

Thunderbolt Product

ARC-8050

(Thunderbolt to 6Gb/s SAS RAID Storage)

Quick Start Guide

Version: 1.0

Issue Date: November, 2012

Copyright and Trademarks

The information of the products in this manual is subject to change without prior notice and does not represent a commitment on the part of the vendor, who assumes no liability or responsibility for any errors that may appear in this manual. All brands and trademarks are the properties of their respective owners. This manual contains materials protected under International Copyright Conventions. All rights reserved. No part of this manual may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the manufacturer and the author.

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-8050 has been tested and found comply with the requirements set up in the council directive on the approximation of the law of member state relating to the EMC Directive 2004/108/EC. For the evaluation regarding to the electromagnetic compatibility, the following standards where applied:

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

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

Contents

1. Introduction	4
1.1 Overview	4
2. Installation.....	8
2.1 Before You First Installing.....	8
2.2 RAID Storage View	9
2.3 Locations of the Storage Component.....	10
2.3.1 Drive Tray LED Indicators	10
2.3.2 LCD Panel LED Indicators	11
2.3.3 Thunderbolt Port LED Indicators	11
2.4 Setting Up RAID Storage.....	12
2.4.1 Software Installation.....	12
2.4.2 Hardware Installation.....	16
2.4.3 Volume Setup	20
2.4.3.1 Configure Volume Set	20
2.4.3.2 Making Volume Sets Available to System	22
2.4.4 Unmounting the Storage Volume	23
2.5 Summary of the Installation	25
2.6 Hot-plug Drive Replacement	26
2.6.1 Recognizing a Drive Failure	27
2.6.2 Replacing a Failed Drive	27
Appendix	28
Understanding RAID	28
RAID 0.....	28
RAID 1.....	29
RAID 10(1E).....	30
RAID 3.....	30
RAID 5.....	31
RAID 6.....	32
RAID x0	32
JBOD	33
Single Disk (Pass-Through Disk)	33
Summary of RAID Levels	34

INTRODUCTION

1. Introduction

This section presents a brief overview of the 6Gb/s SAS RAID storage, ARC-8050. (Thunderbolt to 6Gb/s SAS RAID storage)

1.1 Overview

Thunderbolt technology is a revolutionary high-speed, dual protocol I/O technology designed for performance, simplicity and flexibility. Thunderbolt I/O technology lets you move data between high-resolution displays and high-performance data devices on a single, compact port. Both data and display signals can be sent and received at the same time through dual 10Gbps channels. A single cable attached to one of the ports provides 2 channels able to achieve the 10Gbps speeds flowing both ways simultaneously. A single Thunderbolt port supports hubs as well as a daisy chain of up to seven Thunderbolt devices. To improve bandwidth transmission, Thunderbolt has implemented two duplex (PCIe and Display-Port) channels into the controller and each channel can provide full bi-directional performance.

Unparalleled Performance

ARC-8050 is 8-bay 6Gb/s SAS Thunderbolt box with RAID control capabilities solution for both PC and Mac. Thunderbolt host interface make ARC-8050 RAID box well suited for SOHO group professional who work at home and or in the office. Thunderbolt technology developed for high speed data transfer at the speed of 10Gbps per channel. Thunderbolt port is shared by multiple devices and can transfer data equally distribute to all connected devices. ARC-8050 incorporated on-board high performance dual core 800Mhz ROC storage processor and with 1GB DDR3-1333 SDRAM memory on-board to deliver true high performance hardware RAID for the demands of serious HD media creators needs. For example, the benefit for video editor by using ARC-8050 to unleash their professional creativity work in real-time, with the high-bandwidth allow large amount of audio and video capture/mixing devices transferred faster with low latency and high-accurate synchronization at 10Gbps. Data can be backed up and restored more quickly, so there's less waiting for achieved content to transfer or copy.

Unsurpassed Data Availability

Designed and leveraged with Areca's existing high performance solution, the RAID storage delivers high-capacity at the best of cost performance value. It supports the hardware RAID 6 engine to allow two HDDs failures without impact the existing data and performance. Its high data availability and protection derives from the many advance RAID features. ARC-8050 Thunderbolt RAID storage allows easy scalability from JBOD to RAID. It can be configured to RAID levels 0, 1, 1E, 3, 5, 6, 10, 30, 50, 60, Single Disk for JBOD. With innovative new ROC 6Gb/s SAS feature and support for SATA, SAS and SSDs, the ARC-8050 provides powerful small-workgroup server, power users and consumers with superior levels performance and enterprise level data protection for external storage. The world today, large amounts of arrays data needs by the Professional content creation application for – video editing, capturing or transferring video, managing 3D graphics design, producing video presentations and regularly data backup. ARC-8050 Thunderbolt RAID storage is the best solution.

Easy RAID Management

Configuration and monitoring can be managed either through the LCD control panel, Archttp utility or Ethernet port. Firmware-embedded web browser-based RAID manager allows local or remote to access it from any standard internet browser via a out-of-band 10/100Mbps LAN port or in-band Archttp utility. ARC-8050 Thunderbolt RAID storage also provides API library for customer to combine with its own monitor utility. The intelligent cooling continuously adapts to environmental conditions by automatically controlling the speed of the cooling fans. This super silent design, optimizing balance between noise reduction and necessary cooling, makes ARC-8050 well suited for audio/video application especially the rapidly growing demand from the video editing markets.

INTRODUCTION

1.2 Features

Controller Architecture

- 800MHz Dual Core ROC processor
- 1GB on-board DDR3-1333 SDRAM with ECC protection
- Write-through or write-back cache support
- Support 8 internal 6Gb/s SAS ports
- Multi-RAID storage support for large storage requirements
- Support EFI BIOS for bootable from RAID storage volume
- NVRAM for RAID event & transaction log
- Redundant flash image for controller availability
- Battery Backup Module (BBM) ready (Option)

RAID Features

- RAID level 0, 1, 10(1E), 3, 5, 6, 30, 50, 60, Single Disk or JBOD
- Multiple RAID selection
- Online array roaming
- Offline RAID set
- Online RAID level/stripe size migration
- Online capacity expansion and RAID level migration simultaneously
- Online volume set growth
- Instant availability and background initialization
- Support global and dedicated hot spare
- Automatic drive insertion/removal detection and rebuilding
- Greater than 2TB capacity per disk drive support
- Greater than 2TB per volume set (64-bit LBA support)
- Support intelligent power management to save energy and extend service life
- Support NTP protocol synchronize RAID controller clock over the onboard LAN port

Monitors/Notification

- System status indication through individual activity/fault LED, LCD panel and alarm buzzer
- SMTP support for email notification
- SNMP support for remote manager
- Enclosure management ready

Drive Support

- Up to 8 x 6Gb/s SAS/SATA/SSD

INTRODUCTION

Host Connection

- Two Thunderbolt technology ports
- Simultaneous bi-directional, 10Gbps transfers over a single cable
- Dual-protocol support (PCI Express and DisplayPort)
- Compatible with existing DisplayPort devices
- Daisy-chaining devices

RAID Management

- Field-upgradeable firmware in flash ROM

In-Band Manager

- Firmware-embedded web browser-based McRAID storage manager, SMTP manager, SNMP agent and Telnet function via ArchHttp proxy server for all operating systems
- Support Command Line Interface (CLI)
- API library for customer to write monitor utility

Out-of-Band Manager

- Firmware-embedded web browser-based McRAID storage manager, SMTP manager, SNMP agent and Telnet function via on-board LAN port
- API library for customer to write monitor utility
- Support push button and LCD display panel

Operating System

- Mac OS X 10.6.x/10.7.x/10.8.x
- Windows 7/8

(For latest supported driver version visit <http://www.areca.com.tw>)

Mechanical Specifications

- Form Factor: Compact – 8 Disk Compact Tower
- Operation temperature: 0° ~ 40°C
- Operation humidity: 5 ~ 95 %, Non-condensing
- Cooling Fan: 2 x 2700rpm/0.135A Brushless Fan
- Power Supply/In/out: 270W / 90-256V AC / +12V/26A, +5V/18A, +3.3V/16A
- Dimension (W x H x D): 146 x 302 x 290 mm (5.7 x 11.8 x 11.4 in)
- Weight (Without Disk): 14.9 lbs / 6.8Kg

INSTALLATION

2. Installation

This section describes how to install the ARC-8050 Thunderbolt RAID storage with host computer and disks.

2.1 Before You First Installing

Thanks for purchasing the ARC-8050 as your RAID data storage. The following manual gives simple step-by-step instructions for installing and configuring the ARC-8050 RAID storage.

Unpack

Unpack and install the hardware in a static-free environment. ARC-8050 RAID storage is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage. If the ARC-8050 RAID storage appears damaged, or if any items of the contents listed below are missing or damaged, please contact your dealer or distributor immediately.

Checklist

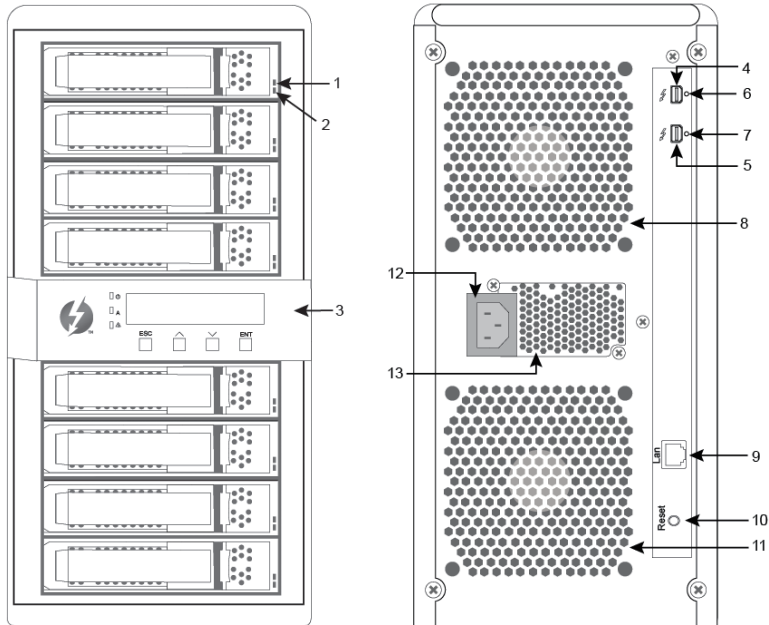
- 1 x ARC-8050 8-bays RAID storage unit
- 1 x Installation CD – containing driver, relative software, an electronic version of this manual and other related manual
- 1 x RJ-45 LAN cable
- 1 x Power cord
- 32 x Drive mounting screws (4 per drive tray)
- 1 x Quick start guide

System Requirements

- Computer with Thunderbolt™ connector
- Mac OS X 10.6.8 or higher
- Windows 7, Windows 8
- Thunderbolt™ cable (included)

2.2 RAID Storage View

The following diagram is the RAID storage front view and rear view.



Front View	Rear View
<ul style="list-style-type: none">1. Disk Activity LED2. Disk Fault/Link LED3. LCD Panel with Keypad	<ul style="list-style-type: none">4. Thunderbolt Port15. Thunderbolt Port26. Thunderbolt Port1 Link LED7. Thunderbolt Port2 Link LED8. System Fan19. LAN Port (For McRAID Web Manager)10. Reset Button11. System Fan212. Power Connector13. Power Supply Fan

INSTALLATION

2.3 Locations of the Storage Component

The following components come with LEDs that inform ARC-8050 RAID storage managers about the operational status.

2.3.1 Drive Tray LED Indicators

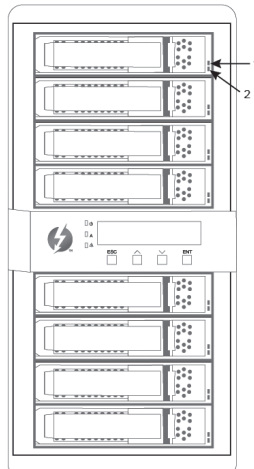


Figure 2-1, Activity/Fault LED for ARC-8050 RAID Storage

The following table describes the RAID storage disk drive tray LED behavior.

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

2.3.2 LCD Panel LED Indicators

There are a variety of status conditions that cause the RAID storage panel monitoring LED to light. The front panel LCD comes with three (3) status-indicating LEDs. The LEDs on the front panel are defined, from top to bottom, Power, Busy, and Caution, as shown in Figure 2-2.

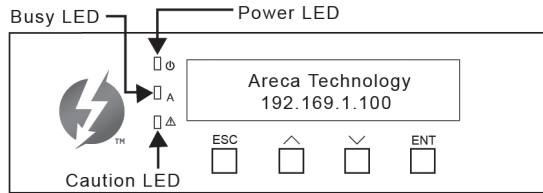


Figure 2-2, LCD Panel LED for ARC-8050 RAID Storage

The following table provides a summary of the front panel LED.

Panel LED	Normal Status	Problem Indication
1. Power LED (Green)	Solid green, when power on	Unlit, when power on
2. Busy LED (Amber)	Blinking amber during host accesses RAID storage	Unlit or never flicker
3. Caution LED (Red)	Unlit indicates that the RAID storage and all its components are operating correctly.	Solid indicates that one or more component failure/Urgent events have occurred.

2.3.3 Thunderbolt Port LED Indicators

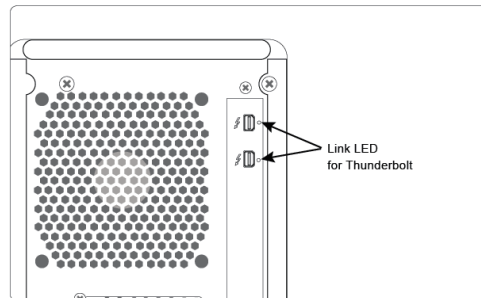


Figure 2-3, Thunderbolt ports LED for ARC-8050 RAID storage

INSTALLATION

The following table describes the ARC-8050 SAS RAID storage Thunderbolt port link LED behavior.

Thunderbolt Ports Link LED	Status
Link LED (Green light)	1. Solid illuminated that indicates RAID storage powered up and maintained the daisy chain with other Thunderbolt devices. 2. Fast blinking (5 times/sec) that indicates RAID storage in sleep mode. 3. Slow blinking (1 times/sec) that indicates RAID storage powered down and maintained the daisy chain with other Thunderbolt devices.
Link LED (Amber light)	There is a proper DisplayPort connection on that Thunderbolt port.
Link LED (Red light)	There is a proper DisplayPort to DVI connection on that Thunderbolt port.

2.4 Setting Up RAID Storage

Follow the instructions below to install ARC-8050 Thunderbolt to 6Gb/s SAS RAID storage.

2.4.1 Software Installation

To install the ARC-8050 driver and software into the existing operating system. Driver is required for the operating system to be able to interact with the ARC-8050 RAID storage. Windows users must firstly install drivers on their computer in order to use the Thunderbolt connection. You can click the "For Windows, Install Driver First" on the <http://www.areca.com.tw/products/thunderbolt.htm> web link to driver and set up instructions for Windows. ArchHTTP has to be installed for GUI RAID console (McRAID storage manager) to run. ArchHttp proxy server is used to launch the web-browser McRAID storage manager. McRAID storage manager provides all of the creation, management and monitor ARC-8050 RAID storage status.

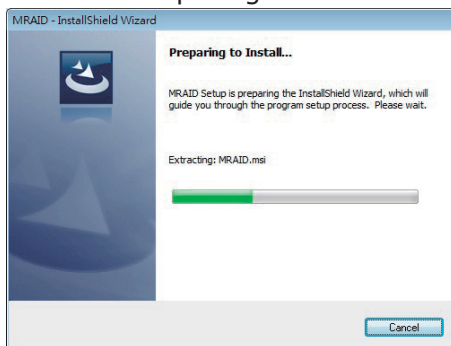
This chapter describes how to install the ARC-8050 RAID storage software to your operating system. The software installation includes device driver, ArchHTTP and CLI.

For PC Thunderbolt compatible system:

In this scenario, you are installing the RAID storage in an existing Windows system. This section describes detailed instructions for installing the Windows driver & utility for the ARC-8050. You can use the installer to install driver & Archttp at once or “Custom” to install special components.

To follow the following process to install driver & utility on Windows as below:

1. Insert the ARC-8050 software CD in the CD-ROM drive or download installer from http://www.areca.com.tw/support/s_thunderbolt/thunderbolt.htm and unzip the file.
2. Run the setup.exe file that resides at: <CD-ROM>\PACKAGES\Windows on CD-ROM or from the website to launch the installer.
3. The screen shows “Preparing to Install”.

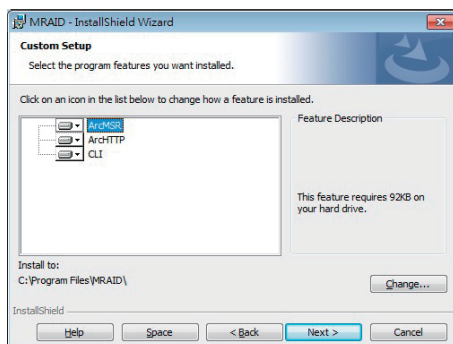


4. Follow the installer on-screen steps, responding as needed, to complete the driver, ArchHTTP and CLI utility installation.

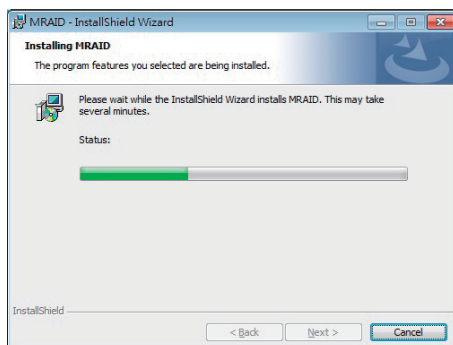
- **Driver** is required for the operating system to be able to interact with the Areca RAID controller.
- **ArcHTTP** has to be installed for GUI RAID console (MRAID storage manager) to run. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. Refer to the chapter 3 Archttp Configuration on ARC-8050 user manual, for details about the mail and SNMP traps configuration.

INSTALLATION

- **CLI (Command Line Interface)** lets you set up and manage RAID controller through a command line interface. Arc-cli performs many tasks at the command line. You can download arc-cli manual from Areca website or software CD <CDROM>\DOCS directory.



5. When you reach the installation page, click the "Install" button. A program bar appears that measures the progress of the driver installation. When this screen completes, you have completed the driver installation.



6. Normally ArcHTTP and CLI are installed at the same time on ARC-8050. Once ArcHTTP and CLI have been installed, the archttp background task automatically starts each time when you start your computer. There is one MRAID icon showing on your "Pro grams" folder. This icon is for you to start up the McRAID storage manager (by ArchHTTP) and CLI utility.

Note:

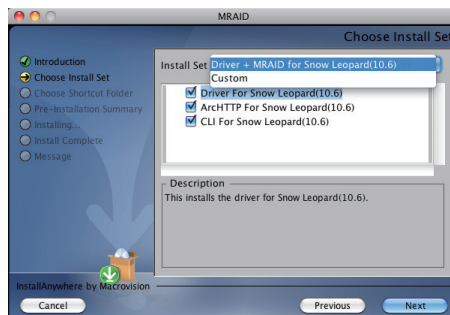
"For Windows, Install Driver First"

For Windows PC: the Thunderbolt™ certified device driver must be installed before plugging in the device for it to function properly.

For Mac Thunderbolt capable system:

This section describes detailed instructions for installing the Areca Mac driver & utility for the ARC-8050 on your Apple Thunderbolt capable machine. You must have administrative level permissions to install Areca Mac driver & utility. You can use the installer to install Areca Mac driver & utility (MRAID) at once or "Custom" to install special components. To follow the following process to install driver & utility on Apple Mac Pro as below:

1. Insert the Areca Mac Driver & Software CD that came with your ARC-8050 storage unit.
2. Double-click on the "install_mraid.zip" file that resides at <CD-ROM>\packages\MacOS to add the installer on the Finder.
3. Launch the installer by double-clicking the install_mraid on the Finder.
4. Follow the installer on-screen steps, responding as needed, to complete the Areca driver and MRAID (ArcHTTP and CLI utility) installation.



INSTALLATION

- **Driver** is required for the operating system to be able to interact with the Areca RAID controller.
- **ArchHTTP** has to be installed for GUI RAID console (MRAID 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 Archhttp Configuration on ARC-8050 user manual, for details about the mail and SNMP traps configuration.
- **CLI (Command Line Interface)** lets you set up and manage RAID controller through a command line interface. Arc-cli performs many tasks at the command line. You can download arc-cli manual from Areca website or software CD <CDROM>\DOCS directory.

5. When you reach the installation page, click the "Install" button. A program bar appears that measures the progress of the driver installation. When this screen completes, you have completed the driver installation.

6. A reboot is required to complete the installation (This will start the ArchHTTP so RAID Console can be used).

7. Normally archhttp64 and arc_cli are installed at the same time on ARC-8050. Once archhttp and arc_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 desktop. This icon is for you to start up the McRAID storage manager (by ArchHTTP) and CLI utility.

2.4.2 Hardware Installation

Please follow the steps below in order they are given to ensure that your ARC-8050 connected on your Thunderbolt computer.

Step 1. Install the Drives in the ARC-8050 RAID Storage

1. Gently slide the drive tray out from the ARC-8050 RAID storage.
2. Install the drive into the drive tray and secure the drive to the drive tray by four of the mounting screws.

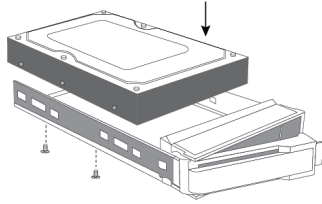


Figure 2-4, Secure the drive to the drive tray

3. After all drives are in the drive tray, slide all of them back into the ARC-8050 RAID storage and make sure you latch the drive trays.

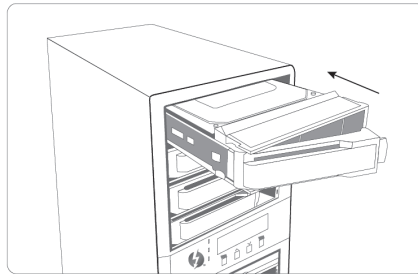


Figure 2-5, Slide drive tray back into the ARC-8050 RAID storage

Step 2. Connecting RAID Storage to Thunderbolt Ports

Thunderbolt connectors are provided on the back of the ARC-8050 RAID storage for connecting the array to Thunderbolt host and next Thunderbolt devices. There are two Thunderbolt connectors on the rear of ARC-8050 RAID storage. You can plug-in two host ports.

1. Direct connection to a Thunderbolt technology capable computer.
2. Daisy chaining Thunderbolt capable devices and displays.

• Thunderbolt Computer Port Connection

By installing Thunderbolt technology capable computer and ARC-8050 Thunderbolt port using the Thunderbolt cable which is included in your RAID enclosure kits. Then connect ARC-8050

INSTALLATION

RAID storage and Thunderbolt technology capable computer port as shown below:

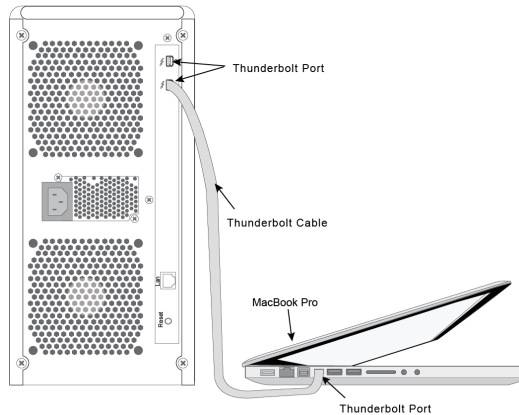


Figure 2-6, Connect ARC-8050 RAID storage and Thunderbolt computer

• Daisy Chain Topologies

A single Thunderbolt technology daisy chain can have seven devices, including the computer. Connect the cable to one of the interface ports on the back of your ARC-8050 RAID storage and to your Thunderbolt capable computer. The additional port may be used to daisy chain compatible computer peripherals, such as hard drives, monitors, and much more. A single Thunderbolt port supports hubs as well as a daisy chain of up to seven Thunderbolt devices on, including the Thunderbolt capable computer.

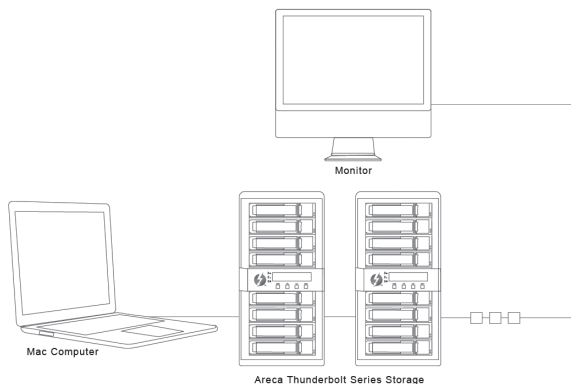


Figure 2-7, Thunderbolt computer daisy chain

Step 3. Connecting Monitor Port

ARC-8050 RAID storage is normally delivered with LCD pre-installed. You can connect LAN port to the manager clinet system, if you want to configure and manage the RAID storage from the clinet system through out-of-band manager.

• LAN Port Connection

ARC-8050 RAID storage has embedded the TCP/IP & web browser-based RAID manager in the firmware (method 1). User can remote manage the RAID enclosure without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100Mbit RJ45 LAN port. Connect LAN port of the ARC-8050 using the included Ethernet cable and then to a LAN port or LAN switch.

Step 4. Connecting RAID Storage Power

To power the RAID storage:

1. Using the included power cord, connect this power cord to a grounded electrical outlet and to the ARC-8050 RAID storage.
2. ARC-8050 RAID storage will turn on automatically when host computer with the power on is received by the ARC-8050. It takes about 30 seconds to fully start up the RAID storage.

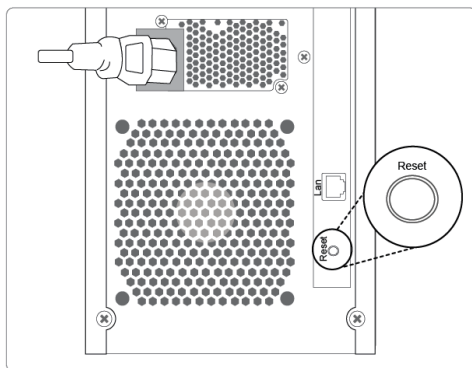


Figure 2-8, Connect the power cord to a grounded electrical outlet and to the ARC-8050 RAID storage.

INSTALLATION

3. ARC-8050 RAID storage automatically turns off when host computer power off is detected by the ARC-8050.

When you are finished installing the ARC-8050 RAID storage, you can set up the RAID volume using McRAID manager or LCD to set up RAID volumes.

Note:

1. User can press and hold the "Reset" button 3 seconds to turn on/off the RAID storage AC power.
2. RAID storage will maintain the daisy chain with other Thunderbolt devices even when the RAID storages have been powered down.

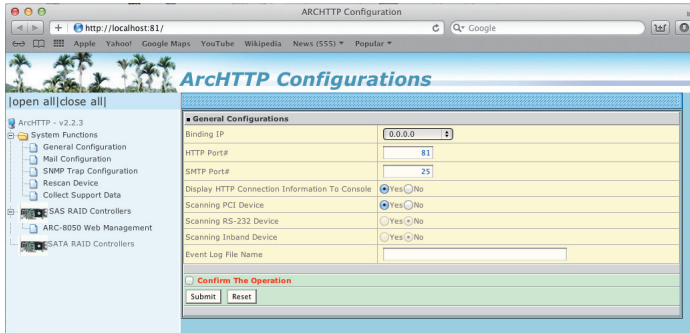
2.4.3 Volume Setup

After hardware installation, the SAS/SATA disk drives connected to the ARC-8050 must be configured and the volume set units initialized by the controller before they are ready to use by the system. With MRAID software installed on your host computer and cables connected, you are ready to turn on your ARC-8050 storage unit and use the McRAID Storage Manager to setup RAID volumes.

2.4.3.1 Configure Volume Set

ARC-8050 RAID storage is normally delivered with LCD pre-installed. Your ARC-8050 RAID storage can be configured by using McRAID storage manager (launched by Archttp proxy server and LAN port) or LCD with keypad (refer to ARC-8050_LCD manual).

- Method 1: Thunderbolt Connection (McRAID Storage Manager)
ARC-8050 RAID storage has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the RAID storage using Archttp proxy server installed via standard web browsers.



Start McRAID Storage Manager – Browser Edition

(1) In Windows, right-click on "Start" menu and choose "Programs". Clicking "MRAID" program icon starts the Archttp utility (From the Start menu, choose Programs > MRAID > ArchHTTP).

(2) On a Mac, there is one MARID icon showing on your desktop. This icon is for you to start up the McRAID storage manager (by archttp) and arc_cli utility.

When you click the archttp, it shows all RAID storages available on the system and create an individual adapter icon located on left column of the "Archttp Configurations" screen. This RAID storage icon is for user to launch the selected RAID storage web browser McRAID RAID Storage Manager.

If there is any RAID adapter missed on the system start-up or plug-in on-line, you can use the "Rescan Device" function. See chapter 5 on ARC-8050 user manual for information on customizing your RAID volumes using McRAID storage manager.

- **Method 2: LAN Port Connection (McRAID Storage Manager)**
ARC-8050 RAID storage has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the RAID storage directly connected to the 10/100Mbps RJ45 LAN port via standard web browsers. For additional information on using the McRAID storage manager to configure the RAID storage see the Chapter 4 "Web Browser-Based Configura-

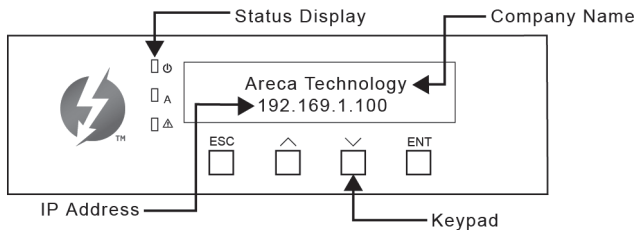
INSTALLATION

tion” on ARC-8050 user manual.

- Method 3: LCD Panel with Keypad

You can use LCD front panel and keypad function to simply create the RAID volume. The LCD status panel also informs you of the disk array’s current operating status at a glance. For additional information on using the LCD to configure the RAID storage see the ARC-8050_LCD manual on the shipping CD. The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information.

The LCD initial screen is shown as the following:



2.4.3.2 Making Volume Sets Available to System

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. Detailed steps for each operating system are provided on their disk utility.

For PC Thunderbolt compatible system:

The following steps show how to make any new disk arrays or independent disks accessible to Windows system. This procedure assumes that the ARC-8050 RAID storage hardware, driver, and Windows are installed and operational in your system.

1. Partition and format the new arrays or disks using “Disk Administrator”:
 - a. Choose “Administrative Tools” from the “Start” menu.
 - b. Choose “Computer Management” from the “Administrative Tools” menu.
 - c. Select “Storage”.

d. Select "Disk Management".

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

3. Right click on the drive and select "Create Volume" from the menu.

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

For Mac Thunderbolt capable system:

When you create a volume through McRAID storage manager, the Mac OS X 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 "Macintosh Disk Utility" manually from the "Finder", use the "Go" menu and open the "Utilities" folder. Double-click on the "Macintosh Disk Utility" program. Follow the on-screen prompts to create a volume set and to assign a disk drive letter.

2.4.4 Unmounting the Storage Volume

For PC Thunderbolt compatible system:

Thunderbolt technology devices are plug and play, allowing you to connect and disconnect them while the host computer is running. In some cases, disconnect the volume without properly unmounting the volume results in data corruption. To prevent the potential data corruption problems, it is important to properly Safely Remove the Thunderbolt storage volume(s).

This will show you how to use "Safely Remove Hardware and Eject Media" in Windows to safely shutdown and eject a storage device before just unplugging or disconnecting it to help prevent accidental data loss if data were still being copied or saved to or from the device. Windows provides a way to help you safely remove such devices.

If you see the "Safely Remove Hardware and Eject Media" icon in

INSTALLATION

the notification area, at the far right of the taskbar, you can use this as an indication that your devices have finished all operations in progress and are ready to be removed. If you don't see the "Safely Remove Hardware and Eject Media" icon, click the Show hidden icons button to display all icons in the notification area.

The notification area, at the far right of the taskbar to safely remove a certain device, click the "Safely Remove Hardware and Eject Media" icon, and then, in the list of devices, click the Thunderbolt storage volume that you want to remove. Windows will display a notification telling you it's safe to remove the Thunderbolt storage volume. Now you can unplug the Thunderbolt cable or press and hold "Reset" button 3 seconds to save energy. The RAID storage will maintain the daisy chain with other Thunderbolt devices even when the RAID storages have been powered down.

Note:

You can also safely remove devices from the computer folder. Click the "Start" button, click "Computer", right-click the device you want to remove, and then click "Eject".

For Mac Thunderbolt capable system:

To avoid possible data corruption, Areca recommends that ARC-8050 RAID storages volume(s) be properly unmounted from the Mac OS X prior to turning off the RAID storage or safely removing the Thunderbolt interface cable

Thunderbolt technology devices are plug and play, allowing you to connect and disconnect them while the host computer is running. In some cases, disconnect the volume without properly unmounting the volume results in data corruption. To prevent the potential data corruption problems, it is important to properly eject the Thunderbolt storage volume(s).

1. Drag RAID storage volume(s) icon to the trash. The Trash will turn into an Eject arrow. This will assure that all data is properly cleared from the system memory before the volume is removed.
2. When the volume icon disappears from the desktop, RAID storage can be disconnected from the computer or you can press

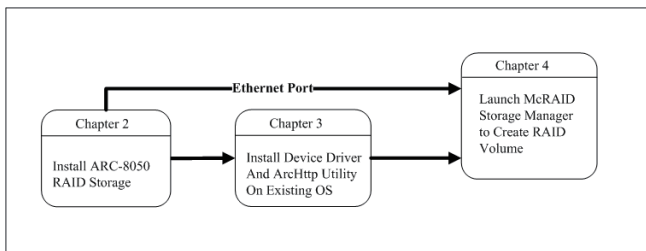
and hold "Reset" button 3 seconds to save energy. The RAID storage will maintain the daisy chain with other Thunderbolt devices even when the RAID storages have been powered down.

2.5 Summary of the Installation

The software components configure and monitor the ARC-8050 RAID storage as following table.

Configuration Utility	Operating System Supported
McRAID Storage Manager (Via Ethernet port)	OS-Independent
McRAID Storage Manager (Via Archttp proxy server)	Mac OS X 10.6.x/10.7.x/10.8.x Windows 7/8

The flow chart below describes the installation procedures for ARC-8050 Thunderbolt RAID storage.



These procedures include hardware installation, the creation and configuration of a RAID volume through the McRAID manager, OS installation and installation of storage software.

McRAID Storage Manager

Before launching the firmware-embedded web server, McRAID storage manager through the Thunderbolt port, you first need to install the Archttp proxy server on your server system. The RAID storage can also be configured through the McRAID storage manager through on-board LAN port. If you need additional information about installation and start-up of this function, see Chapter 4 "Web Browser-Based Configuration" on ARC-8050 user manual.

INSTALLATION

SNMP Manager Console Integration

There are two ways to transport SNMP data on the ARC-8050 RAID storage: Out-of-Band built-in LAN interface or In-Band Thunderbolt 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 Thunderbolt interface, keep blank on the "SNMP Tarp IP Address" option.

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

Out-of-band interface refers to transport SNMP data of ARC-8050 RAID storage from a remote station connected to the controller through a network cable. Before launching the SNMP manager on clinet, you first need 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 4.8.4 "SNMP Configuration" on ARC-8050 user manual.

- **In Band-Using Thunderbolt Port Interface**

In-band interface refers to management of the SNMP data of ARC-8050 RAID storage from a Thunderbolt port. In-band interface is simpler than out-of-band interface for it requires less hardware in its configuration. To enable the RAID storage 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 utility. The Archhttp proxy server 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 controller, please refer to Appendix C, C-3-2 section, "Using Onboard NIC Installation" on ARC-8050 user manual. If you need additional information about installation and start-up the function, see section 3.2 "ArchHttp Configuration" of **SNMP Traps Configuration** on ARC-8050 user manual.

2.6 Hot-plug Drive Replacement

ARC-8050 RAID storage supports the ability of performing a hot-

swap drive replacement without powering down the system. A disk can be disconnected, removed, or replaced with a different disk without taking the system off-line. ARC-8050 RAID storage rebuilding will be processed automatically in the background. When a disk is hot swapped, ARC-8050 RAID storage may no longer be fault tolerant. Fault tolerance will be lost until the hot swap drive is subsequently replaced and the rebuild operation is completed.

2.6.1 Recognizing a Drive Failure

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

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

2.6.2 Replacing a Failed Drive

With our ARC-8050 RAID storage drive tray, you can replace a defective physical drive while your computer is still operating. When a new drive has been installed, data reconstruction will be automatically started to rebuild the contents of the disk drive. The capacity of the replacement drives must be at least as large as the capacity of the other drives in the RAID set.

APPENDIX

Appendix

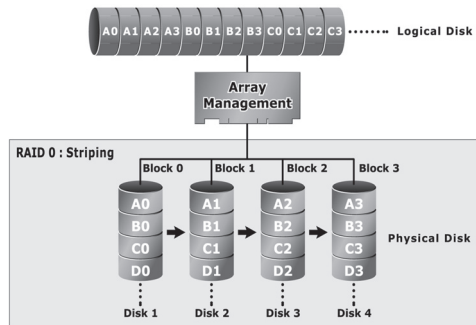
Understanding RAID

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

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

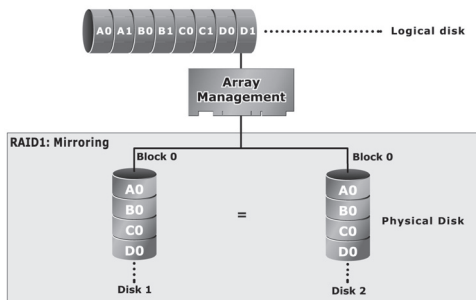
RAID 0

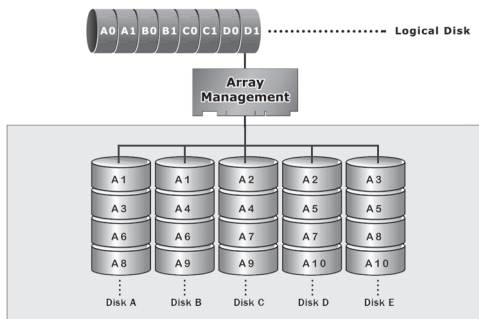
RAID 0, also referred to as striping, writes stripes of data across multiple disk drives instead of just one disk drive. RAID 0 does not provide any data redundancy, but does offer the best High-speed data throughput. RAID 0 breaks up data into smaller blocks and then writes a block to each drive in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

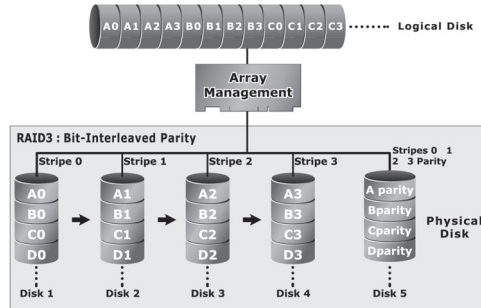


RAID 1

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

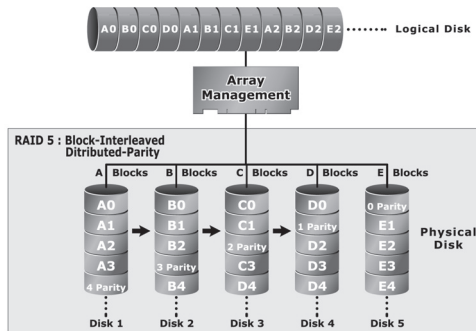






RAID 5

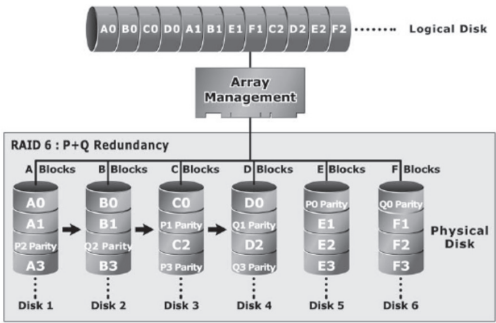
RAID 5 is sometimes called striping with parity at byte level. In RAID 5, the parity information is written to all of the drives in the controllers rather than being concentrated on a dedicated parity disk. If one drive in the system fails, the parity information can be used to reconstruct the data from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



APPENDIX

RAID 6

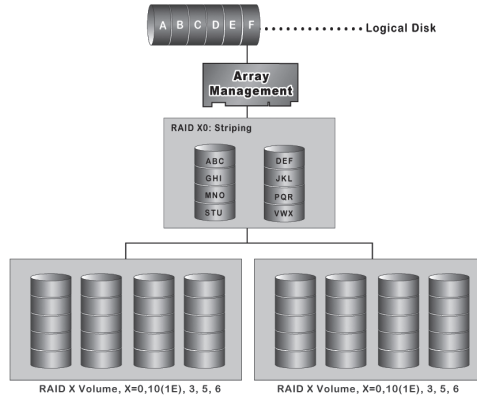
RAID 6 provides the highest reliability. It is similar to RAID 5, but it performs two different parity computations or the same computation on overlapping subsets of the data. RAID 6 can offer fault tolerance greater than RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed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



RAID x0

RAID level-x0 refers to RAID level 00, 100, 30, 50 and 60. RAID x0 is a combination multiple RAID x volume sets with RAID 0 (striping). Striping helps to increase capacity and performance without adding disks to each RAID x array. The operating system uses the spanned volume in the same way as a regular volume. Up to one drive in each sub-volume (RAID 3 or 5) may fail without loss of data. Up to two drives in each sub-volume (RAID 6) may fail without loss of data. RAID level x0 allows more physical drives in an array. The benefits of doing so are larger volume sets, increased performance, and increased reliability.

The following illustration is an example of a RAID level x0 logical drive.



Important:

RAID level 00, 100, 30, 50 and 60 can support up to eight RAID set. If volume is RAID level 00, 100, 30, 50, or 60, you can't change the volume to another RAID level. If volume is RAID level 0, 1, 10(1E), 3, 5, or 6, you can't change the volume to RAID level 00, 100, 30, 50, or 60.

JBOD

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

Single Disk (Pass-Through Disk)

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

APPENDIX

Summary of RAID Levels

ARC-8050 Thunderbolt RAID storage supports RAID Level 0, 1, 10(1E), 3, 5, 6, 30, 50 and 60. The following table provides a summary of RAID levels.

RAID Level Comparison			
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
10(1E)	Also known as mirroring and striping. Data is written to two disks simultaneously, and allows an odd number or disk. Read request can be satisfied by data read from wither one disk or both disks.	3	Up to one disk failure in each sub-volume
3	Also known Bit-Interleaved Parity. Data and parity information is subdivided and distributed across all data disks. Parity information normally stored on a dedicated parity disk.	3	Up to one disk failure
5	Also known Block-Interleaved Distributed Parity. Data and parity information is subdivided and distributed across all disk. Parity information normally is interspersed with user data.	3	Up to one disk failure
6	RAID 6 provides highest reliability, but not widely used. Similar to RAID 5, but does two different parity computations or the same computation on overlapping subsets of the data. The RAID 6 can offer fault tolerance greater that RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed parity data.	4	Up to two disk failure

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