RAID Controller

ARC-8088 Fibre/SAS/iSCSI Series

(12/16/24 bays 12Gb/s SAS cable solution external RAID controller)

Quick Start Guide

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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-8088 series 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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1. Introduction

This section presents a brief overview of the 12/16/24 bays external Fibre/SAS/iSCSI to 12Gb/s SAS cable solution RAID controller, ARC-8088 series.

1.1 Overview

The 12Gb/s SAS interface supports both 12Gb/s SAS disk drives for data-intensive applications and 6Gb/s SATA drives for low-cost bulk storage of reference data. The ARC-8088 RAID controllers attach to SATA/SAS midplanes with 6 x Min SAS HD SFF-8644 connectors or increase capacity using one additional Min SAS HD SFF-8644 external connector. When used with 12Gb/s SAS expanders, the controller can provide up to (256) devices through one or more SAS JBODs, making it an ideal solution for enterprise class storage applications that called for maximum configuration flexibility.

The ARC-8088 RAID controller provides a rack-mounted external storage chassis capable of accommodating up to 12/16/24 12Gb/s, Serial-Attached SCSI (SAS) drives or 6Gb/s Serial ATA (SATA) drives. It provides three kinds of host interface link to the host board on the server system. The dual controller model provides fault-tolerant links across separate host interface, while the single controller model provides a single, straight-through data path.

Unparalleled Performance for 12Gb/s SAS

The ARC-8088 RAID controller raises the standard to higher performance levels with several enhancements including new high performance 1.2 GHz dual core ROC processor, a DDR3-1866 memory architecture and high performance PCIe 3.0 interface bus interconnection. The RAID controller each includes on-board 2GB DDR3-1866 ECC SDRAM. The 12Gb/s SAS is designed for backward compatibility with 6Gb/s and 3Gb/s SAS and SATA hard drives. Regardless of the drive speed, ARC-8088 RAID controllers will provide maximum read/write performance improvements for the most performance-hungry database and IT applications.

The ARC-8088 RAID controller includes one 12Gb/s SAS expander

that incorporates the latest enhancements in SAS along with new LSI DataBolt bandwidth optimizer technology. This is designed to help facilitate the industry transition to 12Gb/s SAS-enabled systems by allowing users to take advantage of 12Gb/s speeds while utilizing existing 6Gb/s drives and backplanes. Using DataBolt, the subsystem buffers 6Gb/s data and then transfers it out to the host at 12Gb/s speeds in order to match the bandwidth between faster hosts and slower SAS or SATA devices.

Unsurpassed Data Availability

Designed and leveraged with Areca's existing high performance RAID solution, ARC-8088 provides superior levels performance and enterprise level data protection for the most demanding next generation server and storage environments. It supports the hardware RAID 6 engine to allow two HDDs failures without impact the existing data and performance. It allows users to hot swap drive in the event of a drive failure with zero downtime. With innovative new RAID-on-Chip 12Gb/s SAS feature and support for SATA, SAS and SSDs, the ARC-8088 RAID controller provide small- to mid-sized enterprises with superior levels of RAID performance and scalability for external storage. The optional flash-based backup module provides power to the cache if it contains data not yet written to the drives when power is lost. The RAID controller also supports traditional Lithium-ion (Li-ion) battery backup module (BBM) to protect cached data on RAID controllers.

Easy RAID Management

Configuration and monitoring can be managed either through the LCD control panel, RS232 port or LAN port. The firmware also contains an embedded terminal emulation via the RS-232 port. The firmware-embedded web browser-based RAID manager allows local or remote to access it from any standard internet browser via a LAN port. The controller also supports API library for customer to write its own monitor utility. The Single Admin Portal (SAP) monitor utility can support one application to manage multiple RAID units in the network. The ARC-8088 firmware and EPLD has implemented the SES-2 protocol and disk activity map to SGPIO based indicator LEDs. For backplane without SGPIO supporting, the expander box also provides two kinds of alternative LED cable header to

support the individual fault/activity status indicator for those backplanes. In addition to meet different enclosure, ARC-8088 box has implemented autonomous chassis management of two power supplies status connectors, four fan monitor/speed control connectors through the SES-2 protocol.

1.2 Features

Controller Architecture

- Dual core RAID-on-Chip (ROC) 1.2GHz processor
- 2GB on-board DDR3-1866 SDRAM with ECC protection
- Write-through or write-back cache support
- Supports up to 256 SATA or SAS devices using SAS expanders
- DataBolt™ Bandwidth Optimizer for balance faster host and slower SAS or SATA devices.
- Redundant flash image for controller availability
- Real time clock support
- Support flash-based or battery backup module (FBM/BBM) ready (optional)

RAID Features

- RAID level 0, 1, 10(1E), 3, 5, 6, 30, 50, 60, Single Disk or JBOD
- Multiple RAID 0 and RAID 10(1E) support (RAID 00 and RAID 100)
- Multiple RAID selection
- Configurable stripe size up to 1024KB
- Support HDD firmware update
- Online array roaming
- 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
- Support for native 4K and 512 byte sector SAS and SATA devices
- Multiple pairs SSD/HDD disk clone function
- SSD automatic monitor clone (AMC) support
- Support intelligent power management to save energy and extend service life

- Support NTP protocol to synchronize RAID controller clock over the on-board LAN port
- Dual controller operation with active/active and failover/failback function
- Dual-active RAID controller with cache mirroring through dedicated high speed bus
- Automatic synchronization of firmware version in the dual-active mode
- Multi-path & load-balancing support (MPIO)
- Max 256 devices
- Max 128 LUNs (volume set) per controller
- Management port seamless take-over

Monitors/Notification

- LCD control panel for setup and configuration (optional)
- System status indication through LCD, LED and alarm buzzer
- SMTP support for email notification
- SNMP support for remote manager
- Enclosure management ready

Drive Interface

- Up to 256 devices using SAS expander (one Min SAS HD SFF-8644 connector)
- Up to 12Gb/s per port using 6 x Min SAS HD SFF-8643 connectors

Host Interface

- SAS-to-SAS
  2 x 12Gb/s SAS Ports
- Fibre-to-SAS
  2/4 x 16Gb/s Fibre channels
- iSCSI-to-SAS
  2 x 10Gb/s iSCSI channels

RAID Management

- Field-upgradeable firmware in flash ROM
- Firmware-embedded manager via RS-232 port
- Firmware-embedded web browser-based RAID manager access your RAID controller from any standard internet browser via a LAN port
- Access terminal menu by telnet via a LAN port
- API library for customer to write its own monitor utility

- SAP management utility to easily manage multiple RAID units in the network

Software Drivers

- OS Independent

Environmental

- Temperature:
  Operating 0° to 40°C
  Storage –40° to 60°C

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

Electrical

- Power Requirements
  65.52W max. on +12V

External Cable Solution 12Gb/s SAS RAID Controller Comparison

	ARC-8088-SAS	ARC-8088-Fibre	ARC-8088-iSCSI
I/O Processor	Dual core RAID-on-Chip (ROC) 1.2GHz processor		
Form Factor	146 (W) x 43 (H) x 250 (L)mm		
Host Bus	2 x 4 Lanes 12Gbps SAS	2/4 x 16Gbps Fibre	2 x 10Gbps Ethernet
Host Connector	2 x SFF-8644	2/4 x SFP	2 x SFP+
Drive Connector	6 x Internal SFF-8643 / 1 x External SFF-8644 connector		
Drive Support	up to 256 SATA or SAS devices using SAS expanders		
RAID Level	0, 1, 10(1E), 3, 5, 6, 30, 50, 60, Single Disk or JBOD		
On-Board Cache	2GB on-board DDR3-1866 SDRAM with ECC protection		
Management Port	In-Band: SES-2 Out-of-Band: LCD, RS-232 and LAN Port	Out-of-Band: LCD, RS-232 and LAN Port	
Enclosure Ready	SES-2		
Host Driver	O/S Independent		

2. Hardware Installation

This section describes the procedures for installing the cable solution external ARC-8088-Fibre/SAS/iSCSI SAS RAID controllers.

2.1 Before Your Begin Installation

Thanks for purchasing the cable solution external ARC-8088 series SAS RAID controller as your RAID data storage subsystem. This user manual gives simple step-by-step instructions for installing and configuring the SAS RAID controller. To ensure personal safety and to protect your equipment and data, reading the following information package list carefully before you begin installing.

Package Contents

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

- 1 x ARC-8088 series RAID controller in an ESD-protective bag
- 1 x RJ11 to RS-232 DB9 cable
- Adapter convert two 4 pin peripheral power cables into a PCI-E power cable
- 3 x Round head screws and 6 x Six eaves copper pillars for BBM/FBM
- 1 x Software Installation CD – containing driver, relative software, an electronic version of this manual and other related manual
- 1 x Quick Start Guide

2.2 Board Layout & Box Outline

The ARC-8088 RAID controller housed in a 5¼-inch half-height canister. The RAID controller is provided for customers who want to use the exiting 12Gb/s SAS enclosure. It is designed to fit into one 5¼-inch half-height drive bays located in a server chassis or storage case. Standard mounting holes are located on both sides of the controller canister. These mounting holes accept commonly available No. 6-32 coarse-thread screws. Use the following instructions below to install the ARC-8088 RAID controller.

2.2.1 RAID Controller Based Board Layout

The SAS RAID controller can support a family included 12/16/24 internal ports using SFF-8643 connectors with an additional 4x external SFF-8644 ports. This section provides the based board layout and connector/jumper for the 12Gb/s SAS RAID controller.

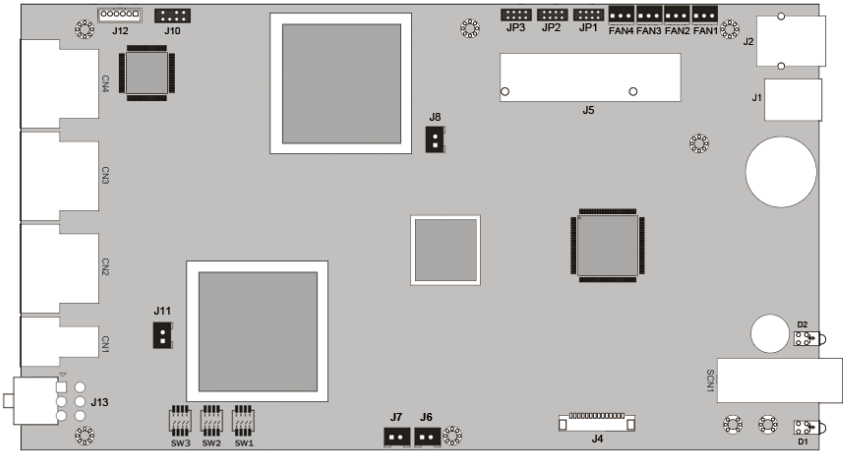


Figure 2-1, ARC-8088 Series Component Layout

Connector	Description	Type
1. (CN1)	Synchronized Cache Bus	SFF-8643
2. (CN2)	SAS 1-8 Ports (Internal)	SFF-8643
3. (CN3)	SAS 9-16 Ports (Internal)	SFF-8643
4. (CN4)	SAS 17-24 Ports (Internal)	SFF-8643
5. (SCN1)	12Gb/s SAS Expander Out	SFF-8644
6. (JP1)	Individual Fault LED Header for SAS 1-8 Ports	8-Pin Header
7. (JP2)	Individual Fault LED Header for SAS 9-16 Ports	8-Pin Header
8. (JP3)	Individual Fault LED Header for SAS 17-24 Ports	8-Pin Header
9. (D1)	Controller Active/Fault Status LED	Bi-color DIP
10. (D2)	Link/Access LED for Host Port	Bi-color DIP
11. (FAN1)	FAN1 with RPM Sense Connector [1]	3-Pin Connector
12. (FAN2)	FAN2 with RPM Sense Connector [1]	3-Pin Connector
13. (FAN3)	FAN3 with RPM Sense Connector [1]	3-Pin Connector
14. (FAN4)	FAN4 with RPM Sense Connector [1]	3-Pin Connector
15. (J1)	Terminal (RS232) Port for RAID Manager	RJ11 Connector
16. (J2)	Ethernet Port for RAID Manager	RJ45 Connector
17. (J4)	Battery Backup Connector	14-Pin Wafer Connector
18. (J6)	Power Fault1 Detective Connector [2]	2-Pin Connector
19. (J7)	Power Fault2 Detective Connector [2]	2-Pin Connector
20. (J8)	The ROC Controller Fan Connector	2-Pin Connector
21. (J11)	The Expander Controller Fan Connector	2-Pin Connector
22. (J12)	LCD Connector	6-Pin Header
23. (J13)	Power Connector	6-Pin PCI Express Power Connector
24. (SW1)	Fan1-Fan4 Input Definition SW1 (3-1) / FAN_NO. OFF OFF OFF / NO ON OFF OFF / FAN1 OFF ON OFF / FAN1~FAN2 ON ON OFF / FAN1~FAN3 OFF OFF ON / FAN1~FAN4	Micro DIP-Switch

<table>
<tr><td></td><td>On Board Fan Detective Control Function
<table><tr><td>SW1 (4)</td><td>On Board Fan Detect</td></tr><tr><td>ON</td><td>Enable</td></tr><tr><td>OFF</td><td>Disable</td></tr></table></td><td></td></tr>
<tr><td>25. (SW2)</td><td>Fan/Power Detective Control Function
<table><tr><td>SW2 (1)</td><td>FAN CONTROL</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table><table><tr><td>SW2 (2)</td><td>PW_FLT1 DETECTION</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table><table><tr><td>SW2 (3)</td><td>PW_FLT2 DETECTION</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table><table><tr><td>SW2 (4)</td><td>PW_FLT CONTROL</td></tr><tr><td>ON</td><td>FAULT HIGH</td></tr><tr><td>OFF</td><td>FAULT LOW</td></tr></table></td><td>Micro DIP-Switch

ENABLE: Monitor function enable.
DISABLE: Monitor function disable.</td></tr>
<tr><td>26. (SW3)</td><td><table><tr><td>SW3 (1)</td><td>DUAL CONTROL</td></tr><tr><td>ON</td><td>ENABLE</td></tr><tr><td>OFF</td><td>DISABLE</td></tr></table><table><tr><td>SW3 (2)</td><td>MASTER/SLAVE</td></tr><tr><td>ON</td><td>SLAVE</td></tr><tr><td>OFF</td><td>MASTER</td></tr></table><table><tr><td>SW3 (4-3)</td><td>RS-232</td></tr><tr><td>OFF OFF</td><td>CTRL TERMINAL</td></tr><tr><td>OFF ON</td><td>EXP TERMINAL</td></tr><tr><td>ON OFF</td><td>CTRL DEBUG</td></tr><tr><td>ON ON</td><td>EXP DEBUG</td></tr></table></td><td>SLAVE: Dual expander slave mode
MASTER: Dual expander master mode</td></tr>
</table>

Table 2-1, Component Definition

Note:

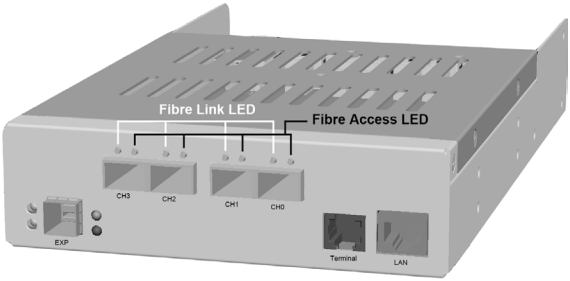
1. Fan Headers (FAN1~FAN4)
   The controller has four 4 3-pin fan headers which can control and detect the fan speed, Each header can only connect to one fan. You can directly connect the enclosure cooling fan to those 3-pin header. Controller hardware monitor can check the RPM status of the cooling fans and show those fan status on the controller's hardware information based on the SW1(1~3) micro switch definition (FAN1~FAN4). SW1(4) micro dip-switch is used to enable the (FAN1~FAN4) fan monitor function. SW1(4) micro dip-switch is used to enable the ROC & expander controller fan (J8 & J11) monitor function. Current limitation of total fan headers are 6A.

2. Power Fail Header (J6&J7)
   Power fail header monitors enclosure power supply fail output pin status based on the SW2 (2~3) micro switch definition (Power Fail).
   Pin definition for J6 and J7.
   Pin 1: GND
   Pin 2: Single input-->Low: power fail, High: power ok

2.2.2 RAID Controller Module Outline

The ARC-8088 SAS RAID controller can support two 12Gb/s SAS host ports, two/four 16Gb/s Fibre host ports, or two 10Gb/s iSCSI host ports additional one external SFF-8644 port (EXP) for expansion. This section provides the 12Gb/s SAS RAID controller box outline.

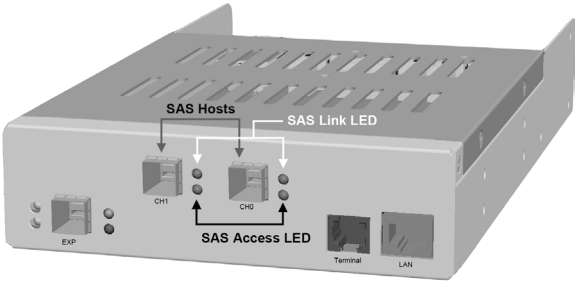
2.2.2.1 Front View of Fibre to SAS RAID Controller



The following describes the ARC-8088-Fibre channel link/access LED.

Fibre Host Port LED	Status
Link LED (Green/Orange light)	Two LEDs (green/orange) are used to indicate the link speed of the operation of each Fibre Channel port. 1. On (green) when the Fibre Channel 16Gbps link speed is connected and established. 2. On (orange) when the Fibre Channel 8Gbps link speed is connected and established. 3. On (green and orange interactive flash) when the Fibre Channel 4Gbps link speed is connected and established.
Access LED (Blue light)	The Fibre channel host accesses to the Fibre to SAS RAID controller.

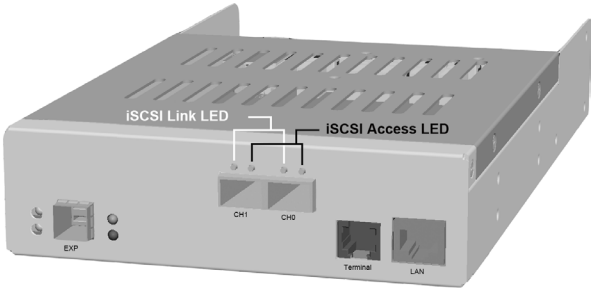
2.2.2.2 Front View of SAS to SAS RAID Controller



The following describes the ARC-8088-SAS channel link/access LED.

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

2.2.2.3 Front View of iSCSI to SAS RAID Controller

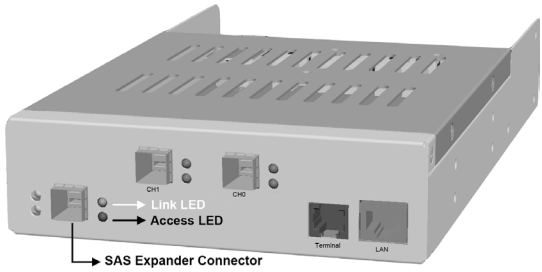


The following table describes ARC-8088-SAS channel link/access and speed LED.

iSCSI Host Port	Status
Link LED (Green light)	When link LED is flashed that indicates the iSCSI host link has connected.
Access LED (Green light)	When access LED is lit that indicates the iSCSI host accesses to the iSCSI RAID controller.

2.2.2.4 Expander Output

The following describes the ARC-8088-Fibre/SAS/iSCSI link/access LED for expander port.



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

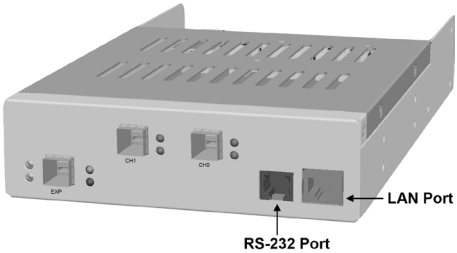
2.2.2.5 Global Status

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

Controller Indicators	Status
Power LED (Heartbeat/ Green light)	When power LED is lit that indicates the controller in working state. Flashing power LED indicates controller CPU access the controller resource.
Fault LED (Red light)	Flashing fault LED indicates a controller reset occurs on a controller.

2.2.2.6 SAS RAID Monitor Port

Your SAS RAID controller module can be configured by using the LCD with keypad (optional), a serial device (terminal emulation) or LAN port.



- **LCD Panel with Keypad (Optional)**
  If you want to configure your SAS RAID controller module by using a LCD with keypad, ARC-8088 series provide this optional function for you. You can connect ARC-1009 5.25” or ARC-1035 3.5” through the J12 port on ARC-8088 RAID controller base board. If you need this function, you must have one another 5.25” or 3.5” drive bay space.

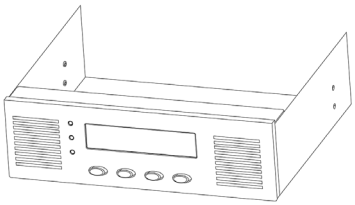


Figure 2-2, ARC-1009

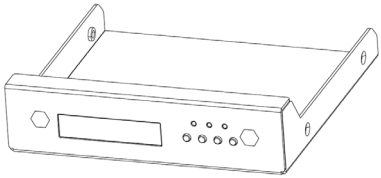


Figure 2-3, ARC-1035

- **RS232C Port (Terminal) Connection**
  The SAS RAID controller can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the SAS RAID controller for access to the text based setup menu.

  - **Terminal Port Function Definition:**
    Please configure the SW3 micro dip-switch settings to define the J2 connector (VT-100 for expander/Debug & VT-100 for controller) function.

SW3 Dip (3-4)	RS-232 Port
OFF OFF	Controller Terminal
OFF ON	Expander Terminal
ON OFF	Controller Debug
ON ON	Expander Debug

Table 2-2, RS-232 Port Function Definition

The serial port on the SAS RAID controller's I/O shield can be used in VT100 mode. The provided interface cable converts the RS232 signal of the RJ11 connector on the RAID controller SAS expander into a 9-pin D-Sub male connector. The firmware-based terminal SAS expander management interface can access the expander through this RS-232 port. You can attach a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program to the serial port for accessing the text-based setup menu. Please reference the ARC-8008/8088 RAID Controller Expander - CLI manual on the shipping package or download from www.areca.com.tw.

- **LAN Port Connection**
  The SAS RAID controller module has embedded the TCP/IP & web browser-based RAID manager in the firmware (method 3). User can remote manage the SAS RAID controller without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port. Connect Ethernet port of the SAS RAID controller using the included Ethernet cable and then to a LAN port or LAN switch.

2.3 Installation

Use the following instructions below to install the ARC-8088 series external cable solution 12Gb/s SAS RAID controller.

Step 1. Power the Enclosure Off

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

Step 2. Unpack RAID Controller Module

Unpack and remove the ARC-8088 series external cable solution 12Gb/s SAS RAID controller from the package. Inspect it carefully, if anything is missing or damaged, contact your local dealer.

Step 3. Open the Controller Canister Top Cover

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

Step 4. Adding a Battery Backup Module (Optional)

Please refer to Appendix B/C for installing the BBM/FBM in your ARC-8088 series external cable solution 12Gb/s SAS RAID controller.

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

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

Step 6. Install the Controller Canister Top Cover

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

Step 7. Mounting RAID Controller Module into the Enclosure

Remove the enclosure cover and find a 5.25 inch CD-ROM wide place to fasten the ARC-8088 series RAID controller in the external enclosure.The RAID controller requires one 5.25” half-height drive bay.

Step 8. Connect Power to RAID Controller

The ARC-8088 series RAID controller supports 6 pin PCI-E power connector. If your power supply doesn't have a 6 pin PCI-E power cable then you can use the adapter to convert two 4 pin peripheral power cables into a PCI-E power cable. If you use an adapter then be sure to plug the 4 pin peripheral power connectors into separate power cables coming from the power supply.

Step 9. Connecting Cable to Backplane

The ARC-8088 series supports 6 SFF-8643 connectors on the back side. User uses suitable cable (depends on the backplane) to connect the RAID controller connector to the enclosure backplane. Please refer to section 2.4 SAS cable to find the suitable cable.

Step 10. Loading Drive to the Drive Tray

You can connect the SAS/SATA drives to the controller through direct cable and backplane solutions. In the direct connection, SAS/SATA drives are directly connected to SAS RAID controller PHY port with SAS/SATA cables. The SAS RAID controller can support up to 24 PHY internal ports and 4 PHY external ports. Remove the front bezel from the computer chassis and install the cages or SAS/SATA drives in the computer chassis. Loading drives to the drive tray if cages are installed. Be sure that the power is connected to the individual drives or cage.

In the backplane solution, SAS/SATA drives are directly connected to SAS system backplane. The number of SAS/SATA drives is limited to the number of slots available on the backplane. Your

ARC-8088 series RAID controller supports up to 24 x 12Gb/s SAS or 6Gb/s SATA drives, each one contained in its individual drive carrier. Each drive is hot-pluggable, allowing you to remove and insert drives without shutting down your ARC-8088 series RAID enclosure. Install the drives to 12-bays ARC-8088 sries RAID enclosure as shown in figure 2-2.

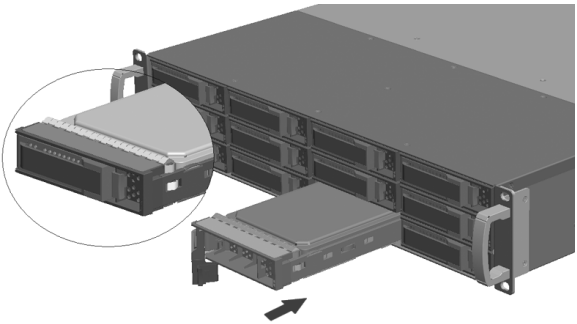


Figure 2-4, Install the Drives to RAID Enclosure.

Step 11. Install the Enclosure Top Cover

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

Step 12. Connecting to Host System

The external host connector is provided on the back of the SAS RAID controller for connecting the array to server host adapter. By installing host port adapter and RAID controller using the correct external cables. Then connect ARC-8088 series SAS RAID controller and host port adapter as shown below:

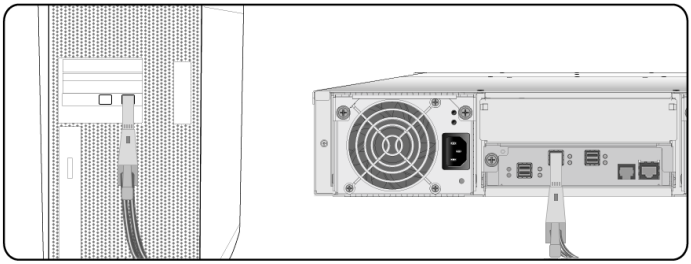


Figure 2-5, Connecting Host Adapter

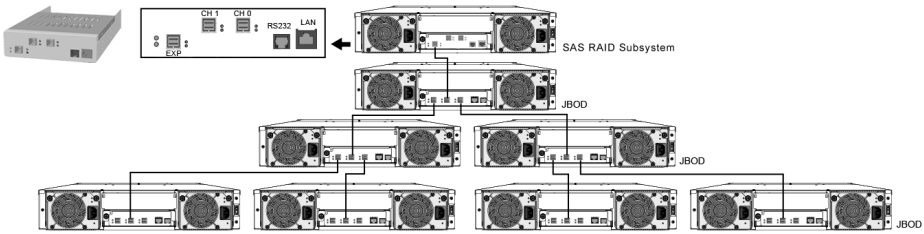
Step 13. Connecting RAID Controller's Ethernet and RS232 Port

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

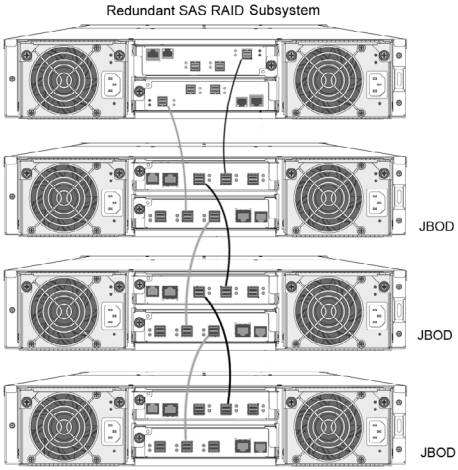
Step 14. Add More JBODs (Optional)

SAS RAID controller expander port supports daisy chain expansion to the next JBOD. The SAS RAID controller can support daisy-chain up to 8 enclosures. The maximum drive no. is 256 devices through 8 enclosures. The following figure shows how to connect the external Min SAS cable from the SAS RAID controller that has external connectors to the external drive boxes or drive enclosures.

- Single Controller Mode



- Dual Controller Mode



The following table is the max no. of SAS RAID controller supported:

	Disks/Enclosure	Expander	Devices/Controller	Volume
Max No.	128	12	256	128

Note:

1. Turn on the SAS RAID subsystem first to make sure the host adapter on the server recognizes the drives in the sub-system.
2. Turn on the JBOD first to make sure the SAS RAID sub-system recognizes the drives in the JBOD.

Step 15. Connect the RAID Subsystem Power

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

Note:

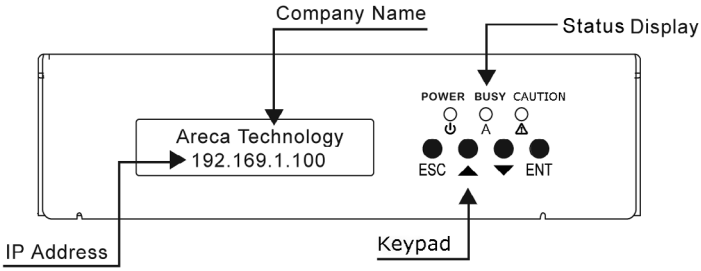
It's a good ideal to turn on your ARC-8088 series RAID controller before turning on the host computer. This will insure that the host computer recognizes the volumes and drivers in the ARC-8088 series RAID controller.

Step 16. Configure RAID Subsystem

Your ARC-8088 series cable solution SAS RAID controller can be configured by using the LCD with keypad, a serial device (terminal emulation) or LAN port.

- Method 1: LCD Panel with Keypad (Optional)
  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 controller see the Chapter 4 of LCD Configuration Menu. The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information.

  The initial screen is as following:



- Method 2: RS-232 Port Connection
  The ARC-8088 series RAID controller can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the RAID controller for access to the text-based setup menu. For additional information on using the RS-232 port to configure the RAID controller see the Chapter 5 of VT-100 Utility Configuration.

- Method 3: LAN Port Connection
  The ARC-8088 series RAID controller has embedded the TCP/IP & web browser-based RAID manager in the firmware. User can remote manage the ARC-8088 series RAID controller without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port. For additional information on using the LAN port to configure the RAID controller see the Chapter 6 of Web Browser-Based Configuration.

Step 17. Turn on Host Computer Power

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

Step 18. Format, Partition and Mount the ARC-8088 series RAID controller Volumes

After you create a unit, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, that is depend on what operating system you are using (Windows, Linux, FreeBSD or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the ARC-8088 series RAID controller can be fully used.

2.4 SAS Cables

You can connect the end devices to each other through direct cables or through the SAS expander/backplane connections. The 12Gb/s SAS RAID controller supports daisy-chain expansion up to 8 enclosures. The following is an example of some internal SAS/SATA cables and an external SAS cable.

2.4.1 Mini SAS HD SFF-8643 to 4xSATA Cable

The Mini SAS HD SFF-8643 to 4xSATA cables are used for connection between the 12Gb/s SAS RAID controller internal connectors and connectors on the SAS/SATA disk drives or SAS/SATA connector backplane. The 12Gb/s SAS controllers have 1-6 Mini SAS HD SFF-8643 internal connectors, each of them can support up to four SAS/SATA drives.

These controllers can be installed in a server RAID enclosure with standard SATA connectors backplane. The following diagram shows the picture of Mini SAS HD SFF-8643 to 4xSATA cables. Backplane with SGPIO header can leverage the SGPIO function on the 12Gb/s SAS RAID controller through the sideband cable.

The SFF-8448 sideband signals cable is reserved for the backplane with header on it.

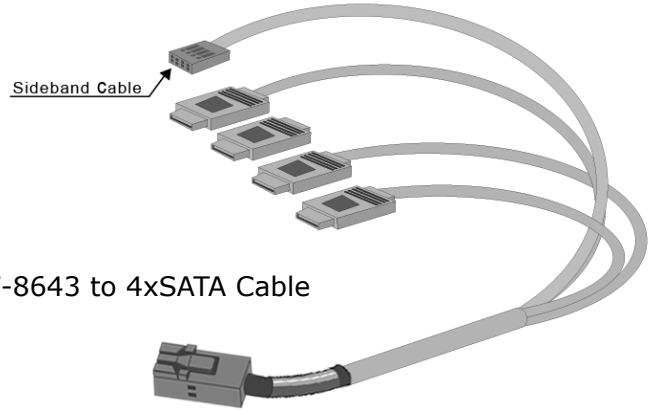


Figure 2-6, SFF-8643 to 4xSATA Cable

2.4.2 Mini SAS HD SFF-8643 to 4xSFF-8482 Cable

These controllers can be installed in a server RAID enclosure with out a backplane. This kind of cable will attach directly to the SAS disk drives. The following diagram shows the picture of Mini SAS HD SFF-8643 to 4xSFF-8482 cables.

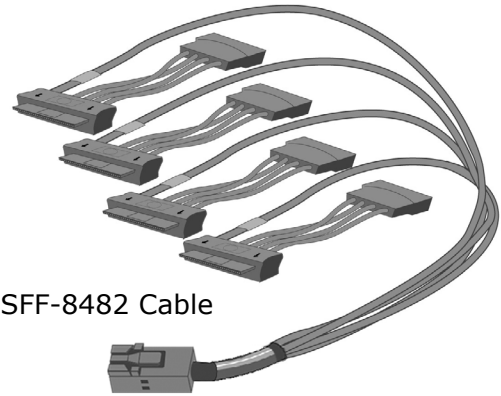


Figure 2-7, SFF-8643 to 4xSFF-8482 Cable

2.4.3 Mini SAS HD SFF-8643 Cable

The 12Gb/s SAS RAID controllers have 1-6 Mini SAS HD SFF-8643 connectors, each of them can support up to four SAS/SATA signals. These controllers can be installed in a server RAID enclosure with Mini SAS HD SFF-8643 internal connectors backplane. This Mini SAS HD cable has eight signal pins to support four SAS/SATA drives and six pins for the SGPIO (Serial General Purpose Input/ Output) side-band signals. The SGPIO bus is used for efficient LED management and sensing drive locate status.

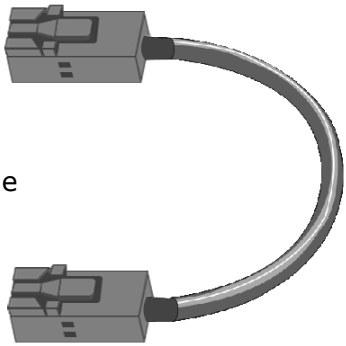


Figure 2-8, Mini SAS HD SFF-8643 Cable

2.4.4 Mini SAS HD SFF-8644 Cable

The Mini SAS HD SFF-8644 cables are used for connection between the 12Gb/s SAS controller external connectors and connectors on the external drive boxes or drive expanders (JBOD). The 12Gb/s SAS controller has one Mini SAS HD SFF-8644 external connector, each of them can support up to four SAS/SATA signals.

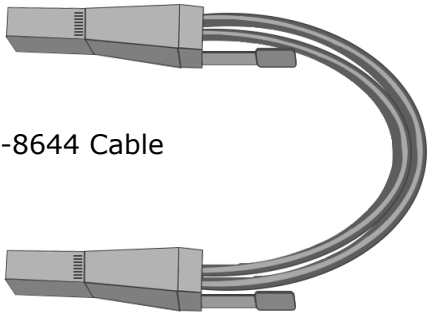
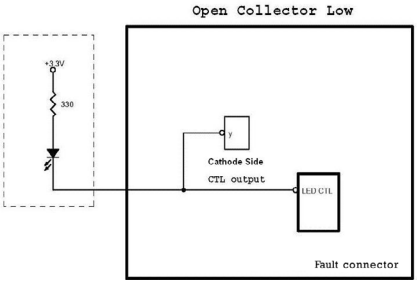


Figure 2-9, Mini SAS HD SFF-8644 Cable

2.5 LED Cables

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

The following electronics schematic is the SAS RAID controller logical of fault header. The signal for each pin is cathode (-) side. The following diagrams and descriptions describe each type of connector.



Note:

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

Connect the cables for the drive fault LEDs between the backplane of the cage and the respective connector on the ARC-8088 series RAID controller header. The following describes the fault LED.

LED	Normal Status	Problem Indication
Fault LED	1. When the fault LED is lit, there is no disk present. 2. When the fault LED is not lit, then disk is present and status is normal.	1. When the fault LED is blinking (2 times/sec), that disk drive has failed and should be hot swapped immediately. 2. When the activity LED is lit and fault LED is fast blinking (10 times/sec) there is rebuilding activity on that disk drive.

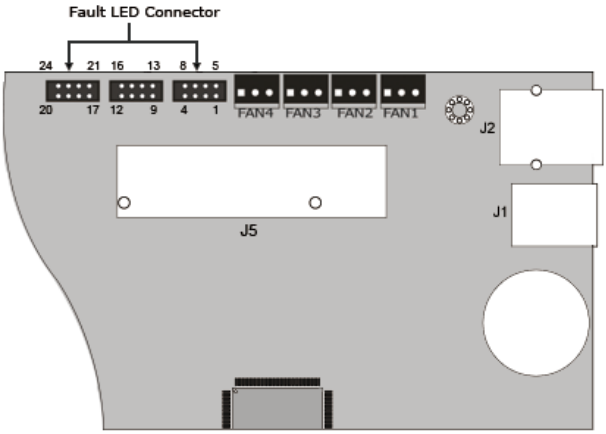


Figure 2-10, Fault LED Connector