

**Installation and User's Guide**  
**Microsemi Adaptec HBA 1000 Series Host Bus**  
**Adapters**

Released  
June 2017



## Revision History

Issue	Issue Date	Details of Change
1-3	Aug/Sept/Oct 2015	Pre-production releases.
4	December 2015	First Production release.
5	March 2016	V1.1.0 Beta Release.
6	April 2016	V1.1.0 Production Release RTP.
7	September 2016	V1.2.0 Production Release RTP; fix connector info on HBA-1000 16i/8i board diagrams to match PCB silkscreen notation; add 16i bay mapping; remove DKMS driver installs, refer to Readme.
8	June 2017	Updated for 1.4 maintenance release.

# Contents

---

Microsemi Adaptec® Product Support.....	7
Limited 3-Year Hardware Warranty.....	8
Regulatory Compliance Statements.....	9
<b>1 About This Guide.....</b>	<b>12</b>
1.1 What You Need to Know Before You Begin.....	12
1.2 Terminology Used in this Guide.....	12
1.3 How to Find More Information.....	12
<b>2 Kit Contents and System Requirements.....</b>	<b>13</b>
2.1 Kit Contents.....	13
2.2 System Requirements .....	13
<b>3 About Your Host Bus Adapter .....</b>	<b>14</b>
3.1 Standard Features.....	14
3.2 Mechanical Information .....	14
3.2.1 Board Dimensions.....	14
3.2.2 Heat Sink.....	14
3.3 Visual Indicators.....	15
3.4 About the Microsemi Adaptec HBA 1000-8i.....	16
3.5 About the Microsemi Adaptec HBA 1000-8e.....	17
3.6 About the Microsemi Adaptec HBA 1000-16e.....	18
3.7 About the Microsemi Adaptec HBA 1000-8i8e.....	19
3.8 About the Microsemi Adaptec HBA 1000-16i.....	20
<b>4 Installing the Controller and Disk Drives.....</b>	<b>21</b>
4.1 Before You Begin.....	21
4.2 Selecting Disk Drives and Cables .....	21
4.2.1 Disk Drives.....	21
4.2.2 Cables.....	21
4.3 Installing the Host Bus Adapter.....	22
<b>5 Installing the Driver and an Operating System .....</b>	<b>24</b>
5.1 Download the Driver Package.....	24
5.2 Creating a Driver Disk.....	24
5.3 Installing with Windows .....	25
5.4 Installing with Red Hat Linux, or CentOS, or Oracle Linux.....	25
5.5 Installing with SuSE Linux Enterprise Server .....	25
5.6 Installing with Ubuntu Linux.....	26
5.7 Installing with VMware .....	27
5.8 Installing with Citrix XenServer .....	28
<b>6 Installing the Driver on an Existing Operating System .....</b>	<b>29</b>
6.1 Download the Driver Package.....	29
6.2 Creating a Driver Disk.....	29
6.3 Installing on Windows .....	30

6.4	Installing on Red Hat, CentOS, or SuSE Linux.....	30
6.5	Installing on Oracle Linux.....	31
6.6	Installing on Ubuntu Linux.....	31
6.7	Installing on VMware.....	32
6.8	Installing on Citrix XenServer.....	33
<b>7</b>	<b>Installing Dynamic Kernel Module Support.....</b>	<b>34</b>
7.1	Installing the DKMS Deb Package on Ubuntu Systems.....	34
7.2	.....	34
7.3	DKMS Reference.....	34
<b>8</b>	<b>Solving Problems .....</b>	<b>36</b>
8.1	Troubleshooting Checklist.....	36
8.2	Resetting the Adapter .....	36
<b>Appendix A</b>	<b>Using the SAS/SATA Configuration Utility.....</b>	<b>37</b>
A.1	Running the SAS/SATA Configuration Utility: Ctrl-A or uEFI/HII? .....	37
A.2	Modifying RAID controller Settings .....	38
A.3	Clearing the Controller Configuration.....	40
A.4	Viewing Disk Drive Properties.....	40
A.5	Updating the RAID controller Firmware.....	40
<b>Appendix B</b>	<b>Driver Event Logging on Windows and Linux.....</b>	<b>42</b>
<b>Appendix C</b>	<b>Safety Information.....</b>	<b>44</b>
C.1	Electrostatic Discharge (ESD).....	44
<b>Appendix D</b>	<b>Technical Specifications.....</b>	<b>45</b>
D.1	Environmental Specifications.....	45
D.2	DC Power Requirements.....	45
D.3	Current and Power Requirements .....	45

## List of Figures

---

Figure 1 • HBA 1000 Status LEDs.....	15
--------------------------------------	----

## List of Tables

---

Table 1 • Board Dimensions .....	14
Table 2 • Status LEDs .....	15
Table 3 • HBA 1000-16i Bay Mapping .....	20
Table 4 • Windows Driver Initialization Failure Events .....	42
Table 5 • Linux Driver Initialization Failure Events .....	42

## Microsemi Adaptec® Product Support

---

If you have questions about installing or using your Microsemi Adaptec® product, check this document first—you will find answers to most of your questions. If you need further assistance, use the support options listed below. To expedite your service, have your computer in front of you.

**Note:** Please visit the Support section of [www.adaptec.com](http://www.adaptec.com) for the most up to date contact information.

### Self Help and Support in English

- Visit our Web site at [www.adaptec.com](http://www.adaptec.com).
- Search the Adaptec Support Knowledgebase (ASK) at [ask.adaptec.com](http://ask.adaptec.com) for articles, troubleshooting tips, and frequently asked questions for your product.
- For support through email, submit your question at [ask.adaptec.com](mailto:ask.adaptec.com).
- To contact Technical Support, visit our product support site at [storage.microsemi.com/en-us-support/](http://storage.microsemi.com/en-us-support/).

### Technische Informationen und Support in Deutsch

- Besuchen Sie unsere Webseite [www.adaptec.com/de-de](http://www.adaptec.com/de-de)
- Suchen Sie in der Adaptec Support Knowledgebase (ASK) unter [ask-de.adaptec.com](http://ask-de.adaptec.com) nach Artikeln, Tipps zur Fehlerbehebung und häufig gestellten Fragen zu Ihrem Produkt.
- Support per Email erhalten Sie unter [ask-de.adaptec.com](mailto:ask-de.adaptec.com).
- Um den Technischen Support zu kontaktieren, besuchen Sie uns bitte unter [start.microsemi.com](http://start.microsemi.com) und klicken Sie auf „Support kontaktieren“, für Auswahlmöglichkeiten.

### Техническая поддержка и информация на русском языке

- Посещаете наш сайт [www.adaptec.com/ru-ru/](http://www.adaptec.com/ru-ru/).
- База знаний Adaptec (ASK) на сайте [ask-ru.adaptec.com](http://ask-ru.adaptec.com) ask-ru.adaptec.com – статьи, советы по устранению неисправностей и часто задаваемые вопросы о Вашем продукте.
- Для поддержки по электронной почте отправьте Ваш запрос на сайте [ask-ru.adaptec.com](mailto:ask-ru.adaptec.com)
- Для обращения в службу Технической Поддержки, пожалуйста, посетите наш web сайт [start.microsemi.com](http://start.microsemi.com) и используйте ссылку "Contact Support".

### 日本語での技術情報とサポート

- 弊社のウェブサイト、[www.adaptec.com/ja-jp](http://www.adaptec.com/ja-jp) をご覧ください。
- [ask.adaptec.co.jp](http://ask.adaptec.co.jp) のAdaptec Support Knowledgebase (ASK)で、お使いの製品の情報、トラブルシューティングのヒント、よくある質問を検索してください。
- Eメールでのサポートには [ask.adaptec.co.jp](mailto:ask.adaptec.co.jp) から質問を送ってください。
- テクニカルサポートへコンタクトするには、弊社ウェブサイト[start.microsemi.com](http://start.microsemi.com)をご覧ください、"Contact Support"をクリックして下さい。

## Limited 3-Year Hardware Warranty

---

1. Microsemi Corporation (“Microsemi”) warrants to the purchaser of this product that it will be free from defects in material and workmanship for a period of three (3) years from the date of purchase. If the product should become defective within the warranty period, Microsemi, at its option, will repair or replace the product, or refund the purchaser's purchase price for the product, provided it is delivered at the purchaser's expense to an authorized Microsemi service facility or to Microsemi.
2. Repair or replacement parts or products will be furnished on an exchange basis and will either be new or reconditioned and will be subject to original warranty term. All replaced parts or products shall become the property of Microsemi. This warranty shall not apply if the product has been damaged by accident, misuse, abuse or as a result of unauthorized service or parts.
3. Warranty service is available to the purchaser by delivering the product during the warranty period to an authorized Microsemi service facility or to Microsemi and providing proof of purchase price and date. The purchaser shall bear all shipping, packing, and insurance costs and all other costs, excluding labor and parts, necessary to effectuate repair, replacement or refund under this warranty.
4. For more information on how to obtain warranty service, click on the Services & Support link at [microsemi.com](http://microsemi.com).
5. THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCT WHICH HAS BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE, OR AS A RESULT OF UNAUTHORIZED SERVICE OR PARTS.
6. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES WHICH NOW OR HEREAFTER MIGHT OTHERWISE ARISE RESPECT TO THIS PRODUCT. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT SHALL (A) HAVE NO GREATER DURATION THAN 3 YEARS FROM THE DATE OF PURCHASE, (B) TERMINATE AUTOMATICALLY AT THE EXPIRATION OF SUCH PERIOD AND (C) TO THE EXTENT PERMITTED BY LAW BE EXCLUDED. IN THE EVENT THIS PRODUCT BECOMES DEFECTIVE DURING THE WARRANTY PERIOD, THE PURCHASER'S EXCLUSIVE REMEDY SHALL BE REPAIR, REPLACEMENT OR REFUND AS PROVIDED ABOVE. INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOSS OF DATA, ARISING FROM BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ARE NOT THE RESPONSIBILITY OF MICROSEMI AND, TO THE EXTENT PERMITTED BY LAW, ARE HEREBY EXCLUDED BOTH FOR PROPERTY DAMAGE, AND TO THE EXTENT NOT UNCONSCIONABLE, FOR PERSONAL INJURY DAMAGE.
7. WITHIN THE US, SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, AND SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION OR EXCLUSIONS MAY NOT APPLY TO YOU.
8. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY DEPENDING ON WHERE YOU RESIDE.
9. FOR AUSTRALIA RESIDENTS, IF THE PRODUCT SHOULD BECOME DEFECTIVE WITHIN THE WARRANTY PERIOD, MICROSEMI, AT ITS OPTION, WILL REPAIR OR REPLACE THE PRODUCT, OR REFUND THE PURCHASER'S PURCHASE FOR THE PRODUCT, PROVIDED IT IS DELIVERED AT THE PURCHASER'S EXPENSE BACK TO THE PLACE OF PURCHASE AFTER MICROSEMI TECHNICAL SUPPORT HAS ISSUED AN INCIDENT NUMBER. IN ADDITION TO THE WARRANTIES SET FORTH HEREIN, OUR GOODS COME WITH GUARANTEES THAT CANNOT BE EXCLUDED UNDER THE AUSTRALIAN CONSUMER LAW. YOU ARE ENTITLED TO A REPLACEMENT OR REFUND FOR A MAJOR FAILURE AND FOR COMPENSATION FOR ANY OTHER REASONABLY FORESEEABLE LOSS OR DAMAGE. YOU ARE ALSO ENTITLED TO HAVE THE GOODS REPAIRED OR REPLACED IF THE GOODS FAIL TO BE OF ACCEPTABLE QUALITY AND THE FAILURE DOES NOT AMOUNT TO A MAJOR FAILURE.



## Regulatory Compliance Statements

### Federal Communications Commission Radio Frequency Interference Statement

**Attention:** Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 harmful 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 instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.
- Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

### UL Compliance Statement



Microsemi Adaptec products are tested and listed by Underwriters Laboratories, Inc. to UL 60950-1 Second Edition and IEC-60950-1 Second Edition standards, file numbers E175975. Microsemi Adaptec products are for use only with UL listed ITE.

Microsemi Corporation


**Use only with the listed ITE:**

Microsemi Adaptec HBA 1000-16i/Microsemi Adaptec HBA 1000-8i8e/  
Microsemi Adaptec HBA 1000-8i/Microsemi Adaptec HBA 1000-8e/  
Microsemi Adaptec HBA 1000-16e

**FC** Tested to Comply  
With FCC Standards

FOR HOME OR OFFICE USE

## European Union Compliance Statement

-  This Information Technology Equipment has been tested and found to comply with EMC Directive 2014/30/EU, in accordance with:
- EN55032 (2014) Emissions:
    - Class B ITE radiated and conducted emissions
  - EN55024 (2010) Immunity:
    - EN61000-4-2 (2009) Electrostatic discharge:  $\pm 4$  kV contact,  $\pm 8$  kV air
    - EN61000-4-3 (2010) Radiated immunity: 3V/m
    - EN61000-4-4 (2012) Electrical fast transients/burst:  $\pm 1$  kV AC,  $\pm 0.5$  kV I/O
    - EN61000-4-5 (2014) Surges:  $\pm 1$  kV differential mode,  $\pm 2$  kV common mode
    - EN61000-4-6 (2014) Conducted immunity: 3 V
    - EN61000-4-11 (2004) Supply dips and variations: 30% and 100%
  - EN50581 (2012) Technical Documentation:
    - For the assessment of electrical and electronic products with respect to the restriction of hazardous substances

In addition, all equipment requiring U.L. listing has been found to comply with EMC Directive 2014/35/EU, in accordance with EN60950 with amendments A1, A2, A3, A4, A11, A12.

## Australian/New Zealand Compliance Statement



This device has been tested and found to comply with the limits for a Class B digital device, pursuant to the Australian/New Zealand standard AS/NZS 3548 set out by the Spectrum Management Agency.

## Canadian Compliance Statement



This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.  
Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## Japanese Compliance (Voluntary Control Council Initiative)



This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use but it may cause radio frequency interference problem if used too near to a television or radio. Please handle it correctly per this documentation.

## Korean Compliance (KCC) Statement



Microsemi Adaptec products are tested and certified by KCC:

MSIP-REM-KHK-1000-8i8e

The above certification covers the following series:

Microsemi Adaptec HBA 1000-16i, Microsemi Adaptec HBA 1000-8i8e,  
Microsemi Adaptec HBA 1000-8i, Microsemi Adaptec HBA 1000-8e,  
Microsemi Adaptec HBA 1000-16e

B급 기기  
(가정용 방송통신기자재)  
Class B Equipment  
(For Home Use Broadcasting & Communication Equipment)  
이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

This equipment is home use (Class B) electromagnetic wave suitability equipment and to be used mainly at home and it can be used in all areas.

# 1 About This Guide

---

This Installation and User's Guide explains how to install and setup your Microsemi® Adaptec® HBA 1000 Series Host Bus Adapter, including driver installation and use of the BIOS-based PMC SAS/SATA Configuration utility. It also provides troubleshooting tips and instructions for flashing the HBA 1000 Series firmware.

These Microsemi Adaptec HBA 1000 Series models are described in this guide:

- Microsemi Adaptec HBA 1000-8i
- Microsemi Adaptec HBA 1000-8e
- Microsemi Adaptec HBA 1000-8i8e
- Microsemi Adaptec HBA 1000-16i
- Microsemi Adaptec HBA 1000-16e

## 1.1 What You Need to Know Before You Begin

This guide is written for data storage and IT professionals who are responsible for installing, configuring, and maintaining HBA 1000 Series Host Bus Adapters in computers or servers in a "cloud" or data center environment. You should be familiar with computer hardware, operating system administration, data storage devices, and SAS and Serial ATA (SATA) technology.

## 1.2 Terminology Used in this Guide

Many of the terms and concepts referred to in this guide are known to computer users by multiple names. This guide uses these terms:

- Host Bus Adapter or HBA (also known as controller, adapter, or I/O card)
- Disk drive (also known as hard disk, hard drive, or hard disk drive)
- Solid State Drive (also known as SSD or non-rotating storage media)
- Enclosure (also known as a storage enclosure, disk drive enclosure, or JBOD)

## 1.3 How to Find More Information

You can find more information about your HBA 1000 Series Host Bus Adapter by referring to these documents, available for download at [start.microsemi.com](http://start.microsemi.com).

- *Microsemi Adaptec Host Bus Adapter 1000 Series Release Notes*—Includes updated product information and known issues and limitations. (PMC-2152169)
- *Microsemi Adaptec Host Bus Adapter 1000 Series Command Line Utility User's Guide*—Describes how to use the ARCCONF utility to perform configuration and storage management tasks from an interactive command line. (PMC-2152156)
- *Microsemi Adaptec HBA 1000 Series Host Bus Adapters Installation and User's Guide* (this manual)—Describes how to install drivers and configure the HBA 1000 Series adapter for initial use. (PMC-2152188)

## 2 Kit Contents and System Requirements

---

This section lists the contents of your Microsemi Adaptec HBA 1000 Series kit and the system requirements for successfully installing and using your HBA.

### 2.1 Kit Contents

- Microsemi Adaptec HBA 1000 Series adapter
- Low-profile bracket

**Note:** The latest firmware, drivers, utilities software, and documentation can be downloaded at [start.microsemi.com](http://start.microsemi.com). For more information, see [Downloading the Driver Package](#) on page 24.

### 2.2 System Requirements

- PC-compatible computer with Intel Pentium, or equivalent, processor
- 4 GB of RAM minimum
- Available compatible PCIe slot (depending on your adapter model—see the descriptions in [About Your Host Bus Adapter](#))
- One of these operating systems:
  - Microsoft® Windows® Server, Windows 10, Windows 8.1, Windows 7
  - Red Hat® Enterprise Linux
  - CentOS
  - SuSE Linux Enterprise Server
  - Ubuntu Linux
  - Oracle Linux
  - Citrix XenServer
  - VMware ESXi

See the *Release Notes* for a complete list of supported OS versions.

- USB flash drive or CD burner, for creating driver disks and bootable media

## 3 About Your Host Bus Adapter

---

This section provides an overview of the features of the Microsemi Adaptec HBA 1000 Series adapter.

### 3.1 Standard Features

- Support for SAS and SATA HDDs, Solid State Drives (SSDs), removable media, and SAS tape drives
- uEFI pre-boot BIOS, CTRL-A configuration utility
- Flash ROM for updates to firmware and BIOS
- up to 16 ports, 12 Gbps I/O
- SAS 3.0, PCIe 3.0
- Low-profile MD2 form factor
- Mini-SAS HD connectors
- Support for disk drive enclosures with SES2 enclosure management hardware
- Thermal sensor with logging capabilities

### 3.2 Mechanical Information

#### 3.2.1 Board Dimensions

This table shows the board dimensions of the Microsemi Adaptec Host Bus Adapter 1000 Series, in inches.

**Table 1 • Board Dimensions**

Dimension	Measure
Height	2.535"
Length	6.60"
PCB Thickness	0.62"
Max Component Height, Top Side	0.570"
Max Component Height, Bottom Side	0.105"

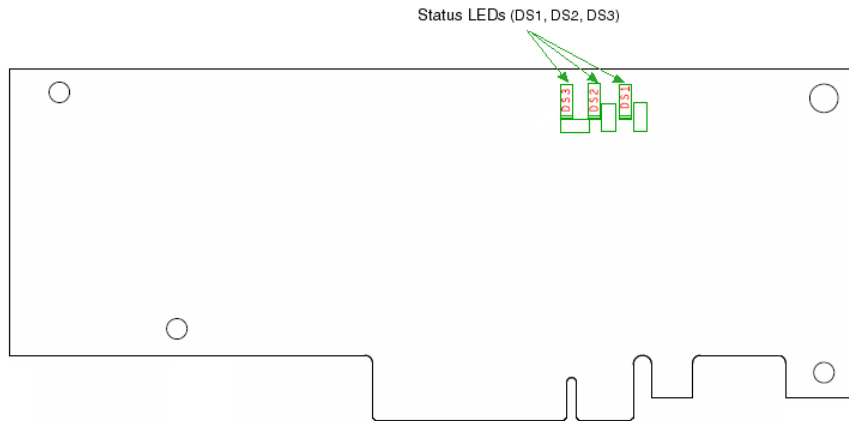
#### 3.2.2 Heat Sink

HBA 1000 Series adapters include a passive heat sink capable of bi-directional airflow. For airflow requirements, see [Environmental Specifications](#) on page 45.

### 3.3 Visual Indicators

HBA 1000 Series adapters include three status LEDs on the back of the printed circuit board (Figure 1 • HBA 1000 Status LEDs). The LEDs signify the status of the actions described in Table 2 • Status LEDs.

**Figure 1 • HBA 1000 Status LEDs**

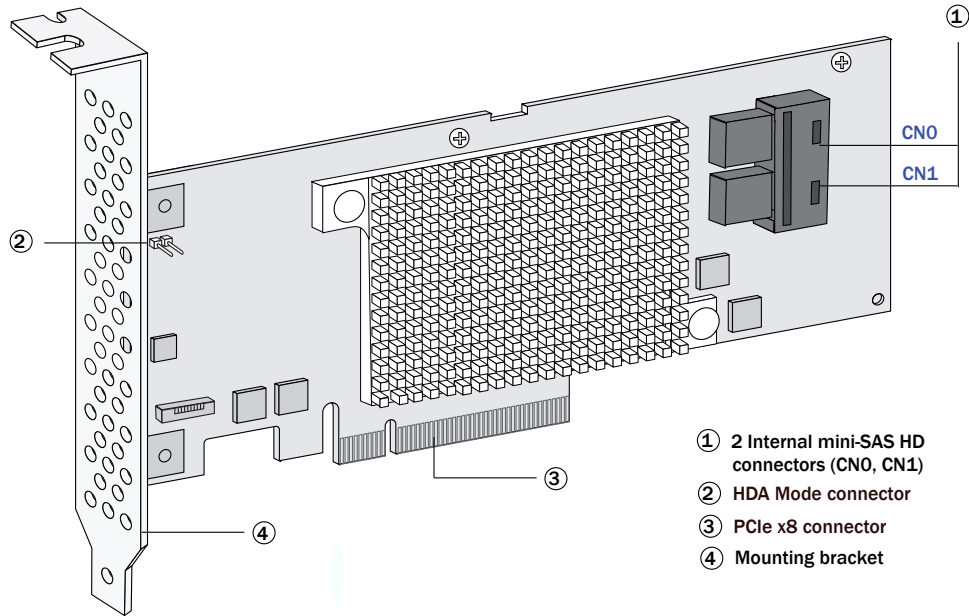


**Table 2 • Status LEDs**

LED	Color	Meaning
DS1	Orange	Unused
DS2	Red/Amber	Lockup/Fault (This LED should be lit only when the firmware hits a lockup)
DS3	Green	Heartbeat (1Hz blinking when firmware operating normally)

### 3.4 About the Microsemi Adaptec HBA 1000-8i

The Microsemi Adaptec HBA 1000-8i is a SAS Host Bus Adapter with these features:

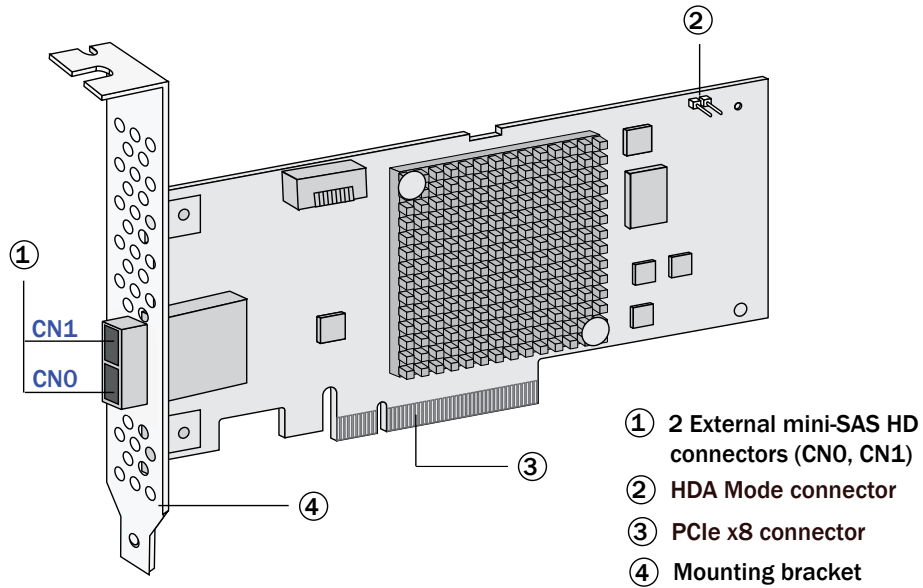


Form Factor	Low-profile MD2
Bus compatibility	PCIe 3.0
PCIe bus width	x8
Data transfer rate	12 Gbps per port
Phys (Unified Serial Ports)	8
Standard memory	16 MB Boot Flash
Connectors, internal	2 mini-SAS HD x4 (SFF-8643)
Maximum number of disk drives	8 direct-attached (or up to 238 with expanders)
Enclosure Support	IBPI and SGPIO
Thermal sensor	Processor temperature



### 3.5 About the Microsemi Adaptec HBA 1000-8e

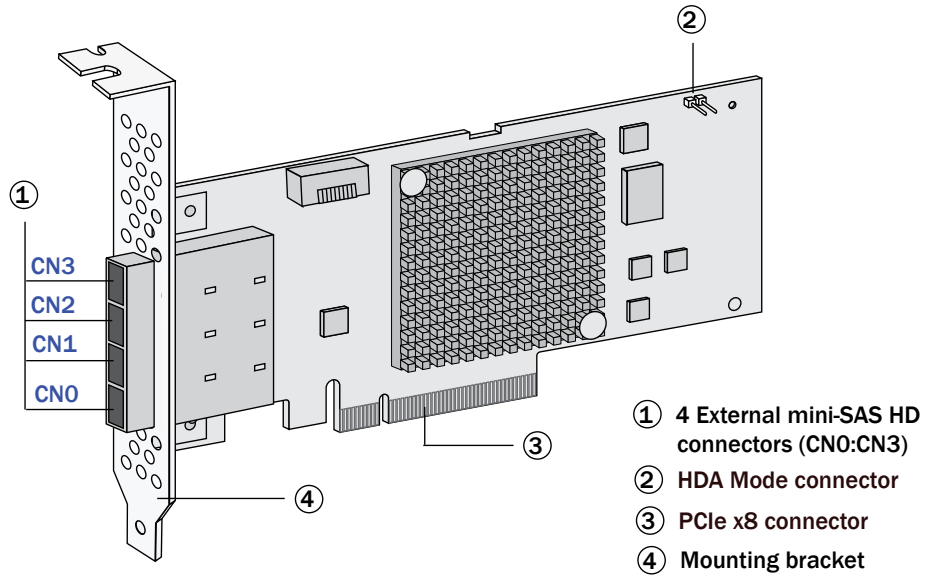
The Microsemi Adaptec HBA 1000-8e is a SAS Host Bus Adapter with these features:



Form Factor	Low-profile MD2
Bus compatibility	PCIe 3.0
PCIe bus width	x8
Data transfer rate	12 Gbps per port
Phys (Unified Serial Ports)	8
Standard memory	16 MB Boot Flash
Connectors, external	2 mini-SAS HD x4 (SFF-8644)
Maximum number of disk drives	8 direct-attached (or up to 238 with expanders)
Enclosure Support	IBPI and SGPIO
Thermal sensor	Processor temperature

### 3.6 About the Microsemi Adaptec HBA 1000-16e

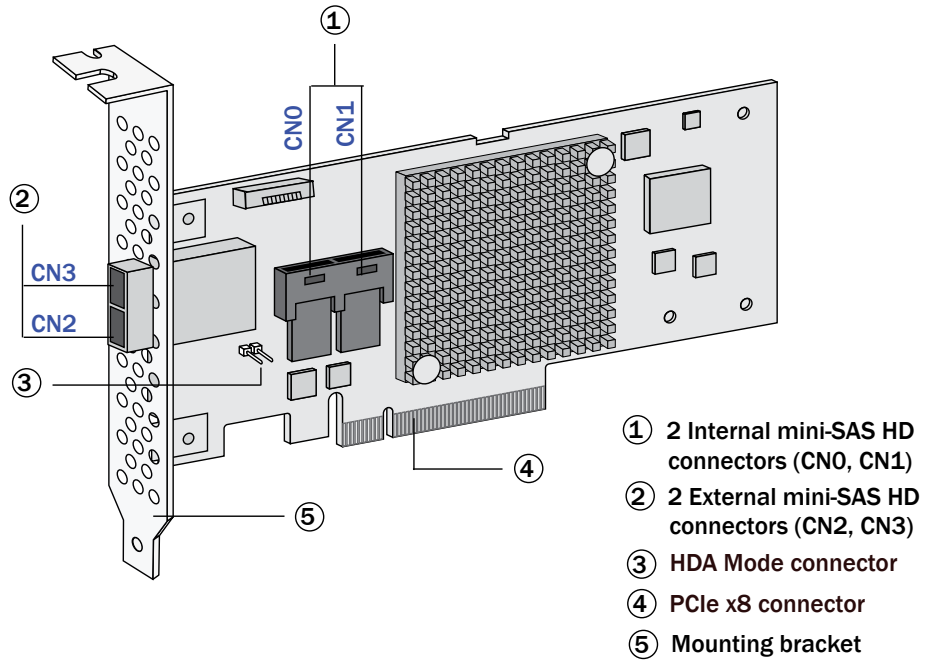
The Microsemi Adaptec HBA 1000-16e is a SAS Host Bus Adapter with these features:



Form Factor	Low-profile MD2
Bus compatibility	PCIe 3.0
PCIe bus width	x8
Data transfer rate	12 Gbps per port
Phys (Unified Serial Ports)	8
Standard memory	16 MB Boot Flash
Connectors, external	4 mini-SAS HD x4 (SFF-8644)
Maximum number of disk drives	16 direct-attached (or up to 238 with expanders)
Enclosure Support	IBPI and SGPIO
Thermal sensor	Processor temperature

### 3.7 About the Microsemi Adaptec HBA 1000-8i8e

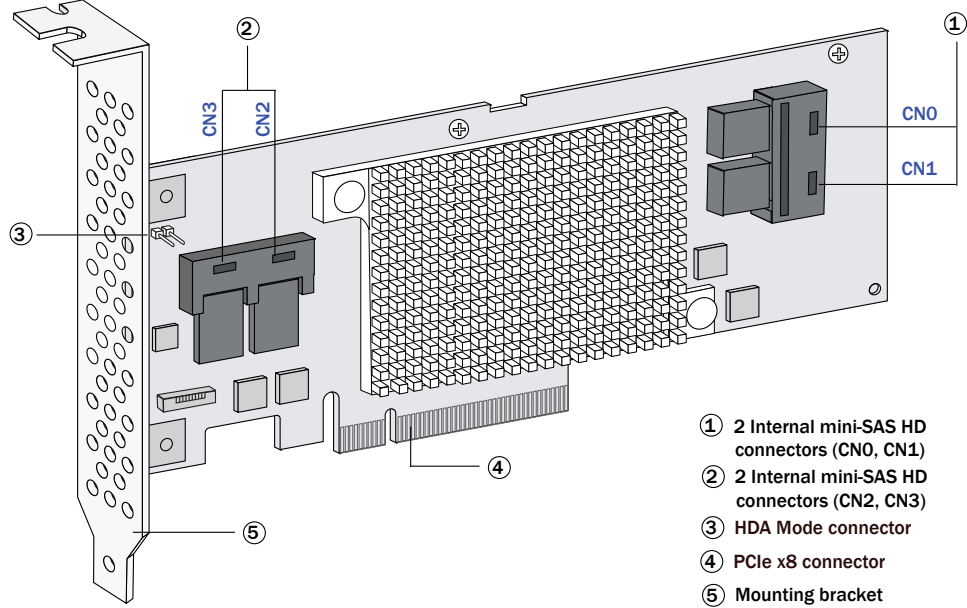
The Microsemi Adaptec HBA 1000-8i8e is a SAS Host Bus Adapter with these features:



Form Factor	Low-profile MD2
Bus compatibility	PCIe 3.0
PCIe bus width	x8
Data transfer rate	12 Gbps per port
Phys (Unified Serial Ports)	16
Standard memory	16 MB Boot Flash
Connectors, internal	2 mini-SAS HD x4 (SFF-8643)
Connectors, external	2 mini-SAS HD x4 (SFF-8644)
Maximum number of disk drives	16 direct-attached (or up to 238 with expanders)
Enclosure Support	IBPI and SGPIO
Thermal sensor	Processor temperature

### 3.8 About the Microsemi Adaptec HBA 1000-16i

The Microsemi Adaptec HBA 1000-16i is a SAS Host Bus Adapter with these features:



Form Factor	Low-profile MD2
Bus compatibility	PCIe 3.0
PCIe bus width	x8
Data transfer rate	12 Gbps per port
Phys (Unified Serial Ports)	16
Standard memory	16 MB Boot Flash
Connectors, internal	4 mini-SAS HD x4 (SFF-8643)
Maximum number of disk drives	16 direct-attached (or up to 238 with expanders)
Enclosure Support	IBPI and SGPIO
Thermal sensor	Processor temperature

**Table 3 • HBA 1000-16i Bay Mapping**

Connector	Bay Mapping
CN1	Bay 13-16
CN0	Bay 9-12
CN2	Bay 5-8
CN3	Bay 1-4

## 4 Installing the Controller and Disk Drives

---

This section explains how to install your Microsemi Adaptec HBA 1000 Series adapter in a computer cabinet or server and connect it to internal and external disk drives.

### 4.1 Before You Begin

- Read [Safety Information](#) on page 44.
- Familiarize yourself with your HBA's physical features (see [Standard Features](#)).
- Ensure that you have the right number of disk drives for your application (see [Selecting Disk Drives and Cables](#) on page 21).

### 4.2 Selecting Disk Drives and Cables

#### 4.2.1 Disk Drives

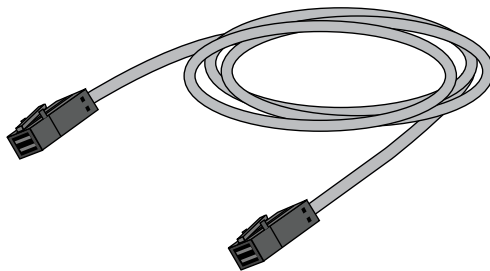
Your Microsemi Adaptec RAID controller supports SAS and SATA disk drives, Solid State Drives (SSDs), and SAS tape drives. For more information about compatible disk drives, refer to [www.adaptec.com/compatibility](http://www.adaptec.com/compatibility).

#### 4.2.2 Cables

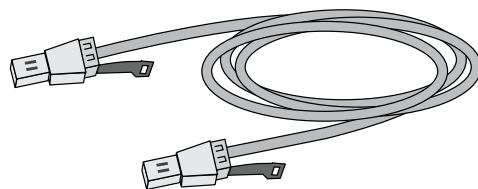
Depending on your HBA model and application requirements, you can use any of the cables listed below. For more information about cabling options for your HBA 1000 series adapter, visit [www.adaptec.com/en-us/products/cables](http://www.adaptec.com/en-us/products/cables).

**Note:** We recommend using Microsemi Adaptec SAS cables only.

#### SAS HD Cables



Internal SAS HD to SAS HD (SFF-8643 to SFF- 8643 )—Connects to a backplane or enclosure.



External SAS HD to SAS HD (SFF-8644 to SFF- 8644 )—Connects to a backplane or enclosure.

## 4.3 Installing the Host Bus Adapter

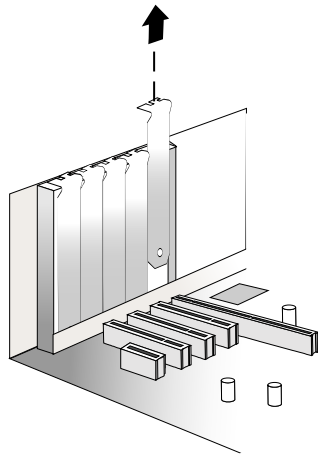
This section describes how to install the HBA 1000 Series adapter into your computer cabinet or server. Microsemi Adaptec HBA 1000 Series adapters have three configurations:

- Adapters with internal connectivity
- Adapters with external connectivity
- Adapters with internal and external connectivity

Follow the steps below to install your HBA and connect internal and external storage devices.

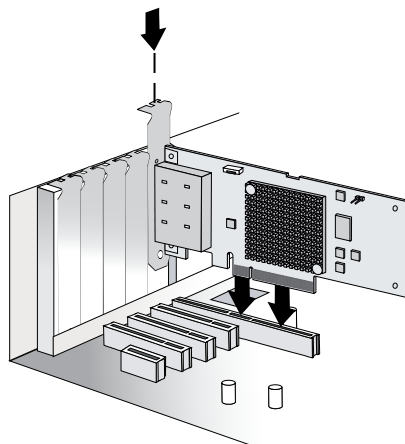
1. Turn off your computer and disconnect the power cord and any network cables. Open the cabinet, following the manufacturer's instructions.
2. Select an available PCIe expansion slot that's compatible with your HBA and remove the slot cover, as shown in the figure below. (To check PCIe bus compatibility of your HBA, see [About Your Host Bus Adapter](#) on page 14.)

**Caution:** Touch a grounded metal object before handling the adapter.

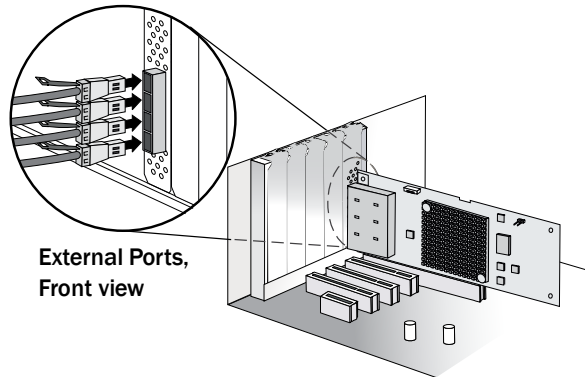


3. Insert the HBA into the expansion slot and press down gently but firmly until it clicks into place. When installed properly, the adapter should appear level with the expansion slot.

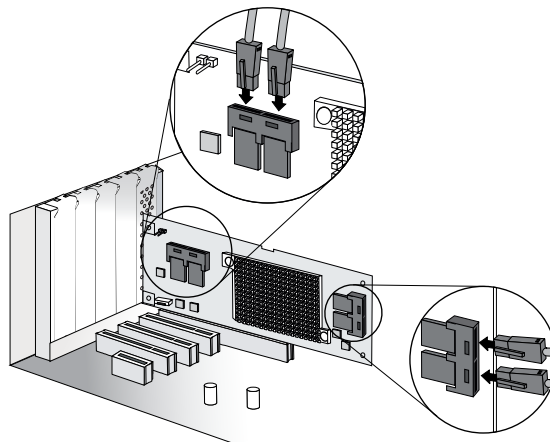
**Caution:** Be sure to handle the adapter by its bracket or edges only. Apply pressure only on the edges when inserting the card into expansion slot.



4. Secure the bracket in the expansion slot, using the retention device (for instance, a screw or lever) supplied with your computer.
5. Connect SAS HD cables between the HBA and internal or external storage devices, as required:
  - For an HBA with external ports, connect SAS HD cables between the HBA and external disk drives or enclosures:



- For an HBA with internal ports, connect SAS HD cables between the HBA and internal disk drives or enclosures:



- For an HBA with with internal and external ports, connect SAS HD cables between the HBA and internal and external disk drives or enclosures.
6. Close your computer cabinet, reconnect the power cord and network cables, then power up the system.

## 5 Installing the Driver and an Operating System

---

This chapter explains how to install the Microsemi Adaptec HBA 1000 Series adapter driver while installing the operating system.

**Note:**

1. To install the driver on an existing operating system, see [Installing the Driver on an Existing Operating System](#) on page 29.
2. To install the Linux drivers from source with Dynamic Kernel Module Support (for persistence across across kernel updates), download the Linux Driver Source Code package from the support page for your product at [start.microsemi.com](http://start.microsemi.com), then follow the instructions in the embedded Readme.

### 5.1 Download the Driver Package

Complete these steps to download the drivers for your operating system(s):

1. Open a browser window, then type `start.microsemi.com` in the address bar.
2. Enter your product or adapter model number, then select HBA 1000.
3. Select your operating system version, for instance, Microsoft Windows Server 2012 x64 or Red Hat Enterprise Linux 7; then select the appropriate driver from the list.
4. Download the HBA 1000 Series driver package.
5. When the download completes, extract the package contents to a temporary location on your machine. Each driver is stored in a separate folder (\windows 2012, \rhel6, \rhel7, and so on).

**Note:** See the *Release Notes* for a complete list of available driver files.

### 5.2 Creating a Driver Disk

Create a driver disk by completing the steps below. You will need a USB flash drive to complete this task.

**Note:** For VMware and XenServer, see [Installing with VMware](#) and [Installing with Citrix XenServer](#) on page 28.

1. Change to the driver directory for your operating system version.
2. Write the driver binary file to a USB flash drive (assuming the USB drive is `/dev/sdc` on Linux systems).

Options	Description
<b>rhel6/centos6</b>	<pre>gunzip hpsa-3.4.10-110.rhel6u5.x86_64.dd.gz dd if=hpsa-3.4.10-110.rhel6u5.x86_64.dd of=/dev/sdc</pre>
<b>rhel7/centos7</b>	<pre>gunzip hpsa-3.4.10-115.rhel7u0.x86_64.dd.gz dd if=hpsa-3.4.10-115.rhel7u0.x86_64.dd of=/dev/sdc</pre>
<b>sles11</b>	<pre>gunzip hpsa-3.4.10-110.sles11sp3.x86_64.dd.gz dd if=hpsa-3.4.10-110.sles11sp3.x86_64.dd of=/dev/sdc</pre>



Options	Description
<b>sles12</b>	<pre>gunzip hpsa-3.4.10-110.sles12sp0.x86_64.dd.gz dd if=hpsa-3.4.10-110.sles12sp0.x86_64.dd of=/dev/sdc</pre>
<b>ubuntu14.04</b>	<pre>gunzip hpsa-3.4.11-100.ubuntu14.04.x86_64.img.gz dd if=hpsa-3.4.11-100.ubuntu14.04.x86_64.img of=/dev/sdc1</pre>
<b>windows</b>	<pre>winzip HpCISSs3.4.10.110.64_pass4.zip cp hpsa.inf hpsa2.inf &lt;usb drive&gt;</pre>

3. Remove and label the driver disk.
4. Continue the installation with the instructions for your operating system.

### 5.3 Installing with Windows

**Note:** Use the following procedure for all supported Windows versions. You will need your Windows Installation DVD (or equivalent virtual media/iso image) to complete this task.

To install the RAID controller driver while installing Windows:

1. Insert the Windows installation DVD, then restart the computer.
2. Follow the on-screen instructions to begin the Windows installation.
3. When prompted to specify a location for Windows, select **Load Driver**.
4. Insert the USB driver disk, browse to the driver location, then click **Ok**.
5. When prompted to select the driver to install, click **Next**. (You will see two drivers in the list; it doesn't matter which driver is selected.)
6. Click **Next** again to accept the default partition configuration.
7. Follow the on-screen instructions to complete the installation.

### 5.4 Installing with Red Hat Linux, or CentOS, or Oracle Linux

**Note:** You will need your installation DVD (or equivalent virtual media/iso image) to complete this task. You must have root privilege to install the driver image.

To install the RAID controller driver while installing Red Hat Linux, or CentOS, or Oracle Linux:

1. Insert your installation CD.
2. Restart your computer.
3. When the first installation screen appears, insert the USB driver disk.
4. Type this command at the Boot: prompt, then press `Enter`:
 

```
linux dd
```
5. Select **Yes** to indicate that you have a driver disk, browse the USB drive (typically, `/dev/sda1`), then select the driver image.
6. Verify that the driver is loaded, then complete the installation following the on-screen instructions.

### 5.5 Installing with SuSE Linux Enterprise Server

**Note:** You will need the SuSE installation DVD (or equivalent virtual media/iso image) to complete this task. You must have root privilege to install the driver image.

To install the RAID controller driver while installing SuSE Linux:

1. Insert the SuSE Installation DVD.
2. Restart your system.
3. When the installation selection screen appears, choose the type of installation you want, press **F6**, then select **Yes** to indicate that you have a driver disk.
4. Insert the USB driver disk.
5. (*SuSE 11 SP3 32-bit, 64-bit*) Add 'brokenmodules=aacraid dud=1' to the Boot menu. This step ensures that the installer loads from the driver disk, not the in-box driver.
6. When prompted to "Please choose the Driver Update medium", highlight the USB partition, then select **OK**.

**Note:** If the "choose Driver Update medium" screen is displayed again, assume that the driver was accepted; select **Back**, then press **Enter**.

7. (*SuSE 11 SP3 32-bit, 64-bit*) On the "Welcome screen", switch to the console by typing **CTRL+ALT+F2**, then type this command:

```
insmod ./update/000/modules/aacraid.ko
```

Press **CTRL+ALT+F7** to return to the Welcome screen.

8. Complete the installation, following the on-screen instructions.

## 5.6 Installing with Ubuntu Linux

**Note:** You will need the Ubuntu installation DVD (or equivalent virtual media/iso image) to complete this task. You must have root privilege to install the driver image.

**Note:** Microsemi's pre-built driver supports the kernel that is delivered as part of the ISO. For other kernels, use DKMS process.

To install the RAID controller driver while installing Ubuntu Linux:

1. Insert the Ubuntu Installation DVD, then restart your computer.
2. When the installation menu appears, select **Install Ubuntu Server**. Continue the installation until the "Configure Network" screen appears, then type **CTRL+ALT+F2** to switch to the console.
3. Insert the USB driver disk.
4. Assuming the USB drive is assigned to `/dev/sda1`, type the following commands to begin loading the driver:

```
mkdir mnt2 /AACRAID
mount /dev/sda1 /mnt2
cp -R /mnt2/* /AACRAID
umount /mnt2
```

5. Copy the driver file to the `/lib/modules` directory:

```
rmmod aacraid
cp -f /AACRAID/aacraid.ko
/lib/modules/3.16.0-23-generic/kernel/drivers/scsi/aacraid/aacraid.ko
```

6. Remove the USB drive.
7. Install the loadable module:

```
insmod /lib/modules/3.16.0-23-generic/kernel/drivers/scsi/aacraid/aacraid.ko
```

8. Press **CTRL+ALT+F1** to switch back to the installation screen, then follow the on-screen prompts to continue the installation.

**Note:** Do not press Continue at the end of the installation until you complete Step [\[9\]](#)!

9. When prompted to reboot the system, press CTRL+ALT+F2 to switch to the console.

10. Type the following commands to complete the driver installation:

Ubuntu 64-bit:

```
cp -f /AACRAID/aacraid.ko
/target/lib/modules/3.16.0-23-generic/kernel/drivers/scsi/aacraid/aacraid.ko
chroot /target
/sbin/depmod -a 2.6.32-28-server
update-initramfs -u -v
exit
```

11. Press CTRL+ALT+F1 to switch back to the installation screen, then reboot.

## 5.7 Installing with VMware

**Note:** You will need a writable CD or USB flash drive to complete this task. You must have administrator privileges to create the driver disk and install the driver image.

To install the RAID controller driver with VMware ESXi 6.0 or VMware ESXi 6.5, you must create a custom boot image using the ESXi-Customizer tool. This tool automates the process of customizing the ESXi install-ISO and runs as a script under Microsoft PowerShell.

You can download the ESXi-Customizer tool, `ESXi-Customizer-PS-v2.5.ps1`, from <https://www.v-front.de/p/esxi-customizer-ps.html> and other locations on the Web.

**Note:** Be sure to install the prerequisite software first, including Powershell and VMware POWERCLI, before you install ESXi-Customizer.

**Note:** VMware 6.0 driver supports VMware 6.5.

To install the RAID controller driver while installing VMware:

1. Download and install Microsoft PowerShell and VMware POWERCLI, as needed. You can download PowerShell from the Microsoft Download Center at [www.microsoft.com/download](http://www.microsoft.com/download), and POWERCLI from [my.vmware.com](http://my.vmware.com).

**Note:** PowerShell is pre-installed on many Windows systems, including Windows Server 2012 and Windows Server 2016.

2. Download the ESXi-Customizer tool from <https://www.v-front.de/p/esxi-customizer-ps.html> or other Web location. Then, unpack the archive to a local directory on your Windows system; `C:\ESXi-Customizer`, for instance.

3. Copy the VMware driver vib for your OS version to a temp directory, such as `C:\temp\pkg`. The driver vib files (listed below, where xxxxxx is the driver version number) should be in the driver download directory on your Windows system (see [Creating a Driver Disk](#)).

Options	Description
<b>ESXi 6.5/6.0</b>	VMware-VMvisor-Installer-6.0.0-2494585.x86_64.iso vmware-esxi-drivers-scsi-aacraid-600.6.2.1.XXXXXX.-1.0.6.2159203.x86_64.vib

4. Run ESXi-Customizer from the installation directory:

```
C:\ESXi-Customizer>ESXi-Customizer.cmd
```

5. In PowerShell, enter the following command:

```
.\ESXi-Customizer-PS-v2.5.ps1 -Vxx -pkgDir C:\temp\pkg
```

where Vxx is the VMware OS version: `v60` for VMmare 6.0, `v65` for VMware 6.5.

PowerShell begins creating the custom ESXi install-ISO with embedded RAID controller driver. It displays "All done" when the ISO is ready.

6. Burn the custom ISO image to a writable CD or USB drive.

**Note:** Use whatever tool you prefer to burn the CD or USB drive.

Remove the CD or USB drive after you finish burning the image.

7. On the VMware ESXi machine, insert the custom boot CD/USB, then restart your computer.
8. Follow the on-screen instructions to begin the VMware installation.
9. Complete the VMware installation, following the on-screen instructions.
10. Remove the custom boot CD or USB drive, then reboot your computer.

## 5.8 Installing with Citrix XenServer

**Note:** To install the RAID controller driver with Citrix XenServer, you must burn the XenServer driver iso image to a writeable CD; USB driver disks are not supported for XenServer (see [Creating a Driver Disk](#)). You will be prompted to insert the XenServer driver CD *twice*. You need the XenServer installation DVD (or equivalent virtual media/iso image) to complete this task. You must have administrator privilege to install the driver image.

To install the RAID controller driver while installing Citrix XenServer:

1. On the machine where you want to install the OS and RAID controller driver, insert the XenServer installation DVD, then restart your computer.
2. When prompted to add a driver, press **F9**.
3. Remove the XenServer installation DVD and insert the driver CD.
4. When the driver update is complete, remove the driver CD and insert the XenServer installation DVD.
5. Continue the XenServer installation, following the on-screen instructions.
6. When prompted to add a driver (at the end of the OS installation), remove the XenServer installation DVD and insert the driver CD.
7. Complete the XenServer installation, following the on-screen instructions.
8. Remove the driver CD, then reboot your computer.

## 6 Installing the Driver on an Existing Operating System

---

This chapter explains how to install the RAID controller driver on an existing operating system.

**Note:**

1. To install the driver while you're installing an operating system, see [Installing the Driver and an Operating System](#) on page 24.
2. To install the Linux drivers from source with Dynamic Kernel Module Support (for persistence across kernel updates), download the Linux Driver Source Code package from the support page for your product at [start.microsemi.com](http://start.microsemi.com), then follow the instructions in the embedded Readme.

### 6.1 Download the Driver Package

Complete these steps to download the drivers for your operating system(s):

1. Open a browser window, then type `start.microsemi.com` in the address bar.
2. Enter your product or adapter model number, then select HBA 1000.
3. Select your operating system version, for instance, Microsoft Windows Server 2012 x64 or Red Hat Enterprise Linux 7; then select the appropriate driver from the list.
4. Download the HBA 1000 Series driver package.
5. When the download completes, extract the package contents to a temporary location on your machine. Each driver is stored in a separate folder (\windows 2012, \rhel6, \rhel7, and so on).

**Note:** See the *Release Notes* for a complete list of available driver files.

### 6.2 Creating a Driver Disk

Create a driver disk by completing the steps below. You will need a USB flash drive to complete this task.

**Note:** For VMware and XenServer, see [Installing with VMware](#) and [Installing with Citrix XenServer](#) on page 28.

1. Change to the driver directory for your operating system version.
2. Write the driver binary file to a USB flash drive (assuming the USB drive is `/dev/sdc` on Linux systems).

Options	Description
<b>rhel6/centos6</b>	<pre>gunzip hpsa-3.4.10-110.rhel6u5.x86_64.dd.gz dd if=hpsa-3.4.10-110.rhel6u5.x86_64.dd of=/dev/sdc</pre>
<b>rhel7/centos7</b>	<pre>gunzip hpsa-3.4.10-115.rhel7u0.x86_64.dd.gz dd if=hpsa-3.4.10-115.rhel7u0.x86_64.dd of=/dev/sdc</pre>
<b>sles11</b>	<pre>gunzip hpsa-3.4.10-110.sles11sp3.x86_64.dd.gz dd if=hpsa-3.4.10-110.sles11sp3.x86_64.dd of=/dev/sdc</pre>
<b>sles12</b>	<pre>gunzip hpsa-3.4.10-110.sles12sp0.x86_64.dd.gz dd if=hpsa-3.4.10-110.sles12sp0.x86_64.dd of=/dev/sdc</pre>

Options	Description
<b>ubuntu14.04</b>	<pre>gunzip hpsa-3.4.11-100.ubuntu14.04.x86_64.img.gz dd if=hpsa-3.4.11-100.ubuntu14.04.x86_64.img of=/dev/sdc1</pre>
<b>windows</b>	<pre>winzip HpCISSs3.4.10.110.64_pass4.zip cp hpsa.inf hpsa2.inf &lt;usb drive&gt;</pre>

3. Remove and label the driver disk.
4. Continue the installation with the instructions for your operating system.

## 6.3 Installing on Windows

**Note:** The following instructions apply to all supported Windows operating systems.

To install the driver on Windows:

1. Start or restart Windows.
2. In the Control Panel, launch the Device Manager, right-click on the SAS Controller listed under Other Devices, then select **Update Driver Software**.
3. Insert the driver disk, then select **Browse my computer for driver software**.
4. Browse to the driver disk location, then click **Next**.
5. Select the driver from the list, then click **Next**.
6. When the installation is complete, remove the driver disk and restart your computer.

## 6.4 Installing on Red Hat, CentOS, or SuSE Linux

**Note:** If your Red Hat 7, SLES 11 SP3, or SLES 12 system is booted with uEFI Secure Boot, you need to add a public key to the MOK list (Machine Owner Key) before completing the steps below:

```
mokutil --import aacraid_key_pub.der
```

Enter and confirm a password for the MOK enrollment request, reboot, then complete the enrollment from the uEFI console.

Enter the password you associated with this request (using mokutil), or enter your root password, then confirm the enrollment. Once the key is on the MOK list, it is propagated automatically to the system key ring for this and subsequent reboots (that is, it persists), when uEFI Secure Boot is enabled.

To install the driver on Red Hat Linux, CentOS, or SuSE Linux:

1. Insert and mount the driver disk (assuming the USB drive is /dev/sda1):

```
mount /dev/sda1 /mnt/usb
```

2. (SLES 11 SP3, SLES 12 only) Install the aacraid-ueficert RPM:

```
rpm -ivh mount-point/xxx/aacraid-ueficert-<OS VERSION>-1.2.1-XXXXX.<OS ARCH>.rpm
```

where *mount-point* is the mount point on the Linux system and *xxx* is the driver path.

3. Install the driver RPM for your operating system:

```
rpm -ivh mount-point/xxx/yyy.rpm
```

where *mount-point* is the mount point on the Linux system, *xxx* is the driver path, and *yyy.rpm* is the rpm file name.

4. Reboot your computer to ensure the driver loaded correctly.

## 6.5 Installing on Oracle Linux

**Note:** The release package includes a driver RPM for UEK kernels only.

To install the driver on Oracle Linux:

1. *Oracle Linux 6.5 Only:*
  - a) Reboot the OS.
  - b) Select the UEK kernel image to boot.
2. Insert and mount the driver disk (assuming the USB drive is `/dev/sda1`):

```
mount /dev/sda1 /mnt/usb
```

**Note:** Be sure the USB driver disk includes both RPMs (see [Creating a Driver Disk](#) on page 24).

3. Install the UEK driver rpm:

```
rpm -ivh mount-point/xxx/kmod-aacraid-UEK-<OS Version>-1.2.1-XXXXX.<OS Arch>.rpm
```

where *mount-point* is the mount point on the Linux system, and *xxx* is the driver path.

4. Restart the system.
5. (*Oracle Linux 6.5*) Select the kernel image to boot (UEK).

## 6.6 Installing on Ubuntu Linux

**Note:** For driver installation on Ubuntu Linux, you may need to create the root account and password. Enter these commands: `sudo bash`; `sudo passwd root`. You must have root privilege to install the driver image.

**Note:** Microsemi's pre-built driver supports the kernel that is delivered as part of the ISO. For other kernels, use DKMS process.

To install the driver on Ubuntu Linux:

1. Update the Ubuntu package index:
 

```
sudo apt-get update
```
2. Load the Ubuntu unpacking tools:
 

```
sudo apt-get install build-essential
```
3. Insert and mount the driver disk (assuming the USB drive is `/dev/sda1`):
 

```
mount /dev/sda1 /mnt/usb
```
4. Install the DEB driver package (where *xxxxx* is the build number):

Ubuntu 11:

```
sudo dpkg -i /mnt/usb/aacraid-1.2.1-xxxxx-Ubuntu11.10+12.04+12.04.1+12.04.2-all.deb
```

Ubuntu 14:

```
sudo dpkg -i /mnt/usb/aacraid-1.2.1-xxxxx-Ubuntu14.10-x86_64.deb
```

Ubuntu 16:

```
sudo dpkg -i /mnt/usb/aacraid-1.2.1-xxxxx-Ubuntu16.10-x86_64.deb
```

5. Reboot your computer to ensure the driver loaded correctly.
6. Continue with [Managing Your Storage Space](#).

## 6.7 Installing on VMware

**Note:** You must remove the old driver before you can install the new one. You must have root privilege to install the new driver.

**Note:** To copy the driver VIB file to the VMware ESXi server (in [Step 2](#) below), you must have access to a remote copy utility, such as WinSCP, putty, or Linux scp.

To install the driver on VMware:

1. At the VMware console screen, type these commands to remove the old driver from a VMware 5.x or VMware 6.0 system:

```
esxcli software vib list | grep -i aacraid (list driver packages)
esxcli software vib remove --vibname=scsi-aacraid --maintenance-mode (remove package)
```

2. Using a remote copy utility, copy the driver VIB file for your operating system version to a local directory on the ESXi server. This example uses Linux scp to copy the driver to /tmp/aacraid (where xxxxx is the build number):

VMware ESXi 5.5:

```
scp
/mnt/sda1/linux/driver/vmware-esxi-drivers-scsi-aacraid-550.5.2.1.xxxxx.-1.5.5.1331820.x86_64.vib
root@esx-server-ip>:/tmp/aacraid
```

VMware ESXi 6.0:

```
scp
/mnt/sda1/linux/driver/vmware-esxi-drivers-scsi-aacraid-600.6.2.1.xxxxx.-1.0.6.2159203.x86_64.vib
root@esx-server-ip>:/tmp/aacraid
```

3. Install the VIB module (where xxxxx is the build number):

VMware ESXi 5.5:

```
esxcli software vib install -f -v
file:/tmp/aacraid/vmware-esxi-drivers-scsi-aacraid-550.5.2.1.xxxxx.-1.5.5.1331820.x86_64.vib
```

VMware ESXi 6.0:

```
esxcli software vib install -f -v
file:/tmp/aacraid/vmware-esxi-drivers-scsi-aacraid-600.6.2.1.xxxxx.-1.0.6.2159203.x86_64.vib
```

4. Reboot your computer.



## 6.8 Installing on Citrix XenServer

**Note:** To copy the driver RPM file to XenServer (in [Step 1](#) below), you must have access to a remote copy utility, such as WinSCP, putty, or Linux scp. You must have root privilege to install the driver.

To install the driver on XenServer (where xxxxx is the build # and .x is the OS version):

1. Using a remote copy utility, copy the driver RPM file to a local directory on XenServer. This example uses Linux scp to copy the driver to /tmp/aacraid:

```
scp /mnt/sda1/linux/driver/citrix-aacraid-1.2.1-xxxxx.xen-6.x.rpm  
root@<xen-server-ip>:/tmp/aacraid
```

2. Install the driver module rpm:

```
rpm -ivh /tmp/aacraid/citrix-aacraid-1.2.1-xxxxx.xen-6.x.rpm
```

3. Reboot your computer.

## 7 Installing Dynamic Kernel Module Support

---

This chapter explains how to install the DKMS driver.

### 7.1 Installing the DKMS Deb Package on Ubuntu Systems

The following steps are for installing the DKMS deb package on an Ubuntu System.

1. Since DKMS involves changing system-level kernel files, it requires superuser permissions.

```
$sudo su
```

2. DKMS requires build-essential (which installs all packages that are required to build an executable on Ubuntu), the current kernel headers, and DKMS.

```
# apt-get install dkms build-essential linux-headers-`uname -r`
```

3. Once the dependency packages have been installed, the DKMS deb package can be installed. Now DPKG calls DKMS internally, which builds the driver and installs it to the current kernel. XXXXX is the driver release version.

```
# dpkg -i aacraid-dkms_1.2.1.XXXXX_all.deb
```

4. After the DKMS install is done, the system needs to be rebooted for the new driver to take effect.

```
# apt-get install linux-headers-`uname -r`
```

**Note:** When the Ubuntu Linux kernel is updated, then DKMS will attempt to build the driver for the newly updated kernel and fail, since the headers for the new kernel have not been installed yet. Reboot the system and select the newly updated kernel. Once it boots up, previous command will install headers for the updated kernel and install AACRAID driver on it as well.

### 7.2 Installing the DKMS RPM Package

The DKMS executable package is available in the EPEL repository.

1. Retrieve the EPEL repository file (the "X" denotes the major version).

```
$ wget https://dl.fedoraproject.org/pub/epel/epel-release-latest-X.noarch.rpm
```

2. Install the EPEL repository.

```
$ sudo rpm -Uvh epel-release-latest-X.noarch.rpm
```

3. Install DKMS.

```
$ sudo yum install dkms
```

### 7.3 DKMS Reference

This section contains information on the other functions of DKMS.

1. Build and install a driver.

```
# dkms add -m aacraid -v 1.2.1.XXXXX  
# dkms build -m aacraid -v 1.2.1.XXXXX  
# dkms install -m aacraid -v 1.2.1.XXXXX
```

2. Build a driver for a different system other than native.

```
# dkms build -k 2.4.21-4.ELsmp -m aacraid -v 1.2.1.XXXXX
# dkms install -k 2.4.21-4.ELsmp -m aacraid -v 1.2.1.XXXXX
```

### 3. Make a driver disk from a set of built drivers.

```
# dkms mkdriverdisk -k 2.4.21-4.ELBOOT,2.4.21-4.ELsmp,2.4.21-4.EL \
-d redhat -m aacraid -v 1.2.1.52009
# dkms mkdriverdisk -k 2.6.11.4-20a-default,2.6.11.4-20a-smp \
-d suse -m aacraid -v 1.2.1.52009
```

### 4. Check current status of DKMS.

```
# dkms status
```

## 8 Solving Problems

---

This section provides basic troubleshooting information and solutions for solving problems with your Microsemi Adaptec HBA 1000 Series Host Bus Adapter.

### 8.1 Troubleshooting Checklist

If you encounter difficulties installing or using your Microsemi Adaptec 1000 Series Host Bus Adapter, check these items first:

- With your computer powered off, check the connections to each disk drive, power supply, enclosure, and so on.
- Try disconnecting and reconnecting disk drives from the adapter.
- Check that your adapter is installed in a compatible PCIe expansion slot. To verify the bus compatibility of your adapter, see [About Your Host Bus Adapter](#) on page 14.
- Ensure that your adapter is firmly seated and secured in the PCIe expansion slot.
- If your adapter is not detected during system boot, try installing it in a different compatible expansion slot. (See [Installing the Host Bus Adapter](#) on page 22 for instructions.)
- Did the driver install correctly? It may need to be reloaded after a reboot or kernel update; see [Installing Linux Drivers with Dynamic Kernel Module Support](#).
- If you have external disk drives (or other devices), are they powered on?
- Check the Release Notes for compatibility issues and known problems.

If you are still unable to resolve a problem, contact Microsemi Support.

### 8.2 Resetting the Adapter

You may need to reset your HBA 1000 Series adapter if it becomes inoperable or if a firmware upgrade is unsuccessful. HBA 1000 Series adapters support a reset protocol called HDA mode flash. For information about HDA mode, contact your support representative. To locate the HDA mode jumper on your adapter, see the board illustrations in [About Your Host Bus Adapter](#) on page 14.

## A Using the SAS/SATA Configuration Utility

---

The SAS/SATA Configuration utility is a BIOS-based utility that you can use to manage your RAID controller and the devices attached to it. It comprises a set of tools for creating and managing arrays, viewing and modifying adapter properties, and managing disk drives and spares.

The SAS/SATA Configuration utility is a BIOS-based utility that you can use to manage your RAID controller and the devices attached to it. It comprises a set of tools for viewing and modifying adapter properties, viewing disk drive properties, and flashing the HBA firmware.

### A.1 Running the SAS/SATA Configuration Utility: Ctrl-A or uEFI/HII?

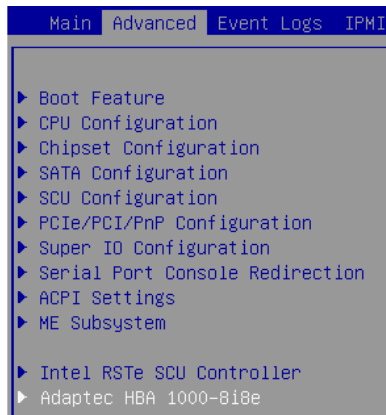
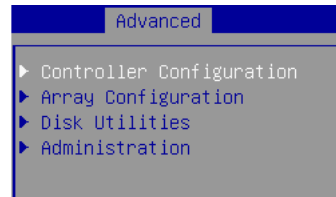
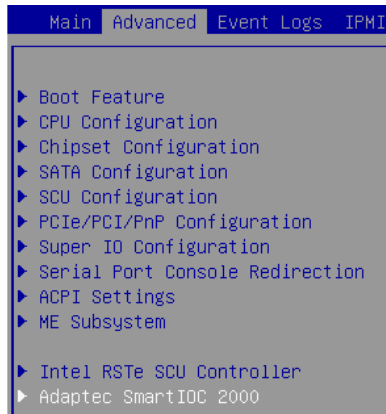
Your Microsemi RAID controller supports two interfaces to the BIOS-level controller configuration options described in this section: Ctrl-A and uEFI/HII.

On servers that support the Unified Extensible Firmware Interface, or uEFI (version 2.10 or higher), the BIOS-level configuration options are presented with a uEFI/HII interface (Human Interaction Infrastructure), rather than Microsemi's legacy Ctrl-A interface. uEFI/HII provides an architecture-independent mechanism for initializing add-in cards, like the RAID controller, and rendering contents to the screen in a uniform way.

To access the RAID controller configuration options with the Ctrl-A interface, start or restart your computer. When prompted, press `Ctrl+A`, then select your controller from the list. The Ctrl-A BIOS main menu is displayed.



In the uEF/HII interface, the server's standard BIOS provides access to the RAID controller configuration options. How you access the BIOS varies, depending on the server manufacturer, but typically it's started by simply pressing `DEL`. Once you enter setup, navigate to the "**Advanced**" menu (below, left), then select your controller from the list. The uEF/HII main menu is displayed (below, right).



From that point on, the uEFI/HII menus and the Ctrl-A menus for configuring your controller are similar. For example, the Array Configuration menu (uEFI/HII) and the Logical Device Configuration menu (Ctrl-A) contain the same options for creating and managing arrays (though the task flow may differ); the Disk Utilities menu contains the same options for managing disk drives; and so on.

From that point on, the uEFI/HII menus and the Ctrl-A menus for managing your controller are similar. For example, the Controller Configuration menu (uEFI/HII) and the Controller Settings menu (Ctrl-A) contain similar options for viewing and modifying controller properties (though the task flow may differ); the Disk Utilities menu contains similar options for working with disk drives; and so on.

**Note:** The Administration menu is available only with the uEFI/HII interface. The Array Configuration menu (uEFI/HII) and the Logical Device Configuration menu (Ctrl-A) are not supported on the RAID controller.

In both interfaces, all the tools are menu-based and instructions for completing tasks appear on-screen. Menus can be navigated using the arrows, Enter, Esc, and other keys on your keyboard.

This appendix provides instructions for navigating and completing tasks with the *uEFI/HII* interface. To complete tasks with the Ctrl-A interface:

- Refer to the on-screen instructions for keyboard navigation and selection options.
- Refer to the option descriptions in this section for details about individual configuration settings.

## A.2 Modifying RAID controller Settings

To modify the RAID controller settings, start the SAS/SATA Configuration Utility, select **Controller Configuration** from the main menu, then select **Controller Properties** or **Advanced Controller Properties**. You can set the options in the table below.

Option	Description
Transformation Priority	Sets the priority for array expansion: <ul style="list-style-type: none"> <li>• Low: normal system operations take priority over array expansion</li> <li>• Medium: normal system operations and array expansion get equal priority</li> <li>• High: expansion takes precedence over all other system operations</li> </ul>
Rebuild Priority	Sets the priority for rebuilding a failed logical drive: <ul style="list-style-type: none"> <li>• Low: normal system operations take priority over rebuilds</li> <li>• Medium: normal system operations and rebuilds get equal priority</li> <li>• Medium High: rebuilds get higher priority than normal system operations</li> <li>• High: rebuilds take precedence over all other system operations</li> </ul>
Surface Scan Analysis Delay	Determines the time, in seconds, that a controller must be inactive before a surface scan analysis is started on the physical drives connected to it. The scanning process checks physical drives for bad sectors and, in fault-tolerant logical drives, such as RAID 5, it also verifies the consistency of parity data. Delay value ranges from 1–30 seconds.
Surface Scan Count	Sets the surface scan count for the controller. Set the value to "1" to disable the feature. <p><b>Caution:</b> Disabling Surface Scan Analysis is not recommended as it will prevent the controller from proactively finding and correcting disk surface errors, which may lead to data loss.</p>
Physical Drive Write Cache State	Enables and disables physical drive write cache for all drives on the controller.
Spare Activation Mode	Sets the spare activation mode to activate on failure or predictive failure activation.
Connector Mode (CN0:CN3)	Configures the controller connectors to different operating modes: <ul style="list-style-type: none"> <li>• HBA: exposes physical drives to the operating system</li> <li>• RAID: exposes only RAID volumes to the operating system</li> <li>• Mixed: exposes RAID volumes and physical drives to the operating system</li> </ul>
<b>Advanced Properties:</b>	
Degraded Mode Perf Optimization	For degraded RAID 5 logical drives, enabling this setting directs the controller to attempt to improve performance of large read requests by buffering physical drive requests. Disabling this setting forces the controller to read from the same drives multiple times.
Physical Drive Elevator Sort	Sets the behavior of the drive's write Elevator sort algorithm, a scheduling optimization that prioritizes I/O requests such that disk arm and head motion continues in the same direction. Enabling the elevator sort improves seek times and disabling the elevator sort improves throughput.
Inconsistent Repair Policy	Sets the surface analysis inconsistency repair policy for RAID 5 when the controller detects that the parity information does not match the data on the drives. Disabling the repair policy directs the controller to update the parity information, leaving the data untouched. Enabling the repair policy directs the controller to update the data on the drives based on the parity information.
MNP Analysis Delay	Sets the Monitor and Performance Analysis delay for the controller, in seconds. Set the value to zero to disable Monitor and Performance Analysis. Default is 60 minutes (3600 seconds).
HDD Flexible Latency Optimization	Enables flexible latency optimization for HDDs. When FLS is enabled, the controller detects high-latency I/O requests and applies a cutoff, or threshold, value, after

Option	Description
	which it suspends elevator sorting and services the request right away. Valid values are: <ul style="list-style-type: none"> <li>• 0 : Disable (default).</li> <li>• 1 : Low. Sets value to 250.</li> <li>• 2 : Medium. Sets value to 100.</li> <li>• 3: High. Sets value to 50.</li> <li>• 4: Aggressive level 1. Sets value to 30.</li> <li>• 5: Aggressive level 2. Sets value to 10.</li> </ul>
Max Drive Request Queue Depth	Sets the queue depth for the controller. Valid values are Automatic, 2, 4, 8, 16, and 32.

### A.3 Clearing the Controller Configuration

Clearing the controller configuration destroys the controller meta-data, including array configurations, partition information, and so on.

**Caution:** When you clear the controller configuration, all data on the attached media (SSD/HDD) will no longer be accessible and cannot be recovered. Be sure you no longer need the data on the controller before proceeding!

To clear the controller configuration:

1. Start the SAS/SATA Configuration Utility in uEFI mode (see [Running the SAS/SATA Configuration Utility: Ctrl-A or uEFI/HII?](#) on page 37).
2. Select your controller, then press `Enter`.
3. From the main menu, select **Controller Configuration**.
4. Select **Clear Controller Configuration**.
5. Select **Clear Config Submit**.

### A.4 Viewing Disk Drive Properties

Use the Disk utilities to view the disk drives on a controller and view disk drive properties.

To view disk drive properties:

1. Start the PMC SAS/SATA Configuration Utility in uEFI mode (see [Running the SAS/SATA Configuration Utility: Ctrl-A or uEFI/HII?](#) on page 37).
2. Select your controller, then press `Enter`.
3. From the main menu, select **Disk Utilities**.
4. Use the arrow keys to select a disk drive.
5. Press `Esc` to return to the previous menu.

### A.5 Updating the RAID controller Firmware

**Note:** This option is available only in the uEFI interface.

To update the RAID controller firmware:

1. Copy the firmware binary file (.bin) to a USB flash drive, then connect the USB drive to the machine. Alternatively, copy the firmware binary to a known location on your machine.
2. Start the SAS/SATA Configuration Utility in uEFI mode (see [Running the SAS/SATA Configuration Utility: Ctrl-A or uEFI/HII?](#) on page 37), select the controller you want to flash, then press `Enter`.



3. From the main menu, select **Administration**, then select **Flash Controller Firmware**.
4. Select **Continue with flashing Firmware**.
5. Select the storage device where the firmware binary file is located (the USB drive, for instance), navigate the folder hierarchy, then select the firmware binary file.  
The firmware is sent to the controller.
6. When the update is complete, reboot the server.

## B Driver Event Logging on Windows and Linux

The Windows and Linux device drivers log initialization failure events during driver startup. The Windows driver logs events in the Windows System Event Log. The Linux drivers log events in `/var/log/messages` (RHEL/CentOS/SLES/Oracle) or `/var/log/kern.log` (Ubuntu).

On Windows systems, events are logged using the standard Windows event logging feature (supported by the Windows Storport driver). To view the events, use the Windows Event Viewer, accessible from the Administrative Tools option in the Control Panel.

Each log entry includes the event message, event level (Information, Warning, Error), failed command, and error code, such as the BLED code. It also includes the date and time of the event, event source, Event ID, and event description. [Table 4 • Windows Driver Initialization Failure Events](#) describes the driver events on Windows.

**Table 4 • Windows Driver Initialization Failure Events**

Event	Event ID (hex)	Event Level	Description
FW Not Up & Running	0x35	Warning	Driver Init: FW Not Up & Running BLED 0x"BLED CODE"
Adapter Ready for Config	0x36	Warning	Driver Init: CT_CONFIG_STATUS_READY ("command code") Failed
Adapter Get Config Status	0x37	Warning	Driver Init: CT_GET_CONFIG_STATUS ("command code") Failed
Adapter Commit Config Status	0x38	Warning	Driver Init: CT_COMMIT_CONFIG ("command code") Failed
Adapter Init Structure Status	0x39	Warning	Driver Init: ADAPTER_INIT_STRUCT_REVISION ("Init struct version number") Failed
Container Config Command Status	0x40	Warning	Driver Init: VM_ContainerConfig ("command code") Failed
Adapter Init Failed Timeout	0x41	Error	Driver Init: Timed out, Init Stage # "decimal number" (indicates Init stage at which it failed)

On Linux systems, the driver logs kernel panics, internal diagnostics failures, timeouts, and other initialization failure events (see [Table 5 • Linux Driver Initialization Failure Events](#)).

**Table 5 • Linux Driver Initialization Failure Events**

Event	Event Level	Description
KERNEL_PANIC	Error	Adapter kernel is in panic mode and cannot start up
SELF_TEST_FAILED	Error	Adapter kernel internal diagnostic failed
MONITOR_PANIC	Error	Adapter monitor kernel panicked is locked
Adapter_INIT_TIMEOUT	Error	Adapter failed to provide response or start up during initialization
FLASH_UPD_PENDING	Error	Adapter is updating the firmware and cannot start yet
CT_GET_CONFIG_STATUS	Error	Driver failed to retrieve configuration data from the adapter
CT_COMMIT_CONFIG	Error	Driver failed to commit driver changes to adapter

VM_ContainerConfig	Error	Driver failed to get information on the disks and mediums attached to the adapter from the adapter kernel
RequestAdapterInfo	Error	Driver failed to get adapter information from the adapter kernel

To view the events, use the Linux `dmesg` command to display the messages in the log files. Each log entry includes the failed command, Linux Internal Device ID, type of event, stage at which the error occurred, and return status of the erroneous function or register.

Example:

```
# aacraid 0000:03:00.0: aac_probe_one: Driver Init: KERNEL_PANIC - 50
```

Where:

- `aacraid` - driver name
- `0000:03:00.0` - Linux Internal Device ID
- `aac_probe_one` - Driver function where Error Occurred
- `Driver Init` - Stage at which Error Occurred
- `KERNEL_PANIC` - Type of Event
- `50` - Return status of erroneous function or register

## C Safety Information

---

To ensure your personal safety and the safety of your equipment:

- Keep your work area and the computer clean and clear of debris.
- Before opening the system cabinet, unplug the power cord.

### C.1 Electrostatic Discharge (ESD)

**Caution:** ESD can damage electronic components when they are improperly handled, and can result in total or intermittent failures. Always follow ESD-prevention procedures when removing and replacing components.

To prevent ESD damage:

- Use an ESD wrist or ankle strap and ensure that it makes skin contact. Connect the equipment end of the strap to an unpainted metal surface on the chassis.
- Avoid touching the adapter against your clothing. The wrist strap protects components from ESD on the body only.
- Handle the adapter by its bracket or edges only. Avoid touching the printed circuit board or the connectors.
- Put the adapter down only on an antistatic surface such as the bag supplied in your kit.
- If you are returning the adapter to Microsemi Product Support, put it back in its antistatic bag immediately.

If a wrist strap is not available, ground yourself by touching the metal chassis before handling the adapter or any other part of the computer.

## D Technical Specifications

### D.1 Environmental Specifications

**Note:** Microsemi Adaptec HBA 1000 Series adapters require adequate airflow to operate reliably. The recommended airflow is **200 LFM** (linear feet per minute), minimum. Forced airflow is **required**.

Ambient temperature with forced airflow	0 °C to 55 °C
Relative humidity	10% to 90%, non-condensing
Altitude	Up to 3,000 meters

**Note:** Ambient temperature is measured 1” from the HBA processor.

### D.2 DC Power Requirements

Bus Type	Description	Requirements
PCIe	DC Voltage	3.3 V ± 9%, 12 V ± 8%

### D.3 Current and Power Requirements

Adapter Model	Typical Power	Typical Current
Microsemi Adaptec HBA 1000-8i	9.40W	0.3A @ 3.3 VDC; 0.7A @ 12.0 VDC
Microsemi Adaptec HBA 1000-8e	8.70W	0.1A @ 3.3 VDC; 0.7A @ 12.0 VDC
Microsemi Adaptec HBA 1000-8i8e	12.30W	0.1A @ 3.3 VDC; 1.0A @ 12.0 VDC
Microsemi Adaptec HBA 1000-16i	11.80W	0.3A @ 3.3 VDC; 0.9A @ 12.0 VDC
Microsemi Adaptec HBA 1000-16e	11.10W	0.1A @ 3.3 VDC; 0.9A @ 12.0 VDC

**Note:** For the HBA 1000-8e/16e/8i8e, 3.3V current is measured without Active cables. Typical current will increase according to the type and number of Active cables.

# Index

## A

adapters [14, 21, 36, 45](#)  
See also controllers  
disk drives [21](#)  
flashing [36](#)  
resetting [36](#)  
specifications [45](#)  
standard features [14](#)  
troubleshooting [36](#)  
See also controllers

## B

boards, See controllers

## C

cards, See controllers  
contents of controller kit [13](#)  
controllers  
[21](#)  
SAS cables [21](#)

## D

descriptions [14, 20](#)  
disk drives  
[14, 21](#)  
solid state [14, 21](#)  
drive requirements [21](#)  
driver and operating system installation [24, 28](#)  
driver installation [29, 33](#)  
drivers  
[24–25, 27–30](#)  
installing on Windows [30](#)  
installing with Linux [25](#)  
installing with VMware [27](#)  
installing with Windows [25](#)  
installing with XenServer [24, 28–29](#)

## E

electrostatic discharge [44](#)  
Event logging [42–43](#)

## F

flashing adapters [36](#)

## H

hard disk  
[12](#)  
hard disk drive  
[12](#)  
hard drive, See disk drive  
HBA  
[14, 20, 38](#)  
figures [14, 20](#)  
modifying settings [38](#)  
HDA mode [36](#)  
HDA mode jumper [36](#)  
HII interface [37, 40](#)  
Human Interaction Infrastructure Interface (HII) [37, 40](#)

## I

installation  
[24–25, 27–29, 33](#)  
driver [29, 33](#)  
driver and Linux [25](#)  
driver and operating system [24, 28](#)  
driver and VMware [27](#)  
driver and Windows [25](#)  
driver and XenServer [24, 28–29](#)

## K

kit contents [13](#)

## L

Linux  
[25](#)  
OS installation [25](#)  
low-profile bracket [13](#)

## M

mechanical information [14](#)

## O

operating system installation [24, 28](#)  
operating systems [13](#)

## R

requirements  
    [13, 21](#)  
    drive [21](#)  
resetting adapters [36](#)

## S

safety information [44](#)  
SAS  
    [21](#)  
    cables [21](#)  
Solid State Drive (SSD) [14, 21](#)  
specifications [45](#)  
SuSE installation [25](#)  
system requirements [13](#)

## T

technical specifications [45](#)  
terminology [12](#)  
troubleshooting tips [36](#)

## U

uEFI [37, 40](#)  
Unified Extensible Firmware Interface (UEFI) [37, 40](#)

## V

VMware  
    [27](#)  
    OS installation [27](#)

## W

Windows  
    [25, 30](#)  
    driver installation [30](#)  
    OS installation [25](#)

## X

XenServer  
    [24, 28–29](#)  
    OS installation [24, 28–29](#)



**Microsemi Corporate Headquarters**  
One Enterprise, Aliso Viejo,  
CA 92656 USA

Within the USA: +1 (800) 713-4113  
Outside the USA: +1 (949) 380-6100  
Fax: +1 (949) 215-4996  
Email: [sales.support@microsemi.com](mailto:sales.support@microsemi.com)  
[www.microsemi.com](http://www.microsemi.com)

© 2017 Microsemi Corporation. All rights reserved. Microsemi and the Microsemi logo are trademarks of Microsemi Corporation. All other trademarks and service marks are the property of their respective owners.

Microsemi makes no warranty, representation, or guarantee regarding the information contained herein or the suitability of its products and services for any particular purpose, nor does Microsemi assume any liability whatsoever arising out of the application or use of any product or circuit. The products sold hereunder and any other products sold by Microsemi have been subject to limited testing and should not be used in conjunction with mission-critical equipment or applications. Any performance specifications are believed to be reliable but are not verified, and Buyer must conduct and complete all performance and other testing of the products, alone and together with, or installed in, any end-products. Buyer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the Buyer's responsibility to independently determine suitability of any products and to test and verify the same. The information provided by Microsemi hereunder is provided "as is, where is" and with all faults, and the entire risk associated with such information is entirely with the Buyer. Microsemi does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other IP rights, whether with regard to such information itself or anything described by such information. Information provided in this document is proprietary to Microsemi, and Microsemi reserves the right to make any changes to the information in this document or to any products and services at any time without notice.

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for aerospace & defense, communications, data center and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs and ASICs; power management products; timing and synchronization devices and precise time solutions, setting the world's standard for time; voice processing devices; RF solutions; discrete components; enterprise storage and communication solutions; security technologies and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; as well as custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees globally. Learn more at [www.microsemi.com](http://www.microsemi.com).