

SAS Host Adapters

ARC-1330 Series

(PCIe 3.0 x8 Lanes 12Gb/s SAS Host Adapters)

USER'S 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-1330 series SAS host adapters have 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 brief overview of the SAS 12Gb/s host adapters: ARC-1330-8i, ARC-1330-8x and ARC-1330-4i4x.

1.1 Overview

ARC-1330 series host adapters provide a blazing-fast storage connectivity solution with enhanced reliability and performance and a wide variety of internal and external connector configurations to support any application and tiered storage solution. The SAS host adapters enable large-scale direct attach storage (DAS) arrays through external 12Gb/s ports, driving up to 128 end-point devices for SFF-8644 connector. With connectivity options including 8-internal ports, 8-external, and 4-internal/4-external ports, ARC-1330 series 12Gb/s host adapters are ideal for large capacity external server storage RAID and no-RAID enclosure.

Unparalleled Performance

Areca PCIe 3.0 x 8 lanes 12Gb/s SAS host adapters are able to connect to 12Gb/s, 6Gb/s and 3Gb/s SATA SAS/SATA hard disk drives, allowing for tiered storage that optimizes costs and performance. This is because SAS adapters leverage a common electrical and physical connection interface that is compatible with SATA technology. SAS drives are optimal when speed and reliability are of the utmost concern, while SATA drives are appropriate when capacity and cost are more important. Areca offers a diverse selection of SAS host adapter including a wide variety of internal and external connector configurations to support any application, from high-performance workstations to large-scale DAS arrays at high performance concerns. System integrators can use the ARC-1330 host adapters to build large-scale storage array infrastructures that support both SAS and SATA devices. The mixing drivers into servers can be felt immediately when using the ARC-1330 to develop a tiered storage solution with hard disk drives (HDDs), solid state drives (SSDs) and removable media (DAS/JBOD).

Easy Management

A set of 8 green LEDs and 8 red LEDs are provided on the front side of the MD2 low profile board to transport activity/fault status for each of up to 8 attached devices. The global state of these activity/fault indicators is also presented on two sets of header. The adapters contain a BIOS set up utility that can access via hot key at system BIOS boot-up screen. This pre-boot setup utility provides flexibility for customer to optimize the host adapter parameter. API library for customer combines the ARC-1330 series function code to its monitor utility. CLI and API code have supported a system level ATA-8 microcode download for upgrading SATA disk firmware and SES microcode download for upgrading enclosure expander firmware.

1.2 Features

Hardware Specification

- PCIe 3.0 x8 lanes (x8, x4, and x1 lane widths)
- Up to 12Gb/s transfer rates per SAS port
- Support 3Gb/s, 6Gb/s and 12Gb/s SAS and SATA link rates
- Connects to SAS/SATA HDDs, solid state driver (SSDs) and removable media (DAS/JBOD)
- Support a maximum 128 SAS/SATA devices using SAS expander
- Available in a low-profile form factor
- Low-profile bracket
- RoHS compliant

Serial Attached SCSI (SAS) 12Gb/s

- Serial Attached SCSI (SAS-3.0) compliant
- Supports wide port (Any combination of x1, x2, and 4x)
- Supports Serial SCSI Protocol (SSP)
- Supports SAS Management Protocol (SMP)
- Supports Serial ATA Tunneling Protocol (STP)
- Hot-plug capability
- Staggered spin-up control

Serial ATA 6Gb/s

- 6Gb/s compliant with speed negotiation to 3Gb/s
- Support programmable SATA signal voltage levels

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- Support staggered spin-up, hot-plug and Native Command Queuing (NCQ)
- Support port multiplier

Easy Management

- Legacy BIOS setup utility
- Supports Command Line Interface (CLI)
- API library for customer to write monitor utility
- Enclosure management for internal port via LED and SES3/SGPIO
- Enclosure management for external port via SAS expander
- Support ATA-8 microcode download for upgrading SATA disk drive firmware
- Support SES microcode download for upgrading enclosure expander firmware
- ArcSAP quick manager for configuring and maintaining SAS host adapter

Operating System

- Windows
- Linux (Red Hat and SuSE, ...)
- XenServer
- FreeBSD
- Mac OS X 10.5/macOS 10.12 or higher

12Gb/s SAS Host Adapter			
Model Name	ARC-1330-8i	ARC-1330-4i4x	ARC-1330-8x
Host Bus Type	PCIe 3.0 x8 Lanes		
RAID Level	Non-RAID		
Form Factor	MD2 Low Profile		
Drives Support	128 X 3Gb/s 6Gb/s and 12Gb/s SAS/SATA		
Connector	2 x SFF-8643	1 x SFF-8643 1 x SFF-8644	2 x SFF-8644
Direct Attach	Yes		
Dimension(LxH)	167 X 64 mm		

2. Hardware Installation

This section describes the procedures for installing the ARC-1330 series SAS host adapters.

2.1 Before Your Begin Installation

Thanks for purchasing the ARC-1330 series host adapters as your data storage subsystem. This user manual gives simple step-by-step instructions for installing and configuring the host adapters. 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.

- 1 x PCIe 3.0 x 8 lanes host adapter in an ESD-protective bag
- 1 x Installation CD – containing driver, relative software, an electronic version of this manual and other related manual
- 1 x ARC-1330 series quick installation guide
- 1 x Low-profile bracket

HARDWARE INSTALLATION

2.2 Board Layout

This section provides the board layout and connector/jumper for the SAS host adapters.

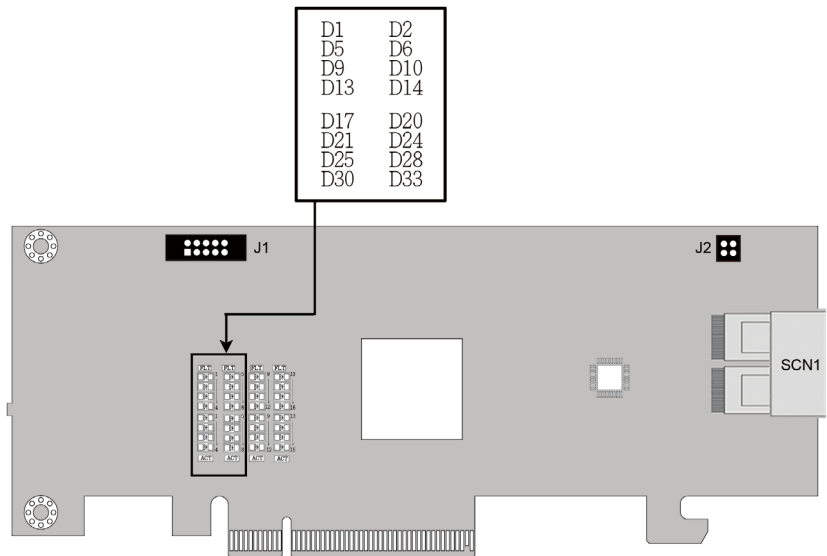


Figure 2-1, ARC-1330-8i Host Adapter

Connector	Type	Description
1. (J1)	Manufacture Purpose Port	10-pin header
2. (J2)	Global Fault/Activity LED	4-pin header
3. (SCN1)	SAS 1-8 Ports (Internal)	SFF-8643
4. (D1,D5,D9,D13,D2,D6,D10,D14)	Fault LED for SAS Port 1-8 (SCN1)	SMT LED
5. (D17,D21,D25,D30,D20,D24,D28,D33)	Activity LED for SAS Port 1-8 (SCN1)	SMT LED

Table 2-1, ARC-1330-8i Connectors

HARDWARE INSTALLATION

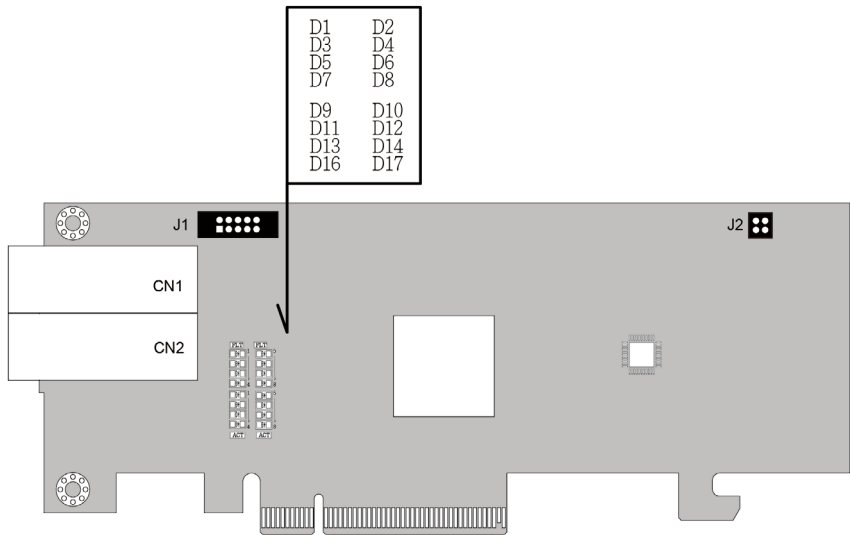


Figure 2-2, ARC-1330-8x Host Adapter

Connector	Type	Description
1. (J1)	Manufacture Purpose Port	10-pin header
2. (J2)	Global Fault/Activity LED	4-pin header
3. (CN1)	SAS 1-4 Ports (External)	SFF-8644
4. (CN2)	SAS 5-8 Ports (External)	SFF-8644
5. (D1,D3,D5,D7)	Fault LED for SAS Port 1-4 (CN1)	SMT LED
6. (D2,D4,D6,D8)	Fault LED for SAS Port 5-8 (CN2)	SMT LED
7. (D9,D11,D13,D16)	Activity LED for SAS Port 1-4 (CN1)	SMT LED
8. (D10,D12,D14,D17)	Activity LED for SAS Port 5-8 (CN2)	SMT LED

Table 2-2, ARC-1330-8x Connectors

HARDWARE INSTALLATION

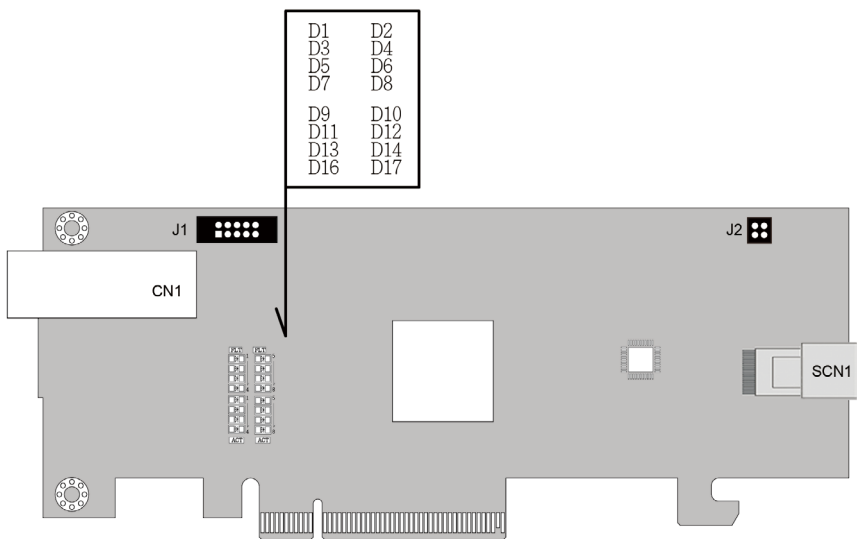


Figure 2-3, ARC-1330-4i4x Host Adapter

Connector	Type	Description
1. (J1)	Manufacture Purpose Port	10-pin header
2. (J2)	Global Fault/Activity LED	4-pin header
3. (CN1)	SAS 1-4 Ports (External)	SFF-8644
4. (SCN1)	SAS 5-8 Ports (Internal)	SFF-8643
5. (D1,D3,D5,D7)	Fault LED for SAS Port 1-4 (CN1)	SMT LED
6. (D2,D4,D6,D8)	Fault LED for SAS Port 5-8 (SCN1)	SMT LED
7. (D9,D11,D13,D16)	Activity LED for SAS Port 1-4 (CN1)	SMT LED
8. (D10,D12,D14,D17)	Activity LED for SAS Port 5-8 (SCN1)	SMT LED

Table 2-3, ARC-1330-4i4x 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-1330 series host adapters can be installed in a universal PCIe slot and requires a motherboard that:

- Comply with the PCIe x 3.0 x8 lanes
It can work on the PCIe 1.0/2.0 expansion slot x1, x4, x8, and x16 signals with x8 or x16 slot M/B.

Installation Tools

The following items may be needed to assist with installing the ARC-1330 series host adapters 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.

Electrostatic Discharge

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

- Do not remove the host adapters from its anti-static packaging until you are ready to install it into a computer case.

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- Handle the host adapters by its edges or by the metal mounting brackets at its each end.
- Before you handle the host adapters 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.

2.3 Installation

Use the following instructions below to install a PCIe host adapter.

Step 1. Unpack the Host Adapters

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

Step 2. 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 3. Install the 12Gb/s SAS Host adapters

To install the 12Gb/s SAS Host adapter, remove the mounting screw and existing bracket from the rear panel behind the selected PCIe 3.0 slot. Align the gold-fingered edge on the card with the selected PCIe 3.0 slot. Press down gently but firmly to ensure that the card is properly seated in the slot, as shown in Figure 2-4. Then, screw the bracket into the computer chassis. ARC-1330 series controllers require a PCIe 3.0 x8 slot for better performance.

HARDWARE INSTALLATION

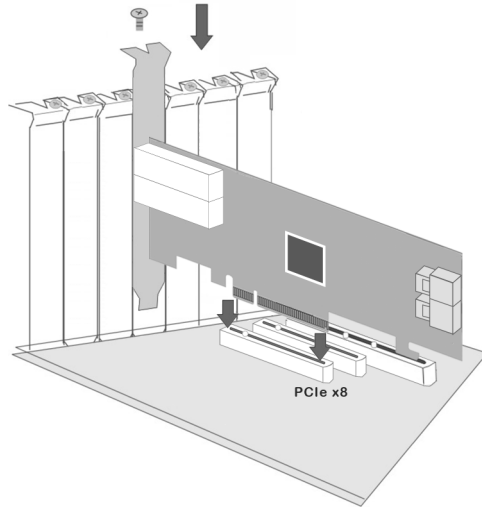


Figure 2-4, Insert ARC-1330 into a PCIe x8 Slot

Note:

Some PCIe slots on desktop board support only graphics boards, these PCIe slots may be not able to support other add-on cards such as storage adapters.

Step 4. Install Cable

You can connect the end devices to each other through direct cables or through the SAS expander/backplane connections. The SAS host adapters support daisy-chain expansion up to 128 end point devices through SAS expander enclosures. The following is an example of some internal SAS/SATA cables and an external SAS cable.

You can connect the SAS/SATA drives to the host adapters through direct cable and backplane solutions. In the direct connection, SAS/SATA drives are directly connected to ARC-1330-4i4x or ARC-1330-8i internal ports with SAS/SATA cables.

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The following pictures are the cables that can use on ARC-1330 series SAS host adapters with your application.

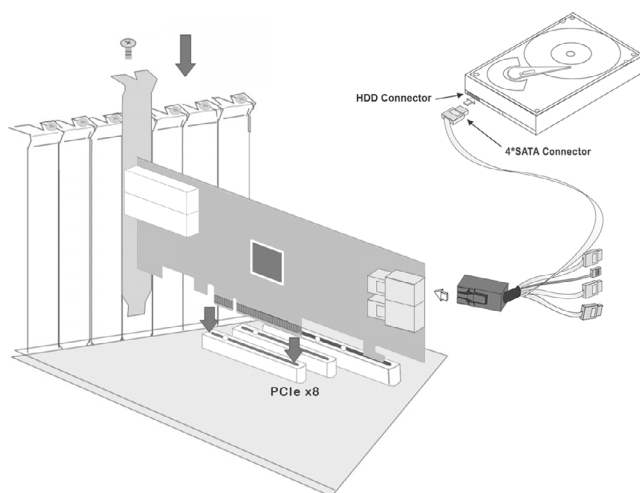


Figure 2-5, SAS Cable Connect to HDD

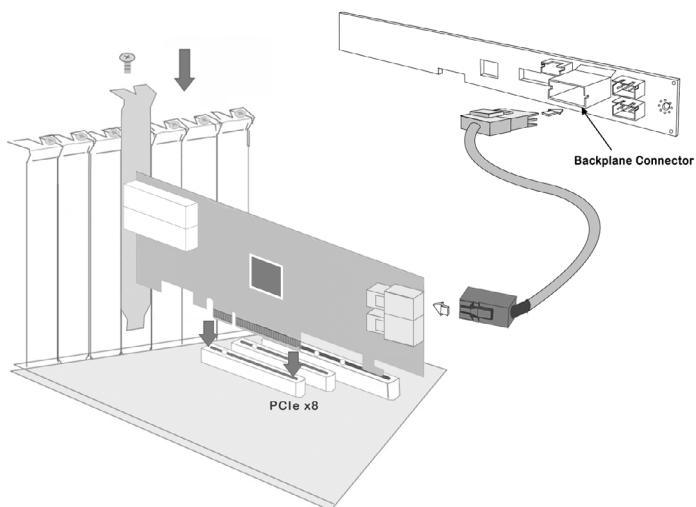


Figure 2-6, Connecting to Backplane

HARDWARE INSTALLATION

1: Internal Mini SAS HD SFF-8643 to 4x SATA Cable

The Mini SAS HD SFF-8643 to 4xSATA cables are used for connection between the 12Gb/s SAS Host adapter internal connectors and connectors on the SAS/SATA disk drives or SAS/SATA connector backplane. The ARC-1330-4i4x or ARC-1330-8i host adapters have 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 host adapter through the sideband cable.

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

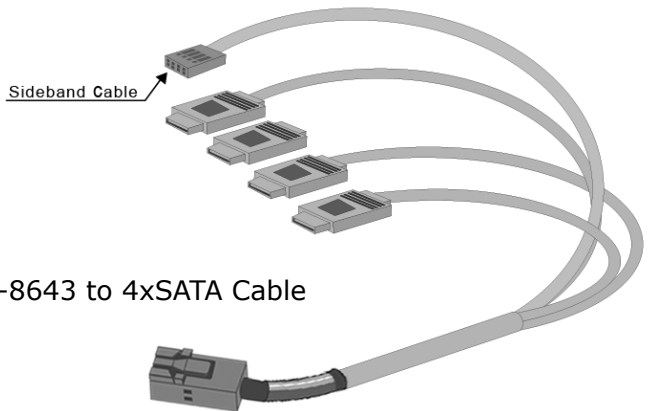


Figure 2-7, SFF-8643 to 4xSATA Cable

2: Internal Mini SAS HD SFF-8643 to 4xSFF-8482 Cable

These controllers can be installed in a server RAID enclosure without a backplane. The 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.

HARDWARE INSTALLATION

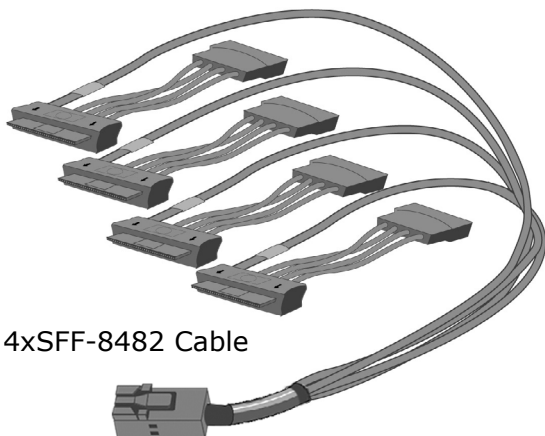


Figure 2-8, SFF-8643 to 4xSFF-8482 Cable

3: Internal Mini SAS HD SFF-8643 Cable

The ARC-1330-4i4x or ARC-1330-8i host adapters have Mini SAS HD SFF-8643 connectors, each of them can support up to four SAS/SATA signals. These adapters 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.

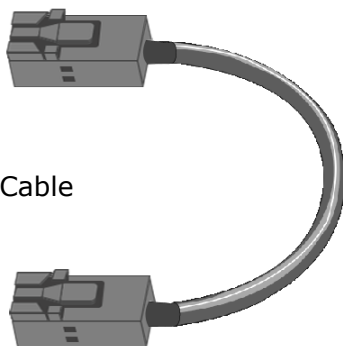


Figure 2-9, Mini SAS HD SFF-8643 Cable

HARDWARE INSTALLATION

4: External 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 ARC-1330-4i4x or ARC-1330-8x host adapters have Mini SAS HD SFF-8644 external connector, each of them can support up to four SAS/SATA signals.

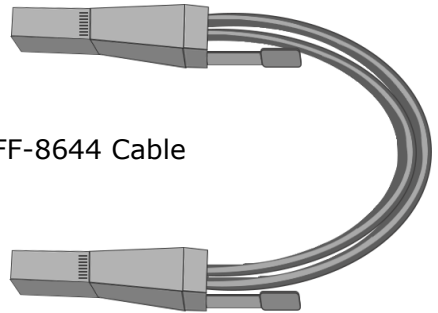


Figure 2-10, Mini SAS HD SFF-8644 Cable

The following figure shows how to connect the external Mini HD SAS cable from the ARC-1330 series host adapters that has external SFF-8644 connectors to the external drive boxes or drive enclosures.

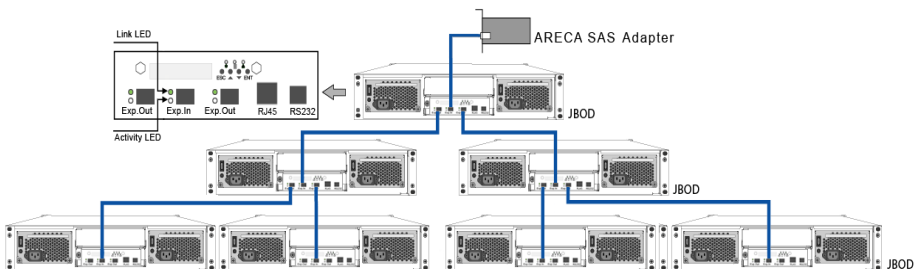


Figure 2-11, Connecting to Drive Enclosure

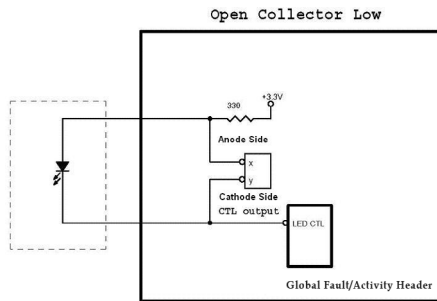
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Step 5. Install the LED Cable (Optional)

The Global Indicator Connector is used by the server global indicator LED.

The following electronics schematic is the ARC-1330-4i4x/ARC-1330-8i host adapters logical of fault/activity header. The signal for each pin is cathode (-) side.

The following diagrams and descriptions describe each type of connector.



Note:

A cable for the global indicator comes with your computer system. Cables for the individual drive LEDs may come with a drive cage, or you may need to purchase them.

Global LED Indicator Connector

If the system will use only a single global indicator, attach the LED to the two pins of the global fault/activity connector. The global fault pin pair connector is the overall fault signal. This signal will light up in any internal disk drive failure. The global activity pin pair connector is the overall activity. This global activity signal will light up in any internal disk activity.

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

LED	Normal Status	Problem Indication
Fault LED	<ol style="list-style-type: none">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.	<ol style="list-style-type: none">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.
Activity LED	<ol style="list-style-type: none">1. When the activity LED is lit, there is I/O activity on that disk drive.2. When the LED is not lit; there is no activity on that disk drive.	N/A

The following diagrams shows global fault/activity connectors and pin locations.

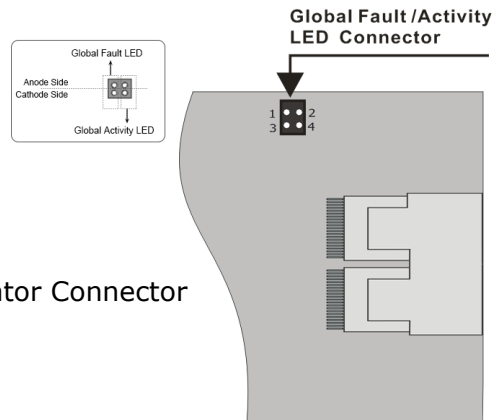


Figure 2-12, Global Indicator Connector

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.

HARDWARE INSTALLATION

Step 7. Install Host Adapters Driver

In an existing system:

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

Step 8. Format, Partition and Mount the Volumes

After you create a unit, it needs to be partitioned, formatted, and mounted by the operating system. There are various steps, that 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-1330 SAS host adapters can be fully used.

3. Host_BIOS Setup Manager

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

- PCI Bus/Device/Function
- I/O Port Address
- Interrupt Channel (IRQ)
- Adapter ROM Base Address

Use Host_BIOS setup manager to further configure the SAS host adapters to suit your server hardware and operating system.

3.1 Starting the Host_BIOS Setup Manager

This section explains how to use the Host_BIOS setup manager to configure your host adapters. The Host_BIOS setup manager is designed to be user-friendly. It is a menu-driven program, residing in the flash ROM, which allows you to scroll through various menus and sub-menus and select among the predetermined configuration options.

When starting a system with a SAS host 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-1330 PCI-Ex8-8.0G SAS Cntrlr - BIOS V1.00 / Date: 2016-08-19

> Bus / Dev / Func=1/0/0, I/O-Port=D2100000h, IRQ=11, BIOS=CF00:0h
>>> [Disk -SATA-III] P/I/L=0/00/000 < ST6700630NS >Size=76(GB)
>>> [Disk -SAS-3.0] P/I/L=1/01/000 < HUS151436VLS300 >Size=34(GB)
>>> [Disk -SAS-3.0] P/I/L=2/02/000 < ATLAS10K5_147SAS >Size=137(GB)
>>> [Disk -SAS-3.0] P/I/L=3/03/000 < HUS151436VLS300 >Size=34(GB)
>>> #Total device(s):<4>, #Int13 device(s):<4>. Areca SAS BIOS installed!
>>> Press <Tab/F6> to enter SETUP menu. 4 second(s) left <ESC> to skip>..
```

The information fields on the adapter setup screen are as follows:

Bus: Indicates the PCI Bus number assigned by the system BIOS to the selected adapter (range 0 - 255 decimal)

Dev: Indicates the PCI Device assigned by the system BIOS to the selected adapter (range 0 - 31 decimal)

BIOS CONFIGURATION

Fnc: Indicates the PCI Function assigned by the system BIOS to the selected adapter (range 0 - 7 decimal)

I/O: Indicates the I/O port address assigned by the system BIOS to an adapter

IRQ: Indicates the interrupt (IRQ) channel of the selected adapter

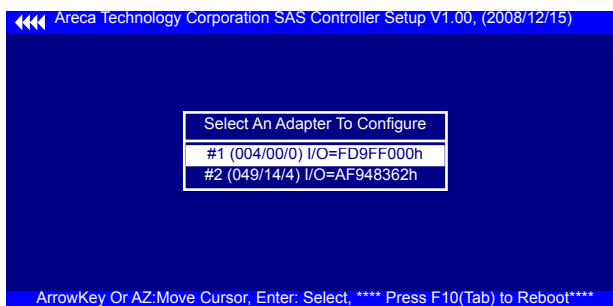
BIOS: Indicates the BIOS address assigned by the system BIOS to the selected address

The adapters scan and up to **eight** devices' information and total connected device count during system bootup. But, the adapters can only boot up from the first **eight** devices on the screen. The operating system device driver will recognize up to 128 end-point devices. The bootable devices need to be put on the first **eight** devices connected to the controller.

Note:

It is normal when it appears "No BIOS disk found. Areca SAS controller BIOS not installed!" during system boot. It represents that there was no bootable SAS device such as SAS HDD found after SAS BIOS detected SAS devices. Thus, above message is shown and this will not affect system operation.

The Host_BIOS setup manager message remains on your screen for about five seconds, giving you time to start the setup menu by pressing **Tab** or **F6**. If you do not wish to enter setup menu, press **ESC** to skip configuration immediately. When activated, the Host_BIOS setup manager appears showing a selection dialog box listing the SAS host adapters that are installed in the system. The legend at the bottom of the screen shows you what keys are enabled for the screens.



BIOS CONFIGURATION

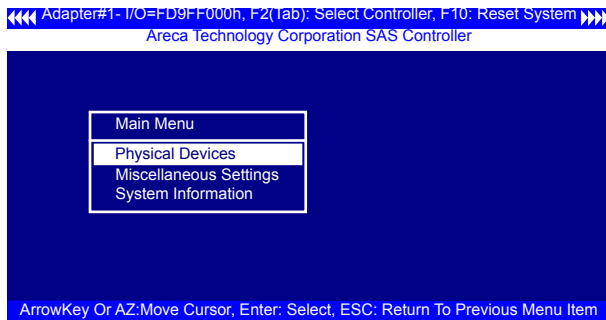
The adapter setup screen displays a scrolling list of up to 128 SAS end point devices in the system, and provides information about each of them.

Use the **Up** and **Down** arrow keys to select the adapter you want to setup. While the desired adapter is highlighted, press the **Enter** key to enter the main menu of the Host_BIOS setup manager.

3.2 Main Menu

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

Esc - Aborts the current context operation, or exits the current screen. If you have changed settings, you will be asked to confirm the exit.



Option	Description
Physical Devices	View individual disk information
Miscellaneous Settings	Configure adapter's control parameters
System Information	View the host adapter system information

Write Protection Channel

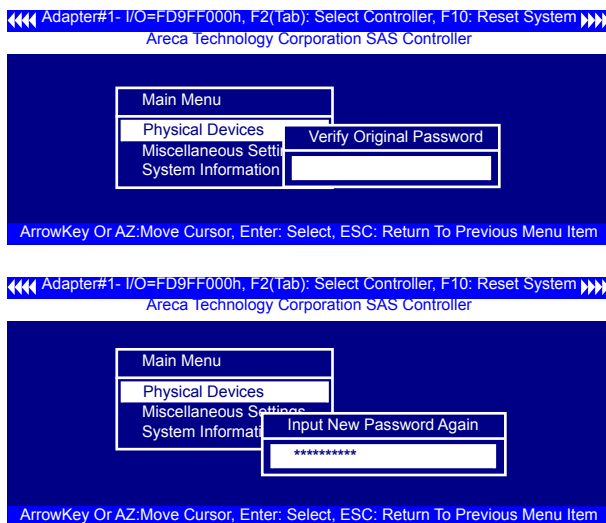
When "Write Protection Channel" is enabled on the "Data Protection", host commands fail if they are issued to a channel in that HBA and attempt to modify a disk's data or attributes.

The following procedures are used to set the "Data Protection Function".

BIOS CONFIGURATION

(1). How To Enter BIOS HBA's Data Protection Password Feature

Once in Main Menu setup, you use the **Ctrl** key along with the **F7** key (**Ctrl+F7**) to enter password setup and change their values. The password option allows user to set the SAS Host Adapter's password protection feature. The user can only setup the Write Protection feature by providing the correct password. The password is used to protect the SAS host adapter's Write Protection feature from unauthorized entry. The manufacture default password is set to **0000**.

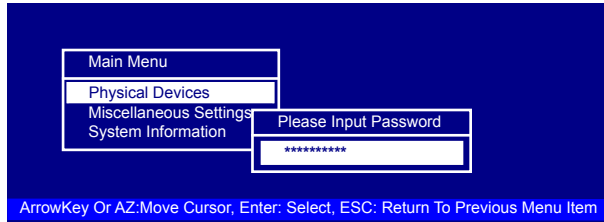


(2). How To Enter BIOS HBA's Data Protection Function

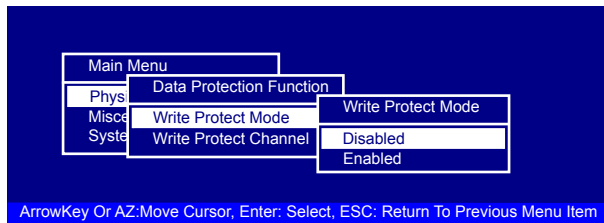
Once in Main Menu setup, you use the **Ctrl** key along with the **F8** key (**Ctrl+F8**) to enter Data Write Protection Function setup. The SAS host adapter will check the password when entering the Data Protection Function setup from the main menu screen. This screen is used to configure the Write Protect Mode and Write Protect Channel. The default for the Write Protect Mode is for the Write Protect to be disabled. Enabling the Write Protect prevents the Write Protect Channel devices from being accessed. When Write Protect Channel is enabled on the Data Protection Function, host commands fail if they are issued to a channel in that HBA and attempt to modify a disk's data or attributes.

BIOS CONFIGURATION

Adapter#1- I/O=FD9FF000h, F2(Tab): Select Controller, F10: Reset System
Areca Technology Corporation SAS Controller



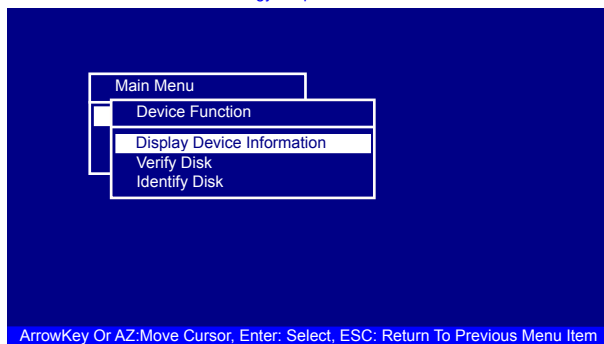
Adapter#1- I/O=FD9FF000h, F2(Tab): Select Controller, F10: Reset System
Areca Technology Corporation SAS Controller



3.2.1 Physical Devices

To access the physical device function screen, highlight the "Physical Devices" field on the adapter's main menu screen and press **Enter**. (But, the Device Function can only work with the first eight devices. You can use the CLI or GUI utility to set others devices not listed on the BIOS boot up screen.) A screen similar to the following appears:

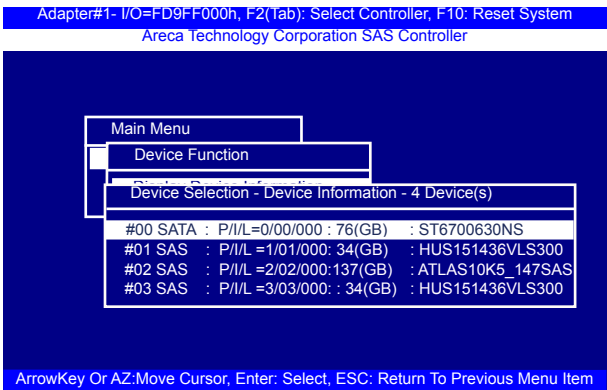
Adapter#1- I/O=FD9FF000h, F2(Tab): Select Controller, F10: Reset System
Areca Technology Corporation SAS Controller



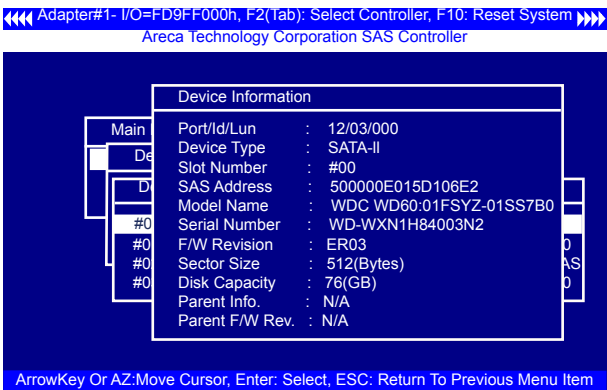
BIOS CONFIGURATION

3.2.1.1 Display Device Information

To view first eight installed devices on the selected host adapter, highlight the “Display Device Information” field and press **Enter**. A screen similar to the following appears:



To display the device information screen for a disk, highlight the disk name in the “Device Selection-Device Information” screen and press **Enter**. A “Device Information” screen similar to the following appears:

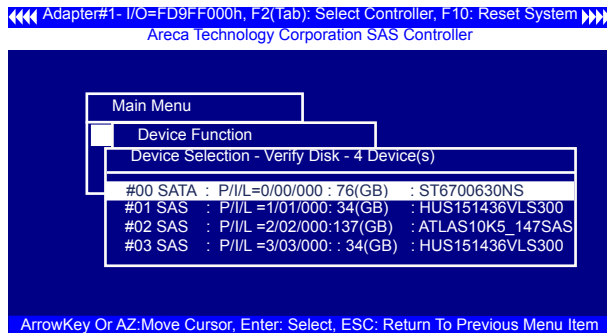


The information fields on the “Device Information” screen are as follows: Port/Id/Lun, Device Type, SAS Address, Model Name, Serial Number, F/W Revision and Disk Capacity.

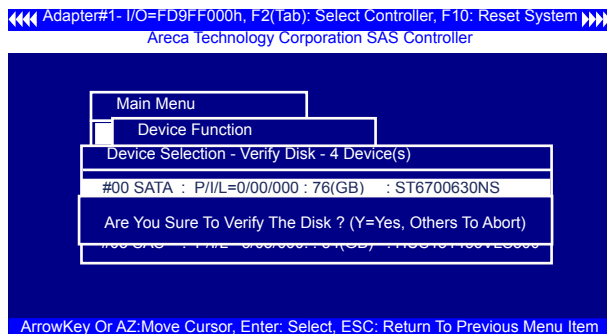
BIOS CONFIGURATION

3.2.1.2 Verify Disk

To select the disk for the verification from the attached disks on the host adapters, highlight the "Verify Disk" field on the "Device Function" screen and press **Enter**. A screen similar to the following appears:

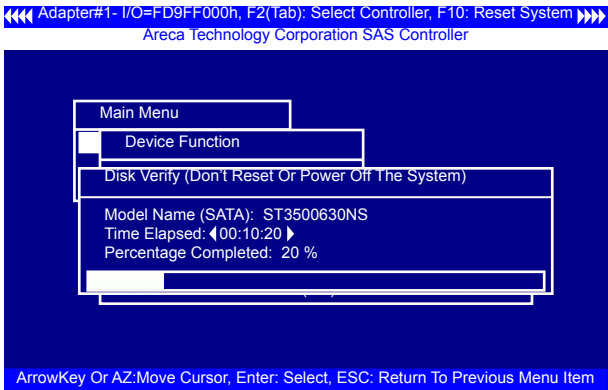


The "Device Selection-Verify Disk" screen displays a scrolling list of installed disks on the selected host adapter. Highlight the disk name in the "Device Selection-Verify Disk" screen and press **Enter**. A screen similar to the following appears:



The "Disk Verify" screen start to perform a verification of the selected device. Use the "Verify Disk" function to verify the sectors on the device and reassign defective Logical Block Addresses (LBAs). To start the verification of the selected device, press **Y**. A screen similar to the following appears:

BIOS CONFIGURATION

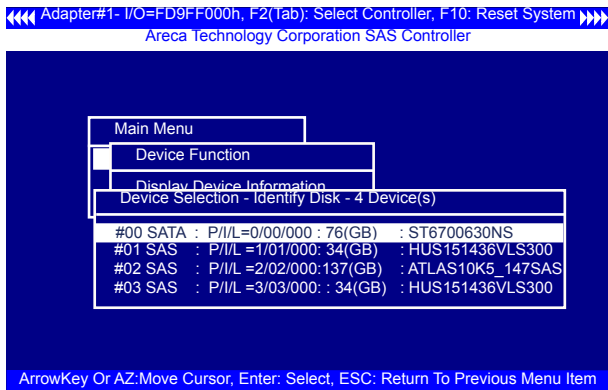


The information fields on the "Disk Verify" are as follows:

- (1) **Model Name:** Indicates the device name for the verification inquiry data.
- (2) **Time Elapsed:** Displays the time elapsed since the start of the verify operation.
- (3) **Percentage Completed:** Indicates the completion percentage of the verify operation.

3.2.1.3 Identify Disk

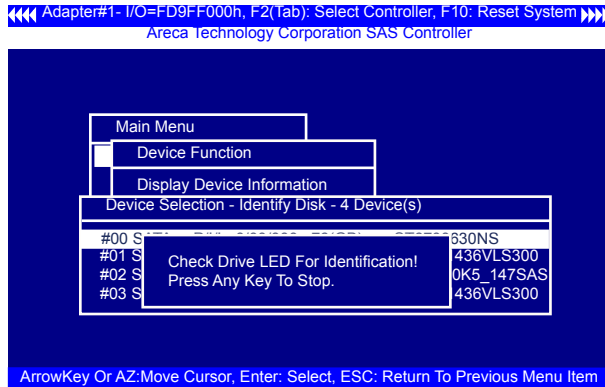
To select the disk for the identification from the attached disks on the host adapter, highlight the "Identify Disk" field on the "Device Function" screen and press **Enter**. A screen similar to the following appears:



BIOS CONFIGURATION

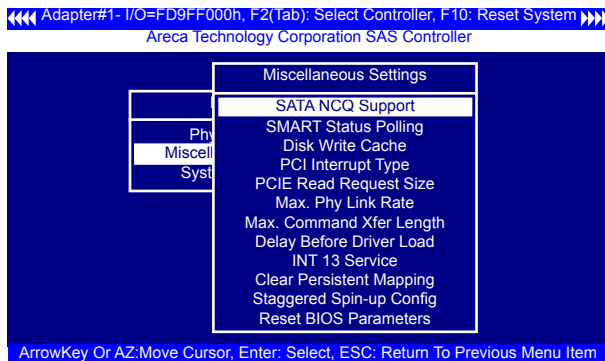
The "Device Selection-Identify Disk" screen displays a scrolling list of installed disks on the selected host adapter.

Highlight the disk name in the "Device Selection-Identify Disk" screen and press **Enter**. The selected disk activity indicator will light for physically locating the selected disk. A screen similar to the following appears:



3.2.2 Miscellaneous Settings

To access the host adapter miscellaneous settings properties, highlight the "Miscellaneous Settings" field on the main menu screen and press **Enter**. A screen similar to the following appears:

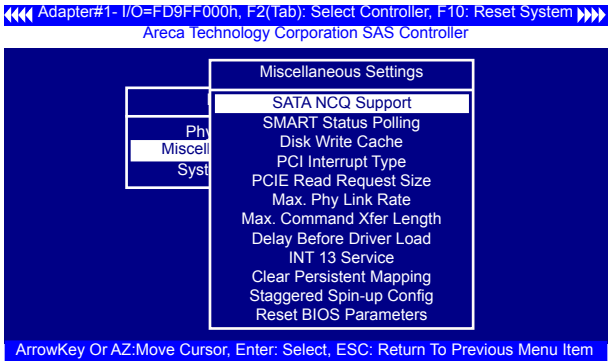


Changes to the "Miscellaneous Settings" are reflected in the option field of the "Miscellaneous Settings" menu. However, the new setting does not take effect until you reboot the system.

BIOS CONFIGURATION

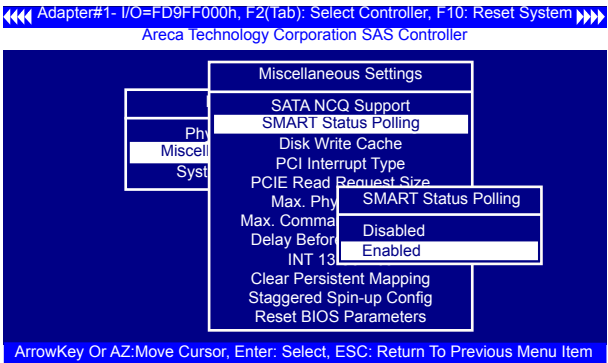
3.2.2.1 SATA NCQ Support

The controller supports both SAS and SATA disk drives. The NCQ allows SATA 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 SAS host adapter allows the user to select the SATA NCQ support: "Enabled" or "Disabled".



3.2.2.2 SMART Status Polling

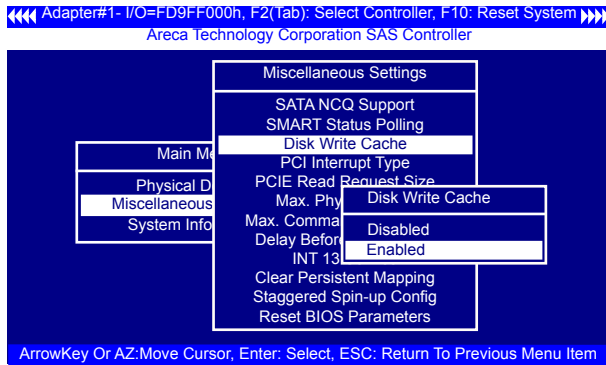
A SATA HDD "SMART Status Polling" function was added to enable scanning of all SATA HDDs SMART information function on the device driver. It is necessary to enable "SMART Status Polling" function before the selected SATA drive SMART information is accessible. This function is used to control the ability of the device driver function. It is disabled by default.



BIOS CONFIGURATION

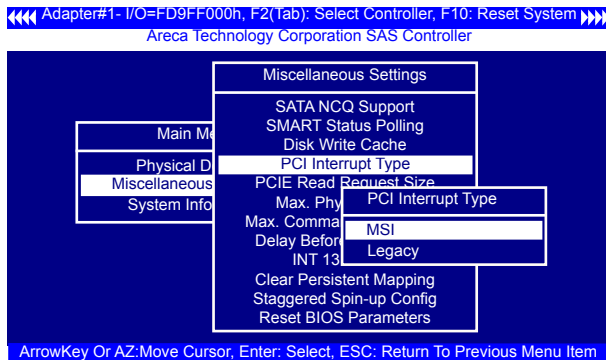
3.2.2.3 Disk Write Cache

Use this command to program the No. disk drive write cache mode. User can set the "Disk Write Cache Mode" to Enabled, or Disabled. "Enabled" increases speed, "Disabled" increases reliability for the selected No. disk drive.



3.2.2.4 PCI Interrupt Type

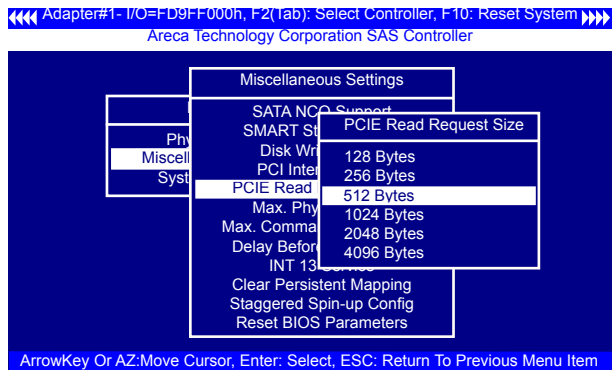
Traditionally legacy, a device has an interrupt line (pin) which it asserts when it wants to signal an interrupt to the host processing environment. MSI (Message Signaled Interrupts) is an alternative in-band method of signaling an interrupt, using special in-band messages to replace traditional out-of-band assertion of dedicated interrupt lines.



BIOS CONFIGURATION

3.2.2.5 PCIE Read Request Size

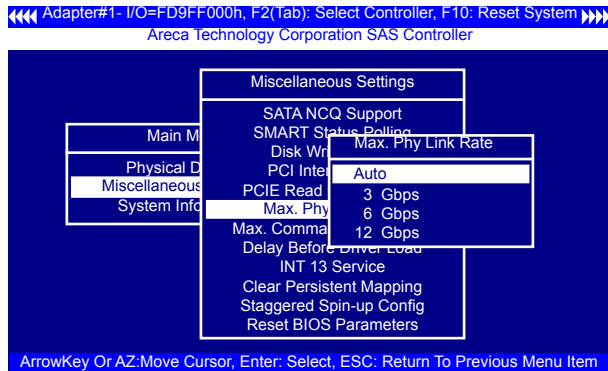
The PCI read request size parameter sets the maximum size of a memory read request, which can be set to a maximum of 4096 bytes in 128-byte increments. The system uses the PCI read request size to balance the allocation of bandwidth throughout the topology. The maximum read request size also affects performance because it determines how many read requests are required to fetch the data.



3.2.2.6 Max. Phy Link Rate

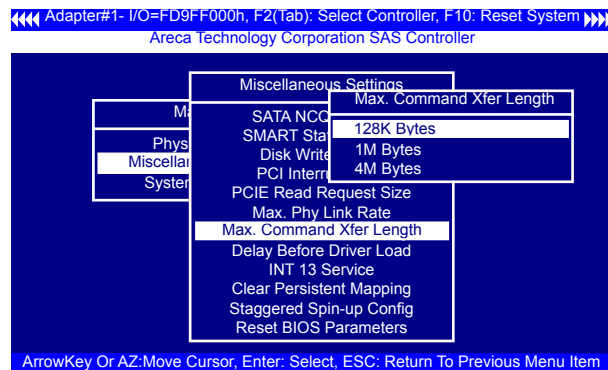
A SAS device is required to support all link rate between and including the specified Max. and Min. hardware link rate. The initiator determines the negotiated physical PHY link rate along all pathways by querring all of the relevant PHYs during discovery. If there is problem on the SAS speed negotiation sequence, you can use this function to adjust the PHY link rate. When you choose this option, the max PHY link rate on the same expander or a different expander within the topology will set this value.

BIOS CONFIGURATION



3.2.2.7 Max. Command Xfer Length

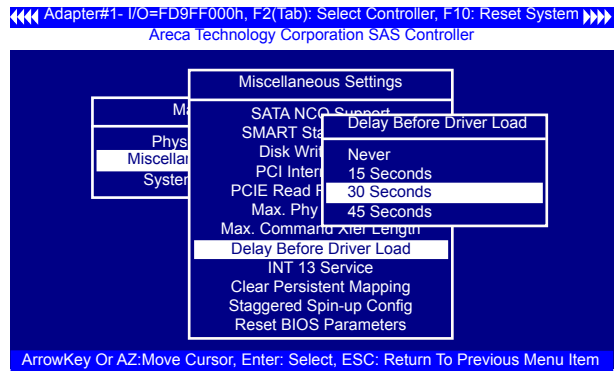
The largest amount of data that can be transferred by a single SAS command is often a concern. The SAS host adapter could have transfer size limits as could the transport and finally the SAS/SATA device itself. Use this command to set a "best" IO size for the SAS host adapter. When you choose this option, the max setting in the device driver is the maximum number of IO size allowed in a single SAS command's scatter gather lists (for data transfers).



BIOS CONFIGURATION

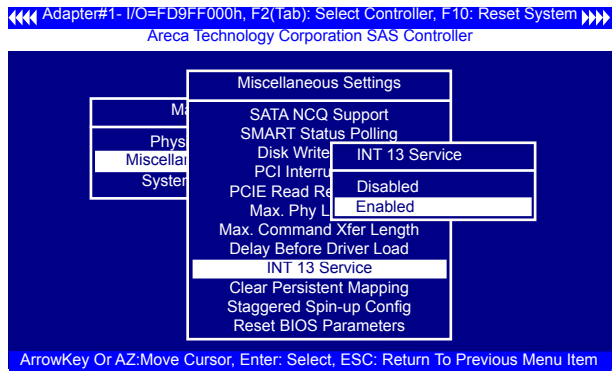
3.2.2.8 Delay Before Driver Load

“Delay Before Driver Load” is useful sometimes to try to delay loading of some OS device drivers. This field specifies the number of seconds that the device driver waits for devices to appear.



3.2.2.9 INT 13 Service

To access the INT 13 service properties, highlight the “INT 13 Service” field from the “Miscellaneous Settings” screen and press **Enter**. A screen similar to the following appears:



The “INT 13 Service” indicates whether the adapter is eligible for BIOS control, or is reserved for control by OS device driver. The information fields on the “INT 13 Service” screen are as follows:

BIOS CONFIGURATION

Disabled: The SAS host adapter is controlled only by the OS device driver and adapter's BIOS is not installed on the system ROM area.

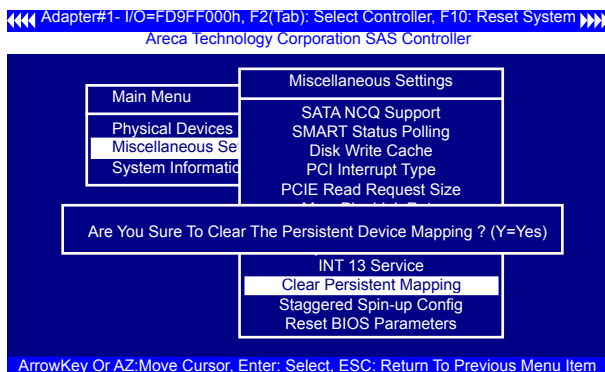
Enabled: The SAS host adapter is controlled only by the BIOS. This setting may not be supported by all OS drivers.

3.2.2.10 Clear Persistent Mapping

To access the persistent device mapping config, highlight the "Clear Persistent Mapping" from the "Miscellaneous Settings" screen and press **Enter**.

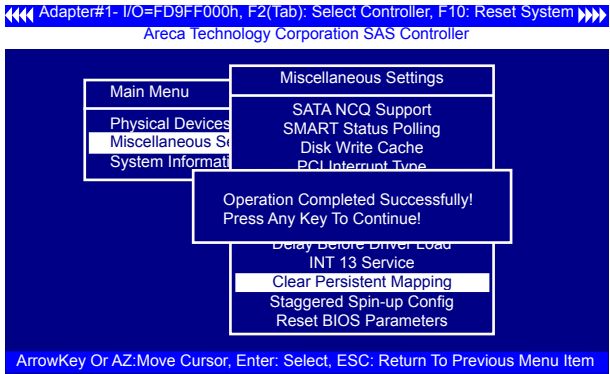
Clear Persistent Mapping is used to ensure the operating system of a server always sees presented LUNs with the same SAS target ID across reboots. On systems where no logical volume manager is present, the specific target and device used to map a file system to its disk will hard code the target and disk number. It is possible that the target number could change, if disks are added or removed from the system. Persistent mapping function maps a user defined LUNs to a SAS ports and ensures that the relationship remains static across reboots.

To enable the clear mapping registry on the HBA, highlight the "Clear Persistent Mapping" from the "Persistent Mapping Config" screen and press **Enter**. A screen similar to the following appears:



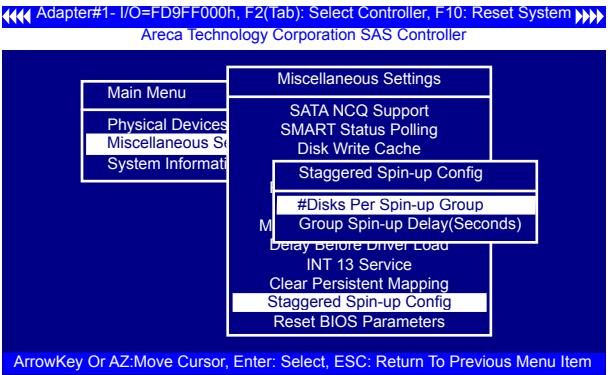
BIOS CONFIGURATION

The device driver detects the hardware SAS devices via SAS HBA. This detection phase then stores or maps SAS drive LUNs information in the HBA when you enable the persistent mapping. When device persistence is in use this operation clears persistent mappings for devices that are not currently present. It is required to clear the HBA previous persistent mapping that ARC-1330 device uses as a bootable device on the new operating system installation. The clear function is for user to reset the registry store on HBA. To start the clear persistent mapping, press **Y**. A screen similar to the following appears:



3.2.2.11 Staggered Spin-up Config

To access the host adapter staggered spin-up configuration properties, highlight the “Staggered Spin-up Config” field from the “Miscellaneous Settings” screen and press **Enter**. A screen similar to the following appears:

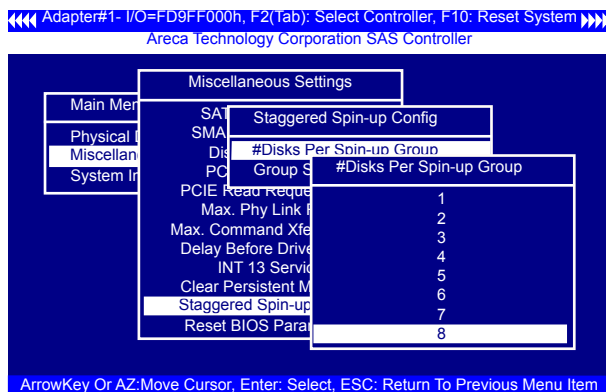


BIOS CONFIGURATION

In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But In a 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. New SATA drives have supported staggered spin-up capabilities to boost reliability. Staggered spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the host the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

3.2.2.11.1 #Disks Per Spin-up Group

To define the # of disks per spin-up group, highlight the "# Disks Per Spin-up Group" field from the "Staggered Spin-up Config" screen and press **Enter**. A screen similar to the following appears:

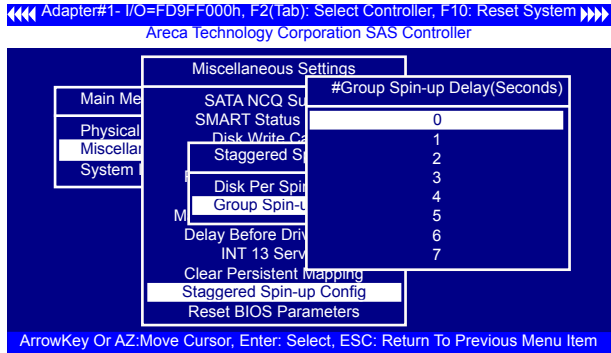


ARC-1330 series host adapters have included the option for customer to select the number of disk drives group per stagger power up value. The values can be selected from 1 to 8 disks per step which powers up the system.

BIOS CONFIGURATION

3.2.2.11.2 Group Spin-up Delay(Seconds)

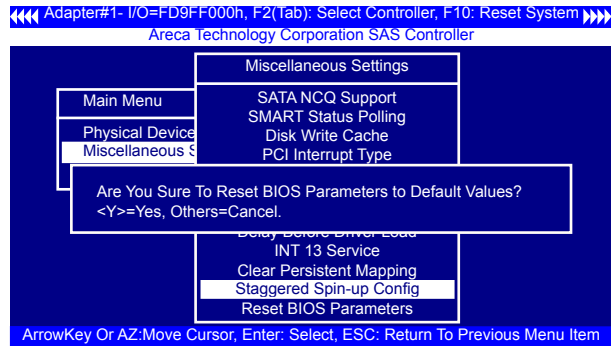
To define the group of disks spin-up delay, highlight the "Group Spin-up Delay" field from the "Staggered Spin-up Config" screen and press **Enter**. A screen similar to the following appears:



Areca host adapters have included the option for customer to select the group of disk drives sequentially stagger power up value. The values can be selected from 0s to 7s per step which powers up one group of disk drives.

3.2.2.12 Reset BIOS Parameters

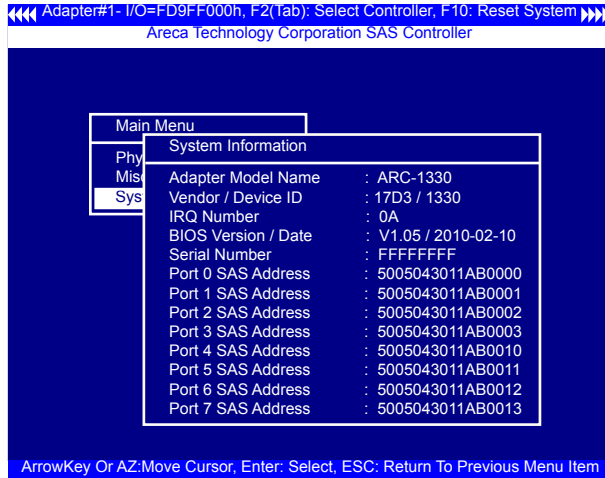
In addition to restoring the BIOS parameters manufacture defaults, if you've recently added new hardware or resetting the default values did not help resolve your issues, you may also want to reset the BIOS parameters. To set this feature, select Reset BIOS Parameters from the Miscellaneous Settings menu and press <Enter>.



BIOS CONFIGURATION

3.2.3 System Information

To access the host adapters system information properties, highlight the "System Information" field on the main menu screen and press **Enter**. A screen similar to the following appears:



Information fields on the "System Information" properties are as follows:

Adapter Mode Name: Indicates the name of the host adapter.

Vendor/Device: Indicates the controller's vendor ID and device name.

IRQ Number: Indicates the Interrupt Request Line used by the adapter. This is assigned by the system BIOS.

BIOS Version / Date: Indicates the revision version and date of this adapter BIOS.

Serial Number: Indicates the production serial number from the manufacture.

Port 0(0 to N) SAS Address: Indicates the SAS address of the the associated SAS Port (0 to N) as configured on this adapter.

Note:

The adapter can not be used, if the 16-digit adapter SAS address is not displayed.

DRIVER INSTALLATION

4. Driver Installation

This chapter describes how to install the ARC-1330 series SAS host adapters device driver to your operating system. The installation procedures use the following terminology:

Installing SAS host adapter into an existing operating system

The computer has an existing operating system installed and the ARC-1330 series host adapters are being installed as a secondary controller.

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

- Microsoft Windows, Linux, FreeBSD, and Mac OS X/macOS installation CD
- ARC-1330 series host adapters software CD
- ARC-1330 series host adapters

4.1 Creating the Driver Disk

The software CD disc shipped with the ARC-1330 series host adapters are included driver files for Windows, Linux, FreeBSD and Mac OS X/macOS.

If you do not have the software CD disc with the package, contact your local dealers or you can also download the latest version drivers from 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.

4.2 Driver Installation for Windows

The ARC-1330 series host adapters can be used with Microsoft Windows with StorPort Drivers.

4.2.1 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 Chapter, to install the controller and connect the disk drives or enclosure.
2. Start the system and then press Tab/F6 to enter the controller Host_BIOS setup utility. Use the setup utility to configure the host adapter parameter. For details, see Chapter 3, BIOS Configuration. Once the host adapters miscellaneous settings properties configured, continue with installation of the driver.
3. Re-Boot Windows and the OS will recognize the SAS host adapter and launch the "Found New Hardware Wizard", this guides you in installing the SAS host adapter 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 SAS host 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.

DRIVER INSTALLATION

After you finish installing device driver, the following steps show how to make any new 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 Uninstall controller from Windows

To remove the SAS host 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 SAS host 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 "Storage controllers" section. Right click on the "ARECA(X86-32-STORPORT) SAS 12G PCI Host Adapter" and select "Uninstall".
4. Click **Yes** to confirm removing the SAS host adapter driver. The prompt to restart the system will then be displayed.

4.3 Driver Installation for Linux

This chapter describes how to install the ARC-1330 series host adapters driver to Red Hat Linux, SuSE and other versions of Linux. Before installing the ARC-1330 series host adapters driver to the Linux, complete the following actions:

1. Install host adapter and hard disk drives according to the instructions in Chapter 2 Hardware Installation.
2. Start the system and then press **Tab+F6** to enter the Host_BIOS setup utility. Using the Host_BIOS setup utility to configure host adapter miscellaneous settings parameter. For details, see Chapter 3, BIOS Configuration.

Compiled and tested drivers for Red Hat and SuSE Linux are included on the shipped software CD. You can download updated versions of compiled and tested drivers for RedHat or SuSE Linux from the Areca web site at <http://www.areca.com.tw>.

Please refer to the "readme.txt" file on the included software CD or website to make driver diskette and to install driver on the system.

4.4 Driver Installation for FreeBSD

This chapter describes how to install the ARC-1330 series host adapters driver to FreeBSD. Before installing the ARC-1330 series host adapters driver to the FreeBSD, complete the following actions:

1. Install host adapters and hard disk drives according to the instructions in Chapter 2 Hardware Installation.
2. Start the system and then press **Tab+F6** to enter the Host_BIOS setup utility. Using the Host_BIOS setup utility to configure host adapters miscellaneous settings parameter. For details, see Chapter 3. BIOS Configuration.

DRIVER INSTALLATION

The supplied software CD that comes with ARC-1330 series host adapters include the compiled and tested drivers for FreeBSD. You can download updated versions of compiled and tested drivers for FreeBSD from the Areca web site at <http://www.areca.com.tw>. Please refer to the "readme.txt" file on the included software CD or website to make driver diskette and to install driver on the system.

4.5 Driver Installation for Mac OS X

After hardware installation, the SAS/SATA disk drives connected to the SAS host adapter must be configured and the volume set units initialized by the controller before they are ready to use by the system.

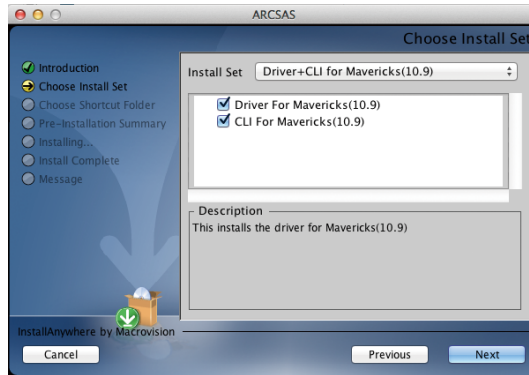
4.5.1 Installation Procedures

This section describes detailed instructions for installing the Areca Mac driver & CLI utility for the ARC-1330 series on your Intel_ based Mac Pro. You must have administrative level permissions to install Mac driver & utility. You can use the ARCSAS installer to install Mac driver & CLI utility at once or "Custom" to install special components.

To follow the process to install driver & utility on Intel-based Mac as below:

1. Insert the Software CD that came with your Areca SAS host adapter.
2. Double-click on the "install_arcsas.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_arcsas on the Finder.
4. Follow the installer on-screen steps, responding as needed, to complete the Areca driver and CLI utility installation.

DRIVER INSTALLATION



- **Driver** is required for the operating system to be able to interact with the Areca SAS host adapter.
- **Command Line Interface (CLI)** lets you set up and manage SAS host adapter through a command line interface. CLI performs many tasks at the command line. You can download CLI manual from Areca website or software CD <CDROM>\DOCS directory.

5. A reboot is required to complete the installation.

There is one "ARCSAS" icon showing on your desktop. Double-click on the "ARCSAS" icon to locate your CLI program file folder.

4.5.2 Making Volume Sets Available to Mac OS X

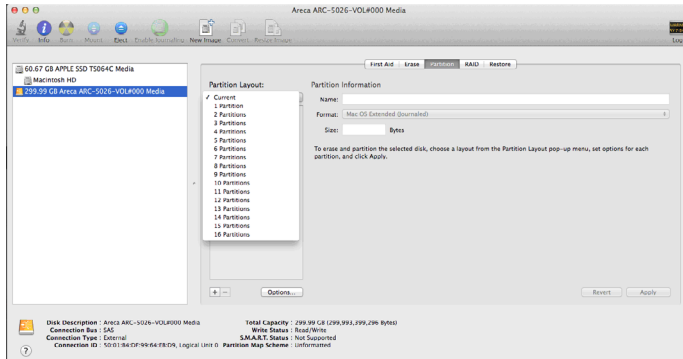
When you reboot the Mac machine, the Mac OS X recognizes that a new disk is avail, and displays a message asking what you next want to do. If the message does not show up, start the "Disk Utility" manually from the "Finder", use the "Go" menu and open the "Utilities" folder. Double-click on the "Disk Utility" program. Follow the on-screen prompts to create a volume set and to assign a disk drive letter.

To initialize and partition your unit

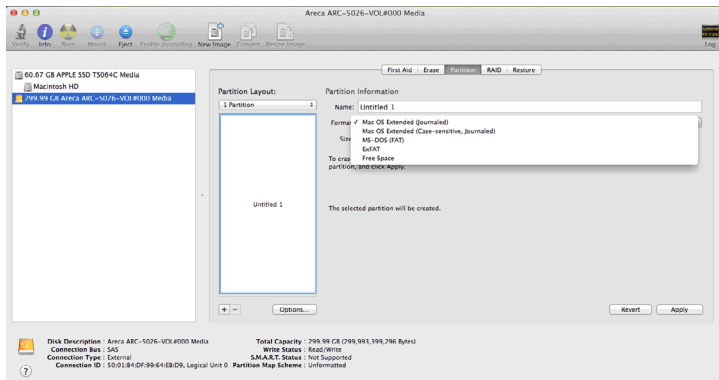
1. When the Disk Utility window opens, find and select the desired drive in the sidebar that represents your SAS host adapter and click on the "Partition" button.

DRIVER INSTALLATION

2. In the Partition Layout column, click on the "Current" to show the drop-down menu and select the number of partitions that you want your SAS host adapter to have. Each partition will appear as a separate drive on your computer.



3. Specify your Partition Information, Option setting and click on the "Apply" button.



If you're not sure which format to use, choose Mac OS X Extended (Journaled).

4. 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 SAS host adapter. When the partitioning is complete, icons for each new partition show up on your desktop. They are now ready to use.

Appendix A

Upgrading Adapter Flash ROM Process

Since the PCIe SAS host adapter features flash ROM firmware, it is not necessary to change the hardware flash chip in order to upgrade the adapter BIOS. The user can simply re-program the old BIOS through the In-Band PCIe bus, using the oflash.exe flash DOS utility. The shipped CD contains the oflash.exe executable utility and a separate adapter flash image on the <CD-ROM>\BIOS\ . New releases of the adapter BIOS is available in the form of a DOS file on the shipped CD or Areca website. The following files name is available at the FTP site or the shipping CD.

i13_1330.bin: PCIe card BIOS for system board using readme.txt contains the history information of the BIOS code change in the main directory. Read this file first to make sure you are upgrading to the proper binary file. The BIOS version and date will be shown on the adapter BIOS startup banner. Select the right version file for the upgrade. Normally, user upgrades the i13_1330.bin for system M/B compatibility.

Upgrading BIOS Through Oflash.exe Flash DOS Utility

The oflash.exe flash utility program is a DOS application, which runs in the DOS operating system. Be sure of ensuring properly to communicate between SAS host adapter and oflash.exe flash DOS utility. Please make a bootable DOS floppy disk or UBS devices from FreeDOS and copy SAS adapter BIOS package: oflash.exe and i13_1330.bin files to it.

Starting the OflashFlash Utility

You do not need to short any jumper cap on running oflash.exe flash utility. The oflasah.exe flash utility provides an on-line table of contents, brief descriptions of the help sub-commands.

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Help Command

This -h or -help command provides an on-line table of contents, providing brief descriptions of the help sub-commands that the oflashflash utility recognizes.

The command syntax for the oflash-h or -help command is as follows:

\> oflash-h or -help --- display the oflashflash utility sub-command option.

The below example shows that oflashflash utility oflash-h or -help command gets detail information about its sub-command.

```
C:\>oflash
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca SAS Host Adapter Flash Utility, Version: 1.04      =
=====
command: oflash[options]

/c ctrl#      -- assign controller number, default 0
/r filename   -- read, backup binary into filename from flash
/w filename   -- write, write binary into flash from filename
/l           -- list, list all adapters found

Example:
Write flash from file i13_1330.bin into adapter#0
command: oflash/ /c 0 /w i13_1330.bin [Enter]

c:\>_
```

/l Command

This /l command uses to display the oflash-supported SAS host adapter installed on your computer. Use this command to see which SAS host adapters are installed, and to identify the ID numbers assigned to each physical host adapter.

The command syntax for the /l command is as follows:

\> oflash/l --- list all SAS host adapters found.

This example shows a typical system response to a /l command:

C:\> oflash/l

```
C:\>oflash/ l
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca SAS Host Adapter Flash Utility, Version: 1.00      =
=====
Adapter Information
Adapter#00
Vendor ID/DeviceID/Bus/DevFunc: 17D3/1330/01/00 I/O Address: EFC80000

Adapter#01
DeviceID/Bus/DevFunc: 1330/1/0 I/O Address: CF00

c:\>_
```

/c Command

This /c command uses to select the host adapter for the /r read command or /w write command.

The command syntax for the /l command is as follows:

oflash/c ctrl# --- Assign controller number, default number=0
ctrl# is the SAS host adapter IDs representing the set of adapter(s) on which the command can be performed. By default, the oflash flash utility value set is host adapter 0.

/r Commands

This /r command uses to saves the contents of a SAS host adapter's flash ROM contents into in a file. The name of the save file is based on the command syntax filename.

The command syntax for the /r command is as follows:

oflash/c filename --- read, backup binary into filename from the flash.

The below example shows that oflashflash utility saves the SAS host adapter's flash ROM contents from SAS adapter 1 to a file name: 1330bak.bin.

```
C:\> oflash/c 1 /r 1330bak.bin
```

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```
C:\>oflash/c 1 /r 1330bak.bin
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca SAS Host Adapter Flash Utility, Version: 1.00      =
=====
Controller Information
  Controller#01
    DeviceID/Bus/DevFunc: 1330/1/0  I/O Address:   CF00

Current : Adapter #00 [AT25F2048]
Writing 262144 bytes into file 1330bak.bin: 100%
Read flash OK

c:\>_
```

/w Commands

This /w command uses to write a flash image data into SAS host adapter's flash ROM from the file. You must restart the computer for new BIOS to take effect after you complete the /w command. The command syntax for the write command is as follows:
oflash/w filename – write, write binary into flash from filename
The following example shows a typical system response after you completed the BIOS updated for the host adapter 1 from the i13_1330.bin file:

```
C:\> oflash c/1 /w i13_1330.bin
```

```
C:\>oflash/c 1 /w i13_1330.bin
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca SAS Host Adapter Flash Utility, Version: 1.00      =
=====
Controller Information
  Controller#01
    DeviceID/Bus/DevFunc: 1330/4/0  I/O Address:   CF00

Current : Adapter #00 [AT25F2048]
Writing 55808 bytes into flash 100%
Write flash OK

c:\>_
```

The following step by step instructions provide the process to update the flash.

1. Make the SAS adapter's BIOS package on bootable floppy disk or USB devices.
2. Insert the oflash floppy disk or USB device and restart your computer.

Note:

If your computer has not been set up to boot from the bootable floppy disk or USB device, enter the system BIOS setup utility to change the setting.

3. At the DOS command, type oflash followed by a /l command to list all SAS host adapter installed on your computer.
4. Update the flash ROM using oflash/c <ctrl#> /w <filename> command.
Where <ctrl#> is the number of the SAS host adapter which update its BIOS using the <filename> image data.
5. The oflashflash utility reads the image data from floppy disk or USB device and updates the flash ROM on the host adapter.