

SAS Host Adapters

ARC-1300 Series

(PCIe to 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.

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INTRODUCTION

1. Introduction

This section presents brief overview of the SAS host adapters, ARC-1300-4e, ARC-1300-4x, ARC-1300-4i and ARC-1300ix-16.

1.1 Overview

The ARC-1300 series is a SAS (Serial Attached SCSI 1.1 compliant) bus to PCIe bus low profile host adapter, which complies to the PCI Express 1.0a compliant specification with Plug-&-Play (PnP) readiness. The adapters bring a high performance, low cost solution to any desktop, workstation and server. The ARC-1300-4e is a 4 eSATA external connector. The ARC-1300-4x/4i host adapter is a low profile one SFF-8088/SFF-8087 Min SAS connector. The ARC-1300ix-16 host adapter is a low profile with two SFF-8088 Min SAS external connectors and four SFF-8087 internal Min SAS connectors. Areca SAS HBAs are able to connect to SATA and SAS hard disk drives, allowing for tiered storage that optimizes costs and performance. 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.

Device drivers are also supported for the major operating systems for compatibility with a full range of SAS peripherals including hard disk drives (HDDs), tape drives, tape autoloaders, solid state drives (SSDs) and removable media (DAS/JBOD).

1.2 Features

PCI-Express 4 Lane

- PCIe x4 bus
- PCIe specification, revision 1.0a
- Support SGPIO interface for ARC-1300ix-16
- RoHS compliant

Serial ATA 3.0Gbps

- 48 bits LBA, support HDD partition larger than 137GB
- Fully compliant with Serial ATA II (3Gbps) compliant, with speed negotiation Serial ATA 1.0a (1.5Gbps) specifications revision 1.1
- Supports external SATA voltage levels

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- Hot-plug capability
- Supports Serial ATA II Port Multiplier 1.0 specifications revision 1.1
- Supports Native Command Queuing (NCQ)
- Output swing control
- Supports four independent Serial ATA channels

Serial Attached SCSI (SAS) 3.0Gbps

- Serial Attached SCSI (SAS-1.1) compliant
- Supports Wide port (Any combination of x1, x2, and 4x)
- Supports Serial SCSI Protocol (SSP)
- Supports SAS Management Protocol (SMP)
- Hot-plug capability
- Staggered Spin-up control

Operating System

- Windows 2000, XP, 2003 Server, Vista and 2008
- Linux
- Mac OS X 10.x (no-bootable)
- BSD/FreeBSD (will be available with 6Gb/s Host Adapter)
- Solaris 10/11 (will be available with 6Gb/s Host Adapter)

SAS Host Adapter				
Model Name	ARC-1300-4e	ARC-1300-4x	ARC-1300-4i	ARC-1300ix-16
Host Bus Type	PCIe x4 Lanes			
RAID Level	N/A			
Form Factor	Low Profile			
Drives Support	4x SATA II Up to 16 with port multiplier box	128 x SAS/ SATA II	128 x SAS/ SATA II	128 x SAS/ SATA II
Connector	4 x eSATA	1 x Min SAS (SFF-8088)	1 x Min SAS (SFF-8087)	4 x Min SAS 4i (SFF-8087) 2 x Min SAS 4x (SFF-8088)
Driver Support	Windows Vista/2003/XP/2000: SCSIport/Storport (32-bit and x64) Red Hat Linux, SuSE Linux, and Fedora Core (32-bit and x64) BSD/FreeBSD (32-bit and x64) Mac OS X 10.4.X and 10.5 Leopard Solaris 10/11(x86-64)			

HARDWARE INSTALLATION

2. Hardware Installation

This section describes the procedures for installing the SAS host adapters.

2.1 Before Your Begin Installation

Thanks for purchasing the ARC-1300 series host adapters as your data storage subsystem. This user manual gives simple step-by-step instructions for installing and configuring the host adapter. To ensure personal safety and to protect your equipment and data, reading the following information package list carefully before you begin installing.

Package Contents

If your package is missing any of the items listed below, contact your local dealers before you install.

- 1 x PCIe x4 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 User Manual

2.2 Board Layout

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

HARDWARE INSTALLATION

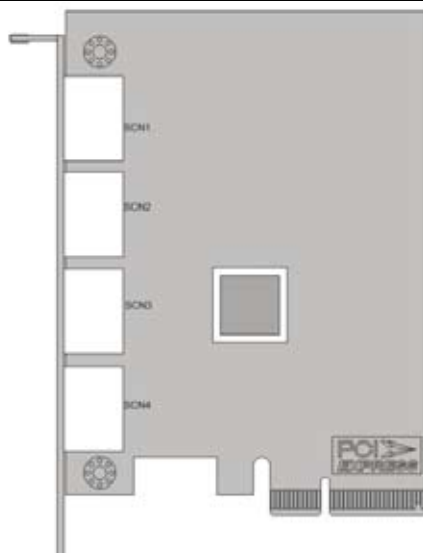


Figure 2-1, ARC-1300-4e Host Adapter

Connector	Description	Type
1. (SCN1)	External Connector	eSATA
2. (SCN2)	External Connector	eSATA
3. (SCN3)	External Connector	eSATA
4. (SCN4)	External Connector	eSATA

Table 2-1, ARC-1300-4e Connectors

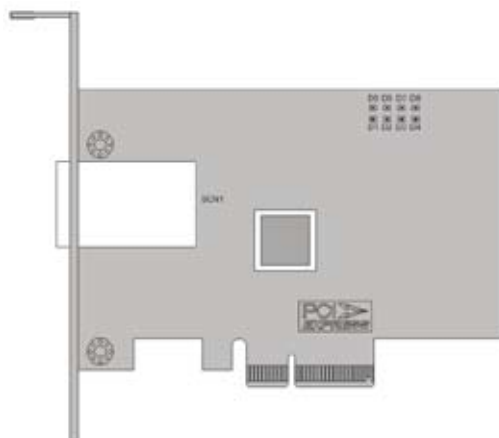


Figure 2-2, ARC-1300-4x Host Adapter

HARDWARE INSTALLATION

Connector	Description	Type
1. (SCN1)	SAS 1-4 Ports (External)	Min SAS 4x
2. (D5-D8)	SAS Link 1-4 Ports	LED
3. (D1-D4)	SAS Activity 1-4 Ports	LED

Table 2-2, ARC-1300-4x Connectors

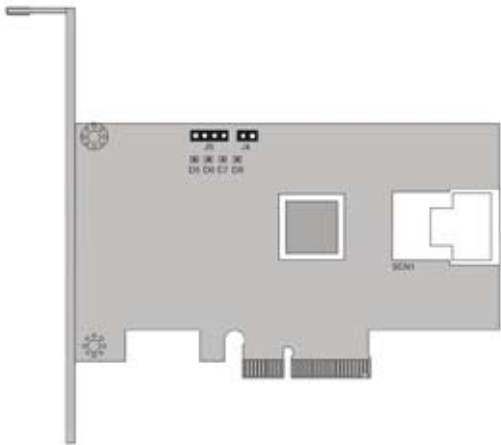


Figure 2-3, ARC-1300-4i SAS Host Adapter

Connector	Description	Type
1. (SCN1)	SAS 1-4 Ports (Internal)	Min SAS 4i
2. (J5)	Individual Activity LED Header for SAS 1-4 Ports	4-Pin Header
3. (J4)	Global Activity-Cache Write Pending	2-Pin Header
4. (D5-D8)	SAS Activity 1-4 Ports	LED

Table 2-3, ARC-1300-4i Connectors

HARDWARE INSTALLATION

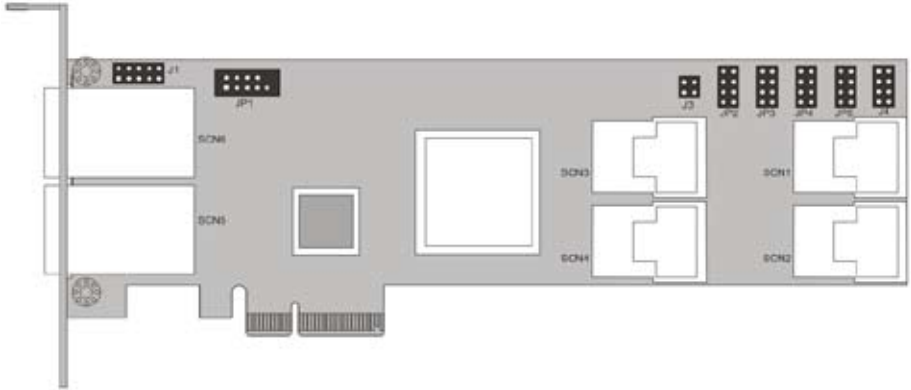


Figure 2-4, ARC-1300ix-16 SAS Host Adapter

Connector	Description	Type
1.(JP1)	RS232 for Expander Configuration	RJ11 Connector
2.(SCN1)	SAS 1-4 Ports (Internal)	Min SAS 4i
3.(SCN2)	SAS 5-8 Ports (Internal)	Min SAS 4i
4.(SCN3)	SAS 9-12 Ports (Internal)	Min SAS 4i
5.(SCN4)	SAS 13-16 Ports (Internal)	Min SAS 4i
6.(SCN5)	SAS 1-4 Ports (External)	Min SAS 4x
7.(SCN6)	SAS 5-8 Ports (External)	Min SAS 4x
8.(J4)	I2C/LCD Connector	8-Pin Header
9.(JP5)	Individual Activity LED Header for SAS 1-8 Ports	8-Pin Header
10.(JP4)	Individual Activity LED Header for SAS 9-16 Ports	8-Pin Header
11.(JP3)	Individual Fault LED Header for SAS 1-8 Ports	8-Pin Header
12.(JP2)	Individual Fault LED Header for SAS 9-16 Ports	8-Pin Header
13.(J3)	Global Activity/Fault Header	4-Pin Header

Table 2-4, ARC-1300ix-16 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-1300 series host adapter can be installed in a universal PCIe slot and requires a motherboard that:

- Comply with the PCIe x4
It can work on the PCIe x1, x4, x8, and x16 signal with x4, x8 or x16 slot M/B.

Installation Tools

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

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

Personal Safety Instructions

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

- Always wear a grounding strap or work on an ESD-protective mat.

Warning:

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

HARDWARE INSTALLATION

- 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 adapter from its anti-static packaging until you are ready to install it into a computer case.
- Handle the host adapter by its edges or by the metal mounting brackets at its each end.
- Before you handle the host adapter in any way, touch a grounded, anti-static surface, such as an unpainted portion of the system chassis, for a few seconds to discharge any built-up static electricity.

2.3 Installation

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

Step 1. Unpack

Unpack and remove the PCIe host adapter 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 PCIe SAS Host Adapters

To install the PCIe host adapter, remove the mounting screw and existing bracket from the rear panel behind the selected PCIe slot. Align the gold-fingered edge on the card with the selected PCIe slot. Press down gently but firmly to ensure that the card is properly seated in the slot, as shown in Figure 2-6. Then, screw the bracket into the computer chassis. ARC-1300 series host adapters require a PCIe x4, x8 or x16 slot.

HARDWARE INSTALLATION

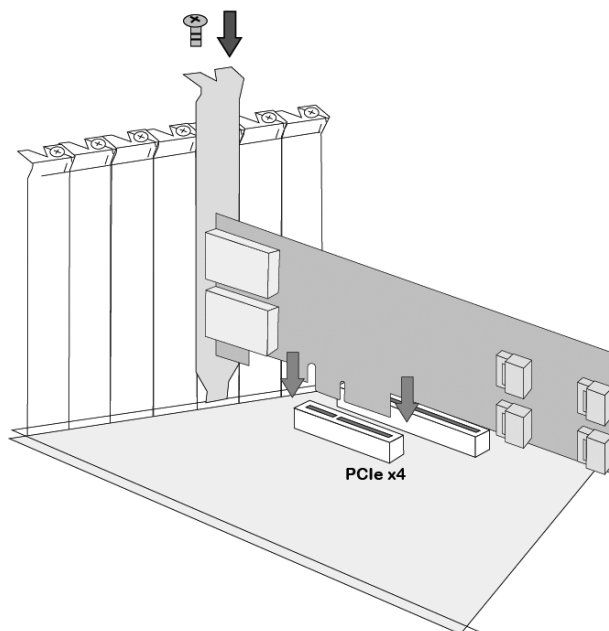
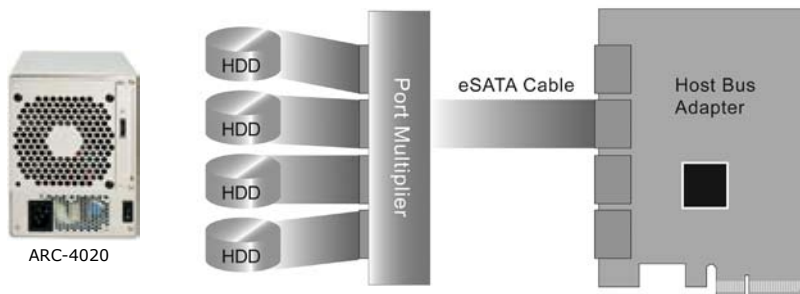


Figure 2-5, Insert ARC-1300 Series Host Adapter into a PCIe Slot

Step 4. Install Cable

Areca is shipping the ARC-1300-4e four ports external SATA PCIe x4 host adapter for Power G5, PowerMac Dual-Core and Quad models with an available PCIe slot. Areca provides a native PCI Express (PCIe) x4 host bus interface with FIS-based port multiplier capability. When using up to four, ARC-4020 4 bay port multiplier enclosures the ARC-1300-4e can mount up to sixteen hard drives.



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You can connect the end devices to each other through direct cables or through the SAS expander/backplane connections. The SAS host adapter supports 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 adapter through direct cable and backplane solutions. In the direct connection, SAS/SATA drives are directly connected to ARC-1300-4i or ARC-1300ix-16 PHY port with SAS/SATA cables.

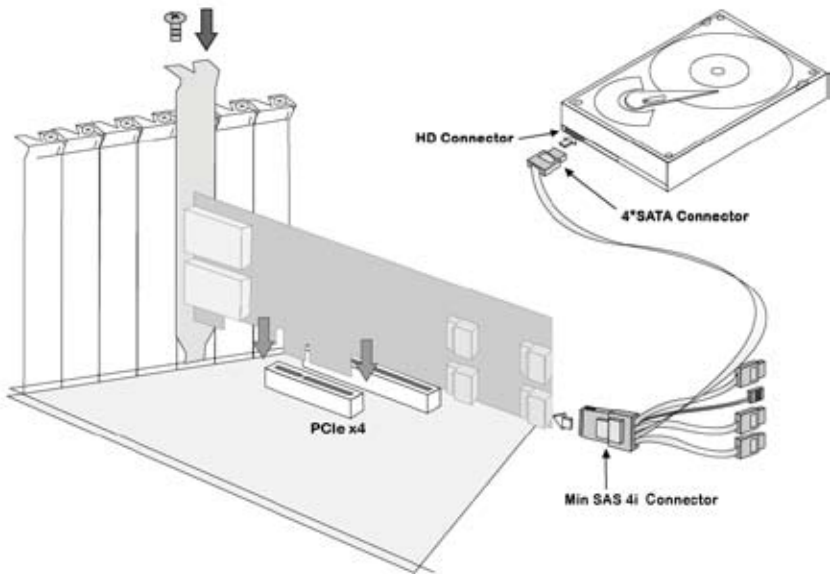


Figure 2-6, SAS Cable Connect to HD

2.3.1 Internal Min SAS 4i to SATA Cable

The Min SAS 4i to SATA cables are used for connection between the ARC-1300ix-16 internal connectors and connectors on the SAS/SATA disk drives or SATA connector backplane.

HARDWARE INSTALLATION

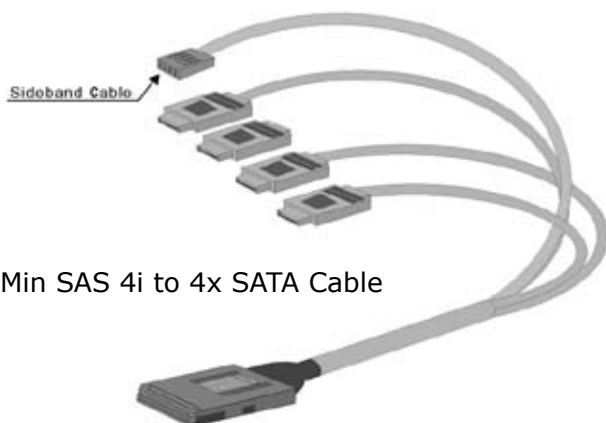


Figure 2-7, Internal Min SAS 4i to 4x SATA Cable

The sideband cable is reserved for the backplane with header on it. Please refer to page 19 for definitions of sideband header signals.

2.3.2 Internal Min SAS 4i to 4xSFF-8482 Cable

These host adapters can be installed in a server enclosure without a backplane. The kind of cable will attach directly to the SAS disk drives. The following diagram shows the picture of Min SAS 4i to 4xSFF-8482 cables.

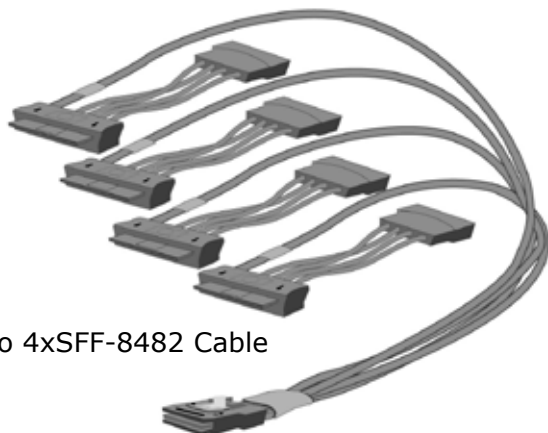


Figure 2-8, Min SAS 4i to 4xSFF-8482 Cable

HARDWARE INSTALLATION

2.3.3 Internal Min SAS 4i to Internal Min SAS 4i Cable

The ARC-1300-4i or ARC-1300ix-16 host adapter has Min SAS 4i internal connectors, each of them can support up to four SAS/SATA signals. These adapters can be installed in a server RAID enclosure with Min SAS 4i internal connectors backplane. This Min SAS 4i 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 for sensing drive locate status.



Figure 2-9, Min SAS 4i to Min SAS 4i Cable

2.3.4 External Min SAS 4x Drive Boxes and Drive Expander

The Min SAS 4x external cables are used for connection between the SAS host adapter external connectors and connectors on the external drive boxes or drive expanders (JBOD). The SAS host adapter has Min SAS 4x (SFF-8088) external connector, each of them can support up to four SAS/SATA signals.

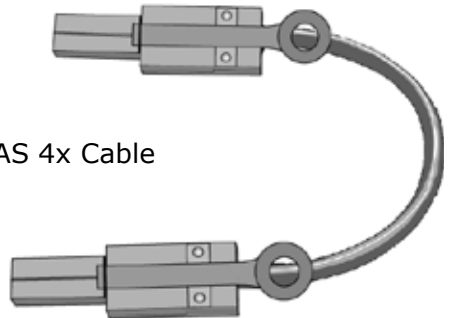
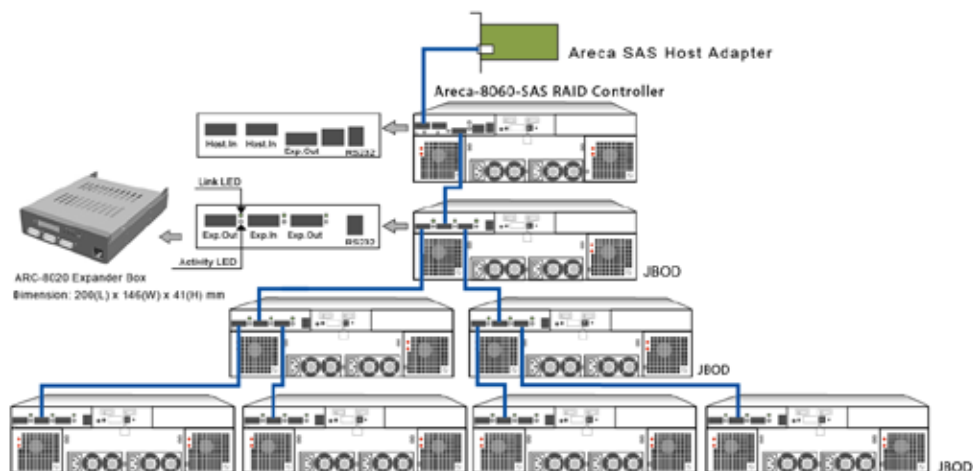


Figure 2-10, Min SAS 4x to Min SAS 4x Cable

HARDWARE INSTALLATION

The ARC-1300-4x or ARC-1300ix-16 host adapter can support daisy-chain up to 128 end point devices through external expander enclosures. The following figure shows how to connect the external Min SAS cable from the ARC-1300-4x or ARC-1300ix-16 series host adapter that has external SFF-8088 connectors to the external drive boxes or drive enclosures.



Step 5. Install the LED Cable (option)

The preferred I/O connector for server backplanes is the Min SAS 4i internal connector. This connector 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 for sensing drive Locate status. See SFF 8485 for the specification of the SGPIO bus. For backplane without SGPIO supporting, Please use the individual cables for fault/activity LED cable installation.

LED Management: The backplane may contain LEDs to indicate drive status. Light from the LEDs could be transmitted to the outside of the server by using light pipes mounted on the SAS drive tray. A small microcontroller on the backplane, connected via the SGPIO bus to a ARC-1300ix-16 could control the LEDs. Activity: blinking 5 times/second and Fault: solid illuminated.

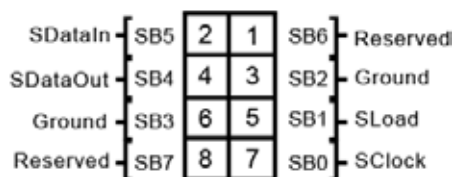
HARDWARE INSTALLATION

Drive Locate Circuitry: The location of a drive may be detected by sensing the voltage level of one of the pre-charge pins before and after a drive is installed.

The following signals define the SGPIO assignments for the Min SAS 4i internal connector (SFF-8087) in the SAS host adapter.

Pin	Description	Pin	Description
SideBand0	SClock (Clock signal)	SideBand1	SLoad (Last clock of a bit stream)
SideBand2	Ground	SideBand3	Ground
SideBand4	SDataOut (Serial data output bit stream)	SideBand5	SDataIn (Serial data input bit stream)
SideBand6	Reserved	SideBand7	Reserved

The following signal defines the sideband header signals which can work with Areca sideband cable on its SFF-8087 to 4 SATA cable. The sideband header is located at backplane. For SGPIO to work properly, please connect Areca 8-pin sideband cable to the sideband header as shown below.



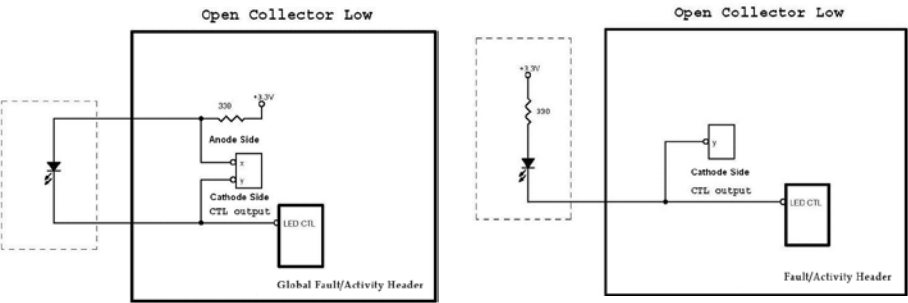
Sideband Pin Definitions

There is no SGPIO supported in the most of old version SATA backplane. The ARC-1300ix-16/ARC-1300-4i host adapter also provides two kinds of alternative LED cable header to support the fault/activity status for those backplanes. The Global Indicator Connector is used by the server global indicator LED.

The following electronics schematic is the ARC-1300ix-16/ARC-1300-4i host adapter logical of fault/activity header. The signal for each pin is cathode (-) side.

HARDWARE INSTALLATION

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.

A: Individual Activity/Fault LED and Global Indicator Connector

Most of the backplane has supported the HDD activity from the HDD. The SAS host adapter also provides the fault activity for fault LED. Connect the cables for the drive fault LEDs between the backplane of the cage and the respective connector on the SAS host adapters.

The following table is the fault LED signal behavior.

LED	Normal Status	Problem Indication
Fault LED	When the fault LED is solid illuminated, there is no disk present. When the fault LED is off, then disk is present and status is normal.	When the fault LED is slow blinking (2 times/sec), that disk drive has failed and should be hot-swapped immediately. When the activity LED is illuminated and fault LED is fast blinking (10 times/sec) there is rebuilding activity on that disk drive.

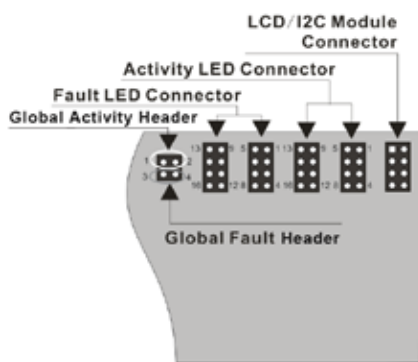
HARDWARE INSTALLATION

B:Global LED Indicator Connector

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

The following diagrams show all LEDs, connectors and pin locations.

Figure 2-11, ARC-1300ix-16 individual LED for each channel drive and global indicator connector for computer case.



Step 6. Power up the System

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

Step 7. Install Host Adapter Driver

For a new system:

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

In an existing system:

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

HARDWARE 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, Solaris or Mac, etc.). Detailed steps for each operating system are provided on their disk utility. After that, the ARC-1300 series host adapter can be fully used.

Step 9. Determining the Boot Sequences

The ARC-1300 series host adapter is a bootable host adapter. If your system already contains a bootable device with an installed operating system, you can set up your system to boot a second operating system from the new host adapter. To add a second bootable host adapter, you may need to enter setup of motherboard BIOS and change the device boot sequence so that the SAS host adapter heads the list. If the system BIOS setup does not allow this change, your system may be not configurable to allow the ARC-1300 series host adapter to act as a second boot device.

3. Host_BIOS Setup Manager

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

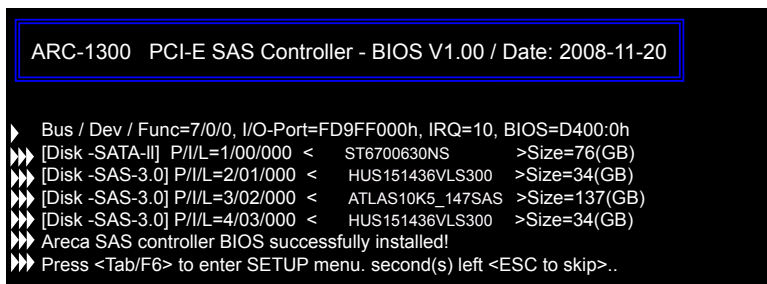
- PCI Bus/Device/Function
- I/O Port Address
- Interrupt Channel (IRQ)
- Adapter ROM Base Address

Use Host_BIOS setup manager to further configure the SAS host adapter 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 adapter. 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-1300 PCI-E SAS Controller - BIOS V1.00 / Date: 2008-11-20

> Bus / Dev / Func=7/0/0, I/O-Port=FD9FF000h, IRQ=10, BIOS=D400:0h
>>> [Disk -SATA-II] P/I/L=1/00/000 < ST6700630NS >Size=76(GB)
>>> [Disk -SAS-3.0] P/I/L=2/01/000 < HUS151436VLS300 >Size=34(GB)
>>> [Disk -SAS-3.0] P/I/L=3/02/000 < ATLAS10K5_147SAS >Size=137(GB)
>>> [Disk -SAS-3.0] P/I/L=4/03/000 < HUS151436VLS300 >Size=34(GB)
>>> Areca SAS controller BIOS successfully installed!
>>> Press <Tab/F6> to enter SETUP menu. 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 an adapter (range 0 - 255 decimal)
Dev: Indicates the PCI Device assigned by the system BIOS to an adapter (range 0 - 31 decimal)

BIOS CONFIGURATION

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

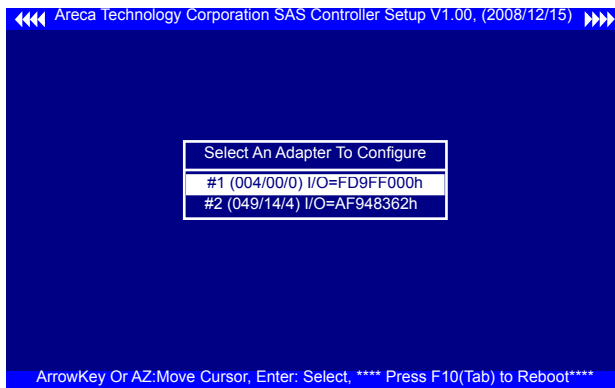
I/O: Indicates the I/O port address assigned by the system BIOS to an adapter

The adapters scan and display up to eight device's information during system bootup. 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 nine 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

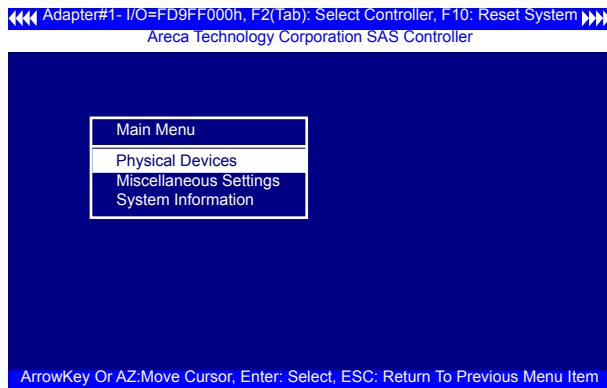
The adapter setup screen displays a scrolling list of up to 128 SAS end point devices in the system, and provides information about each of them.

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.

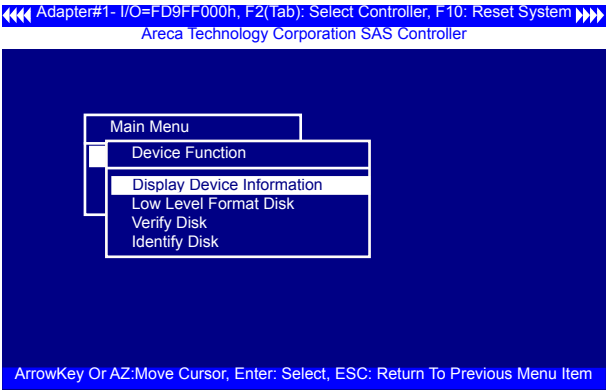


Option	Description
Physical Devices	View individual disk information
Miscellaneous Settings	Configure adapter's control parameters
System Information	View the host adapter system information

3.2.1 Physical Devices

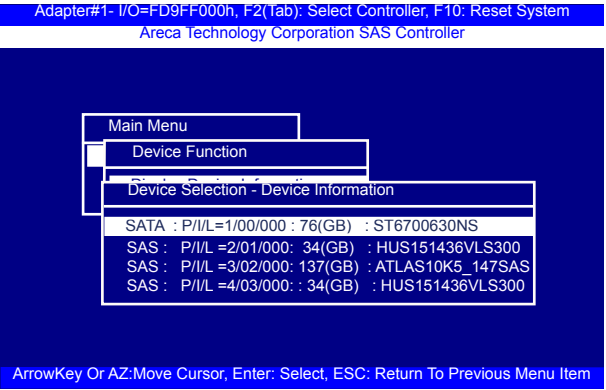
To access the physical device function screen, highlight the "Physical Devices" field on the adapter's main menu screen and press **Enter**. A screen similar to the following appears:

BIOS CONFIGURATION



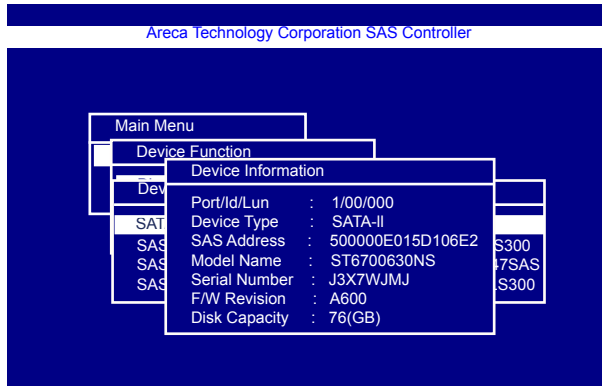
3.2.1.1 Display Device Information

To view all 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:

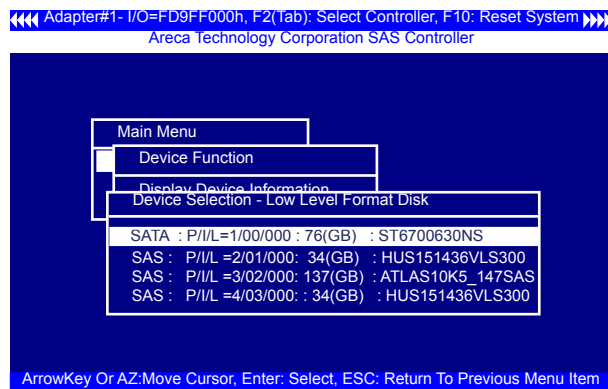
BIOS CONFIGURATION



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.

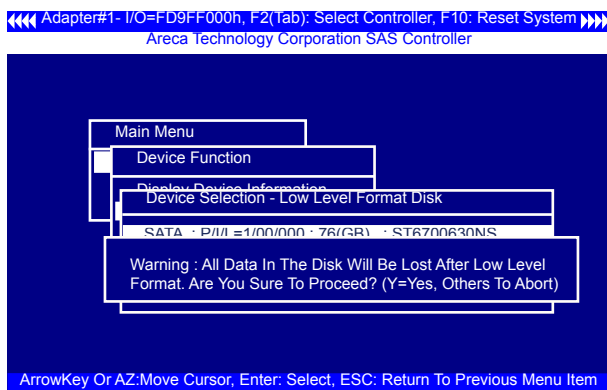
3.2.1.2 Low Level Format Disk

To select the disk for the low level format from the attached disks on the host adapter, highlight the "Low Level Format Disk" field on the "Device Function" screen and press **Enter**. A screen similar to the following appears:

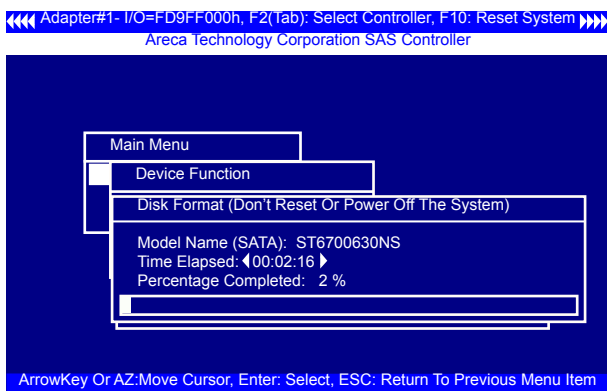


BIOS CONFIGURATION

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



The "Low Level Format Disk" screen to perform a low-level format of the device. The default format is 512-bytes per sector. To start the format, press **Y**. A screen similar to the following appears:



BIOS CONFIGURATION

After format begins, you cannot stop or cancel it. The information fields on the "Disk Format" are as follows:

Device Name: Indicates the device name for the format.

Time Elapsed: Displays the time elapsed since the start of the format operation.

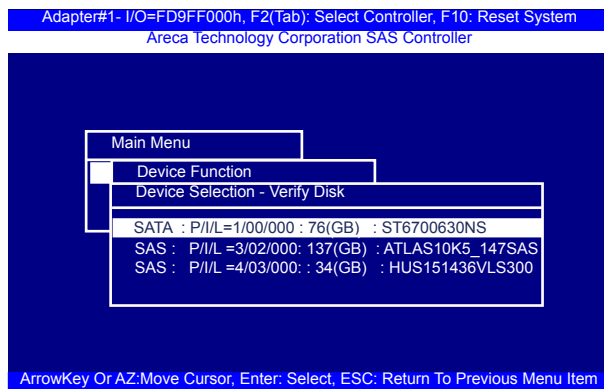
Percentage Completed: Indicates the completion percentage of the format operation.

Note:

Formatting erases all data on a device. Be sure that you have a current, valid backup of important data on the device before you format it.

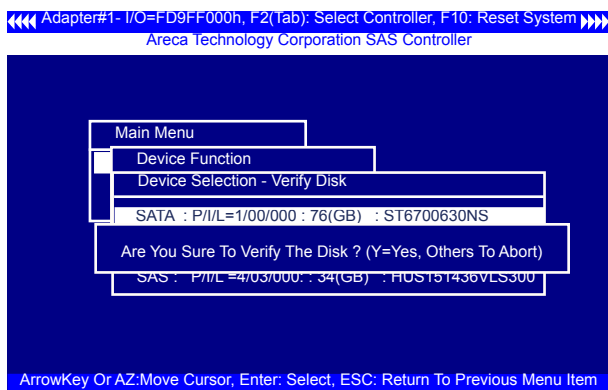
3.2.1.3 Verify Disk

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

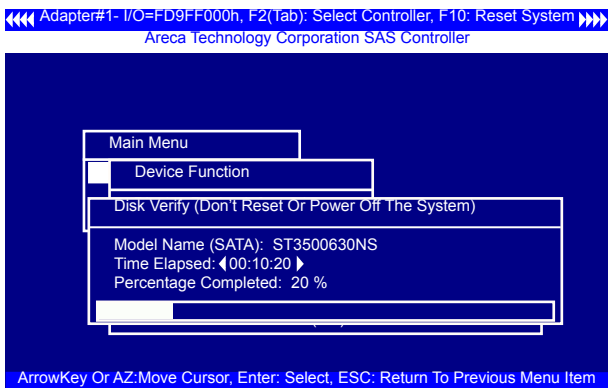


The "Device Selection-Verify Disk" screen displays a scrolling list of installed disks on the selected host adapter. Highlight the disk name in the "Device Selection-Verify Disk" screen and press **Enter**. A screen similar to the following appears:

BIOS CONFIGURATION



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:



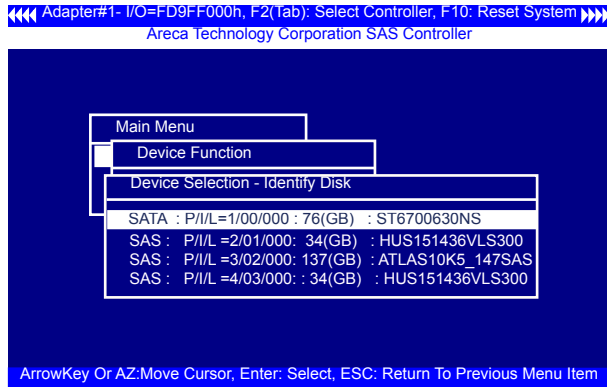
The information fields on the "Disk Verify" are as follows:

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

BIOS CONFIGURATION

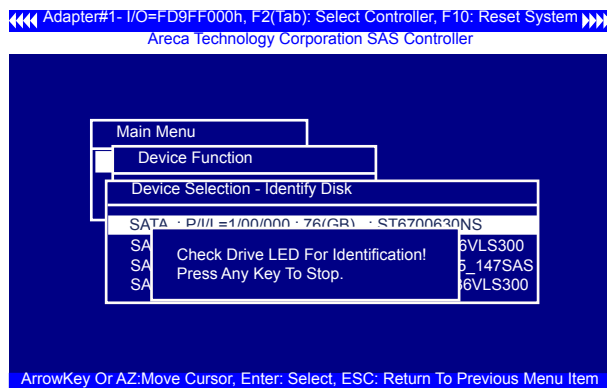
3.2.1.4 Identify Disk

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:



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

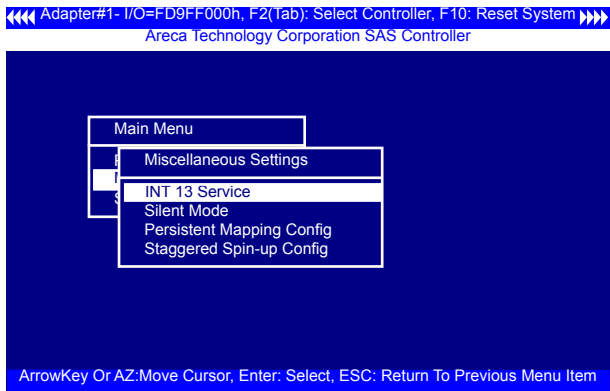
Highlight the disk name in the "Device Selection-Identify Disk" screen and press **Enter**. The selected disk activity indicator will light for physically locating the selected disk. A screen similar to the following appears:



BIOS CONFIGURATION

3.2.2 Miscellaneous Settings

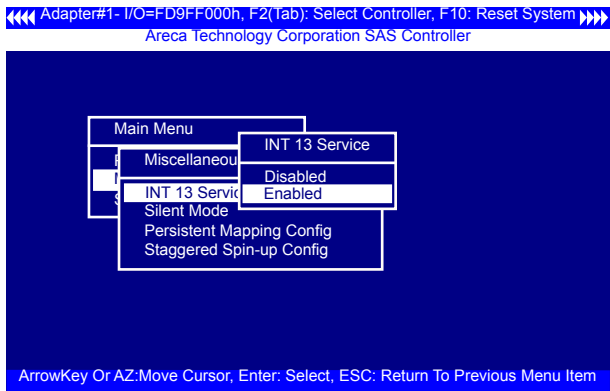
To access the host adapter miscellaneous settings properties, highlight the "Miscellaneous Settings" field on the main menu screen and press **Enter**. A screen similar to the following appears:



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.

3.2.2.1 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:



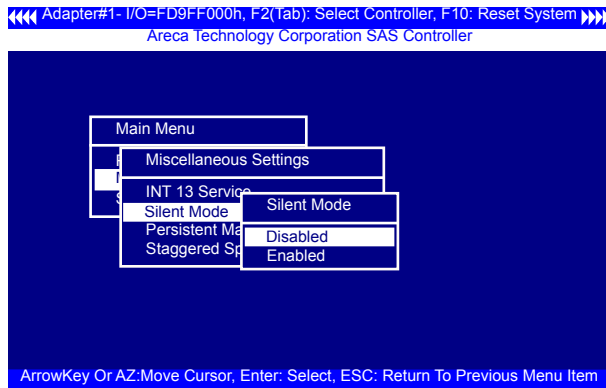
BIOS CONFIGURATION

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:
Disabled: The SAS host adapter is controlled only by the OS device driver.

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

3.2.2.2 Silent Mode

To access the silent mode properties, highlight the "Silent Mode" field from the "Miscellaneous Settings" screen and press **Enter**. A screen similar to the following appears:



The "Silent Mode" indicates whether the adapter buzzer is "Enabled" or "Disabled".

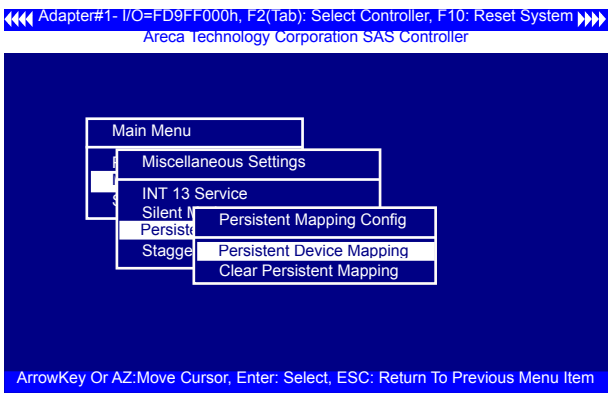
Disabled: SAS host adapter disables the alarm tone generator.
Enabled: SAS host adapter enables the alarm tone generator.

3.2.2.3 Persistent Mapping Config

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

A screen similar to the following appears:

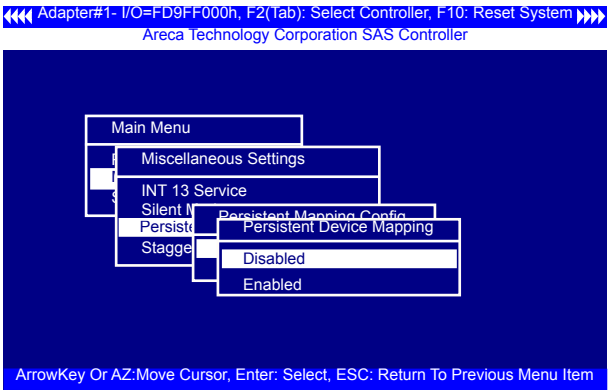
BIOS CONFIGURATION



Persistent mapping config 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.

3.2.2.3.1 Persistent Device Config

To access the persistent mapping function, highlight the "Persistent Device Mapping" from the "Persistent Mapping Config" screen and press **Enter**. A screen similar to the following appears:

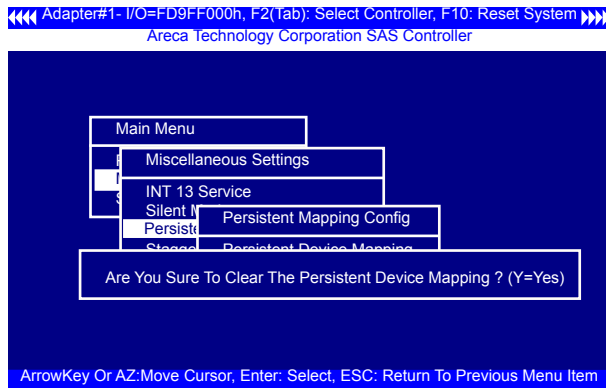


BIOS CONFIGURATION

Enabled: LUNs relative mapping remains static across reboots.
Disabled: LUNs relative mapping is gathered from the SAS HBA device driver on every reboot.

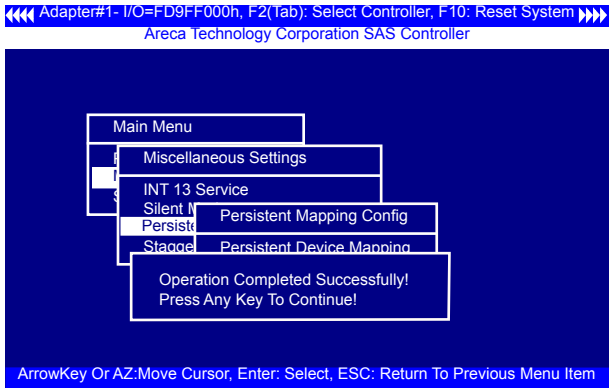
3.2.2.3.2 Clear Persistent Mapping

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:



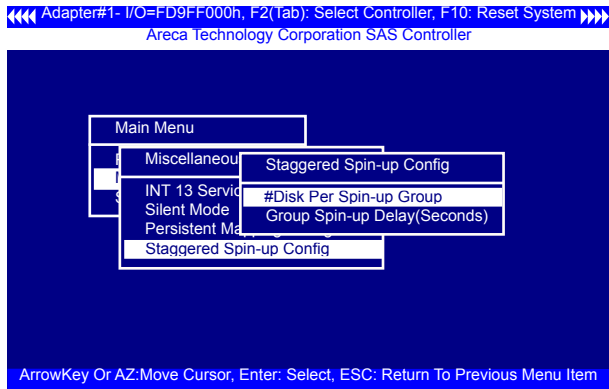
The device driver detects the hardware SAS devices via SAS HBA. This detection phase then stores or maps SAS drive LUNs information in the HBA when you enable the persistent mapping. When device persistence is in use this operation clears persistent mappings for devices that are not currently present. It is required to clear the HBA previous persistent mapping that ARC-1300 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:

BIOS CONFIGURATION



3.2.2.4 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:



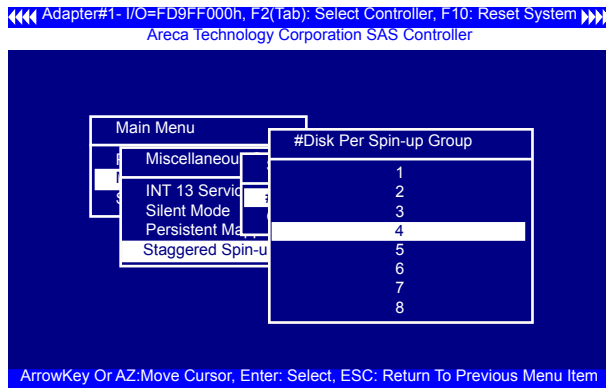
In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But In a systems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and 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

BIOS CONFIGURATION

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.

3.2.2.3.1 #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:

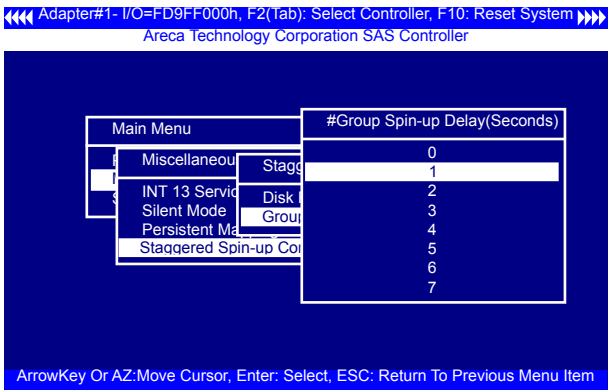


Areca host adapter has included the option for customer to select the number of disk drives group per stagger power up value. The values can be selected from 1 to 8 disks per step which powers up the system.

3.2.2.3.2 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:

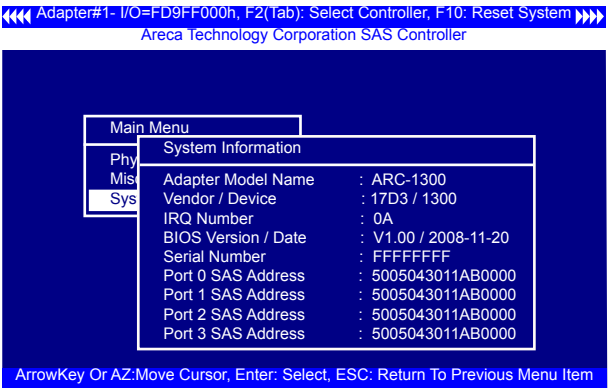
BIOS CONFIGURATION



Areca host adapter has 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.

3.2.3 System Information

To access the host adapter 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.

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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.

DRIVER INSTALLATION

4. Driver Installation

This chapter describes how to install the ARC-1300 series host adapter device driver to your operating system. The installation procedures use the following terminology:

Installing operating system on the SAS/SATA volume

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

Installing SAS host adapter into an existing operating system

The computer has an existing operating system installed and the ARC-1300 series host adapter is being installed as a secondary controller.

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

Materials required:

- Microsoft Windows 2000/XP/2003/Vista/2008, Linux, FreeBSD, Solaris, and Mac installation CD
- ARC-1300 series host adapter software CD
- ARC-1300 series host adapter

4.1 Creating the Driver Diskettes

The software CD disc shipped with the ARC-1300 series host adapter is a self-booting CD. In order to create driver diskettes for Windows, Linux, and FreeBSD installation drivers, your system is required to support booting from the CD-ROM.

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 for Windows 2000/XP/2003/Vista/2008, Linux, FreeBSD, Solaris and Mac from the Areca web site at <http://www.areca.com.tw>

DRIVER INSTALLATION

These driver diskettes are intended for use with new operating system installations. Determine the correct kernel version and identify which diskette images contain drivers for that kernel. If the driver file ends in .img, create the appropriate driver diskette using "dd" utility. The following steps are required to create the driver diskettes:

1. The computer system BIOS must be set to boot-up from the CD-ROM.
2. Insert the ARC-1300 series host adapter driver CD disc into the CD-ROM drive.

Note:

It will take about 5 minutes to boot up the Knoppix GNU/Linux, Live Linux CD.

3. The system will boot-up from CD-ROM drive.
4. To create the driver diskette, for example: making the CentOS 5 driver diskette.
 - a). Execute xterm by clicking the xTerm icon on left-bottom toolbar.
 - b). Change the path to the specific driver image.
`cd /cdrom/PACKAGES/Linux/DRIVER/CentOS_5`
 - c). Dump the driver image into floppy diskette using "dd" utility, command format:
`dd if=<image file> of=<destination>`
Example:
`dd if=driver.img of=/dev/fd0`
 - d). When the operation is complete, the following messages are shown.
2880+0 records in
2880+0 records out
1474560 bytes (1.5 MB) copied, 97.5903 seconds, 15.1 kB/s

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

DRIVER INSTALLATION

4.2 Driver Installation for Windows

The ARC-1300 series host adapter can be used with Microsoft Windows 2000/XP/2003/Vista/2008. The ARC-1300 series host adapter support SCSI Miniport and StorPort Drivers for Windows Server 2003/Vista/2008.

4.2.1 New Storage Device Drivers in Windows 2003/Vista

The Storport driver is new to Windows Server 2003/XP-64/Vista/2008. Storport implements a new architecture designed for better performance in Storage Area Network (SAN) environments. Storport delivers higher I/O throughput, enhanced manageability, and an improved miniport interface. Storport better utilizes faster adapters through the use of reduced Delay Procedure Call (DPC) and improved queue management.

4.2.2 Install Windows 2000/XP/2003/Vista/2008 on a SAS Host Adapter Volume

The following instructions explain how to install the ARC-1300 series host adapter device driverwhile installing Windows 2000/XP/2003/Vista/2008. Have your bootable Microsoft Windows 2000/XP/2003/Vista/2008 CD and follow the required procedure below to install ARC-1300 series host adapter:

1. Make sure you follow the instructions in Chapter 2 "Hardware Installation" to install the controller and connect the disk drives or enclosure.
2. Start the system and then press **Tab/F6** to access the Host_BIOS setup utility. Use the Host_BIOS setup utility to configure the ARC-1300 series host adapter to which you will install Windows. For details, see Chapter 3 "BIOS Configuration". Once ARC-1300 series host adapter has been configured, continue with next step to install the operating system.
3. Insert the Windows setup CD and reboot the system to begin the Windows installation.

DRIVER INSTALLATION

Note:

The computer system BIOS must support bootable from CD-ROM.

4. Press **F6** when the following displays at the bottom of the screen for only 5 seconds, unless you are installing Windows Vista and 2008.

"Press F6 if you need to install..."

This must be done or else the Windows installer will not prompt for the driver from the ARC-1300 series host adapter and the driver diskette will not be recognized.

Note:

If you are installing Windows Vista/2008, click "Load Driver" to locate the device driver and then click "Next".

5. The next screen will show:

"Setup could not determine the type of one or more". Specify an additional ARC-1300 series device driver by pressing **S**.

6. Insert the ARC-1300 series driver diskette in drive "A:" and press **Enter**.

7. Select the appropriate ARC-1300 SAS PCI host adapter from the menu by using the arrow key to highlight it, and then press **Enter** to select it.

8. Setup will load support for the following mass storage devices: "ARECA[Windows X86-32 Storport] SAS Host Adapter". Press **Enter** continue and copy the driver files.

9. From this point on, simply follow the Microsoft Windows installation procedure. Follow the on-screen instructions, responding as needed, to complete the installation. Reboot the system to load the new driver/operating system.

DRIVER INSTALLATION

4.2.3 Installing Controller into an Existing Windows 2000/XP/2003/Vista/2008 Installation

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 adapter miscellaneous settings properties configured, continue with installation of the driver.
3. Boot Windows and the OS will recognize the ARC-1300 series host adapters and launch the “Found New Hardware Wizard”, which guides you in installing the ARC-1300 series host adapters driver.
4. Choose “Display a list of known drivers for this device, so that you can choose a specific driver.” and click on “Next”.
5. Insert the ARC-1300 series host adapters driver diskette or the shipping software CD and type-in or browse to the correct device driver path. Click the “Next”.
8. If the “Digital Signature Not Found” screen appears, click on “Continue” to continue the installation. This message informs you that a nonsigned driver is being installed.
9. Windows automatically copies the appropriate driver files and rebuilds its driver database.
10. Click the “Finish” button to complete the driver installation.
11. Remove the diskette from the drive and click **Yes** to restart the computer to load the new drivers.

4.2.4 Making Volume Sets Available to Windows System

When you reboot the system, log in as a system administrator. The following steps show how to make any new disk arrays or independent disks accessible to Windows 2000/XP/2003/Vista/2008.

This procedure assumes that the ARC-1300 series host adapter hardware, driver, and Windows are installed and operational in your system.

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

4.2.5 Uninstall Controller from Windows 2000/XP/2003/Vista/2008

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. Start from "My Computer", click right side of the mouse. Select "Manage", then choose "Computer Management".

DRIVER INSTALLATION

3. Select the "Device Manager", then choose "SCSI and RAID Controllers". Right click on the "ARECA(X86-32-STORPORT) SAS Host Adapter" and click right side of mouse then select "Uninstall". A "Confirm Device Removal" screen appears.
4. Click **Yes** to remove the ARC-1300 series host adapter driver.

4.3 Driver Installation for Linux

This chapter describes how to install the ARC-1300 series host adapter driver to Red Hat Linux, SuSE and other versions of Linux. Before installing the ARC-1300 series host adapter 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 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 Areca CD or website to make driver diskette and to install driver to the system.

4.4 Driver Installation for Mac OS X

This chapter describes how to install the ARC-1300 series host adapter Mac device driver. You must have administrative level permissions to install Areca Mac device driver. You can install driver on your Power Mac G5 or Mac Pro as below:

1. Insert the Areca Mac Driver & Software CD that came with your ARC-1300 series host adapter.
2. Double-click on the following file that resides at <CD-ROM>\packages\MacOS to add the installer on the Finder.

DRIVER INSTALLATION

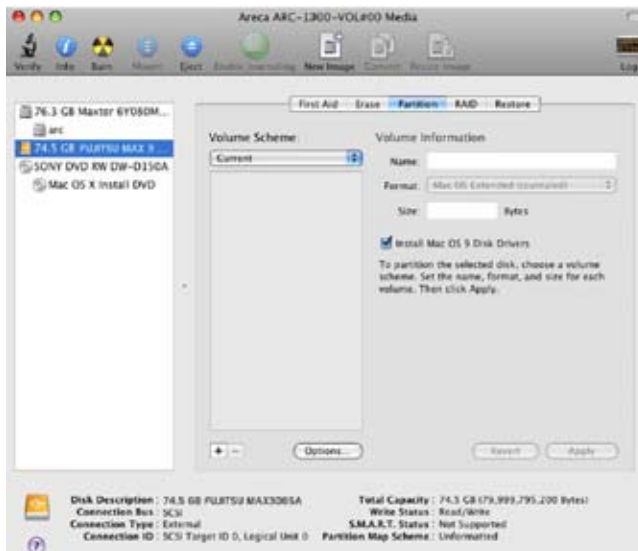
- a). ArcSAS-0.0.0.dmg
3. Launch the installer by double-clicking the ArcSAS-0.0.0 virtual volume on the Finder.
4. Follow the installer steps to install Areca driver.
5. Reboot your Power Mac G5 or MacPro system

4.4.1 Making Volume Sets Available to Mac OS X

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

1 In the Mac OS message, click on the "Initialize" tab.

2 When the Macintosh Disk Utility window appears, select the Areca controller's disks icon on the left in the list of hard disks that are mounted on the Mac system.



DRIVER INSTALLATION

3 In the Macintosh Disk Utility window, click on the "Partition" tab.

4 From the Volume Scheme column, click on the "Current" to show the drop down menu and select the number of partitions that you want to divide Areca controller.

5. On the right "Volume Information" section, assign a name for each partition, choose the right volume format (Mac OS Extended, Mac OS Standard, MS-DOS File System or UNIX File System) and enter the appropriate size of the partitions. Once you have finished the setting, click on the "Partition" tab.

6. When a message "Partitioning a disk will destroy all information on the volume of the disk" asks you to confirm you want to partition the disk, click on the "Partition" tab to continue. It will take a couple of minutes to complete the partition, volume format and shown up the new volume on your desktop when they are now available for use.

Appendix A

CLI Introduction

This Command Line Interface (CLI) is provided for you to configure the ARC-1300ix-16 SAS host adapter expander functions. The CLI is useful in environments where a graphical user interface (GUI) is not available. Please download the CLI_For_SAS_expander manual from the website <http://www.areca.com.tw/support/main.htm>

APPENDIX

Appendix B

Upgrading Adapter Flash ROM Update 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 ship CD contains the oflash.exe executable utility and a separate adapter flash image. 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: i13_1300.bin :→ PCI 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_1300.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 other Windows operating system and copy SAS adapter BIOS package: oflash.exe and i13_1300.bin files to it.

Starting the Oflash Flash Utility

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

Help Command

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

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

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

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

```
C:\>oflash  
=====  
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =  
= Areca Odin Flash Utility, Version: 1.00                  =  
=====  
command: oflash [options]  
  
/c ctrl#           -- assign controller number, default 0  
/r filename        --read, backup binary into filename from flash  
/s filename        -- write, write binary into flash from filename  
/l                 -- list, list all controllers found  
  
Example:  
Write flash from file i13_1300.bin into controller#0  
command: oflash /c 0/ w i13_1300.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

APPENDIX

```
C:\>oflash/ l
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca Odin Flash Utility, Version: 1.00                  =
=====
Controller Information
Controller#00
  DeviceID/Bus/DevFunc: 6445/1/0  I/O Address:   9F00

Controller#01
  DeviceID/Bus/DevFunc: 6445/1/0  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 oflash flash utility saves the SAS host adapter's flash ROM contents from SAS adapter 1 to a file name: 1300bak.bin.

```
C:\> oflash /c 1 /r 1300bak.bin
```

```
C:\>oflash/c 1 /r 1300bak.bin
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca Odin Flash Utility, Version: 1.00                  =
=====
Controller Information
  Controller#01
    DeviceID/Bus/DevFunc: 6445/1/0  I/O Address:   CF00

Writing 262144 bytes into file 1300bak.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_1300.bin file:

```
C:\> oflash c/1 /w i13_1300.bin
```

```
C:\>oflash/c 1 /w i13_1300.bin
=====
= Copyright (c) 2009 Areca, Inc. All rights reserved.      =
= Areca Odin Flash Utility, Version: 1.00                  =
=====
Controller Information
  Controller#01
    DeviceID/Bus/DevFunc: 6445/4/0  I/O Address:   CF00

Writing 55808 bytes into flash 100%
Write flash OK

c:\>_
```

APPENDIX

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 oflash flash utility reads the image data from floppy disk or USB device and updates the flash ROM on the host adapter.

Version History

Revision	Page	Description
1.1	p.50-54	Changed aod to oflash.
1.1	p.46, 47	Deleted Driver Installation for FreeBSD and Solaris.