In fact this scheme - or a slightly modified version of it - is often referred to as RAID 1E and was originally proposed by IBM. When the number of disks comprising a RAID 1E is even, the striping pattern is identical to that of a traditional RAID 1E, with each disk being mirrored by exactly one other unique disk. Therefore, all the characteristics for a traditional RAID 1E apply to a RAID 1E when the latter has an even number of disks. RAID 1E offers a little more flexibility in choosing the number of disks that can be used to constitute an array. The number can be even or odd.



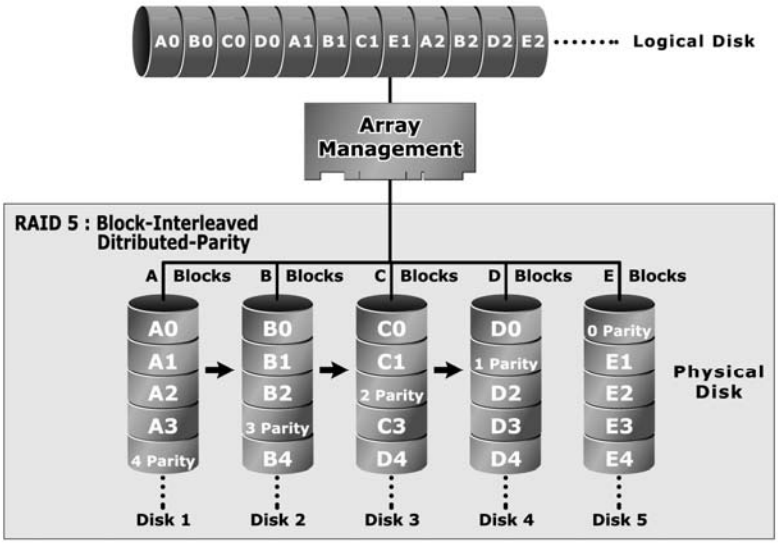
1.2.4 RAID 3

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



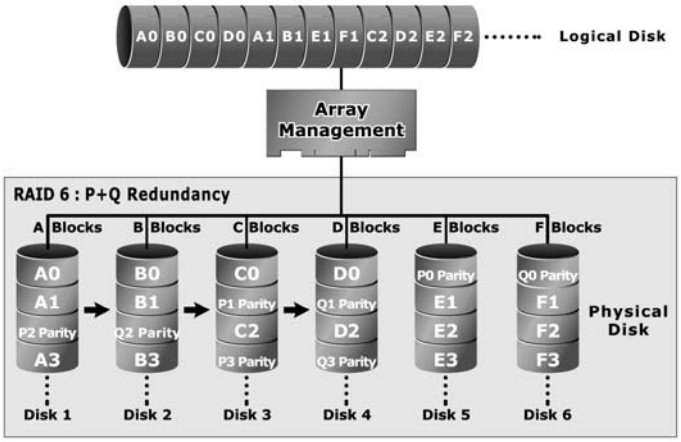
1.2.5 RAID 5

RAID 5 is sometimes called striping with parity at block level. In RAID 5, the parity information is written to all of the drives in the subsystems 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.



1.2.6 RAID 6

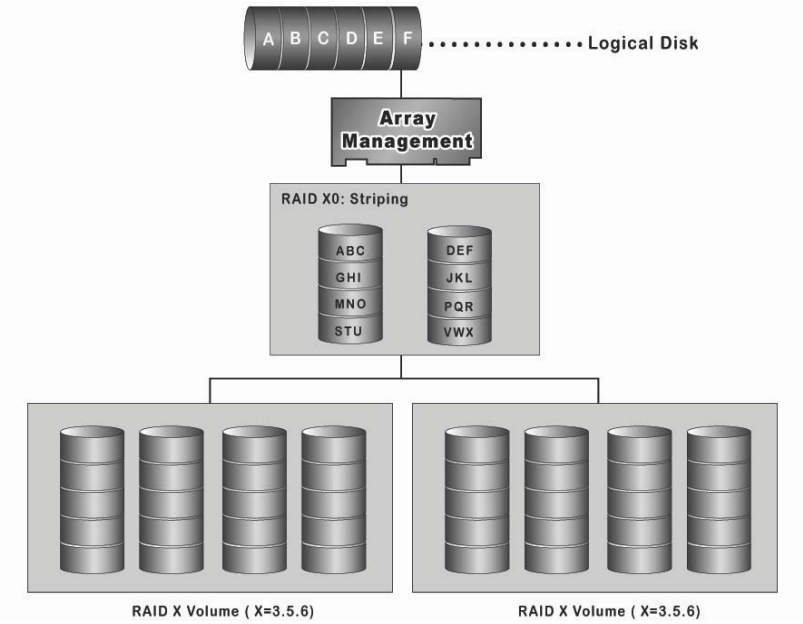
A RAID 6 array is essentially an extension of a RAID 5 array with a second independent distributed parity scheme. Data and parity are striped on a block level across multiple array members, just like in RAID 5, and a second set of parity is calculated and written across all the drives. As larger disk arrays are considered, it is desirable to use stronger codes that can tolerate multiple disk failure. When a disk fails in a parity protected disk array, recovering the contents of the failed disk requires successful reading on the contents of all no-failed disks. RAID 6 provides an extremely high fault tolerance, and can sustain two simultaneous drive failures without downtime or data loss. This is a perfect solution when data is mission-critical.



1.2.7 RAID X0

RAID level-X0 (available only on Alnico 8 Series) refers to RAID level- 10, 30, 50 and 60. RAID X0 is a combination of 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 1, 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.

The following illustration is an example of a RAID level-X0 logical drive.



RAID level-X0 allows more physical drives in an array. The benefits of doing so

are larger volume sets, increased performance, and increased reliability.

NOTE

RAID level-30 50 and 60 can support up to eight sub-Volumes.

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, 1E, 3, 5, or 6, you cannot change the volume to RAID level-30, 50, or 60.

1.2.8 Summary of RAID Levels

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

RAID Level	Description	Disks requirement (Cost)	Data Reliability
0	Also known as stripping. Data distributed across multiple drives in the array. There is no data protection	N	* No data Protection.
1	Also known as mirroring. All data replicated on N Separated disks. N is almost always 2. This is a high availability Solution, but due to the 100% duplication, it is also a costly solution.	2	* Lower than RAID 6. * Higher than RAID 3, 5.
1E (0+1)	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.
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.
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, and 6. * Higher than a single drive.
6	AS RAID level 5, but with additional independently computed redundant information	N+2	* Highest of all listed alternatives.

30	RAID 30 is a combination multiple RAID 3 volume sets with RAID 0 (striping)	(N+1) *2	Up to one disk failure in each sub-volume
50	RAID 50 is a combination multiple RAID 5 volume sets with RAID 0 (striping)	(N+1) *2	Up to one disk failure in each sub-volume
60	RAID 60 is a combination multiple RAID 6 volume sets with RAID 0 (striping)	(N+2) *2	Up to two disk failure in each sub-volume

Chapter 2.

Configuration Methods

2.1 Overview

After the hardware installation, the SAS (or SATA) disk drives installed to the RAID 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
- Remote utility connected through the controller's serial port (VT-100 or Hyper terminal)
- Using HTTP Proxy through the controller's serial port to access web browser-based RAID manager in Windows and Linux system.
- Firmware-embedded TCP/IP & web browser-based RAID manager via the controller's 10/100 Ethernet 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 RAID subsystem allows only one method to access menus at a time.

2.2 Using local front panel touch-control keypad

The front panel keypad and liquid crystal display (LCD) is the primary user interface for the RAID subsystem. All configuration and management of the RAID 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.

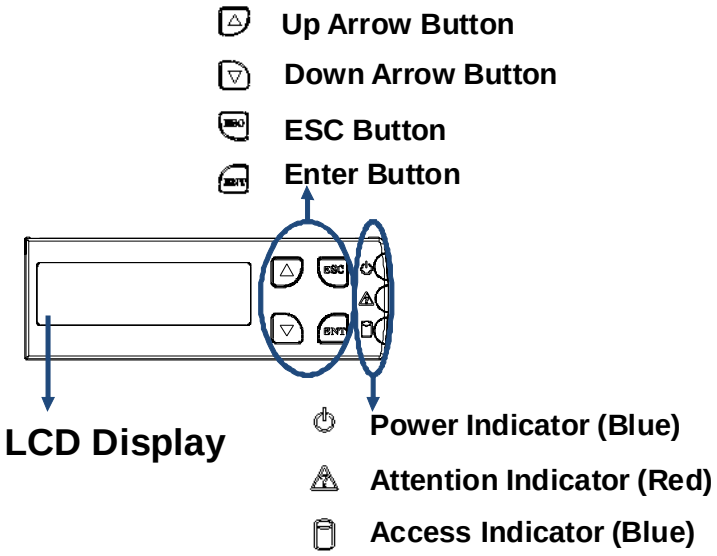
This Chapter provides, in quick reference form, procedures that use the built-in

LCD panel to configure and operate the controller.

A touch-control keypad and a liquid crystal display (LCD) mounted on the front panel 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 controller and for all SAS (or SATA) disk array subsystems to which 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 following:



2.2.1 Function Key Definitions

The four function keys at the button of the front panel 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 three LED indicators on the front panel. Following table provides a summary of the meanings of these LED indicators:

LED Indicator	Normal Status	Problem Indication
Power On indicator	Bright Blue	This LED does not light up after power switched on
Fail Indicator	LED never light up	LED light up as Red.
Data Access Indicator	Blink blue during host computer accessing the RAID subsystem.	LED never flickers

For additional information on using the LCD panel and keypad to configure the RAID see ”LCD Panel Configuration” on Chapter 3.

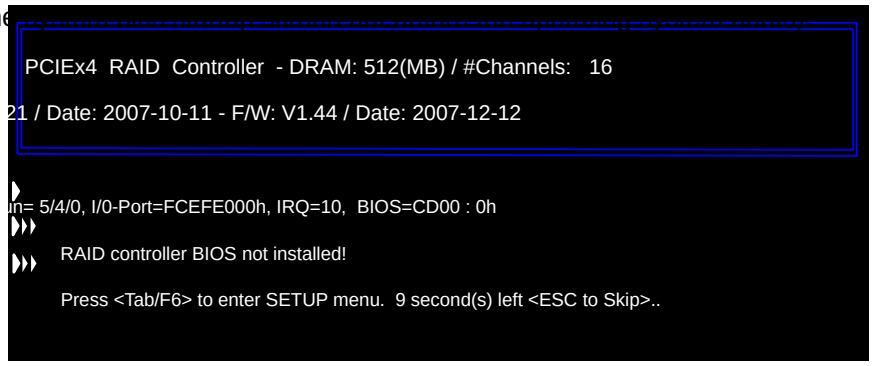
2.3 Using the McBIOS RAID manager via BIOS

The system mainboard BIOS automatically configures the following Alnico 8 PCIe RAID subsystem parameters at power-up:

- I/O Port Address
- Interrupt channel (IRQ)
- Adapter ROM Base Address

Use McBIOS to further configure the Alnico 8 PCIe RAID subsystem to suit your server hardware and operating system.

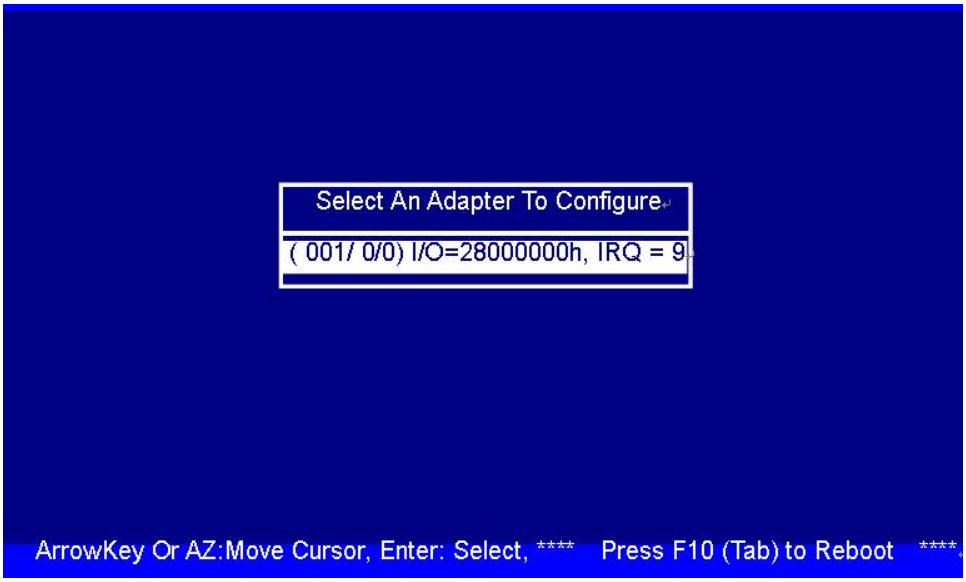
When starting a system with an Alnico 8 PCIe RAID subsystem installed, it will display the following message on the monitor during the start- up sequence (after the



The McBIOS configuration manager message remains on your screen for about nine seconds, giving you time to start the configure menu by pressing **Tab** or **F6**. If you do not wish to enter configuration menu, press <**ESC**> to skip

configuration immediately. When activated, the McBIOS window appears showing a selection dialog box listing the Alnico 8 PCIe RAID subsystems that are installed in the system.

The legend at the bottom of the screen shows you what keys are enabled for the windows.



2.3.1 Keyboard Navigation

The following definition is the McBIOS RAID manager 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

2.4 Using Terminal mode RAID manager via Ethernet Port

Using the controller's 10/100 Ethernet LAN port, you can use Hyper terminal or telnet program connect to RAID, and start terminal mode RAID manager, the configuration page and setting methods same as MCBIOS.

2.4.1 Keyboard Navigation

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

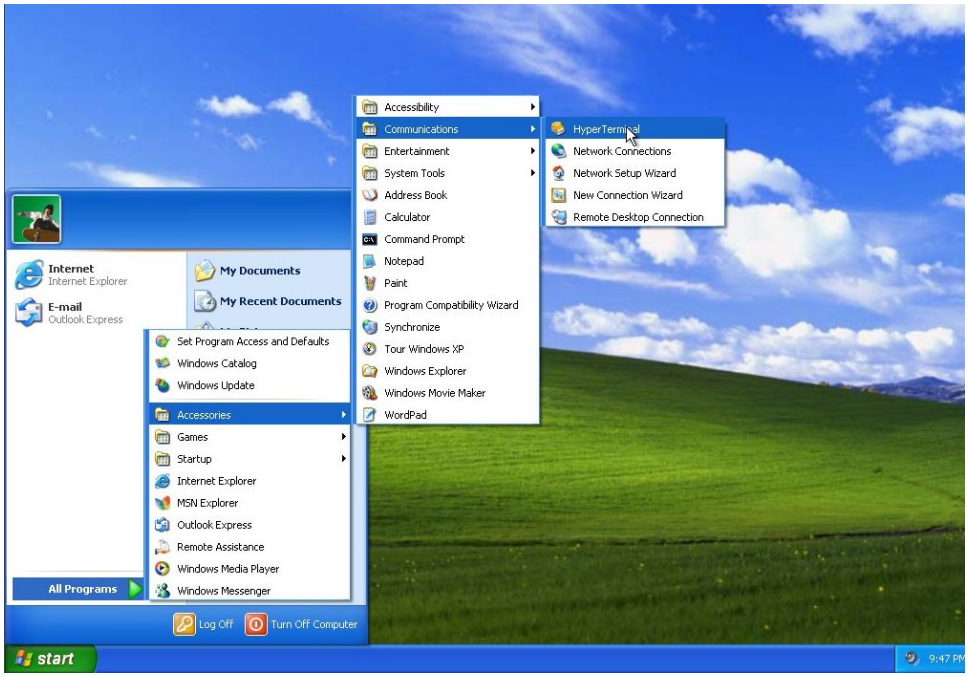
Key	Function
Arrow Key	Move cursor
Enter Key	Submit selection function
ESC Key	Return to previous screen
L Key	Line draw
X Key	Redraw

2.4.2 Start-up VT100 Screen

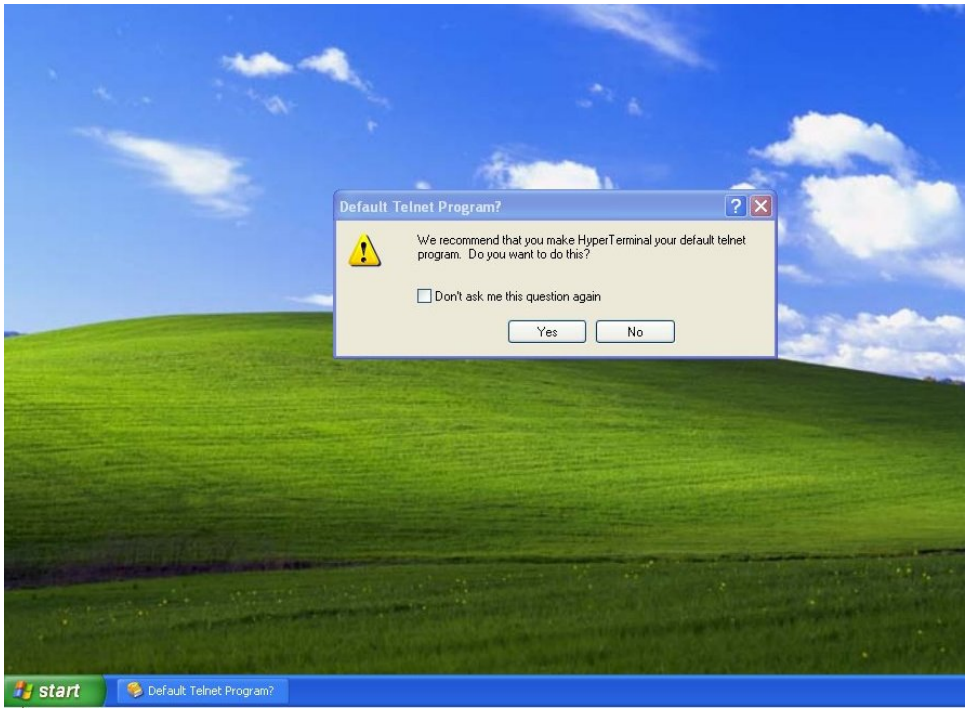
By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all RAID subsystem monitoring, configuration and administration functions can be exercised from the VT100 terminal.

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 of VT100 Terminal in Windows XP system using Hyper Terminal Version 5.1.

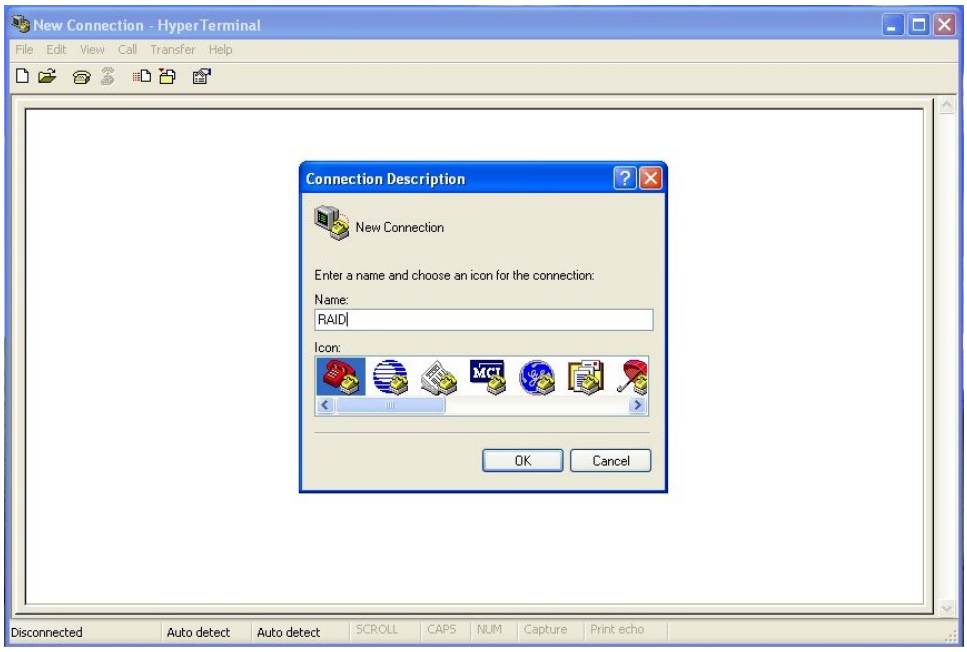
Step 1. From the Desktop open the Start menu. Pick All Programs, Accessories, Communications and Hyper Terminal. Open Hyper Terminal (requires version 3.0 or higher)



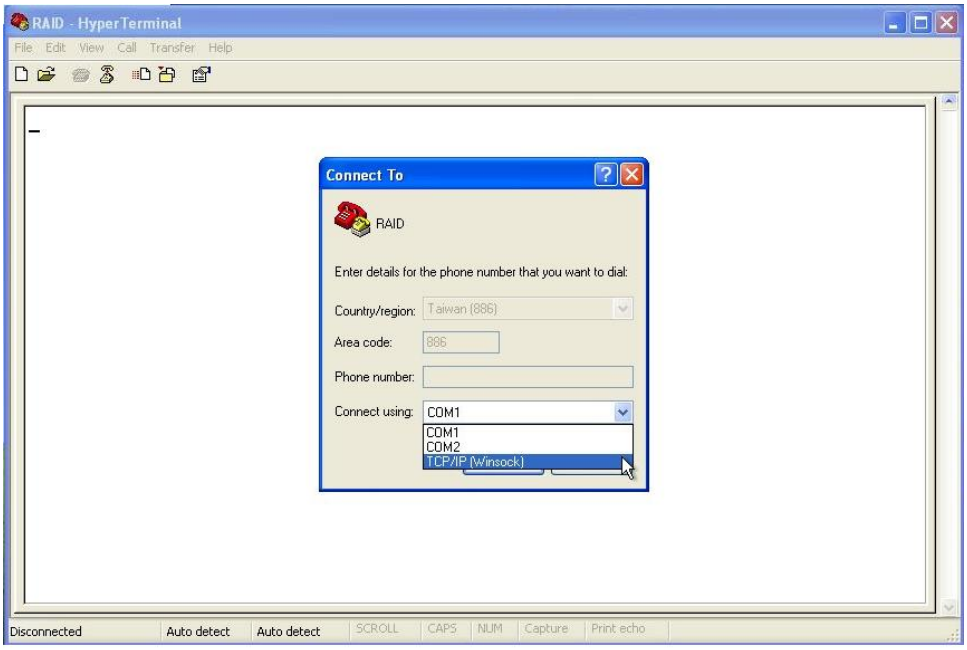
Step 2. Open HYPERTRM.EXE.



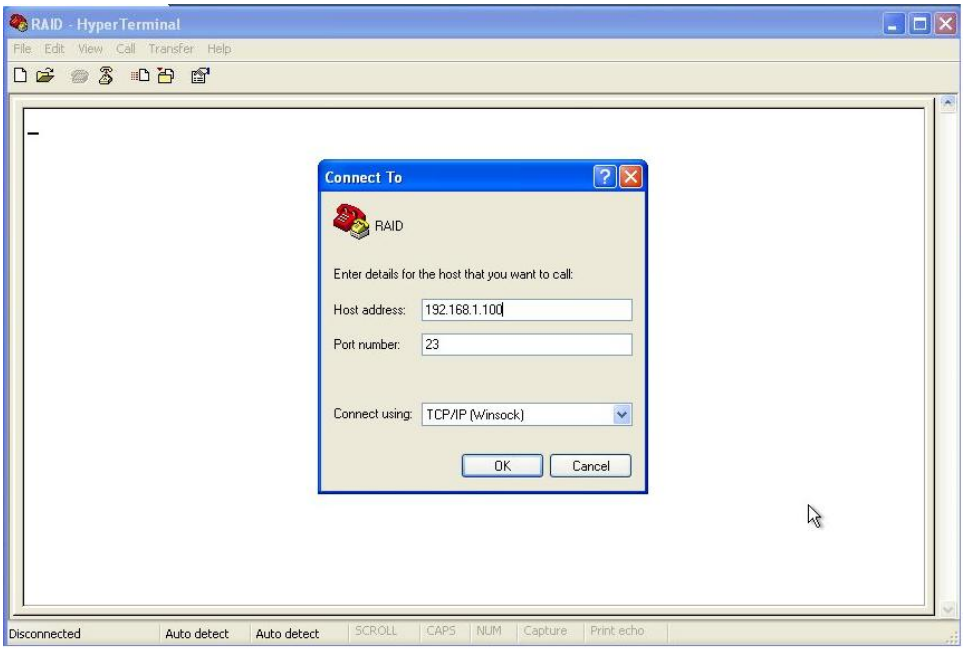
Step 3. Enter a name for your Terminal. Click OK.



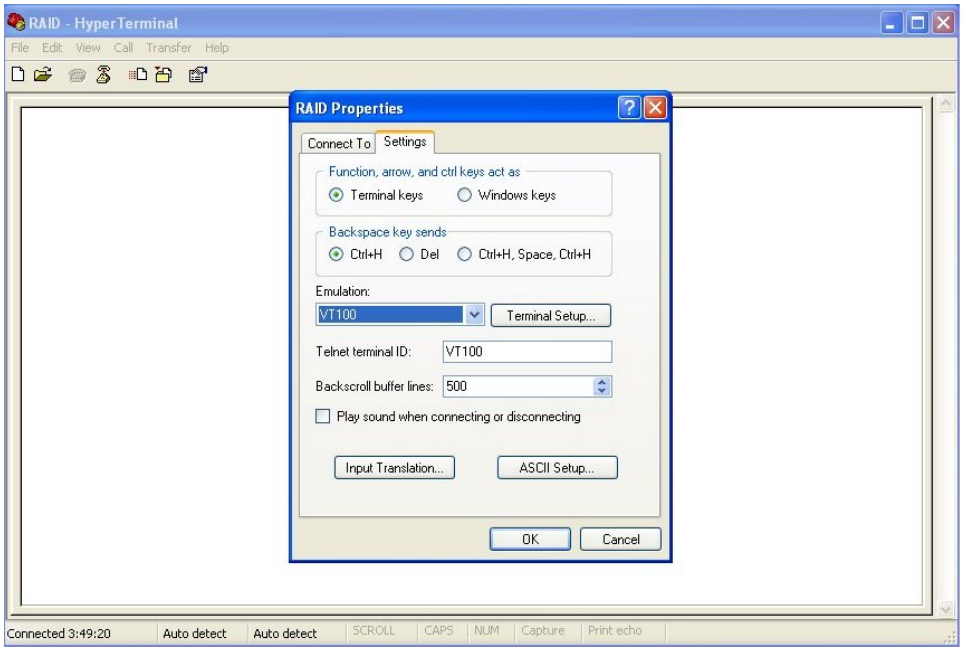
Step 4. Select an appropriate connecting port in your Terminal. Click OK



Step 5. Connection setting; IP address will be default shown on the LCD screen, set Host address to this IP address.



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.

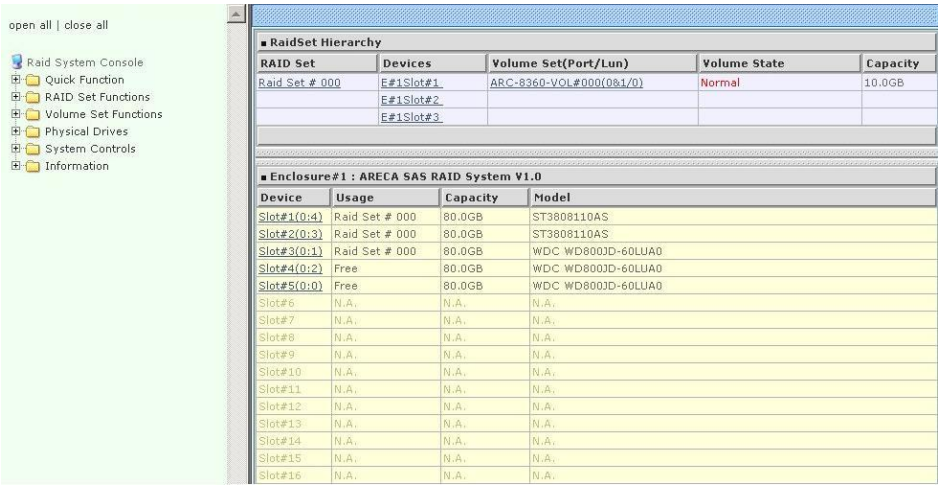
After you have finished the VT100 Terminal setup, you may press "X" key (in your Terminal) to link the RAID subsystem and Terminal together.

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

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

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

The controller has embedded the TCP/IP & Web Browser-based RAID manager in the firmware. User can remotely manage the RAID system, without adding any specific software (platform independent), via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port.



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

Note that you must be logged in as administrator with local admin rights on the remote machine to remotely configure it. The RAID subsystem controller default username is **"admin"** and the password is **"0000".**

Note

*The RAID subsystem controller default User Name is **"admin"** and the Password is **"0000".** Please change the Password when you first log-in.*

2.6 Configuration Menu Tree

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

- Main Menus
  - Quick Function
    - Quick Create
  - Raid Set Functions
    - Create Raid Set
    - Delete Raid Set
    - Expand Raid Set
    - Offline Raid Set
    - Activate Incomplete RAID Set
    - Create Hot Spare
    - Delete Hot Spare
    - Rescue Raid Set
  - Volume Set Functions
    - Create Volume Set
    - Create Raid30/50/60
    - Delete Volume Set
    - Modify Volume Set
    - Check Volume Set
    - Schedule Volume Check
    - Stop Volume Set Check
  - Physical Drives
    - Create Pass-Through Disk

- Modify a Pass-Through Disk
- Delete Pass-Through Disk
- Set Disk To Be Failed
- Activate Failed Disk
- Identify Enclosure
- Identify Drive

System Controls

- System Configuration
- Advanced Configuration
- Hdd Power Management
- EtherNet Configuration
- Alert By Mail Configuration
- SNMP Configuration
- NTP Configuration
- View Events/Mute Beeper
- Generate Test Event
- Clear Event Buffer
- Modify Password
- Upgrade Firmware

- Information
  - RAID Set Hierarchy
  - SAS Chip Information
  - System Information
  - Hardware Monitor

Chapter 3.

LCD Panel Configuration

The Alnico RAID's LCD configuration panel is character-based which you can use after powering the unit. Use LCD Configuration panel 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 and

· Designate drives as hot spares.

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.

3.1 Starting LCD Configuration Utility

The main menu appears on the LCD screen, as shown below:

Use the up and down arrow buttons to move left and right to select a menu item. Press **ENT** to select the item. Press the **UP/DOWN** to browse the selection. Press **ESC** to return to the previous screen.

3.2 LCD Configuration Utility Main Menu Options

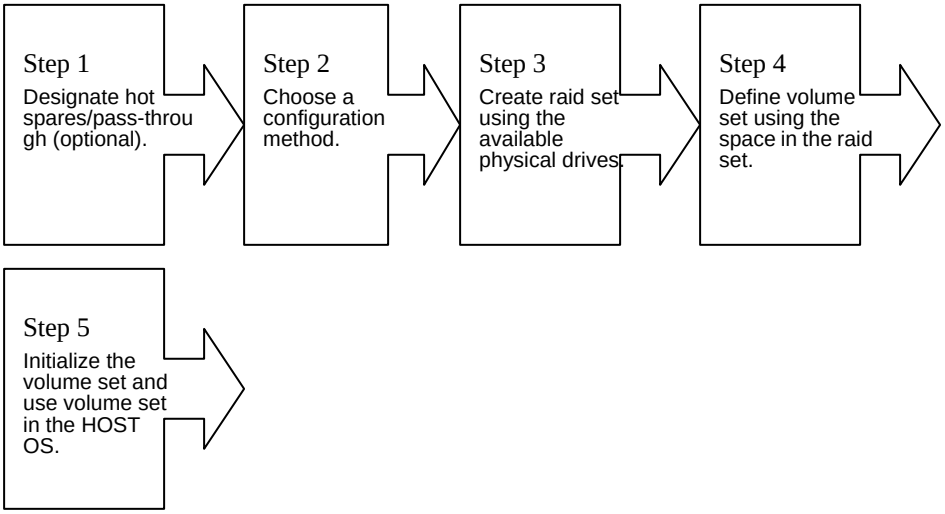
Select an option and the related information or submenu items displayed beneath it. The submenus for each item are explained on the following sections. The configuration utility main menu options are:

Option	Description
Quick Volume And Raid Set Setup	Create a default configurations which are based on the number of physical disk installed
Raid Set Functions	Create a customized raid set

Volume Set Functions	Create a customized volume set
Physical Drive Functions	View individual disk information
Raid System Functions	Setting the raid system configurations
Ethernet Configuration	Setting Local IP Address
Views 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

3.3 Configuring Raid Sets and Volume Sets

You can configure raid sets and volume sets either using “Quick Volume and Raid Set Setup” automatically or “Raid Set Functions/Volume Set Functions” manually configuration method. Each configuration method requires a different level of user input. The general flow of operations for raid set and volume set configuration is:



3.4 Designating Drives as Hot Spares

To designate drives as hot spares, press **ENT** to enter the Main menu. Press **UP/DOWN** to select the **Raid Set Functions** option and then press **ENT**. All raid set functions will be displayed. Press **UP/DOWN** to select the **Create Hot Spare Disk** option and then press **ENT**. The first unused physical device connected to the current controller appears: Press **UP/DOWN** 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.

3.5 Using Quick Volume and Raid Set Setup

In Quick Volume and Raid Setup Configuration, it collects all drives and includes them in a raid set. 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# ; Fibre Channel# ; (iSCSI TargetNode#)/LUN	0/0
Cache Mode	Write Back
Tag Queuing	Yes

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

Follow the steps below to create raid set using Quick Volume and Raid Setup Configuration:

Step1

Choose Quick Volume And Raid Setup from the main menu. The available RAID levels and associated Hot Spare for the current volume set drive are displayed.

Step2

RAID Level Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific array determines the RAID levels that can be implemented with the array.

RAID 0 requires one or more physical drives,

RAID 1 requires at least 2 physical drives,

RAID 1+ Spare requires more than 2 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 3+ Spare requires at least 4 physical drives, and

RAID 5 + Spare requires at least 4 physical drives.

RAID 6 + Spare requires at least 5 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,

RAID 30+ Spare requires at least 7 physical drives, and

RAID 50+ Spare requires at least 7 physical drives.

RAID 60+ Spare require at least 9 physical drives.

Using the UP/DOWN key to select the RAID for the volume set and presses ENT to confirm it.

Step3

Available Capacity Set the capacity size for the volume set. After select *RAID level* and press ENT.

The selected capacity for the current volume set is displayed. Using the UP/DOWN 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.

Step4

Select Stripe size This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 1E, 5, 6, 50 or 60 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. Using the UP/DOWN to select stripe size and press ENT to confirm it.

Step5

When you are finished defining the volume set, press ENT to confirm the Quick Volume And Raid Set Setup function.

Step6

Fast Initialization Press ENT to define fast initialization and ESC to normal initialization. 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. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses.

Step7

The controller will begin to Initialize the volume set you have just configured.

Step8

If you need to add additional volume set using main menu Create Raid Volume Set function.

3.6 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 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. This configuration option allows you to associate volume set with partial and full raid set.

Step1

To setup the Hot Spare (option), choose Raid Set Functions from the main menu. Select the Create Hot Spare Disk to set the Hot Spare.

Step2

Choose Raid Set Function from the main menu. Select the Create A New Raid Set.

Step3

A Select Drive Channel in the next displayed showing the drive connected to the current controller.

Step4

Press the UP/ DOWN to select specific physical drives. Press the ENT to associate the selected physical drive with the current raid set.

Try to use drives of the same capacity in a specific raid set. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific raid set determines the RAID levels that can be implemented with the raid set.

RAID 0 requires one 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 6 requires at least 4 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.

RAID 30 requires at least 6 physical drives,

RAID 50 requires at least 6 physical drives,

RAID 60 requires at least 8 physical drives,

RAID 30+ Spare requires at least 7 physical drives, and

RAID 50+ Spare requires at least 7 physical drives.

RAID 60+ Spare require at least 9 physical drives.

Step5

After adding physical drives to the current raid set as desired, press ESC to confirm the Select Drive Channel function.

Step6

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 7.

Step7

Choose Volume Set Functions from the main menu. Select the Create Raid Volume Set and press ENT.

Step8

Choose one raid set from the Select Raid Set screen. Press ENT to confirm it.

Step9

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:

The Raid Level,

The Capacity (Not supported via LCD Panel.)

The Stripe Size,

The SAS Port# ;Fibre Channel#; iSCSI TargetNode# /LUN,

The Cache Mode,

The Tagged Queuing,

The Volume Name (number).

All value can be changing by the user. Press the UP/ DOWN to select the attributes. Press the ENT to modify each attribute of the default value. Using the UP/DOWN to select attribute value and press the ENT to accept the default value

Step10

After user completes modifying the attribute, press the ESC to enter the Select Capacity for the volume set. Using the UP/DOWN to set the volume set capacity and press ENT to confirm it.

Step11

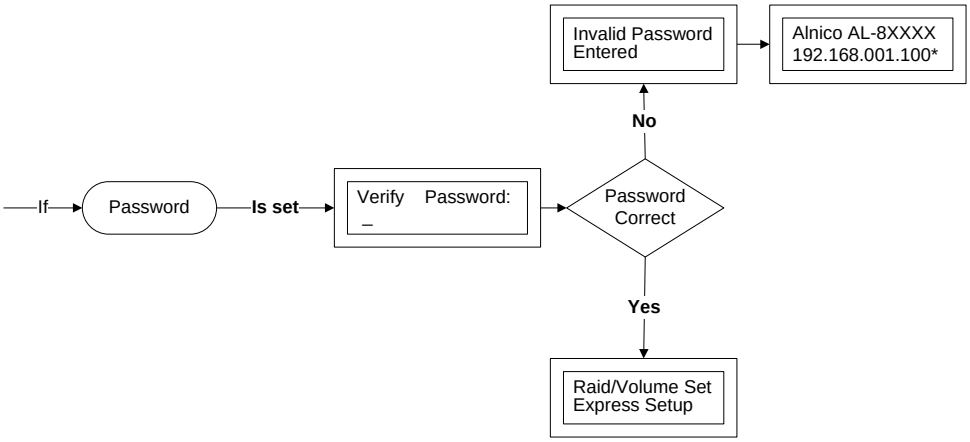
When you are finished defining the volume set, press ENT to confirm the Create function.

Step12

Press ENT to define fast initialization and ESC to normal 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 7 to 12 to configure another volume set.

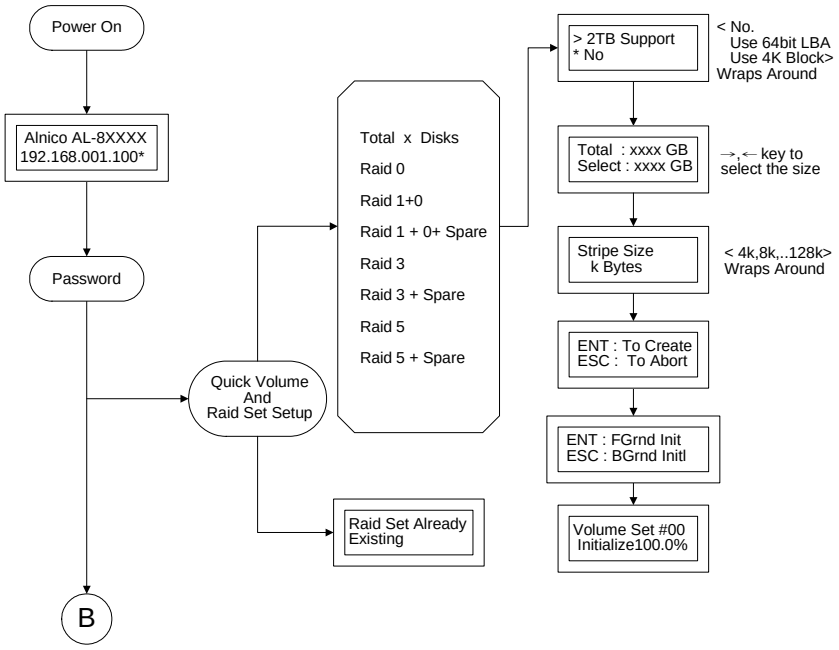
3.7 Navigation Map of the Configuration

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 internal 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 twenty seconds. The RAID subsystem password's default setting is 0000 by the manufacturer.



3.7.1 Quick Volume/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:



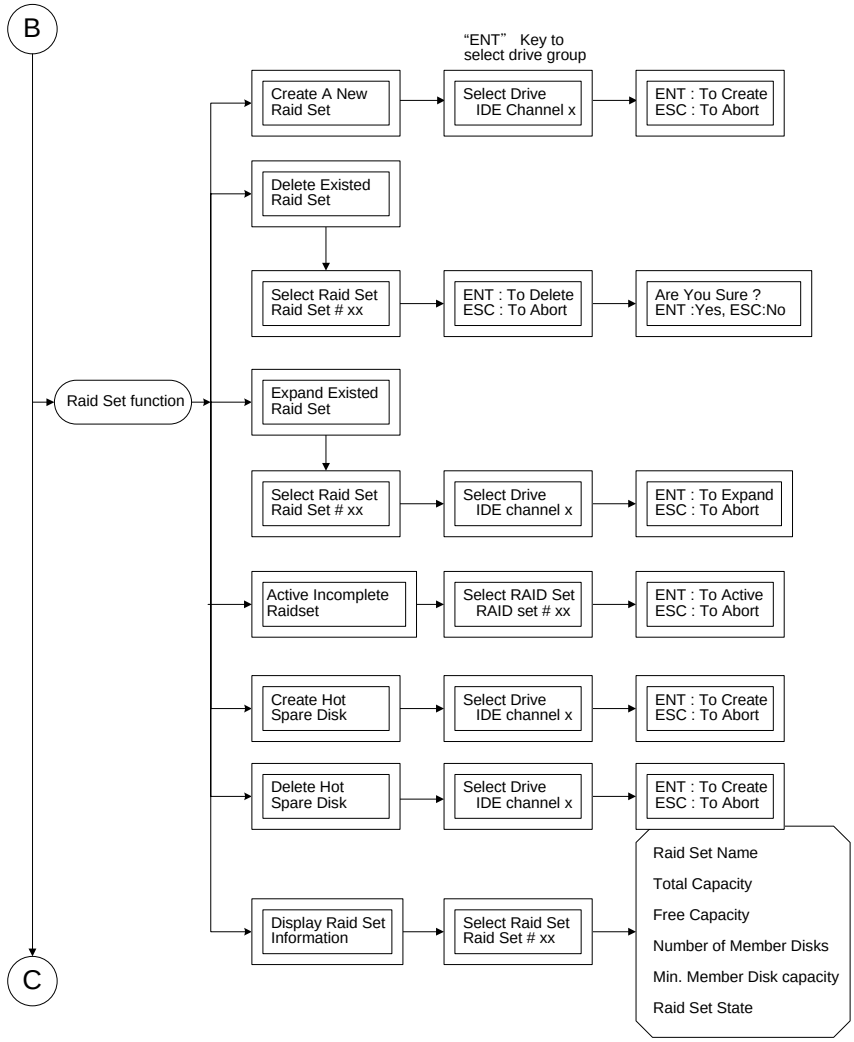
1. All of the physical disk drives are contained in a raid set.
2. The raid levels associated with hot spare, capacity, and stripe size are selected during the configuration process.
3. A single volume set is created and consumes all or a portion of the disk capacity available in this raid set.
4. If you need to add additional volume set, use main menu **Volume Set functions.**

Detail procedure references to this chapter's section: **Using Raid Set and Volume Set Functions**

3.7.2 Raid Set Function

User manual configuration can completely control the raid set setting, but it will take longer time to complete than the Quick Volume and Raid Setup configuration. Select the Raid Set Function to manually configure the raid set for the first time or delete existing raid set and reconfigure the raid set.

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



3.7.2.1 Create A New Raid Set

Detail procedure references to this chapter's section: **Using Raid Set and Volume Set Functions**

3.7.2.2 Delete Existed Raid Set

Press **UP/DOWN** to choose the **Delete Existed Raid Set** option. Using **UP/DOWN** to select the raid set number that user wants to delete and then press **ENT** to accept the raid set number. The Confirmation screen appears, then press **ENT** to accept the delete existed raid set function. The double confirmation screens appears, and then

press **ENT** to make sure to delete the existed raid set function

3.7.2.3 Expand Existed 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** to choose the **Expand Existed Raid Set** option. Using **UP/DOWN** to select the raid set number that user wants to expand and then press ENT to accept the raid set number. If there is an available disk, then the **Select Drive Channel x** appears. Using **UP/DOWN** to select the target disk and then press **ENT** to select it. Press **ENT** to start expanding the existing raid set.

The new add capacity will define one or more volume sets. Follow the instruction presented in the Volume Set Function to create the volume sets.

Note

Once the Expand Raid Set process has started, user cannot stop it. The process must be completed.

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.

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.

3.7.2.4 Activate Incomplete Raid Set

When one of the disk drive is removed 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 powered on, the **Activate Incomplete Raid Set** option can be used to active the raid set. After user completes the function, the Raid State will change to Degraded Mode.

3.7.2.5 Create Hot Spare Disk

Please reference this chapter: **Designating Drives as Hot Spares**.

3.7.2.6 Delete Hot Spare Disk

To delete hot spare, press **UP/DOWN** to choose the **Delete Hot Spare Disk** option.

Using **UP/DOWN** to select the hot spare number that user wants to delete and then press **ENT** to select it. The confirmation screens appear and press **ENT** to delete the hot spare.

3.7.2.7 RAID Set Information

Using **UP/DOWN** to choose the **Display Raid Set Information** option and press **ENT**. Using **UP/DOWN** to select the raid set number that user wants to display. The raid set information will be displayed.

Using **UP/DOWN** to scroll the raid set information; it shows Raid Set Name, Total Capacity, Free Capacity, Number of Member Disks, Min. Member Disk Capacity and Raid Set State.

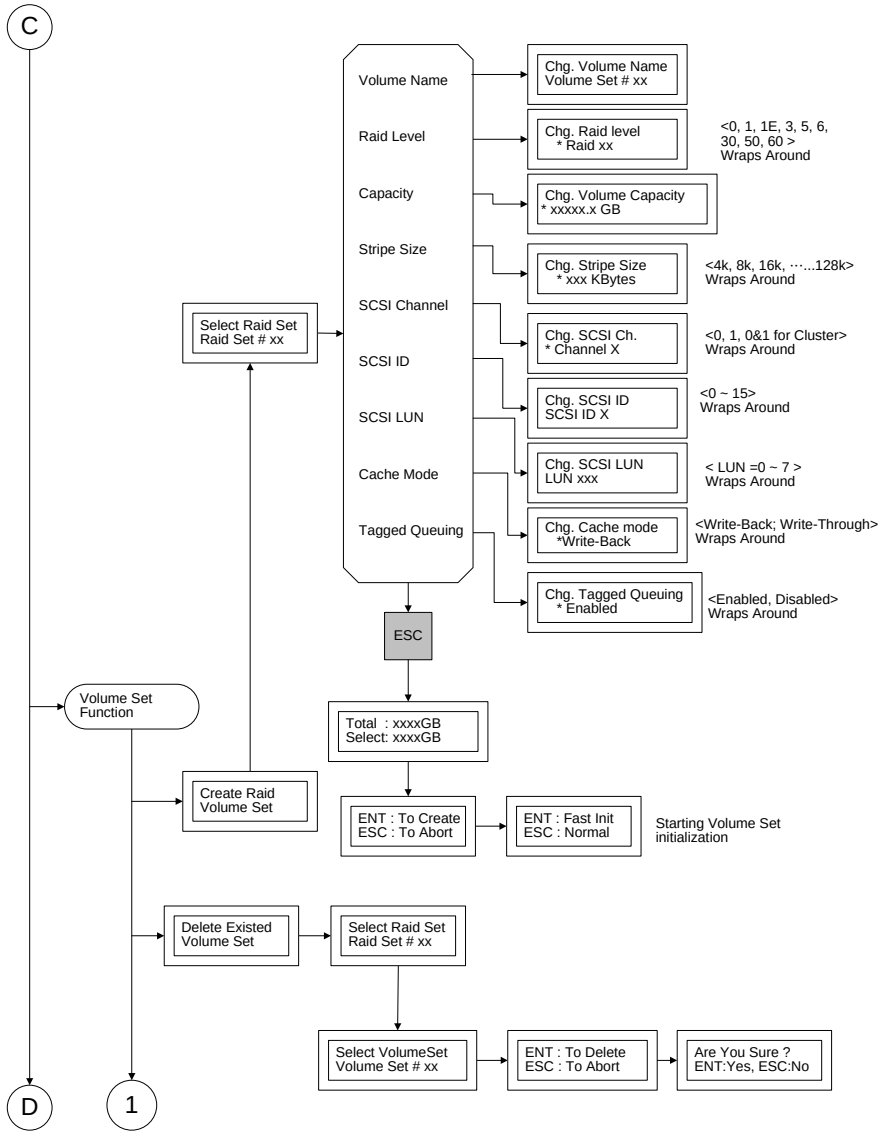
3.7.2.8 Offline RAID Set

If you want to move RAID Set to other enclosures, use this function to offline RAID Set. You don't need to shutdown RAID system and can safely move RAID Set members to other enclosures.

3.7.3 Volume Set Function

A volume set is seen by the host system as a single logical device. It is organized in a RAID level 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 Volume Set Functions, press **ENT** to enter the main menu. Press **UP/DOWN** to select the **Volume Set Functions** option and then press **ENT** to enter further submenus. All volume set submenus will be displayed.



3.7.3.1 Create Raid Volume Set

To create a volume set, Please reference to section 4.6: Using Raid Set and Volume Set Functions. The volume set attributes screen shows the volume set default configuration value that is currently being configured. The attributes are Raid Level, Stripe Size, Cache Mode, SAS Port# (Fibre Channel#)/LUN, Tagged Queuing, and Volume Name (number).

All value can be changed by the user. Press the **UP**/**DOWN** to select attribute. Press the **ENT** to modify the default value. Using the **UP**/**DOWN** to select attribute value and press the **ENT** to accept the default value. The following is the attributes descriptions. Please refer to section 4.6 Using Raid Set and Volume Set Functions to complete the create volume set function.

3.7.3.1.1 Capacity

The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the UP and DOWN arrow keys. Each volume set has a selected capacity which is less than or equal to the total capacity of the raid set on which it resides.

3.7.3.1.2 Raid Level

RAID subsystem can support raid level 0, 1, 1E (0+1), 3, 5, 6, 30, 50, and 60.

3.7.3.1.3 Strip Size

This parameter sets the size of the segment written to each disk in a RAID 0, 1, 1E (0+1), 5, 6, 50 or 60 logical drives. 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.

3.7.3.1.4 Volume Name

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

3.7.3.1.5 SCSI Channel#

RAID subsystem supports PCIe 4 X connector and . and simulate as SCSI Channel 0.

3.7.3.1.6 SCSI ID

SCIS ID : Alnico PCIe RAID simulate as standard SCSI interface, so ID 0~15 can selected .

3.7.3.1.7 SCSI LUN

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

3.7.3.1.8 Cache Mode

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

3.7.3.1.9 Tag 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 SCSI drives that do not support command tag queuing.

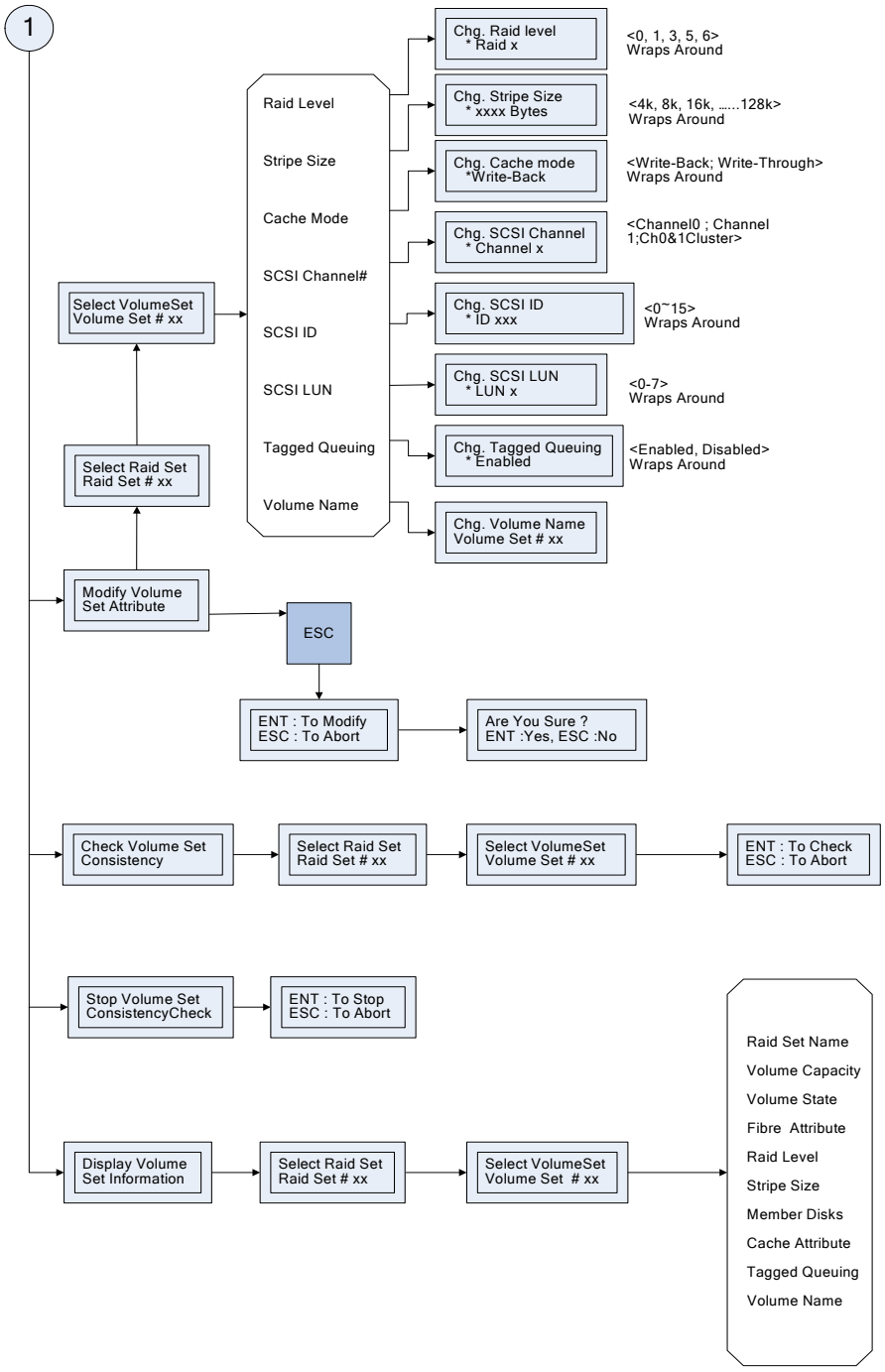
3.7.3.2 Delete Volume Set

Press **UP/DOWN** to choose the **Delete Existed Volume Set** option. Using **UP/DOWN** to select the raid set number that user wants to delete and press **ENT.** Scrolling the **UP/DOWN** to select the volume set number that user wants to delete and press **ENT**. The Confirmation screen appears, and then press **ENT** to accept the delete volume set function. The double confirmation screen appears, then press **ENT** to make sure of the delete volume set function.

3.7.3.3 Modify Volume Set

Use this option to modify volume set configuration. To modify volume set attributes from raid set system function, press **UP/DOWN** to choose the **Modify Volume Set Attribute** option. Using **UP/DOWN** to select the raid set number that user wants to modify and press **ENT.** Scrolling the **UP/DOWN** to select the volume set number that user wants to modify and press **ENT**. Press **ENT** to select the existed volume set attribute. The volume set attributes screen shows the volume set setting configuration attributes that was currently being configured. The attributes are Volume Name (number), Volume Capacity, Raid Level, Stripe Size, Cache Mode, Tagged Queuing, SCSI Channel#, SCSI ID, SCSI LUN and Volume Name (number).

All value can be modified by the user. Press the **UP**/**DOWN** to select attribute. Press the **ENT** to modify the default value. Using the **UP**/**DOWN** to select the attribute value and press the **ENT** to accept the selected value. Choose this option to display the properties of the selected Volume Set; you can modify all values except the capacity.



3.7.3.4 Check Volume Set Consistency

Use this option to check volume set consistency. To check volume set consistency from volume set system function, press **UP/DOWN** to choose the **Check Volume Set**

Consistency option. Using **UP/DOWN** to select the raid set number that user wants to check and press **ENT.** Scrolling the **UP/DOWN** to select the volume set number that user wants to check and press **ENT**. The Confirmation screen appears, pressing **ENT** will start the check volume set consistency.

3.7.3.5 Stop Volume Set Consistency Check

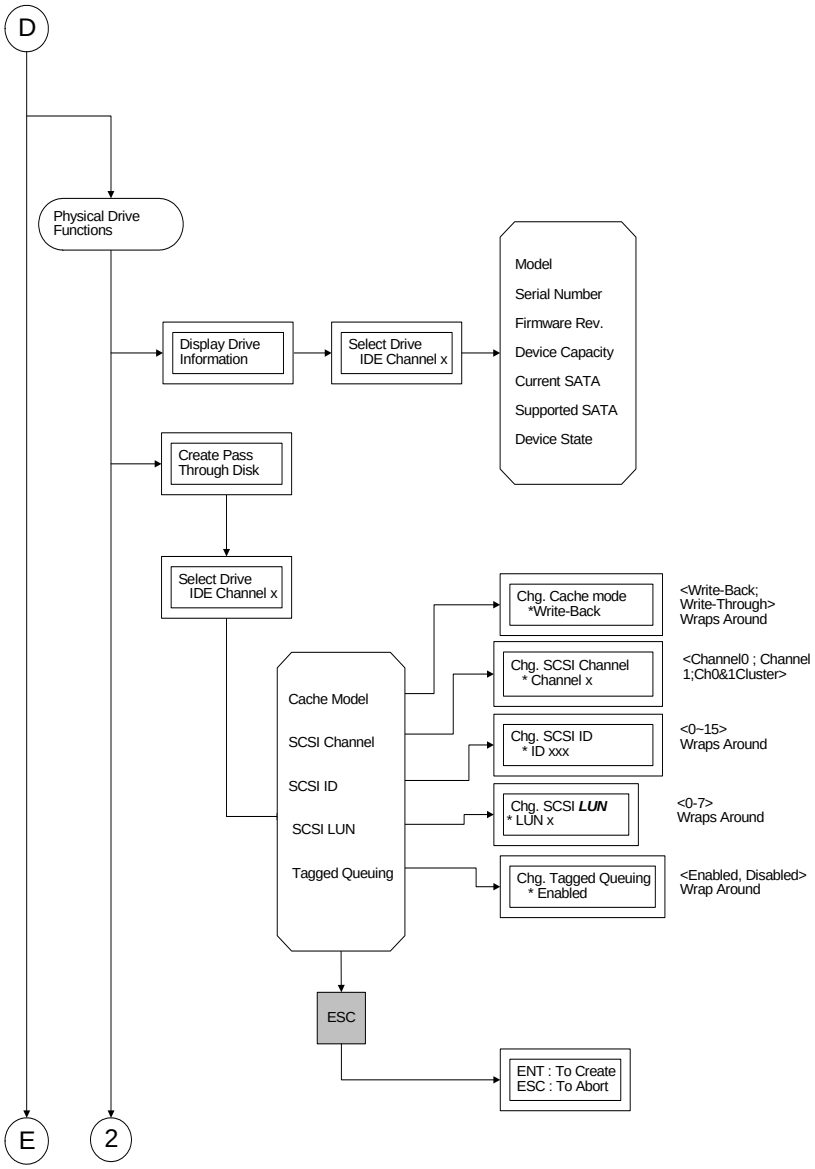
Use this option to stop volume set consistency check. To stop volume set consistency check from volume set system function, press **UP/DOWN** to choose the **Stop Volume Set Consistency Check** option and then press **ENT** to stop the check volume set consistency.

3.7.3.6 Display Volume Set Information

Use this option to display volume set information. To display volume set information from Volume set system function, press **UP/DOWN** to choose the **Display Volume Set Information** option. Using **UP/DOWN** to select the raid set number that user wants to show and press **ENT.** Scrolling the **UP/DOWN** to select the volume set number that user want to display and press **ENT**. The volume set attributes screen shows the volume set setting configuration value that was currently being configured. The attributes are Raid Level, Stripe Size, Cache Mode, Fibre Attribute, Tagged Queuing, and Volume Name (number). All value cannot be modifying by this option.

3.7.4 Physical Drive

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** to select the **Physical Drive Functions** option and then press **ENT** to enter further submenus. All physical drive submenus will be displayed.



3.7.4.1 Display Drive Information

To display all information about HDDs, includes brand, model, serial number, firmware version and so on.

Press **UP/DOWN** to choose the **Display Drive** Information option, then press **ENT** key. This menu will show all physical drive number items. Using **UP/DOWN** to select the Disk that user want to display and press **ENT,** then Press **UP/DOWN** to browse the HDD's information.

3.7.4.2 Create Pass-Through Disk

Disk is not controlled by the RAID subsystem 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 and not controlled by the RAID subsystem firmware.

Using **UP/DOWN** to choose the **Create Pass-Through Disk** option and press **ENT**. Using **UP/DOWN** to select the drive number those users want to create. The drive attributes will be displayed. The drive attributes show the Cache Model, SCSI Channel, SCSI ID, SCSI LUN, and Tagged Queuing.

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

3.7.4.3 Modify Pass-Through Disk

Use this option to modify the Pass-Through Disk attributes. To modify Pass-Through Disk attributes from Pass-Through Disk pool, press **UP/DOWN** to choose the **Modify Pass-Through Drive** option, and then press **ENT** key. The Select Drive Function menu will show all Pass-Through Drive number items. Using **UP/DOWN** to select the Pass-Through Disk that user wants to modify and press **ENT.** The attributes screen shows the Pass-Through Disk setting value that was currently being configured. The attributes are Cache Mode, SCSI Channel, SCSI ID, SCSI LUN and Tagged Queuing.

All value can be modified by the user. Press the **UP**/**DOWN** arrow keys to select the attribute. Press the **ENT** to modify the default value. Using the **UP/ DOWN** key to select attribute value and press the **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.

3.7.4.4 Delete Pass-Through Disk

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

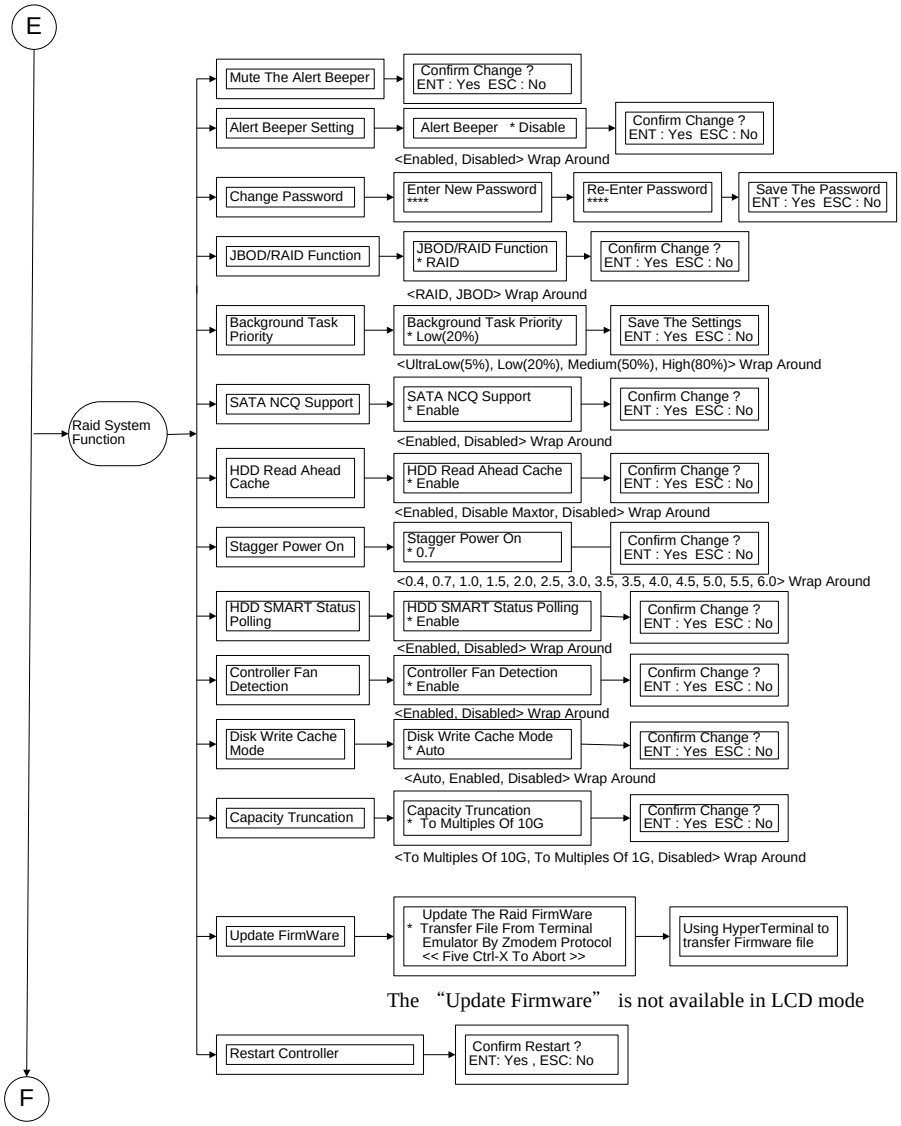
3.7.4.5 Identify the Selected Drive

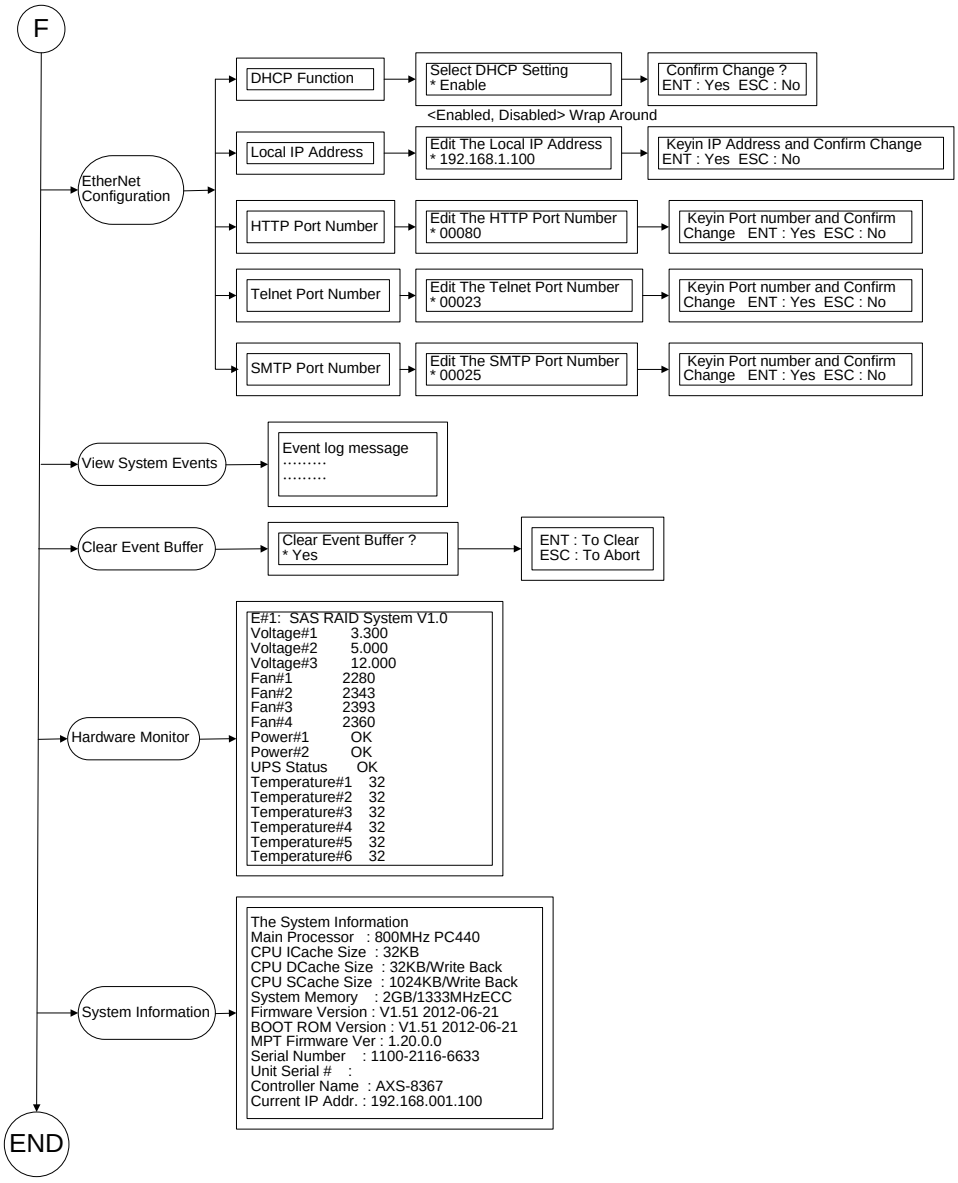
To prevent removing the wrong drive, the selected disk HDD LED Indicator will light for physically locating the selected disk when the Identify Selected Drive function is selected.

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

3.7.5 RAID System Function

To enter a “System Control”, press **ENT** to enter the Main menu. Press **UP/DOWN** to select the **Raid System Function** option and then press **ENT** to enter further submenus. All raid system submenus will be displayed. Using **UP/DOWN** to select the submenus option and then press **ENT** to enter the selection function.





3.7.5.1 Mute the Alert Beeper

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

3.7.5.2 Alert Beeper Setting

The Alert Beeper function item is used to Disable or Enable the RAID subsystem controller alarm tone generator. Using the **UP**/**DOWN** to select alert beeper and then press the **ENT** to accept the selection. After completing the selection, the

confirmation screen will be displayed and then press **ENT** to accept the function

Select the **Disabled** and press **Enter** key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

3.7.5.3 Change Password

To set or change the RAID subsystem password, press the UP/DOWN to select Change Password and then press the ENT to accept the selection. The New Password: screen appears and enter new password that user wants to change.

Using the UP/DOWN keys you can set the password value. After completing 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.

3.7.5.4 JBOD /RAID Mode Configuration

To set or change the RAID Mode of RAID subsystem, press the **UP/ DOWN** to select **JBOD/RAID Mode Configuration** and then press the **ENT** to accept the selection. The RAID mode selection screen appears and uses the **UP/DOWN** to set RAID mode. After completing the modification, the confirmation screen will be displayed and then press **ENT** to accept the function.

3.7.5.5 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 (low, normal, high) to balance volume set access and rebuild tasks appropriately.

To set or change the RAID subsystem RAID Rebuild Priority, press the **UP**/**DOWN** to select **RAID Rebuild Priority** and press the **ENT** to accept the selection. The rebuild priority selection screen appears and uses the **UP/DOWN** to set the rebuild value. After completing the modification, the confirmation screen will be displayed and then press **ENT** to accept the function.

3.7.5.6 SATA NCQ Support

To set or change the configuration, press the **UP/ DOWN** to select **SATA-Mode** and then press the **ENT** to accept the selection.

3.7.5.7 HDD Read Ahead Cache

Alnico supports HDD Read Ahead Cache, allowing the users to disable the cache in the HDD. To some HDD models, disabling the cache in the HDD is necessary to prove the RAID subsystem functions. Press the **UP/ DOWN** to select **mode** and then press the **ENT** to accept the selection.

3.7.5.8 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 your application behavior. The default normal option satisfies the performance requirements for a typical volume. The disabled value implies no read ahead. The most efficient value for the controllers depends on your application. Aggressive read ahead is optimal for sequential access but it degrades random access.

3.7.5.9 Disk Write Cache Mode

Disk cache can be turned off to prevent data lost, turned on to increase the performance of the machine. The following is the reason why a user might want to turn off the cache. In case of power failure, the data stored in the disk cache waiting to be process might be lost. The disadvantage to turn off the disk cache is that performance will decrease dramatically.

Auto: Disk cache's setting will accord the installation of battery backup. When battery backup is installed, Disk cache is disabled. No battery backup installed, Disk cache is enabled.

To set or change the configuration, press the **UP/ DOWN** to select **"Disk Write Cache Mode"** and then press the **ENT** to accept the selection.

3.7.5.10 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**".

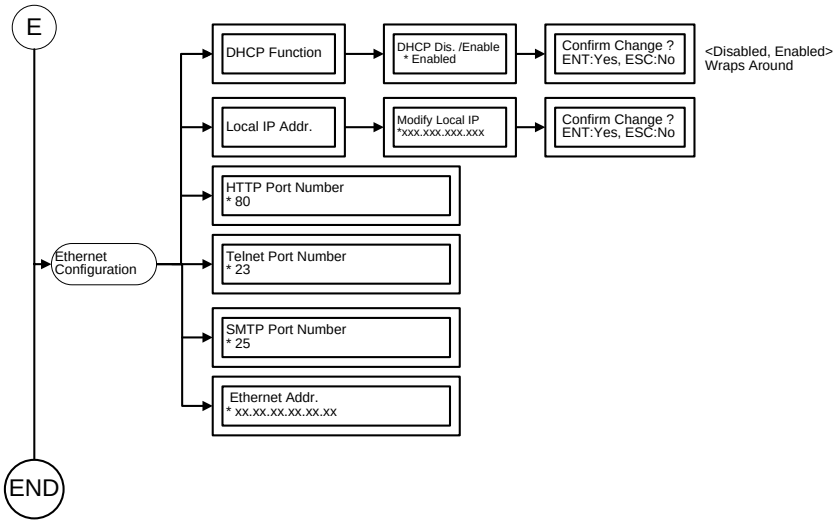
Multiples Of 10G: If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. "Multiples Of 10G" truncates the number under tens. This makes the same capacity for both of these drives so that one could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

3.7.6 Ethernet Configuration

Use to configure the Ethernet port of RAID subsystem.



3.7.6.1 DHCP Function

Use to Enable or Disable the DHCP function.

Press the **UP/ DOWN** to select **DHCP Function** and then press the **ENT** to accept the selection. The confirmation screen will be displayed and then press **ENT** to accept the change.

3.7.6.2 Local IP Address

Use to Modify the Local IP Address.

Press the **UP/ DOWN** to select **Local IP Address** and then press the **ENT** to accept the selection. Then enter the number of Local IP Address. The confirmation screen will be displayed and then press **ENT** to accept the change.

3.7.6.3 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”, and 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.

3.7.6.4 Telnet Port Number

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

3.7.6.5 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", and 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.

3.7.6.5 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.

3.7.7 Show System Events

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

3.7.8 Clear all Event Buffers

Use the feature to clear the entire events buffer information.

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

3.7.9 Hardware Monitoring Information

To view the RAID subsystem controller’s hardware monitor information, press **ENT** to enter the main menu. Press **UP/DOWN** to select the **Hardware Information** option, and then press **ENT**. All hardware information will be displayed. Press **UP/DOWN** to browse all the hardware information.

The Hardware Monitor Information provides the temperature, fan speed (chassis fan) and voltage of the internal RAID subsystem. The temperature items list the current states of the controller board and backplane. All items are also unchangeable. The warning messages will indicate through the LCM, LED and alarm buzzer.

Item	Warning Condition
Controller Board Temperature	**> 72 Celsius**
Backplane Temperature	**> 65 Celsius**
Controller Fan Speed	**< 1700 RPM**
Power Supply +12V	**< 10.5V or > 13.5V**

Power Supply +5V	**< 4.7V or > 5.3V**
Power Supply +3.3V	**< 3.0V or > 3.6V**
CPU Core Voltage +1.5V	**< 1.35V or > 1.65V**

3.7.10 Show System Information

Choose this option to display Main processor, CPU Instruction cache/ and data cache size, firmware version, serial number, controller model name, and the cache memory size. To check the system information, press **ENT** to enter the main menu. Press **UP/DOWN** to select the **Show System Information** option, and then press **ENT**. All major controller system information will be displayed. Press **UP/DOWN** to browse all the system information.

Chapter 4. Driver Installation

This chapter describes how to install the Alnico PCIe RAID subsystem and PCIe repeater card's driver to your operating system. The installation procedures use the following terminology:

Installing operating system on the SAS Controller' Volume

If you have a new drive configuration without an operating system and want to install operating system on a disk drive managed by the SAS RAID controller. The driver installation is a part of the operating system installation.

Installing SAS RAID controller into an existing operating system

The computer has an existing operating system installed and the SAS RAID controller is being installed as a secondary controller.

Have all required system hardware and software components on hand before proceeding with the setup and installation.

Materials required:

- Microsoft Windows, Linux, FreeBSD, Solaris and Mac OS X installation CD
- SAS RAID controller Diver CD
- SAS RAID controller

4.1 Creating the Driver Diskettes

The CD disc shipped with the SAS RAID controller, if you do not have the CD disc with the package, contact your local dealer or you can also download the latest version drivers for Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003, Linux, FreeBSD, Solaris and Mac OS X from the AXUS ftp site, account and password please contacts sales or technical support.

These driver diskettes are intended for use with new operating system installations. For Windows 8/ Server 2012/ 7/ 2008/ Vista, you can copy the Windows driver file to USB device and installed from it. Determine the correct kernel version and identify which diskette images contain drivers for that kernel. If the driver file ends in .img, you can also create the appropriate driver diskette using "dd" utility.

The following steps are required to create the driver diskettes:

1. The computer system BIOS must be set to boot-up from the CDROM.

2. Insert the software driver CD disc into the CD-ROM drive.

3. The system will boot-up from CD-ROM Drive; to create the driver diskettes, select the "SAS RAID Controller Driver Diskette Make Utility", and a screen with several choices will be displayed.

4. Move the highlight bar to the "Create Driver Disk" entry and press Enter.

5. The screen queries the SAS RAID controllers support driver database and

displays a list of available drivers. Move the highlight bar to the correct driver entry and press Enter key to select.

6. The next screen will show “Please insert a formatted diskette into drive A:!! Press any key to continue”. Insert the formatted diskette in drive “A” and press any key to continue.

7. The window will display the driver building message: ”Now is writing to Cylinder…” as it copies the image file from the CDROM to driver diskette.

8. The “Write Complete !!” message will display when the driver diskette ready.

The driver diskette is made now. Proceed to the following instruction for installation procedures.

4.2 Driver Installation for Windows

The SAS RAID controller can be used with Microsoft Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003. The SAS RAID controllers support SCSI MiniPort and StorPort Drivers for Windows 8/Server 2012/7/2008/Vista/2003.

4.2.1 New Storage Device Drivers in Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003.

The Storport driver is new to Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003. Storport implements a new architecture designed for better performance with RAID systems and in Storage Area Network (SAN) environments. Storport delivers higher I/O through-put, enhances manageability, and an improved miniport interface. Storport better utilizes faster adapters through the use of reduced Delay Procedure Call (DPC) and improved queue management

4.2.2 Install Windows Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003 on a SAS RAID Volume

The following instructions explain how to install the SAS RAID controller Driver. For completed details on installing Windows, see the Windows User’s Manual.

4.2.2.1 Installation procedures

The following procedures, detail installing the SAS RAID controller driver while installing Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003. Have your bootable Microsoft Windows CD and follow the required procedures below to install SAS RAID controller:

1. Make sure you follow the instructions in “**Hardware Installation**” to install the controller and connect the disk drives or enclosure.

2. Start the system and then press **Tab+F6** to access the McBIOS RAID manager. Use the McBIOS manager to create the RAIDset and volume set in which you will install Windows. For details, see Chapter 5 "**McBIOS RAID manager**". Once a volume set is created and configured, continue with next step to install the operating system.

3. Insert the Windows setup CD and reboot the system to begin the Windows installation.

Note

The computer system BIOS must support bootable from CD.

4. Press F6 as soon as the Windows screen shows "**Setup is inspecting your Computer's hardware Configuration**". A message stating "**Press F6 to specify third-party RAID controller**" will display during this time. This must be done or else the Windows installer will not prompt for the driver for from the SAS RAID controller and the driver diskette will not be recognized.

5. The next screen will show: "**Setup could not determine the type of one or more mass storage device installed in your system".** Select "specify additional SCSI controller" by pressing S.

6. Window will prompt to place the "**Manufacturer-supplied hardware support disk**" into floppy drive A: Insert the SAS RAID series driver diskette in drive "A:" and press **Enter** key.

7. Windows will check the floppy; select the correct card and CPU type for your hardware from the list and press **Enter** key to install it.

8. After Windows scans the hardware and finds the controller, it will display:

"**Setup will load support for the following Mass Storage devices:**"

"**PCIe-SAS [Windows X86-64 Storport SAS PCI RAID Host Controller (RAID6-Engine Inside)**". Press **Enter** to continue and copy the driver files. From this point on, simply follow the Microsoft Windows installation procedure. Follow the on-screen instructions, responding as needed, to complete the installation.

9. After the installation is completed, reboot the system to load the new drivers / operating system.

10. See Chapter 5 in this manual to customize your RAID volume sets using Storage manager.

4.2.2.2 Making Volume Sets Available to Windows System

When you reboot the system, log in as a system administrator. Continue with the following steps to make any additional volume sets or pass-through disks accessible to

Windows. This procedure assumes that the SAS RAID controller hardware, driver, and Windows are installed and operational in your system.

1. Partition and format the new volume set or disks using Disk Administrator:

   a. Choose Administrative Tools from the Start menu.

   b. Choose Computer Management from the Administrative Tools menu.

   c. Select Storage.

   d. Select Disk Management.

2. Follow the on-screen prompts to write a signature to the drive.

3. Right click on the disk drive and select “Create Volume” from the menu.

4. Follow the on-screen prompts to create a volume set and to give a disk drive letter.

4.2.3 Installing controller into an existing Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003 Installation

In this scenario, you are installing the controller in an existing Windows system. To install the driver:

1. Follow the **Hardware Installation** to install the controller and connect the disk drives or enclosure.

2. Start the system and then press Tab or F6 to enter the McBIOS-based configuration utility. Use the configuration utility to create the raid set and volume set. For details, see Chapter 5, **McBIOS RAID Manager and Terminal mode configuration**. Once a volume set is created and configured, continue with installation of the driver..

3. Re-boot Windows and the OS will recognize the SAS RAID Controller and launch the “**Found New Hardware Wizard**”, which guides you to install the SAS RAID driver.

4. The “**Upgrade Device Driver Wizard**” will pop-up and provides a choice of how to proceed. Choose “**Display a list of known drivers for this device, so that you can choose a specific driver.**” and click on **Next**.

5. When the next screen queries the user about utilizing the currently installed driver, click on the **Have Disk** button.

6. When the “**Install From Disk**” dialog appears, insert the SAS RAID controller driver diskette or the shipping CD and type-in or browse to the correct path for the “**Copy manufacturer’s files from:**” dialog box.

7. After specifying the driver location, the previous dialog box will appear showing the selected driver to be installed. Click the **Next** button.

8. The “**Digital Signature Not Found**” screen will appear. Click on **Yes** to continue the installation.

9. Windows automatically copies the appropriate driver files and rebuilds its driver database.

10. The “**Found New Hardware Wizard**” summary screen appears; click the **Finish** button.

11. The “**System Settings Change**” dialog box appears. Remove the diskette from the drive and click on **Yes** to restart the computer to load the new drivers.

12. See Chapter 5 in this manual for information on customizing your RAID volumes using Storage manager.

4.2.3.1 Making Volume Sets Available to Windows System

When you reboot the system, log in as a system administrator. The following steps show how to make any new disk arrays or independent disks accessible to Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003.

This procedure assumes that the SAS RAID controller hardware, driver and Windows are installed and operational in your system.

1. Partition and format the new arrays or disks by using Disk Administrator:

   a. Choose Administrative Tools from the Start menu.
   b. Choose Computer Management from the Administrative Tools menu.
   c. Select Storage.
   d. Select Disk Management.
2. Follow the on-screen prompts to write a signature to the drive.
3. Right click on the drive and select Create Volume from the menu.
4. Follow the on-screen prompts to create a volume set and to assign a disk drive letter.

4.2.4 Uninstall controller from Windows 8/ Server 2012/ 7/ 2008/ Vista/ 2003

To remove the SAS RAID controller driver from the Windows system, follow the instructions below.

1. Ensure that you have closed all applications and are logged in with administrative rights.

2. Open **Control Panel** and start the **Add/Remove Program** icon and uninstall and software for the SAS RAID controller.

3. Go to Control Panel and select System. Select the Hardware tab and then click the Device Manager Button. In Device Manager, expand the “SCSI and RAID Controllers” section. Right click on the **AXUS SAS RAID Controller** and select “uninstall”.

4. Click on **Yes** to confirm removing the SAS RAID driver. The prompt to restart the system will then be displayed.

4.3 Driver Installation for Linux

This chapter describes how to install the SAS RAID controller driver to Red Hat Linux and SUSE Linux. Before installing the SAS RAID driver to the Linux, complete the following actions:

1. Install and configure the controller and hard disk drives according to the **Hardware Installation**.

2. Start the system and then press **Tab + F6** to enter the McBIOS RAID manager configuration utility. Use the BIOS configuration utility to create the raid set and volume set. For details, see Chapter 5, **McBIOS RAID Manager and Terminal mode configuration**.

If you are using a Linux distribution for which there is not a compiled driver available, you can copy the source from the SAS software CD and compile a new driver.

Compiled and tested drivers for Red Hat and SUSE Linux are included in the shipped CD. You can download updated versions of compiled and tested drivers for Red Hat or SUSE Linux from the Axus ftp site. Included in these downloads is the Linux driver source, which can be used to compile the updated version driver for RedHat, SUSE and other versions of Linux.

Please refer to the "**readme.txt**" file in the included CD or ftp site to make driver diskette and to install driver to the system.

4.4 Driver Installation for FreeBSD

This chapter describes how to install the SAS RAID controller driver to FreeBSD. Before installing the SAS RAID driver to FreeBSD, complete following actions:

1. Install and configure the controller and hard disk drives according to the **Hardware Installation.**

2. Start the system and then press **Tab + F6** to enter the **McBIOS RAID Manager** configuration utility. Use the BIOS configuration utility to create the raid set and volume set. For details, see Chapter 5, **McBIOS RAID Manager**.

The supplied CD-ROM that came with the SAS RAID controller includes compiled and tested drivers for FreeBSD 7.x (7.2 and onwards), 8.x (8.0 and onwards) and 9.x (9.0 and onwards). To check if a more current version driver is available, please see the Axus ftp site.

Please refer to the "**readme.txt**" file in the SAS RAID controller software CD or website to make driver diskette and to install driver to the system.

4.5 Driver Installation for Solaris

This chapter describes how to install the SAS RAID controller driver to Solaris. Before installing the SAS RAID driver to the Solaris, complete the following actions:

1. Install and configure the controller and hard disk drives according to the **Hardware Installation**.

2. Start the system and then press **Tab + F6** to enter the McBIOS RAID manager configuration utility. Use the BIOS configuration utility to create the raid set and volume set. For details, see Chapter 5, **McBIOS RAID Manager and Terminal mode configuration**.

If you are using a Linux distribution for which there is not a compiled driver available, you can copy the source from the SAS software CD and compile a new driver.

The supplied software CD that came with the SAS RAID controller includes compiled and tested drivers for Solaris 10/ 11 x86/ x86_64.

Please refer to the "**readme.txt**" file in the included CD or ftp site to make driver diskette and to install driver to the system.

4.6 Driver Installation for Mac OS X

You must have administrative level permissions to install Mac Driver & Software. You can install Driver& Software on your Mac Pro as below:

1. Insert the Mac Driver & Software CD that came with your PCI-e SAS RAID Systems.

2. Double-click on the following file that resides at <CD-ROM>\packages\MacOS\DRIVER to add the installer on the Finder.

3. Launch the installer by extract the associated compressed file install-mraid-xxxxxxxx.zip

4. Reboot your Mac Pro system.

Chapter 5. Web Browser- Based Configuration

The RAID subsystem web browser-based configuration utility is firmware-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,

. Update firmware,

. Modify system function, and

· Designate drives as hot spares.

If you need to boot the operating system from a RAID system, you must first create a RAID volume by using front panel touch-control keypad, Web Browser through Ethernet LAN, or VT-100 terminal.

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

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

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

To configure External 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.

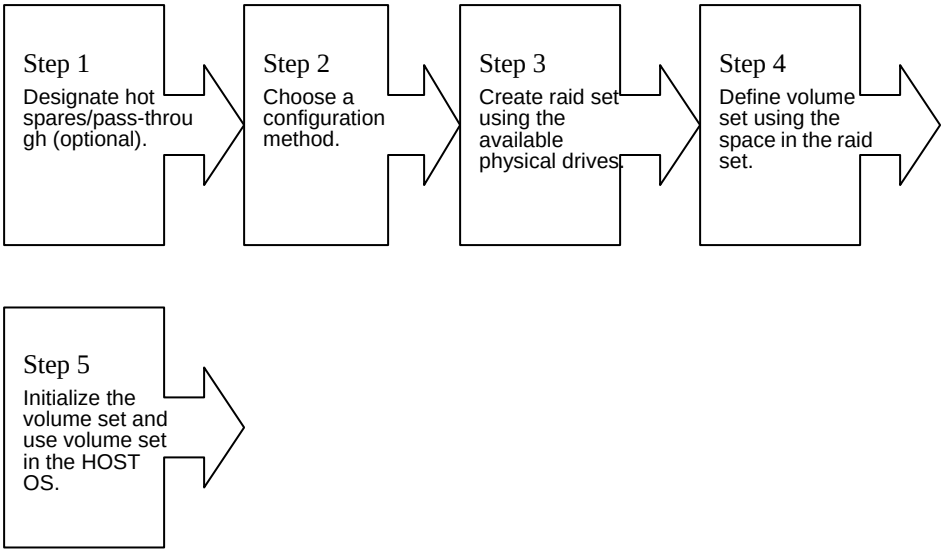
Note that you must be logged in as administrator with local admin rights on the remote machine to remotely configure it. The RAID subsystem controller default User Name

is **"admin"** and the Password is **"0000".**

*The RAID subsystem controller default User Name is **"admin"** and the Password is **"0000".** Please change the Password when you first log-in.*

5.2 Configuring Raid Sets and Volume Sets

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



5.3 Designating Drives as Hot Spares

All unused disk drive that is not part of a raid set can be created as a Hot Spare. The Quick Volume/Raid Setup configuration will automatically add the spare disk drive with the raid level for user to select. For the Raid Set Function configuration, user can use the **Create Hot Spare** option to define the hot spare disk drive.

A Hot Spare disk drive can be created when you choose the **Create Hot Spare** option in the Raid Set Function, all unused physical devices connected to the current

controller appears: 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.

5.4 Using Quick Volume /Raid Setup Configuration

In Quick Volume /Raid Setup Configuration, it collects all drives in the tray and includes them in a raid set. The raid set you create is associated with exactly one volume set, and you can modify the default RAID level, stripe size, and capacity of the volume set. Designating Drives as Hot Spares will also show in the raid level selection option. The volume set default settings will be:

Parameter	Setting
Volume Name	Volume Set # 00
SCSI Channel/SCSI ID/SCSI LUN	0/0/0
Cache Mode	Write Back
Tag Queuing	Yes

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

Follow the steps below to create arrays using Quick Volume /Raid Setup Configuration:

Step1

Choose Quick Volume And Raid Setup from the main menu. The available RAID levels and associated Hot Spare for the current volume set drive are displayed.

Step2

RAID Level Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific array determines the RAID levels that can be implemented with the array.

RAID 0 requires one or more physical drives,

RAID 1 requires at least 2 physical drives,

RAID 1+ Spare requires more than 2 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 3+ Spare require at least 4 physical drives, and

RAID 5 + Spare require at least 4 physical drives.

RAID 6 + Spare require at least 5 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,

RAID 30+ Spare require at least 7 physical drives, and

RAID 50 + Spare require at least 7 physical drives.

RAID 60 + Spare require at least 9 physical drives.

Using the UP/DOWN key to select the RAID for the volume set and presses ENT to confirm it.

Step3

Available Capacity Set the capacity size for the volume set. After select *RAID level* and press ENT.

The selected capacity for the current volume set is displayed. Using the UP/DOWN 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.

Step4

Select Stripe size This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 1E(0+1), 5, 6, 50 or 60 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. Using the UP/DOWN to select stripe size and press ENT to confirm it.

Step5

When you are finished defining the volume set, press ENT to confirm the Quick Volume And Raid Set Setup function.

Step6

Fast Initialization Press ENT to define fast initialization and ESC to normal initialization. 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. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses.

Step7

The controller will begin to Initialize the volume set you have just configured.

Step8

If you need to add additional volume set using main menu Create Raid Volume Set function.

5.5 Using Raid Set/Volume Set Function Method

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 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 set with partial and full raid set.

Step1

To setup the Hot Spare (option), choose Raid Set Functions from the main menu. Select the Create Hot Spare Disk to set the Hot Spare.

Step2

Choose Raid Set Function from the main menu. Select the Create A New Raid Set.

Step3

A Select Drive Channel in the next displayed showing the drive connected to the current controller.

Step4

Press the UP/ DOWN to select specific physical drives. Press the ENT to associate the selected physical drive with the current raid set.

Try to use drives of the same capacity in a specific raid set. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific raid set determines the RAID levels that can be implemented with the raid set.

RAID 0 requires one 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 6 requires at least 4 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.

RAID 30 requires at least 6 physical drives per raid set.

RAID 50 requires at least 6 physical drives per raid set.

RAID 60 requires at least 8 physical drives per raid set.

RAID 30 + Spare requires at least 7 physical drives per raid set.

RAID 50 + Spare requires at least 7 physical drives per raid set.

RAID 60 + Spare requires at least 9 physical drives per raid set

Step5

After adding physical drives to the current raid set as desired, press ESC to confirm the Select Drive Channel function.

Step6

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 7.

Step7

Choose Volume Set Functions from the main menu. Select the Create Raid Volume Set and press ENT.

Step8

Choose one raid set from the Select Raid Set screen. Press ENT to confirm it.

Step9

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:

The Raid Level,

The Capacity (Not supported via LCD Panel.)

The Stripe Size,

The SCSI Channel/SCSI ID/SCSI LUN,

The Cache Mode,

The Tagged Queuing,

The Volume Name (number).

All value can be changing by the user. Press the UP/ DOWN to select the attributes. Press the ENT to modify each attribute of the default value. Using the UP/DOWN to select attribute value and press the ENT to accept the default value

Step10

After user completes modifying the attribute, press the ESC to enter the Select Capacity for the volume set. Using the UP/DOWN to set the volume set capacity and press ENT to confirm it.

Step11

When you are finished defining the volume set, press ENT to confirm the Create function.

Step12

Press ENT to define fast initialization and ESC to normal 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 7 to 12 to configure another volume set.

NOTE

User can use this method to examine the existing configuration. Modify volume set configuration method provides the same functions as create volume set configuration method. In volume set function, you can use the modify volume set function to modify the volume set parameters except the capacity size.

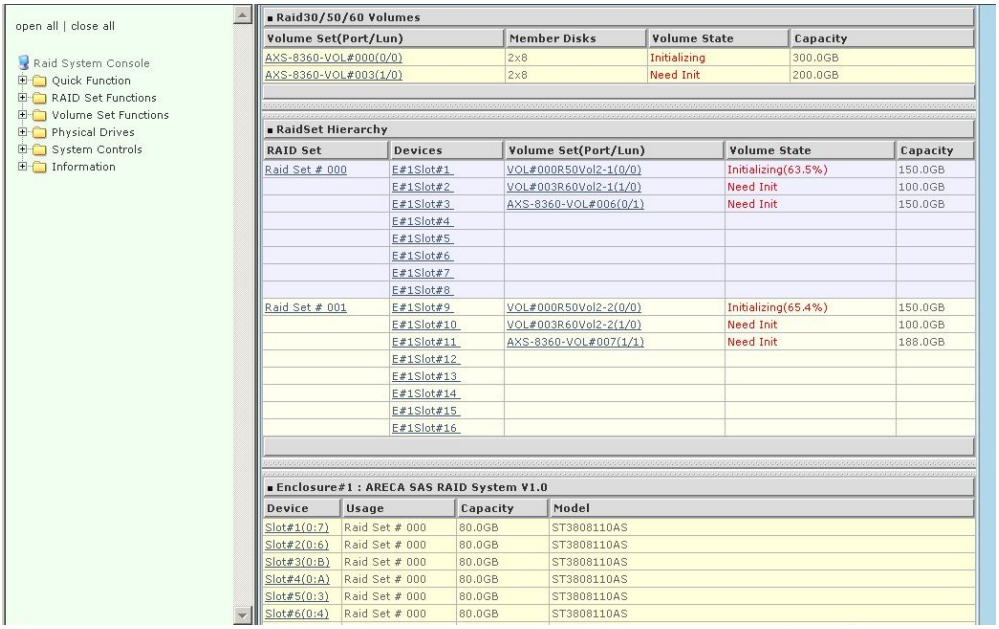
5.6 Configuring Raid Sets and Volume Sets

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 Raid Set Hierarchy screen. The current configuration can also be viewed by clicking on Raid Set 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 be shown 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 be shown in the screen.

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

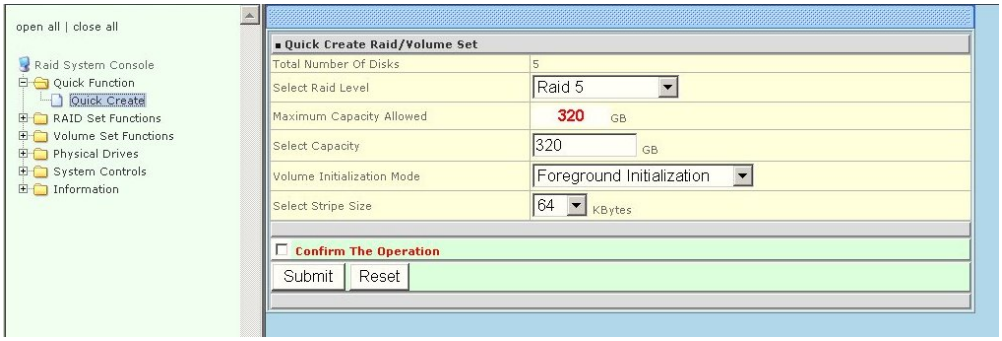


5.6.1 Main Menu

The main menu shows all function that enables the customer to execute actions by clicking on the appropriate link.

Individual Category	Description
Quick Function	Create a default configuration, which is based on the number of physical disk 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 existed pass through drives parameter. It also provides the function to identify the respect disk drive.
System Controls	Setting the raid system configurations
Information	View the controller and hardware monitor information. The Raid Set Hierarchy can also view through the RaidSet Hierarchy item.

5.7 Quick Create



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, stripe size, and capacity. A hot spare option is also created depending upon the existing configuration.

Tick on the **Confirm The Operation** and click on the **Submit** button in the Quick Create screen, the raid set and volume set will start to initialize.

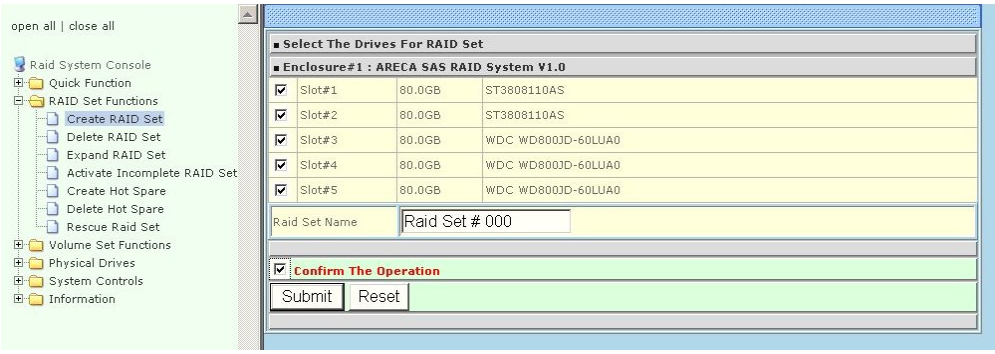
NOTE

In Quick Create your volume set is automatically configured based on the number of disks in your system. Use the Raid Set Function and Volume Set Function if you prefer to customize your system.

5.8 Raid Set Functions

Use the Raid Set Function and Volume Set Function if you prefer to customize your system. User manual configuration can fully control the raid set setting, 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 existing raid set and reconfigure the raid set. A raid set is a group of disks containing one or more volume sets.

5.8.1 Create Raid Set



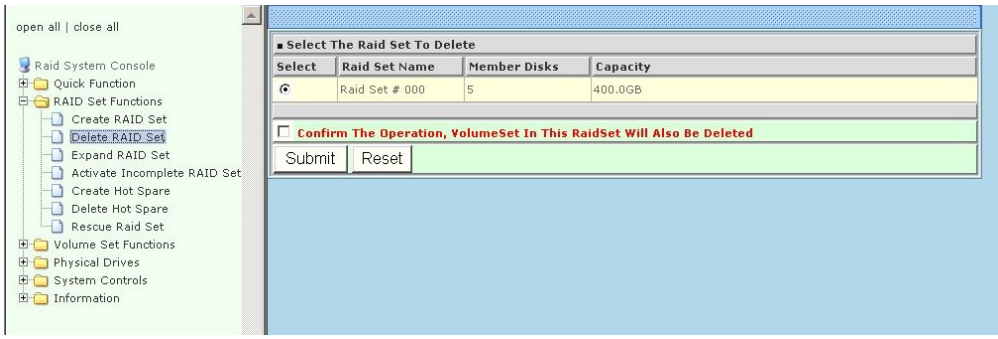
To create a raid set, click on the **Create Raid Set** link. A ***Select The* SAS (*SATA) Drive For RAID Set*** screen will display showing the drives connected to the current controller. Click on the selected physical drives with the current raid set. Enter 1 to 15 alphanumeric characters to define a unique identifier for a raid set. The default raid set name will always appear as Raid Set. #.

Tick on the **Confirm The Operation** and click on the **Submit** button in the screen, the raid set will start to initialize.

5.8.2 Delete Raid Set

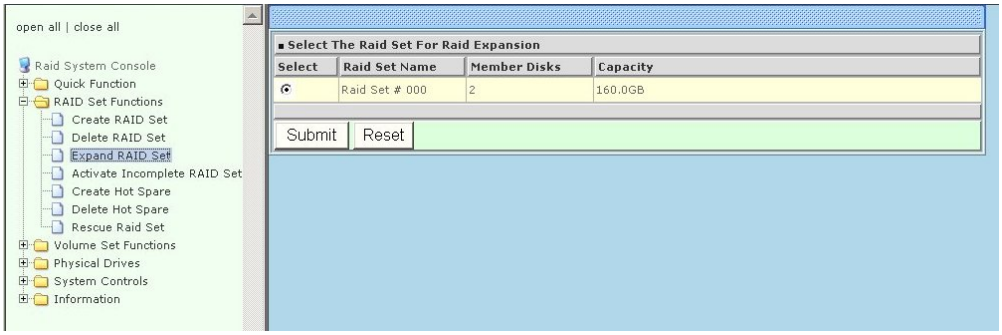
To delete a raid set, click on the Delete Raid Set link. A *Select The RAID SET To Delete screen* will display showing all raid set existing in the current controller. Click the raid set number you wish to delete in the select column to delete screen.

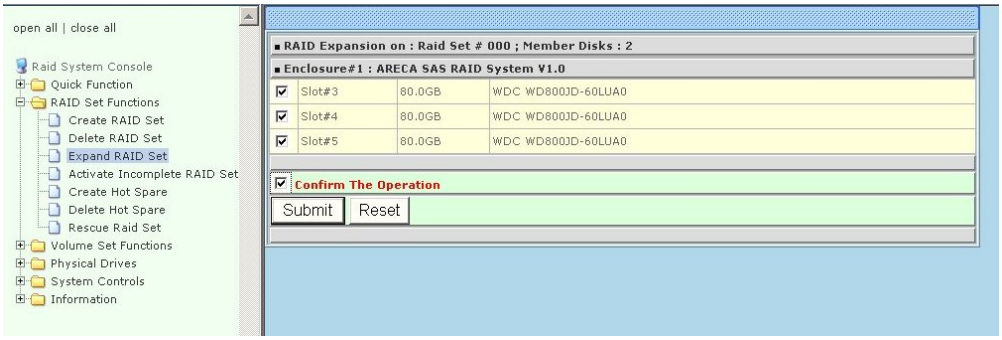
Tick on the Confirm The Operation and click on the Submit button in the screen to delete it.



5.8.3 Expand Raid Set

Use this option to expand a raid set, when a disk is added to your system. This function is active when at least one drive is available.





To expand a raid set, click on the **Expand Raid Set** link. Select the target raid set, which you want to expand it.

Tick on the available disk and **Confirm The Operation**, and then click on the **Submit** button in the screen to add disks to the raid set.

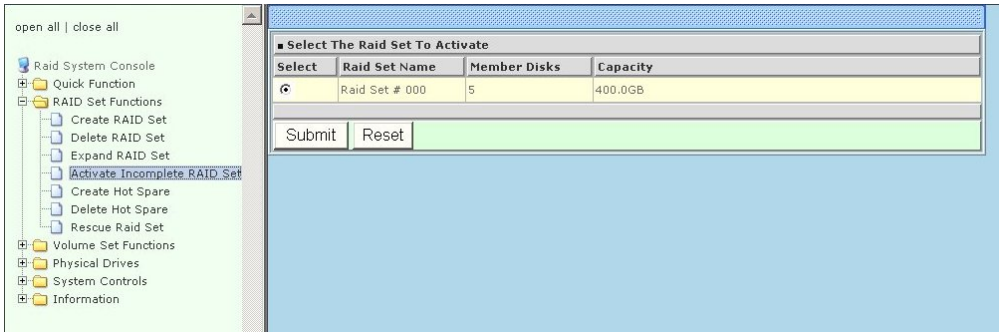
5.8.4 Offline RAID Set

If you want to move RAID Set to other enclosures, use this function to offline RAID Set. You don't need to shutdown RAID system and can safely move RAID Set members to other enclosures.

5.8.5 Activate Incomplete Raid Set

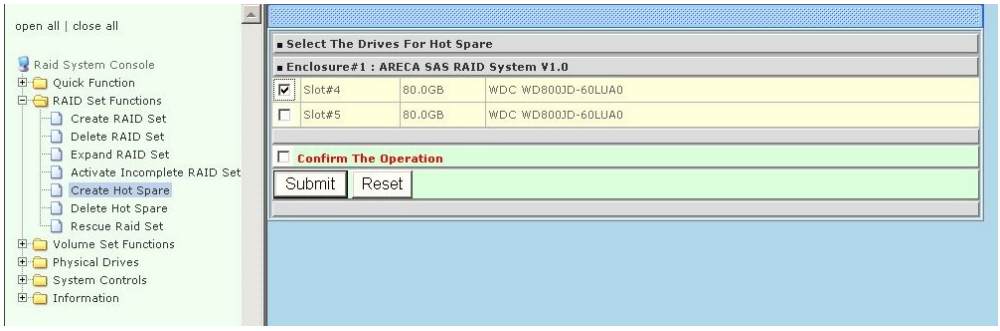
When one of the disk drive is removed in power off state, the raid set state will change to Incomplete State. If user wants to continue to work, when the RAID subsystem is power on, the Activate Raid Set option to active the raid set can be used. After user completes the function, the Raid State will change to Degraded Mode.

To activate the incomplete raid set, click on the Activate Raid Set link. A "*Select The RAID SET To Activate" screen* will display showing all existing raid set in the current controller. Click the raid set number you wish to activate in the select column.



Click on the **Submit** button in the screen to activate the raid set that has removed one of the disk drives in the power off state. The RAID subsystem will continue to work in degraded mode.

5.8.6 Create Hot Spare



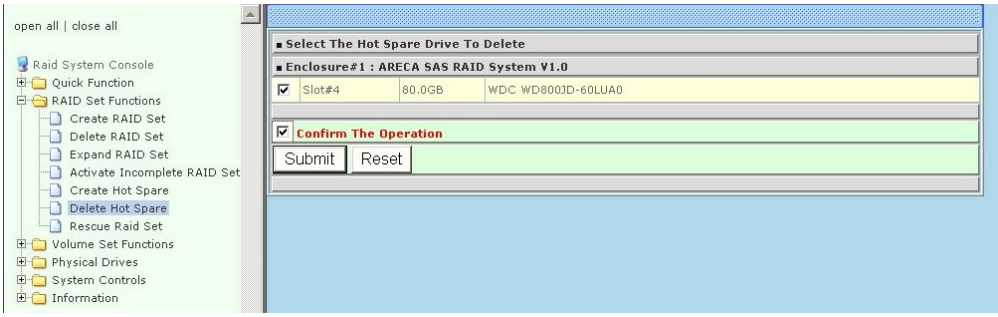
When you choose the **Create Hot Spare** option in the Raid Set Function, all unused physical devices connected to the current controller appear: Select the target disk by clicking on the appropriate check box. Tick on the **Confirm The Operation**, and click on the **Submit** button in the screen to create the hot spares.

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

5.8.7 Delete Hot Spare

Select the target Hot Spare disk to delete by clicking on the appropriate check box.

Tick on the **Confirm The Operation**, and click on the **Submit** button in the screen to delete the hot spares.



5.8.8 Rescue Raid Set

When the system is power off in the Raid set update period, it may disappear in 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.

5.9 Volume Set Function

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.

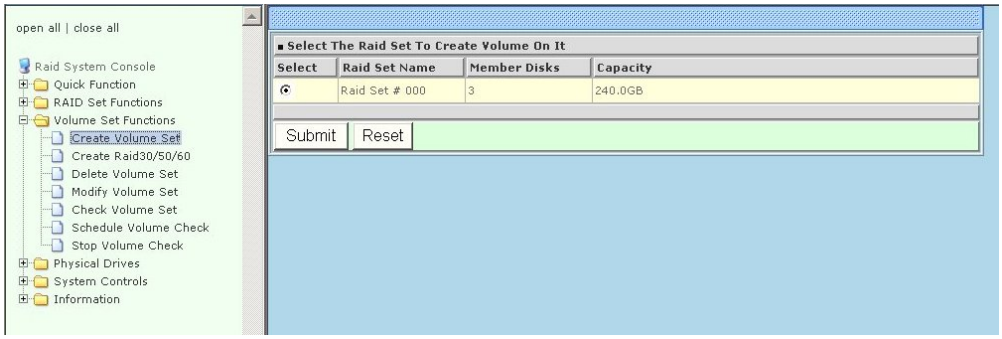
5.9.1 Create Volume Set

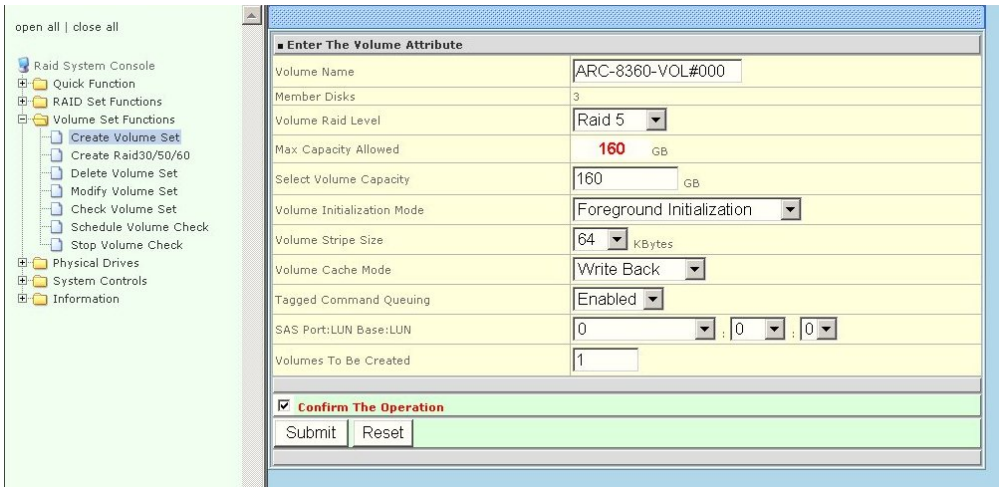
The following is the volume set features for the Alnico SAS/SATA RAID

1. Volume sets of different RAID levels may coexist on the same raid set.
2. Up to 16 volume sets can be created in a raid set.
3. The maximum addressable size of a single volume set can be exceeded than 2 TB (64-bit LBA, firmware define support up to 512TB, for Windows block size set to 4KB can support up to 16TB).

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 allows user to select the Volume name, capacity, RAID level, strip size, SCSI Channel, SCSI ID, SCSI LUN, Cache mode, tag queuing.





5.9.1.1 Volume Name:

The default volume name will always appear as Volume Set. #. You can rename the

volume set name as long as it does not exceed the 15 characters limit.

5.9.1.2 Volume Raid Level:

Set the RAID level for the Volume Set. Highlight *Raid Level* and press Enter.

The available RAID levels for the current Volume Set are displayed. Select a RAID level and press Enter to confirm.

5.9.1.3 Capacity:

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

5.9.1.4 Greater Two TB Volume Support:

When the RAID set capacity of per volume is over 2TB, a special selection will appear on the GUI, please make a choice according to your O.S.:

64bit LBA: for Linux, Unix Windows 2003 SP1 (or later) and etc...

4K Block: Windows 2000, XP, enlarge block size from 512Byte to 4K.

No. : Disable greater than 2TB feature.

5.9.1.5 Volume initiation Mode

This parameter sets the initiation mode of selected volume set,

Foreground Initialization is the fast way to initial of the selected volume

set.

Background Initialization is the normal way to initial of the selected volume set.

No Init is special selection to rescue the volume. RAID system initiate the selected volume set without writing any data and parity bit into the HDDs.

5.9.1.6 Strip Size:

This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 1E (0+1), 5, 6, 50 or 60 logical drives. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, 256KB, 512KN or 1024 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

NOTE

1. *RAID level 3 can't modify strip size.*
2. *Roaming the stripe size 256K / 512K / 1024K Raid Set to firmware version older than 1.52 will cause data corruption.*

5.9.1.7 Cache Mode:

The RAID subsystem supports Write-Through Cache and Write-Back Cache.

5.9.1.8 Volume Write Protection:

Enable this protection to prevent any data being written to Volumes.

5.9.1.9 Full Volume Encryption:

The RAID subsystem have featured with controller based hardware encryption function. Controller based hardware encryption describes the encryption of data occurring at the disk array controller before being sent to the disk drives. Since RAID controller is a natural central point of all data therefore encryption at this level is inherent and also reduces deployment complexity. RAID controller has dedicated electronic circuitry for the cryptographic engine embedded in the ROC and operating at full channel speeds. The hardware encryption does not impact the performance of RAID controller and can implement on any kinds of HDD that is transparent to the user, the OS, and applications.

Encrypting your volume can give your data an extra layer of protection beyond setting up a controller password. Encryption will conceal your volume's data and make accessing the files almost impossible for anyone who does not you're your encryption key. Data saved in the volume will be hidden by Algorithm developed. With this scramble process, no one can see and access into the hidden volume data without access key. RAID controller support 128bit and 256bit encryption keys using AES (a key size of 128, or 256 bits), or password (a variable key size). Each encryption key size causes the algorithm to behave slightly differently, so the increasing key sizes not only offer a larger number of bits with which you can scramble the data, but also increase the complexity of the cipher algorithm. RAID controller provide five new key options in the 'Full Volume Encryption: "Disable", "256Bit key, Password", "256Bit key, AES", "128Bit key, Password", "128Bit key, AES". You can generate the new key by CLI utility or API code function.

This volume encryption function can only work with RAID controller with any kinds of HDD. You can follow below steps to enable the function.

1. Create volume set with "Full Volume Encryption" capability in the web management.
2. Use CLI "vsf genkey" command or API code to generate key file.

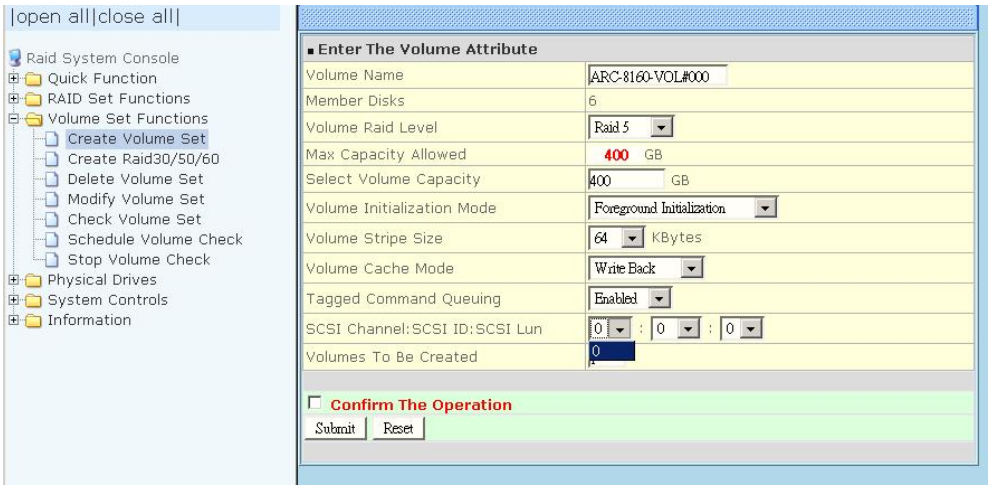
3. Use “Download Volume Key File” in the web management or use CLI “vsf dlkey” command to download volume key file into firmware and unlock the volume.
4. Follow step 3. to unlock volume if volume locked.

5.9.1.10 Tagged Command Queuing:

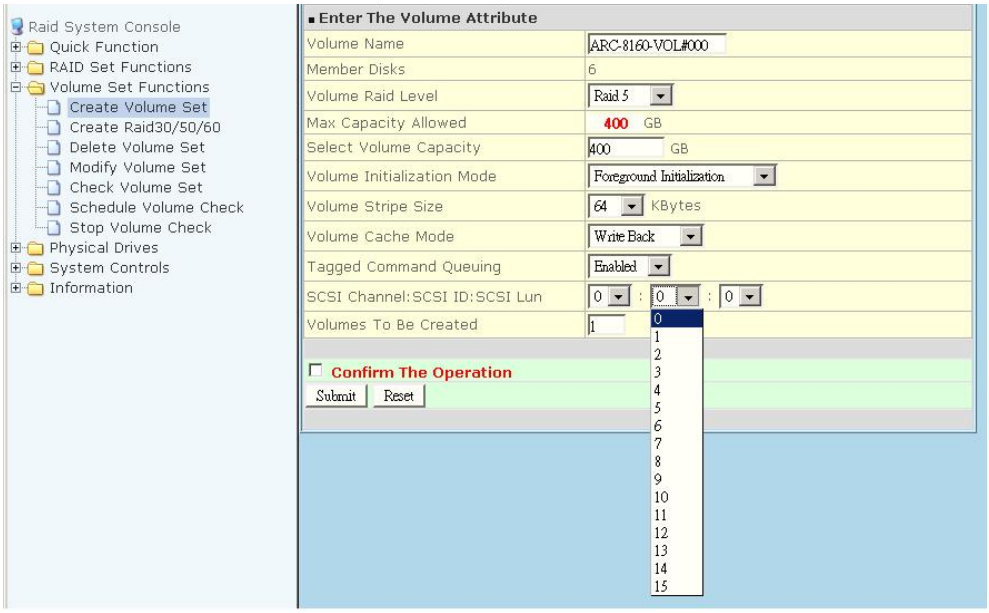
The Enabled option is useful for enhancing overall system performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SCSI command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using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

5.9.1.11 SCSI Channel / SCSI ID / SCSI LUN

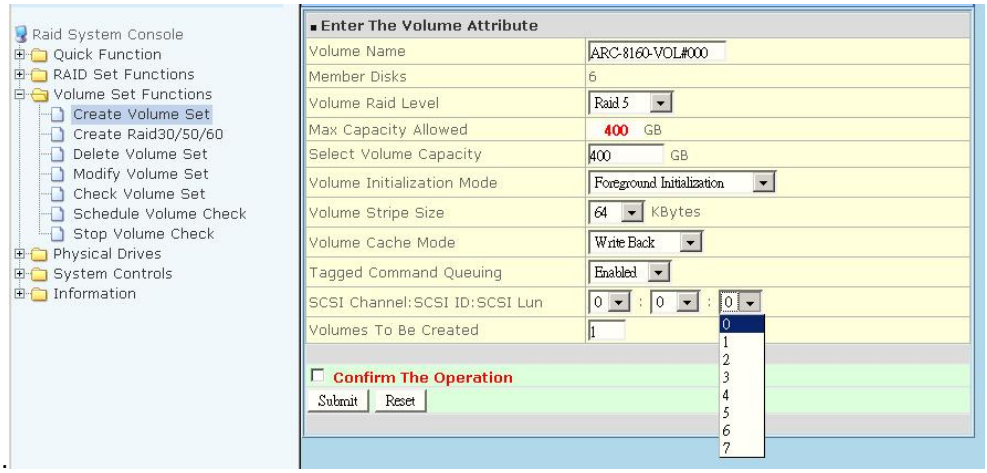
SCSI Channel: The RAID subsystem supports PCIe 4X (2.5 Gb/s * 4) and simulated SCSI Channel 0.



SCSI ID: RAID volume simulates as a large SCSI device. We should assign an ID from a list of SCSI IDs.



SCSI LUN: Each SCSI ID can support up to 8 LUNs, each LUN is like a SCSI disk.



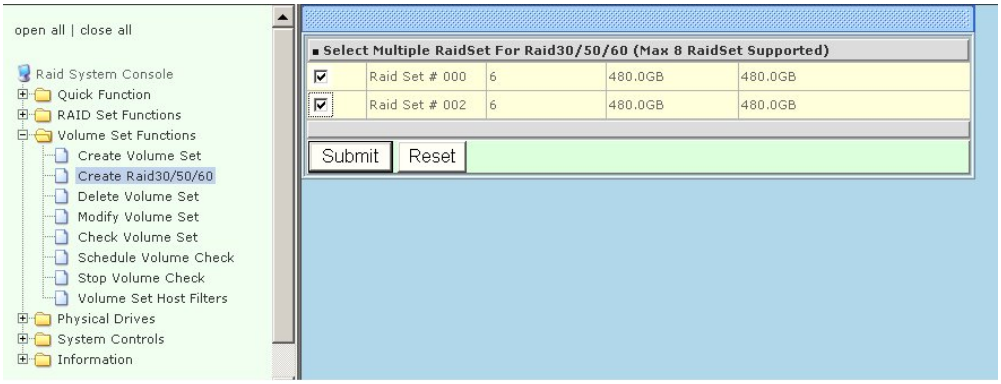
5.9.1.12 Volume to Be Created:

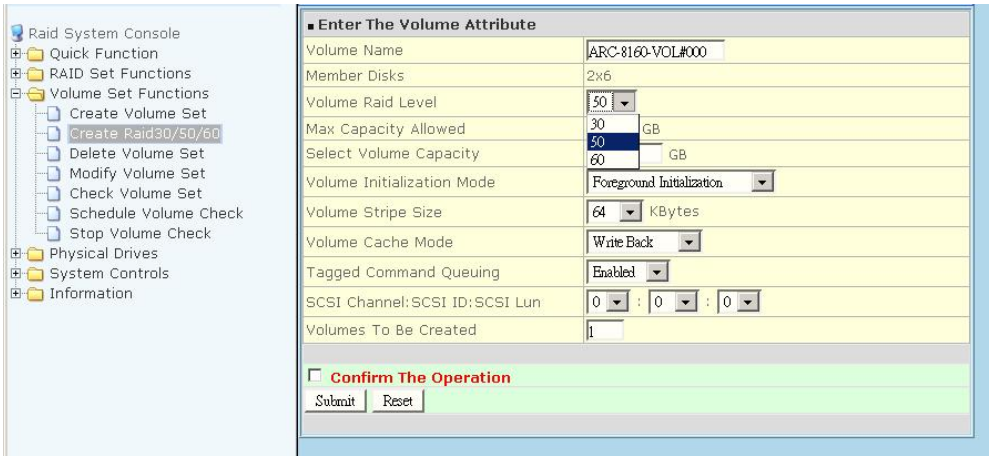
The controller can support up to 128 volume sets. This option is defined volume number using the same volume set attribute here.

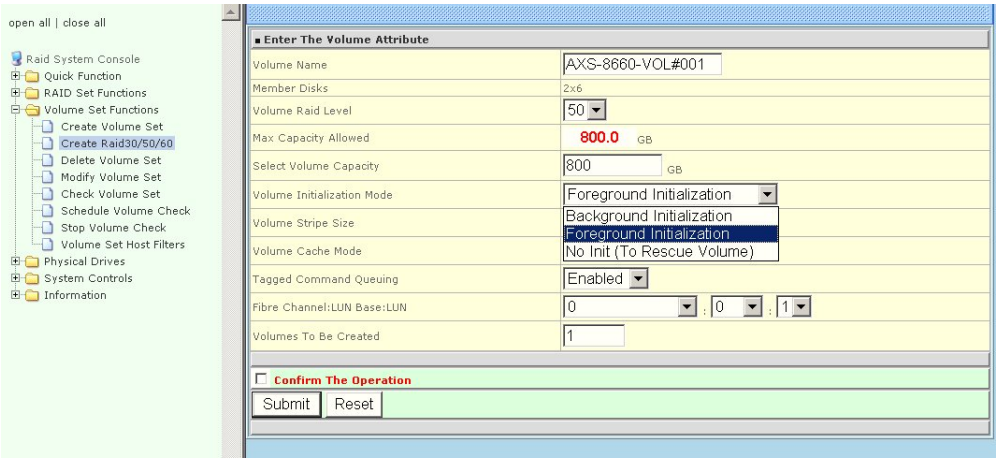
5.9.2 Create Raid30/50/60

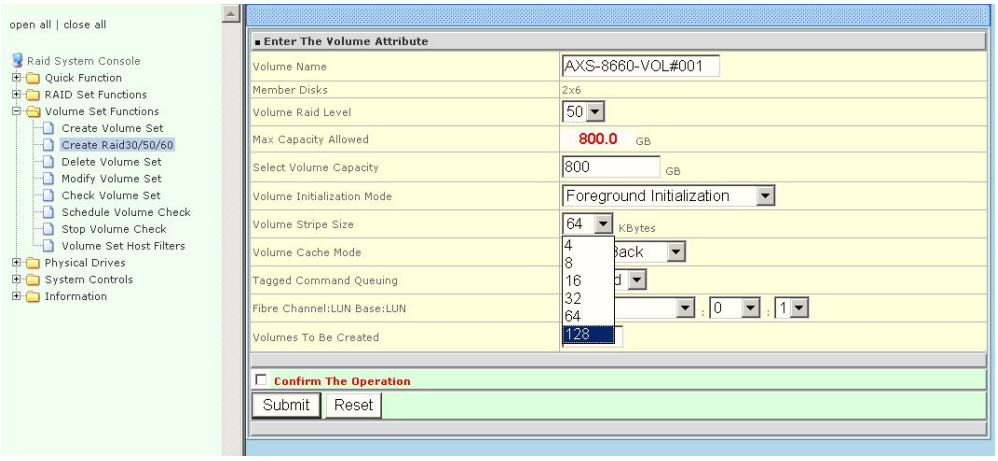
Create Raid30, Raid50 or Raid60, procedure almost same as "**5.9.1 create volume set",** you need create two or more raid set first and follow create volume set procedure to finish create Raidx0.

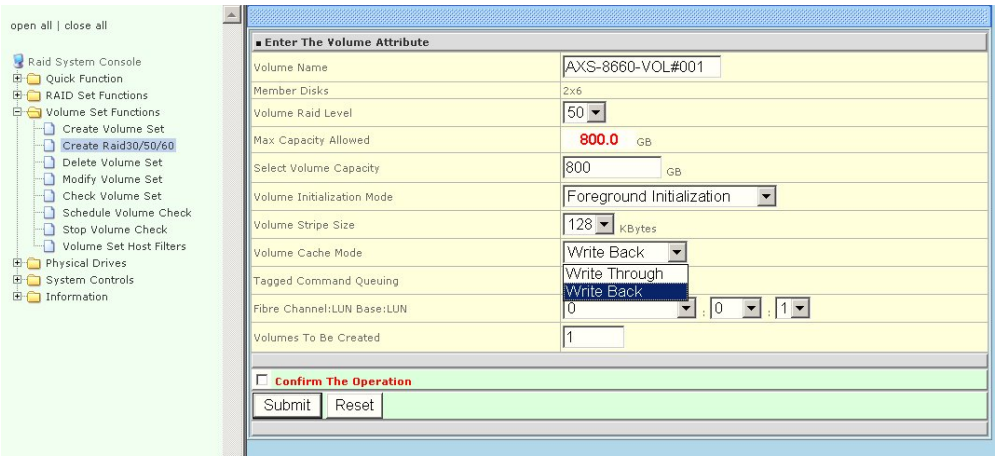
The create Raid30/50/60 function allows user to select the RAID Set group, Volume name, RAID level (R30/R50/R60), Volume capacity, Volume Initialization mode, strip size, SCSI Channel# / SCSI ID/ SCSI LUN, Cache mode, tag queuing.

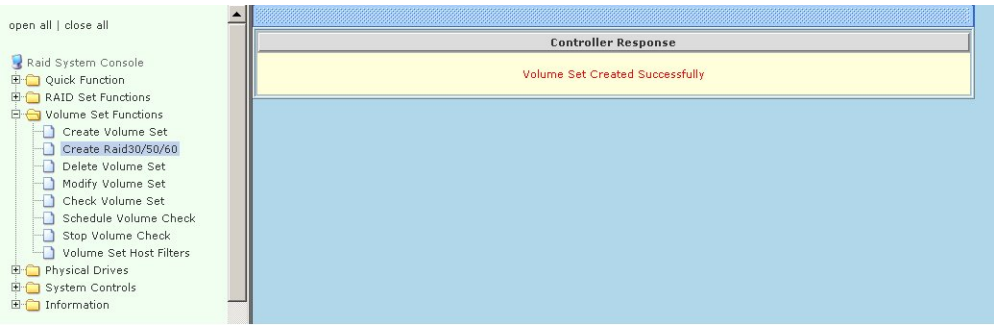


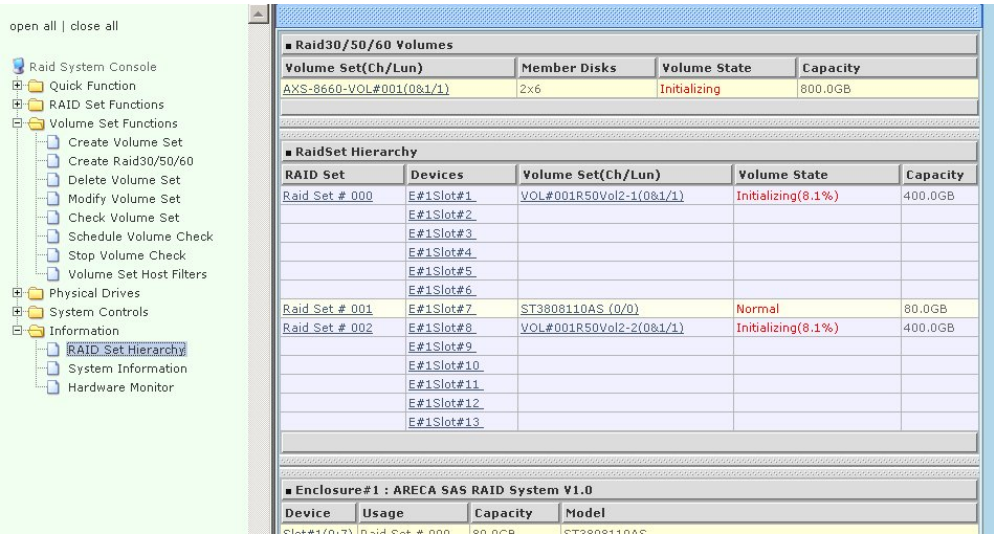



open all | close all
Raid System Console
Quick Function
RAID Set Functions
Volume Set Functions
Create Volume Set
Create Raid30/50/60
Delete Volume Set
Modify Volume Set
Check Volume Set
Schedule Volume Check
Stop Volume Check
Volume Set Host Filters
Physical Drives
System Controls
Information
Enter The Volume Attribute
Volume Name
AXS-8660-VOL#001
Member Disks
2x6
Volume Raid Level
50
Max Capacity Allowed
800.0 GB
Select Volume Capacity
800 GB
Volume Initialization Mode
Foreground Initialization
Volume Stripe Size
Background Initialization
Foreground Initialization
No Init (To Rescue Volume)
Volume Cache Mode
Tagged Command Queuing
Enabled
Fibre Channel:LUN Base:LUN
0 : 0 : 1
Volumes To Be Created
1
Confirm The Operation
Submit
Reset


open all | close all
Raid System Console
Quick Function
RAID Set Functions
Volume Set Functions
Create Volume Set
Create Raid30/50/60
Delete Volume Set
Modify Volume Set
Check Volume Set
Schedule Volume Check
Stop Volume Check
Volume Set Host Filters
Physical Drives
System Controls
Information
Enter The Volume Attribute
Volume Name
AXS-8660-VOL#001
Member Disks
2x6
Volume Raid Level
50
Max Capacity Allowed
800.0 GB
Select Volume Capacity
800 GB
Volume Initialization Mode
Foreground Initialization
Volume Stripe Size
64 KBytes
4
8
16
32
64
128
Volume Cache Mode
Tagged Command Queuing
Fibre Channel:LUN Base:LUN
0 : 1
Volumes To Be Created
Confirm The Operation
Submit
Reset


open all | close all
Raid System Console
Quick Function
RAID Set Functions
Volume Set Functions
Create Volume Set
Create Raid30/50/60
Delete Volume Set
Modify Volume Set
Check Volume Set
Schedule Volume Check
Stop Volume Check
Volume Set Host Filters
Physical Drives
System Controls
Information
Enter The Volume Attribute
Volume Name
AXS-8660-VOL#001
Member Disks
2x6
Volume Raid Level
50
Max Capacity Allowed
800.0 GB
Select Volume Capacity
800 GB
Volume Initialization Mode
Foreground Initialization
Volume Stripe Size
128 KBytes
Volume Cache Mode
Write Back
Write Through
Write Back
Tagged Command Queuing
Fibre Channel:LUN Base:LUN
0 : 0 : 1
Volumes To Be Created
1
Confirm The Operation
Submit
Reset



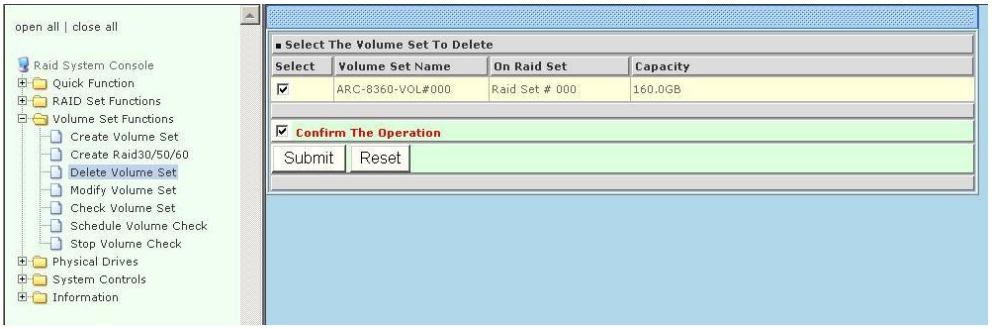


NOTE

RAID level 30 50 and 60 can support up to eight RAID set (four pairs), but it can not support expansion and migration.

5.9.3 Delete Volume Set

To delete Volume from raid set system function, 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 number. **Tick** on a raid set number and the Confirm the Operation and then **click** on the Submit button to show all volume set item in the selected raid set. **Tick** on a volume set number and the Confirm the Operation and then **click** on the **Submit** button to delete the volume set.



5.9.4 Modify Volume Set

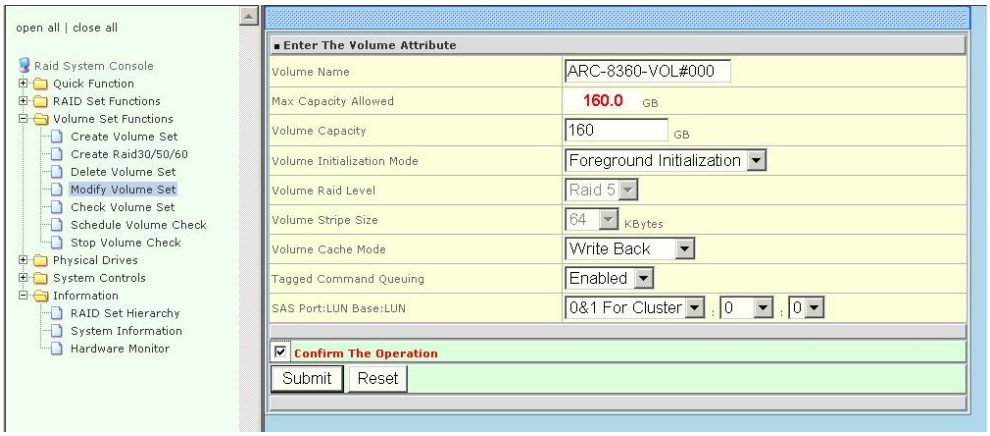
To modify a volume set from a raid set:

(1). Click on the **Modify Volume Set** link.

(2). Tick on the volume set from the list that you wish to modify. Click on the **Submit** button.

The following screen appears.

Use this option to modify volume set configuration. To modify volume set attribute values from raid set system function, move the cursor bar to the volume set attribute menu and click on it. The modify value screen appears. Move the cursor bar to an attribute item, and then click on the attribute to modify the value. After you complete the modification, tick on the **Confirm The Operation** and click on the **Submit** button to complete the action. User can modify all values except the capacity.



5.9.4.1 Volume Growth

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

Operation” check box and click the “Submit” button to complete the action. The last volume set starts to expand its capacity. If you have free spaces from reserved or delete volumes, you can enlarge the last volume set size before the free spaces.

To expand an existing volume noticed:

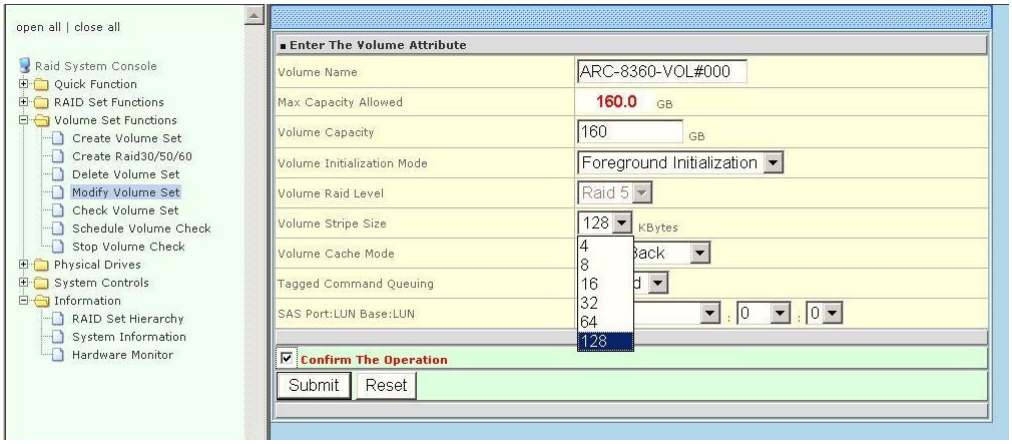
- Only the last volume can expand capacity.
- When expand volume capacity, you can’t modify stripe size or modify RAID level simultaneously.
- You can expand volume capacity, but can’t shrink volume capacity size.
- After volume expansion, the volume capacity can't be decreased.

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.

5.9.4.2 Volume Set Migration

Migrating occurs when a volume set is migrating from one RAID level to another, a volume set stripe size changes, or when a disk is added to a raid set. Migration status is displayed in the volume status area of the Raid Set Hierarchy screen when one RAID level migrates to another, a Volume set stripe size changes or when a disk is added to a raid set.



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. Power failure may damage the migration data. Please backup the RAID data before you start the migration function.

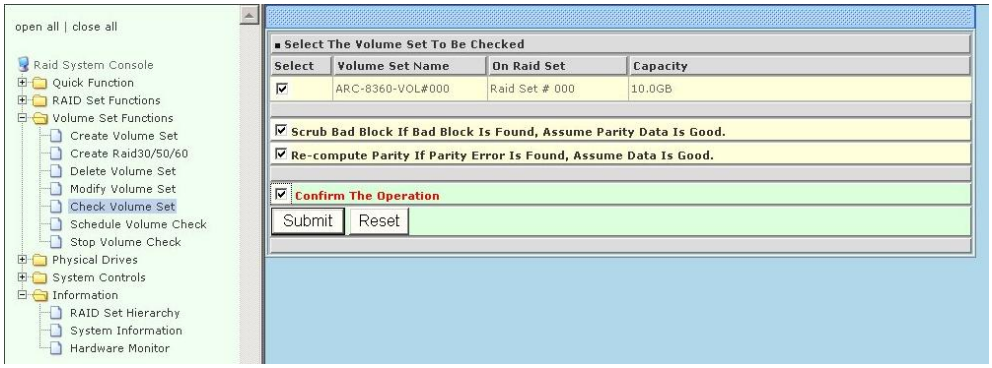
5.9.5 Check Volume Set

To check a volume set from a raid set:

(1). Click on the **Check Volume Set** link.

(2). **Tick** 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.

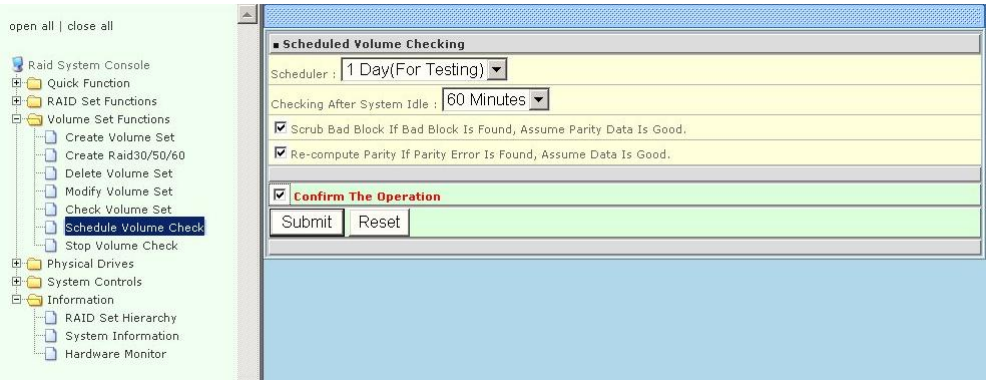


Scrub Bad Block If Bad Block Is Found, Assume Parity Data Is Good option: the check button will be shown when Data disk found bad blocks, and if selected, the RAID controller will regenerate data from Parity disk to data disk, if check button not yet selected RAID controller will report error only.

Re-compute Parity If Parity Error Is Found, Assume Data Is Good option: check button will be shown when Parity Data disk found bad blocks, and if selected, RAID controller will regenerate data from Data disk to Parity disk, if check button not yet select RAID controller will report error only.

5.9.6 Scheduled Volume Checking

Use this option to check volume set consistency at 1 ~12 weeks.



Scheduler option: set to 1 week ~ 12 weeks will start volume check after 1 week ~ 12 weeks,

Checking After System Idle option: set to 1 Minute ~ 30 Minutes, when RAID system idle 1 Minute ~30 Minutes RAID system will start volume check, if host accesses RAID system that will stop volume check. Next time, when RAID system is idle for 1 Minute ~ 30 Minutes, RAID system will continue volume check.

Scrub Bad Block If Bad Block Is Found, Assume Parity Data Is Good option: check button will be shown when Data disk found bad block, and if selected, RAID controller will regenerate data from Parity disk to data disk, if check button not yet selected RAID controller will report error only.

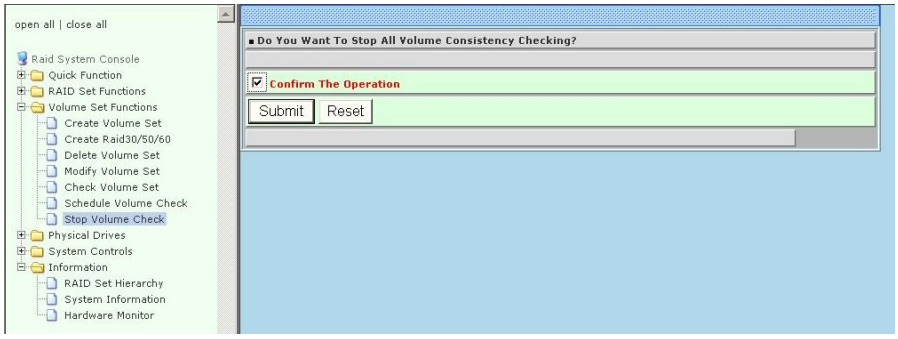
Re-compute Parity If Parity Error Is Found, Assume Data Is Good option: check button will be shown when Parity Data disk found bad block, and if selected, RAID controller will regenerate data from Data disk to Parity Data disk, if check button not yet selected RAID controller will report error only.

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.

5.9.7 Stop Volume Set Check

Use this option to stop the Check Volume Set function.



5.9.8 Download Volume Key File

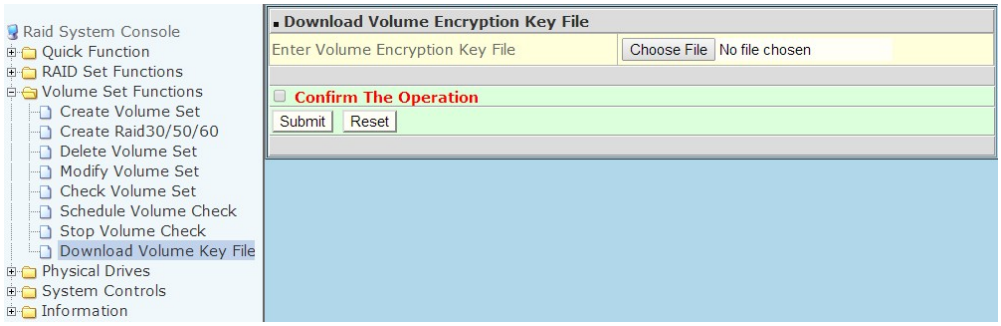
Get the key file which was generated by CLI “vsf genkey” command or API code for your Raid Controller. You can follow below steps to download volume key file.

1. To download volume key file into the firmware, move the mouse cursor to “Download Volume Key file” link and click on it. The “Download Volume Encryption Key File” screen appears.

2. Click on “Browse”. Look in the location to which the key file was generated. Select the file name and click “Open”.

3. Click “Confirm The Operation” and press the “Submit” button.

4. After the key file download is completed, a bar indicator will show “Key File Has Been Downloaded Successfully”.



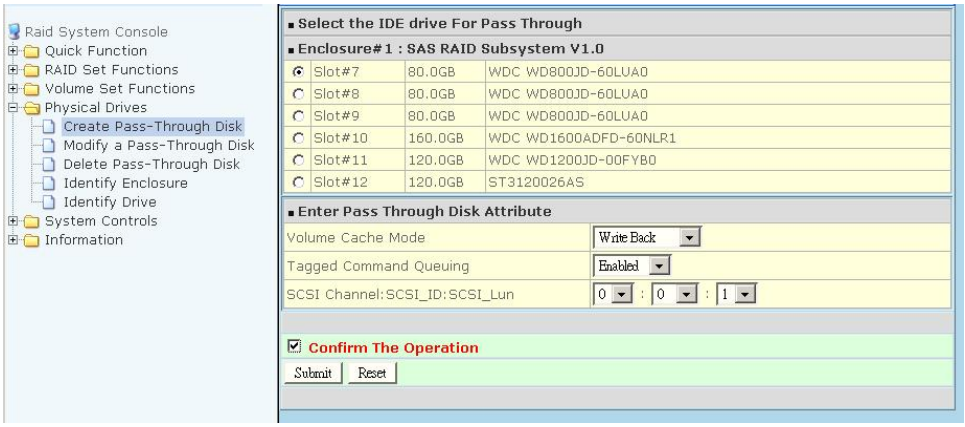
5.10 Physical Drive

Choose this option from the Main Menu to select a physical disk and to perform the operations listed below.

5.10.1 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.

Disk is not controlled by the internal RAID subsystem firmware and thus cannot 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. User can also select the cache mode, Tagged Command Queuing, SCSI Channel/SCSI ID/SCSI LUN for this volume.

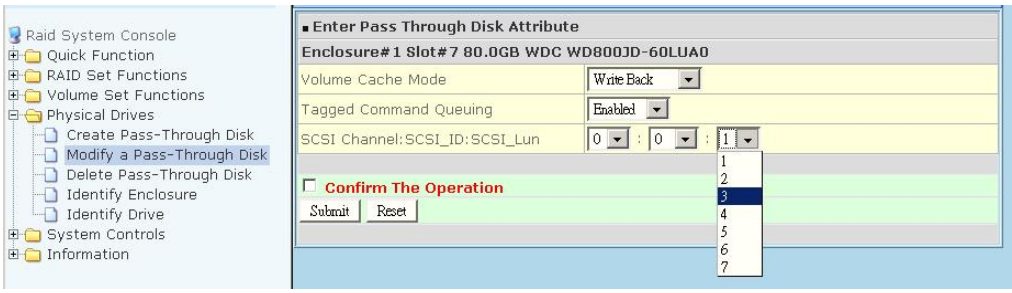


5.10.2 Modify Pass-Through Disk

Use this option to modify the Pass-Through Disk Attribute. User can modify the cache mode, Tagged Command Queuing, SAS Port# (Fiber Channel#)/LUN on an existed pass through disk.

To modify the pass-through drive attribute from the pass-through drive pool, move the mouse cursor bar to click on **Modify Pass-Through** link. The Select The Pass Through Disk For Modification screen appears tick on the Pass-Through Disk from the pass-through drive pool and click on the **Submit** button to select drive.

The Enter Pass-Through Disk Attribute screen appears; modify the drive attribute values, as you want.



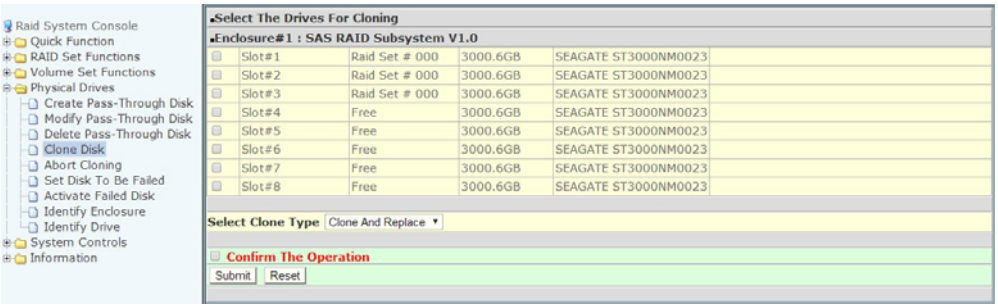
After you complete the selection, tick on the **Confirm The Operation** and click on the **Submit** button to complete the selection action.

5.10.3 Delete Pass-Through Disk

To delete pass-through drive from the pass-through drive pool, move the mouse cursor bar to the main menus and click on **Delete Pass Through** link. After you complete the selection, tick on the **Confirm The Operation** and click on the **Submit** button to complete the delete action.

5.10.4 Clone Disk

Instead of deleting a RAID set and recreating it with larger disk drives, the “Clone Disk” function allows the users to replace larger disk drives to the RAID set that have already been created. Click on the “Clone Disk” option on the “Physical Drives” link to enable the clone function. If there is an available disk, then the “Select The Drives For Cloning” screen appears. There are two “Clone Disk” function options: ”Clone And Replace ” and “Clone Only.”



Clone Disk Procedure

(1). Select one of the members as the “Clone Source” (status indicated as Raid Set #) by clicking on the appropriate check box.

(2). Select a “Clone Target” (status indicated as Free or Hot Spare) by clicking on the appropriate check box.

(3). If you have available disk member, you can repeat above procedures to define another clone pair.

(4). Select clone type.

The pair number for both the “Clone Source” and the “Clone Target” will be indicated in the screen. Click on the “Confirm The Operation” check box and click on the “Submit” button on the screen; the controller will automatically start the cloning process using the existing “stand-by” (Free or Hot Spare drive) to clone the source drive (the Raid Set member drive). The cloning process percentage will be indicated in the “Volume State” area of the “Volume Set Information” screen. Completion of the Clone function process will be indicated by a notification message on the event log.

Clone And Replace

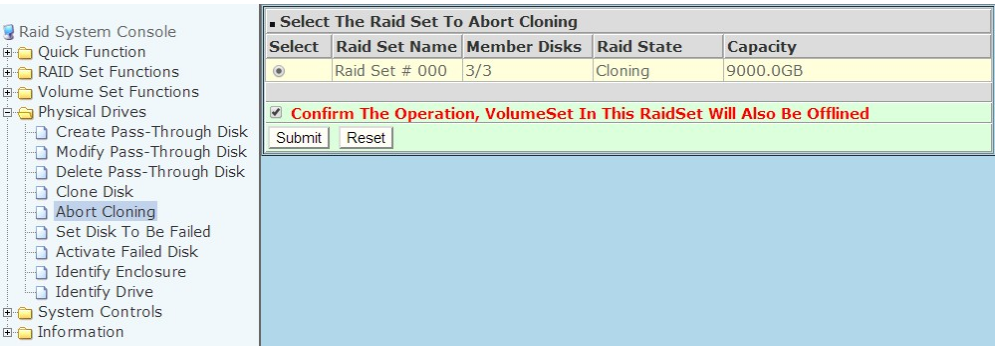
You can enlarge your logical drives by copying and replacing all member drives with drives of higher capacity. The existing data in the logical drives is copied onto the new drives, and then the original members are marked as “Offlined”.

Clone Only

The stand-by disk will clone the logical drives without substituting it. The status of the stand-by drive will be marked as “Offlined” after the cloning process. The source drive will remain a member of the logical drive.

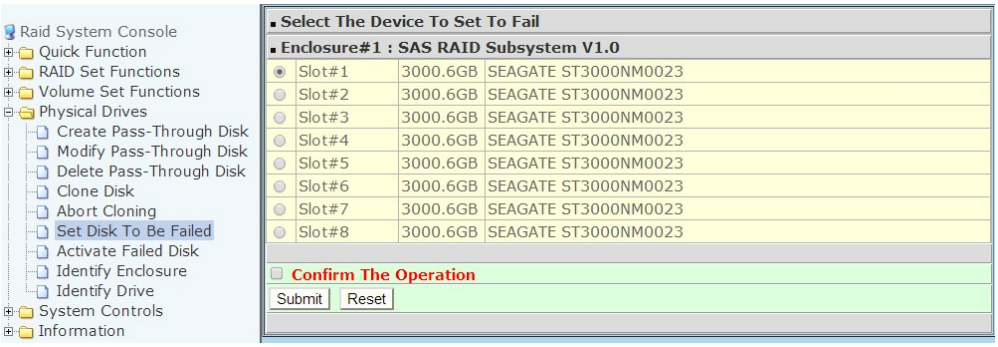
5.10.5 Abort Clone

Use this function to stop the ongoing clone disk action.



5.10.6 Set Disk To Be Failed

It sets a normal working disk as “failed” so users can test some of the features and functions.

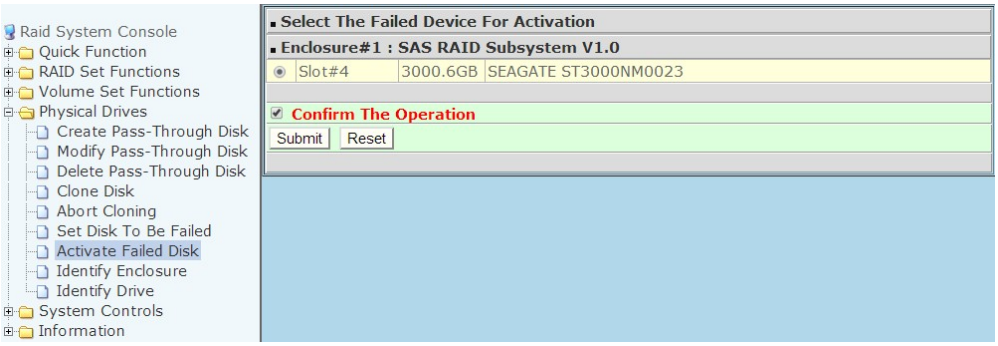


5.10.7 Activate Failed Disk

It forces the current “failed” disk in the system to be back online. “Activate Failed Disk” function has no effect on the removed disks, because a “removed” disk does not give the controller a chance to mark it as “failure”.

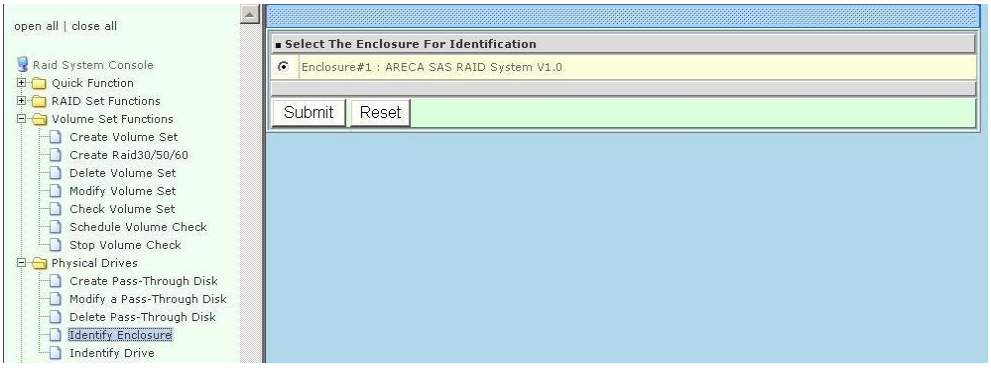
Followings are considered as “Removed-Disk”:
(1). Manually removed by user
(2). Lost PHY connection due to bad connector, cable, backplane
(3). Lost PHY connection due to disk fail

Basically, this function makes the controller sees the disk disappears suddenly due to whatever reason.



5.10.8 Identify Enclosure

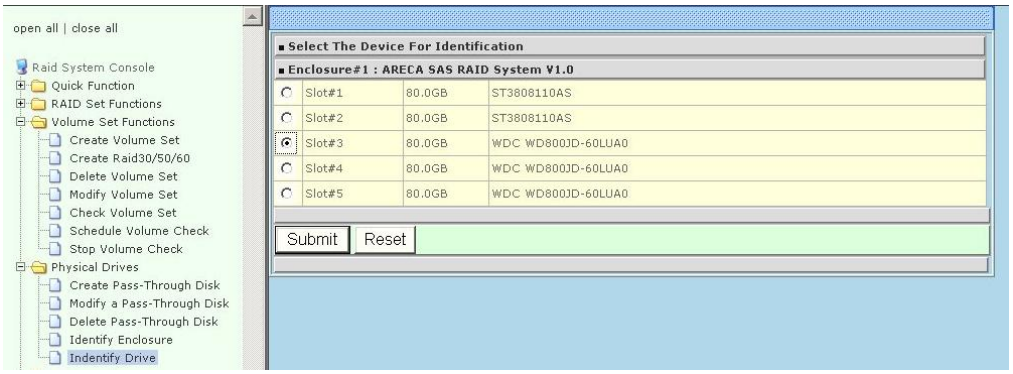
When the Identify Enclose is selected, all HDD’s red LEDs will blink on the enclosure, select any page will stop blink.



5.10.9 Identify Selected Drive

To prevent removing the wrong drive, the selected disk LED will light to physically locate the selected disk when the *Identify Selected Drive* is selected.

To identify the selected drive from the drives pool, move the mouse cursor bar to click on **Identify Selected Drive** link. When The Select the SATA Device For identification screen appears, tick on the SATA device from the drives pool and Flash method. After completing the selection, click on the **Submit** button to identify selected drive.



5.11 System Controls

5.11.1 System Configuration

To set the raid system function, move the cursor bar to the main menu and click on the **System Configuration** link. The **System Configuration** menu will show all items. Move the cursor bar to an item, then press **Enter** key to select the desired function.

5.11.1.1 System Beeper Setting:

The Alert Beeper function item is used to Disable or Enable the RAID subsystem controller alarm tone generator.

5.11.1.2 Back Ground Task priority:

The Back Ground Task 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 (Low, Normal, High) to balance volume set access and rebuild tasks appropriately. For high array performance, specify a Low value.

5.11.1.3 JBOD /RAID Mode Configuration

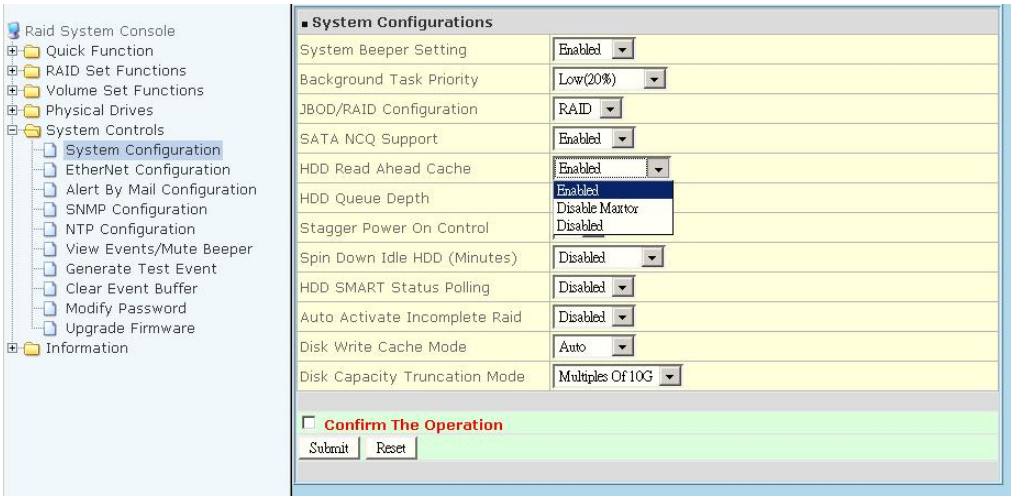
To set or change the RAID Mode of RAID subsystem, press the **UP/ DOWN** to select **JBOD/RAID Mode Configuration** and then press the **ENT** to accept the selection. The RAID mode selection screen appears and uses the **UP/DOWN** to set RAID mode. After completing the modification, the confirmation screen will be displayed and then press **ENT** to accept the function.

5.11.1.4 SATA NCQ Support

To set or change the configuration, press the **UP/ DOWN** to select Enable / Disable and then press the **ENT** to accept the selection.

5.11.1.5 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.



5.11.1.6 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.

5.11.1.7 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.

5.11.1.8 Empty HDD Slot LED

The firmware has added the "Empty HDD Slot LED" option to setup the fault LED light "ON "or "OFF" when there is no HDD installed. When each slot has a power LED for the HDD installed identify, user can set this option to "OFF". Choose option "ON", the SAS RAID controller will light the fault LED; if no HDD installed.

5.11.1.9 CPU Fan Detection

The "CPU Fan Detection" function is for RAID card only. *(Default: Disabled)*

5.11.1.10 SES2 Support

If your SAS backplane does not implement the correct SES2 function, you can disable the SES2 support on controller. Controller will use SMP (only monitor PHY not environment) to communicate with SAS backplane, but you will be not able to monitor the backplane information.

5.11.1.11 Max Command Length

Max Command Length is used to set a "best" IO size for the RAID controller.

5.11.1.12 Auto Activate Incomplete Raid

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

5.11.1.13 Disk Write Cache Mode

Disk cache can be turned off to prevent data lost, turned on to increase the performance of the machine. The following is the reason why a user might want to turn off the cache. In case of power failure, the data stored in the disk cache waiting to be process might be lost. The disadvantage to turn off the disk cache is that performance will decrease dramatically.

Auto: Disk cache's setting will accord the installation of battery backup. When battery backup is installed, Disk cache is disabled. No battery backup installed, Disk cache is enabled.

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

5.11.1.14 Write Same For Initialization

Drives that support the Write Same feature (SCT) can write to multiple drive sectors at once, improving initialization time. To take advantage of this feature, all the drives in the unit must support Write Same. User can set the “SAS And SATA”, “SAS Only”, “SATA Only” or “Disabled” for the controller initialization.

511.1.15 Hot Plugged Disk For Rebuilding

It defines if the RAID volume should start rebuilding or not when controller detects a disk is inserted/re-inserted during online. The options are: “Blank Disk Only”, “Always”, and “Disable”. The default is “Blank Disk Only”.

Blank Disk Only: it will trigger the rebuilding if and only if the inserted disk has not been in the RAID array before, which has no RAID signature on it. When a previously removed disk is self re-inserted, it won’t trigger the degraded RAID array to rebuild, and the administrator has a chance to identify this misbehaving disk and replaces it.

Always: whenever a disk is inserted/re-inserted whether new or previously existed, it always trigger a rebuilding for the Degraded RAID set/Volume.

Disable: it will not trigger rebuilding regardless what sort of disk plugging in. When “Disable” and/or “Blank Disk Only” is selected, the re-inserted/previously removed disk will be identified as a disk in a separate RAID set with duplicated RAID set# and with all the rest of RAID members missing.

5.11.1.16 PCIe Gen3

The “Disabled” option is used to force PCIe running Gen2 mode for compatible issue under Gen3 slot. You must restart the computer twice for the PCIE Gen3 setting to take effect.

5.11.1.17 SES2 H/W Monitor

The options are: “Enabled”, “Disabled”.

5.11.1.18 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.

No Truncation: It does not truncate the capacity.

5.11.1.19 Smart Option For HDD

This option is used to increases the reliability of SSDs/HDDs by automatically copying data from a drive with potential to fail to a designated hot spare or newly inserted drive. The options are: "Failed The Drive", "Failed The Drive If Hot Spare Exist", and "Alert Only".

Failed The Drive : controllers kill off the SMART fail drive immediately.

Failed The Drive If Hot Spare Exist :

controllers kill off the SMART fail disk if hot spare dive is existed.

Alert Only : it will trigger alert when there happens a SMART fail drive.

5.11.1.20 Smart Polling Interval

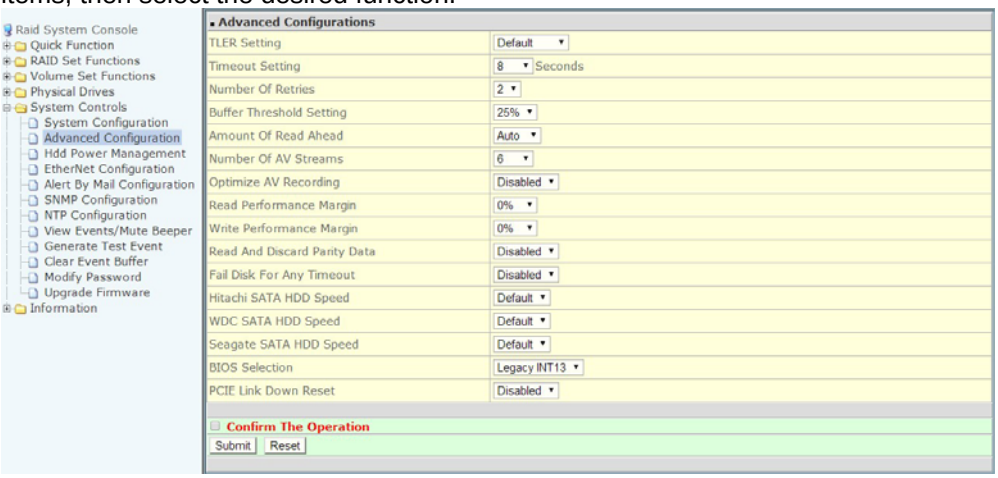
Besides the scheduled volume check, user can define the Smart Pulling Interval to pull the SMART status of each disk. The default is "on demand".

User can schedule every certain period of time interval to pull the SMART status of each disk. When SMART pulling is executed, disk activity will be temporally halted until the SMART parameter reading is finished. That is why you don't want to set the Interval too frequent. What to use is up to the users to decide based on their applications and experiment results.

5.11.2 Advanced Configuration

To set the RAID system function, move the cursor to the main menu and click on the "Advanced Configuration" link. The "Advanced Configuration" menu will show all

items, then select the desired function.



5.11.2.1 TLER Setting

TLER (time-limited error recovery) functions provide support for WD Caviar RE (RAID) series disks. This is a new option from WD to support RAID features that were traditionally missing from standard desktop drives. TLER is a method of signaling the system RAID controller in the event that an error recovery process is taking longer than time-out specifications allow. This prevents the RAID controller from dropping the drive from the array during this period. Default value is manufacture setting. You can select between 5, 6 and 7 second. This feature is to setup the HDD internal timeout value.

5.11.2.2 Time Out Setting

Disk time-out is a registry setting that defines the time that RAID controller will wait for a hard disk to respond to a command. You can modify the retry value by entering a new value in the edit box beside this button and then selecting the button. Normally you should not need to modify this value.

Default value is 8 seconds: You can select between 3~8 second.

5.11.2.3 Number Of Retries

This setting determines the number of access that will be attempted before the current command from the RAID controller to the disk drive is aborted. You can modify the retry value by entering a new value in the edit box beside this button and then selecting the button. Normally you should not need to modify this value. There are two selections, 2 retry or 3 retry.

5.11.2.4 Buffer Threshold Setting

There are 4 options in this new feature; 5%, 25%, 50%, 75%. The percentage represents how much data should be kept in resident cache memory (how full cache should get) before controller starts to flush data onto the hard drives. If the buffer is

set for 25%, then all 25% will be cached and is used for writing data. The remaining cache memory will be used for reading and other system overhead. Write buffer threshold for 5% is added for video recording. This option will push data to disk early.

This feature gives controller extra buffer time in case of slow response from the hard drives within a given time. Consequently, this can prevent a pause in data flow and there will be continues data access and stream. This feature is very useful for the video streaming applications where there is high demand for constant non-stop data flow with no interruption due to lower performance of specific hardware.

5.11.2.5 Amount Of Read Ahead

Read-Ahead data is buffered in the RAID controller cache, however, thereby cutting down on the amount of I/O traffic to the disk. The Amount of Read Ahead defines how many data of reading at a time, making more efficient use of the RAID subsystem. This makes it possible to locate and re-issue the data without repetitive hard parsing activities.

The Amount of Read Ahead parameter is used to allocate an amount of memory in the cache memory the frequently executed queries and return the result set back to the host without real disk read execution.

Default value is Auto: Controller will base on the HDD number to set the amount of Read Ahead value. You can select between 512B ~ 16MB.

To decide how to set AV stream parameter, you need to check the Number of Stream, Amount of Read Ahead, and Total Cache Memory during runtime. You can try to adjust the three numbers to get the best performance as your requirement. Number of Stream shows the number of stream added to the system, Amount of Read Ahead shows the amount of Read Ahead data taken from the cache without real disk execution, and Total Cache Memory shows the total available memory being installed in the RAID controller. The following is the rule of optimized setting for the AV Stream Playout application.

Number of AV Stream x Amount of Read Ahead X 3< Cache Memory installed in the controller

5.11.2.6 Number of AV Stream

RAID controllers are required to have not only the function of processing ordinary data but also the function of dealing with AV (audio/video) stream data which needs real-time processing. Since the bus cycle used in RAID controller was designed to transfer the computer data exactly, it was unsuitable for the transfer of AV stream that needs a great band widths. They are required to do some setting for the handshaking during the processing of stream data. This setting can adjust the efficacy of transferring stream data on an existing RAID controller.

Normally you should not need to modify this value. Default value is 6. You can select between 6~256.

To decide how to set AV stream playout parameter, you need to check the Number of Stream, Amount of Read Ahead, and Total Cache Memory during runtime. You can

try to adjust the three numbers to get the best performance as your requirement. Number of Stream shows the number of stream added to the system, Amount of Read Ahead shows the amount of Read Ahead data taken from the cache without real disk execution, and Total Cache Memory shows the total available memory being installed in the RAID controller.

The following is the rule of optimized setting for the AV Stream Playout application.

5.11.2.7 Optimize AV Recording

AV recording option is for video recording (no time limit), but if used in normal operation, performance may be degraded. There are 4 options in this new feature; Disabled, Mode1, Mode2 and Mode 3. Default value is Disabled. To decide how to optimize AV stream recording parameter, you need to adjust the Optimize AV Recording and Write Buffer Threshold during runtime.

Example: Long time video recording (low data rate), such as Surveillance

Optimize HD Edition option: disabled

Optimize AV Recording option: mode3

Write Buffer Threshold: 5%

5.11.2.8 Read Performance Margin

The “Read Performance Margin” is for controller to reserve n% read margin during AV stream recording.

5.11.2.9 Write Performance Margin

The “Write Performance Margin” is for controller to reserve n% write margin AV stream recording.

5.11.2.10 Read And Discard Parity Data

Determine if parity data is to be read and discarded.

If reading block is not in sequence, some HDD will run as random mode, where performance will be decreased, therefore, by enabling Read And Discard Parity Data, data and parity data both will be read and parity data will be discard, reading block will continue and as a result user can get more smoothly performance.

5.11.2.11 Fail Disk For Any Timeout

The options are: “Enabled”, “Disabled”.

5.11.2.12 Hitachi SATA HDD speed

The options are: “default”, “6Gb/s”, “3Gb/s” and “1.5Gb/s”.

5.11.2.13 WDC SATA HDD speed

The options are: “default”, “6Gb/s”, “3Gb/s” and “1.5Gb/s”.

5.11.2.14 Seagate SATA HDD speed

The options are: “default”, “6Gb/s”, “3Gb/s” and “1.5Gb/s”.

5.11.2.15 BIOS Selection

This option is used to select the BIOS code on the controller. There are legacy BIOS, UEFI and EFI bios, all are 32K bytes.

The ROM size for the controller has fixed to 64K and cannot be adjusted. We change the arrangement of BIOS to

(A) BIOS1: Legacy+EFI+UEFI (32K+32K+32K) --> EFI cannot be used

(B) BIOS2: Legacy+UEFI+EFI (32K+32K+32K) --> UEFI cannot be used

==> If legacy is selected --> BIOS1/BIOS2 can be used

==> If UEFI is selected --> BIOS1 is used

==> If EFI is selected --> BIOS2 is used (for Intel_based MacPro)

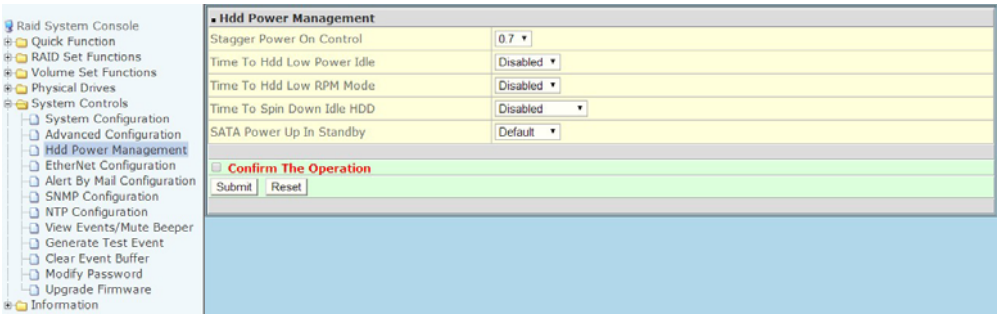
==> If BIOS is to be disabled --> All data are 0xFF

5.11.2.16 PCIE Link Down Reset

The options are: “Enabled”, “Disabled”.

5.11.3 Hdd Power Management

The “HDD Power Management” allow you to choose a “Stagger Power On Control”, “Low Power Idle”, “Low RPM” and completely “Spins Down Idle HDD” “Time To Wait HDD Spin Up”. It is designed to reduce power consumption and heat generation on idle drives.



5.11.3.1 Stagger Power on Control

Normally RAID system’s redundant power can supply enough power to spin up both

drives simultaneously. Using special HDDs that 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 staggered spin-up capabilities to boost reliability. Staggered 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.

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

5.11.3.2 Time to Hdd Low Power Idle

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

5.11.3.3 Time to Hdd Low RPM Mode

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

5.11.3.4 Spin Down Idle HDD

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

5.11.3.5 SATA Power Up In Standby

SATA Power Up In Standby (power management 2 mode, PM2) is a SATA disk drive configuration which prevents the drive from automatic spin-up when power is applied. “Enabled” option allows the drive to be powered-up into the Standby power management state to minimize inrush current at power-up and to allow. The controller to sequence the spin-up of devices. It is mainly for server/workstation environments operating in multiple-drive configurations.

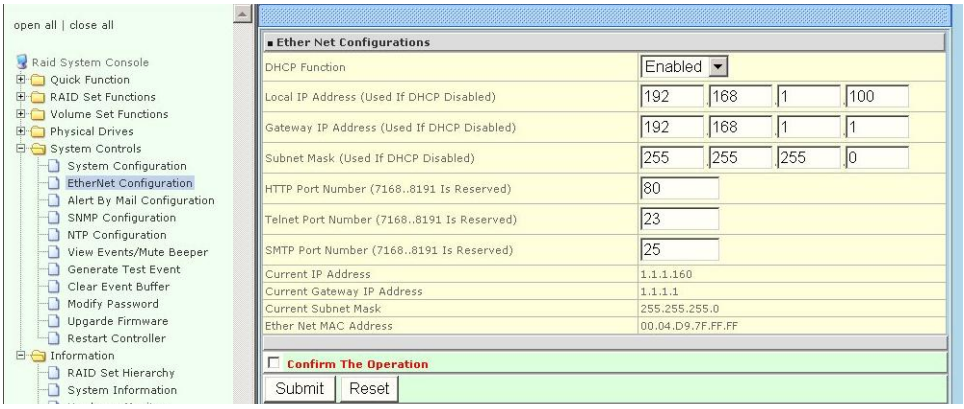
5.11.4 EtherNet Config

Use this feature to set the controller’s Ethernet port configuration. 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.

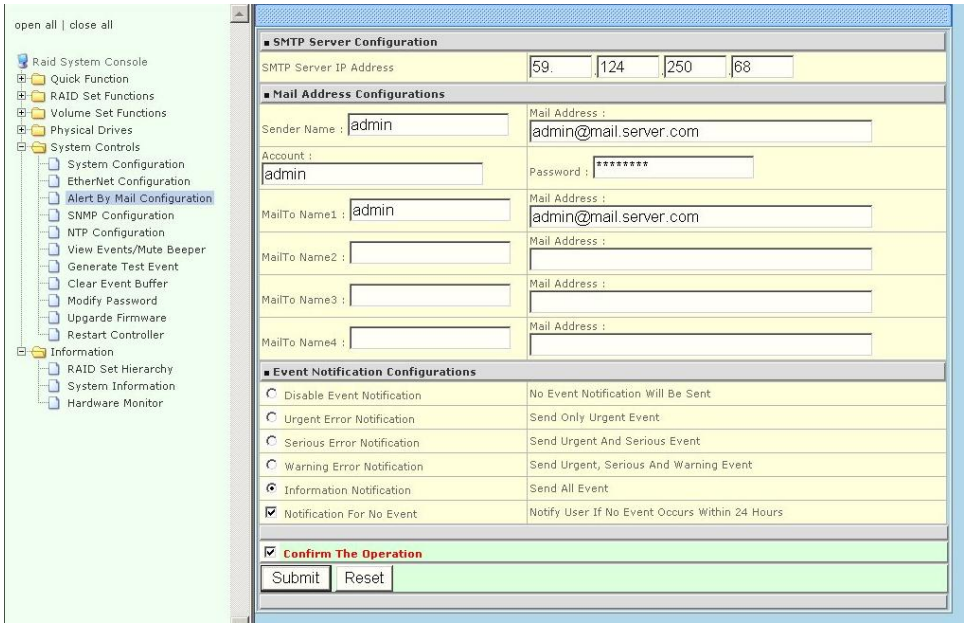
To configure the raid controller's Ethernet port, move the cursor bar to the main menu and click on the **System Controls** link. The **System Controls** menu will show all items. Move the cursor bar to the **Ethernet Config** item, then press **Enter** key to select the desired function.



5.11.5 Alert By Mail Config

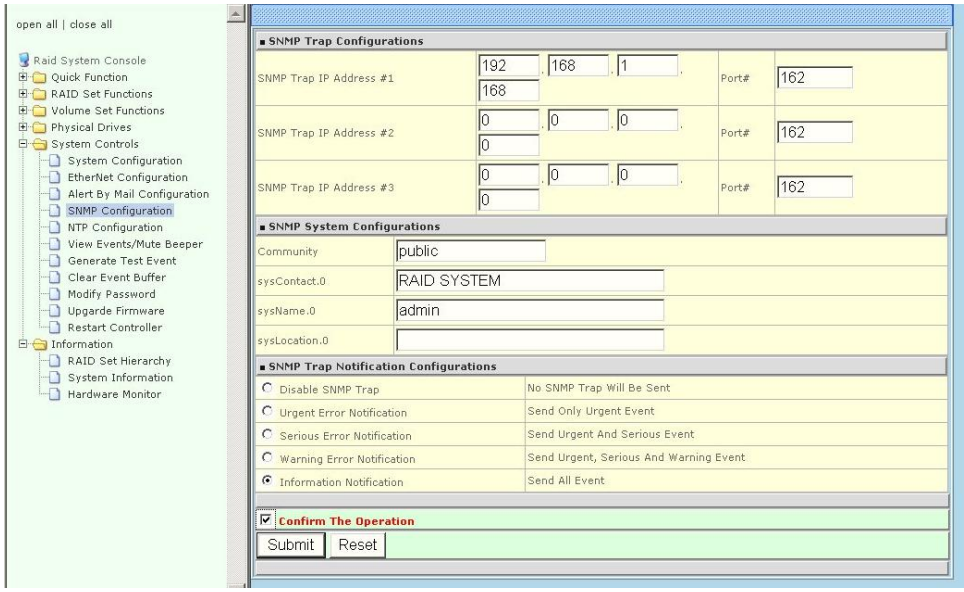
To configure the raid controller email function, move the cursor bar to the main menu and click on the **System Controls** link. The **System Controls** menu will show all items. Move the cursor bar to the **Alert By Mail Config** item, then press **Enter** key to select the desired function. This function can only be set by the web-based configuration.

The firmware contains SMTP manager and it monitors all system events and user can select either single or multiple user notifications to be sent via 'Plain English' e-mails with no software required.



5.11.6 SNMP Configuration

Check Appendix C to get more information about 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.

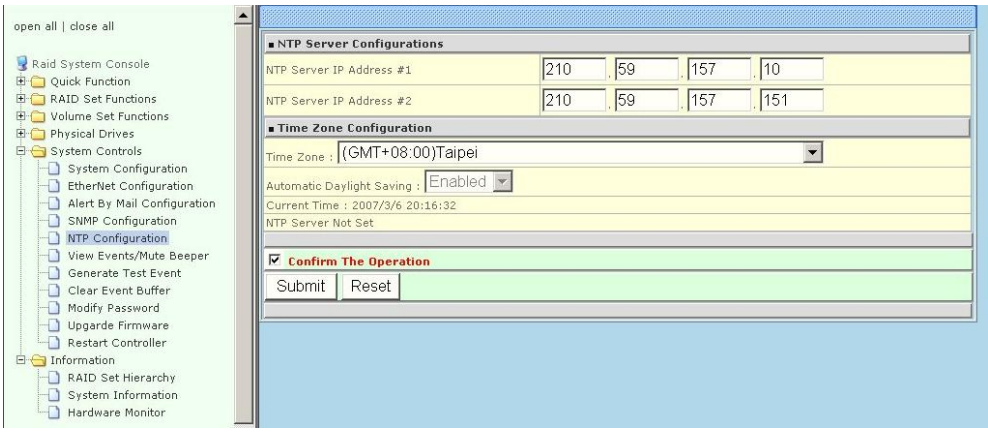
- **SNMP Trap Configurations:** Enter the SNMP Trap IP Address.
- **SNMP System Configurations:** About community, Community name acts as a password to screen accesses to the SNMP agent of a particular network device. Type in the community names of the SNMP agent. Before access is granted to a request 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

5.11.7 NTP Configuration

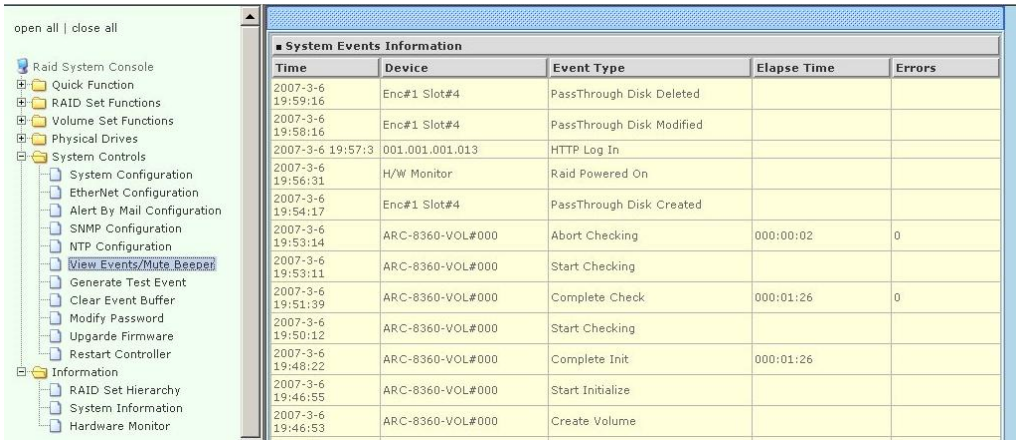
The Network Time Protocol (NTP) is one way to ensure your clock stays accurate. Find out NTP server near you, set up NTP Server IP and Time Zone. After Confirm, controller will connect to NTP Time server and get Time from NTP Server.



5.11.8 View Events/ Mute Beeper

To view the RAID subsystem controller’s information, move the mouse cursor to the main menu and click on the **View Events/Mute Beeper** link. The Raid Subsystem events Information screen appears.

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



Time	Device	Event Type	Elapse Time	Errors
2007-3-6 19:59:16	Enc#1 Slot#4	PassThrough Disk Deleted		
2007-3-6 19:58:16	Enc#1 Slot#4	PassThrough Disk Modified		
2007-3-6 19:57:3	001.001.001.013	HTTP Log In		
2007-3-6 19:56:31	H/W Monitor	Raid Powered On		
2007-3-6 19:54:17	Enc#1 Slot#4	PassThrough Disk Created		
2007-3-6 19:53:14	ARC-8360-VOL#000	Abort Checking	000:00:02	0
2007-3-6 19:53:11	ARC-8360-VOL#000	Start Checking		
2007-3-6 19:51:39	ARC-8360-VOL#000	Complete Check	000:01:26	0
2007-3-6 19:50:12	ARC-8360-VOL#000	Start Checking		
2007-3-6 19:48:22	ARC-8360-VOL#000	Complete Init	000:01:26	
2007-3-6 19:46:55	ARC-8360-VOL#000	Start Initialize		
2007-3-6 19:46:53	ARC-8360-VOL#000	Create Volume		

5.11.9 Generate Test Event

Use this feature to generate a test event to confirm the setting of "**Alert By Mail Config**".

5.11.10 Clear Events Buffer

Use this feature to clear the entire events buffer information.

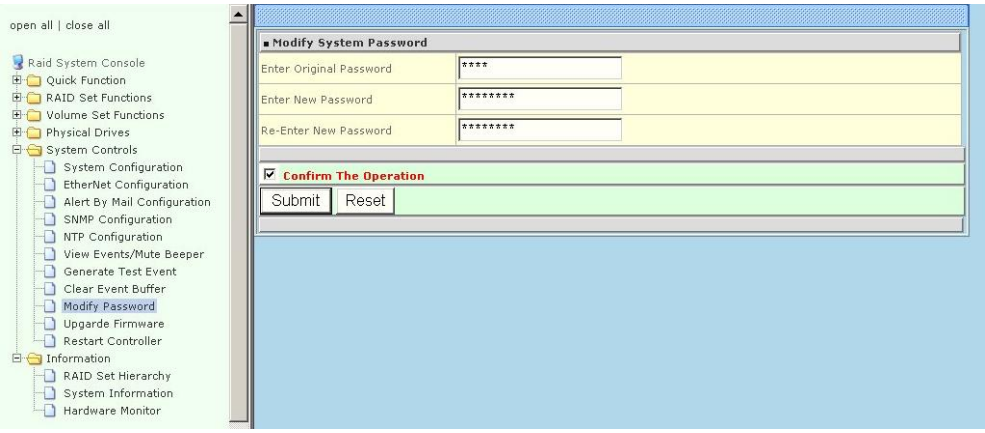
5.11.11 Modify Password

To set or change the RAID subsystem password, move the mouse cursor to **Raid System Function** screen, and click on the **Change Password** link. The Modify System Password screen appears.

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 internal 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 ten seconds.

To disable the password, press **Enter** key only in both the **Enter New Password** and **Re-Enter New Password** column. Once the user confirms the operation and clicks the **Submit** button. The existing password will be cleared. No password checking will occur when entering the main menu from the starting screen.



5.11.12 Update Firmware:

Please reference the Appendix A. Upgrading Firmware.

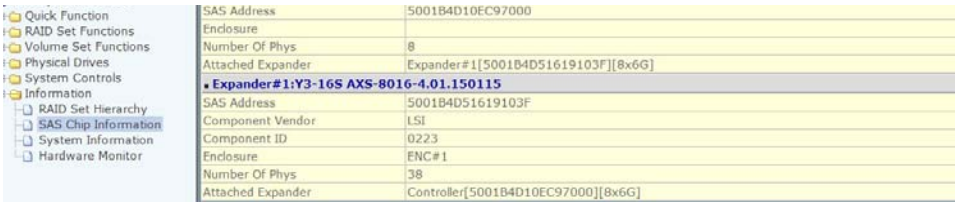
5.12 Information Menu

5.12.1 RaidSet Hierarchy

Use this feature to view the internal raid subsystem current raid set, current volume set and physical disk configuration. Please reference this chapter “Configuring Raid Sets and Volume Sets”.

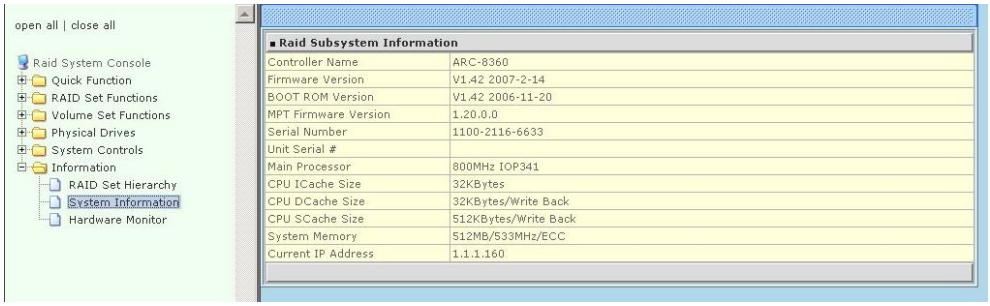
5.12.2 SAS Chip Information

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



5.12.3 System Information

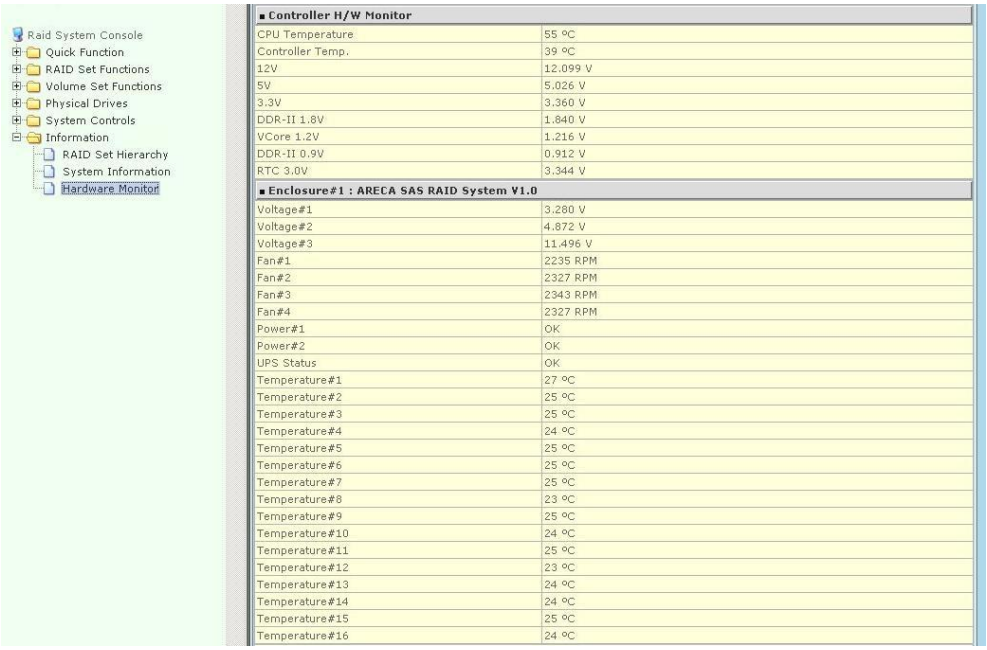
To view the RAID subsystem controller's information, move the mouse cursor to the main menu and click on the **System Information** link. The Raid Subsystem Information screen appears.



Use this feature to view the raid subsystem controller's information. The controller name, firmware version, serial number, main processor, CPU data/Instruction cache size and system memory size/speed appear in this screen.

5.12.4 Hardware Monitor

To view the RAID subsystem controller's hardware monitor information, move the mouse cursor to the main menu and click the **Hardware Monitor** link. The Hardware Information screen appears.



The Hardware Monitor Information provides the temperature, fan speed (chassis fan) and voltage of the internal RAID subsystem. All items are also unchangeable. The warning messages will indicate through the LCM, LED and alarm buzzer.

Item	Warning Condition
Controller Board Temperature	> 72 Celsius
Backplane Temperature	> 65 Celsius
Controller Fan Speed	< 1700 RPM
Power Supply +12V	< 10.5V or > 13.5V
Power Supply +5V	< 4.7V or > 5.3V
Power Supply +3.3V	< 3.0V or > 3.6V
CPU Core Voltage +1.5V	< 1.35V or > 1.65V

Chapter 6. McBIOS RAID Manager and Terminal Mode 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 controller 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,

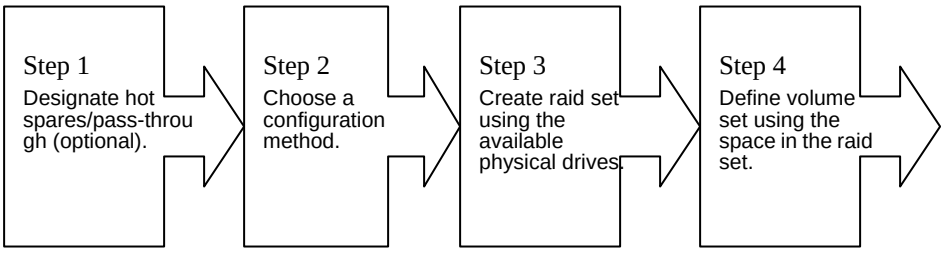
. Update firmware,

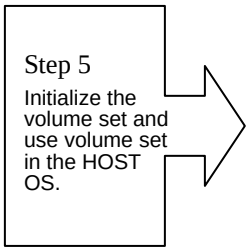
. Modify system function, and

· Designate drives as hot spares.

6.1 Configuring Raid Sets and Volume Sets

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





6.2 Designating Drives as Hot Spares

All unused disk drive that is not part of a raid set can be created as a Hot Spare. The Quick Volume/Raid Setup configuration will automatically add the spare disk drive with the raid level for user to select. For the Raid Set Function configuration, user can use the **Create Hot Spare** option to define the hot spare disk drive.

A Hot Spare disk drive can be created when you choose the **Create Hot Spare** options in the Raid Set Function, all unused physical devices connected to the current controller will appear: 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.

6.3 Using Quick Volume /Raid Setup Configuration

In Quick Volume /Raid Setup Configuration, it collects all drives in the tray and includes them in a raid set. The raid set you create is associated with exactly one volume set, and you can modify the default RAID level, stripe size, and capacity of the volume set. Designating Drives as Hot Spares will also show in the raid level selection option. The volume set default settings will be:

Parameter	**Setting**
Volume Name	Volume Set # 00
SCSI Channel/SCSI ID/ SCSI LUN	0/0/0
Cache Mode	Write Back
Tag Queuing	Yes

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

Follow the steps below to create arrays using Quick Volume /Raid Setup Configuration:

Step1

Choose Quick Volume And Raid Setup from the main menu. The available RAID levels and associated Hot Spare for the current volume set drive are displayed.

Step2

RAID Level Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific array determines the RAID levels that can be implemented with the array.

RAID 0 requires one or more physical drives,

RAID 1 requires at least 2 physical drives,

RAID 1+ Spare requires more than 2 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 3+ Spare requires at least 4 physical drives, and

RAID 5 + Spare requires at least 4 physical drives.

RAID 6 + Spare requires at least 5 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,

RAID 30+ Spare requires at least 8 physical drives, and

RAID 50 + Spare requires at least 8 physical drives.

RAID 60 + Spare requires at least 9 physical drives

Using the UP/DOWN key to select the RAID for the volume set and presses ENT to confirm it.

Step3

Available Capacity Set the capacity size for the volume set. After select *RAID level* and press ENT.

The selected capacity for the current volume set is displayed. Using the UP/DOWN 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.

Step4

Select Stripe size This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 1E (0+1), 5, 6, 50 or 60 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. Using the UP/DOWN to select stripe size and press ENT to confirm it.

Step5 When you are finished defining the volume set, press ENT to confirm the Quick Volume And Raid Set Setup function.

Step6 *Fast Initialization* Press ENT to define fast initialization and ESC to normal initialization. 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. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses.

Step7 The controller will begin to Initialize the volume set you have just configured.

Step8 If you need to add additional volume set using main menu Create Raid Volume Set function.

6.4 Using Raid Set/Volume Set Function Method

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 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 set with partial and full raid set.

Step1 To setup the Hot Spare (option), choose Raid Set Functions from the main menu. Select the Create Hot Spare Disk to set the Hot Spare.

Step2 Choose Raid Set Function from the main menu. Select the Create A New Raid Set.

Step3

A Select Drive Channel in the next displayed showing the drive connected to the current controller.

Step4

Press the UP/ DOWN to select specific physical drives. Press the ENT to associate the selected physical drive with the current raid set.

Try to use drives of the same capacity in a specific raid set. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

The number of physical drives in a specific raid set determines the RAID levels that can be implemented with the raid set.

RAID 0 requires one 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 6 requires at least 4 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.

RAID 30 requires at least 6 physical drives,

RAID 50 requires at least 6 physical drives,

RAID 60 requires at least 8 physical drives,

RAID 30+ Spare requires at least 8 physical drives, and

RAID 50 + Spare requires at least 8 physical drives.

RAID 60 + Spare requires at least 9 physical drives

Step5

After adding physical drives to the current raid set as desired, press ESC to confirm the Select Drive Channel function.

Step6

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 7.

Step7

Choose Volume Set Functions from the main menu. Select the Create Raid Volume Set and press ENT.

Step8

Choose one raid set from the Select Raid Set screen. Press ENT to confirm it.

Step9

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:

The Raid Level,

The Capacity (Not supported via LCD Panel.)

The Stripe Size,

The SCSI Channel/ SCSI ID/ SCSI LUN

The Cache Mode,

The Tagged Queuing,

The Volume Name (number).

All value can be changing by the user. Press the UP/ DOWN to select the attributes. Press the ENT to modify each attribute of the default value. Using the UP/DOWN to select attribute value and press the ENT to accept the default value

Step10

After user completes modifying the attribute, press the ESC to enter the Select Capacity for the volume set. Using the UP/DOWN to set the volume set capacity and press ENT to confirm it.

Step11

When you are finished defining the volume set, press ENT to confirm the Create function.

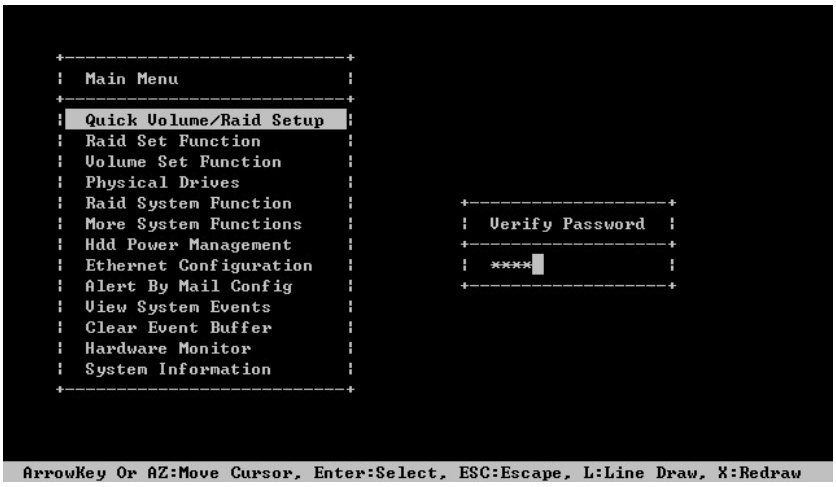
Step12

Press ENT to define fast initialization and ESC to normal 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 7 to 12 to configure another volume set.

Note: User can use this method to examine the existing configuration. Modify volume set configuration method provides the same functions as create volume set configuration method. In volume set function, you can use the modify volume set function to modify the volume set parameters except the capacity size.

6.5 Main Menu

The main menu shows all function that enables the customer to execute actions by clicking on the appropriate link.



NOTE

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

Option	Description
Quick Volume And Raid 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 Function	Setting the raid system configurations
Ethernet Configuration	Use to configure the Ethernet port of RAID subsystem.
Views 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

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 internal 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 twenty seconds. The RAID subsystem password's default setting is 0000 by the manufacture.

6.5.1 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:

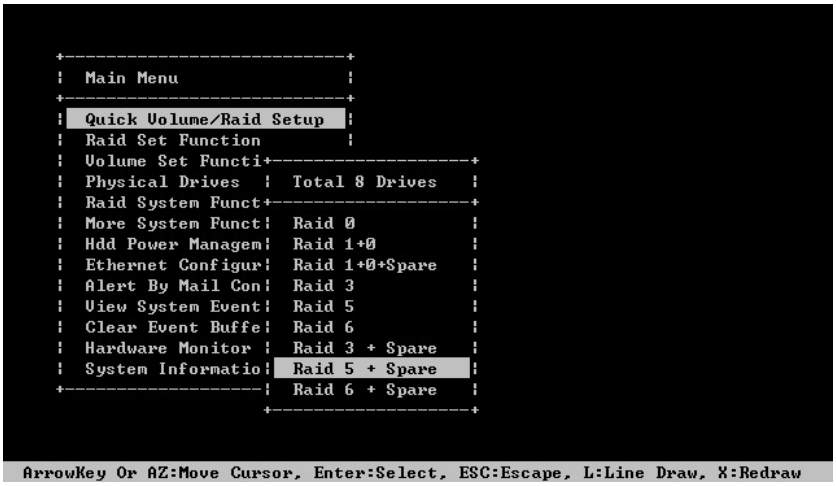
(1). All of the physical disk drives are contained in one RAID set.

(2). The RAID levels, hot spare, capacity, and stripe size option are selected during the configuration process.

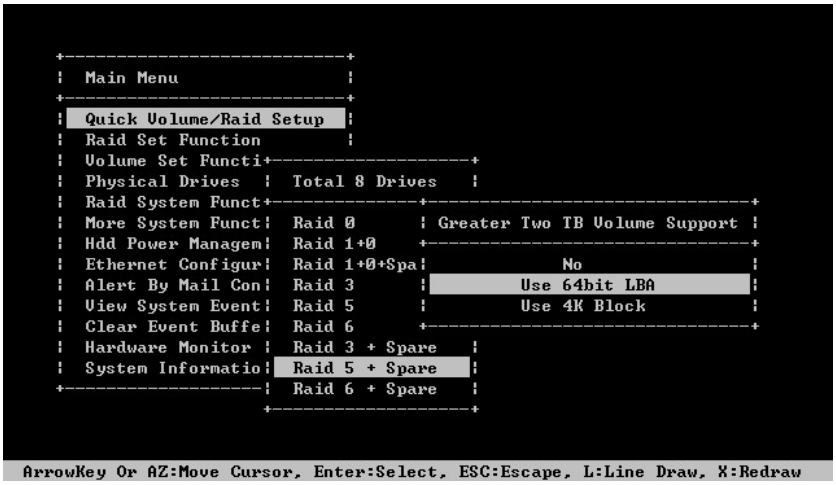
(3). When a single volume set is created, it can consume all or a portion of the available disk capacity available in this RAID set.

(4). If you need to add 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.

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.

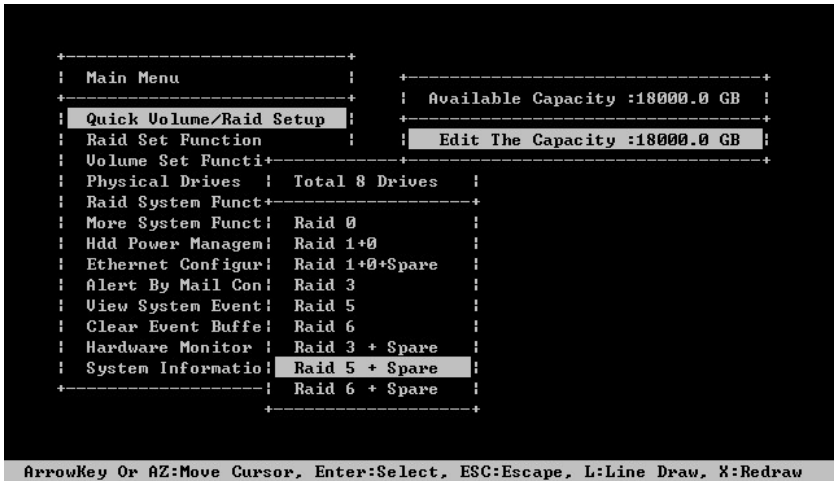
Such as: Windows 2003 with SP1 or later,

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.

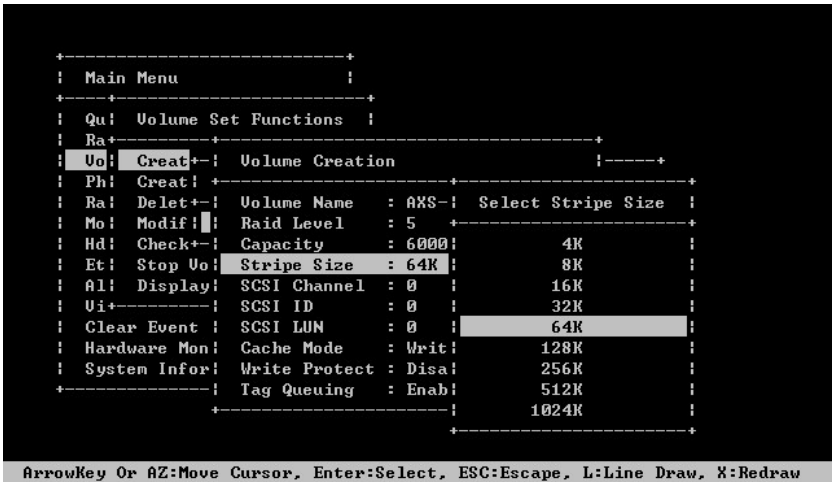
A single volume set is created and consumes all or a portion of the disk capacity available in this RAID set. Define the capacity of volume set in the “Available Capacity” popup. The default value for the volume set, which is 100% of the available capacity, is displayed in the selected capacity. use 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.



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 4KB, 8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB or 1024KB.

NOTE

Roaming the stripe size 256K/512K/1024K Raid Set to firmware version older than 1.52 will cause data corruption.

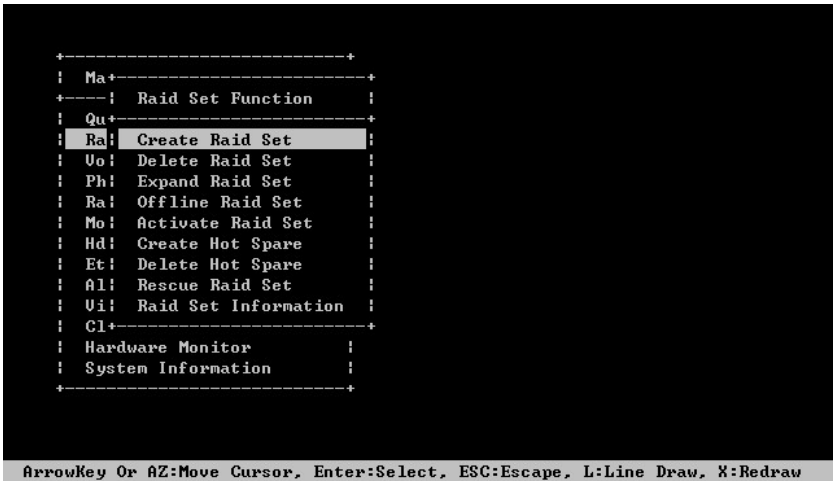


A larger stripe size produces better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer performs random reads more often, select a smaller stripe size.

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

6.5.2 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.



6.5.2.1 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:

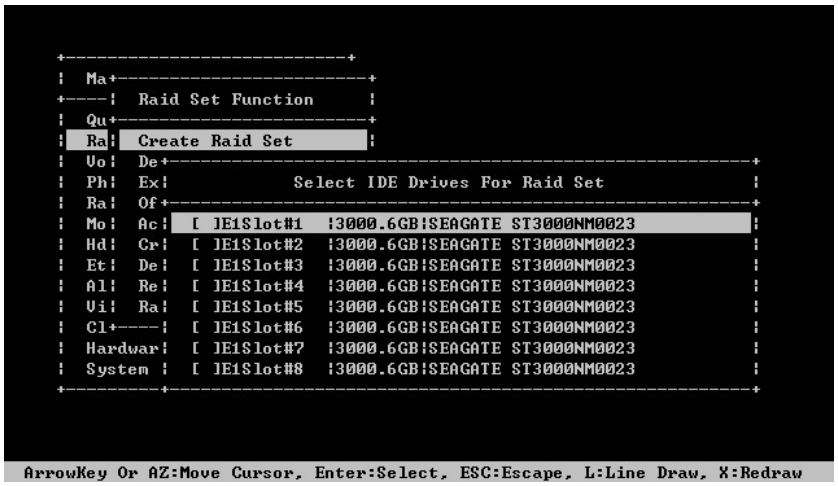
1). Select “Raid Set Function” from the main menu.

2). Select “Create Raid Set“ from the “Raid Set Function” dialog box.

3. A “Select Drive For Raid Set” window is displayed showing the SAS/SATA drives connected to the current controller.

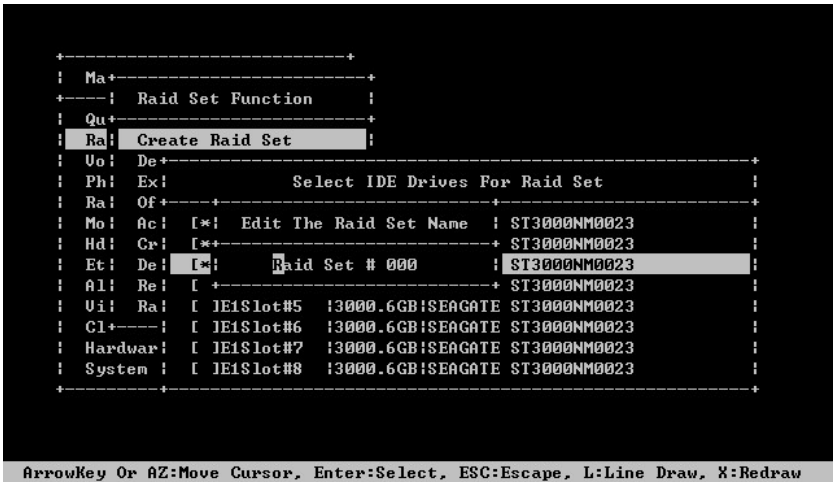
Press the **UP** and **DOWN** arrow keys to select specific physical drives. Press the **Enter** key to associate the selected physical drive with the current RAID set. Repeat this step; the user can add as many disk drives as are available to a single RAID set.

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



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.



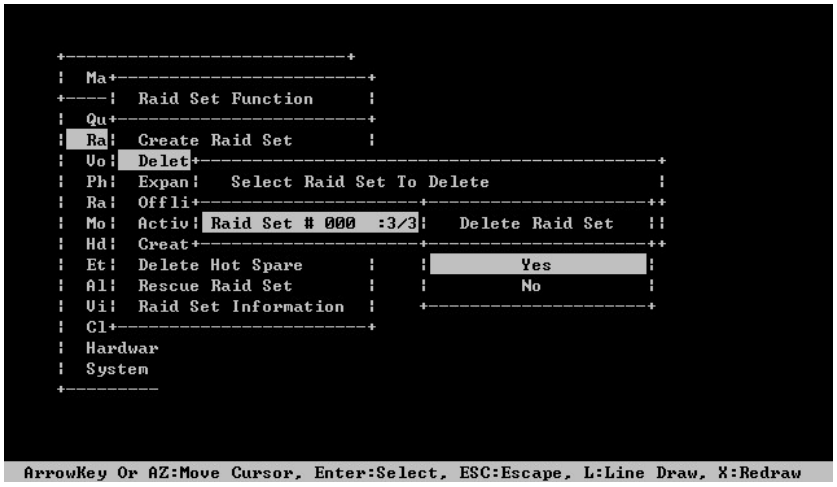
Note

To create RAID 30/50/60 volume, you need create multiple RAID sets (up to 8 RAID sets) first with the same disk members on each RAID set. The max no. disk drives per volume set:

32 for RAID 0/1/10/3/5/6 and 128 for RAID 30/50/60.

6.5.2.2 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 belong to those RAID sets.



6.5.2.3 Expand Raid Set

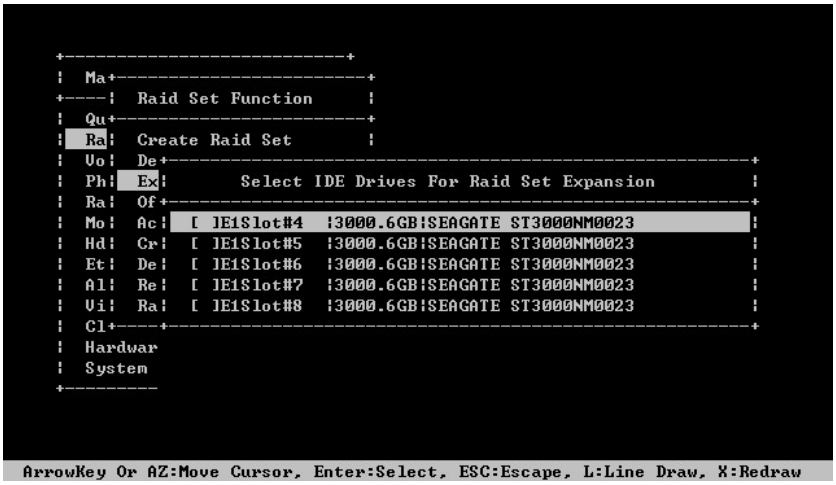
Instead of deleting a RAID set and recreating it with additional disk drives, the “Expand Raid Set” function allows the users to add disk drives to the RAID set that have already been created.

To expand a RAID set:

1. Select the “Expand Raid Set” option. If there is an available disk, then the “Select SATA Drives for Raid Set Expansion” screen appears.

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

3. 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.



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.*

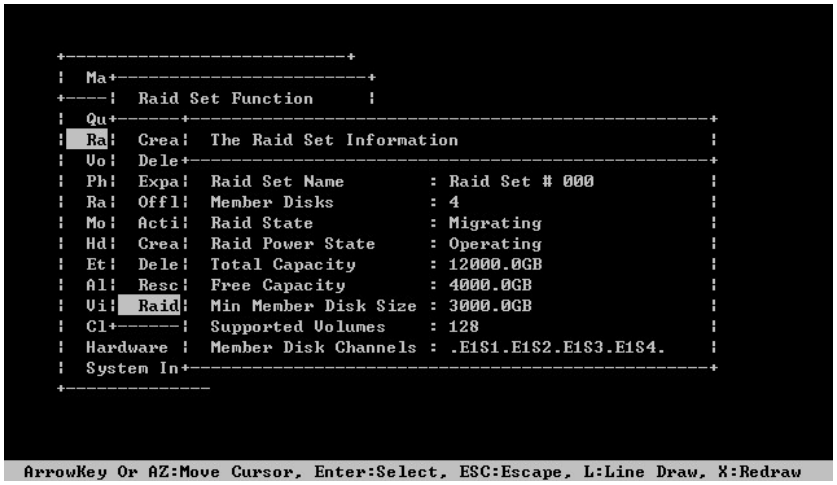
3. *RAID 30/50/60 doesn't support the "Expand Raid Set".*

4. *RAID set expansion is a quite critical process, we strongly recommend customer backup data before expand. Unexpected accident may cause serious data corruption.*

6.5.2.3.1 Migrating

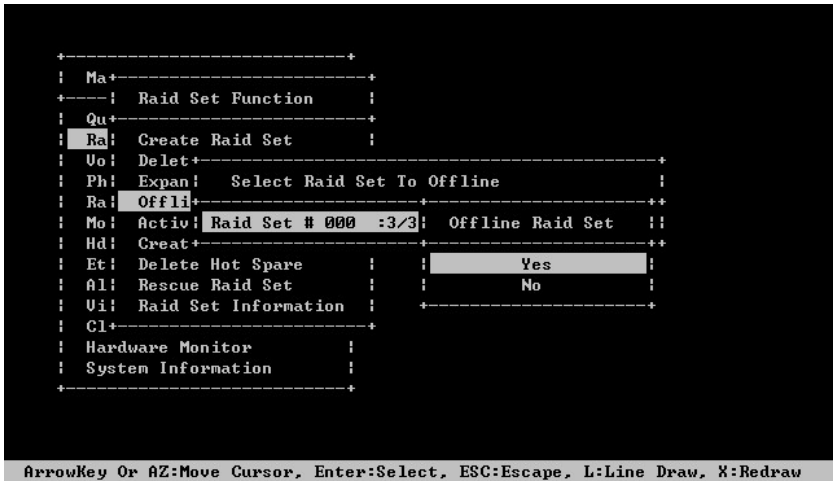
Migration occurs when a disk is added to a RAID set. Migrating state is displayed in the RAID state area of "The Raid Set Information" screen when a

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.



6.5.2.4 Offline Raid Set

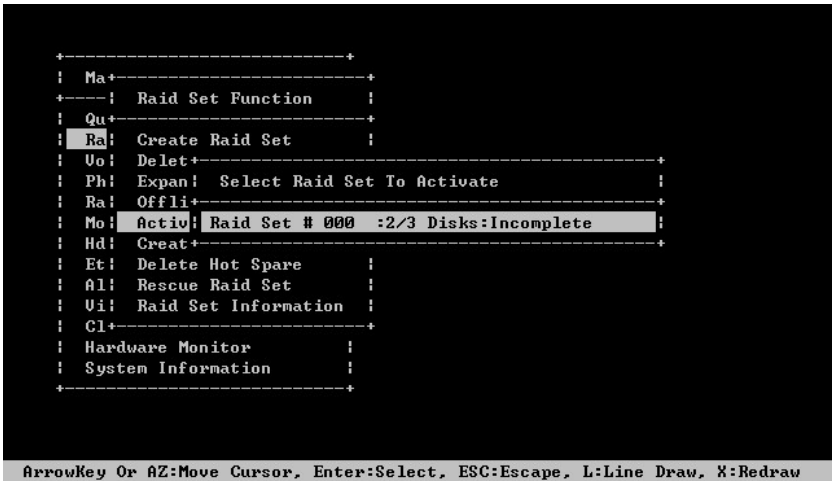
This function is for customer being able to unmount and remount a multi-disk volume. All Hdds of the selected RAID set will be put into offline state and spun down and fault LED will be in fast blinking mode. User can remove those Hdds and insert those Hdds on the others controller empty slots without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



6.5.2.5 Activate Incomplete 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.

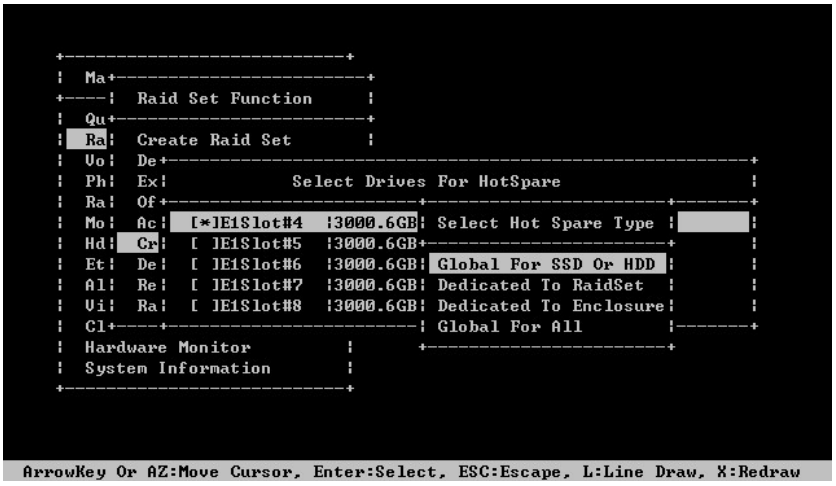
When one of the disk drives is removed in power off state, the RAID set state will change to “Incomplete State”. If user wants to continue to work while the RAID subsystem is powered on, the user can use the “Activate Incomplete Raid Set” option to active the RAID set. After user selects this function,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



6.5.2.6 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.

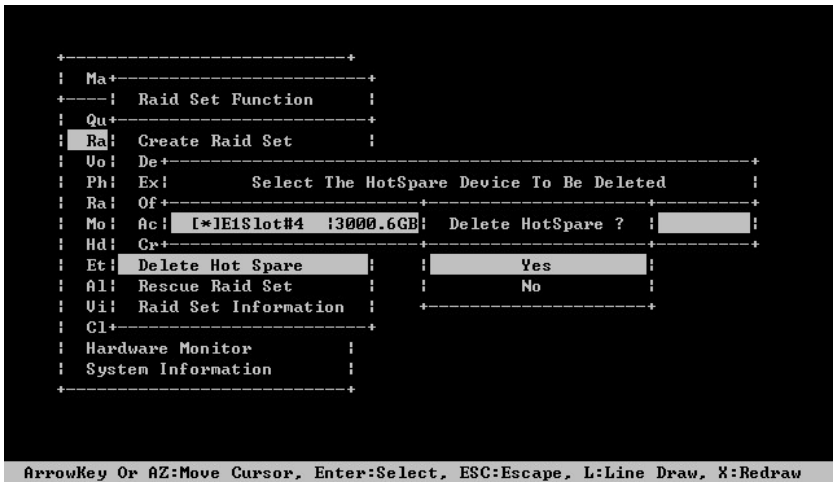


The “Create Hot Spare” gives you the ability to define a global or dedicated hot spare. Unlike “Global Hot Spare” which can be used with any RAID sets, “Dedicated Hot Spare” can only be used with a specific RAID set or Enclosure. When a disk drive fails in the RAID set or enclosure with a dedicated Hot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

6.5.2.7 Delete Hot Spare

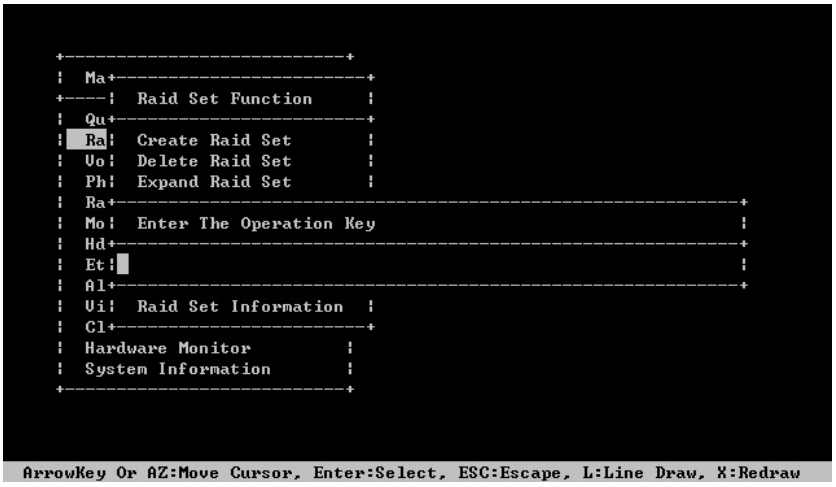
Select the target Hot Spare disk to delete by clicking on the appropriate check box.

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.



6.5.2.8 Rescue Raid Set

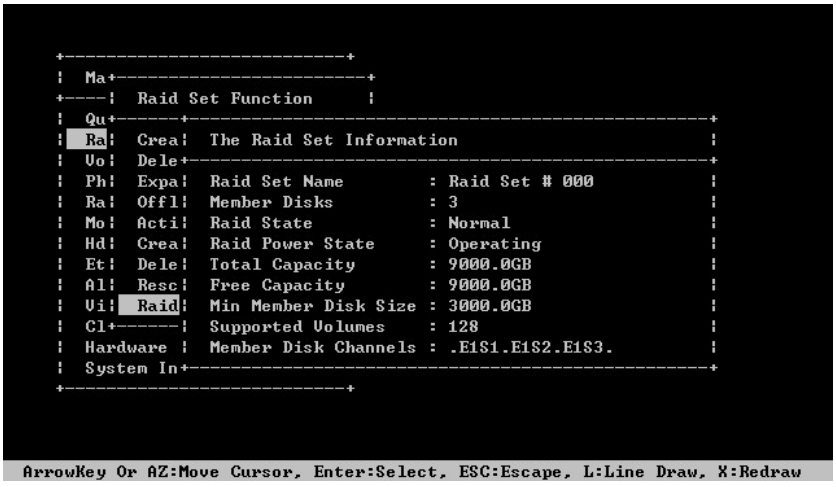
When the system is powered off in the RAID set update/creation period, it possibly could disappear due to this abnormal condition. The “RESCUE” function can recover the missing RAID set information. The RAID controller uses the time as the RAID set signature. The RAID set may have different time after the RAID set is recovered. The “SIGANT” function can regenerate the signature for the RAID set.



6.5.2.9 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.



6.5.3 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

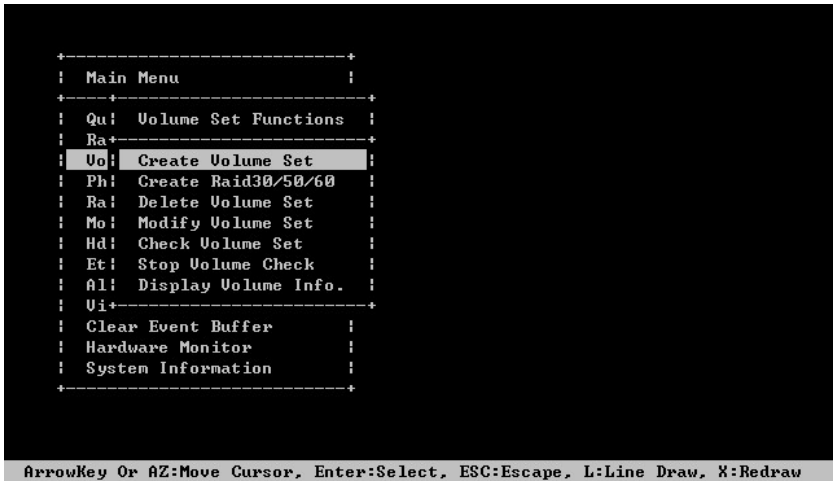
set will have its data spread evenly across all the disks in the RAID set rather than one volume set using some of the available disks and another volume set using other disks.

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 and up to 128 volume sets per controller..

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.



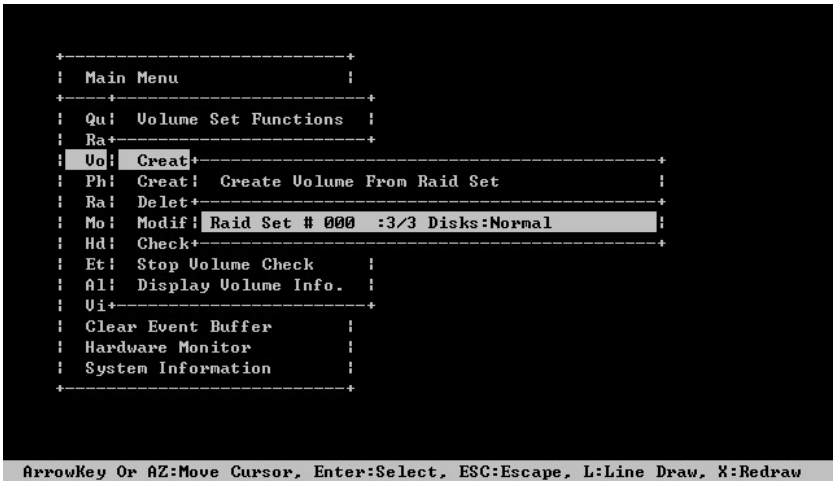
6.5.3.1 Create Volume Set

To create a volume set, following the steps:

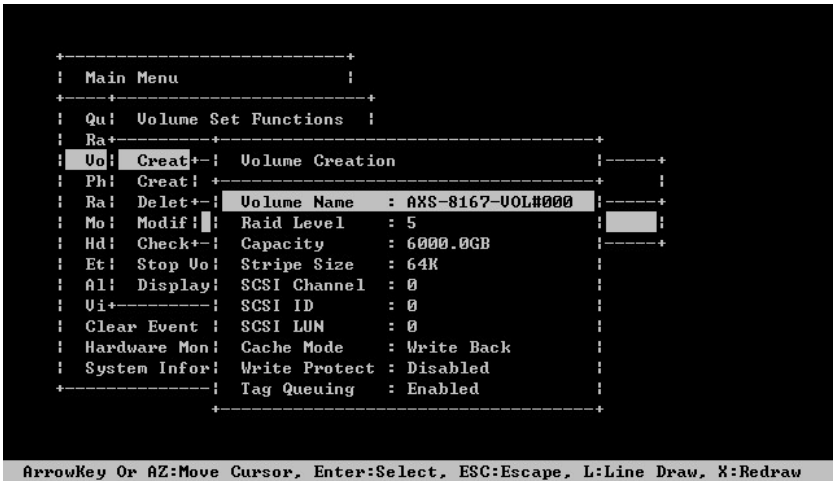
1. Select the “Volume Set Function” from the main menu.

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.

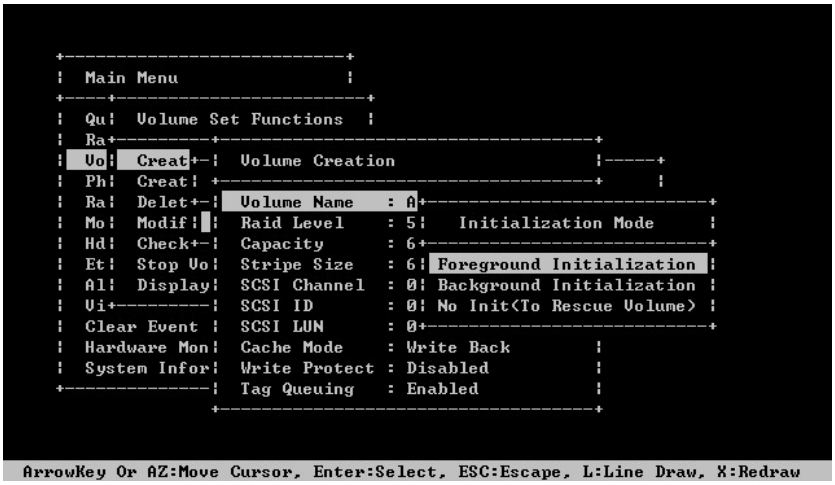


4. The new create volume set attribute allows user to select the Volume Name, Raid level, Capacity, Strip Size, SCSI Channel/SCSI ID/SCSI LUN, Cache Mode, Tagged Command Queuing .



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

- 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.

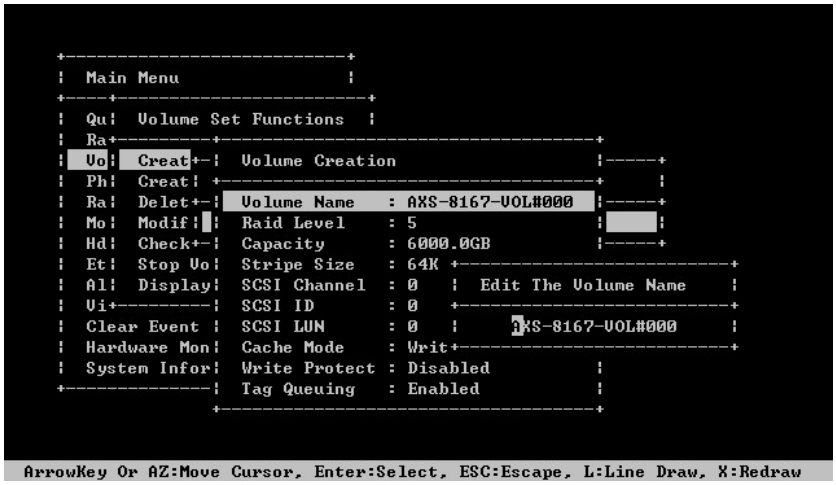


6. Repeat steps 3 to 5 to create additional volume sets.

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

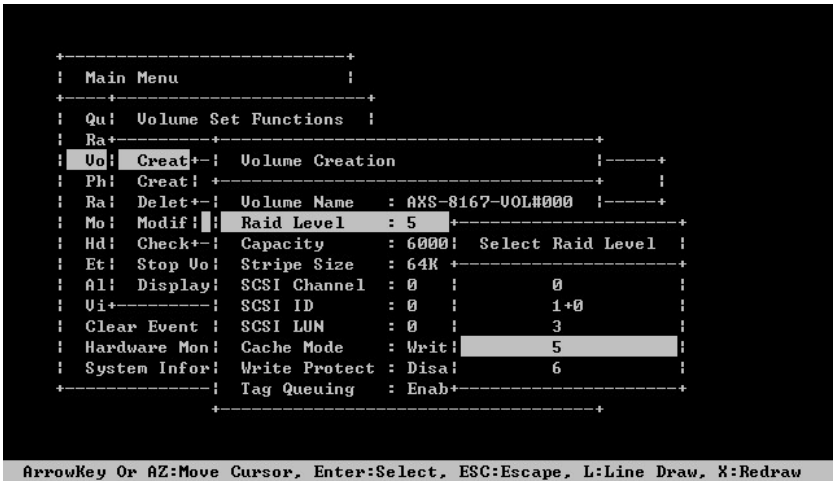
6.5.3.1.1 Volume Name

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



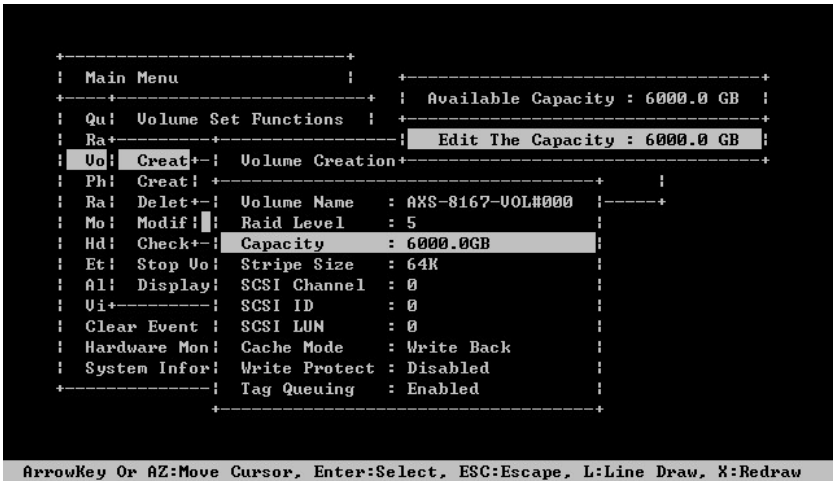
6.5.3.1.2 Raid Level

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.



6.5.3.1.3 Capacity

The maximum volume size is default in the first setting. The capacity can increase or decrease by the **UP** and **DOWN** arrow key. Each volume set has a selected capacity which is less than or equal to the total capacity of the RAID set on which it resides.



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

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 is up to 512TB.

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

Such as:

Windows 2003 with SP1 or later, Linux kernel 2.6.x or later

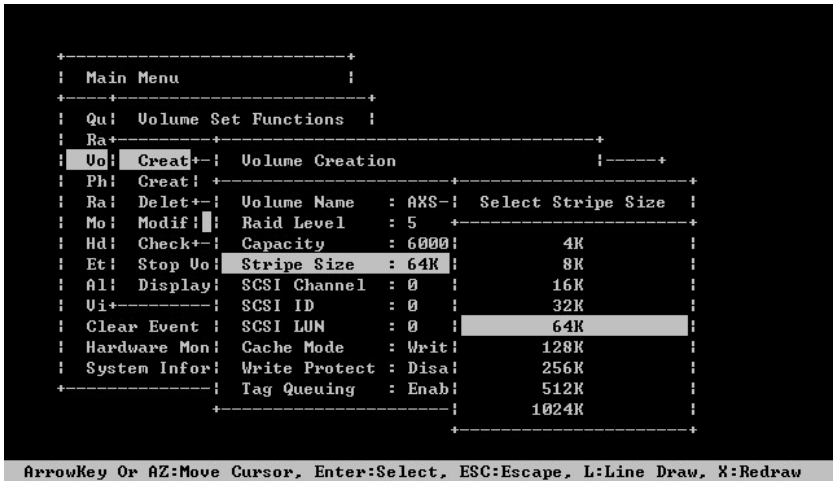
4K Block:

It changes the sector size from default 512 bytes to 4k bytes. The maximum volume capacity is 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.

6.5.3.1.4 Strip Size

This parameter sets the size of the segment written to each disk in a RAID 0, 1, 1E (0+1), 5 or 6 logical drives. You can set the stripe size to 4KB, 8KB, 16KB, 32 KB, 64KB, 128KB, 256KB, 512KB or 1024KB.

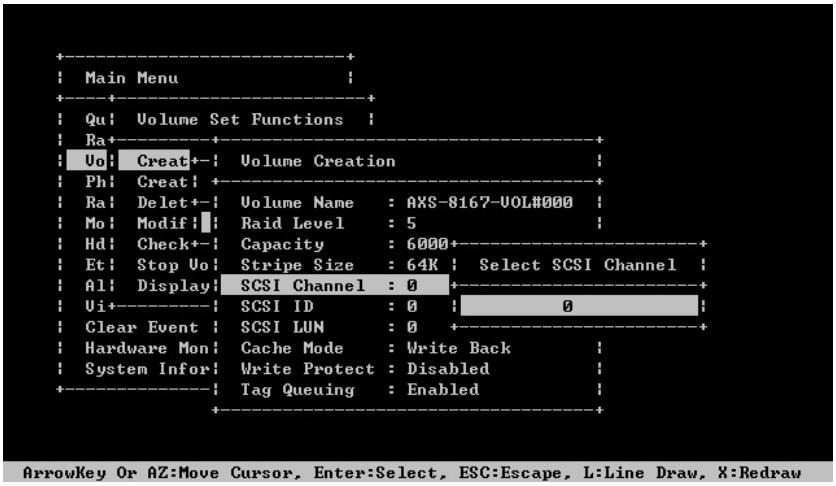


Note

Roaming the stripe size 256K/512K/1024K Raid Set to firmware version older than 1.52 will cause data corruption.

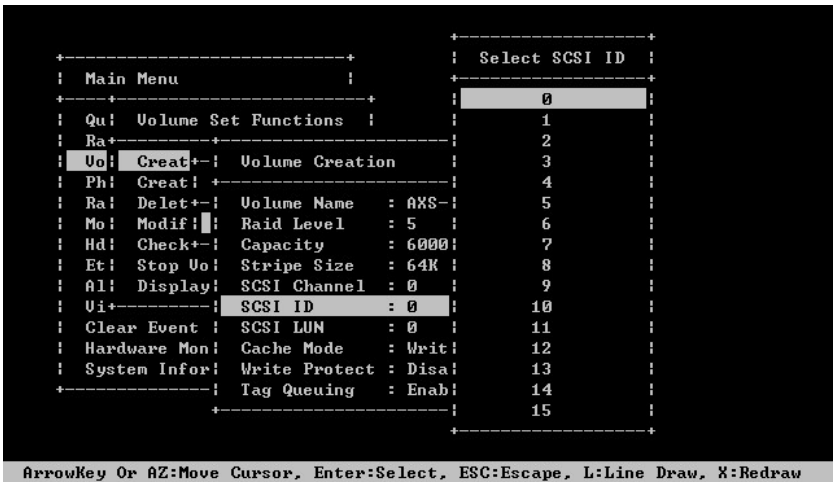
6.5.3.1.5 SCSI Channel

The RAID controller function simulates a external SCSI RAID controller. The host bus represents the SCSI channel. Choose the “SCSI Channel”. A “Select SCSI Channel” dialog box appears; select the channel number and press the Enter key to confirm it.



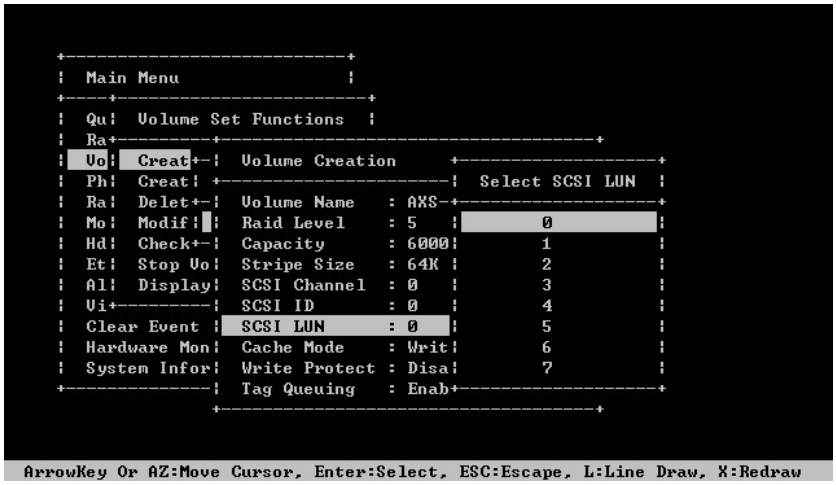
6.5.3.1.6 SCSI ID

Each SCSI device attached to the SCSI card, as well as the card itself, must be assigned a unique SCSI ID number. A SCSI channel can connect up to 15 devices. The SAS RAID controller is a large SCSI device. Assign an ID from a list of SCSI IDs.



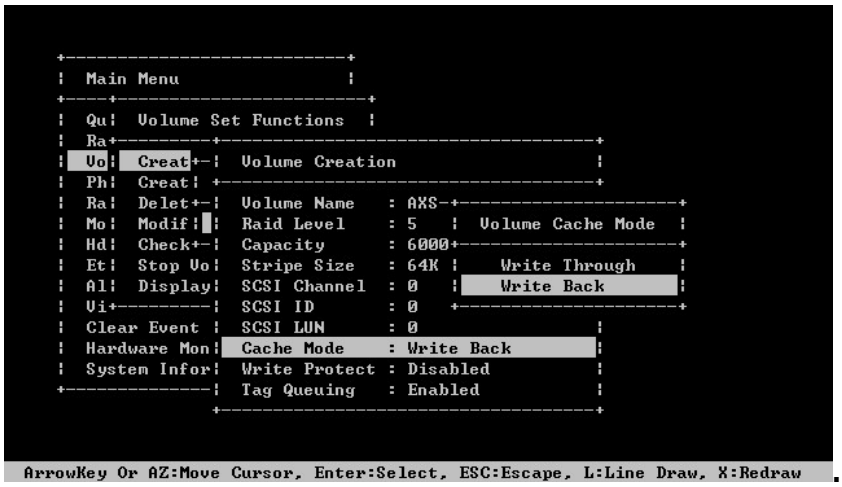
6.5.3.1.7 SCSI Lun

Each SCSI ID can support up to 8 LUNs. Most SAS controllers treat each LUN like a SAS disk.



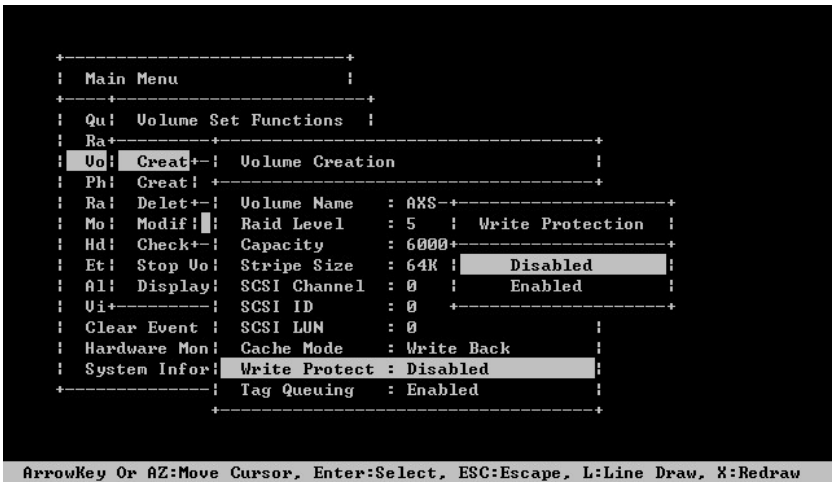
6.5.3.1.8 Cache Mode

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



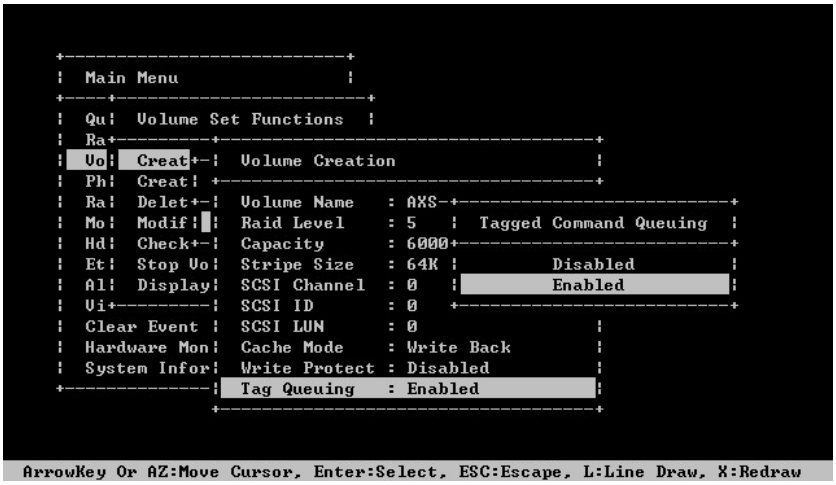
6.5.3.1.9 Write Protection:

Enable this protection to prevent any data being written to Volumes.



6.5.3.1.10 Tag Queuing

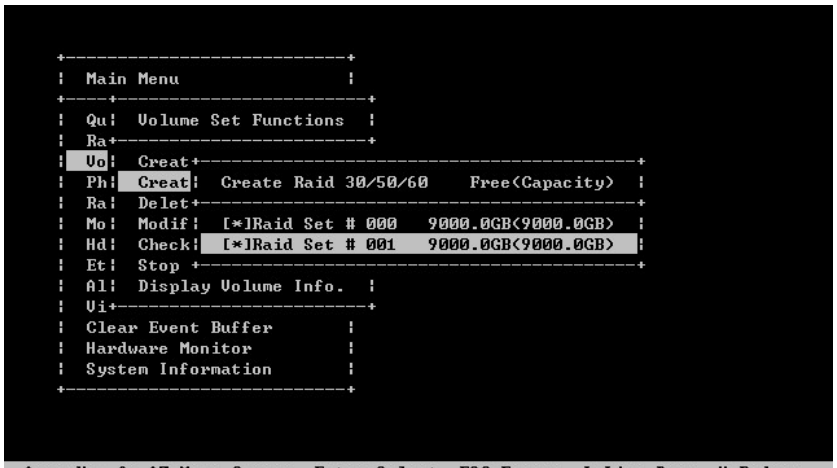
This option, when enabled, can enhance overall system performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SAS command tag queuing support for each drive channel. This function should normally remain enabled. Disabled this function only when using older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

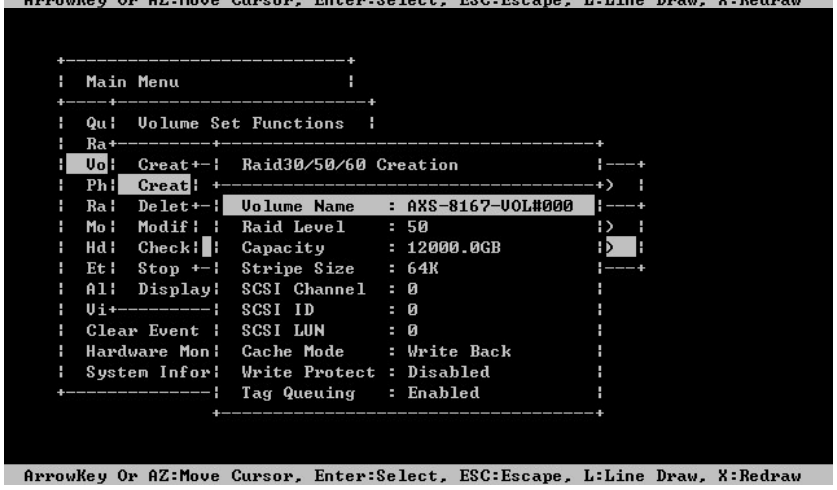


6.5.3.2 Create Raid 30/50/60

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 it.

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





Note

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

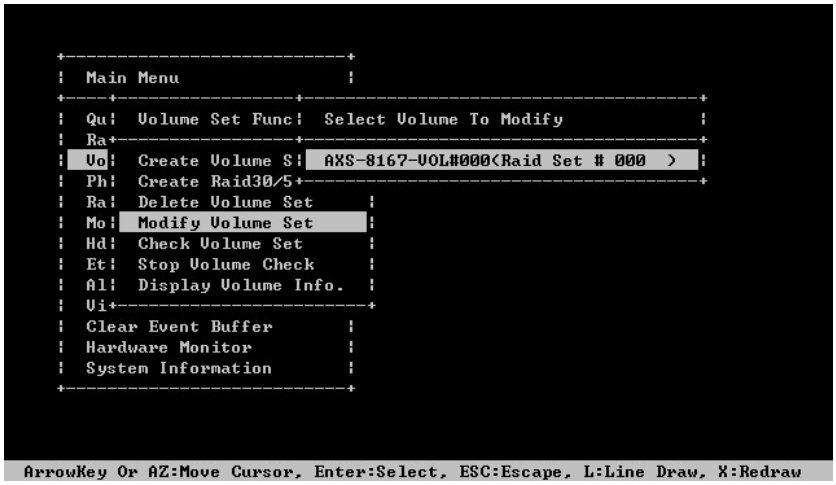
6.5.3.3 Delete Volume Set

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.

6.5.3.4 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.



6.5.3.4.1 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 over 2TB expansion:

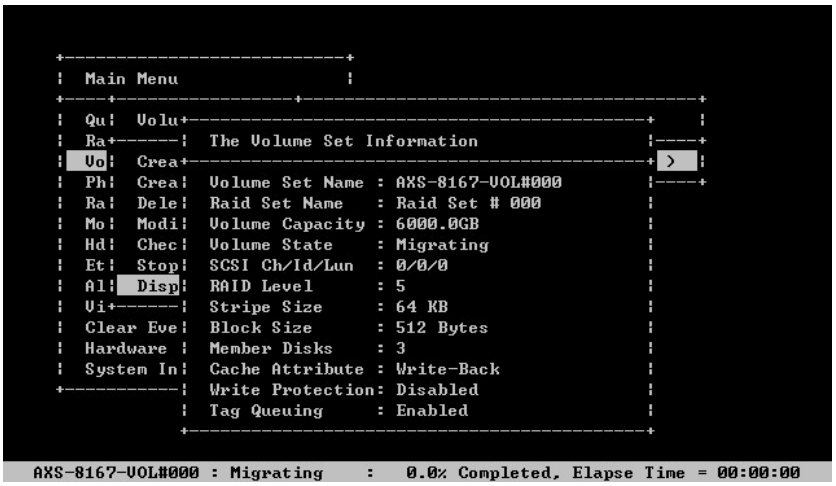
- If your system installed in the volume, don't expand the volume capacity greater 2TB, currently OS can’t support boot up from a greater 2TB capacity device.
- Expand over 2TB used LBA64 mode. Please make sure your OS supports LBA64 before expand it.

6.5.3.4.2 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.

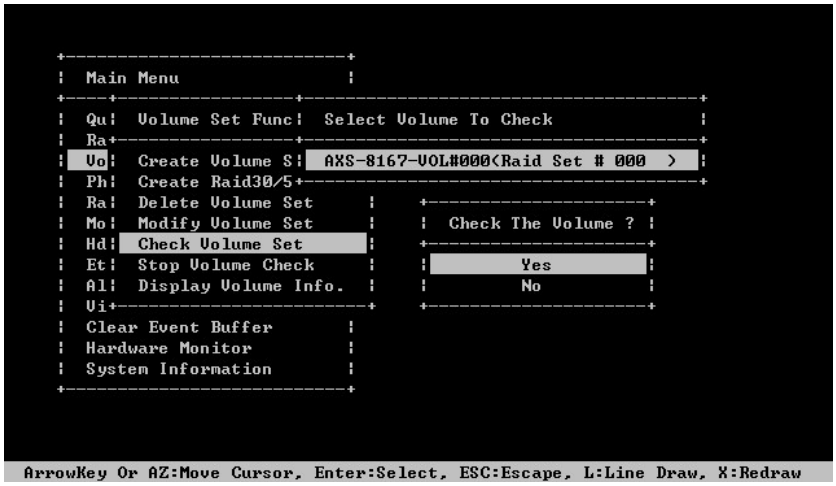
Note

Power failure may damage the migration data. Please backup the RAID data before you start the migration function.



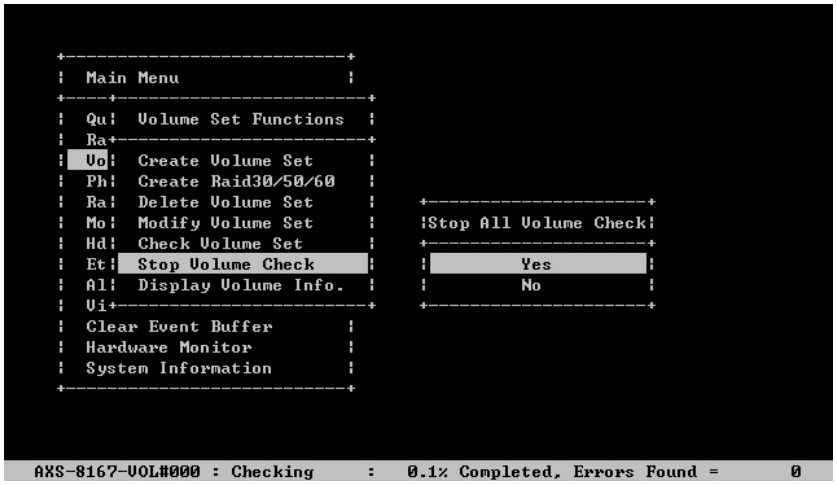
6.5.3.5 Check Volume Set

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.



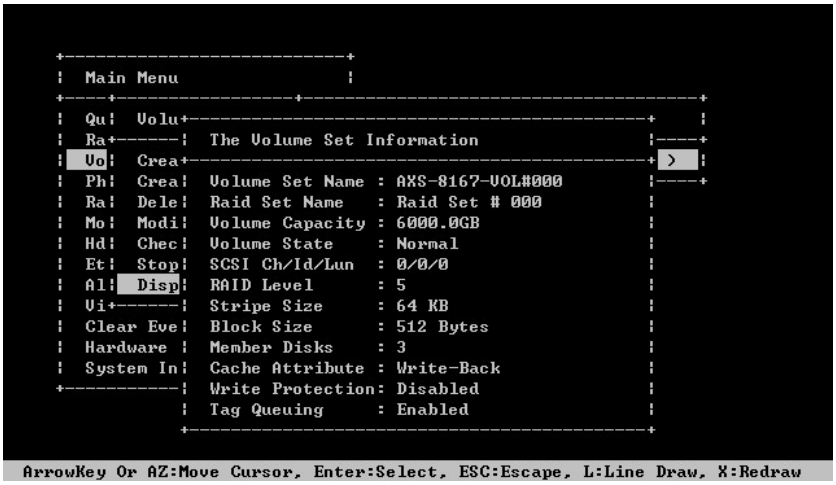
6.5.3.6 Stop Volume Set Check

Use this option to stop all the “Check Volume Set” function.



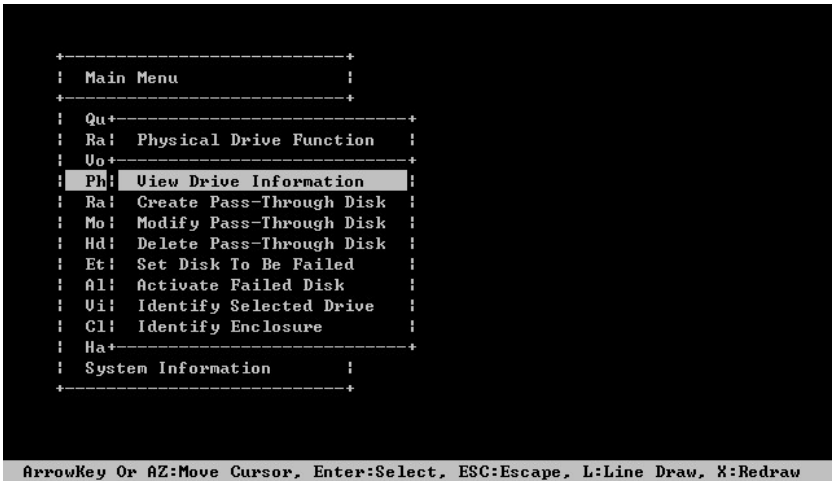
6.5.3.7 Display Volume Set Info.

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



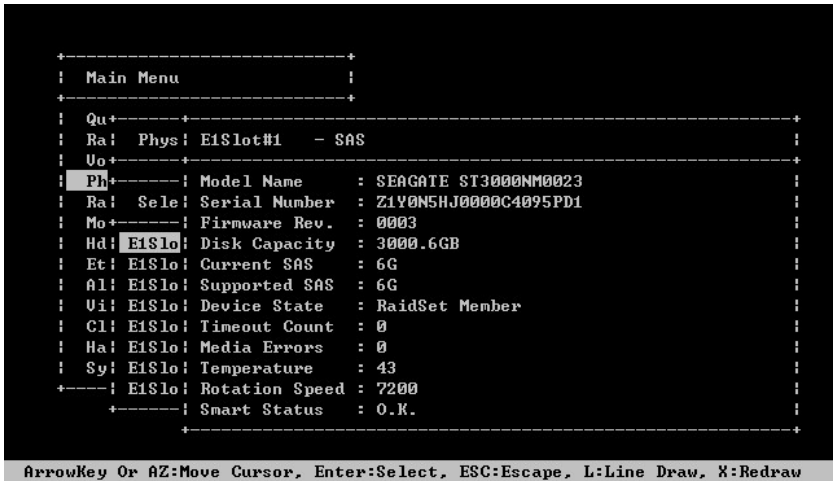
6.5.4 Physical Drive

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.



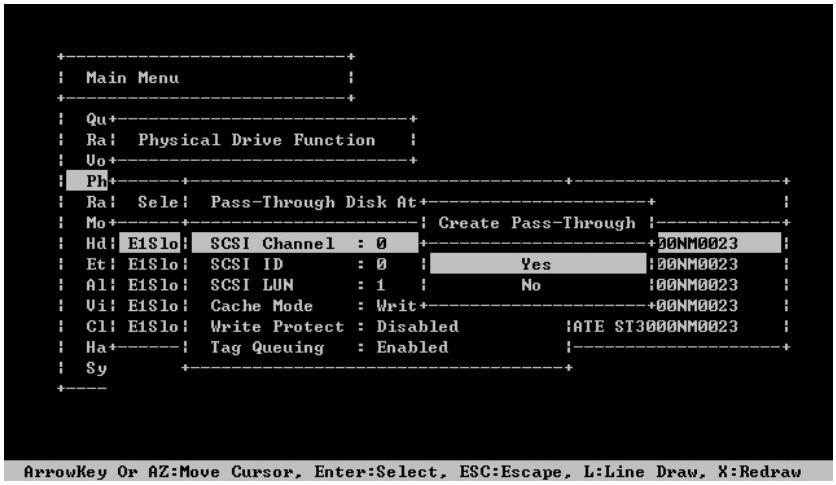
6.5.4.1 View Drive Information

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.



6.5.4.2 Create Pass-Through Disk

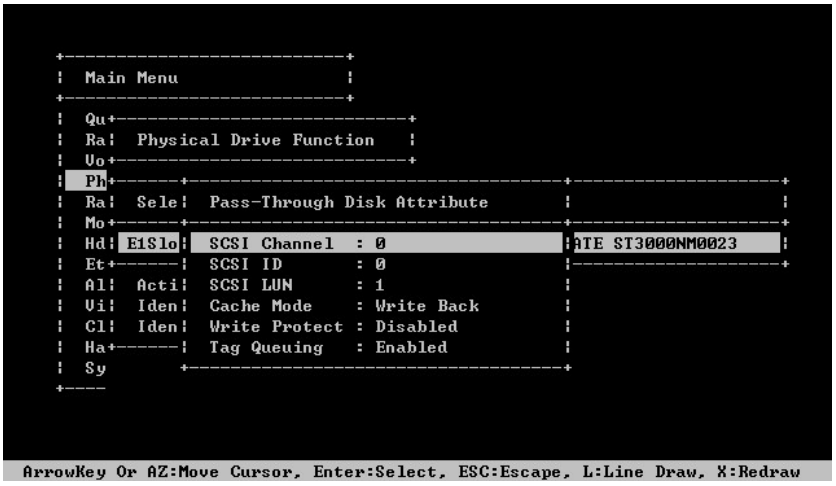
A pass-through disk is not controlled by the RAID subsystem firmware and thus cannot be a part of a volume set. The disk is available directly to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem firmware.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



6.5.4.3 Modify Pass-Through Disk

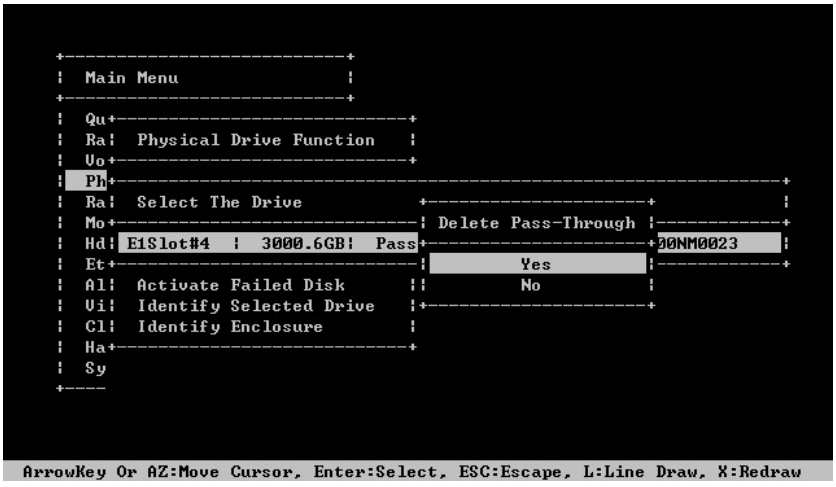
Use this option to modify “Pass-Through Disk Attributes”. To select and modify a pass-through disk from the pool of pass-through disks, move the “Modify Pass-Through Drive” option and then press the **Enter** key. The “Physical Drive Function” menu will show all pass-through drive number options. Move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

pass-through disks attributes. Select the parameter from the list to be changed and then press the **Enter** key to modify it.



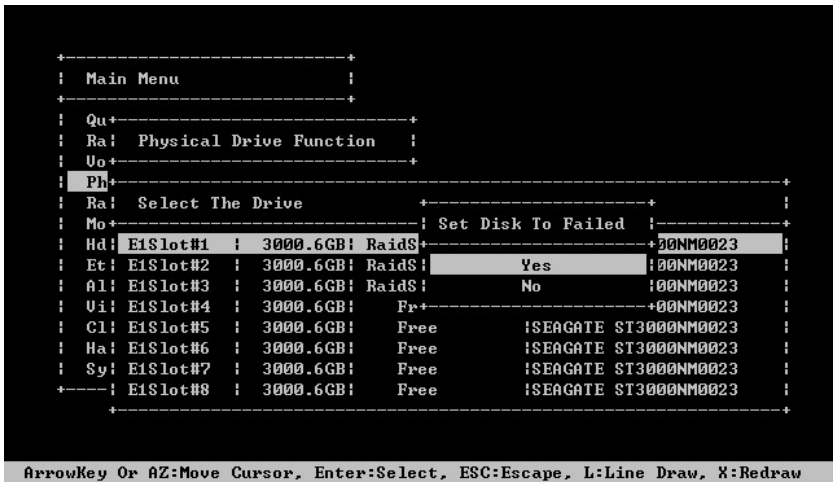
6.5.4.4 Delete Pass-Through Disk

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.



6.5.4.5 Set Disk To Be Failed

It sets a normal working disk as “failed” so users can test some of the features and functions.



6.5.4.6 Activate Failed Disk

It forces the current “failed” disk in the system to be back online. “Activate Failed Disk” function has no effect on the removed disks, because a “removed” disk does not give the controller a chance to mark it as “failure”.

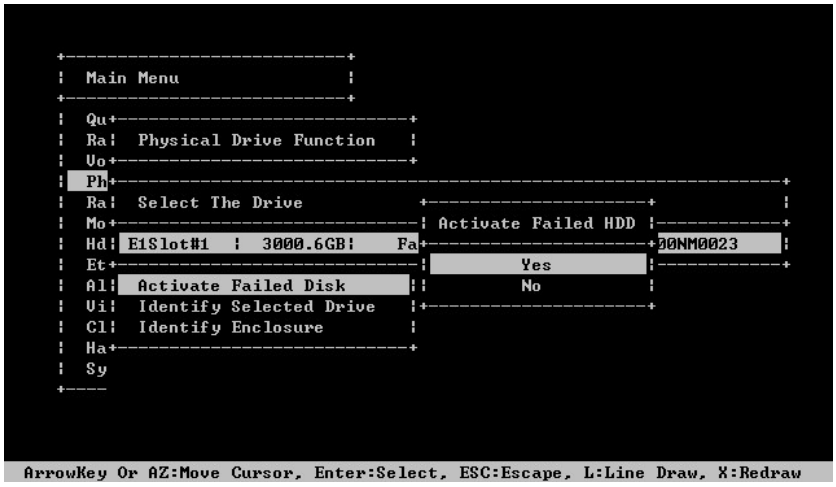
Followings are considered as “Removed-Disk”:

(1). Manually removed by user

(2). Lost PHY connection due to bad connector, cable, backplane

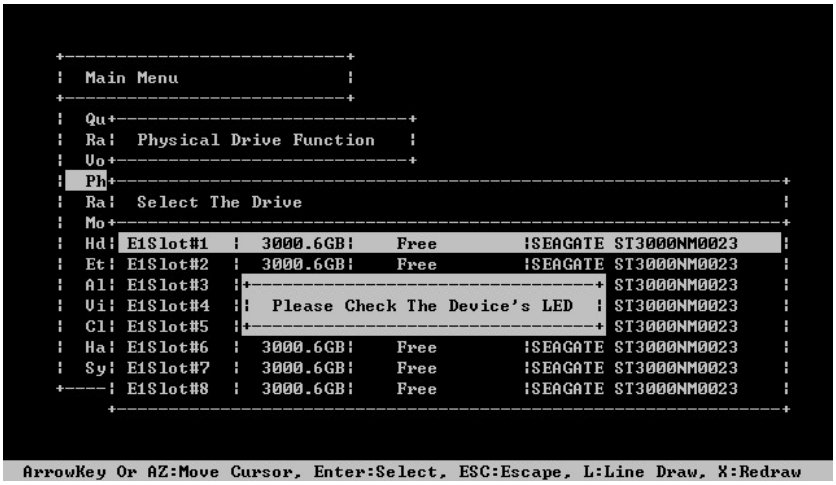
(3). Lost PHY connection due to disk fail

Basically, this function makes the controller sees the disk disappears suddenly due to whatever reason.



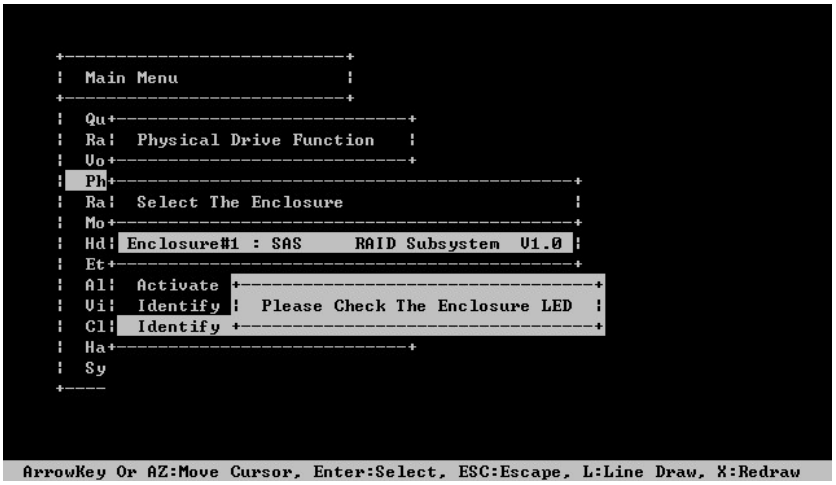
6.5.4.7 Identify Selected Drive

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.



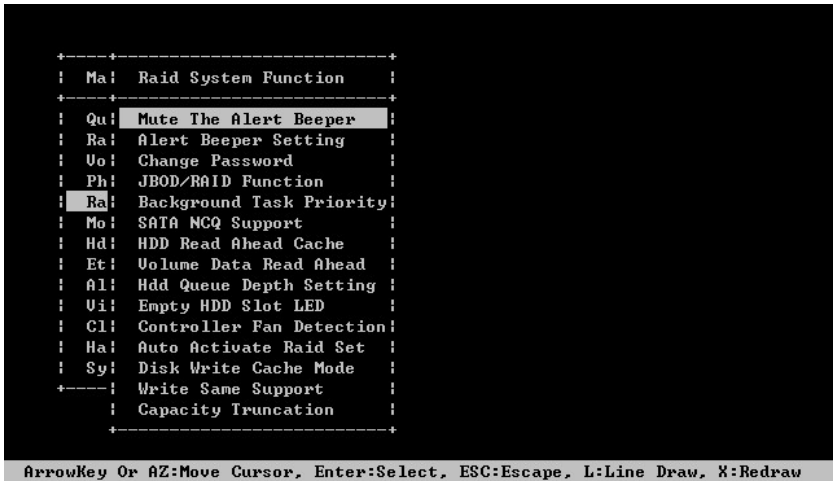
6.5.4.8 Identify Enclosure

To prevent removing the wrong subsystem, the selected 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.



6.5.5 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.



6.5.5.1 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.

6.5.5.2 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.

6.5.5.3 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, press only **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.

6.5.5.4 RAID/JBOD 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.

6.5.5.5 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 (Ultra Low, Low, Normal, High) to balance volume set access and rebuild tasks appropriately.

6.5.5.6 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”.

6.5.5.7 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.

6.5.5.8 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 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.

6.5.5.9 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.

6.5.5.10 Empty HDD Slot LED

The firmware has added the "Empty HDD Slot LED" option to setup the fault LED light "ON "or "OFF" when there is no HDD installed. When each slot has a power LED for the HDD installed identify, user can set this option to "OFF". Choose option "ON", the RAID controller will light the fault LED; if no HDD installed.

6.5.5.11 Controller Fan Detection

The "CPU Fan Detection" function is for RAID card only. *(Default: Disabled)*

6.5.5.12 Auto Activate Raid Set

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

6.5.5.13 Disk Write Cache Mode

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

6.5.5.14 Write Same Support

Drives that support the Write Same feature (SCT) can write to multiple drive sectors at once, improving initialization time. To take advantage of this feature, all the drives in the unit must support Write Same. User can set the “SAS And SATA”, “SAS Only”, “SATA Only” or “Disabled” for the controller initialization.

6.5.5.15 Capacity Truncation Mode

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.

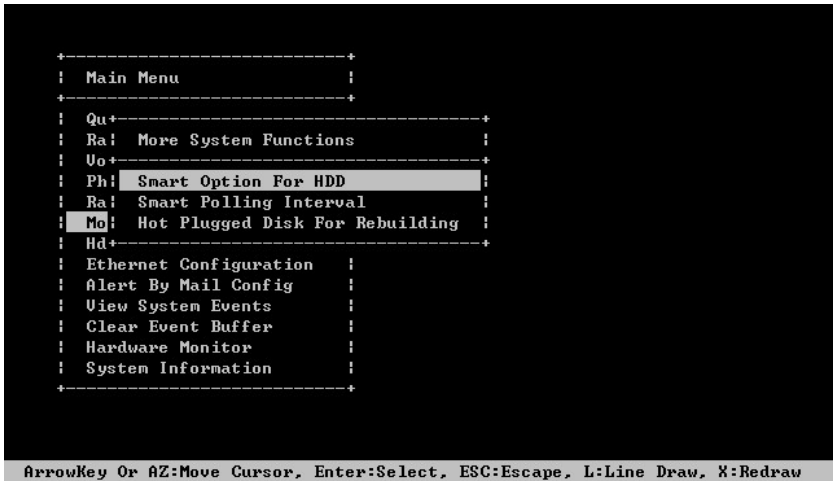
Multiples Of 1G: If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. “Multiples Of 1G” truncates the fractional part. This makes the same capacity for both of these drives so that one could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

6.5.6 More System Functions

To set the “More System Functions”, move the cursor bar to themain menu and

select the “More System Functions” item and then press Enter key. The “More System Functions” menu will show multiple items. Move the cursor bar to an item, then press Enter key to select the desired unction.



6.5.6.1 Smart Option For HDD

This option is used to increases the reliability of SSDs/HDDs by automatically copying data from a drive with potential to fail to a designated hot spare or newly inserted drive. The options are: “Failed The Drive”, “Failed The Drive If Hot Spare Exist”, and “Alert Only”.

Failed The Drive : controllers kill off the SMART fail drive immediately.

Failed The Drive If Hot Spare Exist :

controllers kill off the SMART fail disk if hot spare dive is existed.

Alert Only : it will trigger alert when there happens a SMART fail drive.

6.5.6.2 Smart Polling Interval

Besides the scheduled volume check, user can define the Smart Pulling Interval to pull the SMART status of each disk. The default is “on demand”.

User can schedule every certain period of time interval to pull the SMART status of each disk. When SMART pulling is executed, disk activity will be temporally halted until the SMART parameter reading is finished. That is why you don’t want to set the Interval too frequent. What to use is up to the users to decide based on their applications and experiment results.

6.5.6.3 Hot Plugged Disk For Rebuilding

It defines if the RAID volume should start rebuilding or not when controller detects a disk is inserted/re-inserted during online. The options are: “Blank Disk

Only", "Always", and "Disable". The default is "Blank Disk Only".

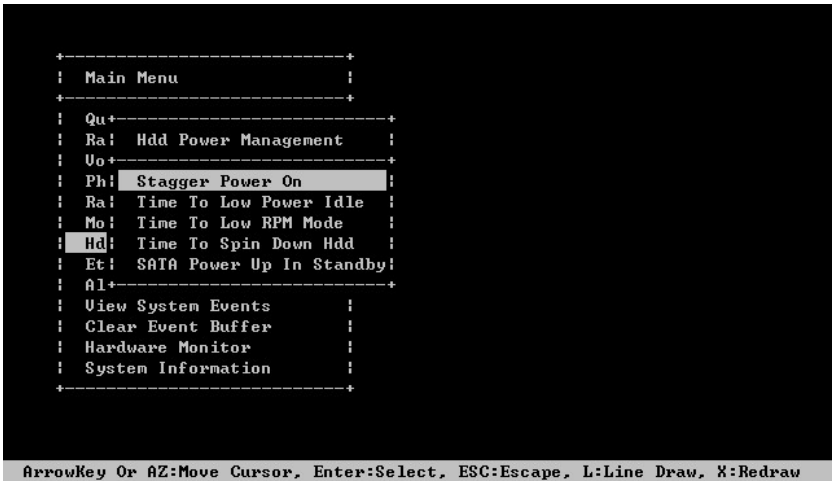
Blank Disk Only: it will trigger the rebuilding if and only if the inserted disk has not been in the RAID array before, which has no RAID signature on it. When a previously removed disk is self re-inserted, it won't trigger the degraded RAID array to rebuild, and the administrator has a chance to identify this misbehaving disk and replaces it.

Always: whenever a disk is inserted/re-inserted whether new or previously existed, it always trigger a rebuilding for the Degraded RAID set/Volume.

Disable: it will not trigger rebuilding regardless what sort of disk plugging in. When "Disable" and/or "Blank Disk Only" is selected, the re-inserted/previously removed disk will be identified as a disk in a separate RAID set with duplicated RAIDset# and with all the rest of RAID members missing.

6.5.7 HDD Power Management

RAID Controller 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.



6.5.7.1 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.

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

6.5.7.2 Time to Hdd Low Power Idle

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

6.5.7.3 Time to Hdd Low RPM Mode

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

6.5.7.4 Time to Spin Down Idle HDD

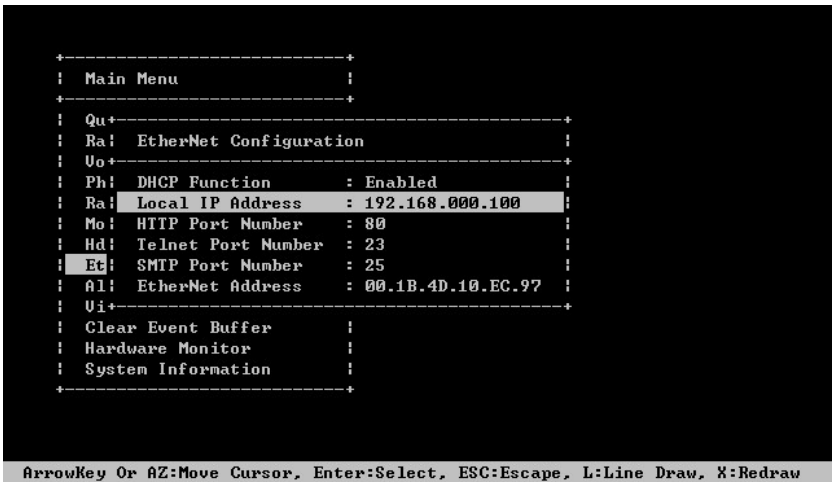
This function can automatically spin down the drive if it hasn’t been accessed for a certain amount of time. This value is used by the drive to determine how long to wait (with no disk activity, before turning off the spindle motor to save power). The values can be selected “Disabled” or within the range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

5.5.7.5 SATA Power Up In Standby

SATA Power Up In Standby (power management 2 mode, PM2) is a SATA disk drive configuration which prevents the drive from automatic spin-up when power is applied. “Enabled” option allows the drive to be powered-up into the Standby power management state to minimize inrush current at power-up and to allow. The controller to sequence the spin-up of devices. It is mainly for server/workstation environments operating in multiple-drive configurations.

6.5.8 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.



6.5.8.1 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.

6.5.8.2 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

using 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.

6.5.8.3 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.

6.5.8.4 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.

6.5.8.5 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.

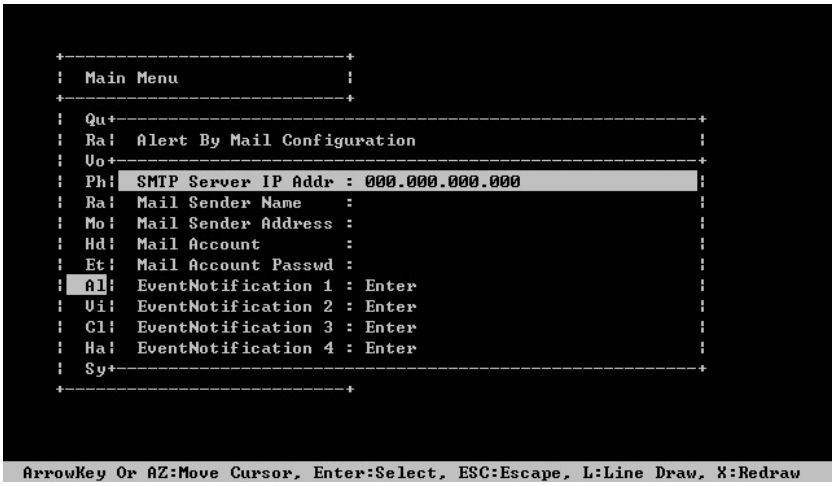
6.5.8.6 Ethernet Address

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.

6.5.9 Alert By Mail Config

To configure the RAID subsystem’s e-mail function, Move the cursor bar to the “Alert By Mail Configuration”, then select the desired function.

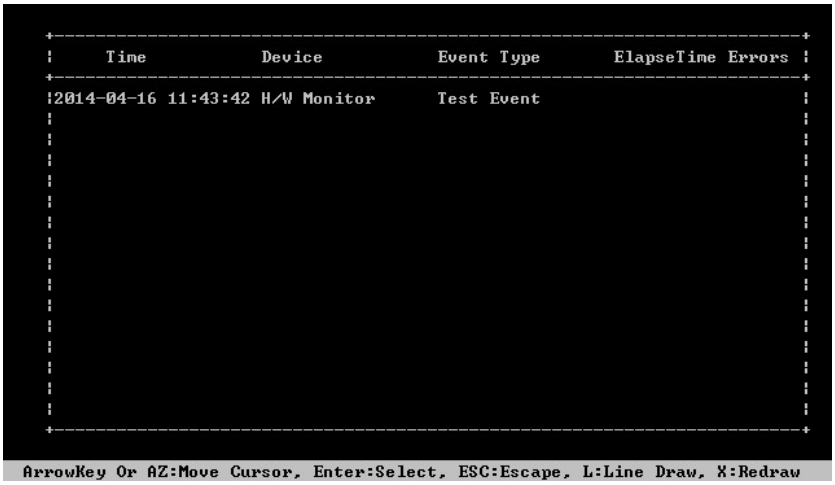
The firmware contains a SMTP manager that monitors all system events. Single or multiple user notifications can be sent via “Plain English” e-mails with no software required.



6.5.10 View System Events

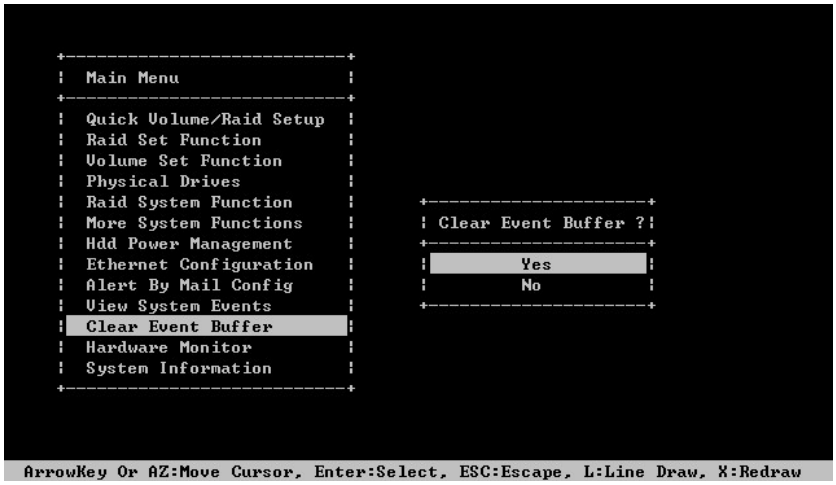
To view the RAID subsystem's system events information, move the cursor bar to the main menu and select the "View System Events" link, then press the **Enter** key. The RAID subsystem's events screen appear.

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.



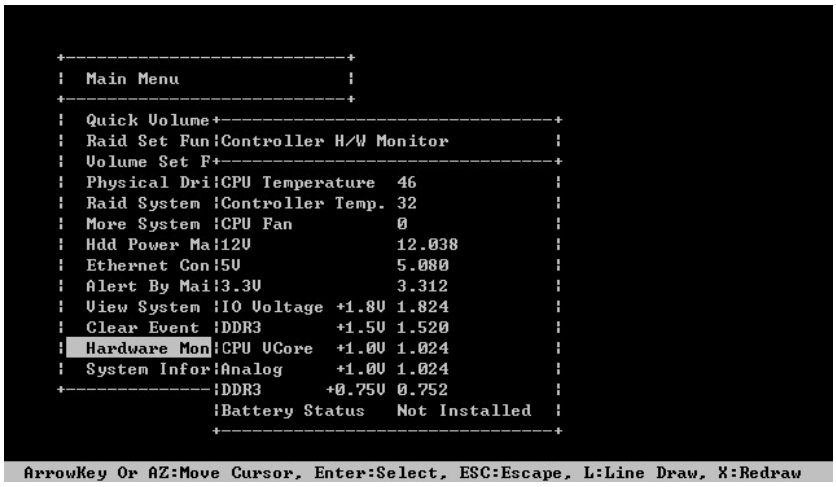
6.5.11 Clear Events Buffer

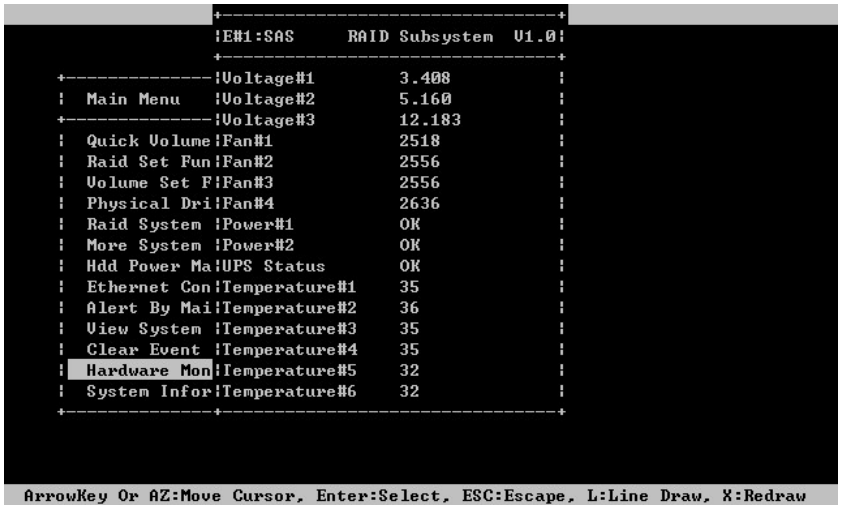
Use this feature to clear the entire events buffer information.



6.5.12 Hardware Monitor

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.





Item	Warning Condition
Controller Board Temperature	> 72 Celsius
Backplane Temperature	> 65 Celsius
Controller Fan Speed	< 1700 RPM
Power Supply +12V	< 10.5V or > 13.5V
Power Supply +5V	< 4.7V or > 5.3V
Power Supply +3.3V	< 3.0V or > 3.6V
CPU Core Voltage +1.5V	< 1.35V or > 1.65V

6.5.13 System Information

Choose this option to display controller name, firmware version, BOOT ROM version, SAS firmware version, serial number, main processor, CPU instruction cache and data cache size, system memory, and current IP address. To check the system information, move the cursor bar to “System Information” item, then press **Enter** key. All relevant controller information will be displayed.

```
+----------------------------+
¦  Main Menu                 ¦
+----------------------------+
¦  Quick Volume+-----------------------------------------+
¦  Raid Set Fun¦  The System Information                  ¦
¦  Volume Set F+-----------------------------------------+
¦  Physical Dri¦  Main Processor    : 800MHz PPC440      ¦
¦  Raid System ¦  CPU ICache Size   : 32KB               ¦
¦  More System ¦  CPU DCache Size   : 32KB/Write Back    ¦
¦  Hdd Power Ma¦  CPU SCache Size   : 1024KB/Write Thr   ¦
¦  Ethernet Con¦  System Memory     : 4GB/1333MHzECC     ¦
¦  Alert By Mai¦  Firmware Version  : V1.52 2014-03-20   ¦
¦  View System ¦  BOOT ROM Version  : V1.52 2014-03-20   ¦
¦  Clear Event ¦  PL Firmware Ver   : 18.0.0.0           ¦
¦  Hardware Mon¦  Serial Number     : A41081671660001    ¦
¦  System Infor¦  Unit Serial #     :                    ¦
+--------------¦  Controller Name   : AXS-8167            ¦
               ¦  Current IP Addr.  : 001.001.001.186     ¦
               +-----------------------------------------+

ArrowKey Or AZ:Move Cursor, Enter:Select, ESC:Escape, L:Line Draw, X:Redraw
```

Appendix A.

Upgrading Firmware

Since the RAID controller features flash firmware, it is not necessary to change the hardware flash chip in order to upgrade the RAID firmware. The user can simply re-program the firmware through the In-Band PCIe or 10/100 Ethernet port. New releases of firmware are available in the form of a DOS file. The file available at the FTP site is usually a self-extracting file that contains the following:

xxx0FIRM.BIN is Firmware Binary,

xxx0BOOT.BIN is Boot code,

xxx0MBR0.BIN is Main boot code

Firmware Release Notes.txt It contains the history information of the firmware change. Read this file first before upgrading the firmware.

Establishing the Connection for IN-Band PCIe and Ethernet port

The firmware can be downloaded to the RAID controller by using an ANSI/VT-100 compatible terminal emulation program or HTTP web browser manager. You must complete the appropriate installation procedure before proceeding with this firmware upgrade.

Web browser-based RAID manager can be used to update the firmware. You must complete the appropriate installation procedure before proceeding with this firmware upgrade. Please refer to Software Operation Manual: chapter 6.1, “Web browser-based RAID manager (Using the controller’s Ethernet port)” for details on establishing the connection.

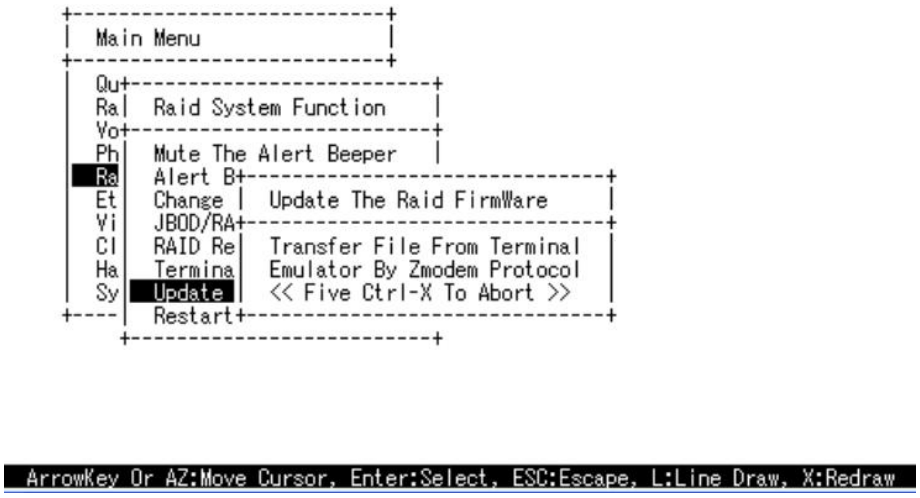
Upgrading Firmware Through ANSI/VT-100 Terminal Emulation

Get the new version firmware for your RAID controller. For Example, download

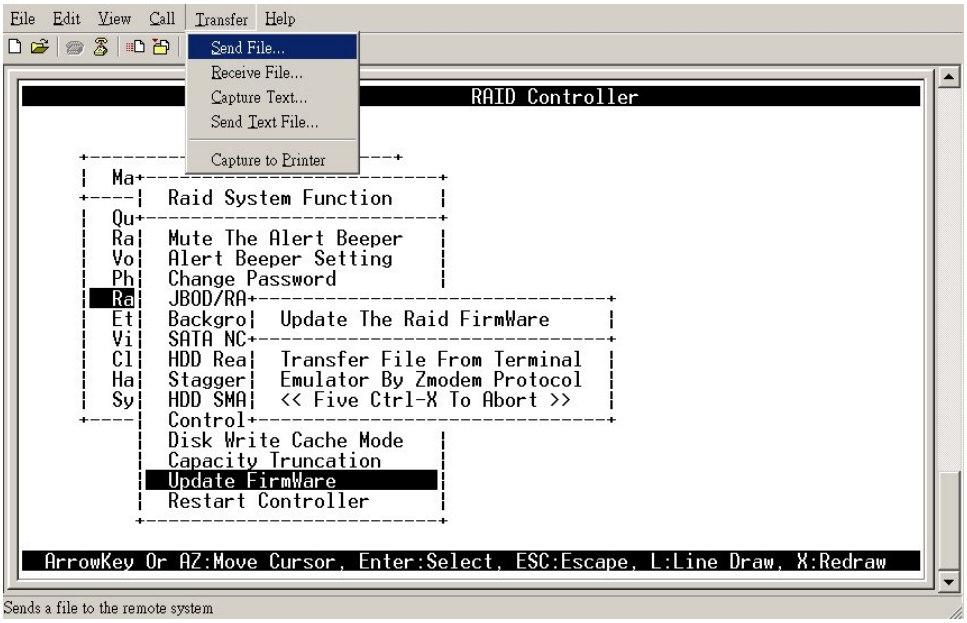
the bin file from your OEM's web site onto the c:

1. From the Main Menu, scroll down to "**Raid System Function**"

2. Choose the "**Update Firmware**"; then "Update The Raid Firmware" dialog box appears.



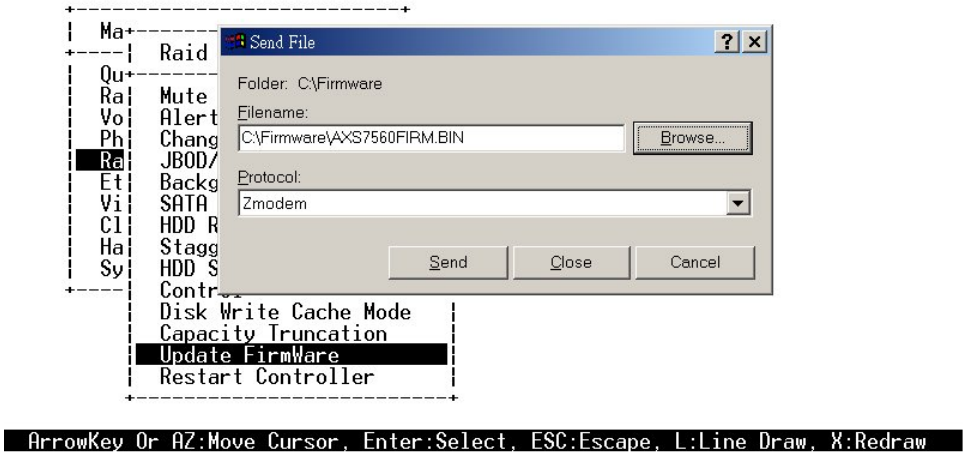
3. Go to the tool bar and select Transfer. Open "**Send File**".



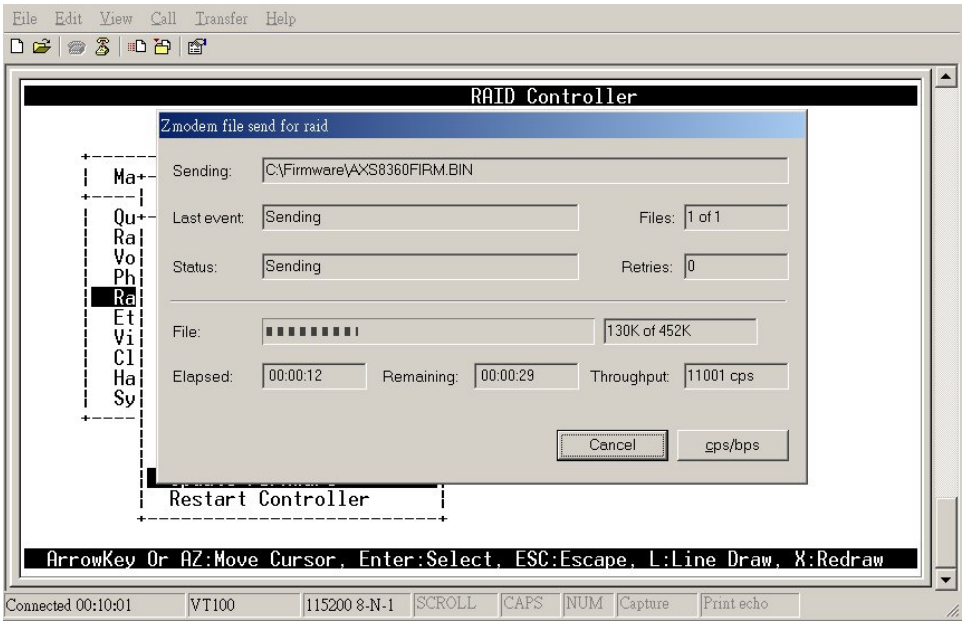
4. Select "**ZMODEM modem**" under Protocol. ZMODEM as the file transfer

protocol of your terminal emulation software.

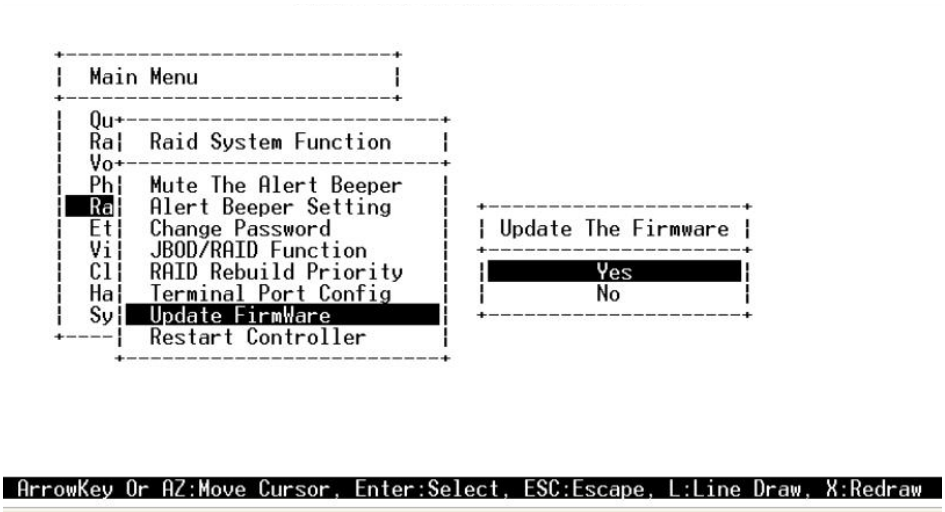
5. Click Browse. Look in the location where the Firmware upgrade software is located. Select the File name and click “**open”**.



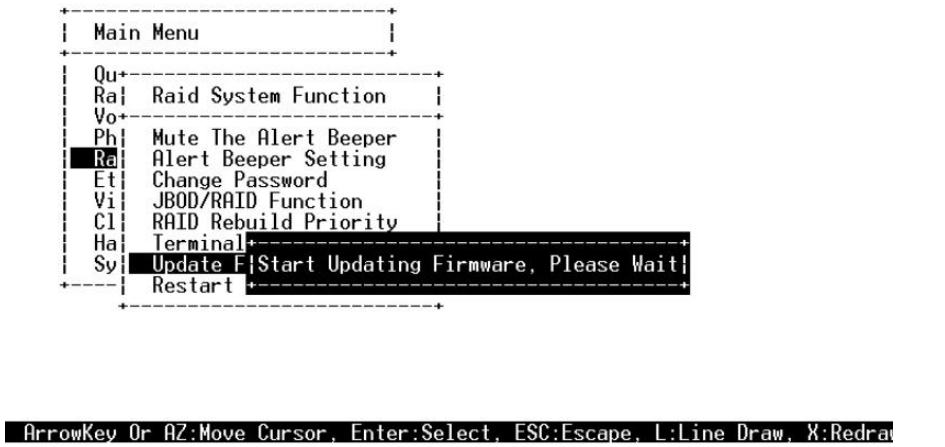
6. Click “**Send**”. Send the Firmware Binary to the controller



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



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



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

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

10. After the new firmware completes download, user should find a chance to restart the controller for the new firmware to take effect.

Note

The user has to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will default to the original default values.

Upgrading Firmware Through Web Browser Management

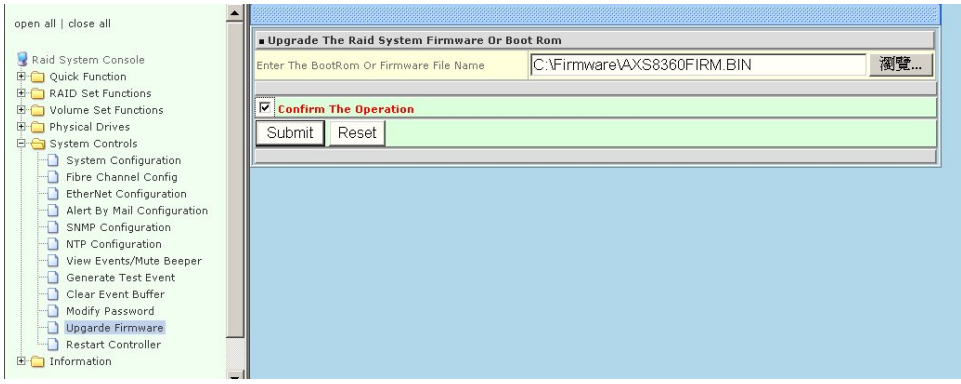
Get the new version firmware for your RAID subsystem controller. For Example, download the bin file from your OEM's web site onto the c:

To upgrade the RAID subsystem firmware, move the mouse cursor to **"Upgrade Firmware"** link. The "**Upgrade The Raid System Firmware"** screen appears.

Click Browse. Look in the location where the Firmware upgrade software is located. Select the File name click "**open"**.

Click the **"Confirm The Operation"** and press the **"Submit"** button.

The Web Browser begins to download the firmware binary to the controller and start to update the flash ROM.



After the firmware upgrade is complete, a bar indicator will show “Firmware Has Been Updated Successfully”

After the new firmware completes download, user should find a chance to restart the controller for the new firmware to take effect.

Note

The user has to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will default to the original default values.

Appendix B. Command Line Interface for Full Volume Encryption

This chapter provides RAID controller Command Line Interface (CLI) instructions for configuring and maintaining your RAID controller.

Before using this CLI, we assume that you have already installed your controller in your system.

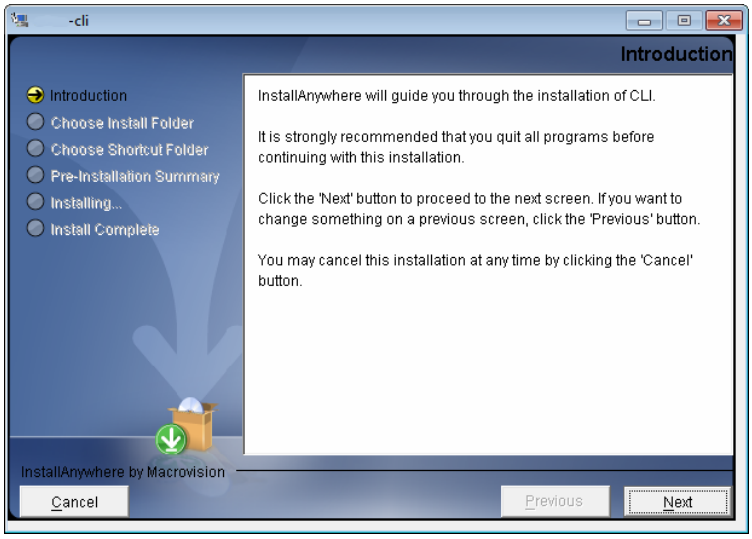
B.1. Installing the CLI

This section describes the procedures for installing Command Line Interface (CLI).

B.1.1 For Windows

Below screen in this section are taken from a Windows 2008 installation. If you are running other Windows, your installing screen may look different, but the CLI installation is essentially the same.

1. Insert the RAID controller CD in the CD-ROM drive. You also can download the CLI from the Axus ftp site
2. Run the setup.exe file that resides at: <CD-ROM>\packages\windows\CLI\setup.exe on the CD-ROM.



3. Click on the “Setup” file then the Welcome screen appears. Follow the on-screen prompts to complete CLI installation.
4. A program bar appears that measures the progress of the CLI.
5. When this screen complete, you have completed the CLI software setup.
6. After a successful installation, the “Setup Complete” dialog box of the installation program is displayed. Click the “Finish” button to complete the installation.

B.1.2 For Linux, FreeBSD, Mac and Solaris

CLI can be installed from the shipping software CD, or downloaded from the Axus ftp site. The following is the CLI installation procedure in the Linux, Free-BSD, Mac and Solaris.
1. Insert the RAID controller CD in the CD-ROM drive.
2. Copy the file CLI to the installation directory from which you want to run the program.

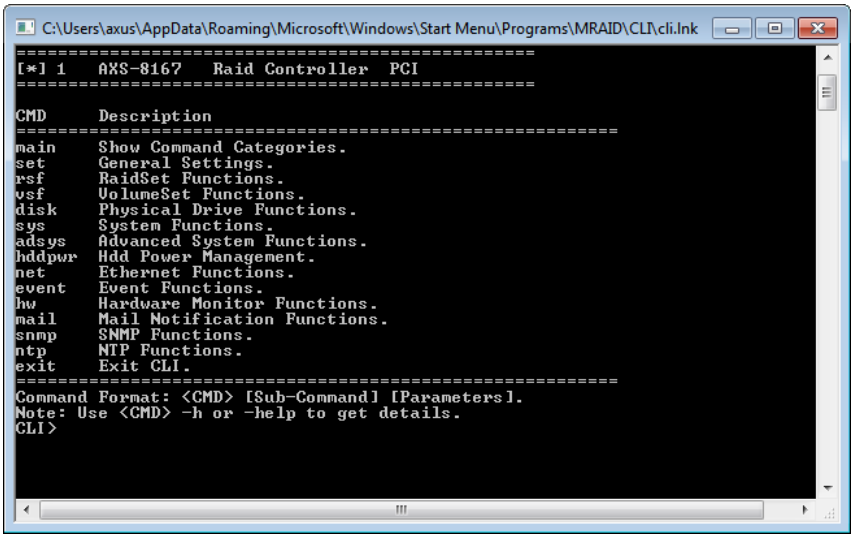
B.2 Accessing CLI

B.2.1 For Windows

This section discusses the methods for accessing the CLI in Windows.

To access the CLI:
1. Click on the “Start” button in the Windows XP/2003/Vista/2008/7 task bar and then click “Program”.
2. CLI screen appears.

The CLI prompt is displayed in a DOS console window.



B.2.2 For Linux, FreeBSD, Mac and Solaris

To access the CLI from the Linux/FreeBSD/Mac/Solaris prompt, display a window and type CLI in the directory. When the system displays the CLI> prompt, which indicates that you can start to use CLI commands.
For the commands to work in any directory, the path in the start-up, please see your Linux/FreeBSD/Mac/Solaris documentation for information on setting up directory paths.

B.3 Using CLI for Volume Encryption

B.3.1 Generate New Encrypted - Volume Key File

To generate new encrypted - volume key file, follow the procedure below:

Syntax:
vsf genkey

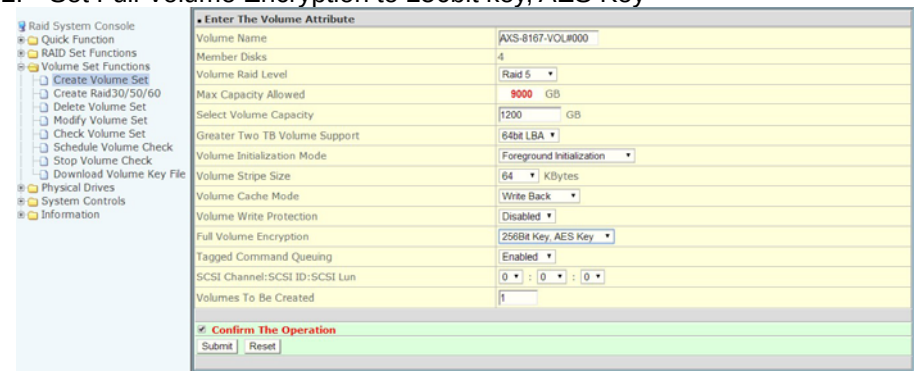
Parameter:
<path=xxx>

Description:
The New Encrypted - Volume Key value is generated in this command by a random number process. The key file includes all keys that assign to every volume on the RAID controller. The RAID controller does not retain the key on the itself. If the New Encrypted - Volume Key is not available, then the data is not

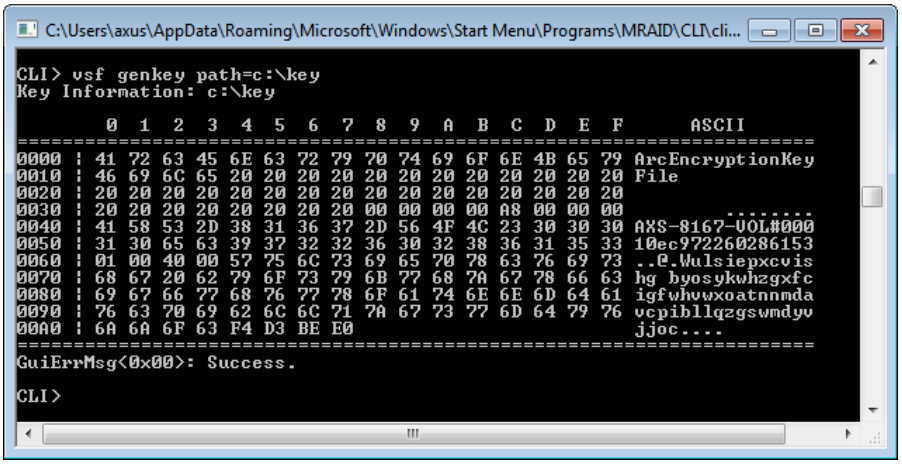
recoverable from that volume. However, good security practice encourages New Encrypted - Volume Key to be backed up.

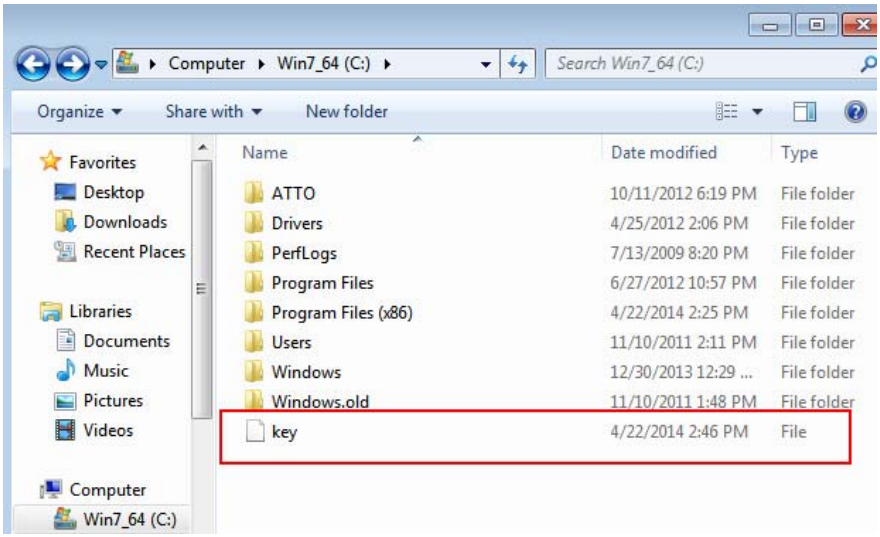
Example:

1. Create one Volume set (AXS-8167-VOL#000)
2. Set Full Volume Encryption to 256bit key, AES Key



3. "**CLI > vsf genkey path=c:\key"** Generate a key file into c:\key.



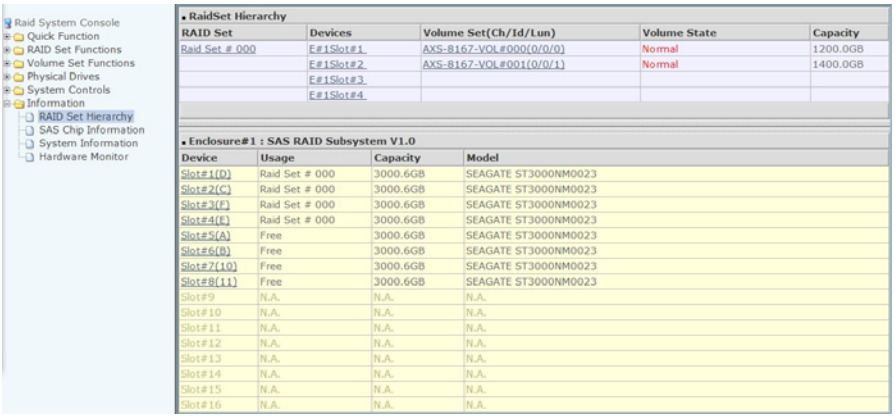


Syntax:
vsf genkey2

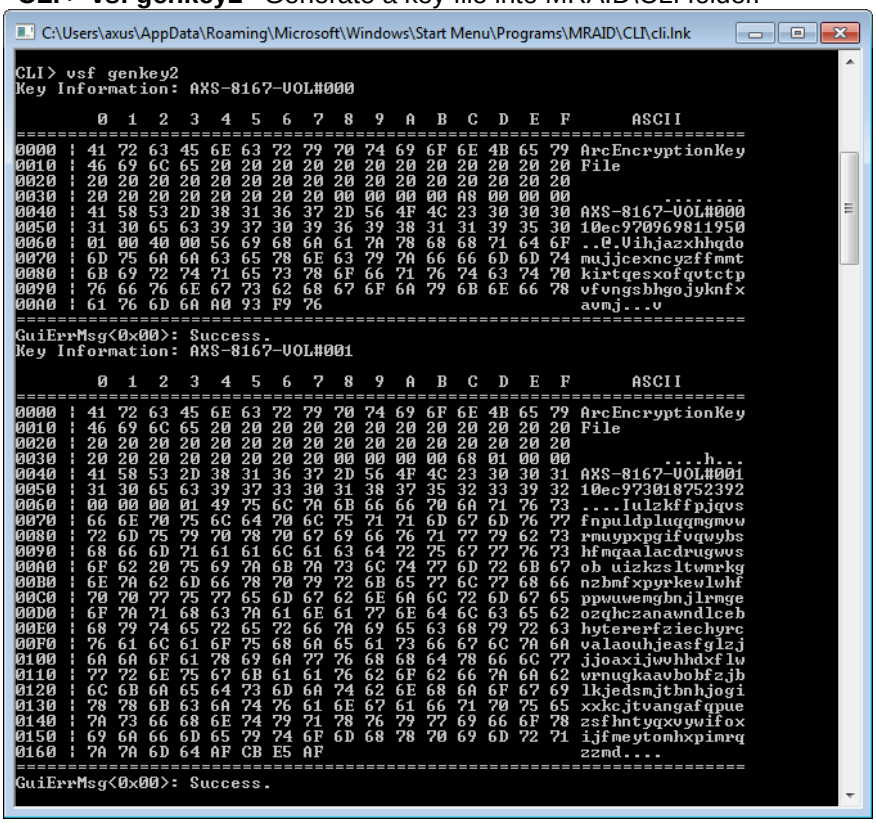
Parameter:
<path=xxx>

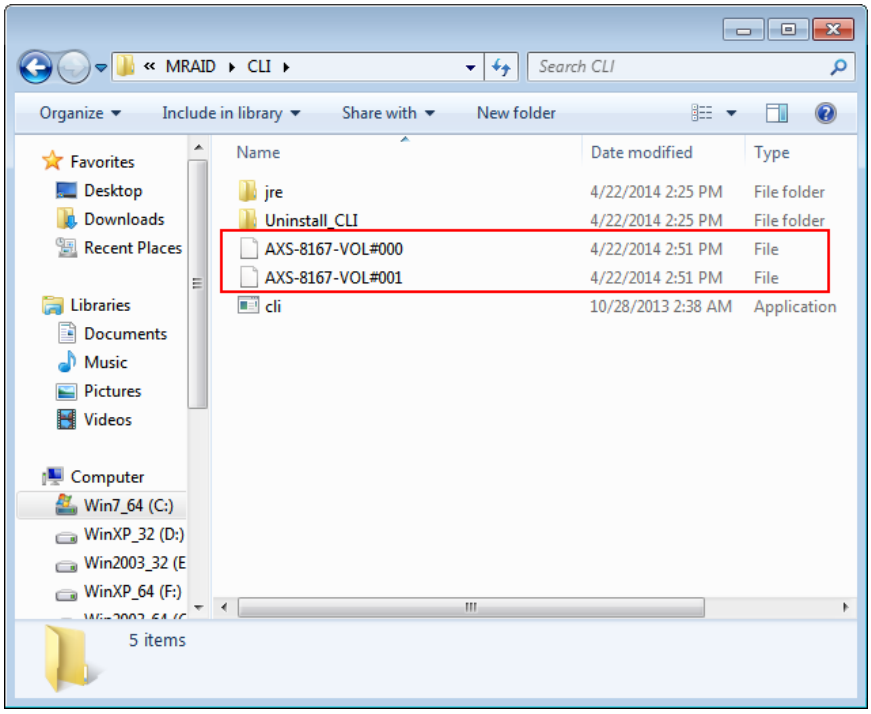
Description:
The New Encrypted - Volume Key value is generated in this command by a random number process. It will generate key file(s) by volume set and the file name is the same as the volume set name. The RAID controller does not retain the key on the itself. If the New Encrypted - Volume Key is not available, then the data is not recoverable from that volume. However, good security practice encourages New Encrypted - Volume Key to be backed up.

Example:
1. Create two Volume set (AXS-8167-VOL#000 & AXS-8167-VOL#001)
2. Set Full Volume Encryption to 256bit key, AES Key (VOL#000)
   & 256bit key, password (VOL#001)



3. "CLI > vsf genkey2" Generate a key file into MRAID\CLI folder.





B.3.2 Lock Volume

To make an encrypted - volume key invalidated, follow the procedure below:

Syntax:
vsf lock

Parameter:
<vol=xx>

Description:
Lock Volume function secures a volume's data from unauthorized access or modification in the event of drive theft, as well as more routine activities such as the return of defective drives for servicing or the decommission or repurposing of drives. When the Lock Volume is configured by the user (or I.T.), the encrypted - Volume Key is used to encrypt the data inside the volume.

Example:
CLI > vsf lock vol=1 [Enter]
Make VolumeSet#1 key invalidation.

B.3.3 Download an Encrypted – Volume Key File

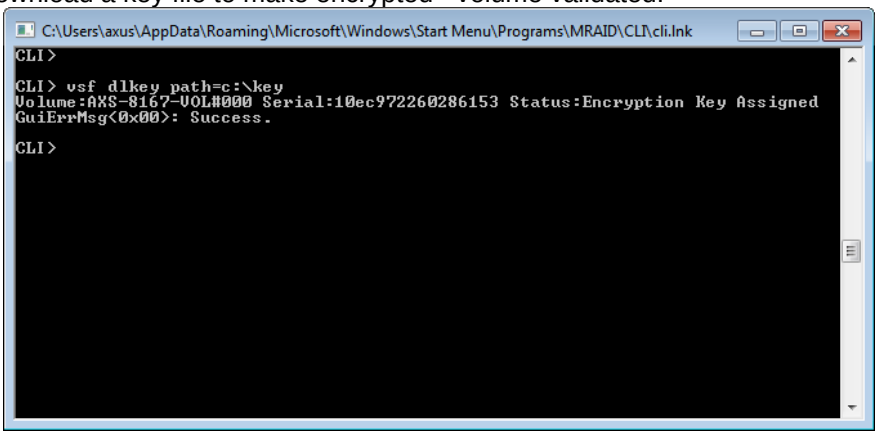
To download an encrypted - volume key file, follow the procedure below:

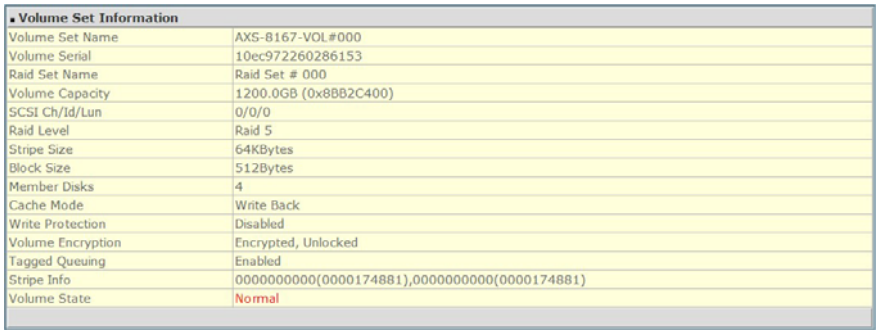
Syntax:
vsf dlkey

Parameter:
<path=xxx>

Description:
However, once the encrypted volume is powered on, the volume will ask for the Encrypted - Volume key to unlock it. If the correct Encrypted - Volume key is not given, the volume cannot be decrypted. Use this command to unlock the volume.

Example:
"CLI > vsf dlkey path=c:\key"
Download a key file to make encrypted - volume validated.





Volume Set Information	
Volume Set Name	AXS-8167-VOL#000
Volume Serial	10ec972260286153
Raid Set Name	Raid Set # 000
Volume Capacity	1200.0GB (0x8BB2C400)
SCSI Ch/Id/Lun	0/0/0
Raid Level	Raid 5
Stripe Size	64KBytes
Block Size	512Bytes
Member Disks	4
Cache Mode	Write Back
Write Protection	Disabled
Volume Encryption	Encrypted, Unlocked
Tagged Queuing	Enabled
Stripe Info	0000000000(0000174881),0000000000(0000174881)
Volume State	Normal

Appendix C.

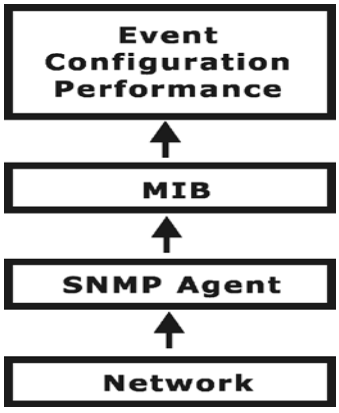
SNMP Operation & Definition

Overview

The Alnico 8 PCIe 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 can be used to augment the RAID controller if you are already running an SNMP management application at your site.

SNMP Definition

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



SNMP Installation

- The installation of the SNMP manager is accomplished in several phases:
- Installing the 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 controller, 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 ARECARAID.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.

ARECARAIDMIB Object Definition

All traps are defined under this object according to the following table:

Trap	Description	Trap Number
[Reserved]		1-127
Traps	**128-255 are RaidSet**	**Traps**

rsCreate		128
rsDelete		129
rsExpand		130
rsRebuild		131
rsDegraded		132
rsNoEvent		133
[Reserved]		134-255
Traps	**256-383 are VolumeSet**	**Traps**
vsInitializing		256
vsRebuilding		257
vsMigrating		258
vsChecking		259
vsCompleteInit		260
vsCompleteRebuild		261
vsCompleteMigrating		262
vsCompleteChecking		263
vsCreate		264
vsDelete		265
vsModify		266
vsDegraded		267
vsFailed		268
vsRevived		269
vsTotals		270
[Reserved]		271-383
Traps	**384-511 are IDE Device**	**Traps**
pdAdded		384
pdRemoved		385
pdReadError		386
pdWriteError		387
pdAtaEccError		388
pdAtaChangeMode		389
pdTimeOut		390
pdMarkFailed		391
pdPciError		392
pdSmartFailed		393
pdCreatePass		394
pdModifyPass		395
pdDeletePass		396
pdTotals		397
[Reserved]		398-511
Traps	**512-639 are SCSI Bus**	**Traps**
scsiReset		512
scsiParity		513

scsiModeChange	514
scsiTotals	515
[Reserved]	516-639

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Traps	**640—676 Hardware Monitor**	**Traps**
hwSdram1BitEcc		640
hwSdramMultiBitEcc		641
hwTempController		642
hwTempBackplane		643
hwVoltage15		644
hwVoltage3		645
hwVoltage5		646
hwVoltage12		647
hwVoltage1_3		648
hwVoltage2_5		649
hwVoltage1_25		650
hwPower1Failed		651
hwFan1Failed		652
hwPower2Failed		653
hwFan2Failed		654
hwPower3Failed		655
hwFan3Failed		656
hwPower4Failed		657
hwFan4Failed		658
hwUpsPowerLoss		659
hwTempController_R		660
hwTempBackplane_R		661
hwVoltage15_R		662
hwVoltage3_R		663
hwVoltage5_R		664
hwVoltage12_R		665
hwVoltage1_3_R		666
hwVoltage2_5_R		667
hwVoltage1_25_R		668
hwPower1Failed_R		669
hwFan1Failed_R		670
hwPower2Failed_R		671
hwFan2Failed_R		672
hwPower3Failed_R		673
hwFan3Failed_R		674
hwPower4Failed_R		675
hwFan4Failed_R		676

Appendix D.

Event Messages

RAID Event List

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	**Type**	**Meaning**	**Action**
Device Inserted	Warning	HDD inserted	
Device Removed	Warning	HDD removed	
Reading Error	Warning	HDD reading error	Keep Watching HDD status, maybe it is caused by noise or HDD unstable.
Writing Error	Warning	HDD writing error	Keep Watching HDD status, maybe it is caused by noise or HDD unstable.
ATA ECC Error	Warning	HDD ECC error	Keep Watching HDD status, maybe it is 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, maybe it is 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 maybe caused by noise. If always happen, please check power supply or contact to us.

Device Failed (SMART)	Urgent	HDD SMART failure	Replace HDD
Pass Through Disk Created	Inform	Pass Through Disk Created	
Pass Through Disk Modified	Inform	Pass Through Disk Modified	
Pass Through Disk Deleted	Inform	Pass Through Disk Deleted	

B. Volume Event			
Event	**Type**	**Meaning**	**Action**
Start Initialize	Warning	Volume start initialize	
Start Rebuilding	Warning	Volume start rebuilding	
Start Migrating	Warning	Volume start migrating	
Start Checking	Warning	Volume start parity checking	
Complete Init	Warning	Volume initialization completed	
Complete Rebuild	Warning	Volume rebuild completed	
Complete Migrate	Warning	Volume Migration completed	
Complete Check	Warning	Volume check completed	
Create Volume	Warning	New Volume Created	
Delete Volume	Warning	Volume deleted	
Modify Volume	Warning	Volume modify	
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 been abort	
Abort Migration	Warning	Migration been abort	
Abort Checking	Warning	Parity Check been abort	
Stop Initialization	Warning	Initialization been stopped	

Stop Rebuilding	Warning	Rebuilding been stopped	
Stop Migration	Warning	Migration been stopped	
Stop Checking	Warning	Parity Check been stopped	

C. Raid Set Event

Event	Type	Meaning	Action
Create Raid Set	Warning	New Raid set created	
Delete Raid Set	Warning	Raid set deleted	
Expand Raid Set	Warning	Raid set expand	
Rebuild Raid Set	Warning	Raid set rebuilding	
Raid Set Degraded	Urgent	Raid set degraded	Replace HDD

D. Host Event

Event	Type	Meaning	Action
SCSI Bus Reset	Inform	SCSI Bus got a Reset command	Depend on system status; it could be normal (such as system boot up) or unstable SCSI cable connection.
FC Link Up	Inform	Fibre Channel Link Up	
FC Link Down	Inform	Fibre Channel Link Down	

E. Hardware Monitor Event

Event	Type	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	Controller temp. (over 72 degree)	Check air flow and cooling fan of the subsystem.
Backplane Over Temperature	Urgent	Backplane temp. (over 65 degree)	Check air flow and cooling fan of the subsystem.
HDD Over	Urgent	Abnormally high temperature detected on HDD. (over 65	Check air flow and cooling fan of the subsystem.

Temperature		degree)	enclosure
#.#V Abnormal	Urgent	Abnormal voltage detected. (exceed 5% tolerance, 12V is 10%)	If only happen once, it maybe caused by noise. If always happen, please check Power Supply
Power Failed	Urgent	Power # failure	Replace Power #
Fan Failed	Urgent	Cooling Fan # failure or speed below 1700RPM	Replace Fan #
UPS AC Power Loss	Urgent	UPS AC Power failure detected	Check AC power status or cabling between UPS and RAID system.
Controller Temp. Recovered	Serious	Controller temperature back to normal level	
Backplane Tempe. Recovered	Serious	Backplane temperature back to normal level	
HDD Temp. Recovered			
#.#V Recovered	Serious	Voltage output back to normal	
Power # Recovered	Serious	Power # back to on-line state	
Fan # Recovered	Serious	Fan # back to on-line state	
UPS AC Power Recovered	Serious	UPS AC power back to on-line state.	
Raid Powered On	Warning	Raid Power On	
Test Event	Urgent	Test Event	
Power On With Battery Backup	Warning	Raid Power On with battery backup	
Incomplete RAID Discovered	Serious	Some Raid Set member disks missing before power on	Check disk information to find out which channel missing.
HTTP Log In	Serious	a HTTP login detected	
Telnet Log In	Serious	a Telnet login detected	
VT100 Log In	Serious	a VT100 login detected	
API Log In	Serious	a API login detected	

Lost Rebuilding/ Migration LBA	Urgent	Some rebuilding / migration RAID set member disks missing before power on	Reinserted the missing member disk back, controller will continued the Incomplete rebuilding/migration

Note

Depend on models, not every model will encounter all events.