

M.2 NVME RAID Cards

ARC-1203-2N

(2Bays M.2 NVMe Hardware RAID Adapter)

User Manual

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FCC Statement

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

Manufacturer's Declaration for CE Certification

We confirm ARC-1203-2N has been tested and found compliant with the requirements in the council directive relating to the EMC Directive 2004/108/EC. Regarding to the electromagnetic compatibility, the following standards were applied:

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

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

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INTRODUCTION

1. Introduction

This section presents a brief overview of 2Bays M.2 NVMe Hardware RAID adapter, ARC-1203-2N.

1.1 Overview

ARC-1203-2N presents the advanced hardware RAID technology in enhanced performance of using 2 Bays M.2 NVMe. The hardware RAID adapter accesses the data of NVMe disk array with a workload preset value. The ARC-1203-2N is the industry's most compelling 2-bays NVME RAID solution which economically delivers fullfeatured true hardware RAID to desktop and workstations as well as entry-level servers.

Unparalleled Performance

The PCIe(NVMe) RAID adapters raise the standard to higher levels with several enhancements including high performance 1066MHz storage processor, a DDR3-1066 memory architecture, and M.2 NVMe in a high performance PCIe2.0 x4 bus interconnection. The ARC-1203-2N default supports on-board 512MB DDR3-1066 SDRAM memory. The test result is against overall performance compared to other standard SATA host adapter.

Unsurpassed Data Availability

With Areca entry-level RAID adapters incorporate onboard storage processors to deliver true hardware RAID. Hardware RAID cards have their own local RAID processor onboard, plus dedicated onboard cache for full hardware offloading of RAID-processing functions. The ability of hardware RAID adapters to rebuild an array in the event of a drive failure is superior to what software RAID adapters offer.

ARC-1203-2N RAID adapter can provide RAID levels 0, 1, Single Disk and JBOD RAID for maximum configuration flexibility. Its high data availability and protection derives from Areca Technology's advanced features: Online RAID Capacity Expansion, Array Roaming, Online RAID Level / Stripe Size Migration, Global Online

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Spare, Automatic Drive Failure Detection, Automatic Failed Drive Rebuilding, Disk Hot-Swap, Online Background Rebuilding, Instant Availability/Background Initialization and Auto Reassign Sector.

During the adapter firmware upgrade flash process, it is possible for a problem to occur resulting in corruption of the controller firmware. With our redundant flash image feature the adapter will revert back to the last known version of firmware and continue operating. This reduces the risk of system failure due to firmware crash. The CBM module provides power to the cache if it contains data not yet written to the drives when power is lost.

Maximum Interoperability

ARC-1203-2N is a half length low profile PCIe(NVMe) RAID adapter. It provides two driver modes. NVMe mode uses inbox OS NVMe host (native) driver, no driver installation needed. Areca Legacy Mode supports broad operating system include Windows 11/10(64bit), Server 2022/2019/2016(64bit), RedHat Linux(open source), FreeBSD(open source), Mac, VMware OS and more, along with key system monitoring features such as SMTP, and SNMP function.

Easy RAID Management

The McBIOS RAID is a BIOS based utility used to simplify configurations and manage RAID adapter via hot keys at M/B BIOS boot-up screen. Without deploying an agent, you can also configure, deploy, update, and monitor the ARC-1203-2N via the GUI or through CLI utility. Customers can launch the firmware browser based McRAID GUI through on-board Ethernet port or ArchHttp proxy server. Additionally, Areca ArcSAP storage manager allows the user to scan multiple RAID units in the network and perform GUI management operations across multiple RAID units.

Supercapacitor onboard

The onboard supercapacitor that provides cache offload capability to protect NVMe module cached data in case of system power loss. When the RAID adapter detects loss of power, the supercapacitor keeps parts of the RAID adapter active long enough to allow cache data to be write back to the NVMe drives.

INTRODUCTION

1.2 Features

Controller Architecture

- ARM_based 1066MHz storage I/O processor
- 512MB on-board DDR3-1066 SDRAM with ECC protection
- PCIe 2.0 x4 bus
- Support both 2280 and 22110 form factor M.2 drives
- Write-through or write-back cache support
- Multi-adapter support for large storage requirements
- BIOS boot support for greater fault tolerance
- BIOS PnP (plug and play) and BBS (BIOS boot specification) support
- NVRAM for RAID event & transaction log
- Boot support for the uEFI host BIOS
- Redundant flash image for controller availability
- RoHS compliant
- Supercapacitor on-board support NVMe off module power loss protection Disk activity/fault LED on bracket

RAID Features

- RAID level 0, 1, Single Disk and JBOD
- Configurable stripe size up to 1024KB
- Multiple RAID selection
- Online array roaming
- Online RAID level/stripe size migration
- Online capacity expansion and RAID level migration simultaneously
- Instant availability and background initialization
- Automatic drive insertion/removal detection and rebuilding
- Greater than 2TB capacity per disk drive support
- SED (self-encrypting drives) function support
- Support intelligent power management to save energy and extend service life
- SSD automatic monitor clone (AMC)
- Support NTP protocol synchronize RAID adapter clock over the on board Ethernet port

Monitors/Notification

- System status indication through global individual M.2 fault LED and alarm buzzer
- SMTP support for email notification
- SNMP support for remote manager

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RAID Management

- Field-upgradeable firmware in flash ROM

In-Band Manager

- Hot key "boot-up" McBIOS RAID manager via M/B BIOS
- Web browser-based McRAID storage manager via ArchHTTP proxy server for all operating systems
- Support Command Line Interface (CLI)
- API library for customer to write monitor utility
- Single Admin Portal (SAP) monitor utility

Out-of-Band Manager

- Support Out-of-Band management via Ethernet port

Operating System

- Windows 10/11(64-bit)/2022/2019/2016(64bit)
- Linux
- FreeBSD
- VMware
- MacOS

(For latest supported OS listing visit <https://www.areca.com.tw>)

RAID adapters	
Model name	ARC-1203-2N
I/O Processor	ARM_based 1066MHz storage I/O processor
Form Factor (H x L)	Low Profile: 64.4 x 134 mm
Host Bus Type	PCIe 2.0 x 4
Drive Connector	2 x M.2 Cconnectors, PCIe 2.0 x1
RAID Level	0,1, Single Disk and JBOD
On-Board Cache	512MB on-board DDR3-1066 SDRAM with ECC protection
Management Port	In-Band: PCIe / Out-of-Band: Lan port

Note:

Low-profile bracket has included on the low profile board shipping package.

HARDWARE INSTALLATION

2. Hardware Installation

This section describes the procedures for installing the ARC-1203-2N RAID adapters.

2.1 Before You First Installing

Thanks for purchasing the RAID adapter as your RAID data storage system. This user manual gives simple step-by-step instructions for installing and configuring the RAID adapter. To ensure personal safety and to protect your equipment and data, reading the following information package list carefully before you begin installing.

Package Contents

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

- 1 x ARC-1203-2N RAID adapter in an ESD-protective bag
- 1 x Quick start guide
- 1 x Low-profile bracket

2.2 Board Layout

The ARC-1203-2N offers 2 x M.2 slots. This section provides the board layout and connector/ LED for the RAID adapter.

HARDWARE INSTALLATION

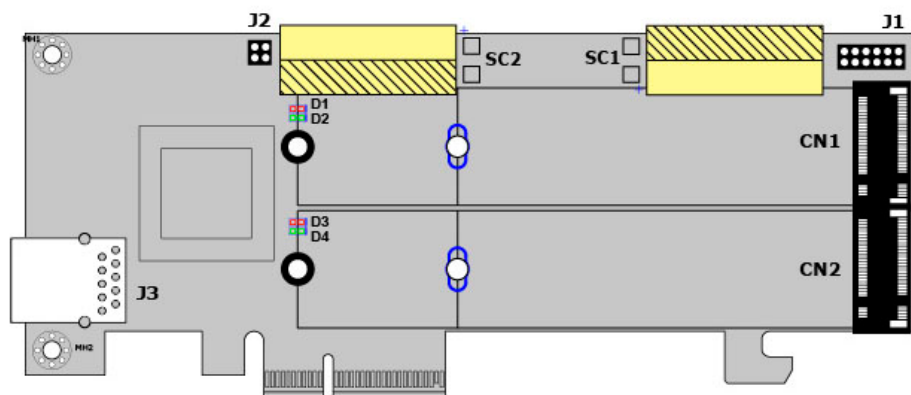


Figure 2-1, ARC-1203-2N RAID adapter

Components	Type	Description
1. (J1)	Manufacture Purpose Port	12-pin header
2. (J2)	Global fault / activity	4-pin box header
3. (J3)	Ethernert Port	RJ45
4. (SC1)	on-board hold up supercapacitor	
5. (SC2)	on-board hold up supercapacitor	
6. (CN1)~(CN2)	M.2 SSD Slot 1 ~ 2	M.2 M-Key Slot
7. (D1), (D2)	Fault LED for Slot 1 ~ 2	Fault LED
8. (D3), (D4)	Activity LED for Slot 1 ~ 2	Activity LED

Table 2-1, ARC-1203-2N connectors

HARDWARE INSTALLATION

Tools Required

An ESD grounding strap or mat is required. Also required are standard hand tools to open your system's case.

System Requirement

The ARC-1203-2N RAID adapter can be installed in an universal PCIe slot and requires a motherboard that:

ARC-1203-2N RAID adapter requires:

- Comply with the PCIe 2.0 x4 lane
- Backward-compatible with PCIe 1.0

Optional cables are required to connect global activity LED and fault LED on the enclosure to the RAID adapter.

Installation Tools

The following items may be needed to assist with installing the RAID adapter into an available PCIe expansion slot.

- Small screwdriver
- Host system hardware manuals and manuals for the disk or enclosure being installed.

Personal Safety Instructions

Use the following safety instructions to help you protect your computer system from potential damage and to ensure your own personal safety.

- Always wear a grounding strap or work on an ESD-protective mat.
- Before opening the system cover, turn off power switches and unplug the power cords. Do not reconnect the power cords until you have replaced the covers.

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Electrostatic Discharge

Static electricity can cause serious damage to the electronic components on this RAID adapter. To avoid damage caused by electrostatic discharge, observe the following precautions:

- Do not remove the RAID adapter from its antistatic packaging until you are ready to install it into a computer case.
- Handle the RAID adapter by its edges or by the metal mounting brackets at its each end.
- Before you handle the RAID adapter in any way, touch a grounded, anti-static surface, such as an unpainted portion of the system chassis, for a few seconds to discharge any built-up static electricity.

Warning:

High voltages may be found inside computer equipment. Before installing any of the hardware in this package or removing the protective covers of any computer equipment, turn off power switches and disconnect power cords. Do not reconnect the power cords until you have replaced the covers.

HARDWARE INSTALLATION

2.3 Installation

Use the following instructions below to install a RAID adapter.

Step 1. Unpack

Unpack and remove the RAID adapter from the package. Inspect it carefully, if anything is missing or damaged, contact your local dealer.

Step 2. Mount the Drives

If you use 2280 M.2 NVMe SSD...

- (1) Gently insert the SSD into slot and fasten SSD with the board latch
- (3) Repeat steps 1 to 3 to install the remaining SSDs

If you use 22110 M.2 NVMe SSD...

- (*1) Turn the latch 90° clockwise or counterclockwise to remove it and also remove six screws on the board, and then stuff the black plastic plugs into the holes
- (*2) Gently insert the SSD into slot, meanwhile put the screw into the groove and fasten the screw to secure SSD
- (*3) Repeat steps (*1) to (*2) to install the remaining SSDs

Step 3. Power PC/Server Off

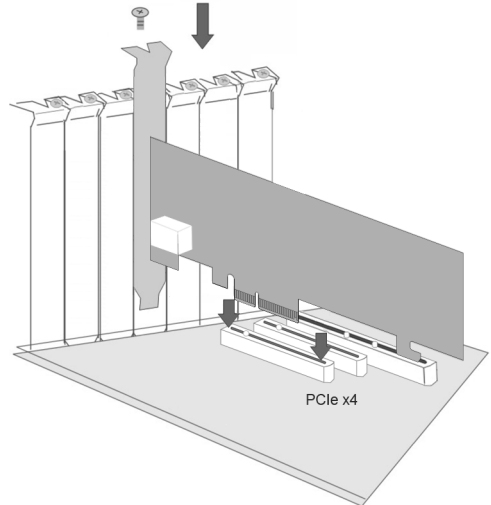
Turn off computer and remove the AC power cord. Remove the system's cover. For the instructions, please see the computer system documentation.

Step 4. Install the PCIe NVMe RAID Cards

To install the RAID adapter, remove the mounting screw and existing bracket from the rear panel behind the selected PCIe 2.0 slot. Align the gold-fingered edge on the card with the selected PCIe 2.0 slot. Press down gently but firmly to ensure that the card is properly seated in the slot, as shown on Figure 2-2. Then, screw the bracket into the computer chassis.

HARDWARE INSTALLATION

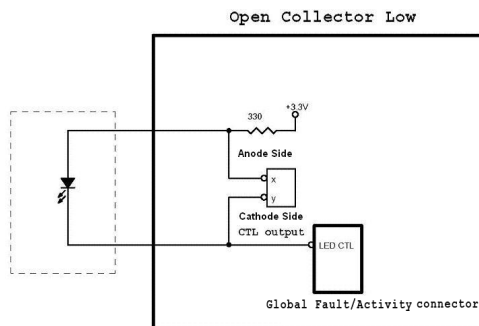
Figure 2-2, Insert into a PCIe slot



Step 5. Install the LED Cable (Optional)

The Raid adapter provides global indicator connector is used by the server/desktop system global indicator LED.

The following electronics schematic is the RAID adapter logical of global fault/activity header.



Note:

A cable for the global indicator comes with your computer system.

HARDWARE INSTALLATION

The following table is the global fault/activity LED signal behavior.

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

If the system will use global indicator, attach the LED to the two pins of the global activity/fault connector. The global activity/fault pin pair connector is the overall activity/fault signal.

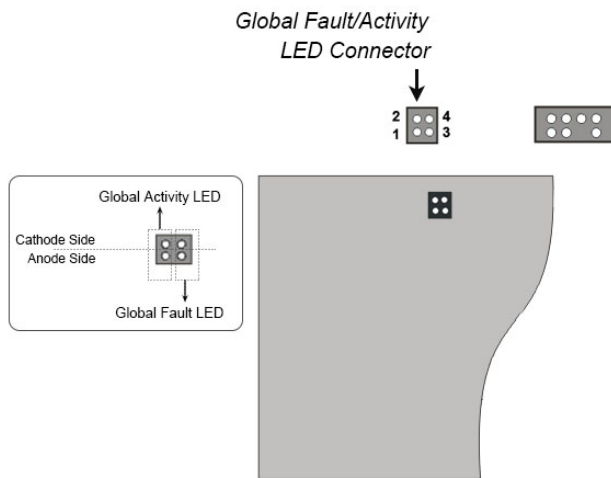


Figure 2-3, ARC-1203-2N global indicator connector for computer case.

HARDWARE INSTALLATION

Step 6. Power up the System

Thoroughly check the installation, reinstall the computer cover, and reconnect the power cord cables. Turn on the power switch at the rear of the computer (if equipped) and then press the power button at the front of the host computer.

Step 7. Install the Adapter Driver

For NVMe Mode:

- ARC-1203-2N RAID adapter use OS NVMe host (native) driver, no driver installation needed.

For Areca Legacy Mode Only

For a new system:

- Driver installation usually takes places as part of operating system installation. Please refer to Chapter 4 "Diver Installation" for the detailed installation procedure.

For In an existing system:

- To install the controller driver into the existing operating system. For the detailed installation procedure, please refer to the Chapter 4, "Driver Installation".

Step 8. Install ArchHTTP Proxy Server

The RAID adapter firmware has embedded the web-browser McRAID storage manager. ArchHTTP proxy server will launch the web-browser McRAID storage manager. It provides all of the creation, management and monitor RAID adapter status. Please refer to the Chapter 5 for the detail "ArchHTTP Proxy Server Installation". For SNMP agent function, please see the "SNMP Operation & Installation" section in the Appendix B of the user manual.

Step 9. Configure Volume Set

The adapter configures RAID functionality through the McBIOS RAID manager. Please refer to Chapter 3 of the user manual, McBIOS RAID Manager, for the detail. The RAID adapter can also be configured through the McRAID storage manager with ArchHTTP proxy server installed or through on-board LAN port and LCD module (refer to LCD manual). For McRAID storage manager option,

HARDWARE INSTALLATION

please refer to Chapter 6 of the user manual, Web Browser-Based Configuration.

Step 10. Format, Partition and Mount the ARC-1203-2N RAID adapter Volumes

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

Step 11. Determining the Boot Sequences

The RAID adapter is a bootable device. You can use it as primary boot drive or secondary storage drive. If your system already contains a bootable device with an installed operating system, you can set up your system to boot a second operating system from the new RAID adapter volume.

For PC system:

To add a second bootable adapter, you may need to enter setup of motherboard BIOS and change the device boot sequence so that the new RAID adapter heads the list. If the system BIOS setup does not allow this change, your system may be not configurable to allow the RAID adapter to act as a second boot device.

For Apple Mac Pro system:

Areca adapter has supported the EFI BIOS on the PCIe 2.0 RAID adapter. You have other alternatively to add volumes on the Intel-based Mac bootable device listing. You can follow the following procedures to add the RAID adapter on the Mac bootable device listing.

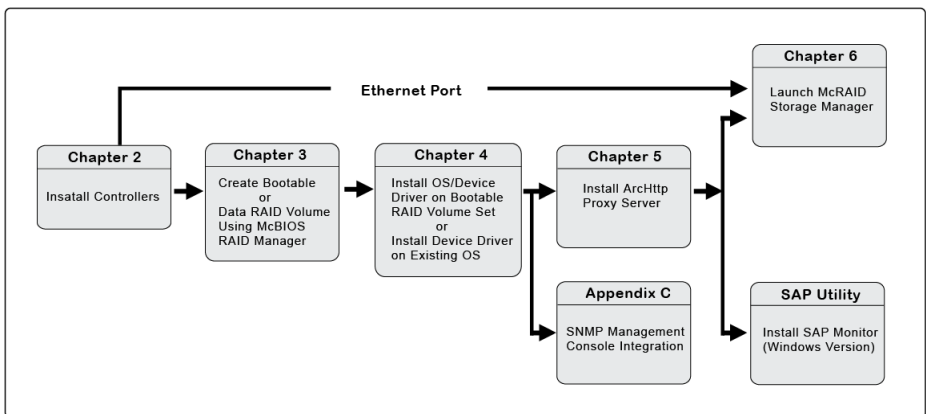
1. Set the BIOS selection in System Controls: Advance Configuration to "EFI" option for Intel-based MacPro boot.
2. Download OS X Mavericks and DiskMaker X. Follow the DiskMaker X to make a bootable OS X Mavericks USB install drive.

HARDWARE INSTALLATION

3. Restart your Mac and after you hear the chime sound, press the Option (Alt) key until you see the option to choose the flash drive to boot from.
4. Follow the on-screen prompts to complete Areca Volume Upgrade and Clean Install of macOS. Power up the Intel-based Mac and Areca volume will be added in the bootable device automatically.

2.4 Summary of the installation

The flow chart below describes the installation procedures for RAID adapter.



These procedures includes hardware installation, the creation and configuration of a RAID volume through the McBIOS/McRAID manager, OS installation and installation of RAID adapter software.

The software components configure and monitor the RAID adapters as following table.

HARDWARE INSTALLATION

Configuration Utility	Operating System Supported
McBIOS RAID Manager	OS-Independent
McRAID Storage Manager (Via Ethernet port)	OS-Independent
McRAID Storage Manager (Via ArchHTTP proxy server)	Windows, Linux, FreeBSD and macOS
ArchHTTP Proxy Server	Windows, Linux, FreeBSD and macOS
CLI Utility	Windows, Linux, FreeBSD, Vmware and macOS
SNMP Manager Console Integration	Windows, Linux and FreeBSD
SAP Monitor (Single Admin Portal to manage multiple RAID units in the network, via ArchHTTP proxy)	macOS / Windows

McRAID Storage Manager

Before launching the firmware-embedded web browser, McRAID storage manager through the PCIe bus, you need first to install the ArchHTTP proxy server on your server system. If you need additional information about installation and start-up of this function, see the McRAID Storage Manager section in Chapter 6 of the user manual.

ArchHTTP Proxy Server

ArchHTTP has to be installed for GUI RAID console (McRAID storage manager) to run. It is used to launch the web browser McRAID storage manager. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. If you need additional information about installation and start-up of this function, see the ArchHTTP Proxy Server Installation section in Chapter 5 of the user manual.

CLI Utility

CLI (Command Line Interface) lets you set up and manage RAID adapter through a command line interface. CLI performs many tasks at the command line. You can download CLI manual from Areca website <https://www.areca.com.tw>.

HARDWARE INSTALLATION

SNMP Manager Console Integration

There are two ways to transport SNMP data on the RAID adapter: in-band PCIe host bus interface or out-of-band built-in LAN interface. Enter the "SNMP Tarp IP Address" option on the firmware-embedded SNMP configuration function for user to select the SNMP data agent-side communication from the out-of-band built-in LAN interface. To use in-band PCIe host bus interface, keep blank on the "SNMP Tarp IP Address" options.

- **Out of Band-Using LAN Port Interface**

Out-of-band interface refers to transport SNMP data of tri-mode RAID adapters from a remote station connected to the adapter through a network cable. Before launching the SNMP manager on the client, you need firstly to enable the firmware-embedded SNMP agent function and no additional agent software inquired on your server system. If you need additional information about installation and start-up this function, see the section 6.9.6 "SNMP Configuration" of the user manual.

- **In-Band-Using PCIe Host Bus Interface**

In-band interface refers to management of the SNMP data of RAID adapter from a PCIe host bus. In-band interface is simpler than out-of-band interface for it requires less hardware in its configuration. Since the RAID adapter is already installed in the host system, no extra connection is necessary.

Just load the necessary in-band Areca SNMP extension agent for the controllers. Before launching the SNMP agent in the sever, you need first to enable the firmware-embedded SNMP community configuration and install Areca SNMP extension agent in your server system. If you need additional information about installation and start-up the function, see the SNMP Operation & Installation section in the Appendix B of the user manual.

Single Admin Portal (ArcSAP) Monitor

This utility can scan for multiple RAID units in the local and remote systems and provide an effective mechanism to configure and monitor your RAID units. For additional information, see the utility manual (ArcSAP) from the web site **<http://www.areca.com.tw>**

BIOS CONFIGURATION

3. McBIOS RAID Manager

The system mainboard BIOS automatically configures the following RAID adapter parameters at power-up:

- I/O Port Address
- Interrupt Channel (IRQ)
- Controller ROM Base Address

Use McBIOS RAID manager to further configure the RAID adapter to suit your server hardware and operating system.

3.1 Starting the McBIOS RAID Manager

The McBIOS RAID manager is designed to be user-friendly. It is a menu-driven program, residing in the firmware, which allows you to scroll through various menus and sub-menus and select among the predetermined configuration options. This section explains how to launch the McBIOS RAID setup utility to configure your RAID adapters that the installed motherboard 'BIOS Mode' is either **Legacy** or **UEFI**.

1. **M/B BIOS mode:** Legacy, or UEFI BIOS with the CSM (compatibility support module) option = enabled

When starting a system with a RAID adapter installed, it will display the following message on the monitor during the start-up sequence (after the system BIOS startup screen but before the operating system boots):

```
ARC-1203-2N PCIe4/5.0G RAID Controller - DRAM: 512(MB) / #Channels: 8
BIOS: V1.30 / Date: 2018-08-07          - F/W: V1.70 / Date: 2024-05-06
```

```
▶ Bus/Dev/Fun= 1/0/0, I/O-Port=FB10000h, IRQ=11, BIOS=CF00 : 0h
▶▶ ID-LUN=00-0, Vol="Areca ARC-1203-VOL#000R001", Size=232 (GB)
▶▶ RAID adapter BIOS not installed!
▶▶ Press <Tab/F6> to enter SETUP menu. 9 second(s) left <ESC to Skip>..
```

BIOS CONFIGURATION

The McBIOS RAID manager message remains on your screen for about nine seconds, giving you time to start the configuration 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 RAID manager window appears showing a selection dialog box listing the RAID adapters that are installed in the system. The legend at the bottom of the screen shows you what keys are enabled for the windows.

2. **M/B BIOS mode:** UEFI and CSM (compatibility support module) option = disabled

After firmware version 1.65 package, Areca RAID card ARC-1203FIRM.BIN code creates a virtual bootable disk (UEFI OS) for the ARC-1203UEFI.BIN code to launch the McBIOS setup utility. When user chooses to boot from the virtual disk in M/B setup, the McBIOS setup utility is launched through boot into UEFI OS during M/B boot. Follow below procedures to launch it.

- a). Add RAID adapters "UEFI OS(Areca A....)" in the M/B boot option: You must enter the setup of motherboard BIOS and add UEFI OS to the boot option if your motherboard BIOS does not automatically add it.
- b). Restart your motherboard to boot from UEFI OS. The motherboard vendors provide two methods for choosing a boot device: Enter boot menu by using hotkey or enter boot menu through BIOS configuration.

Note:

UEFI OS is not loaded when setting the 'Secure Boot' option=enabled in M/B BIOS setup.

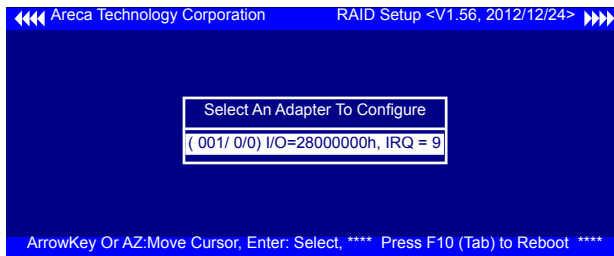
- c). When booted, the McBIOS RAID setup window appears showing the main menu of the RAID adapters that are installed in the system. If there have more than two RAID adapters installed in the system, it will show a selection for user to choose one to configure the RAID adapter.
- d). Follow the on-screen prompts to complete the configuration.

BIOS CONFIGURATION

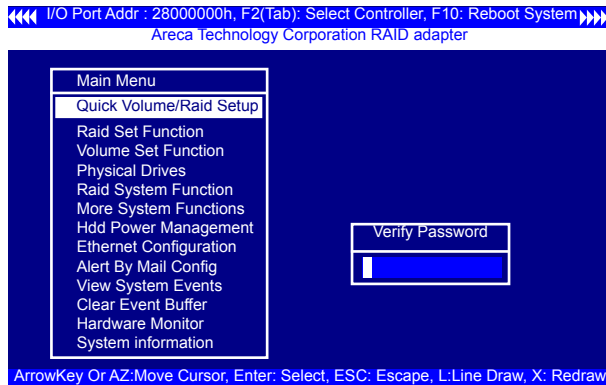
After using "F10" to exit, you can enter " shell>exit" or need to hard power cycle it.

- e). Enter the setup of motherboard BIOS to disable or adjust UEFI OS in the boot option priorities if it is the first priority of overall boot order. Otherwise the system will always boot into UEFI OS without using the hotkey.

McBIOS setup utility operates upon a single RAID adapter at a time. A selection dialog box listing the RAID adapters that are installed in the system.



Use the **Up** and **Down** arrow keys to select the controller you want to configure. While the desired controller is highlighted, press the **Enter** key to enter the main menu of the McBIOS RAID manager.



Note:

The manufacture default password is set to **0000**; this password can be modified by selecting **Change Password** in the **Raid System Function** section.

BIOS CONFIGURATION

3.2 McBIOS RAID manager

The McBIOS RAID manager is firmware-based and is used to configure RAID sets and volume sets. Because the utility resides in the RAID adapter firmware, operation is independent of any operating systems on your computer. This utility can be used to:

- Create RAID sets,
- Expand RAID sets,
- Add physical drives,
- Define volume sets,
- Modify volume sets,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Modify system functions and
- Designate drives as hot spares.

3.3 Configuring Raid Sets and Volume Sets

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

3.4 Designating Drives as Hot Spares

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

BIOS CONFIGURATION

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

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

Choose the target disk by selecting the appropriate check box.

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

3.5 Using Quick Volume /Raid Setup Configuration

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

The default setting values can be changed after configuration is

Parameter	Setting
Volume Name	ARC-1203-VOL#00
SCSI Channel/SCSI ID/SCSI LUN	0/0/0
Cache Mode	Write-Back
Tag Queuing	Yes

BIOS CONFIGURATION

completed. Follow the steps below to create arrays using the "Raid Set / Volume Set" method:

Step	Action
1	Choose "Quick Volume /Raid Setup" from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed.
2	<p>It is recommended that you use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will be set to the capacity of the smallest drive in the RAID set.</p> <p>The numbers of physical drives in a specific array determines which RAID levels that can be implemented in the array.</p> <p>RAID 0 requires 1 or more physical drives.</p> <p>RAID 1 requires at least 2 physical drives.</p> <p>Highlight the desired RAID level for the volume set and press the Enter key to confirm.</p>
3	<p>The capacity for the current volume set is entered after highlighting the desired RAID level and pressing the Enter key.</p> <p>The capacity for the current volume set is displayed. Use the UP and DOWN arrow keys to set the capacity of the volume set and press the Enter key to confirm. The available stripe sizes for the current volume set are then displayed.</p>
4	Use the UP and DOWN arrow keys to select the current volume set stripe size and press the Enter key to confirm. This parameter specifies the size of the stripes written to each disk in a RAID 0 or 1 volume set. You can set the stripe size to 4KB, 8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB, or 1024KB. A larger stripe size provides better read performance, especially when the computer preforms mostly sequential reads. However, if the computer preforms random read requests more often, choose a smaller stripe size.
5	When you are finished defining the volume set, press the Yes key to confirm the "Quick Volume And Raid Set Setup" function.
6	Foreground (Fast Completion) Press Enter key to define fast initialization or selected the Background (Instant Available) or No Init (To Rescue Volume). In the "Background Initialization", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In "Foreground Initialization", the initialization proceeds must be completed before the volume set ready for system accesses. In "No Init", there is no initialization on this volume.
7	Initialize the volume set you have just configured
8	If you need to add additional volume set, using main menu "Create Volume Set" function.

BIOS CONFIGURATION

3.6 Using Raid Set/Volume Set Function Method

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

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

Step	Action
1	To setup the hot spare (option), choose "Raid Set Function" from the main menu. Select the "Create Hot Spare" and press the Enter key to define the hot spare.
2	Choose "Raid Set Function" from the main menu. Select "Create Raid Set" and press the Enter key.
3	The "Select a Drive For Raid Set" window is displayed showing the NVMe drives connected to the RAID adapter.
4	Press the UP and DOWN arrow keys to select specific physical drives. Press the Enter key to associate the selected physical drive with the current RAID set. It is recommended that you use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will be set to the capacity of the smallest drive in the RAID set. The numbers of physical drives in a specific array determines which RAID levels that can be implemented in the array. RAID 0 requires 1 or more physical drives. RAID 1 requires at least 2 physical drives.
5	After adding the desired physical drives to the current RAID set, press the Enter to confirm the "Create Raid Set" function.
6	An "Edit The Raid Set Name" dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for this new RAID set. The default RAID set name will always appear as Raid Set. #. Press Enter key to finish the name editing.
7	Press the Enter key when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8.

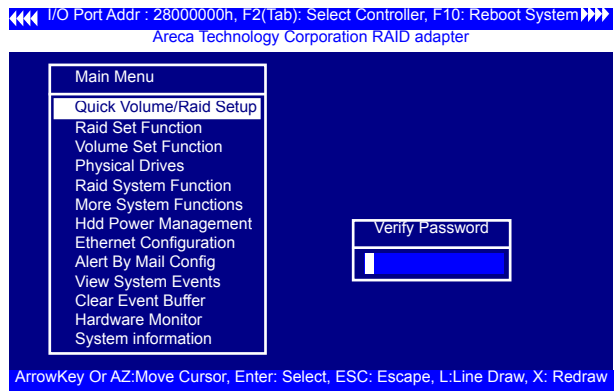
BIOS CONFIGURATION

8	Choose the "Volume Set Function" from the main menu. Select "Create Volume Set" and press the Enter key.
9	Choose a RAID set from the "Create Volume From Raid Set" window. Press the Yes key to confirm the selection.
10	Choosing Foreground (Fast Completion) Press Enter key to define fast initialization or selected the Background (Instant Available) or No Init (To Rescue Volume). In the "Background Initialization", the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In "Foreground Initialization", the initialization proceeds must be completed before the volume set ready for system accesses. In "No Init", there is no initialization on this volume.
11	If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 10 to configure another volume set.

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3.7 Main Menu

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



Note:

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

Option	Description
Quick Volume/Raid Setup	Create a default configuration based on the number of physical disk installed
Raid Set Function	Create a customized RAID set
Volume Set Function	Create a customized volume set
Physical Drives	View individual disk information
Raid System Function	Setup the RAID system configuration
Hdd Power Management	Manage HDD power based on usage patterns
View System Events	Record all system events in the buffer
Clear Event Buffer	Clear all information in the event buffer
Hardware Monitor	Show the hardware system environment status
System Information	View the controller system information

BIOS CONFIGURATION

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

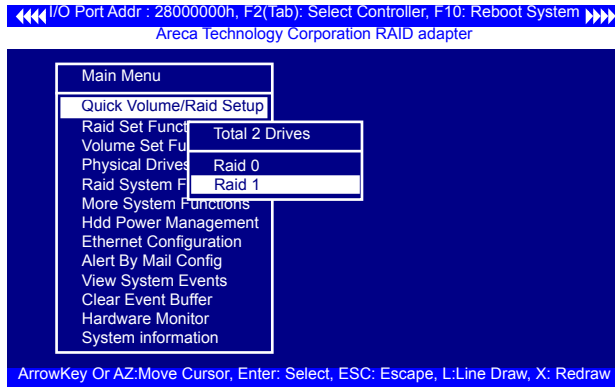
3.7.1 Quick Volume/Raid Setup

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

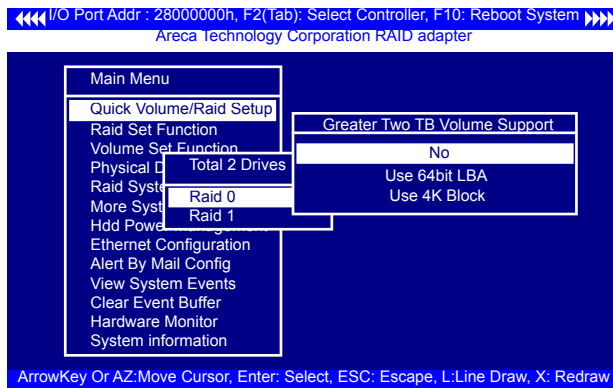
1. All of the physical drives are contained in one RAID set.
2. The RAID level, hot spare, capacity, and stripe size options are selected during the configuration process.
3. When a single volume set is created, it can consume all or a portion of the available disk capacity in this RAID set.
4. If you need to add an additional volume set, use the main menu "Create Volume Set" function.

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

BIOS CONFIGURATION



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



- **No**

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

- **Use 64bit LBA**

This option use 16 bytes CDB instead of 10 bytes. The maximum volume capacity up to 512TB. For any hard disk drives working in the 4K native mode in the Raid set, the volume set directly sets and exposes 4KB sector size to the operating system. This option works on different OS which supports 16 bytes CDB. Such as:

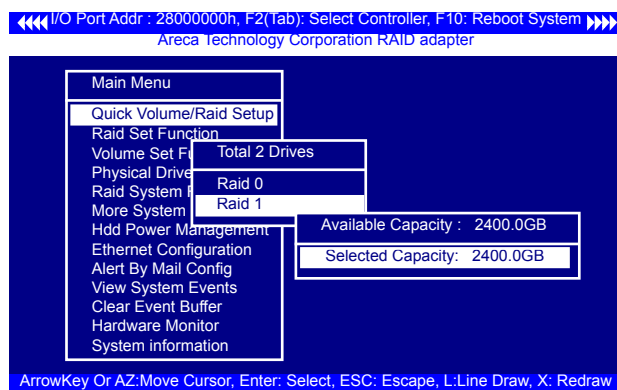
Windows 2003 with SP1 or later
Linux kernel 2.6.x or later

BIOS CONFIGURATION

- **Use 4K Block**

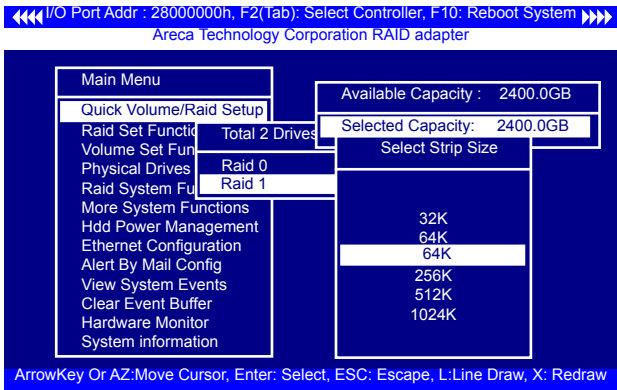
This option uses 16 bytes CDB and changes the sector size from default 512 bytes to 4k bytes. Windows XP only supports maximum volume capacity is up to 16TB.

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.

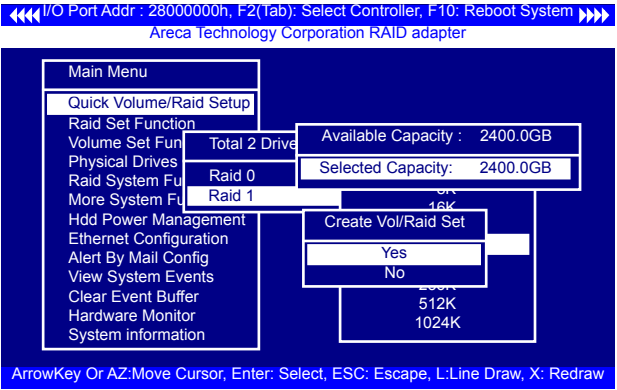


Stripe Size This parameter sets the size of the stripe written to each disk in a RAID 0 or 1 logical drive. You can set the stripe size to 32KB, 64KB, 128KB, 256KB, 512KB, or 1024KB. A larger stripe size produces better-read performance, especially

BIOS CONFIGURATION



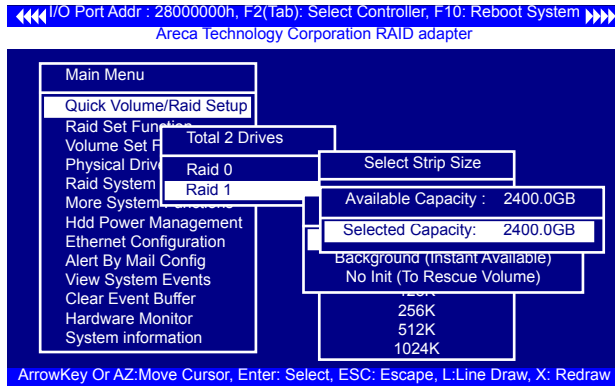
if your computer does mostly sequential reads. However, if you are sure that your computer performs random reads more often, select a smaller stripe size.
Press **Yes** key in the "Create Vol/Raid Set" dialog box, the RAID



set and volume set will start to initialize it.

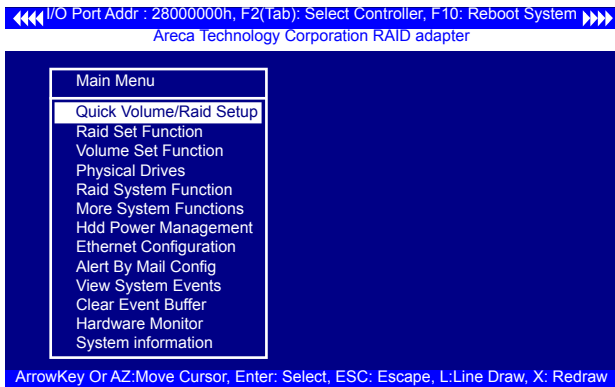
Select "Foreground (Faster Completion)" or "Background (Instant Available)" for initialization and "No Init (To Rescue Volume)" for recovering the missing RAID set configuration.

BIOS CONFIGURATION



3.7.2 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.



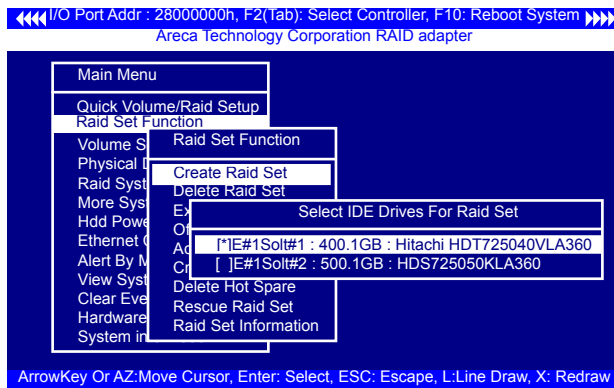
BIOS CONFIGURATION

3.7.2.1 Create Raid Set

The following summaries are the RAID set features for the RAID adapter. Up to 2 disk drives can be included in a single RAID set.

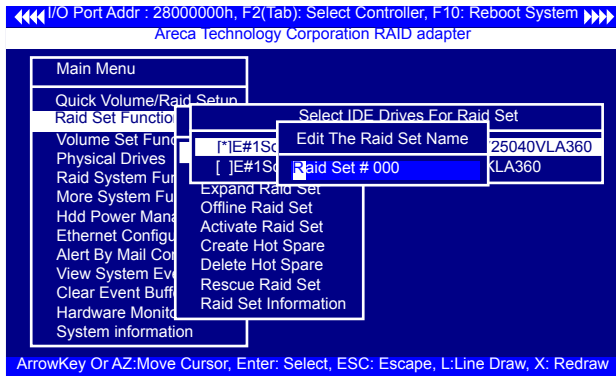
To define a RAID set, follow the procedures below:

- (1). Select "Raid Set Function" from the main menu.
- (2). Select "Create Raid Set" from the "Raid Set Function" dialog box.
- (3). A "Select IDE Drive For Raid Set" window is displayed showing the SATA drives connected to the current adapter. 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 SATA drives for RAID set, press **Esc** key. A "Create Raid Set Confirmation" screen will appear, select the **Yes** option to confirm it.



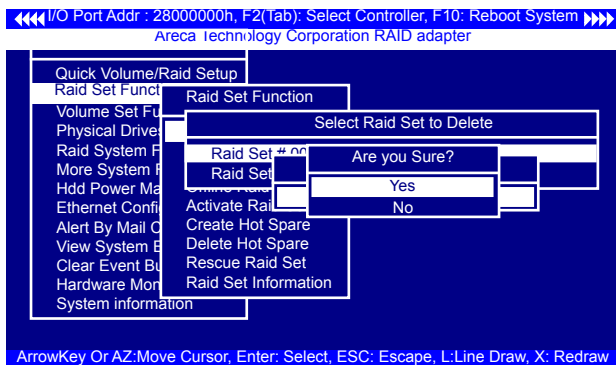
- (4). An "Edit The Raid Set Name" dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for the RAID set. The default RAID set name will always appear as Raid Set #.
- (5). Repeat steps (3) to define another RAID sets.

BIOS CONFIGURATION



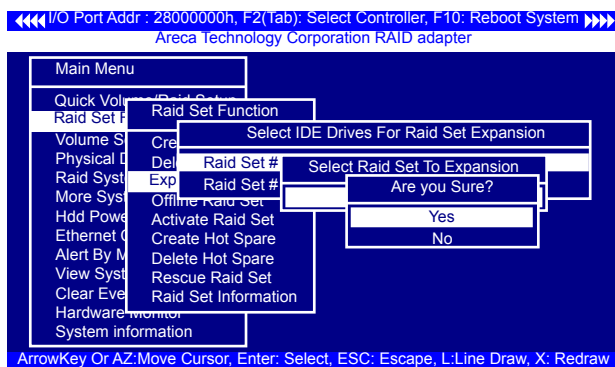
3.7.2.2 Delete Raid Set

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.



BIOS CONFIGURATION

3.7.2.3 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 sets 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 radius 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.

Caution:

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

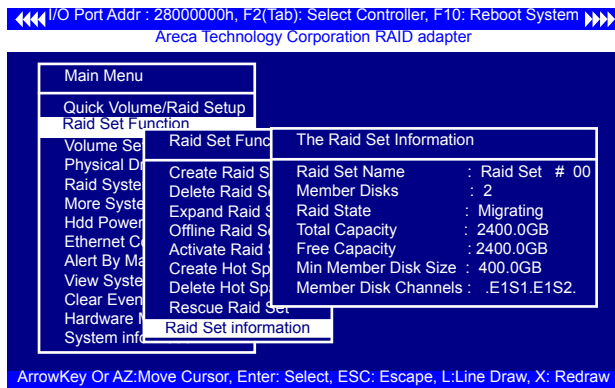
BIOS CONFIGURATION

Note:

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

• Migrating

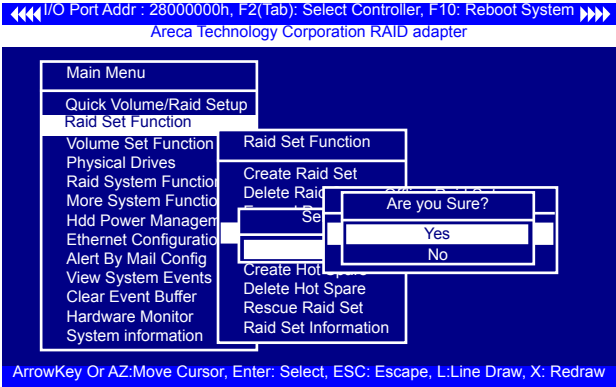
Migration occurs when a disk is added to a RAID set. Migrating state is displayed in the RAID state area of "The Raid Set Information" screen when a disk is being added to a RAID set. Migrating state is also displayed in the associated volume state area of the "Volume Set Information" which belongs this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



3.7.2.4 Offline Raid Set

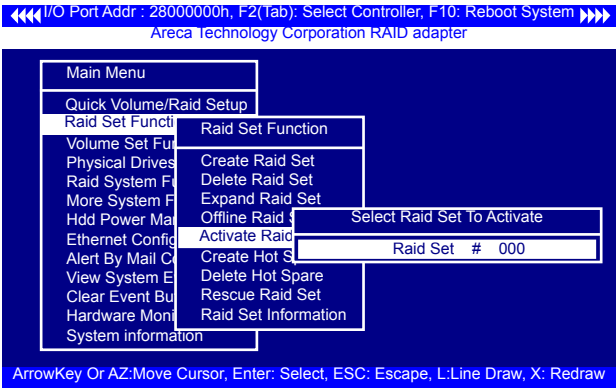
This function is for customer being able to unmount and re-mount a multi-disk volume. All Hdds of the selected RAID set will be put into offline state and spun down and fault LED will be in fast blinking mode.

BIOS CONFIGURATION



3.7.2.5 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 adapter is powered on, the user can use the "Activate Incomplete Raid Set" option to activate the RAID set. After user selects this function, the RAID state will change to "Degraded Mode" and start to work.



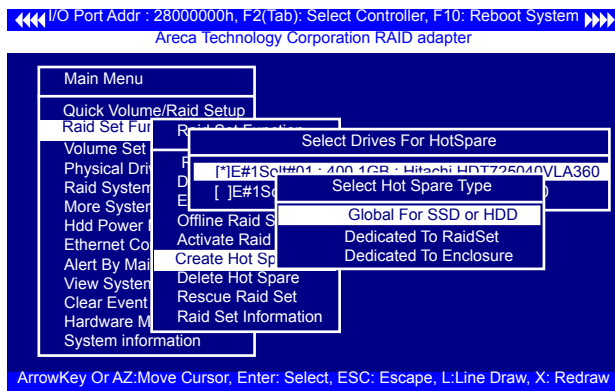
BIOS CONFIGURATION

3.7.2.6 Create Hot Spare

When you choose the "Create Hot Spare" option in the "Raid Set Function", all unused physical devices connected to the current adapter 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. Under "Global For SSD or HDD" option, SSD hot spare is used to rebuild failed SSD and HDD hot spare for rebuild failed HDD. 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.

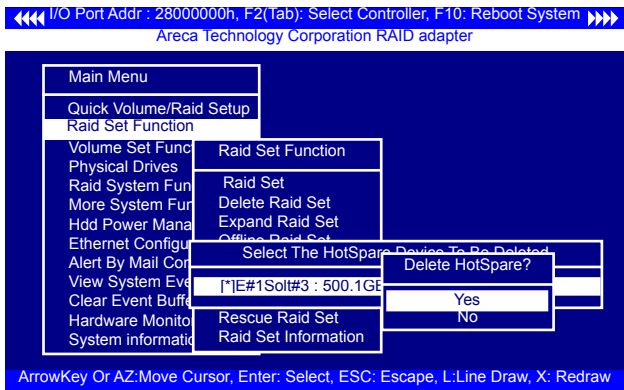


3.7.2.7 Delete Hot Spare

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

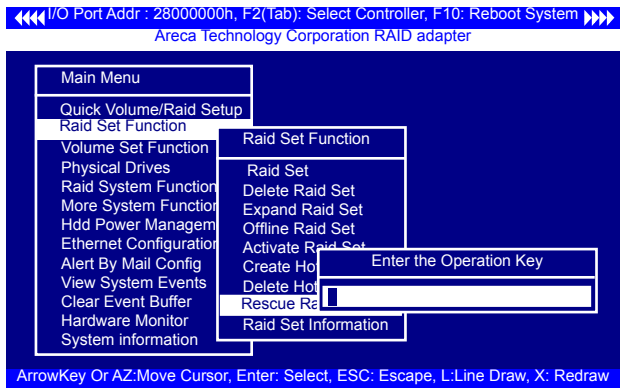
Press the **Enter** key to select a hot spare disk drive, and press **Yes** in the "Delete Hot Spare" screen to delete the hot spare.

BIOS CONFIGURATION



3.7.2.8 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 adapter 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.



Caution:

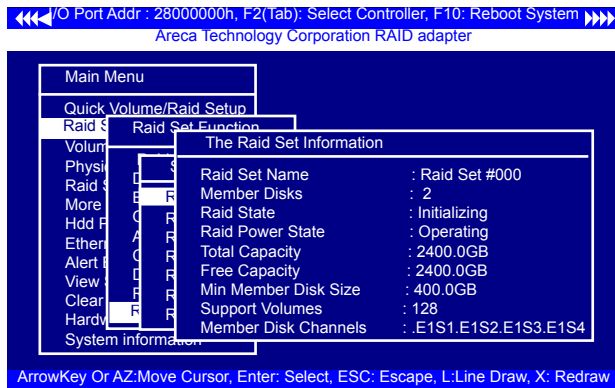
Please contact us to make sure if you need to use rescue function. Improperly usage may cause configuration corruption.

BIOS CONFIGURATION

Once can manually fail a drive, which is useful in kill-off slow speed disk. There is nothing physically wrong with the disk. A manually failed the drive can be rebuilt by the hot spare and brought back on-line.

3.7.2.9 Raid Set Information

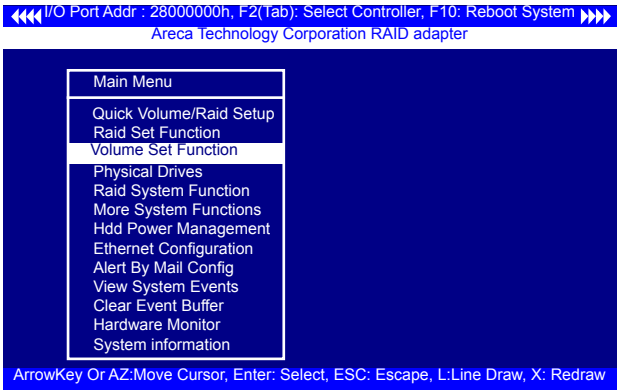
To display RAID set information, move the cursor bar to the desired RAID set number, then press the **Enter** key. The "Raid Set Information" will appear. You can only view information for the RAID set in this screen.



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 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.

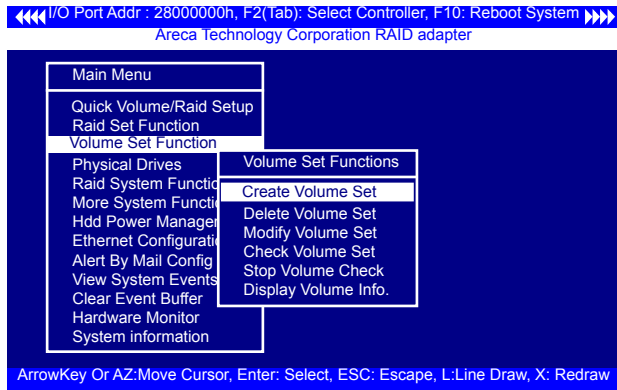
BIOS CONFIGURATION



The following summaries are the volume set features for the RAID adapter.

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.

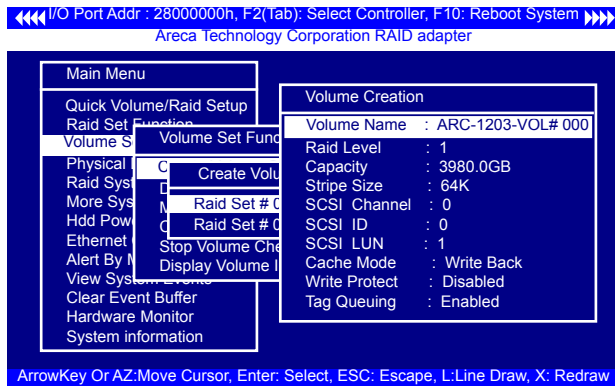
3.7.3.1 Create Volume Set (0/1)



BIOS CONFIGURATION

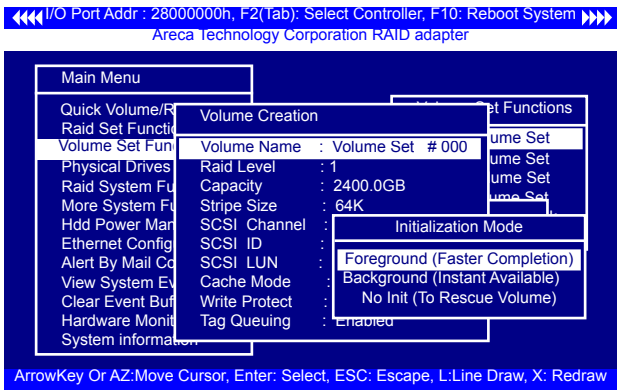
To create a volume set, following the steps:

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, and 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.

BIOS CONFIGURATION



- Repeat steps 3 to 5 to create additional volume sets.
- The initialization percentage of volume set will be displayed at the bottom line.

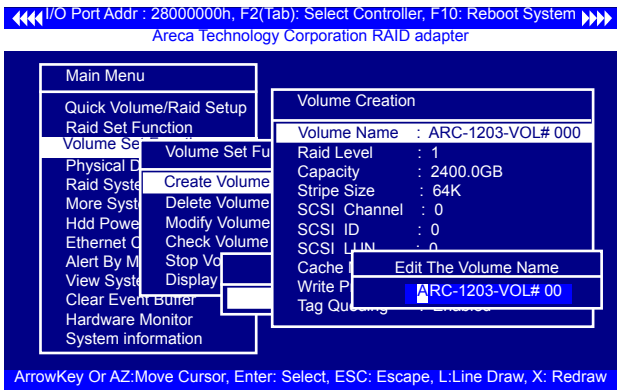
Note:

Controller starts to initialize the volume in two conditions

- Stay in controller bios manager or
- Boot into OS and the controller driver loaded.

● Volume Name

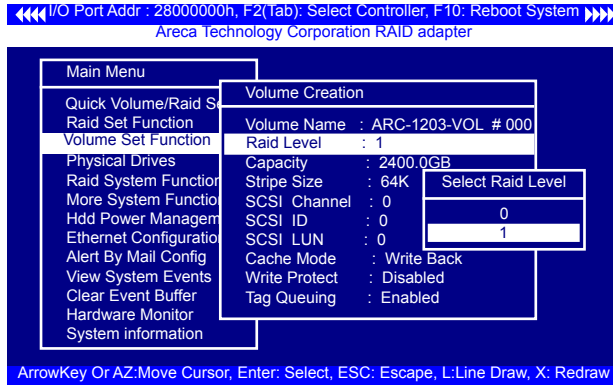
The default volume name will always appear as ARC-1203-VOL #. You can rename the volume set providing it does not exceed the 15 characters limit.



BIOS CONFIGURATION

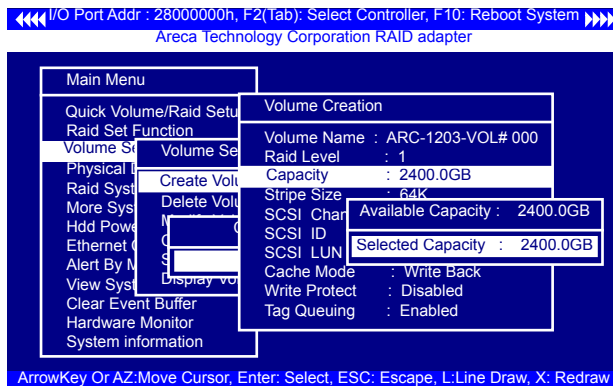
● Raid Level

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.



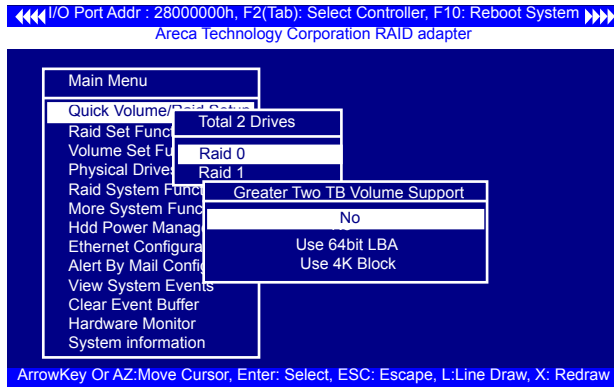
● Capacity

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



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



- No

When this option is enabled, it keeps the volume size with max. 2TB limitation. For any hard disk drives working in the 4K native mode in the Raid set, the volume set directly sets and exposes 4KB sector size to the operating system.

- Use 64bit LBA

This option use 16 bytes CDB instead of 10 bytes. The maximum volume capacity up to 512TB. For any hard disk drives working in the 4K native mode in the Raid set, the volume set directly sets and exposes 4KB sector size to the operating system. This option works on different OS which supports 16 bytes CDB. Such as:

Windows 2003 with SP1 or later

Linux kernel 2.6.x or later

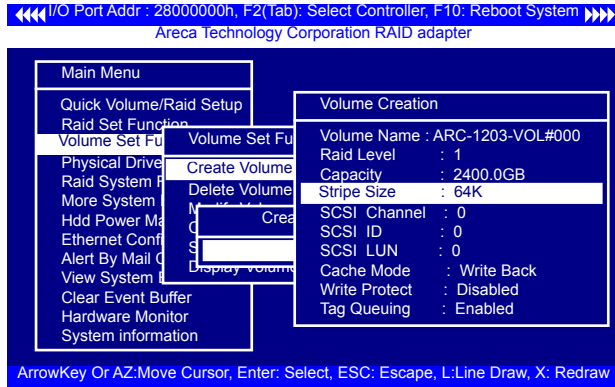
- Use 4K Block

This option uses 16 bytes CDB and changes the sector size from default 512 bytes to 4k bytes. Windows XP only supports maximum volume capacity is up to 16TB.

BIOS CONFIGURATION

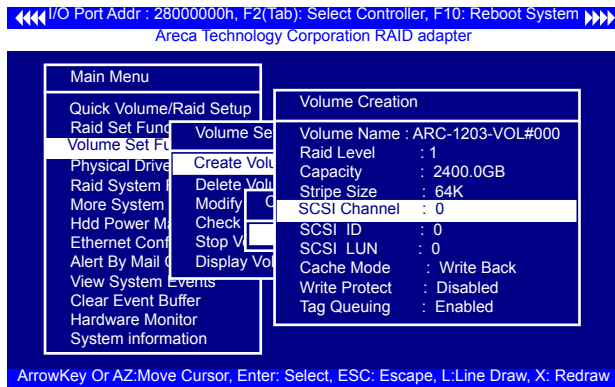
• Stripe Size

This parameter sets the size of segment written to each disk in a RAID 0 or 1 logical drive. You can set the stripe size to 32KB, 64KB, 128KB, 256KB, 512KB, or 1024KB.



• SCSI Channel

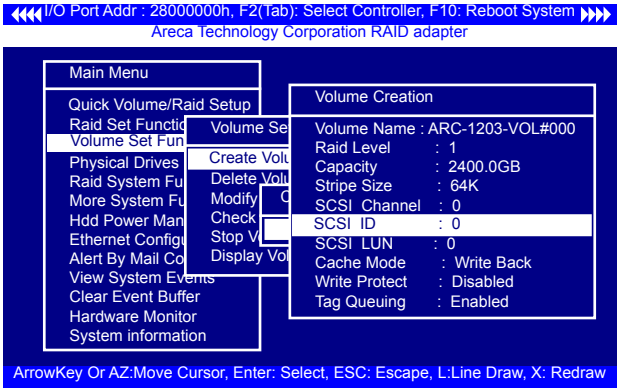
The NVMe RAID adapter function simulates an internal SCSI RAID adapter. The host bus represents the SCSI channel. Choose the "SCSI Channel". A "Select SCSI Channel" dialog box appears; select the channel number and press the **Enter** key to confirm it.



BIOS CONFIGURATION

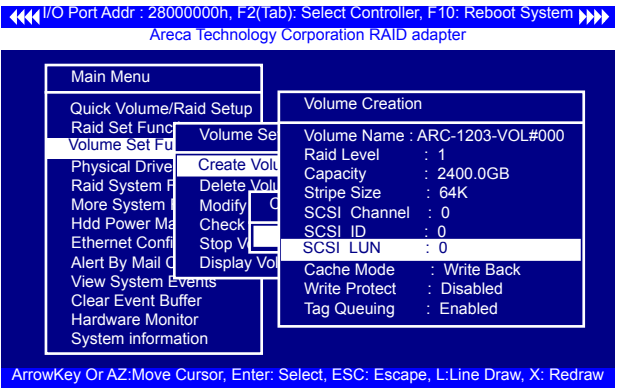
- **SCSI ID**

Each device attached to the RAID adapter, as well as the RAID adapter itself, must be assigned a unique SCSI ID number. A SCSI channel can connect up to 15 devices. It is necessary to assign a SCSI ID to each device from a list of available SCSI IDs.



- **SCSI LUN**

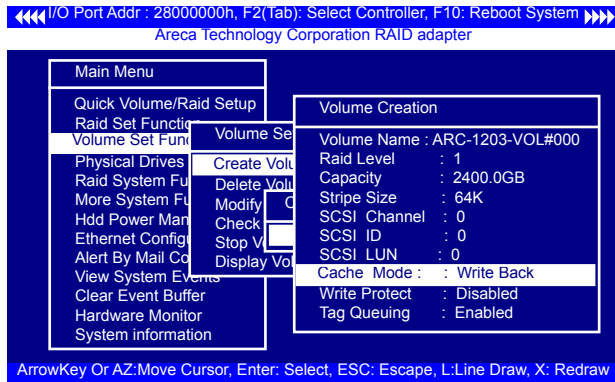
Each SCSI ID can support up to 8 LUNs. Most Raid adapter treat each LUN as if it were a NVMe disk.



BIOS CONFIGURATION

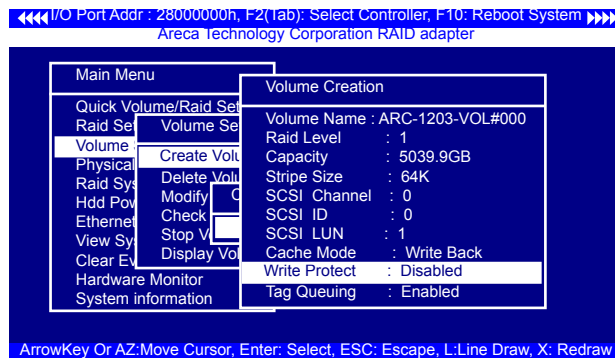
● Cache Mode

User can set the cache mode to either “Write Through” or “Write Back”.



● Write Protect

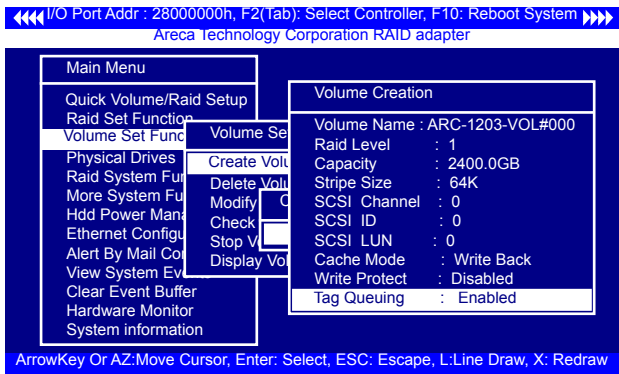
When “Write Protect” is enabled on the “Create Volume Set”, host commands fail if they are issued to a volume in that RAID adapter and attempt to modify a volume’s data or attributes. “Write Protection” is used primarily for customer-initiated disaster recovery testing.



BIOS CONFIGURATION

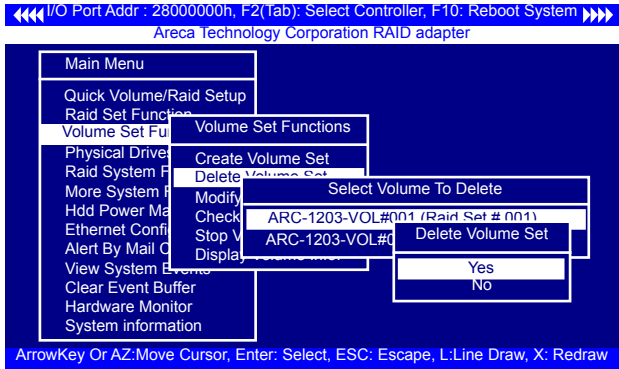
- **Tag Queuing**

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



3.7.3.2 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** key to delete it.

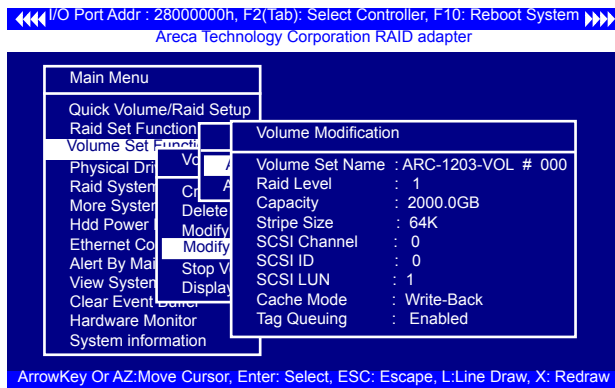


BIOS CONFIGURATION

3.7.3.3 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.



3.7.3.3.1 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.

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To expand an existing volume noticed:

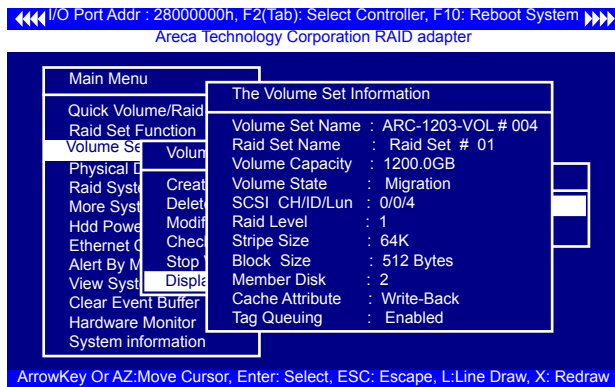
- Only the last volume can expand capacity.
- When expand volume capacity, you can't modify stripe size or modify RAID level simultaneously.
- You can expand volume capacity, but can't reduce volume capacity size.
- After volume expansion, the volume capacity can not be decreased.

For greater 2TB expansion:

- If your system installed in the volume, don't expand the volume capacity greater 2TB; except your OS and RAID adapter can support boot up from a greater 2TB capacity device.
- Expand over 2TB used 64bit LBA mode. Please make sure your OS supports 64bit LBA before expand it.

3.7.3.3.2 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.



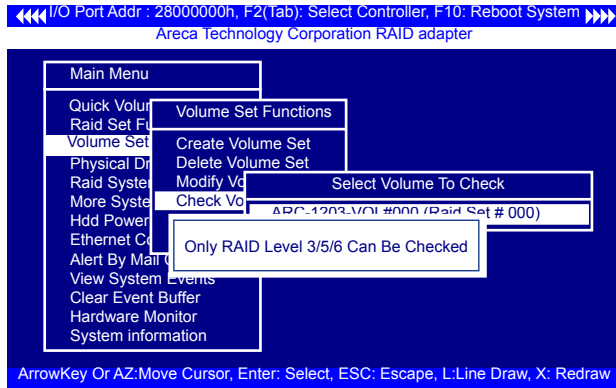
Note:

Power failure may damage the migration data. Please back-up the RAID data before you start the migration function.

BIOS CONFIGURATION

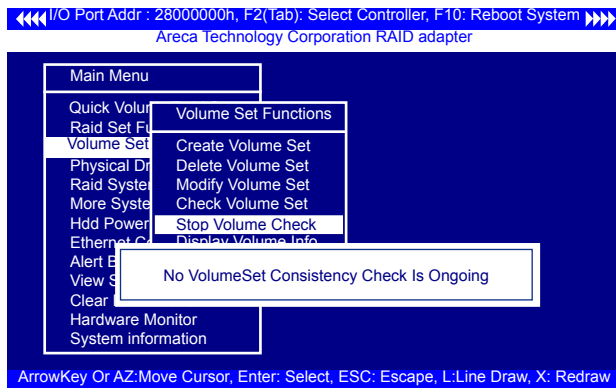
3.7.3.4 Check Volume Set

When You press **Enter** Key, the screen will show you a message: "Only RAID Level 3/5/6 Can Be Checked". ARC-1203-2N can only create RAID 0 and RAID 1, so this option has no function in ARC-1203-2N.



3.7.3.5 Stop Volume Set Check

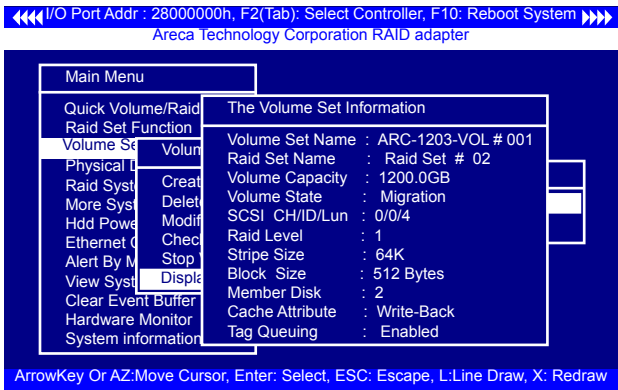
Use this option to stop all of the "Check Volume Set" operations. Due to "Check Volume Set" has no function, this option is not workable either.



BIOS CONFIGURATION

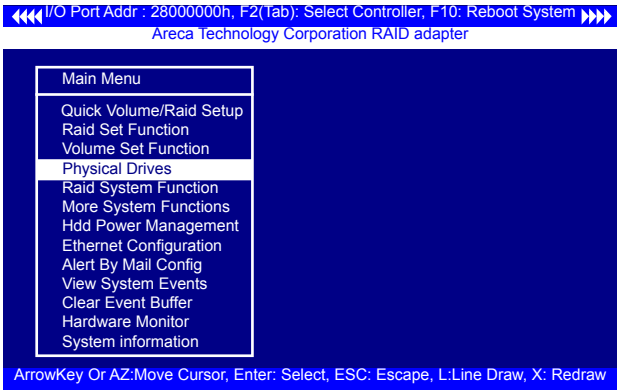
3.7.3.6 Display Volume Set Info.

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.



3.7.4 Physical Drives

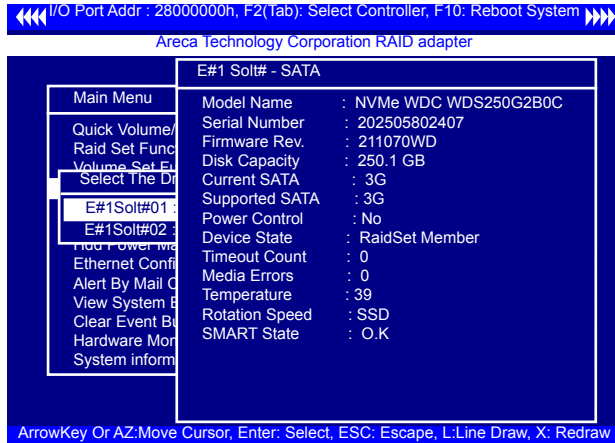
Choose this option from the main menu to select a physical disk and perform the operations listed above. Move the cursor bar to an item, then press **Enter** key to select the desired function.



BIOS CONFIGURATION

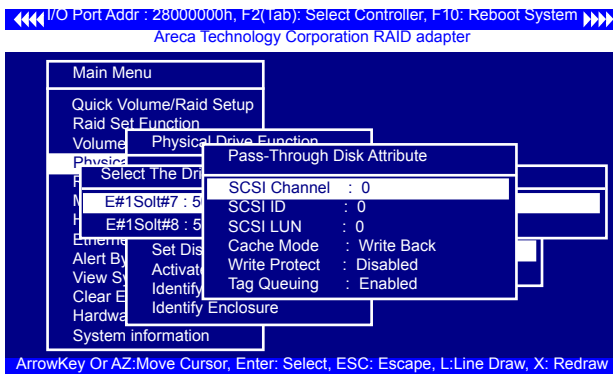
3.7.4.1 View Drive Information

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



3.7.4.2 Create Pass-Through Disk

A pass-through disk is not controlled by the RAID adapter 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 adapter firmware. The SCSI Channel/SCSI ID/SCSI LUN, Cache Mode, Write Protect and Tag Queuing must be specified to create a pass-through disk.



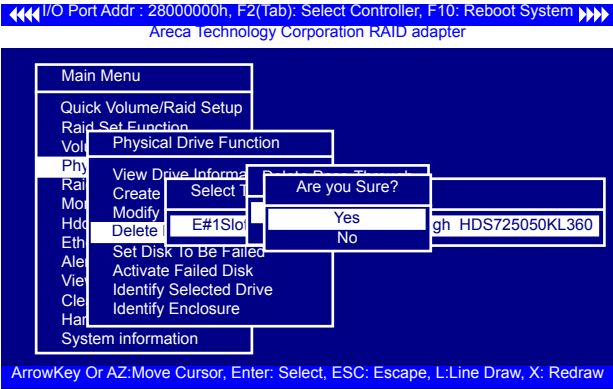
BIOS CONFIGURATION

3.7.4.3 Modify Pass-Through Disk

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

3.7.4.4 Delete Pass-Through Disk

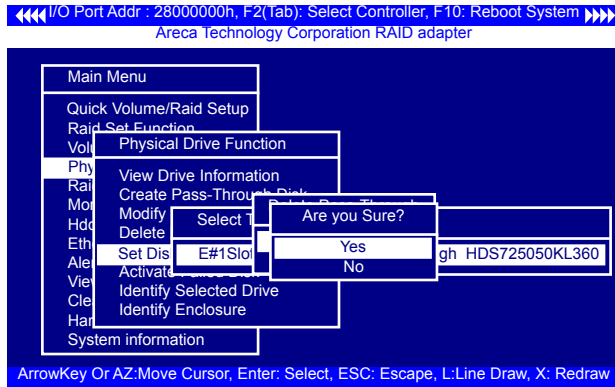
To delete a pass-through drive from the pass-through drive pool, move the cursor bar to the "Delete Pass-Through Drive" item, then press the **Enter** key. The "Delete Pass-Through confirmation" screen will appear; select **Yes** to delete it.



BIOS CONFIGURATION

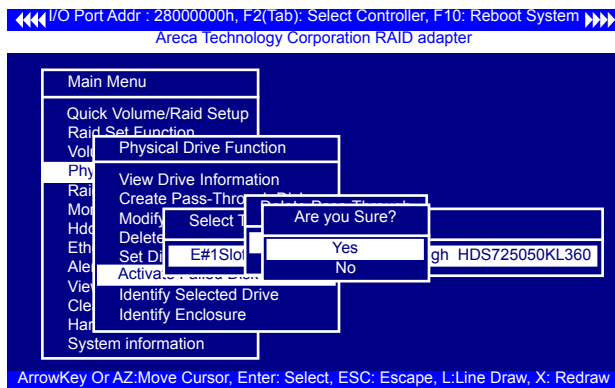
3.7.4.5 Set Disk To Be Failed

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



3.7.4.6 Activate Failed Disk

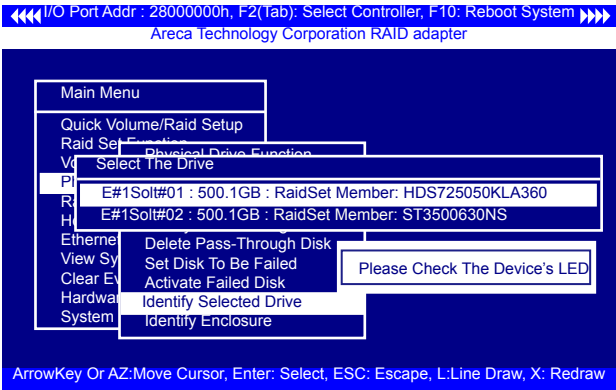
It forces the current “failed” disk in the system to be back on-line. “Activate Failed Disk” function has no effect on the removed disks, because a “removed” disk does not give the controller a chance to mark it as “failure”.



BIOS CONFIGURATION

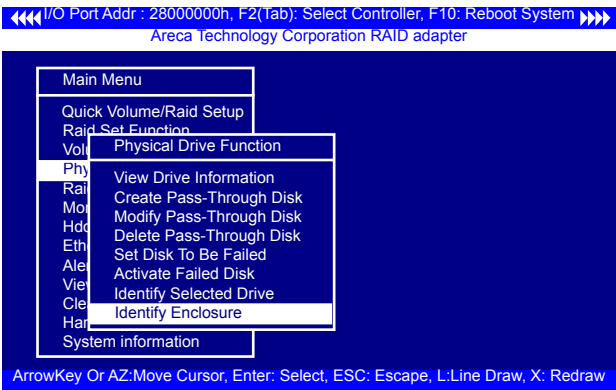
3.7.4.7 Identify Selected Drive

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.



3.7.4.8 Identify Enclosure

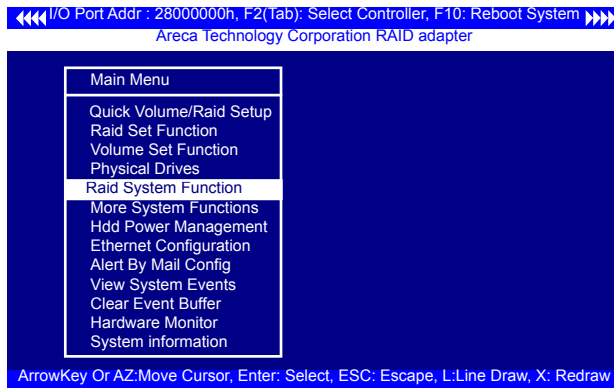
To prevent removing the wrong enclosure, the selected enclosure all disks fault LED indicator will light for physically locating the selected enclosure when the "Identify Enclosure" is selected. This function will also light the enclosure LED indicator, if it is existed.



BIOS CONFIGURATION

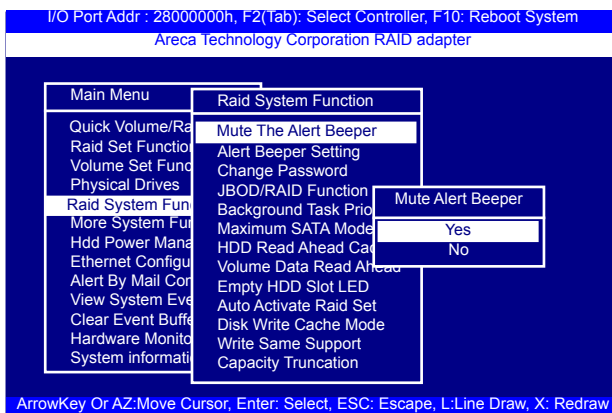
3.7.5 Raid System Function

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.



3.7.5.1 Mute The Alert Beeper

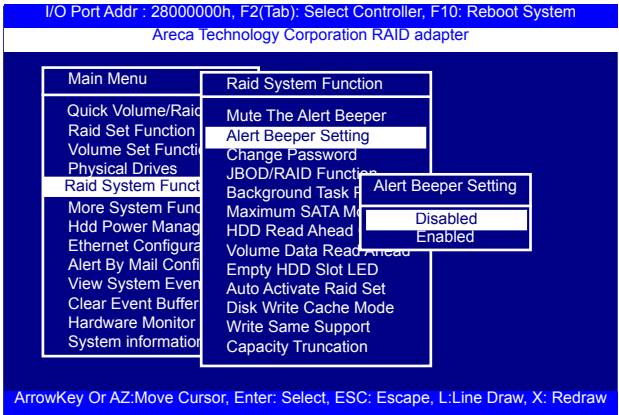
The "Mute The Alert Beeper" function item is used to control the RAID adapter beeper. Select **Yes** and press the **Enter** key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.



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3.7.5.2 Alert Beeper Setting

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



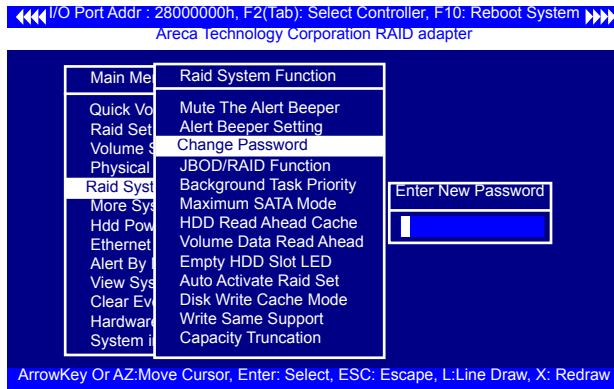
3.7.5.3 Change Password

The manufacture default password is set to 0000.

The password option allows user to set or clear the password protection feature. Once the password has been set, the user can monitor and configure the controller only by providing the correct password. This feature is used to protect the internal RAID system from unauthorized access. The controller will check the password only when entering the main menu from the initial screen. The system will automatically go back to the initial screen if it does not receive any command in 5 minutes.

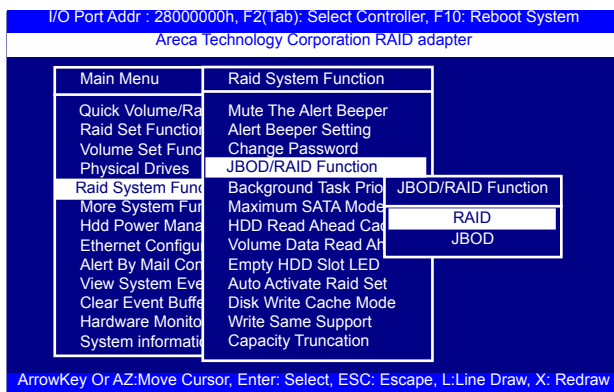
To set or change the password, move the cursor to “Raid System Function” screen, press the “Change Password” item. The “Enter New Password” screen will appear. Do not use spaces when you enter the password. If spaces are used, it will lock out the user. To disable the password, only press **Enter** key in both the “Enter New Password” and “Re-Enter New Password” column. The existing password will be cleared. No password checking will occur when entering the main menu.

BIOS CONFIGURATION



3.7.5.4 JBOD/RAID Function

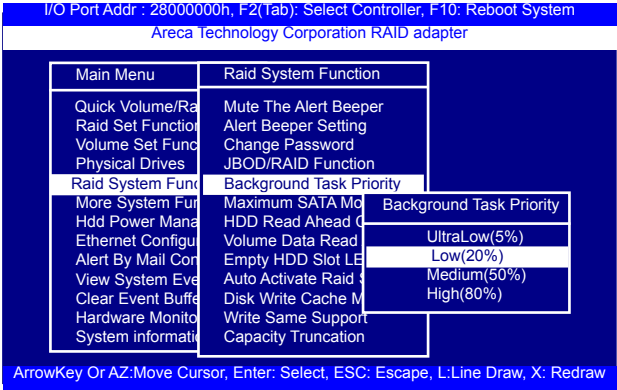
JBOD is an acronym for "Just a Bunch Of Disk". A group of hard disks in a RAID box are not set up as any type of RAID configuration. All drives are available to the operating system as an individual disk. JBOD does not provide data redundancy. User needs to delete the RAID set, when you want to change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



3.7.5.5 Background Task Priority

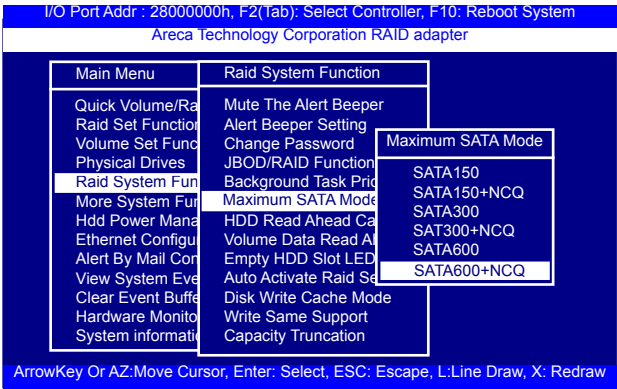
The "Background Task Priority" is a relative indication of how much time the controller devotes to a rebuild operation. The RAID adapter allows the user to choose the rebuild priority (UltraLow, Low, Normal, High) to balance volume set access and rebuild tasks appropriately.

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3.7.5.6 Maximum SATA Mode

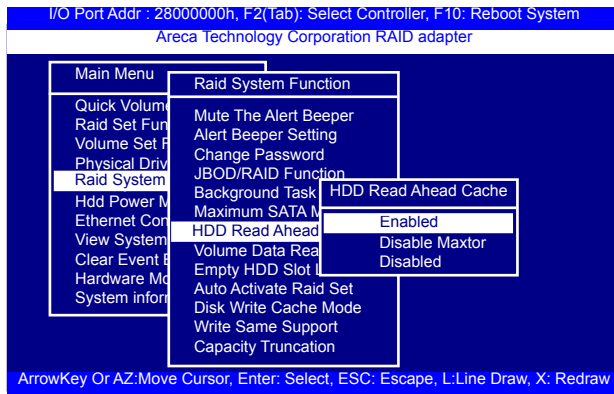
The controller drive channel can support up to SATA III, which runs up to 600MB/s. NCQ is a command protocol in Serial ATA that can only be implemented on native Serial ATA hard drives. It allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal 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 user to choose the SATA Mode: SATA150, SATA150+NCQ, SATA300, SAT300+NCQ, SATA600, SATA600+NCQ.



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3.7.5.7 HDD Read Ahead Cache

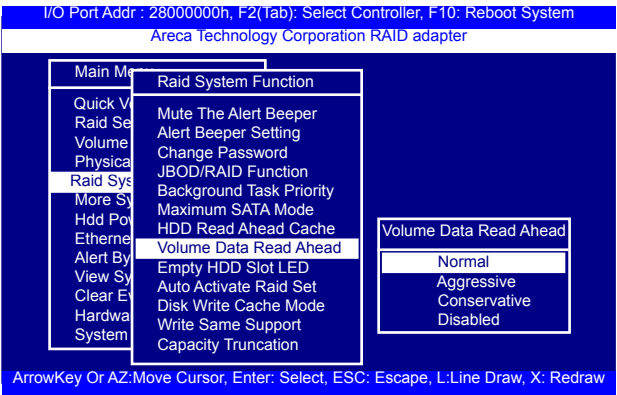
Allow Read Ahead (Default: Enabled)—When "Enabled", the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.



3.7.5.8 Volume Data Read Ahead

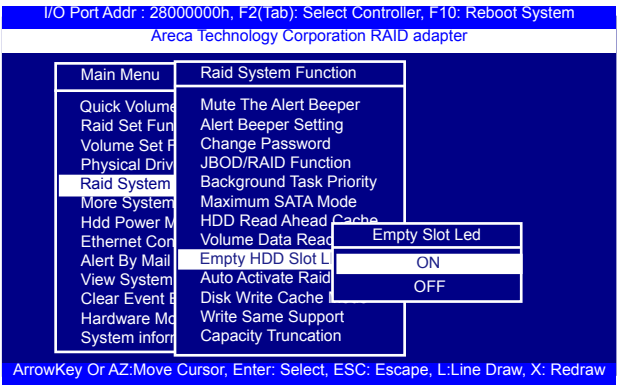
The volume read data ahead parameter specifies the controller firmware algorithms which process the read ahead data blocks from the disk. The "Volume Data Read Ahead" parameter is normal by default. To modify the value, you must set it from the "Raid System Function" using the "Volume Data Read Ahead" 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. The "Aggressive" value is optimal for sequential access but it degrades random access.

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3.7.5.9 Empty HDD Slot LED

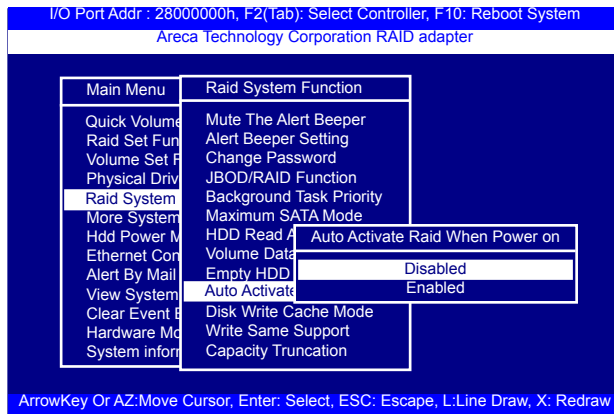
The firmware has added the "Empty HDD Slot LED" option to setup the fault LED light "ON" or "OFF" when there is no HDD installed. When each slot has a power LED for the HDD installed identify, user can set this option to "OFF". Choose option "ON", the RAID adapter will light the fault LED; if no HDD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



BIOS CONFIGURATION

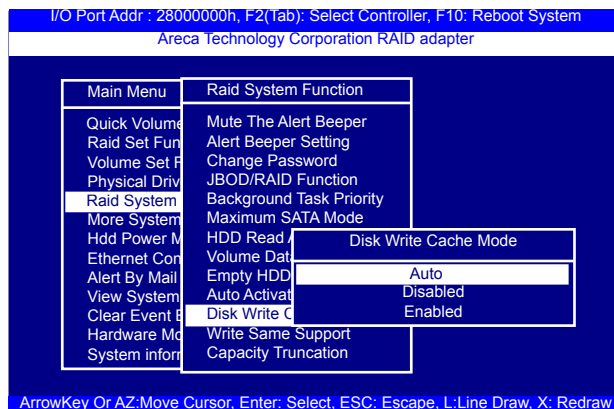
3.7.5.10 Auto Activate Raid Set

When some of the disk drives are removed in power off state or boot up stage, the RAID set state will change to "Incomplete State". But if a user wants to automatically continue to work while the RAID adapter 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.



3.7.5.11 Disk Write Cache Mode

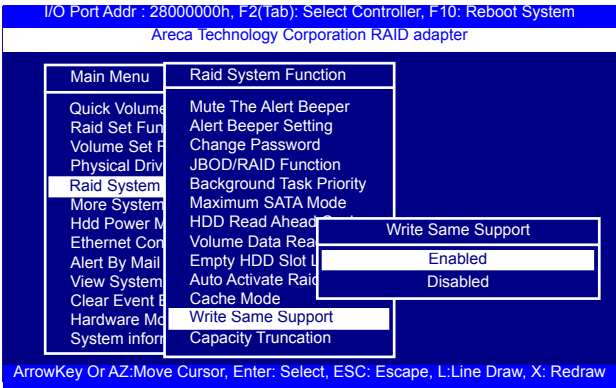
User can set the "Disk Write Cache Mode" to Auto, Enabled, or Disabled. "Enabled" increases speed, "Disabled" increases reliability.



BIOS CONFIGURATION

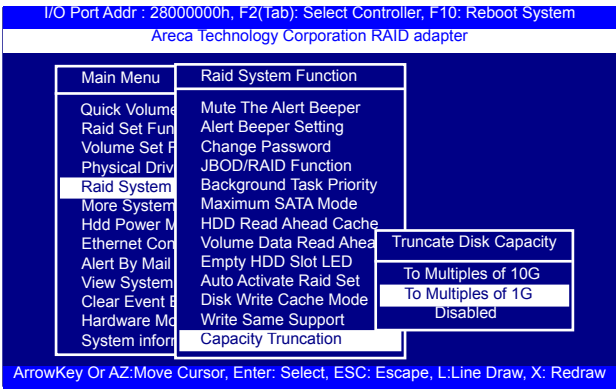
3.7.5.12 Write Same Support

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 “Enabled” or “Disabled” for the controller initialization.



3.7.5.13 Capacity Truncation

The RAID adapter 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.



BIOS CONFIGURATION

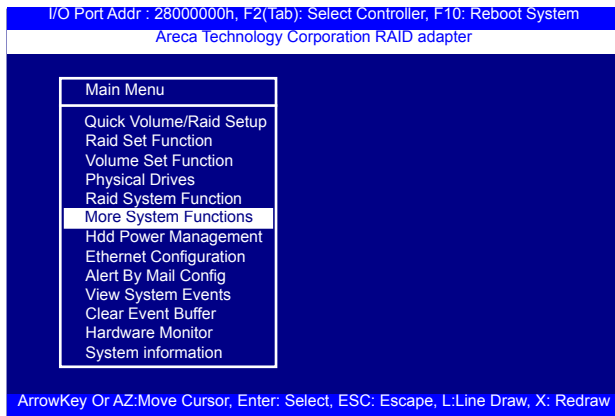
Multiples Of 10G: If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. "Multiples Of 10G" truncates the number under tens. This makes the same capacity for both of these drives so that one could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

To set the "More System Functions", move the cursor bar to the main 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 function.



BIOS CONFIGURATION

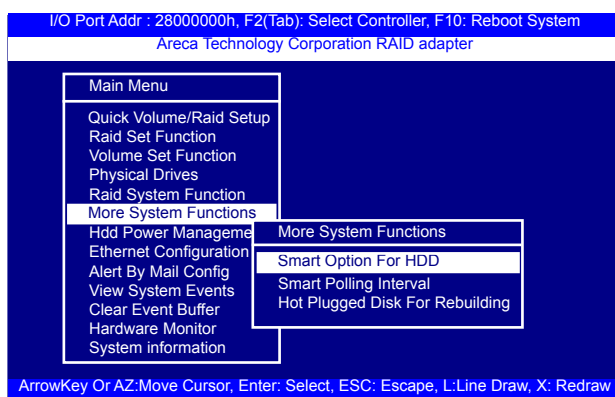
3.7.6.1 Smart Option For HDD

This option is used to increase 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". The default is "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 drive is existed.

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

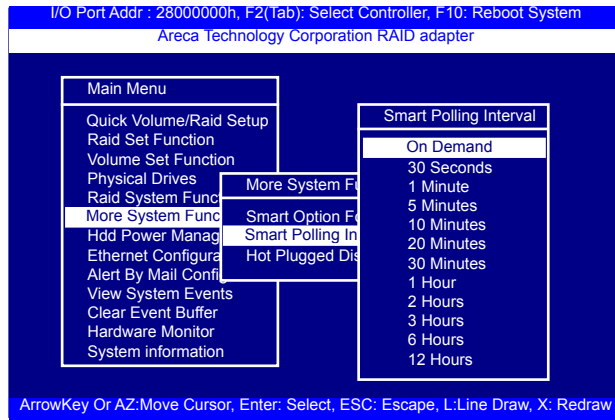


3.7.6.2 Smart Polling Interval

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.

BIOS CONFIGURATION



3.7.6.3 Hot Plugged Disk For Rebuilding

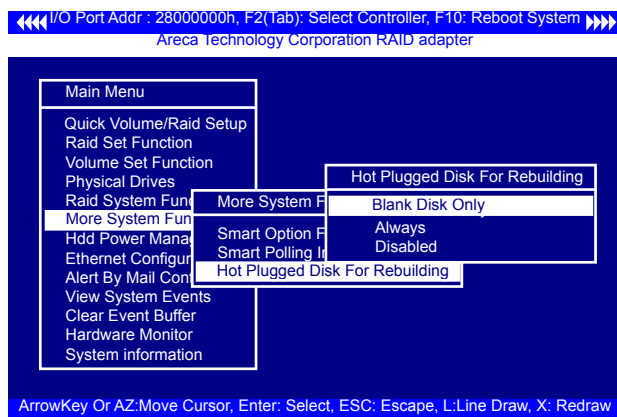
It defines if the RAID array volume should start rebuilding or not when detects a disk is inserted/re-inserted during online. The options are: "Blank Disk Only", "Always", and "Disable". The default is "Blank Disk Only".

"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. So when a previously removed disk is self re-inserted, it won't trigger the degraded RAID array to rebuild, and so that the administrator has a chance to identify this mis-behaving disk and replaces it.

"Always" – it is what it was before. Whenever a disk is inserted/re-inserted whether new or previously existed, it always trigger a rebuilding for the Degraded RAID set/Volume.

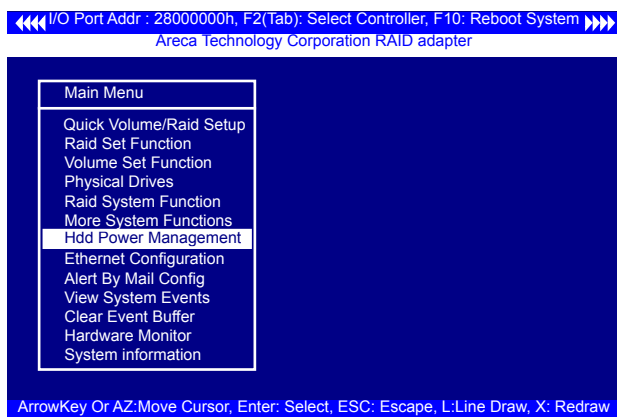
"Disable" – it will not trigger rebuilding regardless what sort of disk plugging in. When "Disable" and/or "Blank Disk Only" is selected, the re-inserted/previously removed disk will be identified as a disk in a separate RAID set with duplicated RAIDset# and with all the rest of RAID members missing.

BIOS CONFIGURATION



3.7.7 HDD Power Management

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

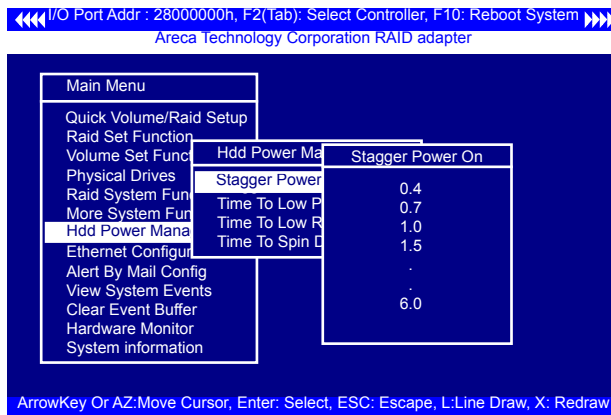


BIOS CONFIGURATION

3.7.7.1 Stagger Power On

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 spin-up of the drives. The SATA drives have supported the staggered spin-up capabilities to boost reliability. The staggered drive 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. The staggered 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.

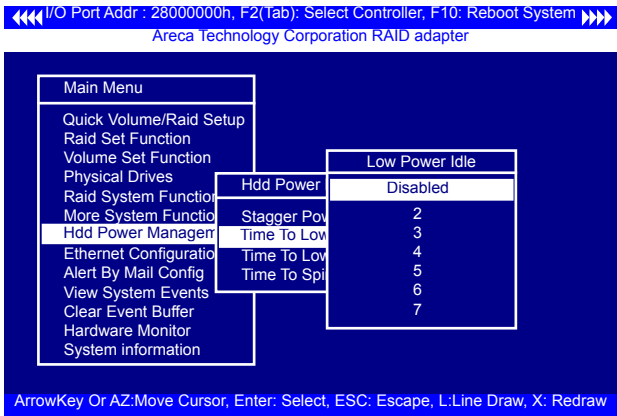
The RAID adapter has included the option for customer to select the disk drives sequentially staggered power up value. The values can be selected from 0.4s to 6s per step which powers up one group of drives.



BIOS CONFIGURATION

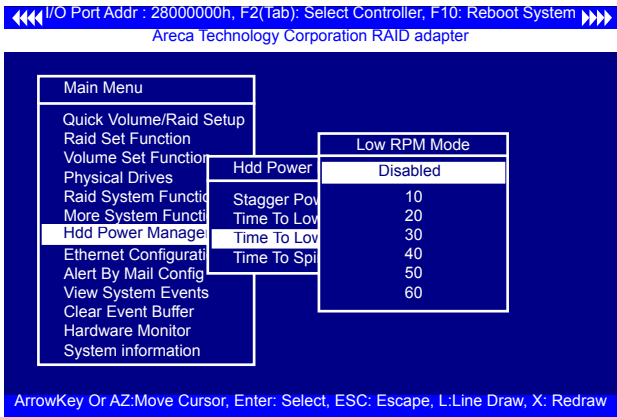
3.7.7.2 Time To Hdd Low Power Idle

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.



3.7.7.3 Time To Low RPM Mode

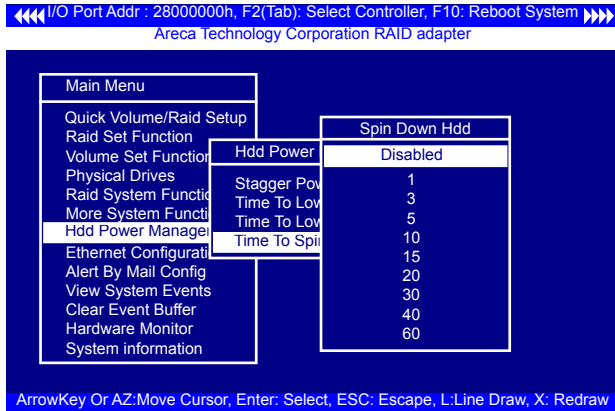
This function can automatically spin disks at lower RPM if there have not been used during the setting idle time. The values can be selected "Disabled" or within the range 10 to 60 minutes.



BIOS CONFIGURATION

3.7.7.4 Time To Spin Down Idle Hdd

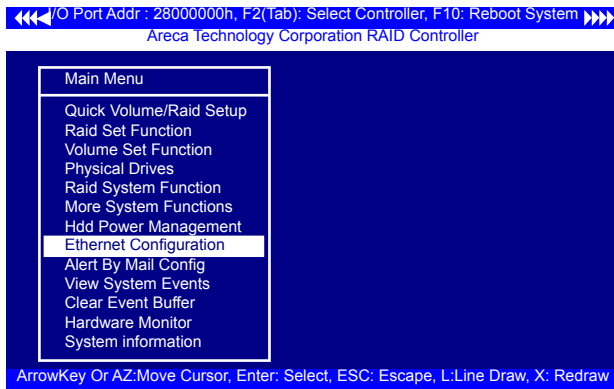
This function can automatically spin down the drive if it hasn't been accessed for a certain amount of time. This value is used by the drive to determine how long to wait (with no disk activity, before turning off the spindle motor to save power). The values can be selected "Disabled" or within the range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



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3.7.8 Ethernet Configuration

Use this feature to set the adapter 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 adapter 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, and then press **Enter** key to select the desired function.

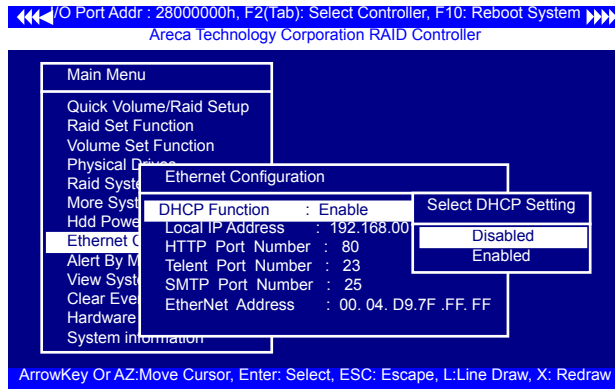


3.7.8.1 DHCP Function

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 adapter, 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 neces-

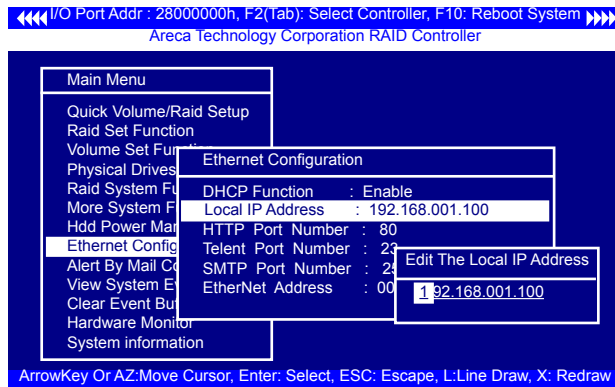
BIOS CONFIGURATION

sary to manually enter a static IP address that does not conflict with other devices on the network.



3.7.8.2 Local IP address

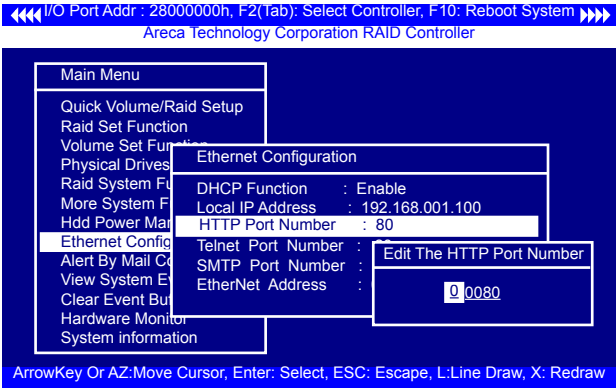
If you intend to set up your client computers manually (no DHCP), make sure that the assigned IP address is in the same range as the default router address and that it is unique to your private network. However, it is highly recommend to use DHCP if that option is available on your network. An IP address 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 adapter, move the cursor bar to Local IP address item, then press the **Enter** key to show the default address setting in the RAID adapter. You can then reassign the static IP address of the adapter.



BIOS CONFIGURATION

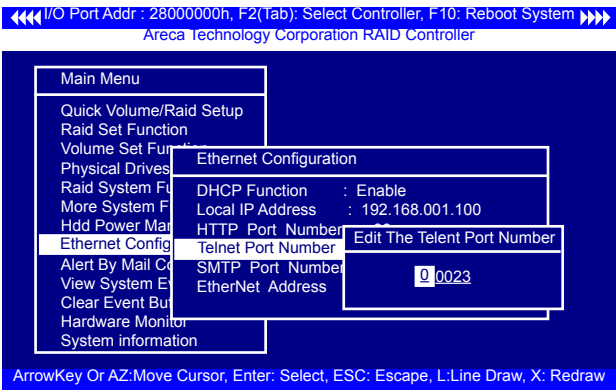
3.7.8.3 HTTP Port Number

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



3.7.8.4 Telnet Port Number

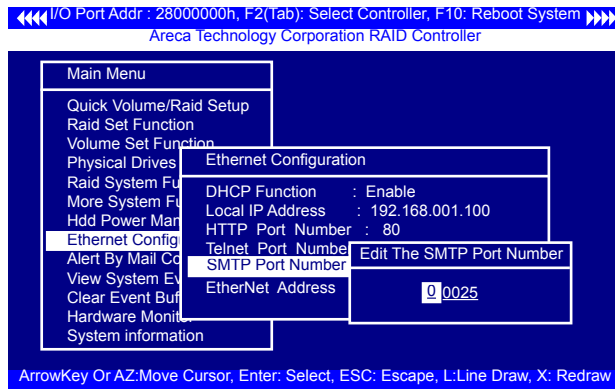
To manually configure the “Telnet Port Number” of the adapter, move the cursor bar to “Telnet Port Number” item, then press the **Enter** key to show the default address setting in the RAID adapter. You can then reassign the default “Telnet Port Number” of the adapter.



BIOS CONFIGURATION

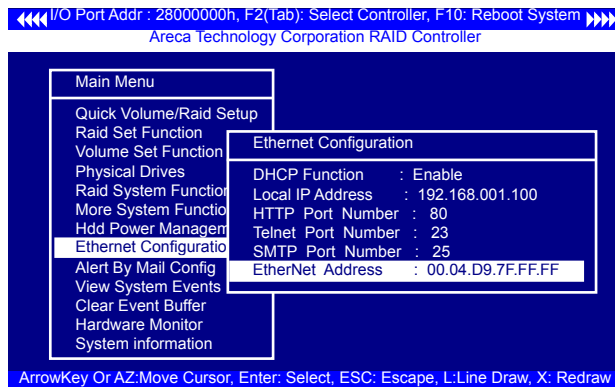
3.7.8.5 SMTP Port Number

To manually configure the "SMTP Port Number" of the adapter, 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 adapter. You can then reassign the default "SMTP Port Number" of the adapter.



3.7.8.6 Ethernet Address

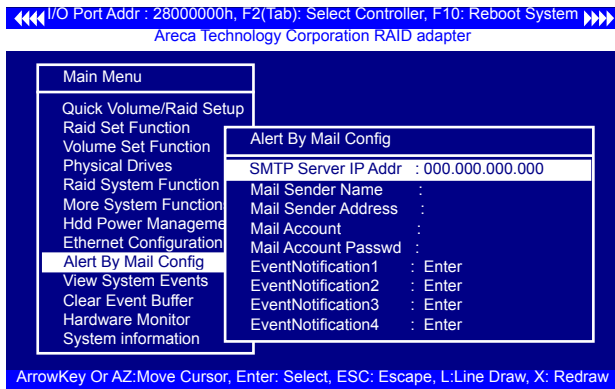
Each Ethernet port has its unique Mac address, which is also factory assigned. Usually, Ethernet address is used to uniquely identify a port in the Ethernet network.



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3.7.9 Alert By Mail Config

To configure the RAID adapter e-mail function, move the cursor bar to the main menu and click on the "Alert By Mail Config" link. The "Alert By Mail Config" menu will show all items. Move the cursor bar to the "Alert By Mail Config" item, then select the desired function.

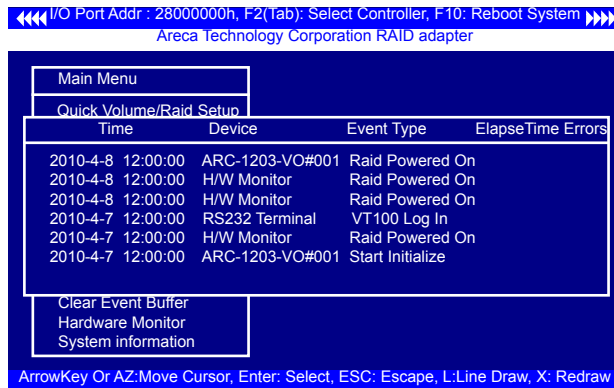


BIOS CONFIGURATION

3.7.10 View System Events

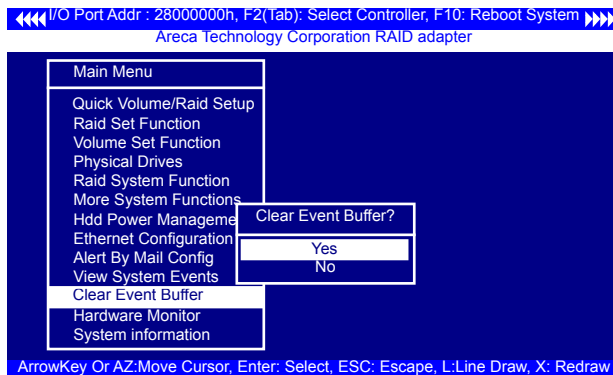
To view the RAID adapter's system events information, move the cursor bar to the main menu and select the "View System Events" link, then press the **Enter** key. The RAID adapter's events screen appear.

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



3.7.11 Clear Events Buffer

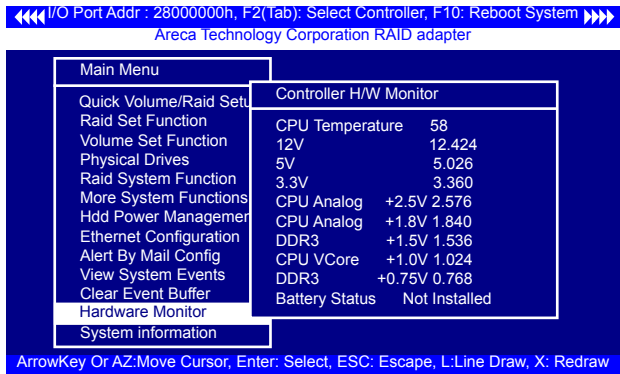
Use this feature to clear the entire events buffer.



BIOS CONFIGURATION

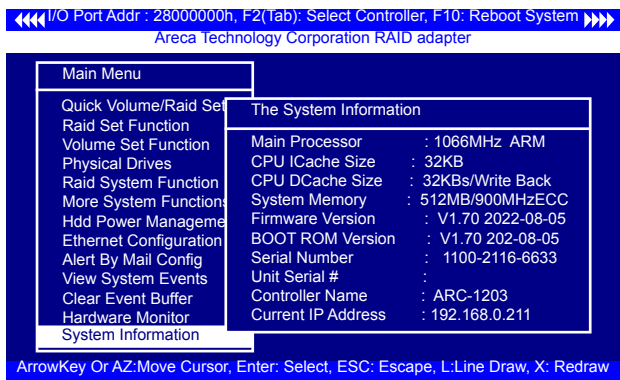
3.7.12 Hardware Monitor

To view the RAID adapter'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 and voltage of the RAID adapter.



3.7.13 System Information

Choose this option to display controller name, firmware version, BOOT ROM version, SATA 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.



4. Driver Installation

This chapter describes how to install the RAID adapter driver to your operating system. The installation procedures use the following terminology:

Installing operating system on RAID adapter's 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 RAID adapter. The driver installation is a part of the operating system installation.

Installing RAID adapter into an existing operating system

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

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

Materials required:

- Microsoft Windows, Linux, FreeBSD and macOS installation
- RAID adapter installation guide
- RAID adapter

4.1 Creating the Driver Disk

You can download the latest version drivers for Windows, Linux, FreeBSD and macOS from the Areca web site at <http://www.areca.com.tw>.

These driver files are intended for use with new operating system installations. You can copy the driver file to USB device and installed from it. Determine the correct kernel version and identify which files contain drivers for that kernel, and a screen with several choices will be displayed.

The driver disk is ready now. Proceed the following installation with the instructions for your operating system.

DRIVER INSTALLATION

4.2 Driver Installation for Windows

The RAID adapter can be used with Microsoft Windows 11/10/Server 2022/2019/2016 with StorPort Drivers.

4.2.1 Installing Windows on a RAID Volume

For completed details on installing Windows, see the Windows User's Manual. The following procedures detail installing the RAID adapter driver while installing Windows 11/10/ Server 2022/2019/2016. Have your bootable Microsoft Windows CD and follow the required procedure below to install RAID adapter:

1. Make sure you follow the instructions in Chapter 2 "Hardware Installation" to install the adapter and connect the disk drives or enclosure.
2. Start the system and then press **Tab** or **F6** to access the Mc BIOS RAID manager. Use the McBIOS RAID manager to create the RAID set and volume set to which you will install Windows. For details, see Chapter 3 "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.
4. Follow the on-screen instructions to begin the Windows installation.
5. When prompted to specify a location for Windows, select "**Load Driver**".
6. Insert the USB driver disk or floppy drive, browse to the driver location, then click "**OK**".
7. Window will check the usb; select the correct card and CPU type for your hardware from the listing and press "**Next**" to install it.

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8. Click on "**Next**" again to accept the default partition configuration, or refer to your Windows documentation to configure partitions manually.
9. From this point on, simply follow the Microsoft Windows installation procedure. Follow the on-screen instructions, responding as needed, to complete the installation.
10. After the installation is completed, reboot the system to load the new driver/operating system.
11. See Chapter 6 in this manual to customize your RAID volume sets using McRAID storage manager.

After you finish creating additional volume, the following steps show how to make any new volumes or independent disks accessible to Windows.

- (a). Click "**Start**" ==> right-click "**Computer**" and select "**Manage**".
- (b). Click "**Disk Management**" in the left pane.
- (c). Scroll down to the bottom of the middle pane.
Windows will display a list of new drives attached to your system with a label such as "Disk 1" or "Disk 2", etc.
- (d). Right-click on the drive you want to partition and then again to format it
- (e). Once it's formatted, Windows automatically assigns the next available drive letter to it and then it will appear in Windows Explorer.

4.2.2 Installing Controller on an Existing Windows

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

1. Follow the instructions in Chapter 2, the Hardware Installation

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Chapter, to install the controller and connect the disk drives or enclosure.

2. Start the system and then press **Tab** or **F6** to enter the controller McBIOS RAID manager. Use the configuration utility to create the RAID set and volume set. For details, see Chapter 3, McBIOS RAID Manager. Once a volume set is created and configured, continue with installation of the driver.
3. Re-Boot Windows and the OS will recognize the RAID adapter and launch the "Found New Hardware Wizard", this guides you in installing the RAID driver.
4. The Windows will pop-up and provide a choice of how to proceed. so that you can choose a specific driver.
5. When the next screen queries the user about utilizing the currently installed driver, click on the "**Have Disk**" button.
6. Insert the RAID adapter driver media to locate the correct path. Click on the "**Next**" button.
7. Windows automatically copies the appropriate driver files and rebuilds its driver database.
8. The summary screen appears; click on the "**close**" button.
9. Restart the computer to load the new drivers.
10. See Chapter 6 in this manual for information on customizing your RAID volumes using McRAID storage manager.

After you finish creating additional volume, the following steps show how to make any new volumes or independent disks accessible to Windows.

- (a). Click "**Start**" ==> right-click "**Computer**" and select "**Manage**".
- (b). Click "**Disk Management**" in the left pane.

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- (c). Scroll down to the bottom of the middle pane.
Windows will display a list of new drives attached to your system with a label such as "Disk 1" or "Disk 2", etc.
- (d). Right-click on the drive you want to partition and then again to format it
- (e). Once it's formatted, Windows automatically assigns the next available drive letter to it and then it will appear in Windows Explorer.

4.2.3 Uninstall adapter from Windows

To remove the RAID adapter 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 RAID adapter.
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 adapters" section. Right click on the RAID adapter and select "Uninstall".
4. Click **Yes** to confirm removing the RAID driver. The prompt to restart the system will then be displayed.

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4.3 Driver Installation for Linux

This chapter describes how to install the RAID adapter driver to Red Hat Linux, SuSE and other versions of Linux. Before installing the RAID driver to the Linux, complete the following actions:

1. Install and configure the controller and hard disk drives according to the instructions in Chapter 2 Hardware Installation.
2. Start the system and then press **Tab** or **F6** to enter the McBIOS RAID manager configuration utility. Using the McBIOS RAID manager to create the RAID set and volume set. For details, see Chapter 3, McBIOS RAID Manager.

If you are using a Linux distribution for which there is not a compiled driver available from Areca, you can download the source from the Areca website and compile a new driver.

You can download updated versions of compiled and tested drivers for RedHat or SuSE Linux from the Areca web site at <https://www.areca.com.tw>. 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 on the included RAID adapter website to make driver diskette and install driver to the system.

4.4 Driver Installation for FreeBSD

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

1. Install and configure the adapter and hard disk drives according to the instructions in Chapter 2, Hardware Installation.
2. Start the system and then press **Tab** or **F6** to enter the McBIOS RAID Manager configuration utility. Use the McBIOS RAID manager to create the RAID set and volume set. For details, see Chapter 3, McBIOS RAID Manager.

DRIVER INSTALLATION

The supplied software for the RAID adapter includes compiled and tested drivers for FreeBSD 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 Areca web site at <http://www.areca.com.tw>.

Please refer to the "readme.txt" file on the RAID adapter website to make driver diskette and install driver to the system.

DRIVER INSTALLATION

4.5 Driver Installation for macOS

After hardware installation, mount the drives to the RAID adapter must be configured and the volume set units initialized by the adapter before they are ready to use by the system.

4.5.1 Installation Procedures

This section describes detailed instructions for installing the Areca Mac driver & utility for the ARC-1203 series. You must have administrative level permissions to install Mac driver & utility.

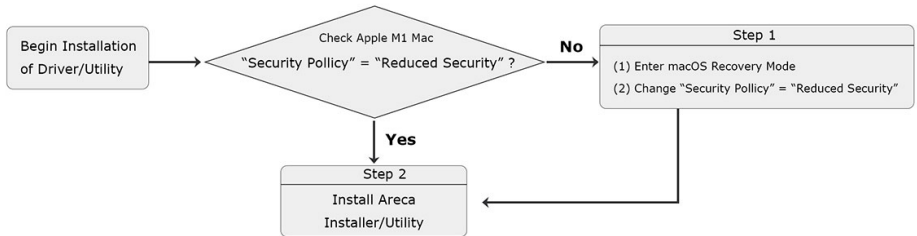
4.5.1.1 Install Areca driver for Mac

On November 10, 2020, Apple revealed new Mac hardware with the revolutionary Apple Silicon M1 processors. Since external boot via 3rd party drivers is not allowed on Apple Silicon based Macs, the default Areca driver doesn't work on new M1 Mac, only for Intel-based Macs.

The macOS 11 had not been integrated any universal KEXTs into macOS, which means that users need to install universal KEXT to support Areca Thunderbolt devices on Apple Silicon. Areca universal KEXT's on Apple Silicon can be installed in /Library/Extensions/, even if Areca RAID storage x86-only versions persists on the system in /System/Library/Extensions/. In order to use 3rd party kernel extensions on Apple Silicon Macs, users must enable system extensions by changing their Mac's Security Policy to Reduced Security and allow user management of kernel extensions from identified developers.

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Installing Areca Driver for Apple M1 Mac in macOS 11.0 or higher Flow Chart



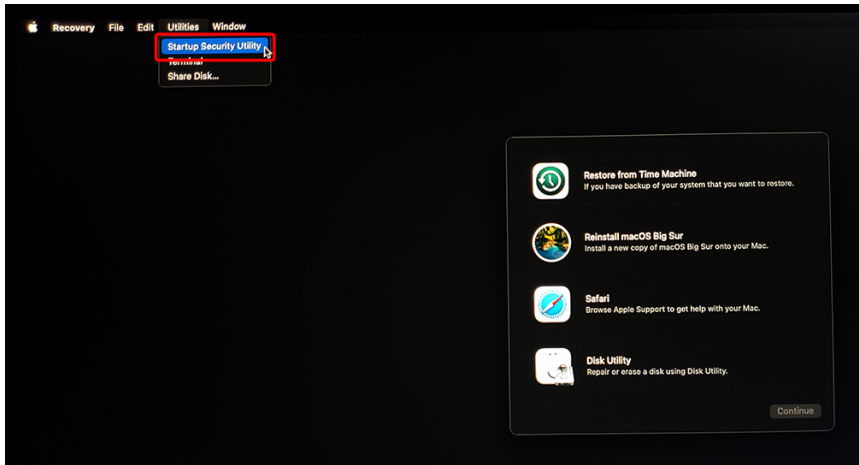
*** If your mac version is below 11.0, you can skip this step**
Step 1. Start up your computer in macOS Recovery

- (1-1). Choose "**Shut Down**".
- (1-2). Press and hold the power button on your Mac until you see "**Loading startup options**".
- (1-3). Click "**Options**", then click "**Continue**". If requested, enter the password for an administrator account.

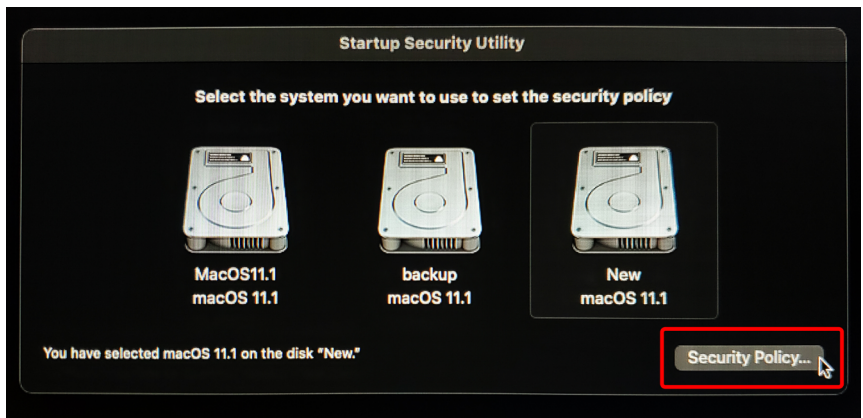


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(1-4). In the Recovery app, choose **Utilities > Startup Security Utility**.



(1-5). Select the system you want to use to set the security policy and click "**Security Policy**". If the disk is encrypted with FileVault, click Unlock, enter the password and then click Unlock.



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- (1-6). Choose "**Reduced Security**" and enable "Allow user management of kernel extensions from identified developers".



- (1-7). Click "**OK**" and confirm the action by entering your administrator credentials.
- (1-8). Restart your Mac for the changes to take effect.

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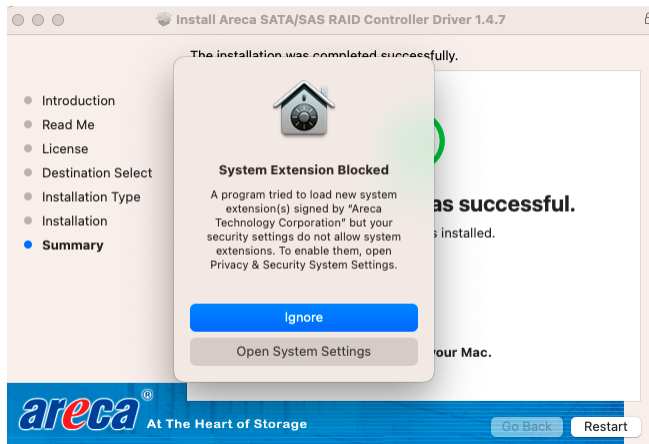
Step 2. Installing Areca driver

- (2-1). Download the driver from Areca website: <https://www.areca.com.tw/support/downloads.html>
- (2-2). Double-click [ArcMSRu.pkg] in the mounted disk image to start.



Follow the installer on-screen steps to complete the installation.

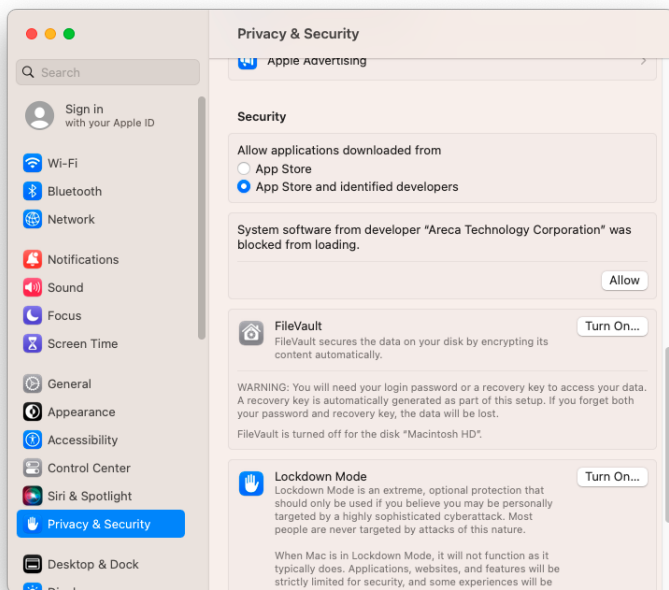
- (2-3). When Areca installation shows successful, system will pop the following "System Extension Updated" warning message: A program tried to load new system extension(s) signed by "Areca Technology corporation" but your security setting do not allow system extensions. To enable them, choose the **"Open Security Preferences"** to allow system extension.



DRIVER INSTALLATION

(2-4). On Security & Privacy's General page

- Make sure the message "System software from developer "Areca Technology Corporation" was blocked from loading."
- Make the setting to allow loading the driver.



* In the following condition, no message is displayed. Loading of the driver is permitted.

- When a driver that has previously been allowed is reinstalled again.
- When you're using a Mac on which the driver was installed before now updating to macOS 11

(2-5). Click "**Restart**" to complete installation.

4.5.1.2 Install the MRAID Utility

Please see the section 5.3 For macOS.

DRIVER INSTALLATION

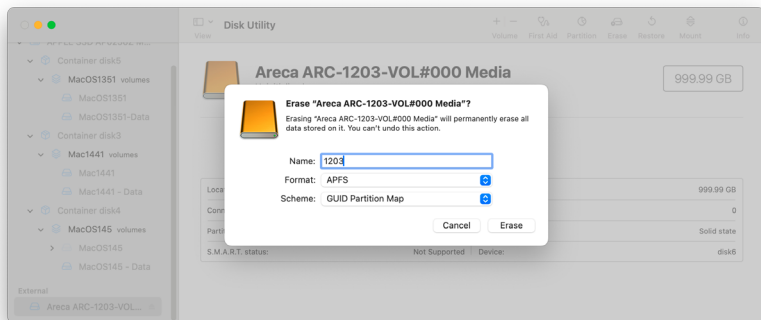
4.5.2 Making Volume Sets Available to macOS

After the volume set is ready for system accesses, it needs to be partitioned, formatted, and mounted by the operating system.

When you create a volume through McRAID storage manager, the macOS recognizes that a new disk is avail, and displays a message asking what you next want to do. If the message does not show up, start the "Disk Utility" manually from the "Finder", use the "Go" menu and open the "Utilities" folder. Double-click on the "Disk Utility" program.

4.5.2.1 To format your volume

1. Though Disk Utility to erase and Format a volume. When the Disk Utility window opens, find and select the desired volume in the sidebar that represents your RAID storage.



2. Click Erase button, Choose Format and Scheme type.

Format type

- Apple File System (APFS): The file system used by macOS 10.13 or later.
- Mac OS Extended: The file system used by macOS 10.12 or earlier.
- MS-DOS (FAT) and ExFAT: File systems that are compatible with Windows.

DRIVER INSTALLATION

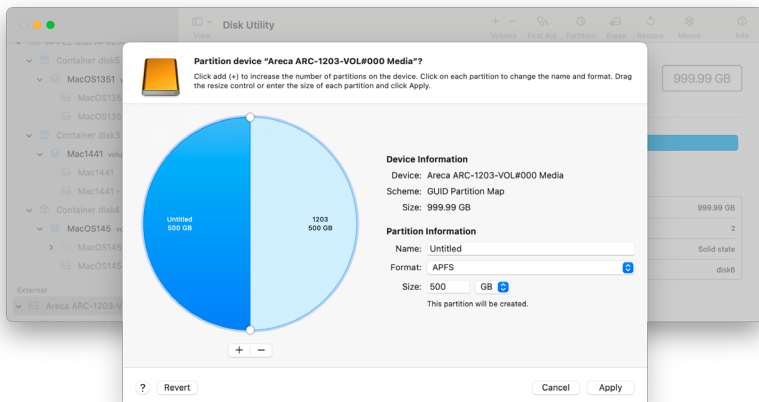
Scheme type

- GUID Partition Map: Choose this option for all Intel-based and Apple Silicon Mac computers. Some newer Microsoft Windows-based computers can also use this scheme.
- Master Boot Record: Choose this option for compatibility with all Microsoft Windows-based computers.
- Apple Partition Map: Choose this option for compatibility with old PowerPC-based Mac computers.

When erase is complete, icons for this volume shows up on your desktop. It is now ready to use.

4.5.2.2 To partition your volume

When the volume already be formatted. You may want to divide a volume into more than one partition. When you do this, each partition is a volume, and each volume shows up as a separate drive on your Desktop. To partition a volume, select it in Disk Utility, and then click "Partition" in the toolbar. Disk Utility shows the RAID storage's space as a pie chart. By default, RAID storage only contain a single partition, but to add one, click the + icon; you'll see two partitions.



DRIVER INSTALLATION

If you want to adjust their sizes, you can do so by dragging the circles dividing the partitions, or by typing a size into the Size field. When you click "**Apply**", Disk Utility erases the RAID storage and splits it into the number of partitions you have selected. Each partition will appear as a separate drive on your Desktop.

When a message asks you to confirm you want to partition the disk, click on the "**Partition**" button. This may take a couple of minutes, depending on the size of the drives in your RAID storage. When the partitioning is complete, icons for each new partition show up on your desktop. They are now ready to use.

5. ArchHTTP Proxy Server Installation

Overview

After hardware installation, the NVMe drives connected to the RAID adapter must be configured and the volume set units initialized before they are ready to use.

The user interface for these tasks can be accessed through the built-in configuration that resides in the adapter's firmware. It provides complete control and management of the adapter and disk arrays, eliminating the need for additional hardware or software.

In addition, a software utility to configure the RAID adapter is provided on the areca website. This software utility can monitor, test, and support the RAID adapter. The software utility and McRAID storage manager can configure and monitor the RAID adapter via ArchHTTP proxy server interface. The following table outlines their functions:

Configuration Utility	Operating System Supported
McBIOS RAID Manager	OS-Independent
McRAID Storage Manager (Via ArchHTTP proxy server)	Windows, Linux, FreeBSD and macOS
SAP Monitor (Single Admin Portal to scan for multiple RAID units in the network, Via ArchHTTP proxy server)	Windows and macOS

The HTTP management software (ArchHTTP) runs as a service or daemon, and have it automatically start the proxy for all adapters found. This way the adapter can be managed remotely without having to sign in the server. The HTTP management software (ArchHTTP) also has integrated the email notification and SNMP extension agent. The email notification can be configured in local or remote standard web browser.

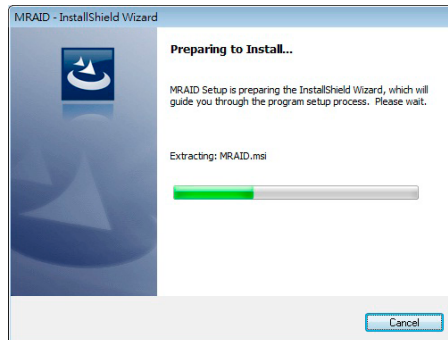
ARCHTTP PROXY SERVER INSTALLATION

5.1 For Windows

This section describes how to install the MRAID software to your operating system. The software installation includes ArchHTTP and CLI utility.

In this scenario, you are installing the MRAID software in an existing Windows system. You can use the installer to install ArchHTTP and CLI at once or "Custom" to install special components. Follow the steps below to install the utility for Windows.

1. Download the install_mraid installer from the website at "<https://www.areca.com.tw/support/downloads.htm>", the file name begins with "install_mraid" followed by the version control.
2. Double-click on the zipped file that comes from the website to unzip it. Double-click on the "setup.exe" file for installing MRAID.
3. The screen shows Preparing to Install.

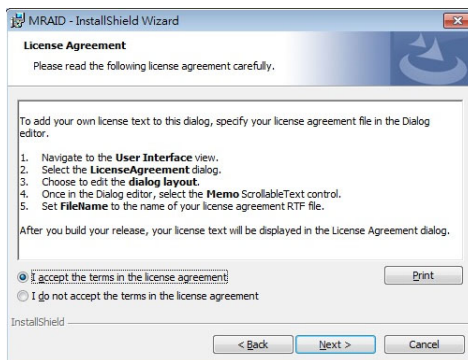


4. The MRAID Installer (or InstallShield Wizard) opens, preparing to install and click on the "**Next**" button to continue.

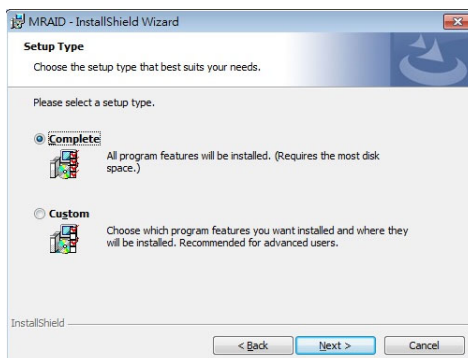
ARCHTTP PROXY SERVER INSTALLATION



5. When the License Agreement screen appears, read and agree to the license information; then let the InstallShield Wizard guide you through the installation process.

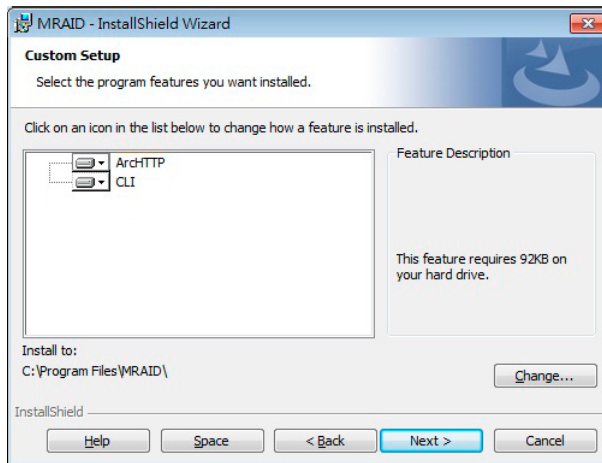


6. On the Setup Type screen, use the settings to specify these things: and click on the **"Next"** button to continue.



ARCHTTP PROXY SERVER INSTALLATION

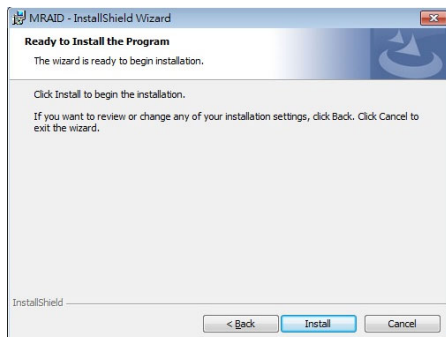
- “Complete” to install ArchHTTP and CLI utility at once, check the first box.
 - “Custom” to install special components and change the program directory. When this “**Custom**” check box is checked, go to the Custom Setup screen.
- 6-1. On the Custom Setup screen, click on an icon to install special components and click on the “**Next**” button to continue.



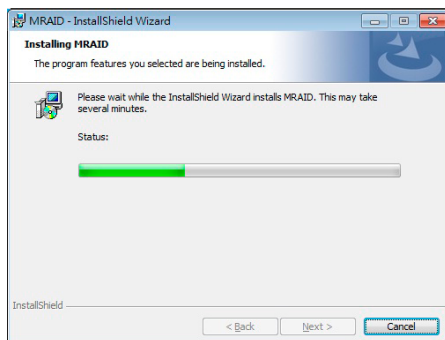
- **ArchHTTP** has to be installed for GUI RAID console (McRAID storage manager) to run. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. Refer to the section 5.4 ArchHTTP Configuration on ARC-1203 user manual, for details about the mail and SNMP traps configuration.
- **CLI (Command Line Interface)** provides the functionality available in MRAID storage manager through a Command Line Interface. You can set up and manage RAID storage inline. CLI performs many tasks at the command line. You can download CLI manual from Areca website.

ARCHTTP PROXY SERVER INSTALLATION

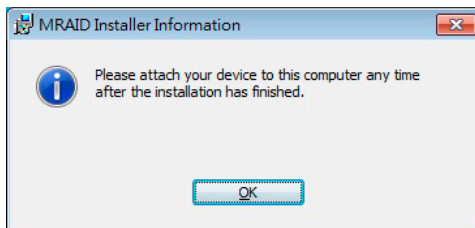
- When you reach the installation page, click on the **"Install"** button to continue.



- A program bar appears that measures the progress of the driver installation.

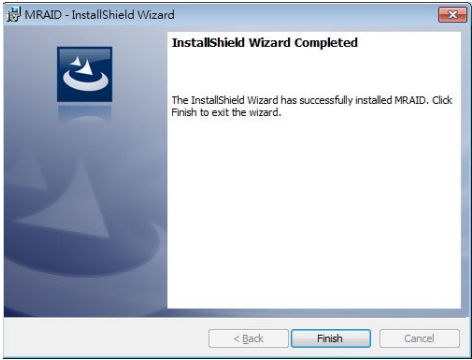


When this screen completes, you have completed the MRAID installation. If you have no ARC-1203 yet installed a "MRAID Installer Information" message displays.



- After installation is complete, click on the **"Finish"** button to exit the InstallShield Wizard.

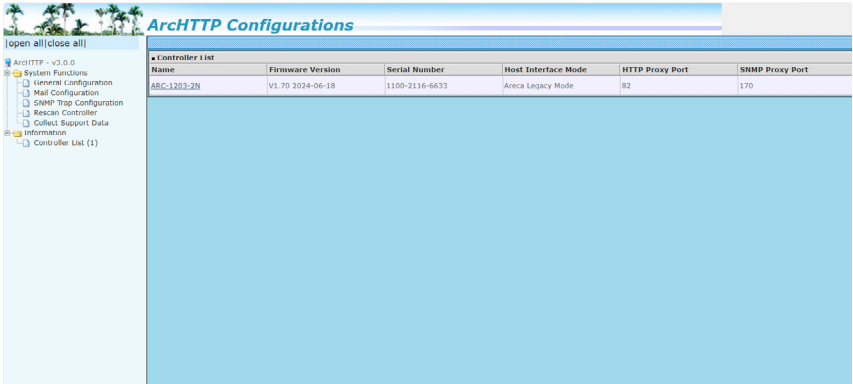
ARCHTTP PROXY SERVER INSTALLATION



10. Once ArchHTTP and CLI have been installed, the ArchHTTP background task automatically starts each time when you start your computer. There is one MRAID icon showing on your "Programs" folder. This icon is for you to start up the McRAID storage manager (by ArchHTTP) and CLI utility.



The **"ArchHTTP Taskbar"** icon shows on the button of system tray by default. Double click "ArchHTTP Taskbar" to launch the ArchHTTP Configuration screen. It automatically scans the local-host RAID units on the system and creates an individual RAID storage icon located in the left column screen. When you double click on a selected element the left column screen, child element belonged parent element appears. Locate "ARC-1203 Web Management" and launch the McRAID storage manager.



ARCHTTP PROXY SERVER INSTALLATION

1. See the next chapter detailing the McRAID Storage Manager to customize your RAID volume set.
2. If you need to configure the "System Function" of ArchHTTP, please refer to section 5.4 ArchHTTP Configuration.

5.2 For Linux

You should have administrative level permissions to install RAID software. This procedure assumes that the RAID hardware and Linux are installed and operational in your system.

The following installation procedure explains how to install the RAID software for Linux.

The ArchHTTP proxy server for the RAID adapter card can be downloaded from the <https://www.areca.com.tw>. The firmware embedded McRAID storage manager can configure and monitor the RAID adapter via ArchHTTP proxy server.

1. Login as root. Copy the ArchHTTP file to a local directory. Download from the www.areca.com.tw or from the email attachment.
2. You must have administrative level permissions to install RAID adapter ArchHTTP proxy server software. This procedure assumes that the RAID hardware and driver are installed and operational in your system.

The following details are the installation procedure of the RAID adapter for Linux ArchHTTP proxy server software.

- (a). Run the ArchHTTP proxy server by using the following command:
Usage: `./archttp32 (TCP_PORT)` or `./archttp64 (TCP_PORT)`.
It depends on your OS version.
Parameters: TCP_PORT value= 1~65535 (If TCP_PORT assigned, ArchHTTP will start from this port. Otherwise, it will use the setting in the `archttpsrv.conf` or default 81). This is the port address assigning for the ArchHTTP configuration (Cfg Assistant). Such as: `archttp64 1553`

ARCHTTP PROXY SERVER INSTALLATION

- (b). ArchHTTP server console started, adapter card detected then ArchHTTP proxy server screen appears.

Copyright (c) 2004 Areca, Inc. All Rights Reserved.
Areca HTTP proxy server V2.4.0 for Areca RAID adapters.

Controller(s) list

Cfg Assistant : Listen to port[1553].
Controller[1](PCI) : Listen to port[1554].
Binding IP:[0.0.0.0]
Note: IP[0.0.0.0] stands for any ip bound to this host.

Press CTRL-C to exit program!!

Controller [1] Http: New client [9] accepted
Controller [1] Http: New Recv 243 bytes
Controller [1] Http: Send [174] bytes back to the client

- (c). If you need the "Cfg Assistant", please refer to section 5.6 ArchHTTP Configuration.
- (d). For detailing about McRAID storage manager to customize your RAID volume set is discussed in Chapter 6.

For Mozilla user:

Because our management need Java support, so user may need upgrade to version 1.6 or later.

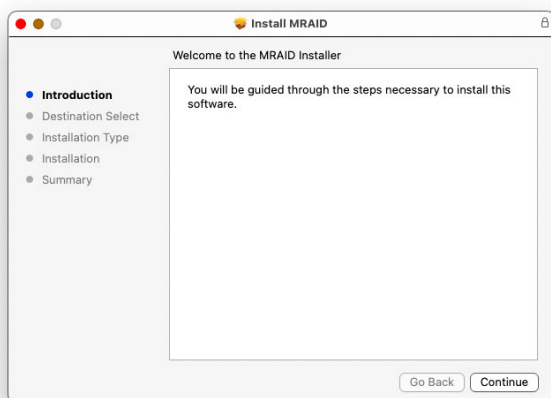
5.3 For MacOS

This section describes detailed instructions for installing the Areca Mac utility on your mac machine. You must have administrative level permissions to install macOS utility. This can be done in just a few steps!

1. Download the install-mraid installer from the website at "<https://www.areca.com.tw/support/downloads.html>", the file name begins with "install-mraid" followed by the version control.
2. Navigate to your Downloads folder and double-click the install-mraid software. The Installer will open.

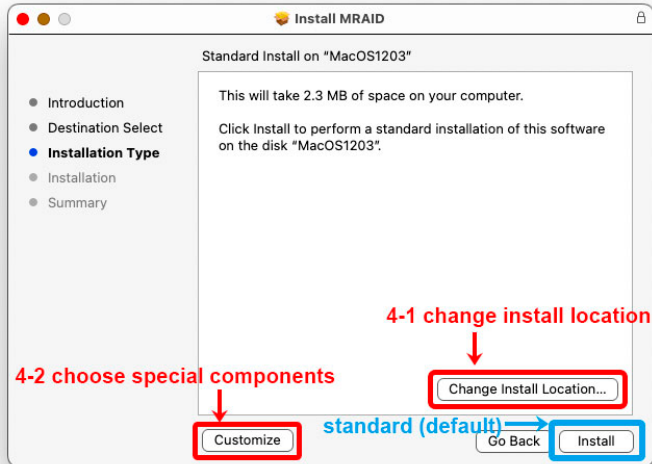


3. Click on the "**Continue**" button to begin the installation.

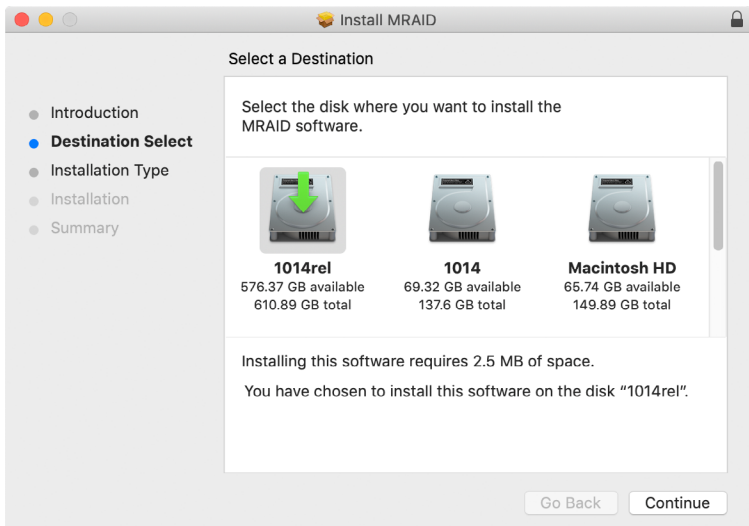


ARCHTTP PROXY SERVER INSTALLATION

4. If you have no need to change the install location or select to install special components, you can skip the step 4-1 and step 4-2, just click on the **"Install"** button to continue the standard (default) installation procedure.

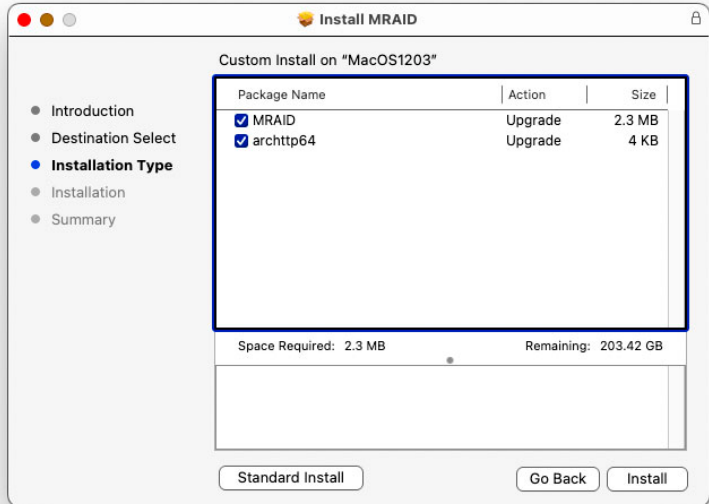


- 4-1. Click on the **"Change Install Location"** button to select the disk where you want to install the MRAID software.



ARCHTTP PROXY SERVER INSTALLATION

4-2, Click on the "**Customize**" button to choose special components. Click on an icon to install special components and click the "Install" button to continue.

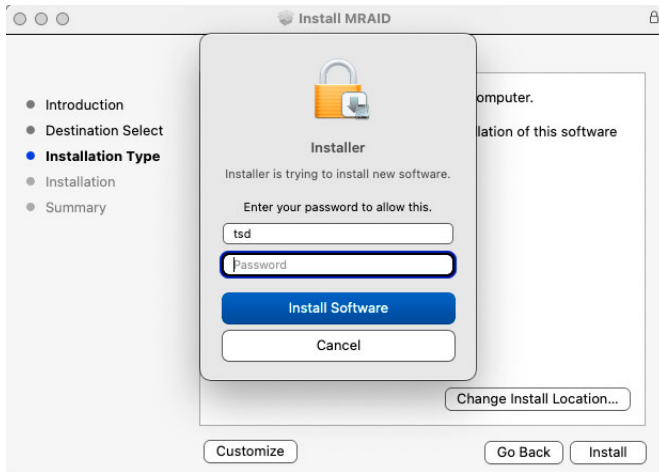


- **MRAID** is included below two applications.
 - *ArchHTTP has to be installed for GUI RAID console (McRAID storage manager) to run. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. Refer to the chapter 5.4 ArchHTTP Configuration on ARC-1203 series user manual, for details about the mail and SNMP traps configuration.*
 - *CLI (Command Line Interface) provides the functionality available in MRAID storage manager through a Command Line Interface. You can set up and manage RAID storage inline. CLI performs many tasks at the command line. You can download CLI manual from Areca website.*

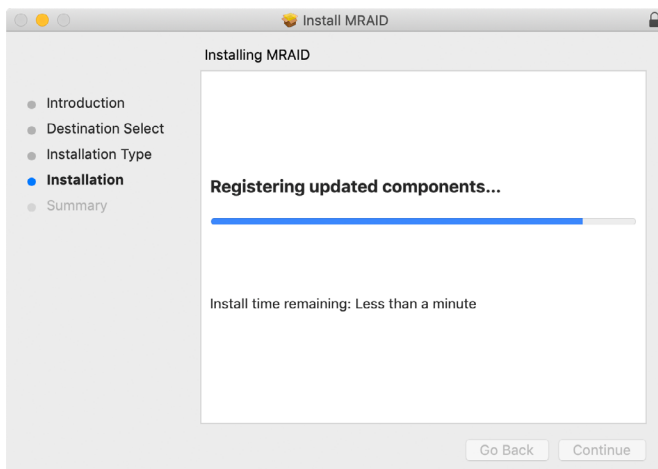
ARCHTTP PROXY SERVER INSTALLATION

- **ArchHTTP64** is required for ArchHTTP running as a service or daemon, and have it automatically start the proxy for all controllers found.

5. Enter your system password and click the “**Install Software**” button.

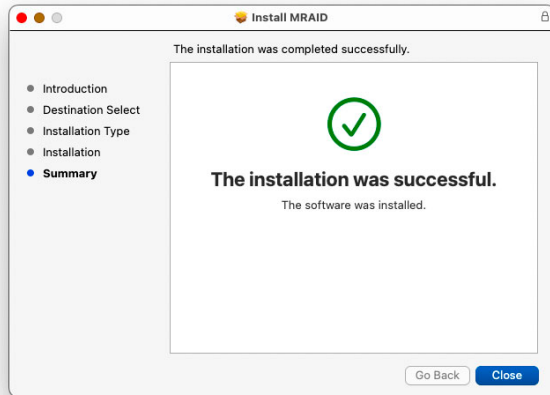


6. A program bar appears that measures the progress of the driver installation.



ARCHTTP PROXY SERVER INSTALLATION

7. When this screen shows, you have completed the installation and click on the "**Restart**" button to reboot your computer in order to complete installation.

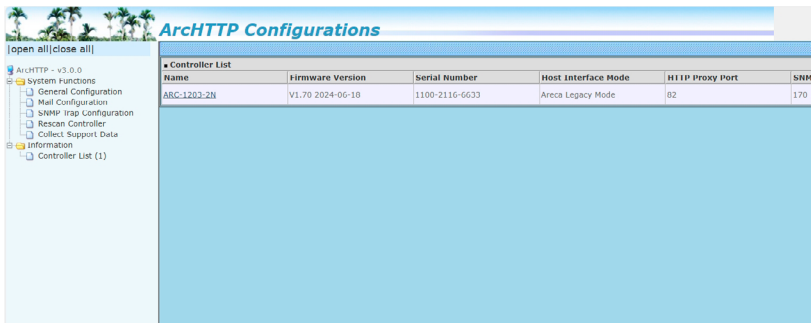


8. There is a MRAID folder icon showing on your desktop. The folder contains two items (ArcCLI64 and ArcHTTP64) that are for you to launch the MRAID storage manager.

ARCHTTP PROXY SERVER INSTALLATION

5.4 ArchHTTP Configuration

The ArchHTTP proxy server will automatically assign one additional port for setup its configuration. If you want to change the “archhttpsrv.conf” setting up of ArchHTTP proxy server configuration, for example: General Configuration, Mail Configuration, and SNMP Configuration, please start Web Browser `http://localhost: Cfg Assistant`. Such as `http://localhost: 81`. The port number for the first controller McRAID storage manager is ArchHTTP proxy server configuration port number plus 1.



- **General Configuration:**

Binding IP: Restrict ArchHTTP proxy server to bind only single interface (If more than one physical network in the server).
HTTP Port#: Value 1~65535.

Display HTTP Connection Information To Console: Select “Yes” to show Http send bytes and receive bytes information in the console.

Scanning PCI Device: Select “Yes” for ARC-1XXX series adapter.

Scanning RS-232 Device: No.

Scanning Inband Device: No.

- **Mail (alert by Mail) Configuration:**

Many users require that email notifications be sent to the appropriate administrators when an alert is detected. To set up your mail servers, click on the “Mail Configuration” link. The “SMTP Server Configurations” allows you to define settings for your mail server. This setup screen is shown as below:

ARCHTTP PROXY SERVER INSTALLATION

The screenshot shows the 'ArchHTTP Configurations' window. The left sidebar has a tree view with 'SMTP Server Configuration' selected. The main area is divided into three sections: 'SMTP Server Configuration', 'Mail Address Configurations', and 'Event Notification Configurations'. Each section has a list of checkboxes on the left and corresponding text input fields on the right. At the bottom, there are buttons for 'Confirm The Operation' and 'Cancel'.

Configuration Section	Option	Value / Action
SMTP Server Configuration	SMTP Server IP Address	[Empty Field]
	Secure Connection (SSL)	<input checked="" type="checkbox"/>
Mail Address Configurations	Sender Name	[Empty Field]
	Mail Address	[Empty Field]
	Password	[Empty Field]
Event Notification Configurations	Mail Name 1	[Empty Field]
	Disable Event Notification	<input checked="" type="checkbox"/>
	Urgent Error Notification	<input type="checkbox"/>
	Serious Error Notification	<input type="checkbox"/>
	Warning Error Notification	<input type="checkbox"/>
	Information Notification	<input type="checkbox"/>
	Notification For No Event	<input type="checkbox"/>
	Mail Name 2	[Empty Field]
	Disable Event Notification	<input checked="" type="checkbox"/>
	Urgent Error Notification	<input type="checkbox"/>
	Serious Error Notification	<input type="checkbox"/>
	Warning Error Notification	<input type="checkbox"/>
Information Notification	<input type="checkbox"/>	
Notification For No Event	<input type="checkbox"/>	
Mail Name 3	[Empty Field]	
Disable Event Notification	<input checked="" type="checkbox"/>	
Urgent Error Notification	<input type="checkbox"/>	
Serious Error Notification	<input type="checkbox"/>	
Warning Error Notification	<input type="checkbox"/>	
Information Notification	<input type="checkbox"/>	
Notification For No Event	<input type="checkbox"/>	
Mail Name 4	[Empty Field]	
Disable Event Notification	<input checked="" type="checkbox"/>	
Urgent Error Notification	<input type="checkbox"/>	
Serious Error Notification	<input type="checkbox"/>	
Warning Error Notification	<input type="checkbox"/>	
Information Notification	<input type="checkbox"/>	
Notification For No Event	<input type="checkbox"/>	

The following article describes a best practice methodology for setting this up in the "SMTP Server Configurations".

1. SMTP Server Configuration:

SMTP Server IP Address: Enter IP address of the SMTP server to configure your mail program correctly.

Ex: 192.168.0.2.

2. Mail Address Configurations:

Sender Name: This is the sender name that the e-mail alerts will appear to be coming from.

Ex: RaidController_1.

Mail address: This is the mail address that the e-mail alerts will appear to be coming from, but don't type IP to replace domain name.

Ex: RaidController_1@areca.com.tw.

Account: Enter the valid account if your SMTP mail server requires authentication.

Password: Enter the valid password if your SMTP mail server requires authentication.

3. Event Notification Configurations:

This step involves setting up of notification rules. Notification rules instruct ArchHTTP on the notifications that should be sent when certain types of alerts are detected.

ARCHTTP PROXY SERVER INSTALLATION

MailTo Name: Enter the alert receiver name that will be shown in the outgoing mail.

Mail Address: Enter the receiver's e-mail address. This is the address you want the e-mail alerts sent to.

Ex: admin@areca.com.tw.

According to your requirement, set the corresponding event level:

Disable Event Notification: No event notification will be sent.

Urgent Error Notification: Send only urgent events.

Serious Error Notification: Send urgent and serious events.

Warning Error Notification: Send urgent, serious and warning events.

Information Notification: Send all events.

Notification For No Event: Notify user if no event occurs within 24 hours.

● **SNMP Traps Configuration:**

This section discusses how to enable the SNMP traps on your RAID storage, and how to control the sending of SNMP traps from the ArchHTTP. To send the SNMP traps to client SNMP manager such as Net-SNMP manager using the IP address assigned to the operating system, you can simply use the SNMP function on the ArchHTTP. The ArchHTTP only provides one direction to send the trap to the SNMP manager without needing to install the SNMP extension agent on the host. If SNMP manager requests to query the SNMP information from RAID storage, please refer the Appendix B "SNMP Operation & Installation".

To set up SNMP traps sending function, click on the "SNMP Configuration" link. SNMP Traps Configurations are set up on this page. This setup screen is shown as below:

ARCHTTP PROXY SERVER INSTALLATION

The screenshot displays the 'ArchHTTP Configurations' web interface. On the left is a navigation menu with options: 'System Functions' (containing 'General Configuration', 'Mail Configuration', 'SNMP Trap Configuration' (highlighted), and 'Rescan Controller'), and 'Information' (containing 'Collect Support Data'). The main content area is titled 'ArchHTTP Configurations' and contains several configuration sections:

- SNMP Trap Configurations:** A table with 5 rows for trap IP addresses. Each row has four input fields for IP octets (all set to 0) and a 'Port#' field (all set to 162).
- SNMP System Configurations:** A 'Community' field with the value 'public'.
- SNMP Trap Notification Configurations:** A section with radio buttons for different notification levels and their corresponding actions:
 - ☒ Disable Event Notification: No Event Notification Will Be Sent
 - ☐ Urgent Error Notification: Send Only Urgent Event
 - ☐ Serious Error Notification: Send Urgent And Serious Event
 - ☐ Warning Error Notification: Send Urgent, Serious And Warning Event
 - ☐ Information Notification: Send All Event
- Confirm The Operation:** A green bar containing 'Submit' and 'Reset' buttons.

The following article describes a best practice methodology for setting this up in the "SNMP Traps Configurations".

1. SNMP Trap Configurations

Enter the SNMP trap IP address.

2. SNMP System Configurations

Community name acts as a password to screen accesses to the SNMP agent of a particular network device. Type the community names of the SNMP agent in this field. Most network devices use "public" as default of their community names. This value is case-sensitive.

3. SNMP Trap Notification Configurations

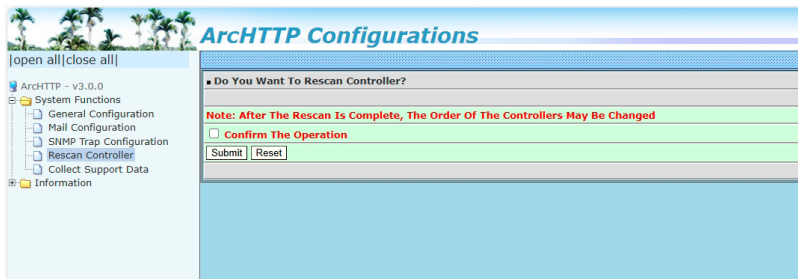
Event Notification Table refers to Appendix C. Before the client side SNMP manager application accepts the RAID storage traps, it is necessary to integrate the MIB into the management application's database of events and status indicator codes. Ensure the compilation process successfully integrates the contents of the `areca_sas.mib` file into the traps database.

Please refer to Appendix B of "SNMP Operation & Installation". The MIBs file can download from areca website.

ARCHTTP PROXY SERVER INSTALLATION

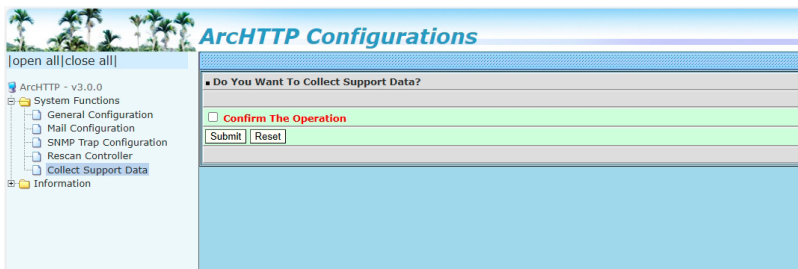
● Rescan Device Configuration:

The ArchHTTP scans the RAID adapters on the system and creates an individual RAID adapter icon located on left column of the "ArchHTTP Configurations" screen. If any RAID adapter is missed at system startup, then you can use the "Rescan Device" function to rescan the targets to allow a missed RAID storage to be added.



● Collect Support Data:

The "Collect Support Data" option on the ArchHTTP is used to download all adapter's information (system information, configuration, disk information and event log) to a supported file (file name:ctrlrxx-xxxxx.log). It will be automatically started when ERROR or SERIOUS event has occurred.



6. Web Browser-based Configuration

Before using the firmware-based browser McRAID storage manager, do the initial setup and installation of this product. If you need to boot up the operating system from a RAID volume set, you must first create a RAID volume by using McBIOS RAID manager. Please refer to section 3.5 Using Quick Volume /Raid Setup Configuration for information on creating this initial volume set.

The McRAID storage manager is firmware-based utility, which is accessible via the web browser installed on your operating system. The web browser-based McRAID storage manager is a HTML-based application, which utilizes the browser (IE, Chrome and Mozilla etc.) installed on your monitor station.

It can be accessed through the in-band PCIe bus or out-of-band LAN port. ArchHTTP is used to launch the in-band web browser-based McRAID storage manager. The firmware-embedded web browserbased McRAID storage manager allows local or remote to access it from any standard internet browser via a LAN or WAN with no software or patches required. The firmware contains SMTP manager monitors all system events and user can select either single or multiple user notifications to be sent via LAN with "Plain English" emails. The firmware embedded SNMP agent allows remote to monitor events via LAN with no SNMP agent required. Use the McRAID storage manager to:

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

6.1 Start-up McRAID Storage Manager

With McRAID storage manager, you can:

WEB BROWSER-BASED CONFIGURATION

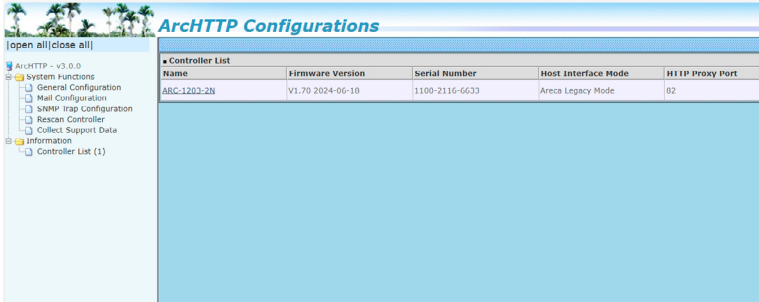
- Locally manage a system containing a supported RAID storage that has Windows or macOS, ArchHTTP and a supported browser.
- Remote and managed systems must have a TCP/IP connection.

• Start-up from Windows/Mac Local Administration

Once ArchHTTP and CLI have been installed, the ArchHTTP - background task automatically starts each time when you start your computer. There is one MARID icon showing on Mac "Desktop"



or one "**ArcHTTP Taskbar**" icon showing on Windows system tray. This icon is for you to start up the ArchHTTP (launch the McRAID storage manager). When you click on the ArchHTTP64 from MRAID or "**ArcHTTP Taskbar**" from system tray, it shows all RAID adapters available on the host system and create an individual RAID adapter icon located on left column of the "ArchHTTP Configurations" screen. This RAID adapter icon is for user to launch the selected RAID adapter web browser McRAID storage manager.



The "Enter Network Password" dialog screen appears, type the User Name and Password. The RAID adapter default User Name is "admin" and the Password is "0000". After entering the user name and password, press **Enter** key to access the McRAID storage manager.

• Start-up McRAID Storage Manager from Linux/ FreeBSD Local Administration

To configure the internal RAID adapter. You need to know its IP

WEB BROWSER-BASED CONFIGURATION

address. You can find the IP address assigned by the ArchHTTP proxy server installation: Binding IP:[X.X.X.X] and adapter listen port.

1. You can click on the individual adapter icon located on left column of the "ArchHTTP Configurations" screen or Launch your McRAID storage manager by entering `http://[Computer IP Address]:[Port Number]` in the web browser.
2. When connection is established, the "System Login" screen appears. The RAID adapter default user name is "admin" and the password is "0000".

● Start-up from Ethernet Port (Out-of-Band)

The RAID adapter also offers an alternative out-ofband method for McRAID storage manager. User can access the built-in configuration without running the ArchHttp proxy server on the host system. The web browser-based McRAID storage manager is a HTML-based application, which utilizes the browser installed on your remote system. To ensure proper communications between the tri-mode RAID adapter and McRAID storage manager, please connect the tri-mode RAID adapter LAN port to any LAN switch port.

The RAID storage has embedded the TCP/IP & web browser-based McRAID storage manager in the firmware. User can remote manage the tri-mode RAID adapter without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100Mbit RJ45 LAN port. To configure RAID adapter on a remote machine, you need to know its IP address. The IP address is default shown on the LCD initial start-up screen. Launch your McRAID storage manager by entering `http://[IP Address]` in the web browser.

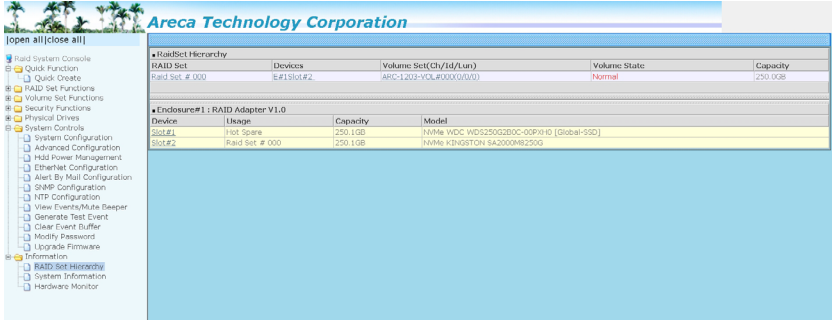
Note:

You can find adapter Ethernet port IP address in McBIOS RAID manager "System Information" option.

WEB BROWSER-BASED CONFIGURATION

6.2 McRAID Storage Manager

The following login screen is displayed in the browser. This screen displays the initial start-up configuration.



The RaidSet Hierarchy 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" on the main menu screen.

- To display RAID set information, move the mouse cursor to the desired RAID set number, then click on it. The RAID set information will be displayed.
- To display volume set information, move the mouse cursor to the desired volume set number, then click on it. The volume set information will be displayed.
- To display drive information, move the mouse cursor to the desired physical drive number, then click on it. The drive information will be displayed.

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6.3 Main Menu

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

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

6.4 Quick Function

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|open all|close all|

- Raid System Console
- Quick Function
 - Quick Create
- RAID Set Functions
 - Create RAID Set
 - Delete RAID Set
 - Expand RAID Set
 - Offline RAID Set
 - Rename RAID Set
 - Activate Incomplete RAID Set
 - Create Hot Spare
 - Delete Hot Spare
 - Rescue Raid Set
- Volume Set Functions
- Security Functions
- Physical Drives
- System Controls
- Information
 - RAID Set Hierarchy
 - System Information
 - Hardware Monitor

Quick Create Raid/Volume Set

Total Number Of Disks	2
Select Raid Level	Raid 1 ▾
Maximum Capacity Allowed	280 GB
Select Capacity	250 GB
Greater Two TB Volume Support	64bit LBA ▾
Volume Initialization Mode	No Initialization ▾
Volume Write Protection	Disabled ▾
Select Stripe Size	64 KBytes
RaidSet Mode	Max 128 Volumes ▾

☐ Confirm The Operation

Submit Reset

WEB BROWSER-BASED CONFIGURATION

The Quick Create option configures the arrays with just a few steps. Although drives of different sizes may be used in the array, Quick Create will only operate upon drives of the same physical size. The number of physical drives in the RAID adapter determines the Raid Levels that can be implemented with the RAID set. You can create a RAID set associated with exactly one volume set. The user can change the Raid Level, Capacity, Initialization Mode, and Stripe Size. A hot spare option is also created, depending on the exist configuration. Tick on the "Confirm The Operation" check box and click on the "Submit" button in the "Quick Create" screen, the RAID set and volume set will start to initialize.

Note:

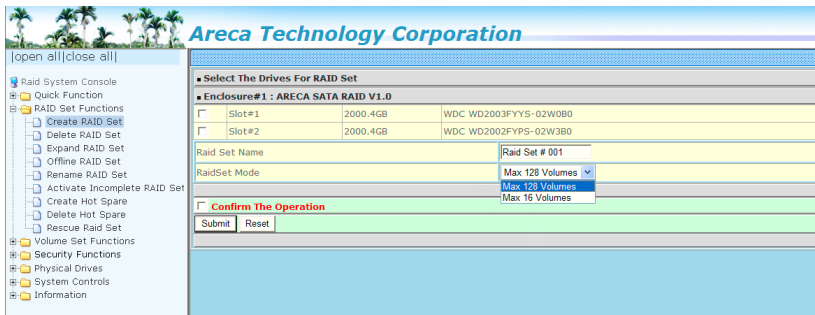
In "Quick Create", your volume set is automatically configured based on the number of disks in your system. Use the "Raid Set Functions" and "Volume Set Functions" if you prefer to customize your volume set, or RAID 30/50/60 volume set.

6.5 Raid Set Functions

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

6.5.1 Create Raid Set

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

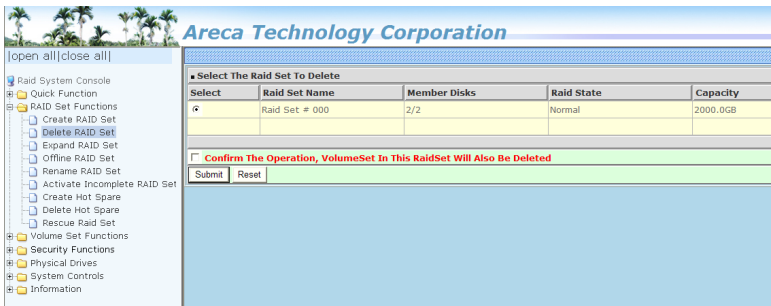


128 volumes is the default mode for RAID adapter, the 16 volumes mode is used for support roaming this raidset to SATA RAID adapters. The SATA RAID adapter is designed to support up to 16 volumes only. You have to use "Max 16 volumes" on the raidset mode if you plan to roam this raidset between RAID adapter and SATA RAID adapter.

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6.5.2 Delete Raid Set

To delete a RAID set, click on the “Deleted Raid Set” link. A “Select The RAID Set To Delete” screen is displayed showing all exist RAID sets in the current adapter. Click the RAID set number which you want to delete in the select column on the delete screen. Then, click the “Confirm The Operation” check box and click on the “Submit” button in the screen to delete it. The volume sets included in the “Delete RAID Set”. It will be deleted by this action.

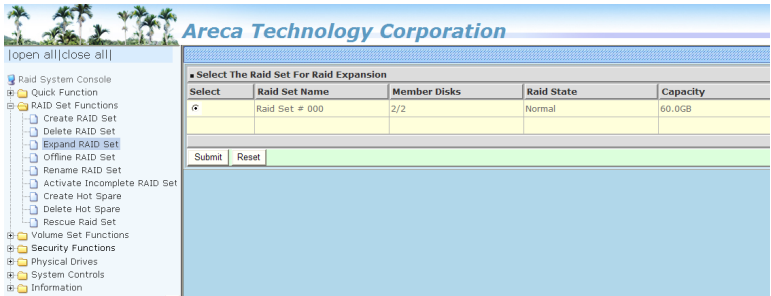


6.5.3 Expand Raid Set

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

To expand a RAID set:

Select the “Expand Raid Set” option. If there is an available disk, then the “Select The Raid Set For Raid Set Expansion” screen appears.



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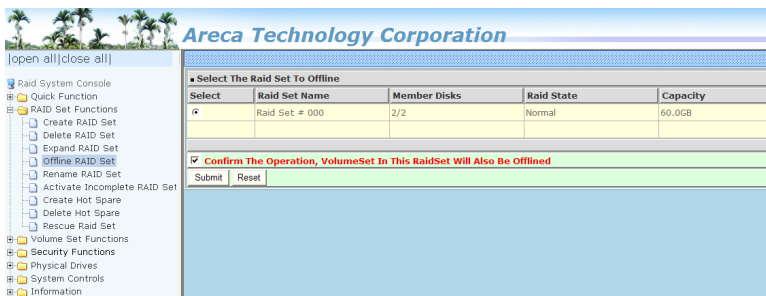
Select the target RAID set by clicking on the appropriate check box. Select the target disk by clicking on the appropriate check box. Click on the "Submit" button to start the expansion on the RAID set. The new additional capacity can be utilized by one or more volume sets. The volume sets associated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

Note:

1. Once the "Expand Raid Set" process has started, user can not stop it. The process must be completed.
2. If a disk drive fails during RAID set expansion and a hot spare is available, an auto rebuild operation will occur after the RAID set expansion completes.
3. RAID 30/50/60 does not support the "Expand Raid set".
4. RAID set expansion is a quite critical process, we strongly recommend customer backup data before expand. Unexpected accident may cause serious data corruption.

6.5.4 Offline Raid Set

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

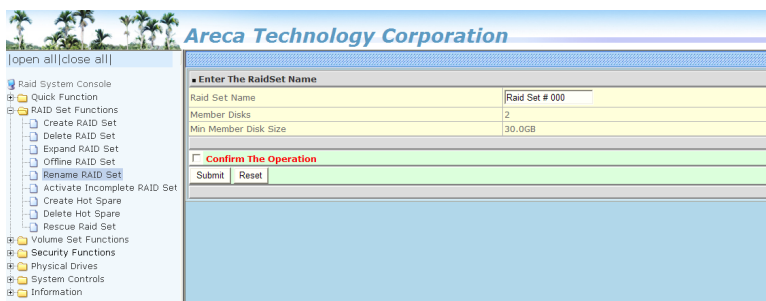


WEB BROWSER-BASED CONFIGURATION

6.5.5 Rename Raid Set

The default RAID set name will always appear as "Raid Set #" when it is first created by the adapter. The "Rename Raid Set" function is for customer to rename the default RAID set name. To rename a RAID set from a group of RAID sets:

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



6.5.6 Activate Incomplete Raid Set

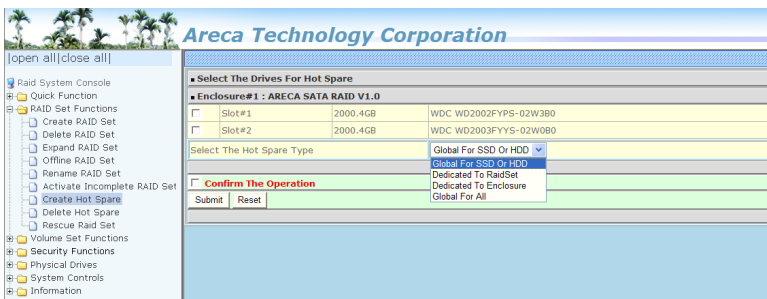
If one of the disk drives is removed in power off state, the RAID set state will change to "Incomplete State". If the user wants to continue to operate the adapter without power off the RAID adapter, the user can use the "Activate Incomplete Raid Set" option to activate the RAID set. After the user completes this function, the Raid State will change to "Degraded Mode" and start to work. To activate the incomplete the RAID set, click on the "Activate Raid Set" link. A "Select The RAID SET To Activate" screen is displayed showing all RAID sets existing on the current adapter.

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

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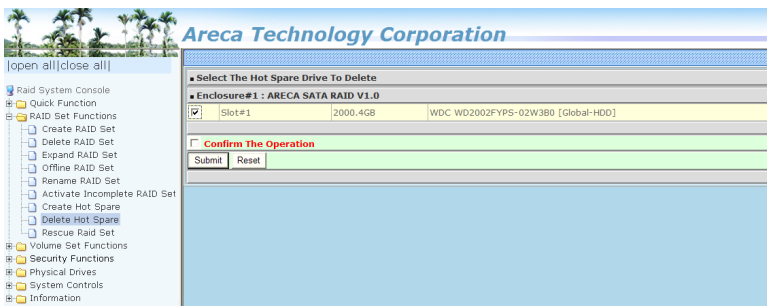
6.5.7 Create Hot Spare

When you choose the "Create Hot Spare" option in the "Raid Set Function", all unused physical devices connected to the current adapter appear. Select the target disk by clicking on the appropriate check box. Click on the "Confirm The Operation" check box and click on the "Submit" button in the screen to create the hot spares. The "Create Hot Spare" gives you the ability to define a global or dedicated hot spare. Unlike "Global Hot Spare" which can be used with any RAID sets, "Dedicated Hot Spare" can only be used with a specific RAID set or Enclosure. When a disk drive fails in the RAID set or enclosure with a dedicated hot spare is preset, data on the disk drive is rebuild automatically on the dedicated hot spare disk.



6.5.8 Delete Hot Spare

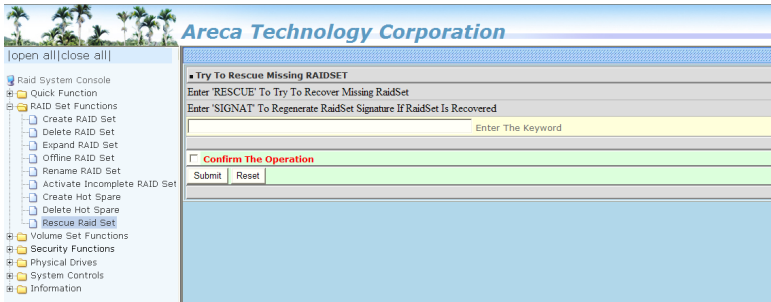
Select the target hot spare disk to delete by clicking on the appropriate check box. Click on the "Confirm The Operation" check box and click on the "Submit" button on the screen to delete the hot spares.



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6.5.9 Rescue Raid Set

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



Caution:

Please contact us to make sure if you need to use rescue function. Improperly usage may cause configuration corruption.

6.6 Volume Set Functions

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

The following summaries are the volume set features for the RAID adapter.

1. Volume sets of different RAID levels may coexist on the same RAID set and up to 128 volume sets per adapter.
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 adapter is capable of 64-bit LBA mode. However the operating system itself may not be capable of addressing more than 2TB.

6.6.1 Create Volume Set (0/1)

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 RaidSet ToCreateOnIt" screen will show all RAID set number. Tick on a RAID set number that you want to create and then click on the "Submit" button.

The new create volume set attribute allows user to select the Volume Name, RAID Level, Capacity, Greater Two TB Volume Support, Initialization Mode, Strip Size, Cache Mode, Write Protect, Tagged Command Queuing, and SCSI Channel/SCSI ID/SCSI LUN.

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open all | close all |

- Raid System Console
 - Quick Function
 - RAID Set Functions
 - Create RAID Set
 - Delete RAID Set
 - Expand RAID Set
 - Offline RAID Set
 - Remove 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 Check
 - Security Functions
 - Physical Drives
 - System Controls
 - Information

• Enter The Volume Attribute

Volume Name	ARC-1203-VOL000
Member Disks	2
Volume Raid Level	Raid 1
Max Capacity Allowed	200 GB
Select Volume Capacity	250 GB
Greater Two TB Volume Support	84bit LBA
Volume Initialization Mode	No Initialization
Volume Stripe Size	64 K/Bytes
Volume Cache Mode	Write Back
Volume Write Protection	Disabled
Tagged Command Queuing	Enabled
SCSI Channel:SCSI ID:SCSI Lun	0 0 0
Volumes To Be Created	1

☐ Confirm The Operation

Submit Reset

- **Volume Name**

The default volume name will always appear as “ARC-1203-VOL”. You can rename the volume set providing it does not exceed the 15 characters limit.

- **Volume Raid Level**

Set the Raid Level for the volume set. Highlight the desired RAID Level from the available RAID levels option.

There are two circumstances when you choose RAID level 1 function:

RAID 1-Simple Mirroring is also known as “**two disk mirror**”; If your RAID set has two disks, data written on one disk drive is simultaneously written to another disk drive.

- **Capacity**

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

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- **Greater Two TB Volume Support**

Adapter uses the "Greater Two TB Volume Support" submenu to set the volume capacity and sector size. Greater Two TB Volume Support option: "No", "64bit LBA" and "4K Block".

- **No**

When this option is enabled, it keeps the volume size with max. 2TB limitation. For any hard disk drives working in the 4K native mode in the Raid set, the volume set directly sets and exposes 4KB sector size to the operating system.

- **64bit LBA**

This option uses 16 bytes CDB instead of 10 bytes. The maximum volume capacity up to 512TB. For any hard disk drives working in the 4K native mode in the Raid set, the volume set directly sets and exposes 4KB sector size to the operating system.

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

- **4K Block**

This option uses 16 bytes CDB and changes the sector size from default 512 bytes to 4k bytes. Windows XP only supports maximum volume capacity is up to 16TB.

- **Initialization Mode**

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

Note:

Adapter starts to initialize the volume in two conditions

1. Stay in adapter bios manager
2. Boot into OS and the adapter driver loaded.

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for customer to rescue volume without losing data in the disk.

- **Stripe Size**

This parameter sets the size of the stripe written to each disk in a RAID 0 or 1 logical drive. You can set the stripe size to 4KB, 8KB, 16KB, 32KB, 64KB, 128KB, 256KB, 512KB, or 1024KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random reads more often, select a smaller stripe size.

- **Cache Mode**

The RAID adapter supports "Write Through" and "Write Back" cache.

- **Volume Write Protection**

When "Volume Write Protection" is enabled on the "Create Volume Set", host commands fail if they are issued to a volume in that RAID adapter and attempt to modify a volume's data or attributes. Volume Write Protection is used primarily for customer-initiated disaster recovery testing.

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

- **SCSI Channel/SCSI ID/SCSI Lun**

SCSI Channel: The RAID adapter function is simulated as a external SCSI RAID adapter. The host bus is represented as a SCSI channel. Choose the SCSI Channel.

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 RAID adapter is a large SCSI device. Assign an ID from a list of SCSI IDs.

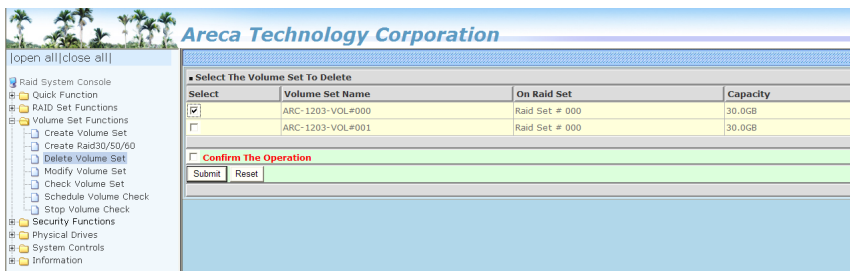
SCSI LUN: Each SCSI ID can support up to 8 LUNs. Most SAS

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adapters treat each LUN like a SAS disk.

6.6.2 Delete Volume Set

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

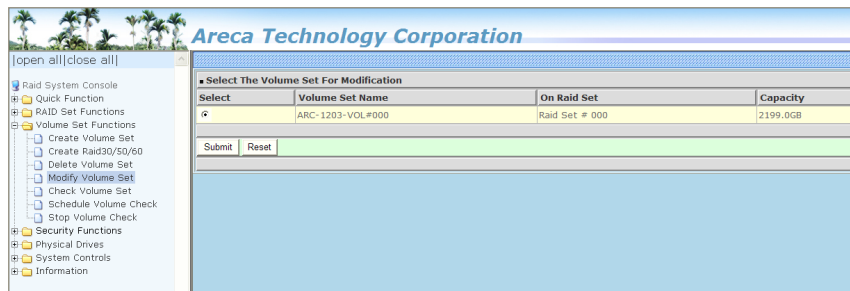


the "Confirm The Operation" check box and then click the "Submit" button to delete the volume set.

6.6.3 Modify Volume Set

To modify a volume set from a RAID set:

1. Click on the "Modify Volume Set" link.
2. Click the volume set check box from the list that you wish to



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modify. Click the "Submit" button. The following screen appears.

Use this option to modify the volume set configuration. To modify volume set attributes, move the cursor bar to the volume set attribute menu and click it. The "Enter The Volume Attribute" screen appears. Move the cursor to an attribute item and then click the attribute to modify the value. After you complete the modification, click the "Confirm The Operation" check box and click the "Submit" button to complete the action. The user can only modify the last volume set capacity.

6.6.3.1 Volume Growth

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

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customer-initiated disaster recovery testing.

6.6.4 Check Volume Set

ARC-1203-2N/ARC-1203-2i can only create RAID 0 and RAID 1,



so this option has no function in ARC-1203-2N/ARC-1203-2i.

6.6.5 Stop Volume Set Check

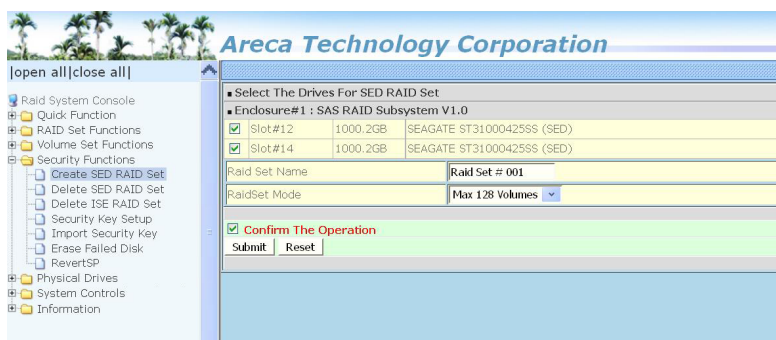
Use this option to stop the “Check Volume Set” function. Due to “Check Volume Set” has no function, this option is not



6.7 Security Function

The “Security Function” on the new firmware supports Self-Encrypting Disks (SED) for protection of data against loss or theft of SEDs. Protection is achieved by the use of encryption technology on the drives. The McRAID storage management allows SED keys to be created and managed as well as create/delete RAID sets. The following section provides the “Security Function” instructions to perform the custom configuration tasks. All SED functions are integrated into the intuitive and user friendly McRAID manager interface for easy access. Choose this option from the main menu and then perform the operations listed below.

6.7.1 Create SED RAID Set



To create a SED RAID set, click on the “Create SED Raid Set” link. A “Select The Drive For SED RAID Set” screen is displayed showing the SED drive(s) connected to the current adapter and enclosures. Click on the selected physical drives within the current RAID set. Enter 1 to 15 alphanumeric characters to define a unique identifier for a SED RAID set. The default RAID set name will always appear as “Raid Set #”. Tick on the “Confirm The Operation” check box and click on the “Submit” button on the screen; the RAID set will start to initialize. If you have available disk member, you can repeat above procedures to define another RAID sets. The Max 128 Volumes is the default mode for RAID adapter.

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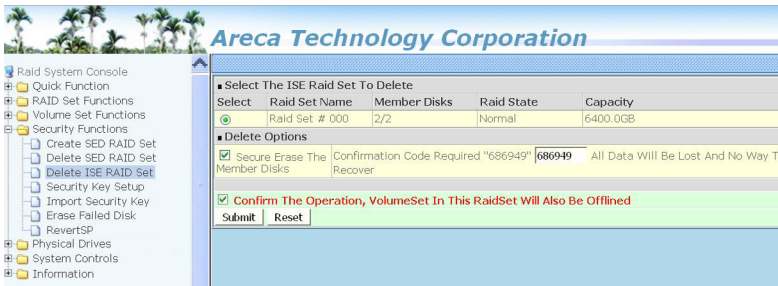
6.7.2 Delete SED RAID Set



A SED RAID Set is a RAID Set that has been locked on a adapter that holds a security key. When you delete existing SED RAID sets, there has one option available to perform an Instant Secure Erase. The "Secure Erase The Member Disks" function is the process of permanently erasing all data on the SED disks and resetting the security attributes. The data on the SED disk is lost.

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

6.7.3 Delete ISE RAID Set



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Instant Secure Erase (ISE) or Crypto Erase allows a drive to be instantly erased using industry-standard commands and options. An ISE RAID Set is a RAID Set that has been created by a group of mixing ISE and no-ISE drives using "Create Raid Set" function on a adapter. When you delete existing ISE RAID sets, there has one option available to perform an Instant Secure Erase. The "Secure Erase The Member Disks" function is the process of permanently erasing all data on the ISE disks and resetting the security attributes. The data on the ISE disk is lost.

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

6.7.4 Security Key Setup

The Areca RAID adapters support Self-Encrypting Disks (SED) for protection of data against loss or theft of SEDs. Protection is achieved by the SED hard drive that automatically and continuously encrypts the data on the drive without any user interaction. There is one SED key per adapter. You can manage the SED key under McRAID manager. Local SED key management in the adapter firmware is designed to protect data from security breaches with minimal cost and complexity. The key can be escrowed in to a file using McRAID manager. Creating and managing SED key is an important part of the cryptographic process. The key must be kept secret from anyone who should not decrypt your data. This section describes how to generate and manage keys.

6.7.4.1 SED Key Management-Creation

There is one SED key per adapter which stores in the adapter flash memory. Areca provides both automatically or password methods to generate a key.

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1. SED Key is generated automatically by internal random number for a SED RAID set use without needing a password input.
2. SED Key is generated by user supplied password for a SED RAID set use.



6.7.4.2 SED Key Management-Modification

If you have evidence that the SED key is known to unauthorized users, you can change the SED key again. The "Disable SED Key" function is used to clear SED key on adapter and RAID set members.



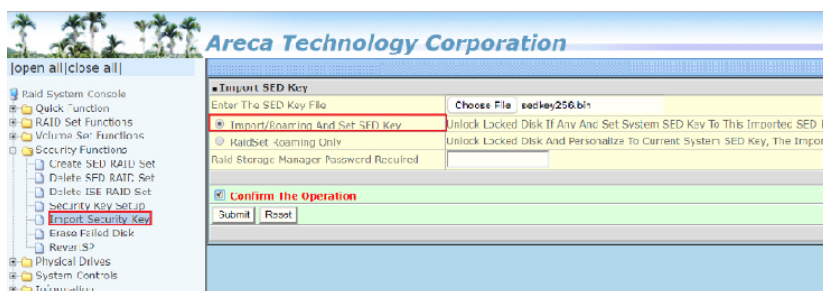
In some cases, you may want to export a SED key to store on removable media or to use on a different computer. If you want to create a backup copy of the SED key or use it on another computer, you must first export the SED key. Exporting the SED key puts it in a file (filename.bin) that you can then transfer to another computer or put in a safe place.

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6.7.5 Import Security Key

SED RaidSet created on an Areca RAID adapters can be migrated to another RAID adapter. If you are importing a RaidSet originally secured with a SED key, you need to import the foreign SED key files to secure or unlock that RaidSet. The "Import Security Key" file is for Raidset Roaming or Change SED Key function. If you roam a RaidSet from old adapter to another new (with Security Functions support), the foreign SED key file must be imported before it can be used.

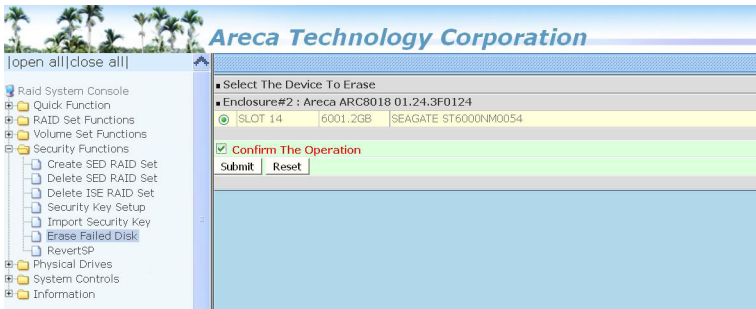


1. Select the "Import/Roaming And Set SED Key" option to unlock the locked disk and change to foreign SED key.
2. Select the "RaidSet Roaming Only" option to unlock the locked disk and personalize to new adapter's SED key. If there is an existing SED key on new adapter, RaidSet is updated with the new security key. If there is not an existing SED key on new adapter, RaidSet is updated to unlock RaidSet.

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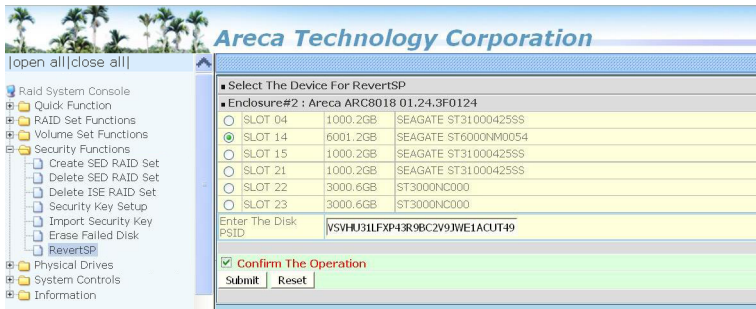
6.7.6 Erase Failed Disk

To erase the failed encryption-capable physical disk, move the cursor bar to the main menu and click on the "Erase Failed Disk" link. The "Select The Device To Erase" screen will show all failed encryption-capable physical disks. Tick on the failed disk that you want to erase and then click on the "Submit" button. In case adapter successfully performs an Instant Secure Erase, it will erase all data on the encryption-capable physical disk disks and reset the security attributes. The data on the encryption-capable physical disk is lost.



6.7.7 RevertSP

SED models will support the RevertSP feature which erases all data in all bands on the device and returns the contents of all SPs (Security Providers) on the device to their original factory state. In order to execute the RevertSP method the unique PSID (Physical Secure ID) printed on the drive label must be provided. PSID is not electronically accessible and can only be manually read from the drive label.



workable either.

6.8 Physical Drive

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

6.8.1 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. You can select one or dual disks for pass-through disk function. A mirrored passthrough mode means adapter will be regarded as the hard disk clone function, a host's data will write simultaneously into two or three hard disks in the RAID adapter. If you combine an SSD and HDDs in a mirrored pass-through hybrid solution, you can get all the reads from the SSD with SSD speed. A pass-through disk is not controlled by the RAID adapter firmware, it can't be a part of a volume set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID firmware. The user can also select the Volume Cache Mode, Write Protection, Tagged Command Queuing, and SCSI channel/SCSI_ID/ SCSI_LUN for this pass-

The screenshot shows the 'Areca Technology Corporation' web interface. On the left is a navigation tree with categories like 'Raid System Console', 'Physical Drives', and 'System Controls'. The 'Physical Drives' category is expanded, showing options such as 'Create Pass-Through Disk', 'Modify Pass-Through Disk', 'Delete Pass-Through Disk', 'Clone Disk', 'Abort Cloning', 'Set Disk To Be Failed', 'Activate Failed Disk', 'Identify Enclosure', and 'Identify Drive'. The 'Create Pass-Through Disk' option is selected. The main content area displays the configuration for 'Select the IDE drive For Pass Through' under 'Enclosure#1 : ARECA SAS RAID AdapterV1.0'. It shows two slots: Slot#1 and Slot#2, both with 600.1GB capacity and WDC WD6000HLHX-01JJPV0 model. Below this is the 'Enter Pass Through Disk Attribute' section, which includes settings for Volume Cache Mode (Write Back), Write Protection (Disabled), Tagged Command Queuing (Enabled), and SCSI Channel (SCSI_ID:SCSI_Lun) set to 0:0:0. At the bottom, there is a 'Confirm The Operation' checkbox and 'Submit' and 'Reset' buttons.

■ Select the IDE drive For Pass Through		
■ Enclosure#1 : ARECA SAS RAID AdapterV1.0		
<input checked="" type="radio"/> Slot#1	600.1GB	WDC WD6000HLHX-01JJPV0
<input type="radio"/> Slot#2	600.1GB	WDC WD6000HLHX-01JJPV0

■ Enter Pass Through Disk Attribute	
Volume Cache Mode	Write Back
Write Protection	Disabled
Tagged Command Queuing	Enabled
SCSI Channel:SCSI_ID:SCSI_Lun	0 : 0 : 0

☒ Confirm The Operation

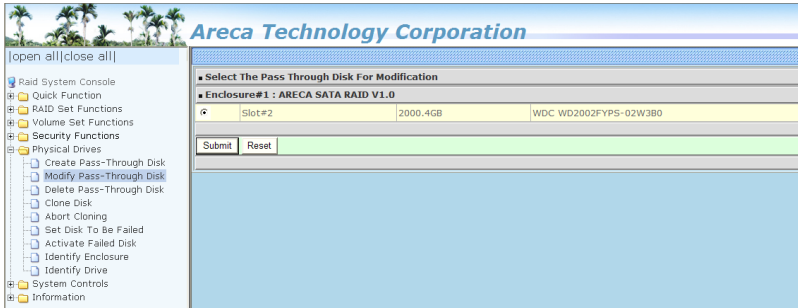
Submit Reset

through disk.

6.8.2 Modify Pass-Through Disk

Use this option to modify the pass-through disk attribute. The user can modify the Cache Mode, Write Protect, Tagged Command Queuing, and SCSI Channel/ID/LUN on an existing pass-through disk.

To modify the pass-through drive attribute from the passthrough drive pool, move the mouse cursor bar and click on the "Modify Pass-Through" link. The "Select The Pass Through Disk For Modification" screen appears mark the check box for the pass-through disk from the pass-through drive pool and click on the "Submit" button to select drive. When the "Enter Pass-Through Disk Attribute" screen appears, modify the drive attribute values, as you want. After you complete the selection, mark the check box for "Confirm The Operation" and click on the "Submit" button to com-

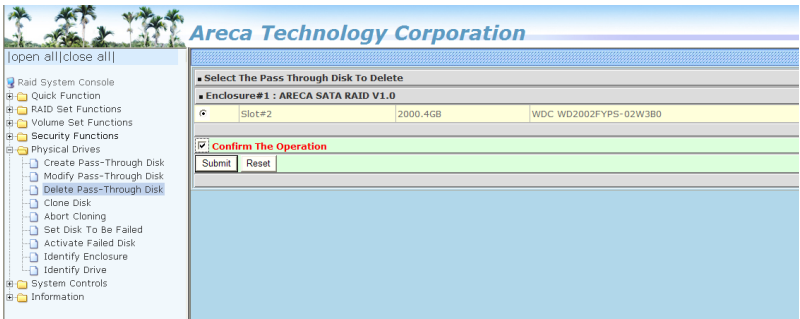


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plete the selection action.

6.8.3 Delete Pass-Through Disk

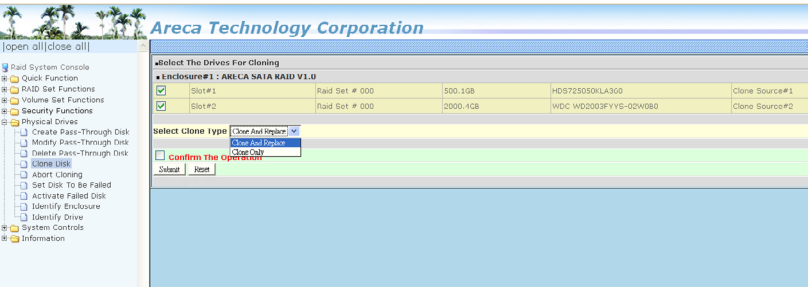
To delete a pass-through drive from the pass-through drive pool, move the mouse cursor bar to the main menus and click the “Delete Pass Through” link. After you complete the selection, mark



the check box for “Confirm The Operation” and click the “Submit” button to complete the delete action.

6.8.4 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 the “Clone Disk” option on the “Physical Drives” link to enable the clone function. If there is an available disk, then the “Select The



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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. Tick on the “Confirm The Operation” check box and click on the “Submit” button on the screen; the adapter 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.

6.8.4.1 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”.

6.8.4.2 Clone Only

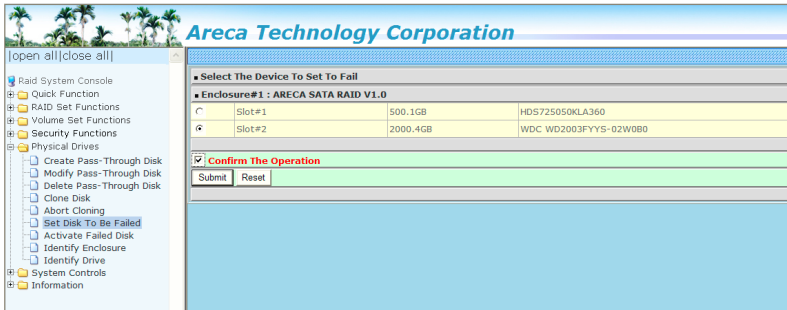
The stand-by disk will clone the logical drives without substituting it. The status of the stand-by drive will be marked as “Offlined” after the cloning process. The source drive will remain a member of the logical drive.

6.8.5 Abort Cloning

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Use this function to stop the ongoing clone disk action.

6.8.6 Set Disk To Be Failed



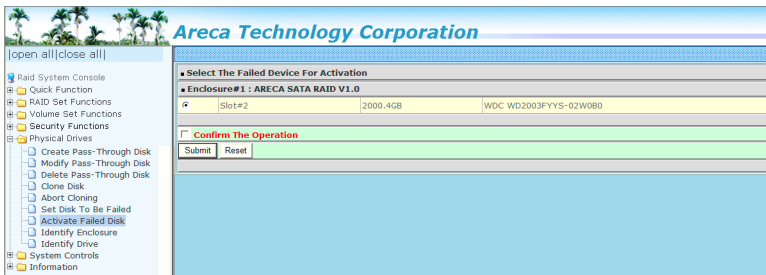
It sets a normal working disk as “failed” so that users can test some of the features and functions.

6.8.7 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. Losing PHY connection due to bad connector, cable, backplane
3. Losing PHY connection due to disk fail

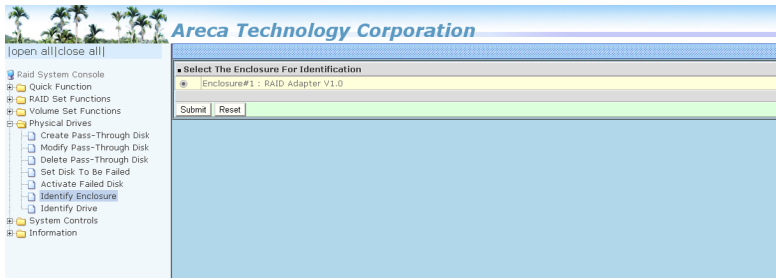


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Basically, in the eyes of the adapter, the disk suddenly disappears due to whatever reason.

6.8.8 Identify Enclosure

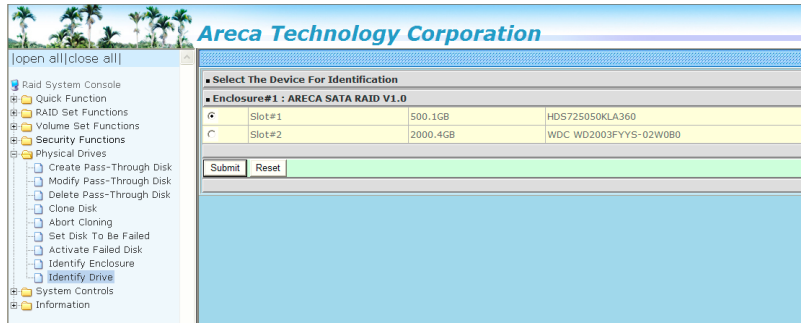
To prevent removing the wrong enclosure, the selected Areca expander enclosure all disks fault LED indicator will light for physically locating the selected enclosure when the “Identify En-



closure” is selected. This function will also light up the enclosure LED indicator, if it is existed.

6.8.9 Identify Drive

To prevent removing the wrong drive, the selected disk fault



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LED indicator will light for physically locating the selected disk when the "Identify Selected Device" is selected.

6.9 System Controls

6.9.1 System Config

To set the RAID system function, move the cursor to the main menu and click on the "System Controls" link. The "Raid System

The screenshot shows the Areca Technology Corporation RAID System Console. The left sidebar contains a tree menu with the following items: Raid System Console, Quick Function, RAID Set Functions, Volume Set Functions, Security Functions, Physical Drives, System Controls (selected), System Configuration (expanded), 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, Import SSL Certificate/Key, Upgrade Firmware, Information, RAID Set Hierarchy, System Information, and Hardware Monitor. The main content area is titled 'System Configurations' and contains a list of settings with dropdown menus and checkboxes. The settings are: System Beeper Setting (Enabled), Background Task Priority (Low(20%)), JBOD/RAID Configuration (RAID), Host Interface Mode (NVMe Mode), HDD Read Ahead Cache (Enabled), Volume Data Read Ahead (Normal), HDD Queue Depth (64), Empty HDD Slot LED (ON), Max Command Length (1M), Auto Activate Incomplete Raid (Disabled), Disk Write Cache Mode (Auto), Write Same For Initialization (Enabled), Hot Plugged Disk For Rebuilding (Blank Disk Only), Disk Capacity Truncation Mode (Multiples Of 10G), Smart Option For HDD (Failed The Drive), and Smart Polling Interval (On Demand). At the bottom, there is a 'Confirm The Operation' section with 'Submit' and 'Reset' buttons.

Function" menu will show all items, and then select the desired function.

- **System Beeper Setting**

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

- **Background Task Priority**

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

- **Host Interface Mode**

The "Host Interface Mode" function is used to configure adapter work type. "Areca Legacy Mode" is adapter work as a legacy RAID adapter, supported by Areca driver. "NVMe Mode"

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is adapter emulate as a NVMe device, supported by system native driver.

- **JBOD/RAID Configuration**

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

User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

- **HDD Read Ahead Cache**

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

- **Volume Data Read Ahead**

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

- **HDD Queue Depth**

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

- **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 drive installed. When each slot has a power LED for the drive installed identify, user can set this option to "OFF". Choose

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option "ON", the RAID adapter will light the fault LED; if no drive installed.

- **Max Command Length**

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

- **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 RAID adapter 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.

- **Disk Write Cache Mode**

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

- **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 "Enabled" or "Disabled" for the controller initialization.

- **Hot Plugged Disk For Rebuilding**

It defines if the RAID array volume should start rebuilding or not when 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. So when a previously removed disk is self re-inserted, it won't trigger the degraded RAID array to rebuild, and so that the administrator has a chance to identify this mis-behaving disk and replaces it.

"Always" - it is what it was before. Whenever a disk is insert-

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ed/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.

- **Disk Capacity Truncation Mode**

Areca RAID adapters 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 adapter provides three truncation modes in the system configuration: “**Multiples Of 10G**”, “**Multiples Of 1G**”, and “**Disabled**”.

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

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

Disabled: It does not truncate the capacity.

- **Smart Option For HDD**

This option is used to increase 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”. The default is “Alert Only”.

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“Failed The Drive” – adapters kill off the SMART fail drive immediately.

“Failed The Drive If Hot Spare Exist” – adapters kill off the SMART fail disk if hot spare drive is existed.

“Alert Only” – it will trigger alert when there happens a SMART failed drive.

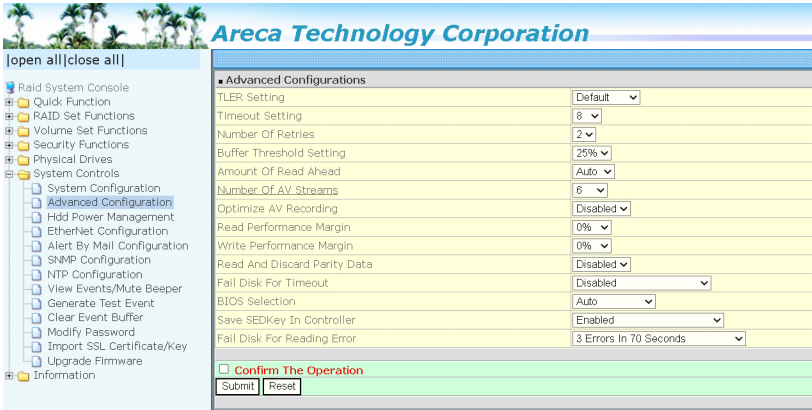
- **Smart Polling Interval**

Besides the scheduled volume check, user can define the Smart Pulling Interval to pull the SMART status of each drive. The default is “on demand”. User can schedule every certain period of time interval to pull the SMART status of each drive. When SMART pulling is executed, drive activity will be temporarily halted until the SMART parameter reading is finished. That is why you don’t want to set the “ Smart Polling Interval” too frequent. What to use is up to the users to decide based on their applications and experimental results.

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6.9.2 Advanced Configuration

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



- **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 adapter in the event that an error recovery process is taking longer than time-out specifications allow. This prevents the RAID adapter 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.

- **Timeout Setting**

Disk time-out is a registry setting that defines the time that RAID adapter 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.

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- **Number of Retries**

This setting determines the number of access that will be attempted before the current command from the RAID adapter 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, either 2 retry or 3 retry.

- **Buffer Threshold**

This new feature there are 4 options; 5%, 25%, 50%, 75%. The percentage represents how much data should be kept in 177 WEB BROWSER-BASED CONFIGURATION 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 incoming write 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 adapter 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 use ful 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.

- **Amount of Read Ahead**

Read-Ahead data is buffered in the RAID adapter 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 sub system. This makes it possible to locate and reissue 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 512KB ~ 32MB.

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- **Number of AV Stream**

RAID adapters are required to have not only the function of processing ordinary data but also the function of dealing with AV (audio/video) stream data needing real-time processing. Since the bus cycle used in RAID adapter was designed to transfer the computer data exactly, it was unsuitable for the transfer of AV stream needing great band widths. They are required to do some setting for the handshaking during the processing of stream data. This setting is an object of transferring stream data efficiently on an existing RAID adapter. 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 adapter.

- **Optimize AV Recording**

AV recording option is for video recording (no time limit), but if used in normal operation, performance may be degraded. This new feature there are 4 options; Disabled, Mode1, Mode2 and Mode 3. Default value is Disabled. Our adapter cache uses LRU method, there have no special memory capacity reserved for read or write. The Mode 1, 2 and 3 are used to define the command sorting method. The default sorting method is helpful for normal applications, but not useful for AV applications, so we have defined three different sorting methods for these special applications. To decide how to optimize AV stream recording parameter, you need to adjust the Optimize AV Recording, and Write Buffer Threshold during runtime.

- **Read Performance Margin**

The "Read Performance Margin" is for adapter to reserve n% read margin during AV stream recording.

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● Write Performance Margin

The "Write Performance Margin" is for adapter to reserve n% write margin AV stream recording.

AJA Mode Usage:

1. Adapter needs to reboot when you adjust the following settings.
 - (1). Optimize For AV Recording: change any setting
 - (2). Read Performance Margin : No <-> X%
 - (3). Write Performance Margin : No <-> X%
2. The following setting is changed for AJA mode, and reboot is required for the setting to take effect.

Setting and Usage			
Optimize AV	Read Margin	Write margin	Description
Mode 3	Any	Any	R/W AJA mode with throttling, no sorting
Mode Disabled/1/2	X%	X%	R/W AJA mode with throttling and sorting
Mode Disabled/1/2	X%	No	Read AJA mode with throttling and sorting
Mode Disabled/1/2	No	X%	Write AJA mode with throttling and sorting

- <a>. Under Optimize For AV Recording mode: 3
Read Performance Margin and Write Performance Margin are enabled with "No" setting is 0%, reboot is not required to change Read Performance Margin and Write Performance Margin
- . If Read Performance Margin or Write Performance Margin are changed to X%, reboot is not required to change X% to Y%.
- <c>. For NON-VIDEO application, the following setting is recommended
Buffer Threshold Setting: 25%
Optimize AV Recording: disabled

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Example:

- (1). Only write throttling is required
 - (a). Buffer Threshold Setting: 5%
 - (b). Optimize For AV Recording Mode left unchanged (Disabled)
 - (c). Read Performance Margin left unchanged (No)
 - (d). Write Performance Margin set to X%
 - (e). Reboot
 - (f). Adjust Write Performance Margin to fine tune the result (no reboot required)

- (2). Read/Write Throttling is required and sorting is to be disabled
 - (1). Buffer Threshold Setting: 5%
 - (2). Optimize For AV Recording Mode set to 3
 - (3). Reboot
 - (4). Adjust Read/Write Performance Margin to fine tune the result (no reboot required)

● **Read And Discard Parity Data**

This function is used to determine if parity data is to be read and discarded.

● **Fail Disk For Any Timeout**

Imaging system products expect to have constant speed for writing raw data to the storage by constant speed without any data loss whenever a drive becomes failure in RAID system. This function is the option that RAID adapter will kill off the HDD for any time out. It can reduce the write cache size to buffer the raw data.

● **BIOS Selection**

It combines the "Legacy BIOS", "UEFI BIOS" and "EFI BIOS" into a single BIOS, and provides BIOS option in the GUI. In the old days, Areca provided separate BIOS files for each, and need to manually flash it in. Now flashing BIOS for different BIOS type is no longer needed, just make the BIOS selection in System Controls: Advance Configuration: BIOS Option.

The adapter provides three BIOS options.

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Auto: depends on the M/B PCIe slot setting for the RAID adapter installed.

UEFI: for PC motherboards using UEFI boot.

EFI: for Intel-based Mac boot

Legacy: for PC motherboards that are using regular BIOS boot.

Disable: disable adapter BIOS at POST (set to 0xFF)

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

- **Save SED Key In Controller**

<a> If enable --> disable, clear SED Key saved in setup

 If disable --> enable, if key exists, save to setup

If enable--->disable, the key will not remain in the flash. So that next time power up again, it will need to input the key from the CLI or McRAID manager. You can also import the key file (Import Security Key) or key-in the password (Enter SED Key By Password) from the GUI interface.

- **Fail Disk For Reading Error**

This option is available to improve the fail disk function if the disk has too many reading errors. This function is the option that RAID adapter will kill off the drive for reading error account setting value.

- 3 errors in 70 seconds: this option also includes 4 errors in 100 seconds, 5 errors in 120 seconds
- 6 errors in 2 minutes: this option also includes 8 errors in 180 seconds, 10 errors in 240 seconds
- 9 errors in 3 minutes: this option also includes 12 errors in 270 seconds, 15 errors in 360 seconds
- Reading Error Does Not Fail Disk

6.9.3 HDD Power Management

This feature is not effective for NVME drive.

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

- **Stagger Power On Control**

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

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

- **Time To Hdd Low Power Idle**

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

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- **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.

- **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.

- **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 spinup 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 adapter to sequence the spinup of devices. It is mainly for server/workstation environments operating in multiple-drive configurations.

WEB BROWSER-BASED CONFIGURATION

6.9.4 Ethernet Configuration

Use this feature to set the adapter Ethernet port configuration. A customer doesn't need to create a reserved space on the arrays before the Ethernet port and HTTP service are working. The firm-ware-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 adapter Ethernet port, move the cursor bar to the main menu and click on the "System Controls" link. The "System Controls" menu will show all items. Move the cursor bar to the "Ethernet Configuration" item, then select the desired function.

The screenshot displays the web interface of the Areca Technology Corporation RAID manager. The top header features the company logo and name. Below the header, a navigation menu on the left lists various system functions, including "System Controls" which is expanded to show "Ethernet Configuration". The main content area is titled "Ether Net Configurations" and contains a table of settings. The "DHCP Function" is set to "Enabled". The table lists various network parameters such as Local IP Address, Gateway IP Address, Subnet Mask, DNS IP Address, HTTP Port Number, Telnet Port Number, SMTP Port Number, Current IP Address, Current Gateway IP Address, Current Subnet Mask, Current DNS IP Address, and Filter Net MAC Address. At the bottom of the configuration table, there are buttons for "Confirm The Operation", "Submit", and "Reset".

Ether Net Configurations				
DHCP Function				
Enabled				
Local IP Address (Used If DHCP Disabled)	192	168	0	100
Gateway IP Address (Used If DHCP Disabled)	192	168	0	1
Subnet Mask (Used If DHCP Disabled)	255	255	255	0
DNS IP Address (Used If DHCP Disabled)	0	0	0	0
HTTP Port Number (7168..8191 Is Reserved)	80			
Telnet Port Number (7168..8191 Is Reserved)	802			
SMTP Port Number (7168..8191 Is Reserved)	25			
Current IP Address	192.168.0.52			
Current Gateway IP Address	192.168.0.1			
Current Subnet Mask	255.255.255.0			
Current DNS IP Address	8.8.8.8			
Filter Net MAC Address	00.04.D9.CA.AA.BD			
<input type="checkbox"/> Confirm The Operation				
<input type="button" value="Submit"/> <input type="button" value="Reset"/>				

WEB BROWSER-BASED CONFIGURATION

Note:

If you configure the HTTP Port Number to 0, the HTTP console will be closed.

6.9.5 Alert By Mail Configuration

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

The firmware contains a SMTP manager monitoring all system events. Single or multiple user notifications can be sent via "Plain English" e-mails with no software required. (Please refer to section 5.4 ArcHTTP Configuration of SMTP Server Configuration, Mail Address Configuration and Event Notification Configuration.)

The screenshot displays the "Alert By Mail Configuration" web interface for Areca Technology Corporation. On the left is a navigation tree with categories like RAID System Console, RAID Set Functions, Security Functions, Physical Drives, and System Controls. Under System Controls, "Alert By Mail Configuration" is selected. The main content area is titled "SMTP Server Configuration" and includes sections for "Mail Address Configurations" and "Event Notification Configurations".

SMTP Server Configuration

SMTP Server Name/IPV4 Address/IPV6 Address: [Text Field]

Mail Address Configurations

Sender Name: [Text Field] Mail Address: [Text Field]
Account: [Text Field] Password: [Text Field]

Event Notification Configurations

MailTo Name1: [Text Field] Mail Address: [Text Field]

☒ Disable Event Notification No Event Notification Will Be Sent
☐ Urgent Error Notification Send Only Urgent Event
☐ Serious Error Notification Send Urgent And Serious Event
☐ Warning Error Notification Send Urgent, Serious And Warning Event
☐ Information Notification Send All Event
☐ Notification For No Event Notify User If No Event Occurs Within 24 Hours

MailTo Name2: [Text Field] Mail Address: [Text Field]

☒ Disable Event Notification No Event Notification Will Be Sent
☐ Urgent Error Notification Send Only Urgent Event
☐ Serious Error Notification Send Urgent And Serious Event
☐ Warning Error Notification Send Urgent, Serious And Warning Event
☐ Information Notification Send All Event
☐ Notification For No Event Notify User If No Event Occurs Within 24 Hours

MailTo Name3: [Text Field] Mail Address: [Text Field]

☒ Disable Event Notification No Event Notification Will Be Sent
☐ Urgent Error Notification Send Only Urgent Event
☐ Serious Error Notification Send Urgent And Serious Event
☐ Warning Error Notification Send Urgent, Serious And Warning Event
☐ Information Notification Send All Event
☐ Notification For No Event Notify User If No Event Occurs Within 24 Hours

MailTo Name4: [Text Field] Mail Address: [Text Field]

☒ Disable Event Notification No Event Notification Will Be Sent
☐ Urgent Error Notification Send Only Urgent Event
☐ Serious Error Notification Send Urgent And Serious Event
☐ Warning Error Notification Send Urgent, Serious And Warning Event
☐ Information Notification Send All Event
☐ Notification For No Event Notify User If No Event Occurs Within 24 Hours

WEB BROWSER-BASED CONFIGURATION

6.9.6 SNMP Configuration

Please refer to Appendix B of SNMP Operation & Installation.

The screenshot shows the 'Areca Technology Corporation' web interface. On the left is a navigation tree with categories like 'Raid System Console', 'RAID Set Functions', 'Volume Set Functions', 'Physical Drives', 'System Controls', 'NTP Configuration', and 'Information'. The 'SNMP Configuration' section is active, displaying three sub-sections: 'SNMP Trap Configurations', 'SNMP System Configurations', and 'SNMP Trap Notification Configurations'. The 'SNMP Trap Configurations' section has three rows for 'SNMP IPv4 Address' and 'Port#', all set to '162'. The 'SNMP System Configurations' section has fields for 'Community', 'sysContact.0', 'sysName.0', and 'sysLocation.0'. The 'SNMP Trap Notification Configurations' section has radio buttons for 'Disable SNMP Trap' (selected), 'Urgent Error Notification', 'Serious Error Notification', 'Warning Error Notification', and 'Information Notification', each with a corresponding 'Send' action.

6.9.7 NTP Configuration

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

The screenshot shows the 'Areca Technology Corporation' web interface. On the left is a navigation tree with categories like 'Raid System Console', 'RAID Set Functions', 'Volume Set Functions', 'Physical Drives', 'System Controls', 'NTP Configuration', and 'Information'. The 'NTP Configuration' section is active, displaying two sub-sections: 'NTP Server Configurations' and 'Time Zone Configuration'. The 'NTP Server Configurations' section has fields for 'NTP Server Name/IPv4 Address' and 'Current NTP Server IP', both set to '0.0.0.0'. The 'Time Zone Configuration' section has a 'Time Zone' dropdown set to '(GMT-12:00) International Date Line West', 'Automatic Daylight Saving' set to 'Enabled', and 'Current Time' set to '2024/7/9 16:10:4'. Below these sections is a 'Confirm The Operation' button and a 'Submit' button.

Note:

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

WEB BROWSER-BASED CONFIGURATION

- **NTP Sever Configurations**

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

- **Time Zone**

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

- **Automatic Daylight Saving**

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

6.9.8 View Events/Mute Beeper

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

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

6.9.9 Generate Test Event

Use this feature is generate events for testing purposes.

6.9.10 Clear Events Buffer

Use this feature to clear the entire events buffer information.

WEB BROWSER-BASED CONFIGURATION

6.9.11 Modify Password

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

The manufacture default password is set to 0000.

The password option allows user to set or clear the RAID adapter's password protection feature. Once the password has been set, the user can only monitor and configure the tri-mode RAID adapter by providing the correct password. The password is used to protect the RAID adapter from unauthorized entry. The adapter will check the password only when entering the main menu from the initial screen. The tri-mode RAID adapter will automatically go back to the initial screen when it does not receive any command in 5 minutes. Do not use spaces when you enter the password, If spaces are used, it will lock out the user. To disable the password, leave the fields blank. Once the user confirms the operation and clicks on the "Submit" button, the existing password will be cleared. Then, no password checking will occur when entering the main menu from the starting screen.

6.9.12 Import SSL Certificate/Key

If the customers have their own SSL key and certificate, apply them by importing the files from the HTTP interface. This action must be done with the HTTP port of 80, it ensures that the customer could restore the SSL files to the factory setting once the TLS connection is dead after importing. Configure the HTTP port number to the value other than 80 after the TLS connection is confirmed to work.

WEB BROWSER-BASED CONFIGURATION

1. Configure the HTTP port number to 80

Areca Technology Corporation

open all | close all

- Raid System Console
 - Quick Function
 - RAID Set Functions
 - Create RAID Set
 - Delete RAID Set
 - Expand RAID Set
 - Offline RAID Set
 - Rename RAID Set
 - Activate Incomplete RAID S
 - 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 Check
 - Security Functions
 - Physical Drives
 - System Controls
 - System Configuration
 - Advanced Configuration
 - Hdd Power Management
 - EtherNet Configuration
 - Alert By Mail Configuration
 - SNMP Configuration

■ Ether Net Configurations

DHCP Function	Enabled ▾			
Local IP Address (Used If DHCP Disabled)	192	168	1	100
Gateway IP Address (Used If DHCP Disabled)	192	168	1	1
Subnet Mask (Used If DHCP Disabled)	255	255	255	0
DNS IP Address (Used If DHCP Disabled)	0	0	0	0
HTTP Port Number (7168..8191 Is Reserved)	80			
Telnet Port Number (7168..8191 Is Reserved)	992			
SMTP Port Number (7168..8191 Is Reserved)	25			
Current IP Address	192.168.0.57			
Current Gateway IP Address	192.168.0.1			
Current Subnet Mask	255.255.255.0			
Current DNS IP Address	8.8.8.8			
Ether Net MAC Address	00.04.D9.CA.AA.BD			

☐ Confirm The Operation

Submit Reset

Note:

If the key and the certificate are two separate files, please import them individually by the above steps.

2. Back to Import SSL Certificate/Key page, Choose the SSL file -> Select "Import Certificate or Private Key File" -> Tip the checkbox of "Confirm the Operation" -> Submit

Areca Technology Corporation

open all | close all

- Raid System Console
 - Quick Function
 - RAID Set Functions
 - Volume Set Functions
 - Security Functions
 - Physical Drives
 - 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
 - Import SSL Certificate/Key
 - Upgrade Firmware
 - Information

■ Import SSL Certificate/Key

Enter The Certificate(or Key) Name:

☒ Import Certificate or Private Key File ☐ Default

Import Key Or Certificate File In CER, DER, CRT, PEM Format

Restore To Factory Setting

Note:

1. The Imported Key And Certificate Files In Use Will Be Shown In Below.
2. User Can Import Key And Certificate In Two Steps.
3. User Can Combine Key With Certificate In PEM Format, And Import It To Upload Key And Certificate At Once.
4. Maximum Size Is 8KB Per File.
5. Must Have HTTP Port Value Of 80. It Ensures That HTTP Could Be Used Once HTTPS Interface Is Lost. And Restore It Later If Needed.

☒ Confirm The Operation

Submit Reset

WEB BROWSER-BASED CONFIGURATION

3. Refresh the page, there is a paragraph describing the information of the imported files. The files take effect now, please try to use HTTPS to make the connection. After checking the HTTPS connection works fine, restore the HTTP port number to the original value if needed.



4. Once the HTTPS interface is dead after importing files, it might be caused by the illegal files or the compatibility issue. Please restore the SSL files to the factory setting by the following steps: Select "Default" -> Tip the checkbox of "Confirm the Operation" -> Submit

WEB BROWSER-BASED CONFIGURATION



Note:

1. User Can Combine Key With Certificate In PEM Format, And Import It To Upload Key And Certificate At Once.
2. Maximum Size Is 8KB Per File.

6.9.13 Update Firmware

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

6.10 Information

6.10.1 Raid Set Hierarchy

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

RAID Set	Devices	Volume Set(Ch/Id/Lun)	Volume State
Raid Set # 000	C#1Slot#1	ARC_1203_VOL#000(0/0/0)	Normal
	C#1Slot#2	ARC_1203_VOL#001(0/0/1)	Normal

Enclosure#1 : ARECA SATA RAID V1.0			
Device	Usage	Capacity	Model
Slot#1(0)	Raid Set # 000 (00)	200.1GB	HDS22050KLA360
Slot#2(1)	Raid Set # 000 (0A)	2000.4GB	WDC WD2003FYYS-02W0B0

APPENDIX

6.10.2 System Information

To view the RAID adapter's system information, move the mouse cursor to the main menu and click on the "System Information" link. The RAID adapter "RAID Subsystem Information" screen appears. Use this feature to view the RAID adapter's system information. The adapter name, adapter firmware version, Boot ROM version, serial number, main processor, CPU instruction/data cache size, system memory size/speed and current IP address appear in this screen.

open all | close all |

Raid System Console

Quick Function

RAID Set Functions

Volume Set Functions

Security Functions

Physical Drives

System Controls

Information

RAID Set Hierarchy

System Information

Hardware Monitor

Areca Technology Corporation

■ RAID Subsystem Information

Controller Name	ARC-1203-2N
Firmware Version	V1.70 2024-06-18
BOOT ROM Version	V1.70 2024-06-18
Serial Number	1100-2116-6633
Unit Serial #	
Main Processor	1066MHz ARM
CPU ICache Size	32KBytes
CPU DCache Size	32KBytes/Write Back
CPU SCache Size	1024KBytes/Write Back
System Memory	1024MB/1066MHz/ECC
PCI-E Link Status	4X/5G
Current IP Address	192.168.0.52

6.10.3 Hardware Monitor

The hardware monitor information of the enclosure attached in this adapter is also shown on this screen.

open all | close all |

Raid System Console

Quick Function

RAID Set Functions

Volume Set Functions

Physical Drives

System Controls

Information

RAID Set Hierarchy

System Information

Hardware Monitor

Areca Technology Corporation

☐ Stop Auto Refresh

■ Controller H/W Monitor

CPU Temperature	79 °C
Controller Temp.	39 °C
12V	12.160 V
5V	4.999 V
3.3V	3.424 V
CPU Analog +1.8V	1.776 V
DDR3 +1.5V	1.488 V
CPU +1.2V	1.152 V
SATA Chip +1.0V	1.008 V
DDR3 +0.75V	0.736 V
Battery Status	Not Installed

■ Enclosure# 1 : RAID Adapter V1.0

Appendix A

Upgrading Flash ROM Update Process

A-1 Overview

Since the RAID adapter features flash ROM firmware, it is not necessary to change the hardware flash chip in order to upgrade the RAID firmware. The user can simply re-program the old firmware through the in-band PCIe bus, out-of-band Ethernet port McRAID storage manager or nflash DOS utility. New releases of the firmware are available in the form of a DOS file on Areca website. The files available at the website for each model contain the following files in each version:

ARC1203UEFI.BIN:→ An EFI shell and a home brewed small application

ARC1203BIOS.BIN:→ PCIe BIOS for system board using

ARC1203BOOT.BIN:→ RAID adapter hardware initialization

ARC1203FIRM.BIN:→ RAID kernel program

ARC1203MBR0.BIN:→ Master Boot Record for supporting Dual Flash Image in the RAID adapter

BIN for system M/B compatibility and ARCxxxxFIRM.BIN for RAID function. All these files in the firmware package are a part of the firmware. You should update all files in the package, no special update order needed. New firmware works after a system restart not instant available, so you can update all files before restart the system. The controller firmware is independent of the array, and update firmware does not touch anything you stored in the array.

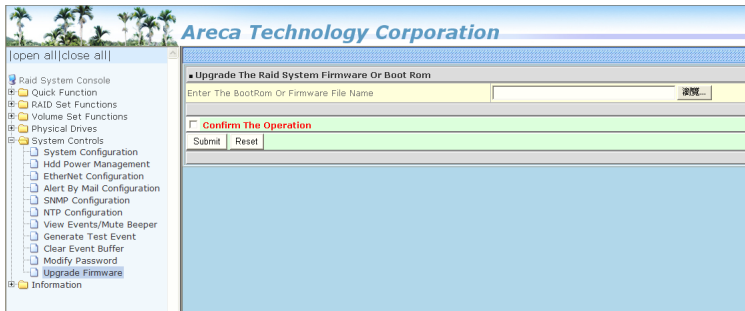
Note:

Please update all binary code (BIOS, UEFI, BOOT, FIRM and MBR0) before you reboot system. Otherwise, a mixed firmware package may result the adapter hang.

APPENDIX

A-2 Upgrading Firmware Through McRAID Storage Manager

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



1. To upgrade the RAID adapter firmware, move the mouse cursor to "Upgrade Firmware " link. The "Upgrade The Raid System Firmware or Boot Rom" screen appears.
2. Click "Browse". Look in the location to which the Firmware upgrade software was downloaded. Select the file name and click "Open".
3. Click "Confirm The Operation" and press the "Submit" button.
4. The web browser begins to download the firmware binary to the adapter and start to update the flash ROM.
5. After the firmware upgrade is complete, a bar indicator will show "Firmware Has Been Updated Successfully".
6. After the new firmware package completes downloading, find a chance to restart the adapter/computer for the new firmware to take effect.

The web browser-based McRAID storage manager can be accessed through the in-band PCIe bus or out-of-band LAN port. The in-band method uses the ArchHTTP proxy server to launch the McRAID storage manager.

The out-of-band method allows local or remote to access the McRAID storage manager from any standard internet browser via a LAN or WAN with no software or patches required. Controller with onboard LAN port, you can directly plug an Ethernet cable to the adapter LAN port, then enter the McBIOS RAID manager to configure the network setting. After network setting configured and saved, you can find the current IP address in the McBIOS RAID manager "System Information" page.

From a remote pc, you can directly open a web browser and enter the IP address. Then enter user name and password to login and start your management. You can find the firmware update feature from the "Raid system Console" on the "System Controls" option.

A-3 Upgrading Firmware Through nflash DOS Utility

Areca now offers an alternative means communication for the RAID adapter – Upgrade the all files (BIOS, BOOT, FIRM and MBR0) without necessary system starting up to running the ArchHTTP proxy server. The nflash utility program is a DOS application, which runs in the DOS operating system. Be sure of ensuring properly to communicate between RAID adapter and nflash DOS utility. Please make a bootable DOS floppy diskette or USB devices from other Windows operating system and boot up the system from those bootable devices.

• Starting the nflash Utility

You do not need to short any jumper cap on running nflash utility. The nflash utility provides an on-line table of contents, brief descriptions of the help sub-commands. The nflash utility can download from <https://www.areca.com.tw>. You can run the <nflash> to get more detailed information about the command usage. Typical output looks as below:

```
A:\nflash
RAID adapter Flash Utility
V1.52 2013-11-07
Command Usage:
NFLASH FileName
NFLASH FileName /cn --> n=0,1,2,3 write binary to controller#0
FileName May Be ARC1203FIRM.BIN or ARC1203*
For ARC1203* Will Expand To ARC1203BOOT /FIRM/BIOS.BIN

A:\>nflash arc120~1.bin
RAID adapter Flash Utility
V1.52 2013-11-07
MODEL : ARC-1203
MEM FE620000 FE7FF000
File ARC120~1.BIN : >>*** => Flash OK
```

A-4 Upgrading Firmware Through CLI

This Command Line Interface (CLI) provides you to configure and manage the RAID adapter components in Windows, Linux, FreeBSD and more environments. The CLI is useful in environments where a graphical user interface (GUI) is not available. Through the CLI, you perform firmware upgrade that you can perform with the McRAID storage manager GUI. The adapter has added protocol on the firmware for user to update the adapter firmware package (BIOS, BOOT, FIRM and MBR0) through the utility.

To update the adapter firmware, follow the procedure below:

```
Parameter: <path=<PATH_OF_FIRMWARE_FILE>>
Fn: Firmware Updating.
Ex: Update Firmware And File Path Is In [C:\FW\ARC1203FIRM.BIN.]
Command: sys updatefw path=c:\fw\ARC1203firm.bin [Enter]
```

Appendix B

SNMP Operation & Installation

B-1 Overview

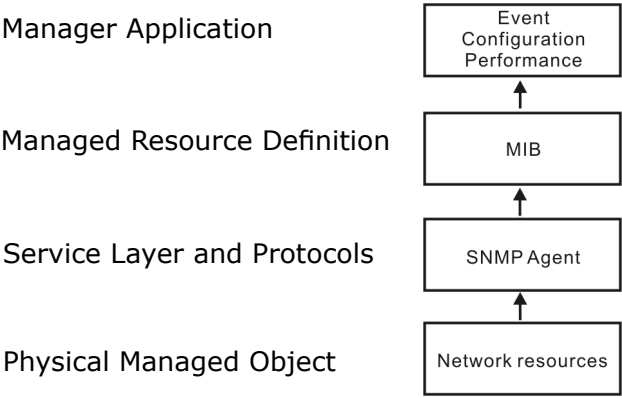
The McRAID storage manager includes a firmware-embedded Simple Network Management Protocol (SNMP) agent and SNMP Extension Agent for the Areca RAID adapter. An SNMP-based management application (also known as an SNMP manager) can monitor the disk array. An example of a SNMP management application is Hewlett-Packard's Open View, Net-SNMP or SNMPc. The SNMP extension agent can be used to augment the Areca RAID adapter if you are already running an SNMP management application at your site.

B-2 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. Each type of device on your network has its own specific MIB file. The MIB file defines the device as a set of managed objects — values that can be read or changed by the SNMP manager. The MIB file enables the SNMP manager to interpret trap messages from devices. To make sense out of a trap that's sent by a device, the SNMP manager needs to have access to the MIB that describes the format and content of the possible traps that the device can send. The objective is for all vendors to create products in compliance with these MIBs so that inter-vendor interoperability can be achieved. To be available for the SNMP manager, a command adds the MIB file for each of devices to the MIB database. This enables the devices to be managed via the SNMP manager.

The following figure illustrates the various components of an SNMP-based management architecture.

APPENDIX



B-3 SNMP Installation

Perform the following steps to install the Areca RAID adapter SNMP function into the SNMP manager. The installation of the SNMP manager is accomplished in several phases:

Step 1. Installing the SNMP manager software on the client

Installing the SNMP manager software on the client. This installation process is well-covered in the User’s Guide of your SNMP manager application.

Step 2. Compiling the MIB description file with the management

Placing a copy of the RAID adapter’s MIBs file in a directory which is accessible to the management application and compile the MIB description file with the SNMP management application database. Before the manager application accesses the Areca RAID adapter, it is necessary 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 manager application. Ensure the compilation process successfully integrates the contents of the `areca_sata.mib` file into the traps database. The MIBs file can download from <http://www.areca.com.tw>.

Each RAID adapter needs to have its own MIBs file. Areca provide 4 adapters MIBs file for users. User can request it if more adapters install on one system.

Note:

1. The MIB compiler may be not installed by default with SNMP manager.
2. Some SNMP managers have unique rule on the format of MIB files, you may need to refer the error message to modify the mib file to be able to meet the software requirement.

Step 3. SNMP Service Method

With Areca series RAID cards, there are 3 service methods to get SNMP:

ArchHTTP, onboard NIC and in-band PCIe + SNMP extension agent.

1. Service Method-1: using ArchHTTP proxy server
Pay attention to these:
 - Do not check mark the option: "SNMP Through PCI".
 - Make sure you have the latest driver and ArchHTTP, from this URL <http://www.areca.com.tw/support/>
 - ArchHTTP supports sending "traps" only, do not support the "get" command.
2. Service Method-2: using Onboard NIC.
Pay attention to these:
 - Do not check mark the option: "SNMP Through PCI".
 - Do need to fill out the "SNMP Trap Config".
3. Service Method-3: using in-band PCIe + SNMP extension agent.
Pay attention to these:
 - Download the SNMP extension agent from Areca URL.
 - The agent is to be installed on the system which has the Areca controller.
 - Check Mark the option: "SNMP Through PCI".
 - To use in-band PCIe host bus interface, keep space (or zero) on all "SNMP Trap IP Address" options.

APPENDIX

B-3-1 Using ArchHTTP

The HTTP management software (ArchHTTP) runs as a service or daemon, and have it automatically start the proxy for all adapters found. This way the adapter can be managed remotely without having to sign in the server. The HTTP management software (ArchHTTP) also has integrated the ability of sending SNMP trap. Please reference chapter 5. ArchHTTP Proxy Server Installation section to install it. The ArchHTTP proxy server will automatically assign one additional port for setup its configuration. If you want to change the " archttpsrv.conf " setting up of ArchHTTP proxy server configuration, for example: General Configuration, Mail Configuration, and SNMP Configuration, please start Web Browser <http://localhost: Cfg Assistant>. Such as <http://localhost: 81>. The port number for the first adapter McRAID storage manager is ArchHTTP proxy server configuration port number plus 1.

To enable the adapter to send the SNMP traps to client SNMP manager using the IP address assigned to the operating system, such as Net-SNMP manager, you can simply use the SNMP function on the ArchHTTP proxy server software. To enable the RAID adapter SNMP traps sending function, click on the "SNMP Configuration" link. The ArchHTTP proxy only provide one direction to send the trap to the SNMP manager without needing to install the SNMP extension agent on the host. If SNMP manager requests to query the SNMP information from RAID adapter, please refer the B-3-2 section. Using Onboard NIC and B-3-3 section. Using in-band PCI + SNMP extension agent.

For detailed information on using ArchHTTP to send the SNMP traps, please see SNMP Traps Configuration section on 5.6 ArchHTTP Configuration.

Note:

After you confirm and submit configurations, you can use "Generate Test Event" feature to make sure these settings are correct. Event Notification Table refers to Appendix D.

B-3-2 Using Onboard NIC Installation

By using the built-in LAN port on the RAID adapter. You can use the browser-based manager or CLI SNMP configuration to setup the firmware-based SNMP configuration.

To launch the browser-based RAID adapter SNMP function, click on the "System Controls" link. The "System Controls" menu will show available items. Select the "SNMP Configuration" item. The firmware-embedded SNMP agent manager monitors all system events and the SNMP function becomes functional with no agent software required. The following article describes a best practice methodology for setting this up in the "SNMP Traps Configurations".

1. **SNMP Trap Configurations**
Enter the SNMP Trap IP Address.
2. **SNMP System Configurations**
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. The system Contact, Name and Location that will be shown in the outgoing SNMP trap.
3. **SNMP Trap Notification Configurations**
Please refer to Appendix C of Event Notification Configurations.

B-3-3 Using in-band PCI + SNMP extension agent

By using the IP address assigned to the operating RAID adapter using Areca SNMP extension agent through PCIe host bus interface.

1. Set only "Community" field and select the "SNMP Port" option on the firmware-embedded SNMP configuration function. There is no function to set other fields on "SNMP System Configuration"

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The SNMP community and SNMP port can setup by using browserbased manager or CLI SNMP configuration. To launch the above browser-based RAID adapter SNMP function, click on the " System Controls" link. The "System Controls" menu will show available items. Select the "SNMP Configuration" item.

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.

2. Mark the check box on the 'SNMP Through PCI Inband " setting and keep space (or zero) on all "SNMP Tarp IP Address" options.
3. Installing the SNMP extension agent on the server.

Please refer to next section of SNMP Extension Agent Installation for different operation system such as Windows, Linux and Free-BSD.

B-3-4 SNMP Extension Agent Installation

B-3-4-1 Windows

You must have administrative level permission to install tri-mode RAID adapter extension agent software. This procedure assumes that the RAID hardware and Windows are both installed and operational in your system. To enable the SNMP agent for Windows, configure Windows for TCP/IP and SNMP services. The Areca SNMP extension agent file is ARCSNMP.DLL.

Screen captures in this section are taken from a Windows XP installation. If you are running another version of Windows, your screens may look different, but the Areca SNMP extension agent installation is essentially the same.

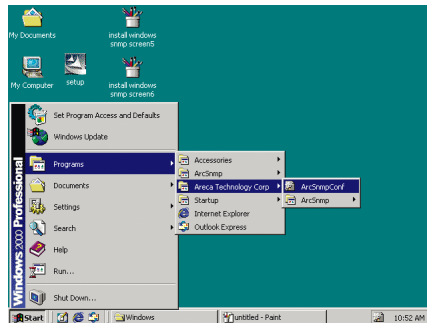
1. Download the file from https://www.areca.us/support/s_windows/snmp/winsnmp_V1.0_220307.zip.
2. Unzip and double-click on the install.exe file. (If SNMP service was not installed, please install SNMP service first.) installed, please install SNMP service first.)

- **Starting SNMP Trap Notification Configurations**

To start "SNMP Trap Notification Configurations", there have two methods. First, double-click on the "Areca RAID Controller".



Second, you may also use the "Taskbar Start/programs/Areca Technology Corp/ArcSnmpConf" menus shown below.



- **SNMP Community 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.

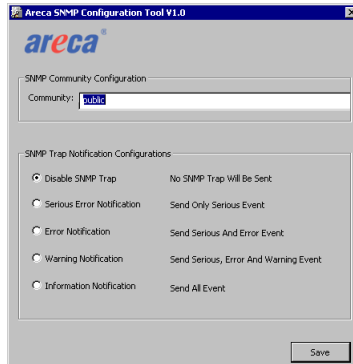
- **SNMP Trap Notification Configurations**

The "Community Name" should be the same as firmware-embedded SNMP Community. The "SNMP Trap Notification Configurations" includes level 1: Serious, level 2: Error, level

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3: Warning and level 4: Information.

The level 4 covers notification events such as initialization of the adapter and initiation of the rebuilding process; Level 3 includes events which require the issuance of warning messages; Level 2 covers notification events which once have happen; Level 1 is the highest level, and covers events the need immediate attention (and action) from the administrator.



B-3-3-2 Linux

You must have administrative level permission to install Areca RAID software. This procedure assumes that the Areca RAID hardware and Linux are installed and operational in your system. The old version agent has to modify the open source project, integrate the changes from Areca manually, then take the modified binaries and manually deploy them. Users need to change source code from the linux distribution and then maintain it by themselves.

The new version agent provides the way to integrate with those codes into snmpd/snmptrapd and create a sub-agent for user easy to install it. The new version SNMP extension agent installation for Linux procedure, please download the file from: **ftp://ftp.areca.com.tw/RaidCards/AP_Drivers/Linux/SNMP/V4.2/** and refer to the **HowToBuildSubAgent.txt** & **HowToRunSubAgent.txt**.

B-3-3-3 FreeBSD

You must have administrative level permission to install Areca RAID software. This procedure assumes that the Areca RAID hardware and FreeBSD are installed and operational in your system. The old version agent has to modify the open source project, integrate the changes from Areca manually, then take the modified binaries and manually deploy them. Users need to change source code from the linux distribution and then maintain it by themselves.

The new version agent provides the way to integrate with those codes into snmpd/snmptrapd and create a sub agent for user easy to install it. The new version SNMP extension agent installation for FreeBSD procedure, please download the file from : **ftp://ftp.areca.com.tw/RaidCards/AP_Drivers/FreeBSD/SNMP/V4.1/** and Unzip the file, then refer the files **HowTo-BuildSubAgent.txt** & **HowToRunSubAgent.txt**.

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Appendix C

Event Notification Configurations

The adapter 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 adapter 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 that need immediate attention (and action) from the administrator. The following lists sample events for each level:

A. Device Event

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

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

B. Volume Event

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

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C. RAID Set Event

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

D. Hardware Monitor Event

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

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

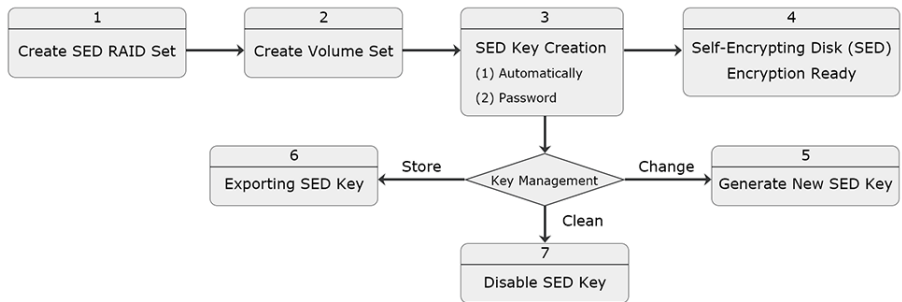
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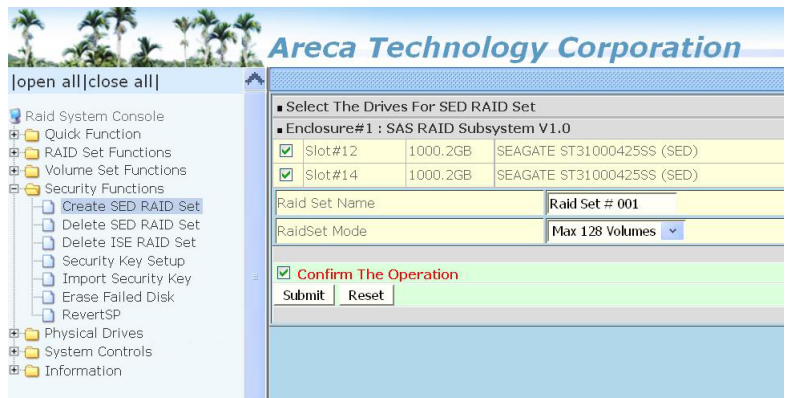
Self-Encrypting Disk (SED) Encryption

The “Security Function” on the firmware supports Self-Encrypting Disks (SED) for protection of data against loss or theft of SEDs. Protection is achieved by the use of encryption technology on the drives. The McRAID storage management allows SED keys to be created and managed as well as create/delete RAID sets.

Self-Encrypting Disk (SED) Encryption Flow Chart



Step 1. Create SED RAID Set



Step 2. Create Volume Set

Create volume set in the web management.

The screenshot shows the 'Enter The Volume Attribute' form in the Areca Technology Corporation web management interface. The left sidebar contains a tree view with categories like 'Raid System Console', 'Quick Function', 'RAID Set Functions', 'Volume Set Functions', 'Security Functions', 'Physical Drives', 'System Controls', and 'Information'. The 'Volume Set Functions' category is expanded, showing options like 'Create Volume Set', 'Create Raid30/50/60', 'Delete Volume Set', 'Modify Volume Set', 'Check Volume Set', 'Schedule Volume Check', 'Stop Volume Check', and 'Download Volume Key File'. The main form area is titled 'Enter The Volume Attribute' and contains the following fields:

Volume Name	ARC-1883-VOL#012
Member Disks	2
Volume Raid Level	Raid 1
Max Capacity Allowed	300 GB
Select Volume Capacity	300 GB
Greater Two TB Volume Support	No
Volume Initialization Mode	No Initialization
Volume Stripe Size	64 KBytes
Volume Cache Mode	Write Back
Volume Write Protection	Disabled
Full Volume Encryption	Disabled
Tagged Command Queuing	Enabled
SCSI Channel:SCSI ID:SCSI Lun	0 : 0 : 2
Volumes To Be Created	1

At the bottom of the form, there is a 'Confirm The Operation' section with 'Submit' and 'Reset' buttons.

Step 3. SED Key Creation

There is one SED key per adapter. You can create the SED key under McRAID manager. The key can be escrowed in to a file using McRAID manager. There is one SED key per adapter which stores in the adapter flash memory. Areca provides both automatically or password methods to generate a key.

The screenshot shows the 'SED Key Management' form in the Areca Technology Corporation web management interface. The left sidebar is the same as in Step 2, with 'Security Functions' expanded. The main form area is titled 'SED Key Management' and contains the following fields:

Create SED Key Automatically	SED Key Created And Saved For SED Raid use
Create SED Key By User Password	
Enter SED Key By User Password	
Raid Storage Manager Password Required	

At the bottom of the form, there is a 'Confirm The Operation' section with 'Submit' and 'Reset' buttons.

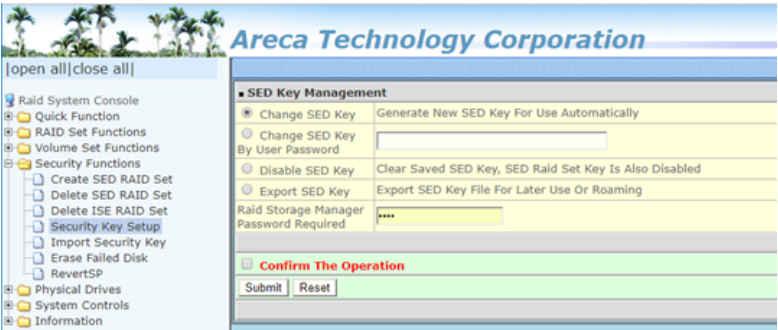
Step 4. Self-Encrypting Disk (SED) Ready

Now, whenever you write data to the drive (e.g. create a file and save it to the SED volume), it gets encrypted with the SED key. And whenever you read data from the drive (e.g. access a file stored on the SED), it's decrypted with the same SED key.

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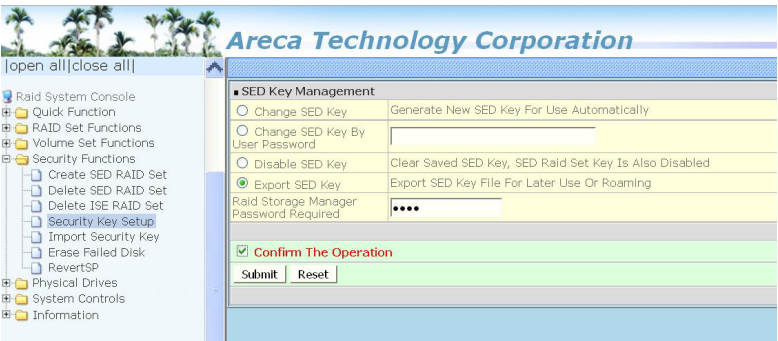
Step 5. Generate New SED Key

If you have evidence that the SED key is known to unauthorized users, you can change the SED key again. Areca provides both automatically or password methods to generate a New key to replace the foreign SED key.

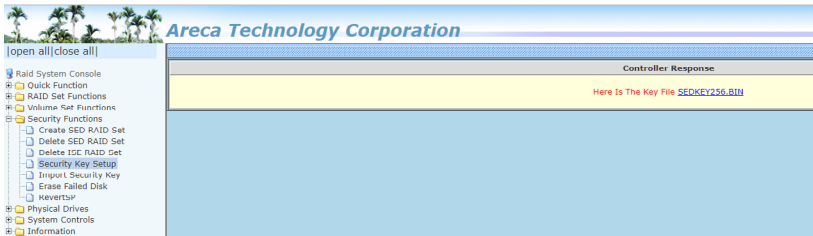


Step 6. Exporting SED Key

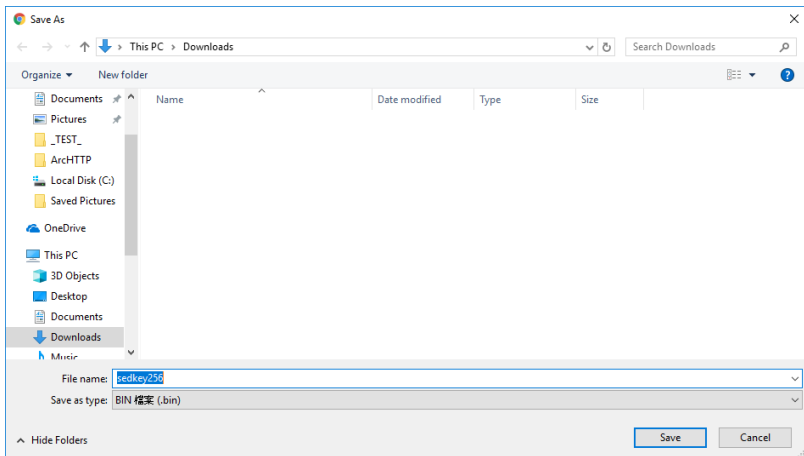
In some cases, you may want to export a SED key to store on removable media or to use on a different computer. If you want to create a backup copy of the SED key or use it on another computer, you must first export the SED key.



Exporting the SED key puts it in a file (SEDKEY256.BIN) that you can then transfer to another computer or put in a safe place.



The key file (SEDKEY256.BIN) is stored on the specific location.

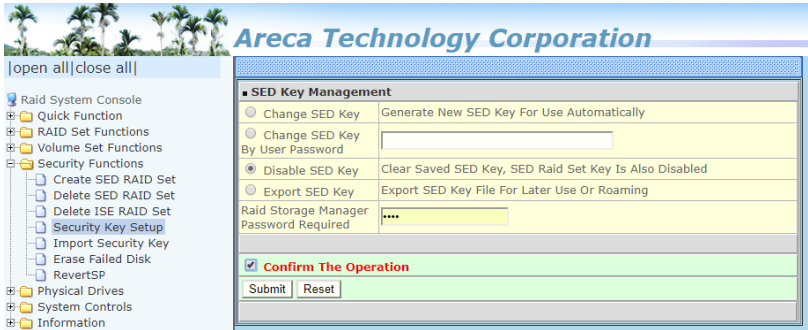


Without the proper authentication key (SED key), even if the SED RAID set is removed and placed in another new RAID adapter, the data remains inaccessible.

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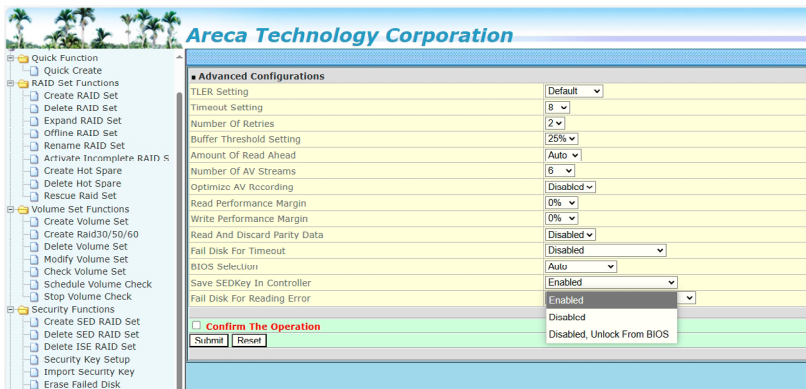
Step 7. Clean Saved SED Key

The "Disable SED Key" function is used to clear SED key on adapter and RAID set members.



● Save SED Key In Controller

There is one SED key per adapter which stores in the adapter flash memory. You can disable the SED Key saved in adapter flash using "Save SEDKey In Controller" on the Advanced Configurations. So that next time power up again, it will ask for key again.

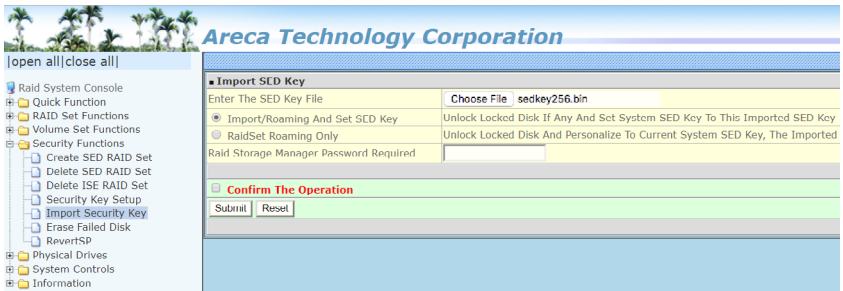


<a> If enable --> disable, clear SED Key saved in setup
 If disable --> enable, if key exists, save to setup
<C> set --> disable, Unlock From BIOS. Unlock from BIOS, when Legacy BIOS mode

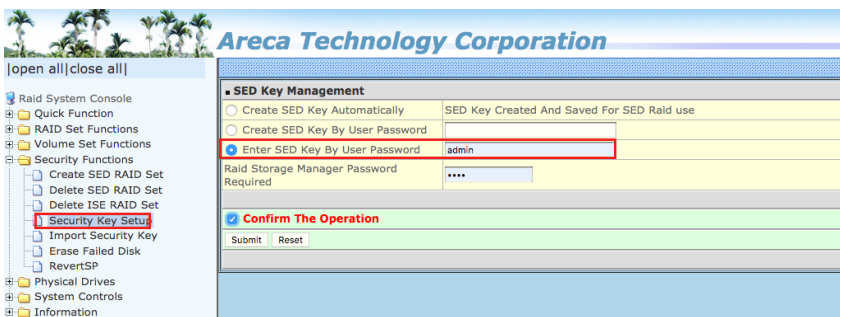
If you setup from enable--->disable, the key will not remain in the flash. So that next time power up again, it will need to input the key from the CLI or McRAID manager again. The adapter volume will be in the lock stage. It will be not available to the OS.

After your run the CLI to upload the key, volume will be unlocked and available to the OS. You can also import the key file (Import Security Key), keyin the password (Enter SED Key By User Password) from the GUI interface or keyin the password from the BIOS screen on startup to unlock the volume.

(1) Import Security Key



(2) Enter SED Key By User Password



(3) Enter At BIOS Screen On Startup



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Appendix E

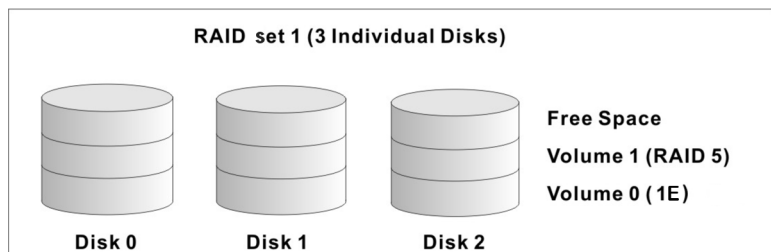
RAID Concept

RAID Set

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

Volume Set

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



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

Ease of Use Features

- **Foreground Availability/Background Initialization**

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

- **Online Array Roaming**

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

- **Online Capacity Expansion**

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

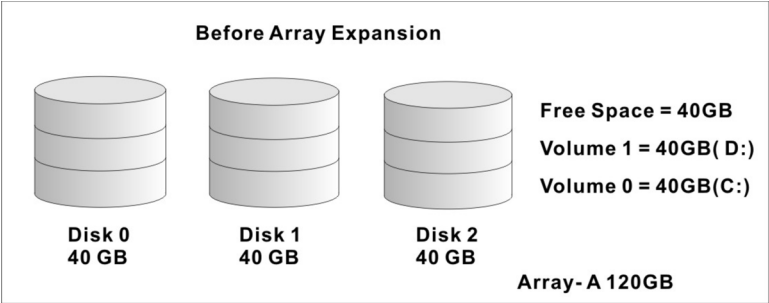
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the newly expanded RAID set) is redistributed evenly across all the disks. A contiguous block of unused capacity is made available on the RAID set. The unused capacity can be used to create additional volume sets.

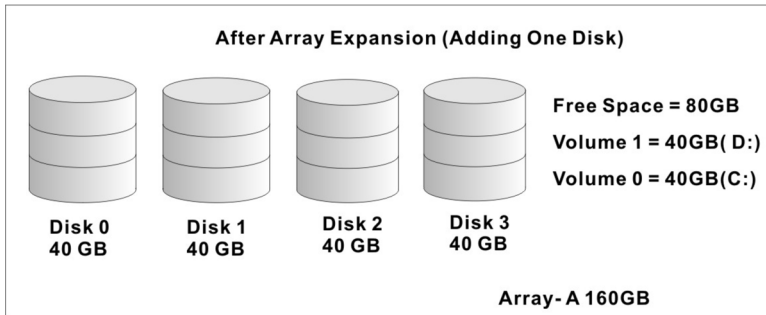
A disk, to be added to a RAID set, must be in normal mode (not failed), free (not spare, in a RAID set, or passed through to host) and must have at least the same capacity as the smallest disk capacity already in the RAID set.

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

The expansion process is illustrated as following figure.



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



• Online RAID Level and Stripe Size Migration

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

The RAID adapters 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 when additional physical disks are added to the RAID adapter. For example, in a system using two drives in RAID level 1, it is possible to add a single drive and add capacity and retain fault tolerance. (Normally, expanding a RAID level 1 array would require the addition of two disks). A third disk can be added to the existing RAID logical drive and the volume set can then be migrated from RAID level 1 to 5. The result would be parity fault tolerance and double the available capacity without taking the system down. A fourth disk could be added to migrate to RAID level 6. It is only possible to migrate to a higher RAID level by adding a disk; disks in an existing array can't be reconfigured for a higher RAID level without adding a disk.

Online migration is only permitted to begin, if all volumes to be migrated are in the normal mode. During the migration process, the volume sets being migrated are accessed by the host system. In addition, the volume sets with RAID level 1 is protected against data loss in the event of disk failure(s). In

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the case of disk failure, the volume set transitions from migrating state to (migrating+degraded) state. When the migration is completed, the volume set transitions to degraded mode. If a global hot spare is present, then it further transitions to rebuilding state.

• Online Volume Expansion

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

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

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

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

High Availability

• Global/Local Hot Spares

A hot spare is an unused online available drive, which is ready for replacing the failure disk. The hot spare is one of the most important features that RAID adapters provide to deliver a high degree of fault-tolerance. A hot spare is a spare physical drive that has been marked as a hot spare and therefore

is not a member of any RAID set. If a disk drive used in a volume set fails, then the hot spare will automatically take its place and the data previously located on the failed drive is reconstructed on the hot spare.

Dedicated hot spare is assigned to serve one specified RAID set. Global hot spare is assigned to serve all RAID set on the RAID adapter. Dedicated hot spare has higher priority than the global hot spare. For this feature to work properly, the hot spare must have at least the same capacity as the drive it replaces. The hot spare function only works with RAID level 1 volume set.

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

Important:

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

● **Hot-Swap Disk Drive Support**

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

● **Auto Declare Hot-Spare**

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

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

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

● Auto Rebuilding

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

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

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

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

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

● Adjustable Rebuild Priority

Rebuilding a degraded volume incurs a load on the RAID subsystem. The RAID adapters allow the user to select the rebuild priority to balance volume access and rebuild tasks

appropriately. The Background Task Priority is a relative indication of how much time the controller devotes to a background operation, such as rebuilding or migrating.

RAID adapter allows user to choose the task priority (Ultra Low (5%), Low (20%), Medium (50%), High (80%)) to balance volume set access and background tasks appropriately. For high array performance, specify an Ultra Low value. Like volume initialization, after a volume rebuilds, it does not require a system reboot.

High Reliability

● Hard Drive Failure Prediction

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

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

● Auto Reassign Sector

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

The RAID adapter drives perform automatic defect re-assignment for both read and write errors. Writes are always com-

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pleted - if a location to be written is found to be defective, the drive will automatically relocate that write command to a new location and map out the defective location. If there is a recoverable read error, the correct data will be transferred to the host and that location will be tested by the drive to be certain the location is not defective. If it is found to have a defect, data will be automatically relocated, and the defective location is mapped out to prevent future write attempts.

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

Data Protection

• Battery Backup

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

The batteries in the BBM are recharged continuously through a trickle-charging process whenever the system power is on. The batteries protect data in a failed server for up to three or four days, depending on the size of the memory module. Under normal operating conditions, the batteries last for three years before replacement is necessary.

● Recovery ROM

RAID adapter firmware is stored on the flash ROM and is executed by the I/O processor. The firmware can also be updated through the RAID adapters PCIe 2.0 bus port or Ethernet port without the need to replace any hardware chips. During the controller firmware upgrade flash process, it is possible for a problem to occur resulting in corruption of the controller firmware. With our Redundant Flash Image feature, the controller will revert back to the last known version of firmware and continue operating. This reduces the risk of system failure due to firmware crash.

APPENDIX

Appendix F

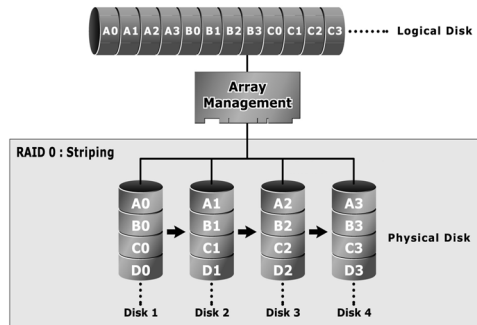
Understanding RAID

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

The RAID adapters 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 adapter requires a proper understanding of RAID technology and the concepts.

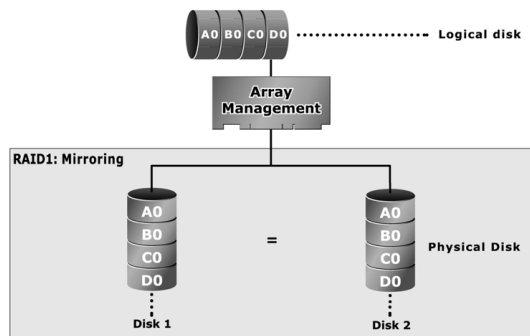
RAID 0

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



RAID 1

RAID 1 is also known as “two disk mirror” ; data written on one disk drive is simultaneously written to another disk drive. Read performance will be enhanced if the array adapter can, in parallel, access both members of a mirrored pair. During writes, there will be a minor performance penalty when compared to writing to a single disk. If one drive fails, all data (and software applications) are preserved on the other drive. RAID 1 offers extremely high data reliability, but at the cost of doubling the required data storage capacity. HDDs and SSDs have different characteristics. If you combine an SSD and a HDD in a RAID1 hybrid solution, you can get all the reads from the SSD with SSD speed and at the same time have the redundancy of RAID1 without the need to buy a second, expensive SSD.



APPENDIX

JBOD

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

Single Disk (Pass-Through Disk)

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

Summary of RAID Levels

RAID adapter supports RAID Level 0 and 1. The following table provides a summary of RAID levels.

RAID Level Comparision			
RAID Level	Description	Disks Requirement (Minimum)	Data Availability
0	Also known as striping. Data distributed across multiple drives in the array. There is no data protection.	1	No data Protection
1	Also known as mirroring. All data replicated on 2 separated disks. N is almost always 2. Due to this is a 100 % duplication, so is a high costly solution.	2	Up to one disk failure