NVMe Switch Adapter

ARC-1389-8N

(PCIe 5.0 x16 NVMe Switch Adapter)

User Manual

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FCC Statement

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

Manufacturer's Declaration for CE Certification

We confirm ARC-1389-8N has been tested and found compliant with the requirements in the council directive relating to the EMC Directive 2004/108/EC. Regarding to the electromagnetic compatibility, the following standards were applied:

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

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

Contents

1. Introduction

This section presents a brief overview of 8 Bays M.2 NVMe switch adapters, PCIe Gen5 x16 ARC-1389-8N.

1.1 Overview

The ARC-1389-8N presents advanced switch technology with enhanced performance using 8 Bays Gen5 x4 M.2 NVMe. The switch adapter supports off module power loss protection (PLP), and ARC-1689-CBM provides features for guaranteed data protection. This system is designed with a high performance management engine and PCIe Gen 5.0 host/device interface, and supports AIC mode, allowing customers to build high-bandwidth, low-latency, scalable, cost-effective and robust performance storage solutions for ML/AI, HPC and enterprise applications.

NVMe Performance Gains for Fast Data

Based on Broadcom's 48-Channel PEX89048 switch chip that provides x16 lanes of dedicated PCIe Gen 5.0 upstream bandwidth and x4 lanes of dedicated downstream bandwidth to each device interface, the ARC-1389-8N NVMe switch adapter raises the standard to higher performance levels with several enhancements, including a new high performance management engine, outstanding performance PCIe Gen 5.0 host and PCIe Gen 5.0 (NVMe) interface bus interconnection. The ARC-1389-8N provides an extremely fast, reliable and ultra-compact solution for companies that need storage and is especially designed for accelerated computing, ML/AI, HPC and enterprise applications. This switch adapter can support up to 8x Gen5 x4 NVMe drives on just one PCIe adapter, increasing capacity and speed as more NVMe drives are added. The ARC-1389-8N supports both up to 4x 2280 and 4x 22110 form factor NVMe drives and combines them on a switch adapter for high-capacity, high-performance, low latency storage array environments.

Unsurpassed Advantages

In Areca's high-performance switch solution, ARC-1389-8N brings PCIe NVMe to superior performance switch adapter with elevated

throughput, and low latency. ARC-1389-8N hardware secure boot helps ensure that the firmware code running on ARC-1389-8N hardware platforms is authentic and unmodified. During the adapter firmware upgrade process, it is possible for a problem to occur, resulting in corruption of the controller firmware. With our redundant flash image feature, the adapter will revert back to the last known good firmware and continue operating. The ARC-1389-8N switch adapter off module power loss protection (PLP) is optimized for datacenter environments. Its efficient PLP typically uses the capacitors on the NVMe SSD to provide hold-up power until the data is flushed from the NVMe internal DRAM to the NAND flash upon sudden power loss or any failure condition occurrence. The ARC-1689-CBM module (optional) supports the supercapacitor to provide off module hold-up power, eliminating the need for capacitors on the NVMe SSDs which helps reduce cost. The ARC-1389-8N advanced thermal solution employs a full-length aluminum heatsink and two low-profile cooling fans to effectively cool the installed M.2 NVMe SSDs so they always operate and perform within their operating temperature rating to maximize reliable performance and endurance. Also, with LED status for each individual NVMe channel on the bracket is closely monitored to help your business continuity.

Maximum Interoperability

The ARC-1389-8N switch adapter enables support for maximum interoperability using standard system UEFI secure boot and OS in-box driver. The in-box plug-and-play function allows automatic installation of the best-matched driver with no user intervention required for driver media insertion. The ARC-1389-8N switch supports in-box NVMe drivers for most major operating systems. ARC-1389-8N products and technology are based on extensive testing and validation processes, optimizing switch adapter in field-proven compatibility with operating systems, motherboards, and applications

Intuitive Management Access

Modern IT infrastructure relies heavily on efficient storage management to ensure optimal performance, reliability, and longevity of hardware components. Software management provides critical in-

sights into adapter drive health, and predictive failure analysis. By leveraging these metrics, organizations can optimize storage efficiency, reduce downtime, and extend hardware lifespan. Similar to Areca Switch adapter, the ARC-1389-8N switch adapter is supplied with fully validated and supported firmware and in-band manageability (S.M.A.R.T) features. McBIOS switch setup utilityis a BIOS based utility used to simplify manage Areca switch adapter. The switch adapter firmware contains a browser-based switch storage manager which can be accessed through the ArcHttp proxy server in Windows, Linux, FreeBSD and more environments. The switch storage manager allows local and remote to configure from standard web browser.The adapter also supports CLI and API libraries for custom monitor.

1.2 Features

Adapter Architecture

- PEX 89048 Gen5 Switch/ High-performance management engine
- PCIe Gen5 x16 lane host interface
- Support both 4x 2280 and 4x 22110 form factor M.2 NVMe drives
- Support 8 bays M.2 (PCIe Gen5 x4 per bay)
- Drive interface at each M.2 bay - PCIe Gen5 at 32GT/per lane
- Hardware secure boot
- Multi-adapter support for large storage requirements
- Delivers 64GB/s bandwidth & sustained transfer speeds up to 60GB/s
- Advanced intelligent thermal solution to control dual cooling fan
- Support External PCIe standard 2x3 power connector
- Support NVMe off module power loss protection using ARC-1689-CBM supercapacitor module (optional)

Firmware Features

- Downstream port containment
- Read tracking
- Surprise Add and Remove (Hot-Plug) support
- Synthetic Hierarchy generation
- Support for UEFI secure boot
- Redundant flash image for adapter availability
- Supprt S.M.A.R.T via in-band management

- NVRAM for switch event & transaction log

Monitors/Notification

- System status indication via alarm buzzer
- SMTP support for email notification
- Bracket LED for each NVMe activity status
- SNMP support for remote manager
- Support slot link control capabilities, link status and error count monitoring

Switch Management

- Field-upgradeable firmware in flash ROM
- UEFI OS to launch McBIOS switch setup utility
- Web browser-based switch storage manager via Archttp utility in Windows, Linux, and FreeBSD
- Support command-line interface (CLI)
- API library for developers to monitor switch adapters with their own utility

OS Native NVMe Driver Support

- OS Native NVMe Driver Support

PCIe Gen5 x16 M.2 NVMe Switch Adapter	
Model Name	ARC-1389-8N
PCIe Switch	PEX89048 Gen5 Switch/Management Engine
Host Bus Type	PCIe 5.0 x 16 Lanes
Device Interface	Gen 5.0 x4 PCIe (NVMe)
Form Factor (L x H)	262 x 107.2 mm
Device Connector	8 x M.2 Connector
Power Loss Protection (PLP) Support	Yes
Device Driver	In-Box(Native) NVMe driver
Hold-up Supercapacitor	ARC-1689-CBM(optional)
Management Port	In-Band: PCIe
Power Consumption	Approximately 18 Watts (without M.2 drive)

2. Hardware Installation

This section describes the procedures for installing the ARC-1389-8N switch adapters.

2.1 Before You First Installing

Thanks for purchasing the switch adapter as your data storage system. This user manual gives simple step-by-step instructions for installing and managing the switch 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 ARC-1389-8N switch adapter in an ESD-protective bag

2.2 Board Layout

The ARC-1389-8N offers 8 x M.2 slots. This section provides the board layout and connector/LED for the switch adapter.

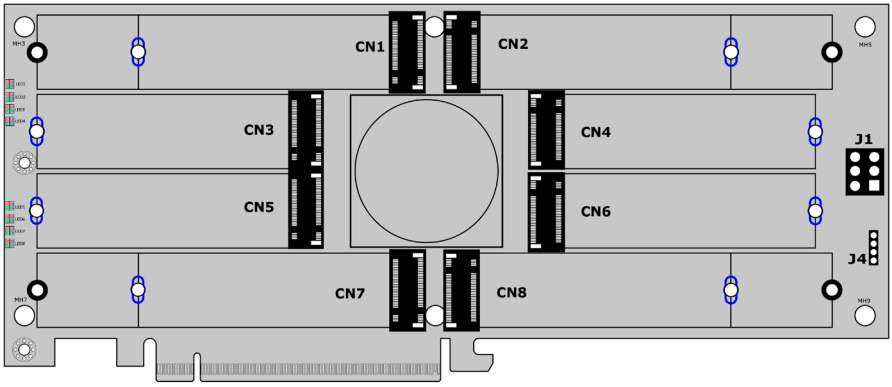


Figure 2-1, ARC-1389-8N Top View

Components	Description	Type
1. (J1)	External PCIe Power Connector	Right Angle 6-pin Connector
2. (CN3)~(CN6)	M.2 NVMe SSD Slot for 2280 FF	M.2 M-Key Slot
3. CN1, CN2, CN7, CN8	M.2 NVMe SSD Slot for 2280 & 22110 FF	M.2 M-Key Slot
4. (MH3), (MH4), (MH5), (MH7), (MH8), (MH9)	Screw Hole for Hestsink of the Adapter PCB	Screw Holes
5. (LED1), (LED2), (LED3), (LED4)	Green/Red LED for M.2 Slot 1 ~ 4	Dual-Color LED
6. (LED5), (LED6), (LED7), (LED8)	Green/Red LED for M.2 Slot 5 ~ 8	Dual-Color LED
7. (J4)	Fan Touch Probe Pins	4-pin Header

Table 2-1, ARC-1389-8N Top Components

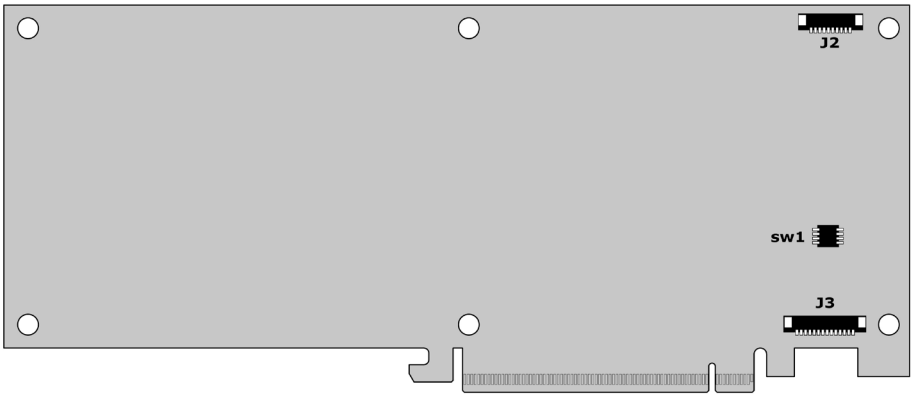


Figure 2-2, ARC-1389-8N Bottom View

Components	Description	Type
1. (J2)	BBM (Cache Backup Module for NVMe SSD)	10-pin Right Angle Box Header
2. (J3)	Debug (Manufacture Purpose Port)	14-pin Right Angle Box Header
3. (SW1)	DIP Switch	Manufacture Reserved

Table 2-2, ARC-1389-8N Bottom Components

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

LED	Status	Indication
Green LED (Activity)	Off	There is not any I/O activity on that NVMe SSD.
	On (10 times/sec.)	There is a I/O activity on that NVMe SSD.
Red LED (Fault)	Off	This NVMe SSD is present and status is normal.
	On (6 times/ sec.)	Adapter is identifying this NVMe SSD.

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-1389-8N switch adapter can be installed in an universal PCIe slot and requires a motherboard that:

ARC-1389-8N switch adapter requires:
- Comply with the PCIe 5.0 x16 lanes
  It can work on the PCIe 5.0 x1, x4, x8, and x16 signal with x16 mechanical slot M/B.
- Backward-compatibe with PCIe 3.0/4.0

Installation Tools

The following items may be needed to assist with installing the ARC-1389-8N switch adapter into an available PCIe expansion slot.
- Small screwdriver
- Host system hardware manuals and manuals for the disk or enclosure being installed

HARDWARE INSTALLATION

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 switch adapter. To avoid damage caused by electrostatic discharge, observe the following precautions:

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

Warning:

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

2.3 Installation

Use the instructions below to install a ARC-1389-8N switch adapter.

Step 1. Unpack

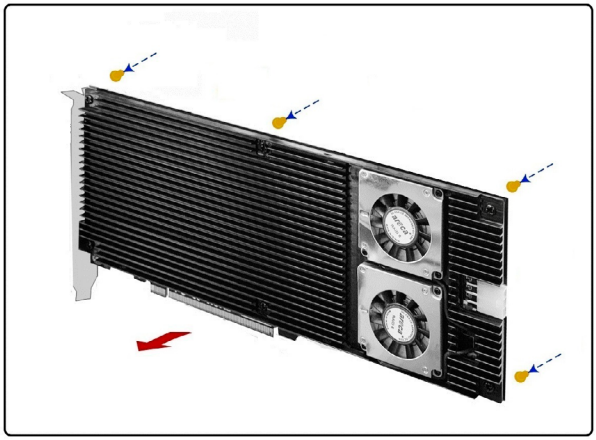
Unpack and remove the switch adapter from the package. Inspect it carefully, if anything is missing or damaged, contact your local dealer.

Step 2. Power PC/Server Off

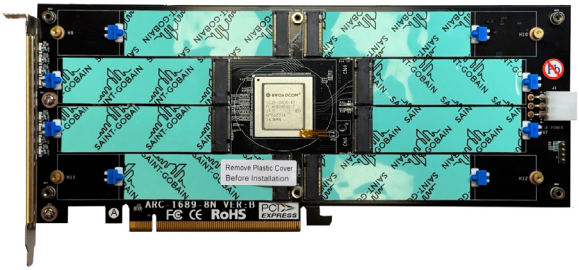
Turn off computer and remove the AC power cord. Remove the system's cover. For the instructions, please see the computer system documentation.

Step 3. Mount the M.2 Modules

1. Remove six screws that secure unit's heatsink to the board and lift the heatsink up from adapter board to remove it.



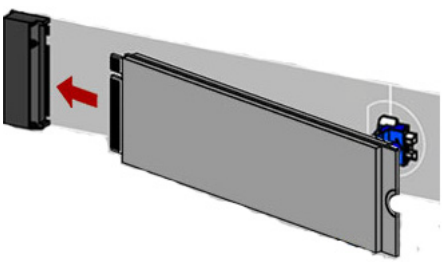
2. Remove the blue film for M.2 NVMe from the thermal pad on the ARC-1389-8N PCB board.

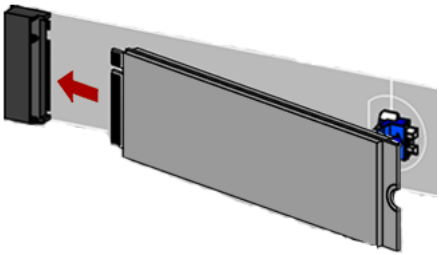


3. Install the NVMe SSDs to the ARC-1389-8N.

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

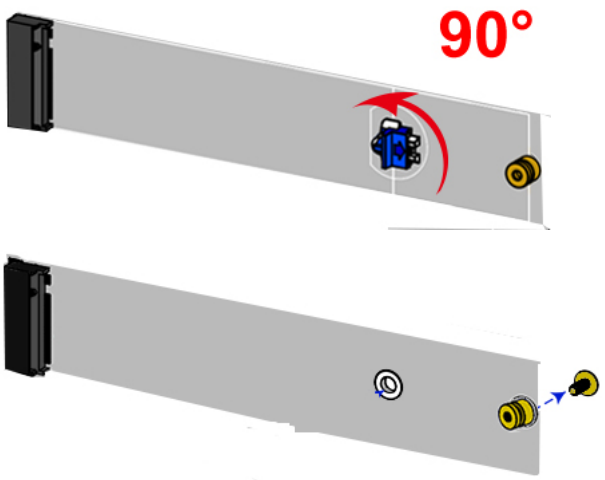
(1) Gently insert the SSD into slot and fasten SSD with the board latch.
(2) Repeat steps 1 to install the remaining SSDs.



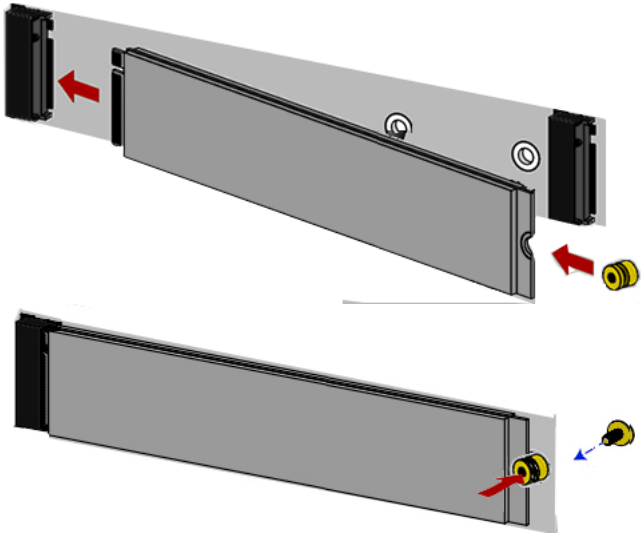


If you use 22110 M.2 NVMe SSD...

(*1) Turn the latch 90° clockwise or counterclockwise to remove it and also remove eight screws on the PCB board.



(*2) Gently insert the SSD into slot, meawhile put the screw into the groove and fasten the screw to secure SSD.

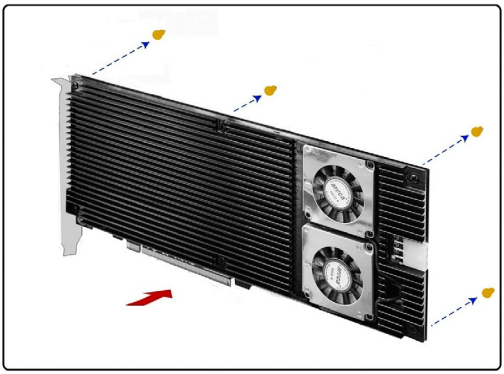


(*3) Repeat steps (*1) to (*2) to install the remaining SSDs.

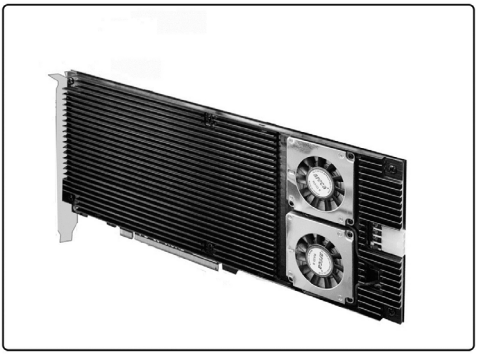
4. Install the heatsink to the ARC-1389-8N PCB board.

(1) Remove the blue film for M.2 NVMe and switch chip from the thermal pad on the heatsink.

(2) Carefully and properly Align the heatsink with the PCB board.



(3) Refasten six screws to secure unit's hestsink.



Step 4. Install the switch Adapter

To install the switch adapter, remove the mounting screw and existing bracket from the rear panel behind the selected PCIe 5.0 x16 slot for better performance. 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 2-4. Then, screw the bracket into the computer chassis.

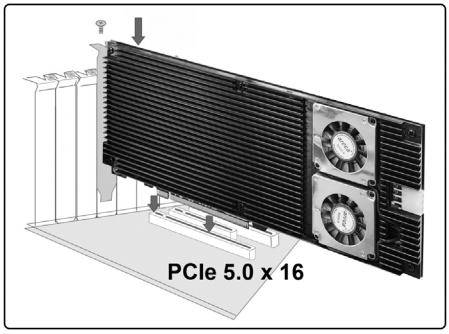


Figure 2-4, Insert into a PCIe Slot

Step 5. Connect External Power to the Adapter

There is a 6-pin PCI-E connector on the right side of ARC-1389-8N labelled J4. You must plug in a PSU's PCI-E cable at all times to supply enough stable power for the adapter.

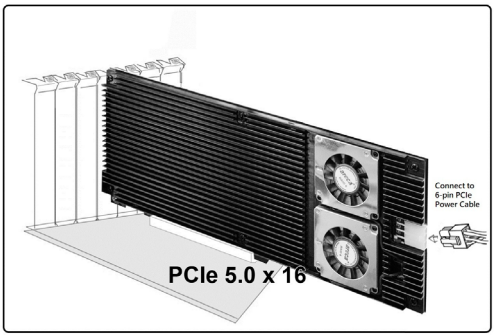


Figure 2-9, Connect Direct from Power Supply

Step 5. 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 6. Install the Adapter Driver

ARC-1389-8N NVMe switch adapter uses OS NVMe host (native) driver, no driver installation needed. All major operating systems natively support native NVMe driver. User does not need to install device drivers, or software management suite. All attached M.2 NVMe SSDs on the ARC-1389-8N will be automatically recognized by the operating system. If you don't monitor information from the adapter, belows step 8 and step 9 can be ignored.

Step 8. Manage Switch Adapter(optional)

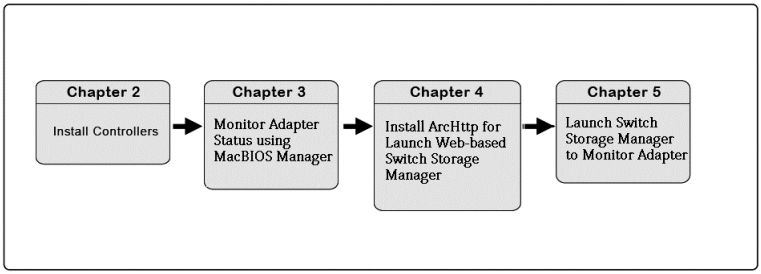
The adapter status can be managed via the McBIOS switch setup utility and web-based switch setup utility. Refer to Chapter 3 of the user manual, McBIOS Switch Setup Utility, for the detail.

Step 9. Install ArcHTTP Proxy Server (optional)

The switch adapter firmware has embedded the web-browser switch storage manager. ArcHTTP proxy server will launch the web-browser switch storage manager. It monitors NVMe switch adapter status. Refer to the Chapter 4 ArcHTTP Proxy Server Installation and Chapter 5 Switch Storage Manager of the user manual, for the detail.

2.4 Summary of the installation

The flow chart below describes the installation procedures for NVMe switch adapters.



These procedures motntor the NVMe adapter through the McBIOS/ switch setup utility, and installation of switch adapter software. The table below shows the software components that monitor the switch adapters.

Configuration Utility	Operating System Supported
McBIOS Switch Setup Utility	OS-Independent
Switch Storage Manager (Via ArcHTTP proxy server)	Windows, Linux, and FreeBSD
ArcHTTP Proxy Server	Windows, Linux, and FreeBSD
CLI Utility	Windows, Linux, and FreeBSD
SAP Monitor (Single Admin Portal to manage multiple Switch units in the network, via ArcHTTP proxy server)	Windows

Switch Storage Manager

Before launching the firmware-embedded web browser, switch storage manager through the PCIe bus, you need first to install the ArcHTTP proxy server on your server system. If you need additional information about installation and start-up of this function, see the Switch Storage Manager section in Chapter 5 of the user manual.

ArcHTTP Proxy Server

ArcHTTP has to be installed for GUI switch console (switch storage manager) to run. It is used to launch the web browser switch storage manager. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. If you need additional information about installation and start-up of this function, see the ArcHTTP Proxy Server Installation section in Chapter 4 of the user manual.

CLI Utility

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

Single Admin Portal (ArcSAP) Monitor

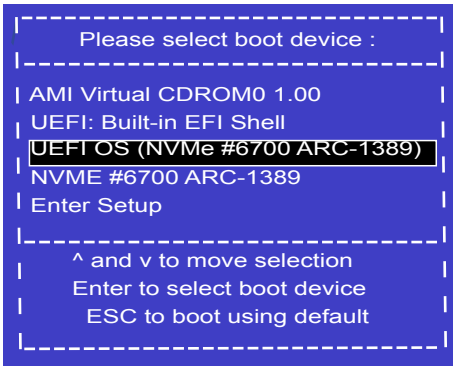
This utility can scan and manage multiple switch and Switch units in the local and remote systems and provide an effective mechanism to configure and monitor your switch and RAID units. For additional information, see the utility manual (ArcSAP) from the web site **https://www.areca.com.tw**.

3. McBIOS Switch Setup Utility

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

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

a). Add switch adapters "UEFI OS(Areca A....)" in the M/B boot option: You must enter the setup of motherboard BIOS and add UEFI OS to the boot option if your motherboard BIOS does not automatically add it.

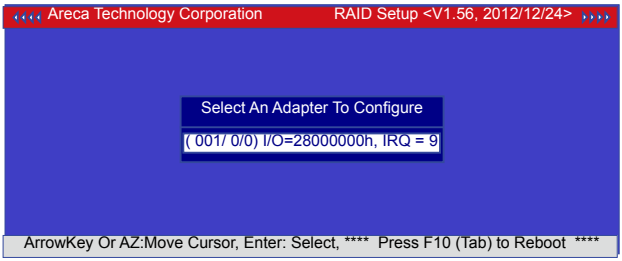


b). Restart your motherboard to boot from UEFI OS. The motherboard vendors provide two methods for choosing a boot device: Enter boot menu by using hotkey or enter boot menu through BIOS configuration.

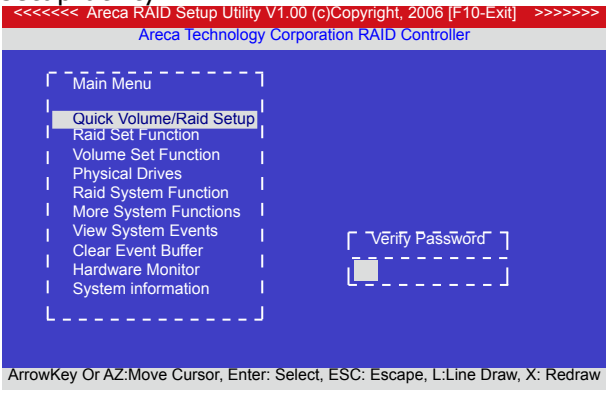
Note:

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

c). When booted, the McBIOS switch setup utility window appears showing the main menu of the switch adapters that are installed in the system. If there have more than two switch adapters installed in the system, it will show a selection for user to choose one to configure the switch adapter.McBIOS setup utility operates upon a single switch adapter at a time. A selection dialog box listing the switch adapters that are installed in the system.



Use the **Up** and **Down** arrow keys to select the adapter you want to monitor. While the desired controller is highlighted, press the **Enter** key to enter the main menu of the McBIOS switch setup utility.



d). Follow the on-screen prompts to complete the configuration. After using "F10" to exit, you can enter " shell>exit" or need to hard power cycle it.

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

Note:

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

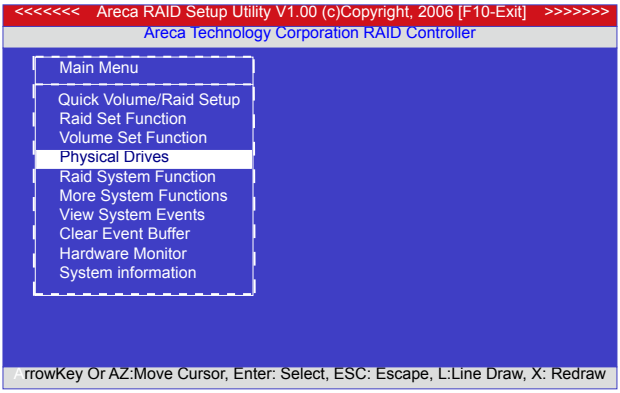
3.1 Main Menu

Since ARC-1389-8N uses same ARC-1689-8N McBIOS interface, it will be not avaliable any RAID function item on the RAID setup utility.
The main menu shows all functions that are available for executing actions, which is accomplished by clicking on the appropriate link. This password option allows user to set or clear the switch adapter's password protection feature. Once the password has been set, the user can only monitor and configure the switch adapter by providing the correct password. The password is used to protect the internal switch adapter from unauthorized entry. The adapter will prompt for the password only when entering the main menu from the initial screen. The switch adapter will automatically return to the initial screen when it does not receive any command in five minutes.

Option	Description
Quick Volume/Raid Setup	N/A
Raid Set Function	N/A
Volume Set Function	N/A
3.2 Physical Drives	Identify and view individual disk information
3.3 Raid System Function	Setup the switch system configuration
More System Function	N/A
3.4 View System Events	Record all adapter system events in the buffer
3.5 Clear Event Buffer	Clear all information in the event buffer
3.6 Hardware Monitor	Show the hardware system environment status
3.7 System Information	View the adapter system information

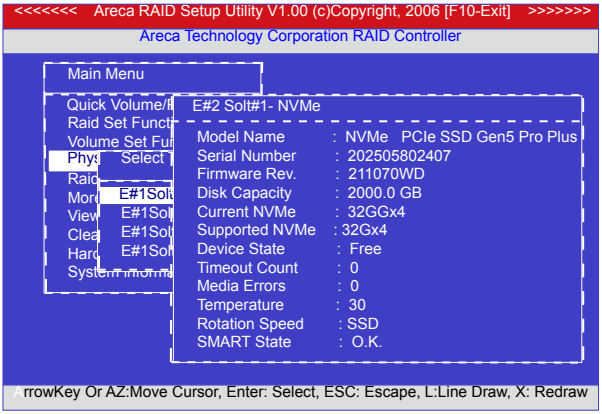
3.2 Physical Drives

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



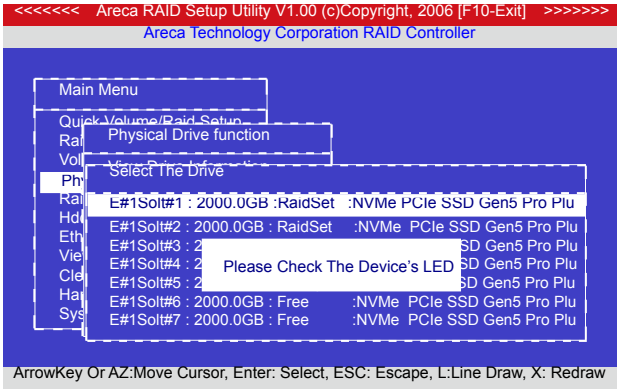
3.2.1 View Drive Information

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



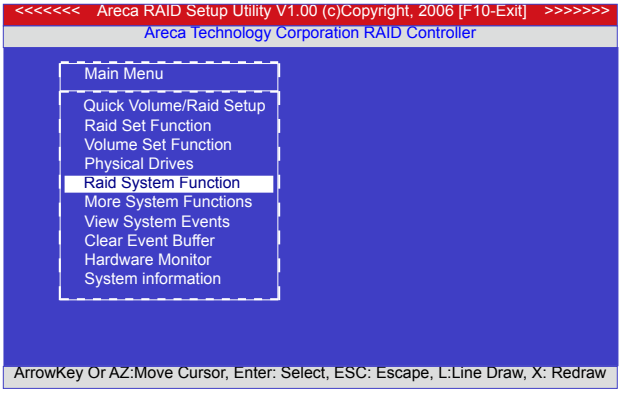
3.2.2 Identify Selected Drive

To prevent removing the wrong drive, the selected disk fault LED indicator will light for physically locating the selected disk when the "Identify Selected Device" is selected.



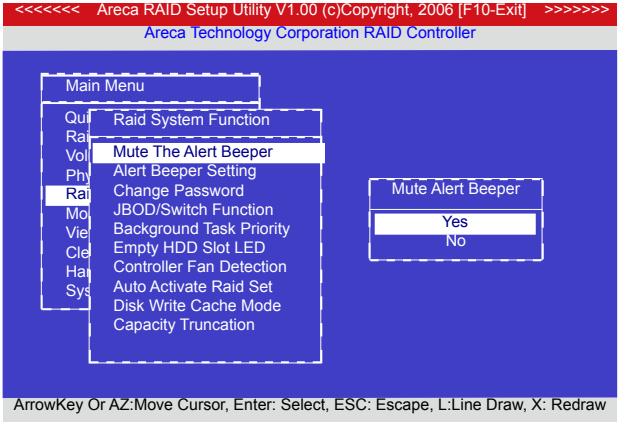
3.3 Raid System Function

To set the "Raid System Function", move the cursor bar to the main menu and select the "Raid System Function" item and then press **Enter** key. The "Raid System Function" menu will show multiple items. Move the cursor bar to an item, and then press **Enter** key to select the desired function.



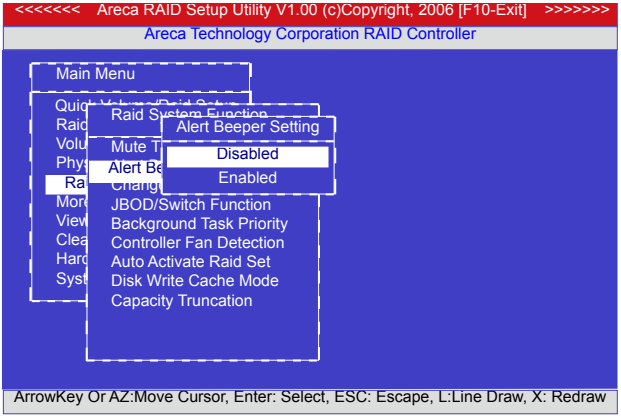
3.3.1 Mute The Alert Beeper

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



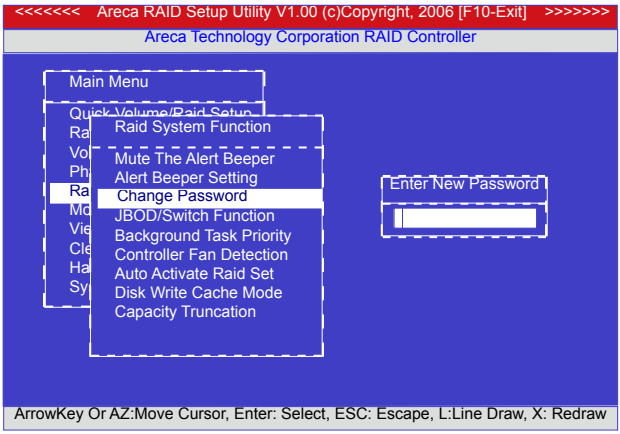
3.3.2 Alert Beeper Setting

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



3.3.3 Change Password

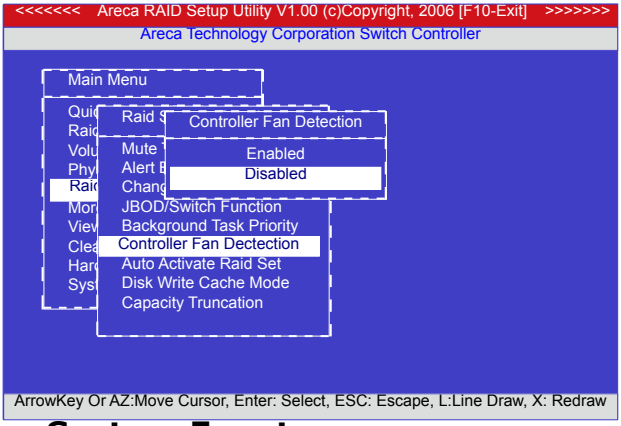
The manufacture default password is set to 0000. The password option allows user to set or clear the password protection feature. Once the password has been set, the user can monitor and configure the adapter only by providing the correct password. This feature is used to protect the internal Switch system from unauthorized access. The adapter will check the password only when entering the main menu from the initial screen. The system will automatically go back to the initial screen if it does not receive any command in 5 minutes. To set or change the password, move the cursor to "Raid System Function" screen, press the "Change Password" item. The "Enter New Password" screen will appear. Do not use spaces when you enter the password, If spaces are used, it will lock out the user. To disable the password, only press **Enter** key in both the "Enter New Password" and "Re-Enter New Password" column. The existing password will be cleared. No password checking will occur when entering the main menu.



3.3.4 Controller Fan Detection

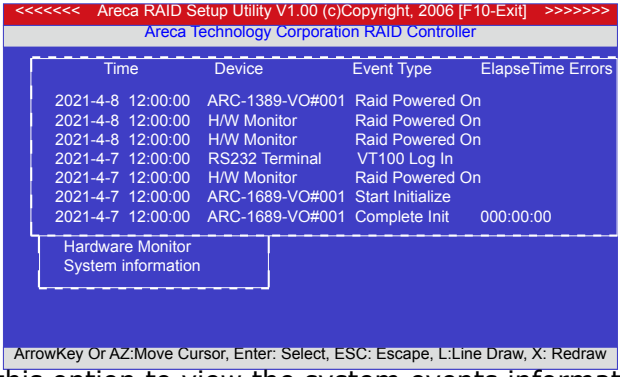
The ARC-1389-8N incorporate one big passive heatsink attaching two active cooling fans that allows the hot devices such as PCIe switch and M.2 NVMe module to keep cool. In addition, newer systems already have enough air flow blowing over the adapter.

The "Controller Fan Detection" function is available in the firmware for detecting the cooling fan function on the heatsink which uses the active cooling fan. When using the passive heatsink on the adapter, disable the "Controller Fan Detection" function through this McBIOS switch setup utility setting. The following screen shot shows how to change the McBIOS switch setup utility setting to disable the warning beeper function.



3.4 View System Events

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

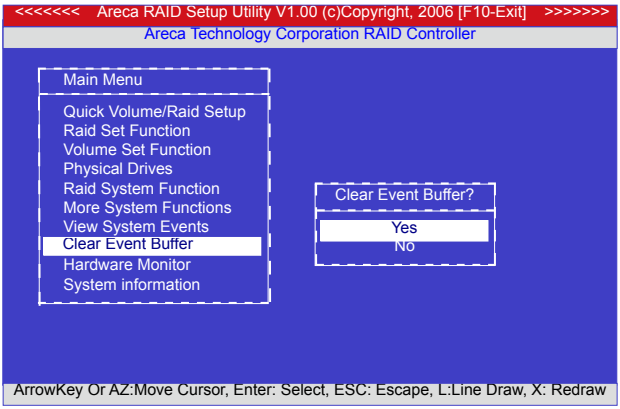


Choose this option to view the system events information: Timer, Device, Event type, Elapsed Time, and Errors. The switch adapter

does not have a build-in real time clock. The time information is the relative time from the NVMe Switch adapter powered on.

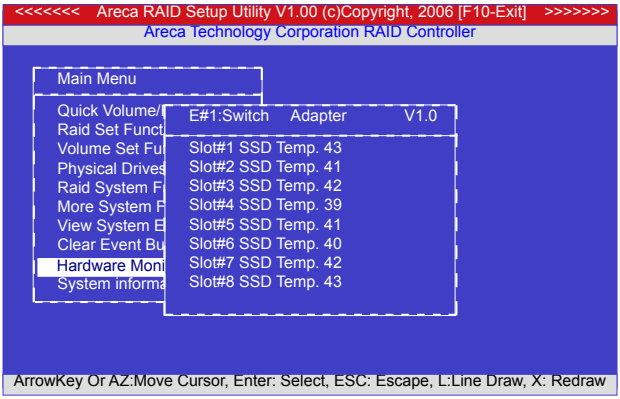
3.5 Clear Events Buffer

Use this feature to clear the entire events buffer.



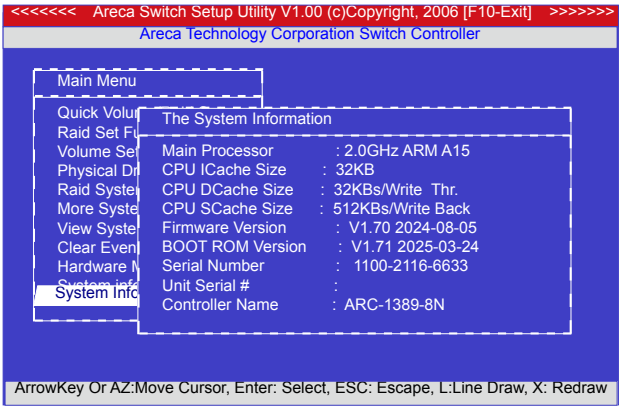
3.6 Hardware Monitor

To view the Switch adapter's hardware monitor information, move the cursor bar to the main menu and click on the "Hardware Monitor" link. The "Controller H/W Monitor" screen appears. The "Controller H/W Monitor" provides the PCIe switch chip temperature, adapter temperature and voltage of the NVMe switch adapter.



3.7 System Information

Choose this option to display adapter name, firmware version, BOOT ROM version, serial number, main processor, CPU instruction cache and data cache size, serial number, and controller name. To check the system information, move the cursor bar to "System Information" item, then press **Enter** key. All relevant adapter information will be displayed.



4. ArcHTTP Proxy Server Installation

Overview

The NVMe disk drives connected to the NVMe switch adapter can be monitored through the built-in configuration that resides in the adapter's firmware. It provides to monitor the adapter, eliminating the need for additional hardware or software.

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

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

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

4.1 For Windows

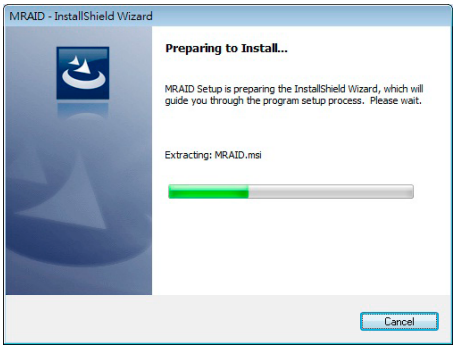
This section describes how to install the switch software to your operating system. The software installation includes ArcHTTP and CLI utility.

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

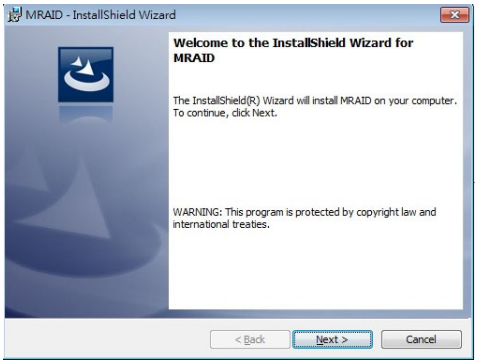
1. Download the install_mraid installer from the website at "*https://www.areca.com.tw/support/downloads.html*", the file name begins with "install_mraid" followed by the version control.

2. Double-click on the zipped file that comes from the website to unzip it. Double-click on the "setup.exe" file for installing MSwitch.

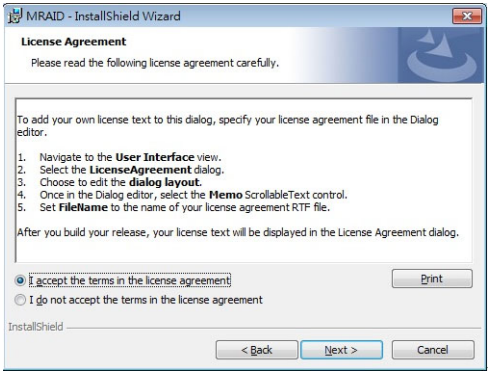
3. The screen shows Preparing to Install.



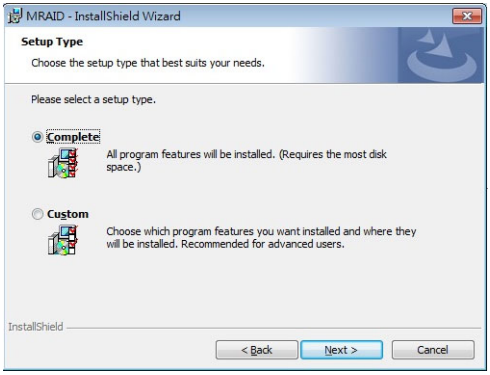
4. The Mraid Installer (or InstallShield Wizard) opens, preparing to install and click on the "**Next**" button to continue.



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

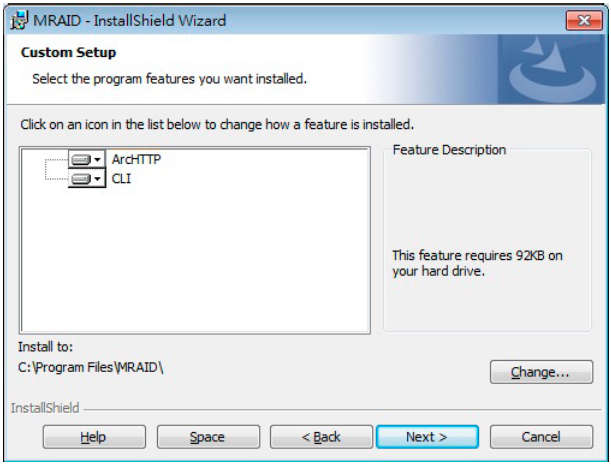


6. On the Setup Type screen, use the settings to specify these things: and click on the "**Next**" button to continue.



- "Complete" to install ArcHTTP and CLI utility at once, check the first box.
- "Custom" to install special components and change the program directory. When this "**Custom**" check box is checked, go to the Custom Setup screen.

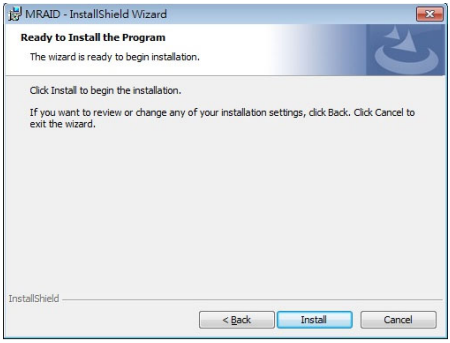
6-1. On the Custom Setup screen, click on an icon to install special components and click on the "**Next**" button to continue.



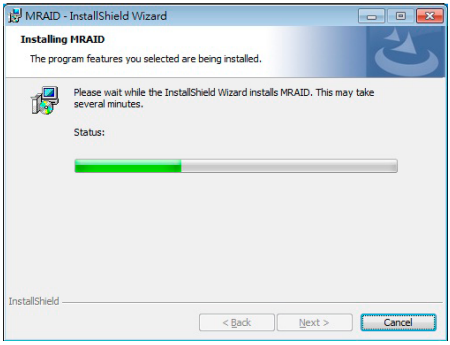
- **ArcHTTP** has to be installed for GUI switch console (switch storage manager) to run. It also runs as a service or daemon in the background that allows capturing of events for mail and SNMP traps notification. Refer to the section 4.4 ArcHTTP Configuration on ARC-1389-8N user manual, for details about the mail and SNMP traps configuration.

- **CLI (Command Line Interface)** provides the functionality available in switch storage manager through a Command Line Interface. You can set up and manage Switch storage inline. CLI performs many tasks at the command line. You can download CLI manual from Areca website.

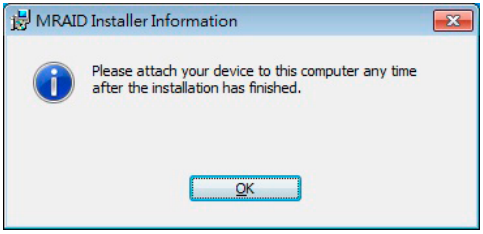
7. When you reach the installation page, click on the "**Install**" button to continue.



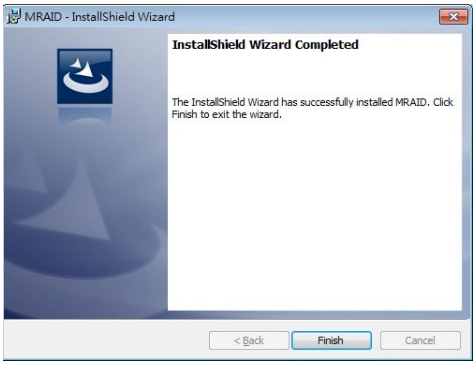
8. A program bar appears that measures the progress of the driver installation.



When this screen completes, you have completed the switch installation. If you have no ARC-1389-8N yet installed a "Switch Installer Information" message displays.

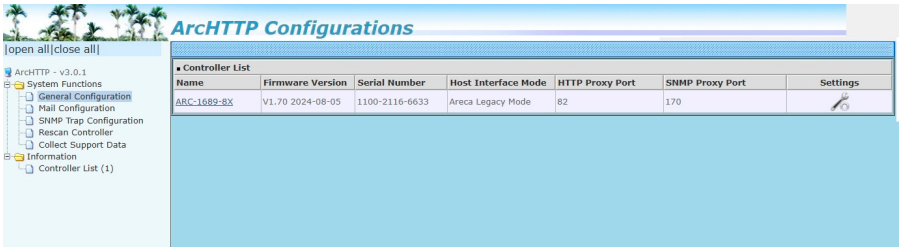


9. After installation is complete, click on the "**Finish**" button to exit the InstallShield Wizard.



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

The "**ArcHTTP Taskbar**"  icon shows on the button of system tray by default. Double click "ArcHTTP Taskbar" to launch the ArcHTTP Configuration screen. It automatically scans the localhost switch adapters on the system and creates an total Controller List icon located in the left column screen. The child element belonged each switch adapter appears on the right column screen. Locate "ARC-1389-8N" and launch the switch storage manager.



1. See the next chapter detailing the Switch Storage Manager to monitor your switch adapter.

2. If you need to configure the "System Function" of ArcHTTP, please refer to section 4.4 ArcHTTP Configuration.

4.2 For Linux

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

The following installation procedure explains how to install the NVMe switch software for Linux. The ArcHTTP proxy server for the NVMe switch adapter card can download from the **https://www.areca.com.tw**. The firmware embedded switch storage manager can configure and monitor the NVMe switch adapter via ArcHTTP proxy server.

1. Login as root. Copy the ArcHTTP file to a local directory. Download from the www.areca.com.tw or from the email attachment.

2. You must have administrative level permissions to install and run Switch adapter ArcHTTP proxy server software. This procedure assumes that the NVMe switch hardware and driver are installed and operational in your system.

   The following details are the installation procedure of the tri-mode Switch adapter for Linux ArcHTTP proxy server software.

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

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

```
Copyright (c) 2004-2024 Areca, Inc. All Rights Reserved.
Areca HTTP proxy server, Version: v3.0.0, Arclib: 390, Date:
Oct23 2024

Starting HTTP Proxy Server...Please wait(MAX = 5 minutes)
Controller(s) list
-----------------------------------------------------
Cfg Assistant : Listen to port[81].
Controller[1](NVME) : Listen to port[82].
Binding IP: [0.0.0.0]
Note: IP[0.0.0.0] stands for any ip bound to this host.
-----------------------------------------------------
##############################
Press CTRL-C to exit program!!
##############################
```

(c). If you need the **"**Cfg Assistant**",** please refer to section 4.4 ArcHTTP Configuration.

(d). Launch your switch storage manager by entering http:// [Computer IP Address]:[Port Number] in the web browser. For detailing about switch storage manager to monitor your switch adapter is discussed in Chapter 5.

4.3 For FreeBSD

You must have administrative level permissions to install NVMe Switch software. This procedure assumes that the NVMe Switch hardware and FreeBSD are installed and operational in your system.

The following installation procedure explains how to install the NVMe switch software for FreeBSD. The ArcHTTP proxy server for the NVMe Switch adapter card can download from the **https:// www.areca.com.tw**. The firmware embedded switch storage manager can configure and monitor the NVMe switch adapter via ArcHTTP proxy server.

1. Login as root. Copy the ArcHTTP file to a local directory. Download from the www.areca.com.tw or from the email attachment.

2. This procedure assumes that the NVMe switch hardware and driver are installed and operational in your system.The following details are the installation procedure of the NVMe switch adapter ArcHTTP proxy server software.

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

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

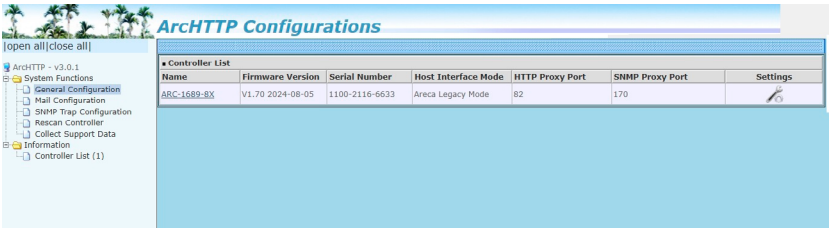
```
Copyright (c) 2004-2024 Areca, Inc. All Rights Reserved.
Areca HTTP proxy server, Version: v3.0.0, Arclib: 390, Date:
Oct 23 2024

Starting HTTP Proxy Server...Please wait(MAX = 5 minutes)
Controller(s) list
-----------------------------------------------------
Cfg Assistant : Listen to port[81].
ARCHTTP PROXY SERVER INSTALLATION
Controller[1](NVME) : Listen to port[82].
Binding IP: [0.0.0.0]
Note: IP[0.0.0.0] stands for any ip bound to this host.
-----------------------------------------------------
################################
Press CTRL-C to exit program!!
################################
```

(c). If you need the **"**Cfg Assistant**",** please refer to section 4.4 ArcHTTP Configuration.

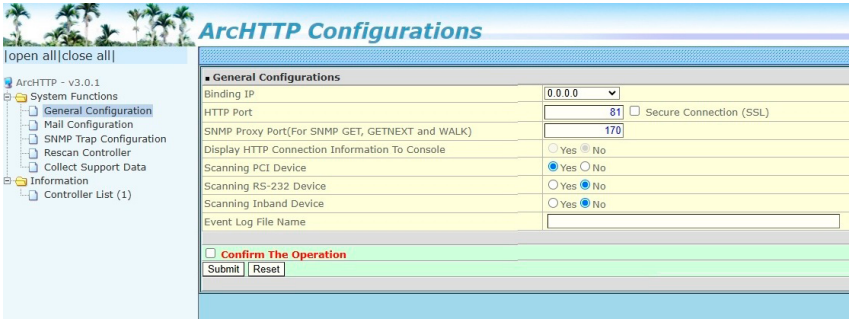
(d). Launch your switch storage manager by entering http:// [Compute IP Address]:[Port Number] in the web browser. For detailing about switch storage manager to monitor your switch adapter is discussed in Chapter 5.

4.4 ArcHTTP Configuration

The ArcHTTP proxy server will automatically assign one additional port for setup its configuration. If you want to change the "archttpsrv.conf" setting up of ArcHTTP proxy server configuration, for example: General Configuration, Mail Configuration, and SNMP Configuration, please start Web Browser http:\\localhost: Cfg Assistant. Such as http:\\localhost: 81. The port number for the first adapter switch storage manager is ArcHTTP proxy server configuration port number plus 1.



- **General Configuration:**

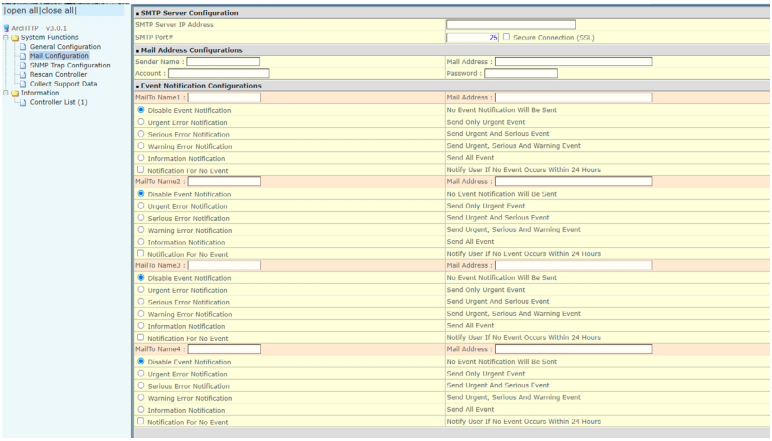


1. **Binding Ip:**
   Restrict ArcHTTP proxy server to bind only single interface (If more than one physical network in the server).
2. **HTTP Port#:**
   Value 1~65535. Click on the "check box" to enable the SSL.
3. **SNMP Proxy Port (For SNMP GET, GET NEXT and WALK):**
   The ArcHttp can send get requests to an SNMP agent to obtain data. After receiving a get request, the SNMP agent executes the corresponding instruction in the MIB and sends the result to the ArcHttp. It does not need a subagent.

4. **Display HTTP Connection Information to Console:**
   Select "Yes" to show Http send bytes and receive bytes information in the console.
5. **Scan PCI Device:**
   Select "Yes" for ARC-1XXX series adapter.
6. **Scan RS-232 Device:**
   Select "No" for ARC-1XXX series adapter.
7. **Scan Inband Device:**
   Select "No" for ARC-1XXX series adapter.
8. **Event Log File Name:**
   Redefine the file name for "Collect Data" function.

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

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



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

1. **SMTP Server Configuration:**
   SMTP Server IP Address: Enter IP address or domain name of the SMTP server to configure your mail program correctly.
   Ex: 192.168.0.2. or smtp.gmail.com

2. Mail Address Configurations:

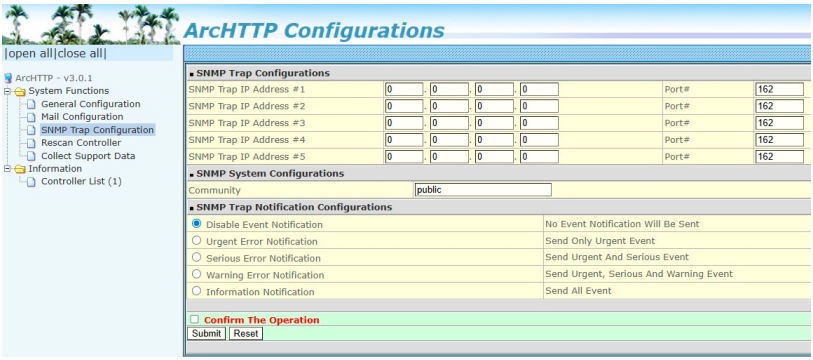
Sender Name: This is the sender name that the e-mail alerts will appear to be coming from.
Ex: RaidController_1.
Mail address: This is the mail address that the e-mail alerts will appear to be coming from, but don't type IP to replace domain name.
Ex: RaidController_1@areca.com.tw.
Account: Enter the valid account if your SMTP mail server requires authentication.
Password: Enter the valid password if your SMTP mail server requires authentication.

3. Event Notification Configurations:

This step involves setting up of notification rules. Notification rules instruct ArcHTTP on the notifications that should be sent when certain types of alerts are detected.
MailTo Name: Enter the alert receiver name that will be shown in the outgoing mail.
Mail Address: Enter the receiver's e-mail address. This is the address you want the e-mail alerts sent to.
Ex: admin@areca.com.tw.
According to your requirement, set the corresponding event level:
Disable Event Notification: No event notification will be sent.
Urgent Error Notification: Send only urgent events.
Serious Error Notification: Send urgent and serious events.
Warning Error Notification: Send urgent, serious and warning events.
Information Notification: Send all events.
Notification For No Event: Notify user if no event occurs within 24 hours.

- **SNMP Traps Configuration:**

This section discusses how to enable the SNMP traps on your Switch adapter, and how to control the sending of SNMP traps from the ArcHTTP. To send the SNMP traps to client SNMP manager such as Net-SNMP manager using the IP address assigned to the operating system, you can simply use the SNMP function on the ArcHTTP. The ArcHTTP only provides to send the trap without needing to install the SNMP extension agent on the host.



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

1. SNMP Trap Configurations

Enter the SNMP trap IP address.

2. SNMP System Configurations

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

3. SNMP Trap Notification Configurations

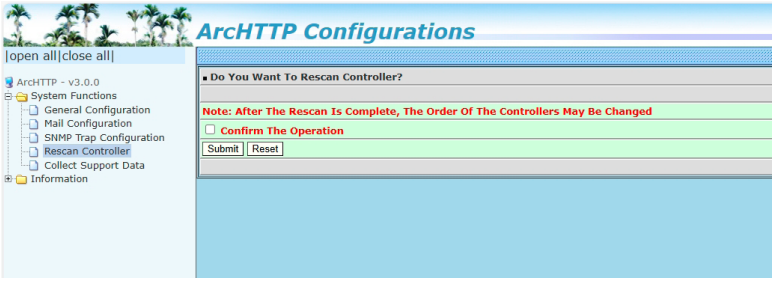
Event Notification Table refers to Appendix C. Before the client side SNMP manager application accepts the Switch storage traps, it is necessary to integrate the MIB into the management application's database of events and status indicator codes. Ensure the compilation process successfully integrates the contents of the areca_sas.mib file into the traps database. The MIBs file can download from https://www.areca.com.tw. Each Switch adapter needs to have its own MIBs file. Areca provide 4 adapters MIBs file for users. User can request it if more adapters install on one system.

Note:

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

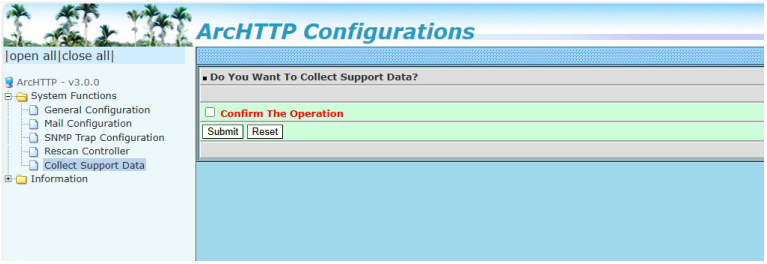
- **Rescan Device Configuration:**

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



- **Collect Support Data:**

The “Collect Support Data” option on the ArcHTTP is used to download all adapter’s information (system information, disk information and hardware information) to program directory (file name:ctlrxx-xxxxx.log). It will be automatically started when URGENT or SERIOUS event has occurred.



5. Web Browser-based Configuration

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

It can be accessed through the in-band PCIe bus . ArcHTTP is used to launch the in-band web browser-based switch storage manager.

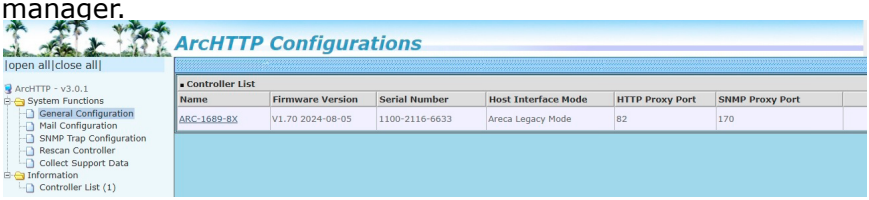
5.1 Start-up Switch Storage Manager

With switch storage manager, you can:

- Locally manage a system containing a supported switch adapter that has Windows, ArcHTTP and a supported browser.

- **Start-up from Windows Local Administration**

  Once ArcHTTP and CLI have been installed, the ArcHTTP - back ground task automatically starts each time when you start your computer. There is one MARID icon showing on Mac "Desktop" or one "**ArcHTTP Taskbar**"  icon showing on Windows system tray. This icon is for you to start up the ArcHTTP (launch the switch storage manager). When you click on the ArcHTTP64 from "**ArcHTTP Taskbar**" from system tray, it shows all switch adapters available on the host system and create an individual switch adapter icon located on left column of the "ArcHTTP Con figurations" screen. This switch adapter icon is for user to launch the selected switch adapter web browser switch storage manager.



The "Enter Network Password" dialog screen appears, type the User Name and Password. The switch adapter default User

Name is “admin” and the Password is “0000”. After entering the user name and password, press **Enter** key to access the switch storage manager.

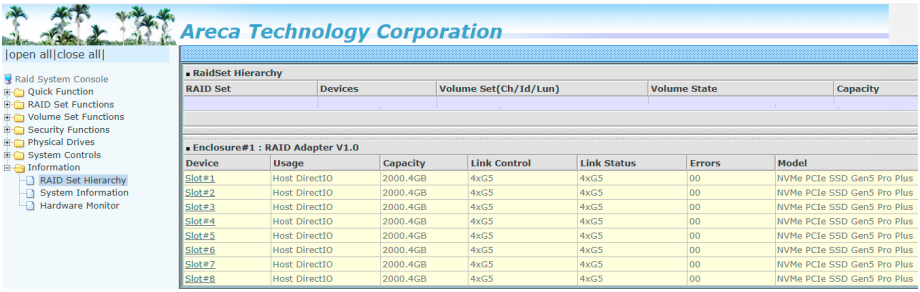
- **Start-up Switch Storage Manager from Linux/ FreeBSD Local Administration**

  To configure the internal NVMe switch adapter. From switch storage manager, you need to know its IP address. You can find the IP address assigned by the ArcHTTP proxy server installation: Binding IP:[X.X.X.X] and adapter listen port. See chapter 4.2/4.3 for ArcHTTP proxy server installation.

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

5.2 Switch Storage Manager

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



- To display drive information, move the mouse cursor to the desired physical drive number, then click on it. The drive information will be displayed. Use this feature to view the RAID switch adapter current physical NVMe device information. The firmware can monitor and check the current attached device status. It includes slot control capabilities, slot link status, transaction error count reports and device information.

5.3 Main Menu

The main menu shows all available functions, accessible by clicking on the appropriate link. Since ARC-1389-8N uses same ARC-1689-8N GUI interface, it will be not avaliable any RAID function item on the web-based browser.

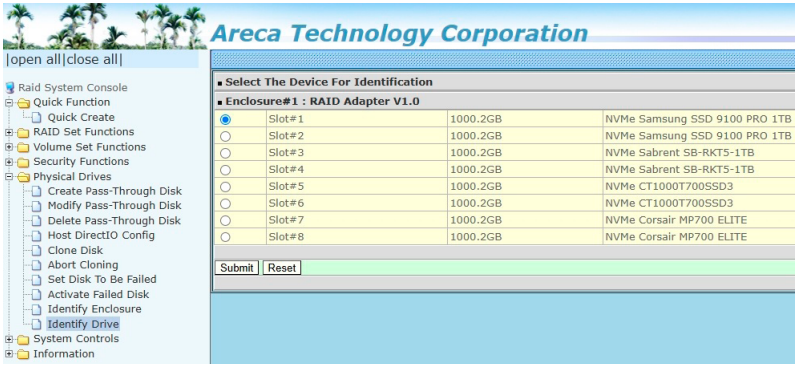
Individual Category	Description
Quick Function	N/A
Raid Set Functions	N/A
Volume Set Functions	N/A
Security Functions	N/A
5.5 Physical Drives	Provides the function to identify disk drives (blinking fault LED).
5.6 System Controls	Setting the switch adapter configuration.
5.7 Information	Viewing the adapter information. The Raid Set Hierarchy can be viewed through the "Raid Set Hierarchy" item.

5.4 Physical Drive

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

5.4.1 Identify Drive

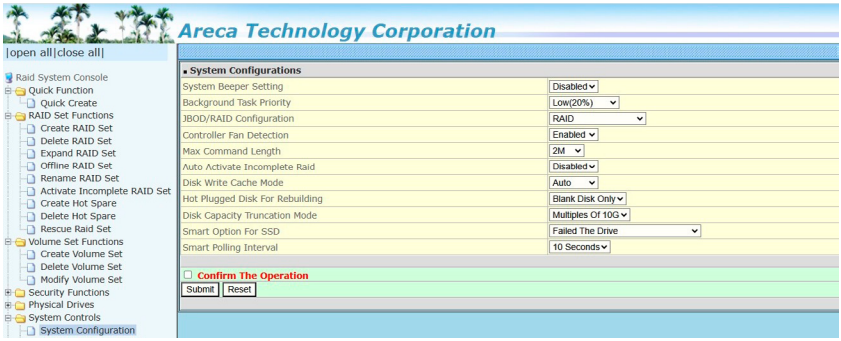
To prevent removing the wrong drive, the selected disk fault LED indicator will light for physically locating the selected disk when the "Identify Selected Device" is selected.



5.5 System Controls

5.5.1 System Config

To set the Switch system function, move the cursor to the main menu and click on the "System Controls" link. The "Raid System Function" menu will show all items, and then select the desired function.



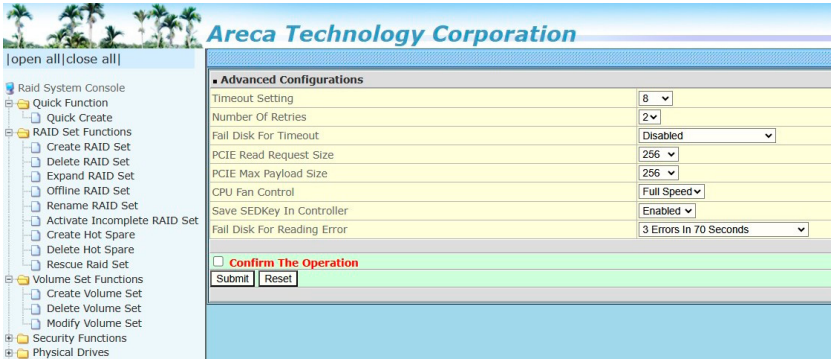
- **System Beeper Setting**
  The "System Beeper Setting" function is used to "Disabled" or "Enabled" the NVMe switch adapter alarm tone generator.

- **Controller Fan Detection**
  The ARC-1389-8N incorporate one big passive heatsink attaching two active cooling fans that allow the hot devices such as a PCIe switch and NVMe drives to keep cool. In addition, newer systems already have enough air flow blowing over the adapter. If the systems have provided enough adequate cooling for PCIe switch and NVMe drives, user can remove the attaching fan on the big passive heat sink.

  The "CPU Fan Detection" function is available in the firmware for detecting the cooling fan function on the PCIe switch. When using the passive heatsink on the adapter, disable the "Controller Fan Detection" function through this from McBIOS switch setup utility setting or Web Browser.

5.5.2 Advanced Configuration

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



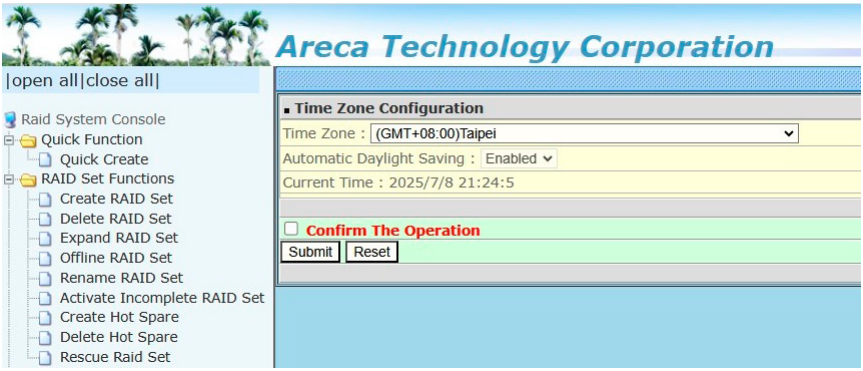
- **Controller Fan Control**
  You can select "Full Speed" or "Auto" to control Switch adapter Fan.

  - **Full Speed** : CPU fan always run at full speed.

  - **Auto** : Switch adapter automatically adjust fan speed based on the current temperature of Switch adapter.

5.5.3 Time Zone Configuration

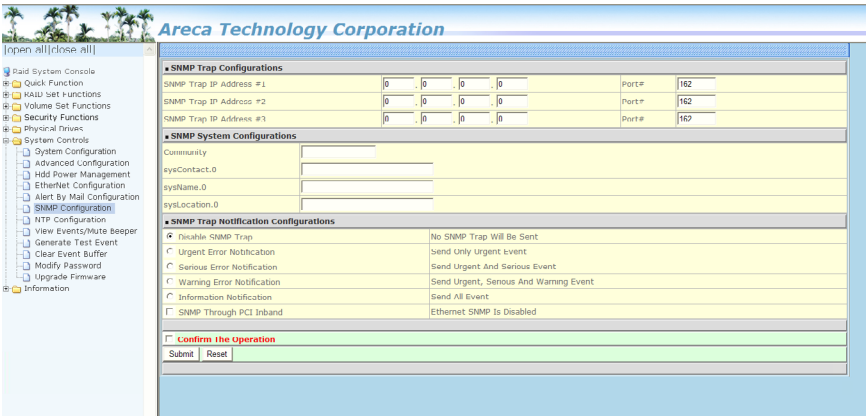
Set of rules that dictates the offset of the user's local time from Universal Coordinated Time (UTC).



- **Time Zone**
  Time Zone conveniently runs in the system tray and allows you to easily view the date and time in various locations around the world. You can also quickly and easily add your own personal locations to customize time zone the way you want.
- **Automatic Daylight Saving**
  Automatic Daylight Saving will normally attempt to automatically adjust the system clock for daylight saving changes based on the computer time zone. This tweak allows you to disable the automatic adjustment.

5.5.4 SNMP Configuration

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



1. **SNMP Trap Configurations**
   Enter the SNMP trap IP address.

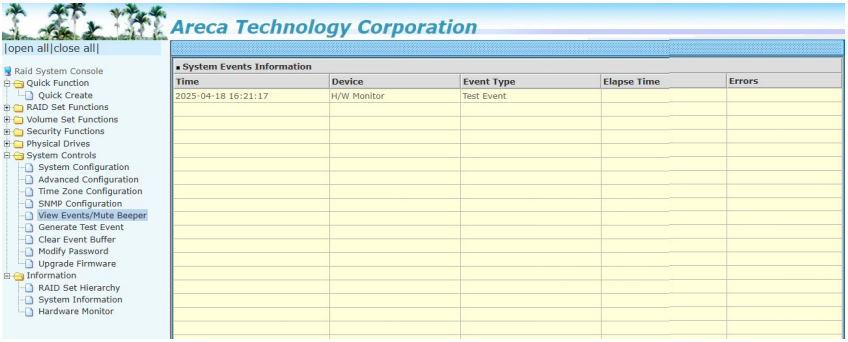
2. **SNMP System Configurations**
   Community name acts as a password to screen accesses to the SNMP agent of a particular network device. Type the community names of the SNMP agent in this field. Most network devices use “public” as default of their community names. This value is case-sensitive.

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

   The MIBs file can download from https://www.areca.com.tw. Each switch adapter needs to have its own MIBs file. Areca provide 4 adapters MIBs file for users. User can request it if more adapters install on one syste

5.5.5 View Events/Mute Beeper

To view the NVMe switch adapter's event information, click on the "View Event/Mute Beeper" link. The NVMe switch adapter "System events Information" screen appears. The mute beeper function automatically enable by clicking on "View Events/Mute Beeper". Select this option to view the system events information: Time, Device, Event Type, Elapse Time and Errors. The switch adapter does not have a built-in real time clock. The time information is the relative time from the system time setting. The maximum event no. is 256 per adapter.



5.5.6 Generate Test Event

Use this feature to generate events for testing purposes.

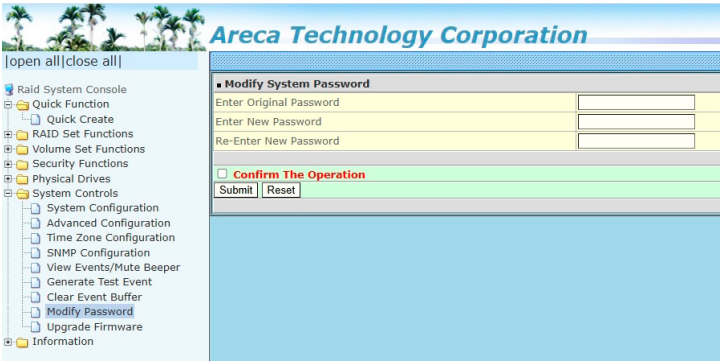
5.5.7 Clear Events Buffer

Use this feature to clear the entire events buffer.

5.5.8 Modify Password

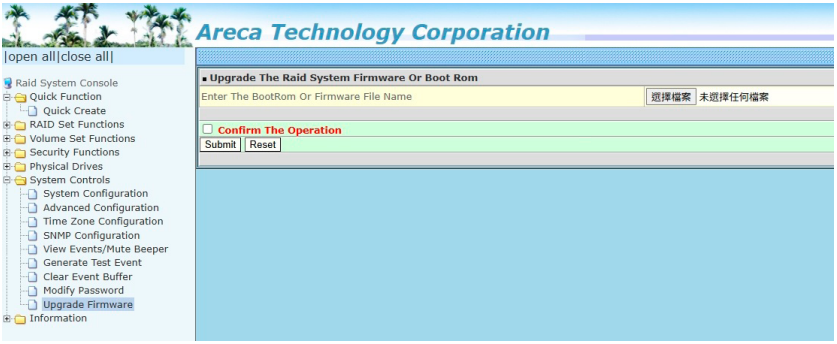
To set or change the NVMe switch adapter password, select "System Controls" from the menu and click on the "Modify Password" link. The "Modify System Password" screen appears.The password option allows user to set or clear the password protection feature. **The manufacture default password is set to 0000.**

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



5.5.9 Update Firmware

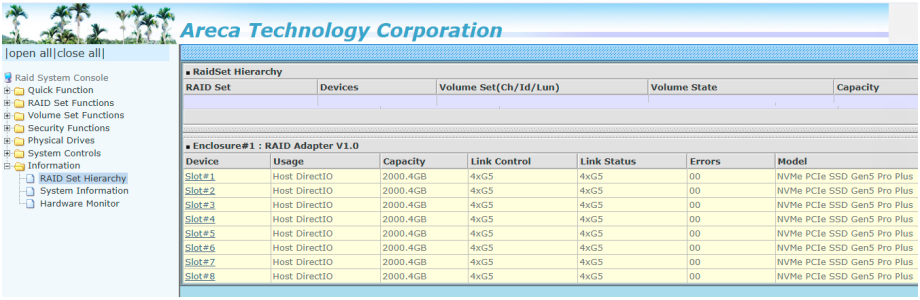
Please refer to the appendix A "Upgrading Flash ROM Update Process".



5.6 Information

5.6.1 Raid Set Hierarchy

Use this feature to view the NVMe switch adapter current physical disk information. The Usage and model are also shown in this screen.



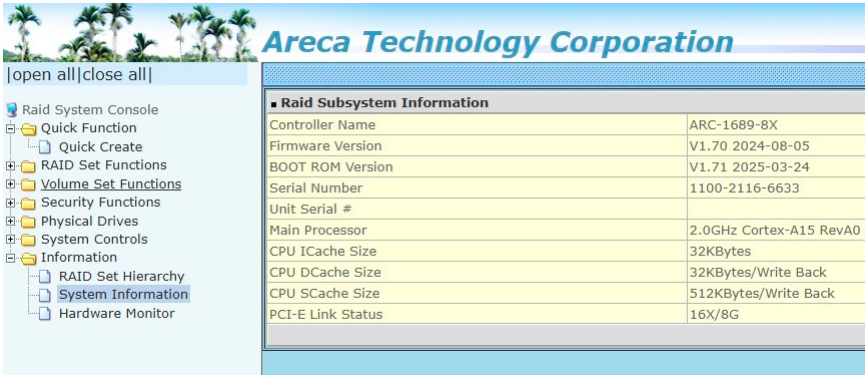
- **Device & Slot Signal Integrity Inforamtion**

  The “Raid Set Hierarchy ” menu will show all items, and then select the “Device” item. This area can view the RAID adapter adapter current physical device information and slot signal integrity status. The firmware can monitor and check the current attached device status. It includes slot control capabilities, slot link status, transaction error count reports and device information. A error count refers to the number of bit errors detected by the physical laye transceivers within the PCIe switch. These errors can be correctable, where the system can recover without data loss or intervention, or uncorrectable, which negatively impact the interface’s function and a high rate can indicate underlying signal integrity issues that may impact performance (latency,bandwidth) or system failures.

5.6.2 System Information

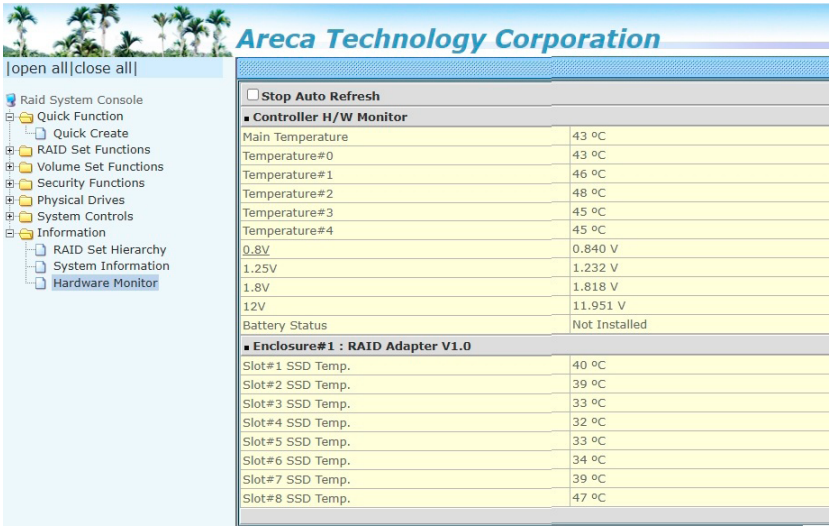
To view the NVMe switch adapter’s system information, move the mouse cursor to the main menu and click on the “System Information” link. The NVMe switch adapter “RAID Subsystem Information” screen appears. Use this feature to view the NVMe switch adapter’s system information. The adapter name, adapter

firmware version, Boot ROM version, serial number, main processor, CPU instruction/data cache size, and PCI-E link status appear in this screen.



5.6.3 Hardware Monitor

Provides the PEX89048 switch chip temperature (Main Temperature and Temperature#0~4), Voltage, ARC-1689-CBM status and installed NVMe SSD temperature and of the NVMe RAID adapter on this screen.



APPENDIX

Appendix A

Upgrading Flash ROM Update Process

A-1 Overview

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

ARC1389UEFI.BIN:→ An EFI shell and home brewed small application
ARC1389BOOT.BIN :→ switch adapter hardware initialization
ARC1389FIRM.BIN :→ management kernel program

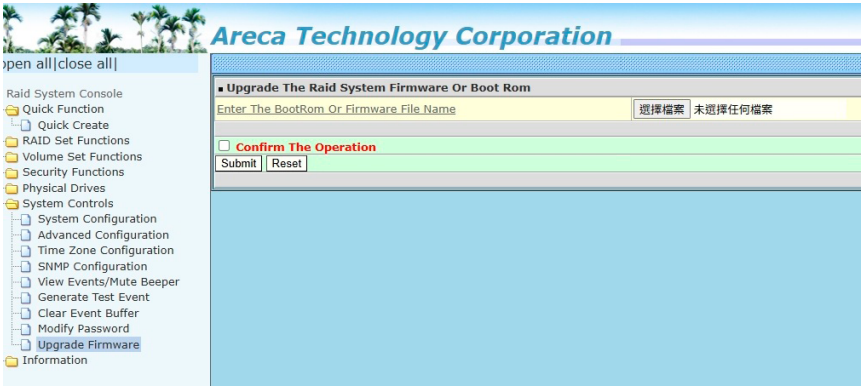
Release_note_version-date.TXT contains the history information of the software code change in the main directory. This file can download from **https://www.areca.com.tw/support/downloads.html** page. Read this file first to make sure you are upgrading to the proper binary file. Select the right file for the upgrade. Normally, user upgrades the ARC1389FIRM.BIN for management function. All these files in the firmware package are a part of the firmware. You should update all files in the package, no special update order needed. New firmware works after a system restart not instantant available, so you can update all files before restart the system. The adapter firmware is independent of the array, update firmware does not touch anything you stored in the array.

Note:

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

A-2 Upgrading Firmware Through Switch Storage Manager

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



1. To upgrade the NVMe switch adapter firmware, move the mouse cursor to "Upgrade Firmware" link. The "Upgrade The Switch System Firmware or Boot Rom" screen appears.

2. Click on "Browse". Look in the location to which the Firmware upgrade software was downloaded. Select the file name and click on "Open".

3. Tick on "Confirm The Operation" and press the "Submit" button.

4. The web browser begins to download the firmware binary to the adapter and start to update the flash ROM.

5. After the firmware upgrade is complete, a bar indicator will show "Firmware Has Been Updated Successfully".

6. After the new firmware package completes downloading, find a chance to restart the adapter/computer for the new firmware to take effect.

The web browser-based switch storage manager can be accessed through the in-band PCIe bus. The in-band method uses the ArcHTTP proxy server to launch the switch storage manager.

A-3 Upgrading Firmware Through nflash DOS Utility

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

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

```
A:\nflash
Raid Controller Flash Utility
V1.61 2022-02-24
Command Usage:
NFLASH FileName
NFLASH FileName /cn --> n=0,1,2,3 write binary to adapter#0
FileName May Be ARC1389FIRM.BIN or ARC1389*
For ARC1686* Will Expand To ARC1389BOOT /FIRM/BIOS.BIN

A:\>nflash arc138~1.bin
Raid Controller Flash Utility
V1.61 2022-02-24
MODEL : ARC-1389-8N
MEM FE620000 FE7FF000
File ARC168~1.BIN : >>*** => Flash 0K
```

A-4 Upgrading Firmware Through CLI

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

To update the adapter firmware, follow the procedure below:

```
Parameter:<path=<PATH_OF_FIRMWARE_FILE>>
Fn: Firmware Updating.
Ex: Update Firmware And File Path Is In [C:\FW\ARC1389FIRM.BIN.]
Command: sys updatefw path=c:\fw\arc1389firm.bin [Enter]
```

Appendix B

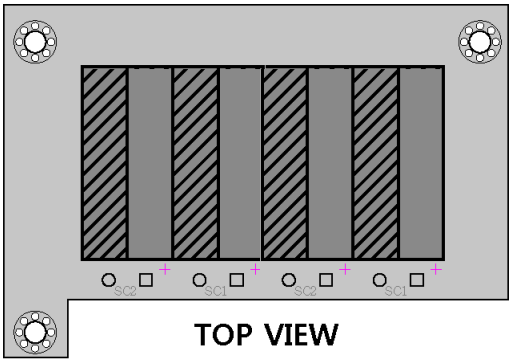
Cache Backup Module (ARC-1689-CBM)

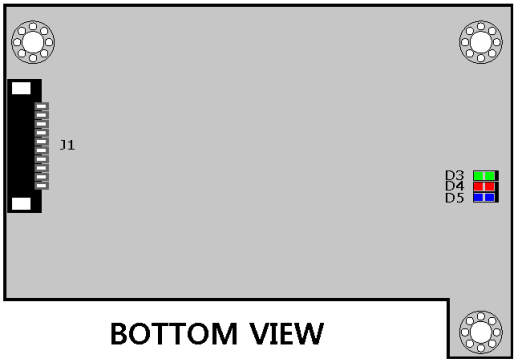
B-1 Overview

The ARC-1689-CBM kit includes the supercapacitor backup module (CBM), and one cable. The CBM features controller circuit and supercapacitor technology that provides NVMe internal cache offload capability to protect internal cached data in case of system power loss. The ARC-1689-CBM module is mounted supercapacitor pack that provides power for the backup of your NVMe data. ARC-1389-8N switch adapter off module power loss protection (PLP) is optimized for datacenter environments. Its efficient PLP typically applies the capacitors on the NVMe SSD to provide hold-up power until the data is flushed from the NVMe internal DRAM to the NAND flash upon a sudden power off or any failure condition occurrence. ARC-1689-CBM (optional) module support the supercapacitor to provide off module hold-up power, eliminating the need for capacitors on the NVMe SSDs which helps reduce cost. The module attaches directly to the NVMe switch adapter by the cable.

B-2 CBM Components

The following figure provides the board layout and connector/jumper of the CBM.





Components	Description	Type
1. (J1)	BBM (Cache Backup Module for NVMe SSD)	10-pin Right Angle Box Header
2. (D3,D4,D5)	Refer "B-4 Status of CBM"	Status LED

Table B-1, ARC-1689-CBM Components

B-3 CBM Outline

The following figures provide the upper and top view of the CBM using supercapacitor.

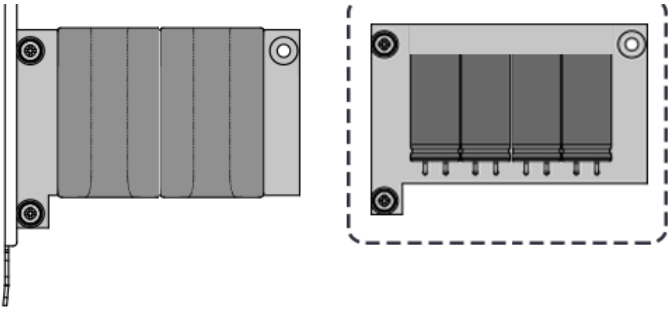


Figure B-1, ARC-1689-CBM (top view)

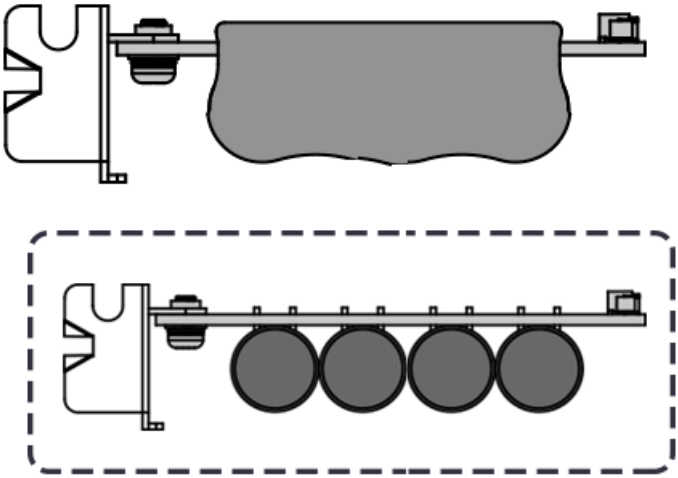


Figure B-2, ARC-1689-CBM (upper view)

B-4 Status of CBM

The following table provides the LED status of the CBM.

D3 (Green)	Status
On	Power On
Off	Power Off

D4 (Red)	Status
Normal	Off
Fail	Quick Flash 10Hz
Calibration	Slow Flash 1Hz
Need Replace	On

D5 (Blue)	Status
Charge	Quick Flash 1Hz
Charge-Done	On
Discharge	Slow Flash 10Hz

Table B-2, ARC-1689-CBM LED Status

Note:

The CBM status will be shown on the web browser of "Hardware Monitor Information" screen.

B-5 Installation

Follow these steps to attach the cache backup module to the ARC-1389-8N switch adapter.

1. Turn off the system power, and unplug the power cords.

2. Remove the mounting screw and existing bracket from the rear panel behind the selected PCIe slot.

3. Insert the CBM in the PCIe slot and press down gently, but firmly, to ensure that the card is properly seated in the slot.

4. Screw the bracket into the computer chassis.

5. Remove the cable that is included in the ARC-1689-CBM kit box. The cable has a 10-pin connector on both ends.

6. Insert one end of the cable into the 10-pin cable connector on the ARC-1389-8N NVMe switch adapter and the other end into the 10-pin J1 cable connector on the ARC-1689-CBM with supercapacitor packs, as shown in below figure.

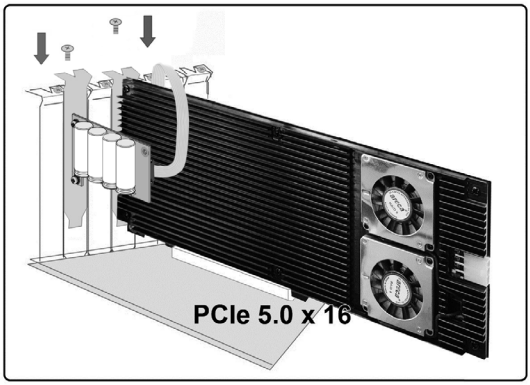


Figure B-3, ARC-1689-CBM Installation

Note:

1. Low profile bracket also provided.
2. The CBM will occupy one PCI slot on the host backplane.

B-6 Capacitor Backup Module Capacity

The CBM backup capacity is defined as the maximum duration of a power failure for which data in the cache memory can be written into the flash on NVMe module. The CBM can support memory chips that installed on the NVMe module.

B-7 Operation

1. There are no manual procedures for CBM conditioning or pre conditioning to be performed by the user.
2. No further power is required once the supercapacitor is fully charged.

B-8 CBM Functionality Test Procedure:

1. Writing amount of data into adapter device, about 5GB or bigger.
2. Power failed system by remove the power cable.
3. Power on system.Launch the web browser-based switch storage manager to check the power loss event. 'Information' > 'Switch Set Hierarchy' > 'Device Information' > 'Unsafe Shutdowns')

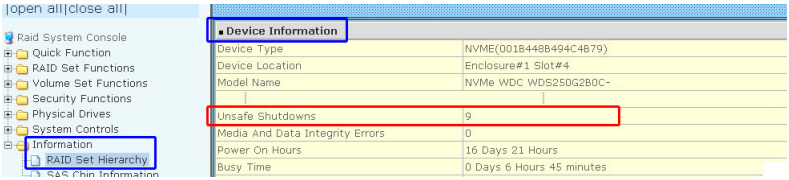


Figure B-4, Unsafe Shutdowns Count

B-9 CBM Specifications

Mechanical
- Module Dimension (W x H x D): 50 x 14.1 x 46 mm
- CBM Connector (J1): (1*10) box header

Environmental
- Operating Temperature: 0°C to +50°C

APPENDIX

Appendix C

Event Notification Configurations

The adapter classifies disk array events into four levels depending on their severity. These include level 1: Urgent, level 2: Serious, level 3: Warning and level 4: Information. The level 4 covers notification events such as initialization of the adapter; Level 2 covers notification events which once have happen; Level 3 includes events which require the issuance of warning messages; Level 1 is the highest level, and covers events that need immediate attention (and action) from the administrator. The following lists sample events for each level:

A. Device Event

Event	Level	Meaning	Action
Device Failed(SMART)	Urgent	M.2 NVMe SMART failure	Replace M.2 NVMe

B. Hardware Monitor Event

Event	Level	Meaning	Action
Controller Over Temperature	Urgent	Abnormally high temperature detected on adapter	Check air flow and cooling fan of the enclosure, and contact us.
Hdd Over Temperature	Urgent	Abnormally high temperature detected on NVMe	Check air flow and cooling fan of the enclosure.
Fan Failed	Urgent	Cooling Fan # failure or speed below 1700RPM	Check cooling fan of the enclosure and replace with a new one if required.
Controller Temp. Recovered	Serious	Controller temperature back tonormal level	
Hdd Temp. Recovered	Serious	NVMe temperature back tonormal level	
Raid Powered On	Warning	Switch adapterpower on	
Test Event	Urgent	Test event	
Power On With Battery Backup	Warning	Switch power on with battery backuped	
HTTP Log In	Serious	a HTTP login detected	
API Log In	Serious	a API login detected	

APPENDIX

Appendix D

High Reliability

• Hard Drive Failure Prediction

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

The S.M.A.R.T can often predict a problem before failure occurs. The adapters will recognize a S.M.A.R.T error code and notify the administer of an impending hard drive failure.

Data Protection

• Off Module Power (OMP) Loss Protection

The switch adapters are armed with a Off Module Power (OMP) Loss Protection. An enterprise storages need to ensure data integrity in the event of power losses and system crashes. The Power Loss Protection (PLP) is a hardware and firmware solution on the ARC-1389-8N switch adapter to ensure that the NVMe SSDs integrity is maintained should a power loss event occur. While a Uninterruptible Power Supply (UPS) protects most servers from power fluctuations or failures, a Off Module Power (OMP) Loss Protection pro-vides an additional level of protection. In the event of a power failure, a Off Module Power (OMP) Loss Protection supplies power for the backup of your data in the NVMe cache, thereby permitting any potentially dirty data in the cache to be flushed out to NAND flash in the NVMe when power is restored.

The supercapacitor in the controller are recharged continuously through a trickle-charging process whenever the system power is on. When the controller detects loss of power, the supercapacitor keeps parts of the switch adapter active long enough to allow cache data to be copied to the flash memory available on the NVMe.

- **Recovery ROM**

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