# Table of Contents

1. About This Guide .......................................................................................................................... 5  
   1.1. What You Need to Know Before You Begin ........................................................................ 5  
   1.2. Terminology Used in this Guide ......................................................................................... 5  
   1.3. How to Find More Information ........................................................................................... 5  
2. Kit Contents and System Requirements .......................................................................................... 6  
   2.1. Kit Contents ........................................................................................................................ 6  
   2.2. System Requirements .......................................................................................................... 6  
3. About Your SmartRAID 3100 Series Host Bus Adapter .............................................................. 7  
   3.1. Standard Features ............................................................................................................... 7  
   3.2. Mechanical Information ..................................................................................................... 7  
   3.3. Visual Indicators .................................................................................................................. 7  
   3.4. About the Adaptec SmartRAID 3101-4i/3151-4i ................................................................. 9  
   3.5. About the Adaptec SmartRAID 3101E-4i .......................................................................... 11  
   3.6. About the Adaptec SmartRAID 3102-8i/3152-8i/3154-8i ...................................................... 13  
   3.7. About the Adaptec SmartRAID 3102E-8i .......................................................................... 15  
   3.8. About the Adaptec SmartRAID 3154-8e ........................................................................... 17  
   3.9. About the Adaptec SmartRAID 3154-8i8e ......................................................................... 19  
   3.10. About the Adaptec SmartRAID 3154-8i16e ..................................................................... 21  
   3.11. About the Adaptec SmartRAID 3154-16i ......................................................................... 23  
   3.12. About the Adaptec SmartRAID 3154-24i ......................................................................... 25  
   3.13. About the SmartRAID 3162-8i/SmartRAID 3162-8i/e Adapter ....................................... 27  
4. About Your SmartHBA 2100 Series Host Bus Adapter ............................................................... 30  
   4.1. Standard Features ............................................................................................................... 30  
   4.2. Mechanical Information ..................................................................................................... 30  
   4.3. Visual Indicators .................................................................................................................. 30  
   4.4. About the Adaptec SmartHBA 2100-4i4e ......................................................................... 31  
   4.5. About the Adaptec SmartHBA 2100-8i .............................................................................. 33  
   4.6. About the Adaptec SmartHBA 2100-8i8e .......................................................................... 35  
   4.7. About the Adaptec SmartHBA 2100-16i ........................................................................... 37  
   4.8. About the Adaptec SmartHBA 2100-24i ........................................................................... 39  
5. Installing the Controller and Disk Drives ...................................................................................... 42  
   5.1. Before You Begin ................................................................................................................ 42  
   5.2. Selecting Disk Drives and Cables ...................................................................................... 42  
   5.3. Installing the Host Bus Adapter .......................................................................................... 42  
6. Installing the Driver and an Operating System ............................................................................. 50  
   6.1. Download the Driver Package ............................................................................................. 50  
   6.2. Creating a Driver Disk ........................................................................................................ 50  
   6.3. Installing with Windows ...................................................................................................... 50  
   6.4. Installing with Red Hat Linux ............................................................................................ 51  
   6.5. Installing with SuSE Linux Enterprise Server .................................................................... 51  
   6.6. Installing with Oracle Linux .............................................................................................. 52  
   6.7. Installing with Ubuntu Linux ............................................................................................. 52
6.8. Installing with Debian Linux................................................................. 52
6.9. Installing with FreeBSD........................................................................ 53
6.10. Installing with Solaris.......................................................................... 54
6.11. Installing with Citrix XenServer............................................................ 56
6.12. Installing with VMware......................................................................... 57

7. Installing the Driver on an Existing Operating System.......................... 58
7.1. Download the Driver Package................................................................. 58
7.2. Creating a Driver Disk........................................................................... 58
7.3. Installing on Windows............................................................................ 58
7.4. Installing on Red Hat............................................................................. 58
7.5. Installing on SuSE Linux Enterprise Server......................................... 59
7.6. Installing on Oracle Linux...................................................................... 59
7.7. Installing on Ubuntu Linux..................................................................... 59
7.8. Installing on Debian Linux..................................................................... 60
7.9. Installing on FreeBSD............................................................................ 60
7.10. Installing on Solaris............................................................................ 60
7.11. Installing on Citrix XenServer.............................................................. 61
7.12. Installing on VMware........................................................................... 62

8. Solving Problems .................................................................................. 63
8.1. Troubleshooting Checklist..................................................................... 63
8.2. Resetting the Adapter........................................................................... 63

9. Using the Microchip SAS/SATA HII Configuration Utility................... 64
9.1. Running the Microsemi SAS/SATA Configuration Utility: Ctrl-A or UEFI/HII?......................................................... 64
9.2. Controller Information.......................................................................... 64
9.3. Creating an Array................................................................................ 64
9.4. Creating a maxCache Array.................................................................. 65
9.5. Managing Arrays and Logical Drives................................................... 65
9.6. Modifying SmartHBA 2100/SmartRAID 3100 Controller Settings...... 67
9.7. Clearing the Controller Configuration.................................................. 67
9.8. Backup Power Source......................................................................... 68
9.9. Managing Power Settings................................................................... 68
9.10. Out of Band Messaging Settings......................................................... 68
9.11. Using the Encryption Manager............................................................. 69
9.12. Configuring the Controller Port Mode............................................... 73
9.13. Device Information............................................................................ 73
9.14. Identifying a Disk Drive..................................................................... 73
9.15. Erasing a Disk Drive.......................................................................... 74
9.16. Updating Drive Firmware................................................................. 74
9.17. Clearing Configuration Meta-data...................................................... 74
9.18. Setting the Bootable Device(s) for Legacy Boot Mode........................ 74
9.19. Updating the SmartHBA 2100 Firmware......................................... 75
9.20. Creating a Support Archive............................................................... 75
9.21. Resetting the Controller to Factory Defaults.................................... 75

10. Installing the SmartPQI Drivers from Source ..................................... 76
10.1. Installation Instructions for Supported Linux OSes......................... 76
1. **About This Guide**

This Installation and User's Guide explains how to install and setup your SmartRAID 3200 or SmartHBA 2200 Series Host Bus Adapter, including driver installation, BIOS operations, troubleshooting tips, and instructions for flashing the adapter firmware.

These SmartRAID 3200 Series adapter models are described in this guide:

- Adaptec SmartRAID Ultra 3258P-32i /e
- Adaptec SmartRAID Ultra 3258P-16i /e
- Adaptec SmartRAID 3258-16i /e
- Adaptec SmartRAID 3254-16i /e
- Adaptec SmartRAID Ultra 3254-16e
- Adaptec SmartRAID 3254-8i
- Adaptec SmartRAID 3252-8i
- Adaptec SmartRAID 3204-8i

These SmartHBA 2200 Series adapter models are described in this guide:

- Adaptec SmartHBA 2200-16i

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 SmartHBA 2100/SmartRAID 3100 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.

If you are responsible for configuring the storage resources on the SmartRAID and SmartHBA adapters, you should be familiar with RAID technology and creating bootable volumes.

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 SmartHBA 2100/SmartRAID 3100 Series Host Bus Adapter by referring to these documents, available for download at start.adaptec.com.

- *ARCCONF Command Line Utility User’s Guide for Adaptec Smart Storage Controllers*—Describes how to use the ARCCONF utility to perform configuration and storage management tasks from an interactive command line. (ESC-2161615)
- *SmartRAID 3200 Series and SmartHBA 2200 Series Host Bus Adapters Installation and User’s Guide* (this manual)—Describes how to install SmartRAID 3200 and SmartHBA 2200 Series adapters in a computer or server, install drivers, and configure the adapter for initial use. (DS-00004037A)
- *Adaptec Flash Backup Module ASCM-35 and ASCM-40 Installation Instructions* (ESC-2170352)—Describes how to install the ASCM-35 and ASCM-40 Flash Backup module using the mounting plate method.
Kit Contents and System Requirements

This section lists the contents of your SmartHBA 2100/SmartRAID 3100 Series kit and the system requirements for successfully installing and using your adapter.

2.1 Kit Contents

SmartRAID 3200 Series kits:

- SmartRAID 3200 Series adapter
- Full-height ("FH") and Low-profile ("LP") brackets, with mounting screws
- ASCM-40F or ASCM-35F Supercap Module, including:
  - Supercap module extension cable
  - Full-height and Low-profile mounting plate, with mounting screws
  - Supercap mounting clip
  - Tie-wraps (nylon)

SmartHBA 2200 Series kits:

- SmartHBA 2200 Series adapter
- Full-height ("FH") and Low-profile ("LP") brackets, with mounting screws

Note: The latest firmware, drivers, utilities software, and documentation can be downloaded at storage.microsemi.com. For more information, see Downloading the Driver Package.

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:
  - Red Hat® Enterprise Linux
  - CentOS
  - SuSE Linux Enterprise Server
  - Ubuntu Linux
  - Debian Linux
  - Oracle Linux
  - Citrix Xenserver
  - Solaris
  - FreeBSD
  - 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 SmartRAID 3100 Series Host Bus Adapter

This section provides an overview of the features of the SmartRAID 3100 Series adapter.

3.1 Standard Features

- Support for SAS and SATA Hard Disk Drives (HDD) and Solid State Drives (SSD)
- UEFI pre-boot BIOS, CTRL-A configuration utility
- Flash ROM for updates to firmware and BIOS
- Up to 24 ports, 12 Gb/s I/O
- SAS 3.0, PCIe 3.0
- Low-profile MD2 form factor
- Mini-SAS HD connectors
- Cache protection with supercapacitor module
- maxCrypto Controller-Based Encryption (CBE) (SmartRAID 3162-8i/e only)
- Support for disk drive enclosures with SES2 enclosure management hardware
- Thermal sensor, with logging capabilities
- GUI and CLI management utilities
- Support for RAID 0, 1, 5, 6, 10, 50, 60
- Universal asynchronous receiver/transmitter (UART) debug/diagnostic port

Note: See the Product Brief for a complete list of supported features.

3.2 Mechanical Information

3.2.1 Board Dimensions

This table shows the board dimensions of the SmartRAID 3100 Series adapter, in inches.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>2.700&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>6.600&quot;</td>
</tr>
<tr>
<td>PCB Thickness</td>
<td>0.062&quot;</td>
</tr>
<tr>
<td>Max Component Height, Top Side</td>
<td>0.570&quot;</td>
</tr>
<tr>
<td>Max Component Height, Bottom Side</td>
<td>0.105&quot;</td>
</tr>
</tbody>
</table>

3.2.2 Heat Sink

SmartRAID 3100 Series adapters include a passive heat sink. The heat sink does not support an optional fan. The heat sink has four push-pins located at its four corners to ensure an even distribution of force across the top of the ASIC. For airflow requirements, see 13.1. Environmental Specifications.

3.3 Visual Indicators

LEDs on SmartRAID 3100 Series adapters provide a visual indication of the board hardware status and cache backup system. The LED locations vary, and may be on the front of the board or back of the board (see figures
below), and include DDR LEDs (also referred to as Flash-Based Write Cache, or FBWC, LEDs) and status LEDs. The LED states are described in the following tables.

Front panel brackets on SmartRAID 3100-4i/8i controllers have three holes for the Heartbeat LED, Fault LED, and Crypto LED.

**Figure 3-1. SmartRAID 3100 Series LED Locations**

---

**Table 3-2. SmartRAID 3100 Series Status LEDs**

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDR_LED1</td>
<td>Yellow</td>
<td>Cache backup error</td>
</tr>
<tr>
<td>DDR_LED2</td>
<td>Green</td>
<td>Dirty cache</td>
</tr>
<tr>
<td>DDR_LED3</td>
<td>Green</td>
<td>Charge status</td>
</tr>
<tr>
<td>HEARTBEAT</td>
<td>Green</td>
<td>Heartbeat (blinks once per/second when firmware operating normally)</td>
</tr>
<tr>
<td>FAULT</td>
<td>Yellow</td>
<td>Hardware Lockup/Fault</td>
</tr>
<tr>
<td>CRYPTO</td>
<td>Green</td>
<td>Cryptographic State: Off = NON-ENCRYPTING, On = ENCRYPTING</td>
</tr>
<tr>
<td>AVS_ENB</td>
<td>Green</td>
<td>The controller is operating normally if this LED is on or off:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On = Adaptive Voltage Scaling (AVS) Enabled, Off = Adaptive Voltage Scaling (AVS) Disabled</td>
</tr>
</tbody>
</table>

**Note:** Not supported on SmartRAID 3100-16i and SmartRAID 3100-24i adapters.
Table 3-3. SmartRAID 3100 Series DDR/FBWC LED States

<table>
<thead>
<tr>
<th>Cache Status</th>
<th>DDR_LED1 (Yellow)</th>
<th>DDR_LED2 (Green)</th>
<th>DDR_LED3 (Green)</th>
<th>Meaning/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power-ON state</td>
<td>Off</td>
<td>1 Hz</td>
<td>1 Hz</td>
<td>Power-up</td>
</tr>
<tr>
<td>Not Charged</td>
<td>Off</td>
<td>Off</td>
<td>1 Hz</td>
<td>Backup power not ready</td>
</tr>
<tr>
<td>Battery Charged / not dirty</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
<td>Backup power ready, no dirty cache</td>
</tr>
<tr>
<td>Battery Charged / dirty</td>
<td>Off</td>
<td>On</td>
<td>On</td>
<td>Backup power ready, dirty cache</td>
</tr>
<tr>
<td>No Battery</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>Cache error / Battery not connected</td>
</tr>
<tr>
<td>Over Temperature</td>
<td>1 Hz</td>
<td>On</td>
<td>Off</td>
<td>Over temperature</td>
</tr>
<tr>
<td>Backup in Progress</td>
<td>Off</td>
<td>1 Hz</td>
<td>Off</td>
<td>Backup State</td>
</tr>
<tr>
<td>Backup in Flash</td>
<td>Off</td>
<td>On</td>
<td>1 Hz</td>
<td>Backup State Cont. State</td>
</tr>
<tr>
<td>Backup Complete</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
<td>Backup complete state</td>
</tr>
<tr>
<td>Charge Timeout</td>
<td>2 Hz</td>
<td>2 Hz</td>
<td>On</td>
<td>Battery charge timeout</td>
</tr>
<tr>
<td>General Error</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>Cache Error</td>
</tr>
<tr>
<td>Backup Incomplete</td>
<td>1 Hz</td>
<td>1 Hz</td>
<td>Off</td>
<td>Idle State &amp; BDIF &amp; brownout &amp; bad volt</td>
</tr>
<tr>
<td>Backup/restore Error</td>
<td>On</td>
<td>On</td>
<td>Off</td>
<td>Backup complete state, restore error</td>
</tr>
</tbody>
</table>

3.4 About the Adaptec SmartRAID 3101-4i/3151-4i

The Adaptec SmartRAID 3101-4i/3151-4i is a SAS Host Bus Adapter with these features:
Figure 3-2. Adaptec SmartRAID 31x1-4i
### About Your SmartRAID 3100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>4</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 256 Kb SEEPROM, 1Mb MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>1 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>1 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>4 direct-attached (or up to 238 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Encryption</td>
<td>No</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Inlet ambient temperature, ASIC die temperature, Top-side board ambient temperature, Bottom-side board ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>SmartRAID 3101-4i: No (non-upgradeable)</td>
</tr>
<tr>
<td></td>
<td>SmartRAID 3151-4i: Integrated ASCM-35F backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

#### 3.5 About the Adaptec SmartRAID 3101E-4i

The Adaptec SmartRAID 3101E-4i is a SAS Host Bus Adapter with these features:
Figure 3-3. Adaptec SmartRAID 3101E-4i

1. Mounting Bracket
2. HDA mode jumper
3. UART
4. Internal mini-SAS HD connector (CN0)
5. PCIe x8 Connector
## Form Factor
- Low-profile MD2

## Bus compatibility
- PCIe 3.0

## PCIe bus width
- x8

## Data transfer rate
- 12 Gb/s per port

## Phys (Unified Serial Ports)
- 4

## Standard memory
- 32 MB Boot Flash, 256 Kb SEEPROM, 1Mb MRAM

## Cache
- 1 GB

## Connectors, internal
- 1 mini-SAS HD x4 (SFF-8643)

## Maximum number of disk drives
- 4 direct-attached

## Enclosure Support
- SES2, SES3, IBPI and SGPIO

## Expander Support
- No (no drives of any type detected if connected via expander)

## Encryption
- No

## Thermal sensor
- Inlet ambient temperature, ASIC die temperature, Top-side board ambient temperature, Bottom-side board ambient temperature

## Cache Protection/Backup
- No (non-upgradeable)

### 3.6 About the Adaptec SmartRAID 3102-8i/3152-8i/3154-8i

The Adaptec SmartRAID 3102-8i/3152-8i/3154-8i is a SAS Host Bus Adapter with these features:
<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>8</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 256 Kb SEEPROM, 1Mb MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>SmartRAID 3102-8i/3152-8i: 2 GB</td>
</tr>
<tr>
<td></td>
<td>SmartRAID 3154-8i: 4 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>2 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>8 direct-attached (or up to 246 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Encryption</td>
<td>No</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Inlet ambient temperature, ASIC die temperature,</td>
</tr>
<tr>
<td></td>
<td>Top-side board ambient temperature, Bottom-side</td>
</tr>
<tr>
<td></td>
<td>board ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>SmartRAID 3102-8i: No (non-upgradeable)</td>
</tr>
<tr>
<td></td>
<td>SmartRAID 3152-8i/3154-8i: Integrated ASCM-35F</td>
</tr>
<tr>
<td></td>
<td>backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

### 3.7 About the Adaptec SmartRAID 3102E-8i

The Adaptec SmartRAID 3102E-8i is a SAS Host Bus Adapter with these features:
Figure 3-5. Adaptec SmartRAID 3102E-8i

1. Mounting Bracket
2. HDA mode jumper
3. UART
4. Internal mini-SAS HD connectors (CN0, CN1)
5. PCIe x8 Connector
<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>8</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 256 Kb SEEPROM, 1Mb MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>2 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>2 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>8 direct-attached</td>
</tr>
<tr>
<td>Enclosure support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Expander support</td>
<td>No (no drives of any type detected if connected via expander)</td>
</tr>
<tr>
<td>Encryption</td>
<td>No</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Inlet ambient temperature, ASIC die temperature, Top-side board ambient</td>
</tr>
<tr>
<td></td>
<td>temperature, Bottom-side board ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>No (non-upgradeable)</td>
</tr>
</tbody>
</table>

### 3.8 About the Adaptec SmartRAID 3154-8e

The Adaptec SmartRAID 3154-8e is a SAS Host Bus Adapter with these features:
Figure 3-6. Adaptec SmartRAID 3154-8e
### About Your SmartRAID 3100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>8</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 256 Kb SEEPROM, 1 Mb MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>4 GB</td>
</tr>
<tr>
<td>Connectors, external</td>
<td>2 mini-SAS HD x4 (SFF-8644)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>8 direct-attached (or up to 254 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Encryption</td>
<td>No</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Inlet ambient temperature, ASIC die temperature, Top-side board ambient temperature, Bottom-side board ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>Integrated ASCM-35F backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

### 3.9 About the Adaptec SmartRAID 3154-8i8e

The Adaptec SmartRAID 3154-8i8e is a SAS Host Bus Adapter with these features:
Figure 3-7. Adaptec SmartRAID 3154-8i8e
## About Your SmartRAID 3100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>16</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 128 Kb SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>4 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>2 mini SAS HD x4 (SFF-8644) and 2 mini SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>16 direct-attached (or up to 246 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Processor temperature, Ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>Integrated ASCM-35F backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

### 3.10 About the Adaptec SmartRAID 3154-8i16e

The Adaptec SmartRAID 3154-8i16e is a SAS Host Bus Adapter with these features:
Figure 3-8. Adaptec SmartRAID 3154-8i16e
### Form Factor
- Low-profile MD2

### Bus compatibility
- PCIe 3.0

### PCIe bus width
- x8

### Data transfer rate
- 12 Gb/s per port

### Phys (Unified Serial Ports)
- 24

### Standard memory
- 32 MB boot flash, 128 Kb SEEPROM, 128 KB MRAM

### Cache
- 4 GB

### Connectors, internal
- 4 mini SAS HD x4 (SFF-8644) and 2 mini SAS HD x4 (SFF-8643)

### Maximum number of disk drives
- 24 direct-attached (or up to 246 with expanders)

### Enclosure Support
- SES2, SES3, IBPI and SGPIO

### Thermal sensor
- Processor temperature, Ambient temperature

### Cache Protection/Backup
- Integrated ASCM-35F backup module with external supercapacitor

## 3.11 About the Adaptec SmartRAID 3154-16i

The Adaptec SmartRAID 3154-16i is a SAS Host Bus Adapter with these features:
Figure 3-9. Adaptec SmartRAID 3154-16i

1. Mounting Bracket
2. UART
3. Supercapacitor Connector
4. 4 internal mini-SAS HD connectors (END-EN)
5. PCIe x8 Connector
6. HDA mode jumper
### About Your SmartRAID 3100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>16</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB boot flash, 128 Kb SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>4 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>4 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>16 direct-attached (or up to 238 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Processor temperature, Ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>Integrated ASCM-35F backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

### 3.12 About the Adaptec SmartRAID 3154-24i

The Adaptec SmartRAID 3154-24i is a SAS Host Bus Adapter with these features:
Figure 3-10. Adaptec SmartRAID 3154-24i

1. Mounting Bracket
2. UART
3. Supercapacitor Connector
4. 2 internal mini-SAS HD connectors (CN4-CN5)
5. 4 internal mini-SAS HD connectors (CN0-CN3)
6. PCIe x8 Connector
7. HDX mode jumper
### 3.13 About the SmartRAID 3162-8i/SmartRAID 3162-8i /e Adapter

The SmartRAID 3162-8i/SmartRAID 3162-8i /e is a SAS Host Bus Adapter with these features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>24</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 128 Kb SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Cache</td>
<td>4 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>6 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>24 direct-attached (or up to 230 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensor</td>
<td>Processor temperature, Ambient temperature</td>
</tr>
<tr>
<td>Cache Protection/Backup</td>
<td>Integrated ASCM-35F backup module with external supercapacitor</td>
</tr>
</tbody>
</table>

© 2022 Microchip Technology Inc. and its subsidiaries
<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate</td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>8</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 16 KB Boot SEEPROM, 128 KB MRAM, 256 KB Crypto SEEPROM (SmartRAID 3162-8i /e only)</td>
</tr>
<tr>
<td>Cache</td>
<td>2 GB</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>2 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>8 direct-attached (or up to 246 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES2, SES3, IBPI and SGPIO</td>
</tr>
</tbody>
</table>
| maxCrypto Controller-Based Encryption | **SmartRAID 3162-8i**: No  
**SmartRAID 3162-8i /e**: Yes |
| Thermal sensor                  | Processor temperature, Ambient temperature          |
| Cache Protection/Backup         | Integrated flash backup module ASCM-17F, with board-mounted supercapacitor |
4. About Your SmartHBA 2100 Series Host Bus Adapter

This section provides an overview of the features of the SmartHBA 2100 Series adapter.

4.1 Standard Features

- Support for SAS and SATA Hard Disk Drives (HDD) and Solid State Drives (SSD)
- UEFI pre-boot BIOS, CTRL-A configuration utility
- Flash ROM for updates to firmware and BIOS
- Up-to 24 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 SES 2.x/3.x inband support, TWI, IBPI and SGPIO enclosure management
- Thermal sensors, with logging capabilities
- Support for RAID 0, 1, 5, 10

4.2 Mechanical Information

4.2.1 Board Dimensions

This table shows the board dimensions of the SmartHBA 2100 Series adapters, in inches.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>SmartHBA 2100-4i4e</th>
<th>SmartHBA 2100-8i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>2.70&quot;</td>
<td>2.712&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>5.20&quot;</td>
<td>6.60&quot;</td>
</tr>
<tr>
<td>PCB Thickness</td>
<td>0.062&quot;</td>
<td>0.062&quot;</td>
</tr>
<tr>
<td>Max Component Height, Top Side</td>
<td>0.570&quot;</td>
<td>0.570&quot;</td>
</tr>
<tr>
<td>Max Component Height, Bottom Side</td>
<td>0.105&quot;</td>
<td>0.105&quot;</td>
</tr>
</tbody>
</table>

4.2.2 Heat Sink

SmartHBA 2100 Series adapters include a passive heat sink capable of bi-directional airflow. The heat sink does not support an optional fan. The heat sink has four push-pins located at its four corners to ensure an even distribution of force across the top of the ASIC.

4.3 Visual Indicators

LEDs on the SmartHBA 2100 Series adapters provide a visual indication of the board hardware status. The LED locations vary, and may be on the front of the board or back of the board (see figures below). The LED states are described in the following table.
4.4 About the Adaptec SmartHBA 2100-4i4e

The Adaptec SmartHBA 2100-4i4e is a SAS Host Bus Adapter with these features:
Figure 4-2. Adaptec SmartHBA 2100-4i4e

1. Mounting Bracket
2. HBA mode jumper
3. UART
4. Internal mini-SAS HD connector (EXP)
5. PCIe x8 Connector
6. External mini-SAS HD connector (EXP)
### About Your SmartHBA 2100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>PCIe Low-profile MD2 (smaller than MD2)</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate (SAS)</td>
<td>12 Gbps per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>8</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 16 KB SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>1x1 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Connectors, external</td>
<td>1x1 mini-SAS HD x4 (SFF-8644)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>4/port direct-attached (or up to 250 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES 2.x/3.x inband support, TWI, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensors</td>
<td>Inlet ambient temperature, ASIC die temperature, Top-side board ambient temperature, Bottom-side board ambient temperature</td>
</tr>
</tbody>
</table>

### 4.5 About the Adaptec SmartHBA 2100-8i

The Adaptec SmartHBA 2100-8i is a SAS Host Bus Adapter with these features:
Figure 4-3. Adaptec SmartHBA 2100-8i Features

1. Mounting bracket
2. HBA mode jumper
3. UART
4. Internal mini-SAS
   HD connectors (CN0, CN1)
5. PCIe x8 Connector
### 4.6 About the Adaptec SmartHBA 2100-8i8e

The Adaptec SmartHBA 2100-8i8e is a SAS Host Bus Adapter with these features:
Figure 4-4. Adaptec SmartHBA 2100-8i8e Features

1. Mounting Bracket
2. HDA mode Connector
3. UAR/T
4. 2 Internal mini-SAS HD connectors (C/N4-C/N5)
5. PCIe slot Connector
6. 2 External mini-SAS HD connectors (C/N0-C/N1)
<table>
<thead>
<tr>
<th><strong>Form Factor</strong></th>
<th>PCIe Low-profile MD2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bus compatibility</strong></td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td><strong>PCle bus width</strong></td>
<td>x8</td>
</tr>
<tr>
<td><strong>Data transfer rate</strong></td>
<td>12 Gb/s per port</td>
</tr>
<tr>
<td><strong>Phys (Unified Serial Ports)</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>Standard memory</strong></td>
<td>32 MB Boot Flash, 128 Kb SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td><strong>Connectors, internal</strong></td>
<td>2 mini SAS HD x4 (SFF-8644) and 2 mini SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td><strong>Maximum number of disk drives</strong></td>
<td>16 direct-attached (or up to 246 with expanders)</td>
</tr>
<tr>
<td><strong>Enclosure Support</strong></td>
<td>SES 2.x/3.x inband support, TWI, IBPI and SGPIO</td>
</tr>
<tr>
<td><strong>Thermal sensor</strong></td>
<td>Ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>

### 4.7 About the Adaptec SmartHBA 2100-16i

The Adaptec SmartHBA 2100-16i is a SAS Host Bus Adapter with these features:
Figure 4-5. Adaptec SmartHBA 2100-16i Features

1. Mounting Bracket
2. HBA mode jumper
3. UART
4. 4 Internal mini-SAS HD connectors (CN0-CN3)
5. PCIe x8 Connector
About Your SmartHBA 2100 Series Host Bus Adapter

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>PCIe Low-profile MD2 (smaller than MD2)</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate (SAS)</td>
<td>12 Gbps per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>16</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 32 KB SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>4 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>16 direct-attached (or up to 238 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES 2.x/3.x inband support, TWI, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensors</td>
<td>Inlet ambient temperature, ASIC die temperature, Top-side board ambient temperature, Bottom-side board ambient temperature</td>
</tr>
</tbody>
</table>

4.8 About the Adaptec SmartHBA 2100-24i

The Adaptec SmartHBA 2100-24i is a SAS Host Bus Adapter with these features:
About Your SmartHBA 2100 Series Host Bus Adapter

Figure 4-6. Adaptec SmartHBA 2100-24i Features

1. Mounting Bracket
2. UART
3. 2 Internal mini-SAS HD connectors (EN=CN)
4. 4 internal mini-SAS HD connectors (EN=CN)
5. PCIe x8 Connector
6. HDA mode jumper
<table>
<thead>
<tr>
<th>Specification</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>PCIe Low-profile MD2</td>
</tr>
<tr>
<td>Bus compatibility</td>
<td>PCIe 3.0</td>
</tr>
<tr>
<td>PCIe bus width</td>
<td>x8</td>
</tr>
<tr>
<td>Data transfer rate (SAS)</td>
<td>12 Gbp/s per port</td>
</tr>
<tr>
<td>Phys (Unified Serial Ports)</td>
<td>24</td>
</tr>
<tr>
<td>Standard memory</td>
<td>32 MB Boot Flash, 16 KB SEEPROM, 128 KB MRAM</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>6 mini-SAS HD x4 (SFF-8643)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>24 direct-attached (or up to 230 with expanders)</td>
</tr>
<tr>
<td>Enclosure Support</td>
<td>SES 2.x/3.x inband support, TWI, IBPI and SGPIO</td>
</tr>
<tr>
<td>Thermal sensors</td>
<td>Inlet ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>

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5. **Installing the Controller and Disk Drives**

This section explains how to install your SmartHBA 2100/SmartRAID 3100 Series adapter in a computer cabinet or server and connect it to internal and external disk drives.

5.1 **Before You Begin**

- Read Safety Information.
- Familiarize yourself with your host bus adapter'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).

5.2 **Selecting Disk Drives and Cables**

5.2.1 **Disk Drives**

Your SmartHBA 2100/SmartRAID 3100 Series adapter supports SAS and SATA disk drives, Solid State Drives (SSDs), and SAS tape drives. For more information about compatible disk drives, refer to www.microsemi.com/products/storage/compatibility.

5.2.2 **Cables**

Depending on your adapter model and application requirements, you can use any of the cables listed below. For more information about cabling options for your SmartHBA 2100/SmartRAID 3100 Series adapter, visit www.microsemi.com/products/storage/cables-accessories.

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

**SAS HD Cables**

- **Internal Mini SAS HD to SAS HD (SFF-8643 to SFF-8643)**—Connects to a backplane or enclosure.
- **External Mini SAS HD to SAS HD (SFF-8644 to SFF-8644)**—Connects to a backplane or enclosure.

5.3 **Installing the Host Bus Adapter**

This section describes how to install your SmartHBA 2100/SmartRAID 3100 Series adapter in a computer cabinet or server and connect internal and external storage devices. The SmartHBA 2100/SmartRAID 3100 Series adapters have these configurations:
Adapters with internal connectivity
- Adapters with external connectivity
- Adapters with internal and external connectivity
- Adapters with internal connectivity and an external supercapacitor module

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 adapter model and remove the slot cover, as shown in the figure below. (To check PCIe bus compatibility of your adapter, see About Your Host Bus Adapter.)

**Note:** For SmartRAID 3200 Series adapters with an external supercapacitor module, select a slot for the adapter that's next to an empty slot in the backplane, ideally, a short.

---

**CAUTION** Touch a grounded metal object before handling the adapter.

---

3. Insert the adapter 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 adapter and internal or external storage devices, as required:
   - For adapters with internal ports, connect SAS HD cables between the adapter and internal disk drives or enclosures:
Installing the Controller and Disk Drivers

- For adapters with external ports, connect SAS HD cables between the adapter and external disk drives or enclosures:
Installing the Controller and Disk Drives

External Port, Front view
• For adapters with internal and external ports, connect SAS HD cables between the adapter 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.
6. **Installing the Driver and an Operating System**

This chapter explains how to install the SmartPQI controller driver and an operating system on a bootable volume. It assumes that the SmartHBA 2100/SmartRAID 3100 is installed in a computer or server.

**Note:**
- For information about building the SmartPQI drivers from source, see 10. Installing the SmartPQI Drivers from Source.

### 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 [https://www.microchip.com/wwwregister/default.aspx](https://www.microchip.com/wwwregister/default.aspx) in the address bar.
2. Enter your myMicrochip account credentials.
3. Navigate to the SmartHBA 2100/SmartRAID 3100 product page.
4. Download the controller driver package (zip file archive).
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 2016, rhel7, rhel6, and so on).

**Note:** See the *Release Notes* for a complete list of driver files and folder structure.

### 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, see 6.12. Installing with VMware.

1. Change to the driver directory for your operating system version.
2. Write the driver binary file to a USB flash drive.

   For example, if the USB drive is `/dev/sdc` on the Linux system, type (where #.#.#-### is the build number):

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHEL 7</td>
<td><code>dd if=smartpqi-#.##-###.&lt;rhel_version&gt;.x86_64.dd of=/dev/sdc</code></td>
</tr>
<tr>
<td>SLES 12</td>
<td><code>dd if=smartpqi-#.##-###.&lt;sles_version&gt;.x86_64.dd of=/dev/sdc</code></td>
</tr>
</tbody>
</table>

**Note:** See the Release Notes for the latest build number.

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

### 6.3 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 controller SmartPQI 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.
6. Follow the on-screen instructions to complete the installation.
### 6.4 Installing with Red Hat Linux

To install the controller SmartPQI driver while installing Red Hat Linux, follow the steps in the sections below.

#### RHEL7 Update 6 Installation and Above

To install the RHEL7 driver with a Linux system:

1. Install the Linux system using the inbox smartpqi driver.
2. After the installation completes, install the latest smartpqi driver rpm by using the following command (where #.#.#-### is the build number and the RHEL version is formatted as follows: rhel7u9):
   ```
   rpm –ivh kmod-smartpqi-#.#.#-###.<rhel_version>.x86_64.rpm
   ```

#### RHEL7 Installation with Secure Boot

To install the RHEL driver with a Linux system with secure boot enabled:

**Note:** For more information about installing RHEL with secure boot, refer to the RedHat online resources for "Signing Kernel Modules for Secure Boot".

1. Install the Linux system using the inbox smartpqi driver in secure boot mode.
2. Enroll the Microchip public key for secure boot:
   a. Import public key:
      ```
      mokutil --import smart_driver_key_pub.der
      ```
   b. Reboot system.
   c. During boot, perform MOK key enrollment to accept the new key.
3. After the installation completes, install the signed driver rpm using the following command (where #.#.#-### is the build number):
   ```
   rpm –ivh kmod-smartpqi-#.#.#-###.<rhel_version>.x86_64.rpm
   ```
4. Reboot.

### 6.5 Installing with SuSE Linux Enterprise Server

To install the controller SmartPQI driver while installing SuSE Linux, follow the steps in the sections below.

#### Installing with SLES 12 SP3 and Above

Follow these steps to install the driver while installing SLES 12 SP5:

1. Install the Linux system using the inbox smartpqi driver.
2. After the installation completes, install the latest smartpqi driver rpm by using the following command (where #.#.#-### is the build number and the SLES version is formatted as follows: sles12sp5):
   ```
   rpm -ivh smartpqi-ueficert-#.#.#-###.<sles_version>.x86_64.rpm
   rpm -ivh smartpqi-kmp-default-#.#.#-###.<sles_version>.x86_64.rpm
   ```

#### SLES 12 Installation with Secure Boot

To install the SLES driver with a Linux system with secure boot enabled:

1. Install the Linux system using the inbox smartpqi driver in secure boot mode.
2. Enroll the Microchip public key for secure boot.
   a. Install the ueficert package:
      ```
      rpm -ivh smartpqi-ueficert-#.#.#-###.<sles_version>.x86_64.rpm
      ```
b. Import public key:

```
mokutil --import /etc/uefi/certs/17A8B2BE.crt
```

c. Reboot.

d. During boot, perform MOK key enrollment to accept the new key.

3. Install Microchip signed driver rpm package:

```
rpm -ivh smartpqi-kmp-default-#.#.###.<sles_version>.x86_64.rpm
```

4. Reboot.

### 6.6 Installing with Oracle Linux

To install the controller SmartPQI driver while installing Oracle Linux, follow the steps in the sections below.

#### Installing with Oracle Linux 7.6 and Above

Follow these steps to install the driver while installing Oracle Linux 7.6:

1. Install the Linux system using the inbox smartpqi driver.
2. After the installation completes, install the latest smartpqi driver rpm for the kernel you intend to run (where #.#.#-### is the build number and the Oracle Linux version is formatted as follows: ol7u9):

   - **Base Kernel:**
     ```
rpm -ivh kmod-smartpqi-#.#.###.<ol_version>.x86_64.rpm
```
   - **UEK Kernel:**
     ```
rpm -ivh kmod-smartpqi-uek-#.#.###.<ol_version>.x86_64.rpm
```

### 6.7 Installing with Ubuntu Linux

To install the controller SmartPQI driver while installing Ubuntu Linux:

**Note:** The following instructions apply to Ubuntu Server 18.04 LTS and above only.

1. Install the Linux system using the inbox smartpqi driver.
2. Install the smartpqi DKMS package (`smartpqi-dkms_#.#.#-###_all.deb`) by using the following commands (where #.#.#-### is the build number):

   - **Note:** The smartpqi DKMS package rebuilds the smartpqi driver automatically whenever the kernel on the system is updated. This ensures you have a smartpqi driver to support the new kernel.

   ```
   apt-get update
   apt-get -f install build-essential dkms
dpkg -i smartpqi-dkms_#.#.###_all.deb
   ```

### 6.8 Installing with Debian Linux

To install the controller SmartPQI driver while installing Debian Linux 9.13 and above:

1. Install the Linux system using the inbox smartpqi driver.
2. Reboot the system.
3. Install the smartpqi DKMS package (`smartpqi-dkms_#.#.###_all.deb`) by using the following commands (where #.#.#-### is the build number):

   - **Note:** The smartpqi DKMS package rebuilds and activates the smartpqi driver automatically any time the kernel on the system is updated. This insures you have a smartpqi driver to support the new kernel.

   ```
   apt-get install build-essential dkms
dpkg -i smartpqi-dkms_#.#.###_all.deb
   ```
6.9 Installing with FreeBSD

To install the controller SmartPQI driver while installing FreeBSD:

1. Copy the driver module (smartpqi.ko) to a USB drive.
   Disk partition the USB key, using gpart on a unix system.
   
   For example:
   ```bash
   # gpart create -s GPT da1
   # gpart add -t freebsd-ufs da1
   # newfs /dev/da1p1
   # mount /dev/da1p1 /mnt
   # cp smartpqi.ko /mnt
   ```

2. Insert the USB driver disk.
3. Insert the FreeBSD Installation disk into the CD/DVD drive and boot from it.
4. From the FreeBSD boot menu, press Escape to launch the boot loader prompt.
5. Perform the following steps at the boot loader prompt:
   a. Check all the present modules by executing following command.
      ```bash
      # lsmod
      ```
      Expected Output: It will show all the present modules.
   b. Unload the kernel module by executing the following command:
      ```bash
      # unload
      ```
   c. Check whether the kernel is unloaded or not by executing the following command:
      ```bash
      # lsmod
      ```
      Expected Output: It will show all the present modules.
   d. Check whether the USB drive is detected or not by executing the following command:
      ```bash
      # lsdev
      ```
      Expected Output:
      ```
      part 0: ............ (removable)
      part 1: ............ (removable)
      part 2: ............ (removable)
      ```
   e. Load the kernel by executing the following command:
      ```bash
      # load /boot/kernel/kernel
      ```
   f. Load the driver module by executing the following command:
      ```bash
      # load part< USB key location >:smartpqi.ko
      ```
      For example: # load part2:smartpqi.ko
   g. Continue the Installation procedure by typing the following command and pressing Enter.
      ```bash
      # boot
      ```
   h. After completing the kernel installation and before rebooting the system, add the driver to the new system. Choose "YES" when it prompts the following message for the manual configuration.
      "The installation is now finished. Before exiting the installer, would you like to open a shell in the new system to make any final manual modifications?"
i. Use the following commands to complete the manual configuration:
   i. Mount the USB key by using the following command:
      
      ```
      # mount /dev/da1p1 /media
      ```
   ii. Copy the driver to the boot directory by using the following command:
      
      ```
      # cp /media/smartpqi.ko /boot/modules/smartpqi.ko
      ```
   iii. Ensure that the boot loader loads by using the following command:
      
      ```
      # vi /boot/loader.conf
      ```
      Add the following line:
      
      ```
      smartpqi_load="YES"
      # reboot
      ```
   iv. If the system halts at # mountroot>, check for the boot partition using the following command:
      
      ```
      # mountroot> ?
      ```
      Note: The boot partition is primarily present in P2, so use the following command:
      
      ```
      # mountroot> ufs:/dev/<da0p2>
      ```

6.10 Installing with Solaris

To install the controller SmartPQI driver while installing Solaris, follow the steps in the sections below.

6.10.1 Installing with Solaris Live Media

To install the SmartPQI controller driver with Solaris Live Media:

1. Copy the smartpqi.pkg or iso file and adddriver.sh file to a USB flash drive and insert that drive into the installation system.
2. Boot to the Solaris 11 live media DVD in the installation system. Select the Solaris version and press Enter.
3. Select the keyboard (default is 27) and language (default is 3).
4. Enter your login credentials.
   The GUI will appear.
5. Open the terminal and switch to the root user by using the following command:
   
   ```
   # su
   ```
   Use "solaris" as the root password.
6. Adaptec controllers are shipped with the inbox aac driver, so it is necessary to remove the driver. Use the following command to remove the inbox aac driver:
   
   ```
   # remDrv aac
   ```
7. Open the "Device driver utility" from the desktop and enter the root password.
8. The DD utility scans and automatically highlights the controller or devices that are not claimed by the driver.
9. Click Browse to load the driver image from the USB flash drive.
10. Select smartpqi.pkg or iso file and click "OK".
11. Click Install.
    The Installation Successful message gets displayed.
12. The DD utility rescans the devices.
13. The available disks are viewable in the terminal by typing the format command. Press Ctrl+C to return to the command prompt.
14. Return to the desktop by typing `exit` at the `~#` prompt.
15. Double click the **Install Oracle Solaris** icon for OS installation and follow the steps to complete the OS installation.

**Notes:** After the OS is installed, perform following procedure:

1. Open the terminal and copy the `adddriver.sh` file to `/tmp` directory.

   ```bash
   # cp /media/USB_DRIVE/adddriver.sh /tmp/
   # cd /tmp
   ```

2. Execute the `adddriver.sh` script file with the parameter `live` as follows:

   ```bash
   # chmod +x adddriver.sh
   # ./adddriver.sh live
   ```

3. Reboot the system using the following command:

   ```bash
   # reboot
   ```

### 6.10.2 Installing with Solaris Text Installer

To install the SmartPQI driver with Solaris Text Installer:

1. Copy the `smartpqi.pkg` or `iso` file and `adddriver.sh` files to a USB flash drive and plug that drive into the installation system.
2. Boot to the Solaris 11.3 or 11.4 text installer DVD in the installation system, and select the keyboard and language.
3. After the DVD boots, select option 3 (**Shell**) from the list.
4. Remove the inbox `aac` driver and exit the shell using the following commands:

   ```bash
   #rem_drv aac
   #exit
   ```

5. Select option 2 (**Install Additional Drivers**) from the list. The **Device Driver Utility** screen appears.
6. Press the F4 key (**Media**) to search for the driver image file on your flash drive.
7. Select **USB drive** and press **Enter**.
8. Find the location of the `smartpqi.pkg` or `iso` file on the flash drive, highlight it, and press the F2 key to select it.
9. Press the F2 key again to install the driver.
10. If the installation succeeds, the following screen will appear:
11. Press the F9 key to exit to the Options menu.
12. Select option 3 (Shell) from the list.
13. Type the format command in the terminal window to list the available disks. Press Ctrl+C to return to the command prompt.
14. Type exit at the ~# prompt to go back to the Options menu.
15. Enter option 1 to Install Oracle Solaris.
   The Welcome to Oracle Solaris screen appears.
16. Press the F2 key to continue.
17. Select the disk discovery method and press the F2 key to continue.
18. Follow installation steps accordingly.
19. At the installation summary, press the F2 key to install the Oracle package; or, press the F3 key to go back to make changes.
20. After the OS has been installed, press F9 to go back to the Options menu.
21. Select Option 3 (Shell).
22. Open the terminal and copy the adddriver.sh file to /tmp directory using the following commands:

   ```bash
   # cp /media/USB_DRIVE/adddriver.sh /tmp/
   # cd /tmp
   ```
23. In the terminal, execute the adddriver.sh script file with the parameter text as follows:

   ```bash
   # chmod +x adddriver.sh
   # ./adddriver.sh text
   ```
24. Reboot the system using the following command:

   ```bash
   #reboot
   ```

### 6.11 Installing with Citrix XenServer

**Note:** For Hypervisor 8.2 or later, install Hypervisor on the system using the driver included in the release. Then update driver as necessary using the latest driver release from the Citrix support site.
Note: For XenServer 7.6 and above, a USB key is supported for the driver update ISO. On a Linux system, use the dd command to write the SmartPQI driver ISO image to the USB key. You will 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 controller SmartPQI driver while installing Citrix XenServer:

1. On the machine where you want to install the OS and SmartPQI driver, insert the XenServer installation DVD, then restart your computer.
2. When prompted to add a driver, insert the driver USB key, press F9, then select local media.
   Note: Leave the driver USB key inserted throughout the installation.
3. Verify the SmartPQI driver and “use”.
4. Continue the XenServer installation, following the on-screen instructions.
5. Remove the driver USB key, then reboot your computer.

6.12 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 controller SmartPQI driver with VMware ESXi, 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.

To install the SmartPQI controller driver while installing VMware:

1. Use VMware’s ESXi image builder process to build a boot/install image that includes the desired driver. Instructions for this process can be found at docs.vmware.com/en/VMware-vSphere/7.0/com.vmware.esxi.install.doc/GUID-62B15826-B529-4519-B57A-98DFD00C5522.html?hWord=N4lghgNiBcIJIFswHMCmACAQgVwJYQBNUAnEAXyA.
2. On the VMware ESXi machine, insert the custom boot CD/USB, then restart your computer.
3. Follow the on-screen instructions to begin the VMware installation.
4. Complete the VMware installation, following the on-screen instructions.
5. Remove the custom boot CD or USB drive, then reboot your computer.
7. Installing the Driver on an Existing Operating System

This chapter explains how to install the SmartPQI controller driver on an existing operating system. It assumes that the SmartHBA 2100/SmartRAID 3100 is installed in a computer or server and the OS is already installed.

Notes:
• To install the driver while you're installing an operating system, see Installing the Driver and an Operating System.
• For information about building the SmartPQI drivers from source, see 10. Installing the SmartPQI Drivers from Source.

7.1 Download the Driver Package

Complete these steps to download the drivers for your operating system(s):
1. Open a browser window, then type https://www.microchip.com/wwwregister/default.aspx in the address bar.
2. Enter your myMicrochip account credentials.
3. Navigate to the SmartHBA 2100/SmartRAID 3100 product page.
4. Download the controller driver package (zip file archive).
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 2016, \rhel7, \rhel6, and so on).
   Note: See the Release Notes for a complete list of driver files and folder structure.

7.2 Creating a Driver Disk

Create a driver disk by completing the steps below. You will need a USB flash drive to complete this task.
1. Change to the driver directory for your operating system version.
2. Write the driver binary file to a USB flash drive.
3. Remove and label the driver disk.
4. Continue the installation with the instructions for your operating system.

7.3 Installing on Windows

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

To install the controller SmartPQI driver on Windows:
1. Start or restart Windows.
2. In the Control Panel, launch the Device Manager, right-click your Smart Storage Controller, 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.

7.4 Installing on Red Hat

To install the controller SmartPQI driver on Red Hat Linux, follow the steps in the sections below.

Installing on RHEL7 Update 6 and Above

To install the RHEL7 driver on a Linux system:
1. Install the latest smartpqi driver rpm by using the following command (where #.#.#-### is the build number and the RHEL version is formatted as follows: rhel7u9):
   `rpm –ivh kmod-smartpqi-#.#.#-###.<rhel_version>.x86_64.rpm`
2. Reboot the system.

7.5 Installing on SuSE Linux Enterprise Server
To install the controller SmartPQI driver on SLES, follow the steps below.

Installing on SLES 12 SP3 and Above
Follow these steps to install the driver on SLES 12 SP5:
1. Install the latest smartpqi driver rpm by using the following command (where #.#.#-### is the build number and the SLES version is formatted as follows: sles12sp5):
   ```
   rpm –ivh smartpqi-ueficert-#.#.#-###.<sles_version>.x86_64.rpm
   rpm –ivh smartpqi-kmp-default-#.#.#-###.<sles_version>.x86_64.rpm
   ```
2. Reboot the system.

7.6 Installing on Oracle Linux
To install the controller SmartPQI driver on Oracle Linux, follow the steps below.

Installing on Oracle Linux 7.6 and Above
To install the SmartPQI driver on an Oracle Linux system:
1. Install the latest smartpqi package using the following commands (where #.#.#-### is the build number and the Oracle Linux version is formatted as follows: ol7u9):
   ```
   Base Kernel: rpm –ivh kmod-smartpqi-#.#.#-###.<ol_version>.x86_64.rpm
   UEK Kernel: rpm –ivh kmod-smartpqi-uek-#.#.#-###.<ol_version>.x86_64.rpm
   UEK6ol7 Kernel: rpm –ivh kmod-smartpqi-uek6ol7-#.#.#-###.x86_64.rpm
   UEK6ol8 Kernel: rpm –ivh kmod-smartpqi-uek6ol8-#.#.#-###.x86_64.rpm
   ```

7.7 Installing on Ubuntu Linux
Notes:
1. For driver installation on Ubuntu Linux, you may need to create the root account and password.
2. The SmartPQI driver is available as inbox for Ubuntu 18.04 and above.
To install the controller SmartPQI driver on Ubuntu:
1. Login to the system using the root user credentials.
2. Update the Ubuntu package index by using the following command:
   ```
   sudo apt-get update
   ```
3. Load the Ubuntu unpacking tools:
   ```
   sudo apt-get -f install build-essential dkms
   ```
4. Install the latest SmartPQI DKMS DEB driver package by using the following command (where #.#.#-### is the build number):
   ```
   dpkg -i smartpqi-dkms_#.#.###_all.deb
   ```
7.8 Installing on Debian Linux
To install the controller SmartPQI driver on Debian 9.13 and above:

1. Login to the system as root, or sudo to root.
2. Install the supporting package for the SmartPQI DKMS deb package:

   ```
   apt-get update
   apt-get install build-essential dkms
   ```
3. Install the SmartPQI DKMS DEB driver package using the following command (where #.#.#-### is the build number):

   ```
   dpkg -i smartpqi-dkms_#.#.#-###_all.deb
   ```
4. Reboot system.

7.9 Installing on FreeBSD
To install the controller SmartPQI driver on FreeBSD:

1. Check whether the driver package is installed or not.

   ```
   # pkg info | grep smartpqi
   ```
2. Install the SmartPQI package by using the following command:

   ```
   # pkg add smartpqi10x-amd64.txz
   ```

   **Note:** Upgrade the package if it already exists, using the following command.

   ```
   # pkg upgrade smartpqi10x-amd64.txz
   ```
3. Restart the system.

   ```
   # reboot
   ```

7.10 Installing on Solaris
To install the controller SmartPQI driver on Solaris, follow the steps in the sections below.

1. Remove the inbox aac driver, since the Adaptec Smart Storage Controller is shipped with the inbox aac driver.

   ```
   #rem_drv aac
   ```
2. Extract the SmartPQI driver package from a .zip or .tar file.
3. Perform the following instructions to load the driver package.
   a. If "smartpqi.pkg" is present, execute the following command:

      ```
      # pkgadd -d smartpqi.pkg
      ```
   or,
   b. Ensure that the MCHPsmartpqi folder is present in the current directory. The dot (.) in following the command will read this folder as a driver package:

      ```
      # pkgadd -d .
      ```

   In the terminal, the following messages will appear:

   ```
   The following packages are available:
   1  MCHPsmartpqi MICROCHIP Smart PQI RAID Controller driver
   ```
Select package(s) you wish to process (or 'all' to process all packages). (default: all) [?,??,q]:

Enter "1" or "all".

The following prompt will appear:

Do you want to continue with the installation of <MCHPsmartpq> [y,n,?]"n"

Enter "y".

The following message appears after a successful installation:

Installation of <MCHPsmartpq> was successful.

4. Reboot the system using the following command:

```
# reboot
```

5. Use the following command to confirm whether the driver is loaded or not:

```
# modinfo -c | grep smartpq
```

6. Use the following command to identify the driver package information:

```
# pkginfo -l MCHPsmartpq
```

Removing the Driver Package

1. Remove the loaded driver package using the following command:

```
# pkgrm MCHPsmartpq
```

In the terminal, the following messages will appear:

```
The following package is currently installed:
MCHPsmartpq MICROCHIP Smart PQI RAID Controller driver
  (i386) 1.0.0-100,REV=2016.06.06.22.10
```

The following prompt will appear:

```
Do you want to remove this package? [y,n,?,q]
```

Enter "y". Once the selection is made, the following prompt will appear:

```
Do you want to continue with the removal of this package [y,n,?,q]
```

Enter "y". The following message will appear to signify the successful removal of the driver package:

```
Removal of <MCHPsmartpq> was successful
```

2. Reboot the system using the following command:

```
# reboot
```

7.11 Installing on Citrix XenServer

Note: For Hypervisor 8.2 or later, if Hypervisor was installed on the system using the driver included in the release, then update the driver as necessary using the latest driver release from the Citrix support site.
Installing the Driver on an Existing Operating System...

**Note:** To copy the driver RPM file to XenServer, 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 controller SmartPQI driver on Citrix XenServer (where #.#.#-### is the build number and the Citrix XenServer version is formatted as follows: xen7.6):

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/smartpqi:
   ```
   scp citrix-smartpqi-#.#.#.###.<xen_version>.rpm root@<xen-server-ip>:/tmp/
   smartpqi
   ```
2. Install the driver module rpm:
   ```
   rpm -ivh /tmp/smartpqi/citrix-smartpqi-#.#.#.###.<xen_version>.rpm
   ```
3. Reboot your computer.

### 7.12 Installing on VMware

**Note:** The instructions in this section must be executed on the ESXi server's command line. To access the command line:

1. Enable ESXi system console login. At ESXi system console, press **F2** and log in as root.
2. Select “Troubleshooting Options” and press **ENTER**.
3. Select “Enable ESXi shell”.
4. Select “Enable SSH”.
5. Press **ESC** to exit from the menus back to the ESXi splash screen.
6. Press **ALT + F1** to open the ESXi shell login screen.
7. Log in as root.

To install the controller SmartPQI driver on VMware:

1. Using a remote copy utility, such as Linux scp, copy the downloaded driver VIB package onto the ESXi server’s tmp directory using the following command (where xxxxxxx is the version/build number):
   ```
   # scp smartpqi-67.xxxx.0.xxx-1OEM.670.0.0xxxxxxx.x86_64.vib
   root@<esxi_server_address>:/tmp
   ```
2. On the ESXi server console, install the driver package (.vib file).
   ```
   # esxcli software vib install -v file:/tmp/
   smartpqi-67.xxxx.0.xxx-1OEM.670.0.0xxxxxxx.x86_64 -maintenance-mode
   ```
3. Restart the system.
   ```
   # reboot
   ```
4. After rebooting the system, check whether the driver package is installed. Compare the driver vib version shown by the command below with the version that was installed, to make sure they are the same.
   ```
   # esxcli software vib list | grep smartpqi
   ```
5. Restore system console security settings:
   a. At ESXi system console, press **F2** and log in as root.
   b. Select “Troubleshooting Options” and press **ENTER**.
   c. Select “Disable ESXi shell”.
   d. Select “Disable SSH”.
   e. Press **ESC** to exit back to the ESXi splash screen.
8. Solving Problems
This section provides basic troubleshooting information and solutions for solving problems with your SmartHBA 2100/SmartRAID 3100 Series Host Bus Adapter.

8.1 Troubleshooting Checklist
If you encounter difficulties installing or using your SmartHBA 2100/SmartRAID 3100 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 .
• 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 for instructions.)
• Did the driver install correctly? It may need to be reloaded after a reboot or kernel update.
• Check the Release Notes for compatibility issues and known problems.

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

8.2 Resetting the Adapter
You may need to reset your SmartHBA 2100/SmartRAID 3100 if it becomes inoperable or if a firmware upgrade is unsuccessful. SmartHBA 2100/SmartRAID 3100 adapters support a reset protocol called Side Band Recovery. For information about Side Band Recovery, contact your support representative. To locate the Side Band Recovery jumper on your adapter, see the board illustrations in .
Using the Microchip SAS/SATA HII Configuration Utility

The Microchip SAS/SATA Configuration Utility (MSCU) is a BIOS-based utility that you can use to manage your SmartHBA 2100/SmartRAID 3100 adapters and the devices attached to them. It comprises a set of tools for creating and managing arrays, viewing and modifying adapter properties, viewing disk drive properties, flashing the HBA firmware, and managing disk drives and spares.

9.1 Running the Microsemi SAS/SATA Configuration Utility: Ctrl-A or UEFI/HII?

Your Adaptec SmartHBA 2100 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 SmartHBA 2100 controller, and rendering contents to the screen in a uniform way.

To access the SmartHBA 2100 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 main menu is displayed.

In the UEFI/HII interface, the server's standard BIOS provides access to the SmartHBA 2100 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 UEFI/HII main menu is displayed (below, right).

Note: The Administration menu is available only with the UEFI/HII interface.

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.

9.2 Controller Information

The Controller Information menu provides details about the controller, including the Board Id, firmware revision number, operating mode, UEFI driver version, encryption support, and World Wide Name. It also provides a configuration summary. To view the SmartHBA 2100 information, start the Microchip SAS/SATA HII Configuration Utility and select Controller Information from the main menu.

9.3 Creating an Array

Use the Array Configuration option to create new arrays. You can select drives, specify the RAID level and encryption options (if supported by your controller), and configure array settings, including stripe size and logical drive size.

To create an array:

1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press `Enter`. 
3. From the main menu, select Array Configuration, then select Create Array.

4. Select each drive you want to include in the array: use the arrow keys to select a drive, press Enter, then Proceed.

   **Note:** Be sure not to mix drive types! Select SATA drives or SAS drives only.

5. Select Proceed to next Form, then press Enter.

6. (For controllers with maxCrypto Controller-Based Encryption only) Select encryption options for the array: encrypted volume or plaintext volume (not encrypted).

   **Note:** You will be prompted for your account credentials (Admin or User) if you are not logged into the Encryption Manager; see 9.11.1. Encryption Manager Full Setup.

7. Select the RAID level.

8. Select Proceed to next Form.

9. Configure array settings: select the stripe size (from 16KiB to 1024KiB, depending on the number of disks and RAID level), logical drive size (default=all available space), the unit of measure (GiB, TiB, MiB), SSD Over Provisioning Optimization (enable or disable over provisioning on solid state drives in the array, if applicable), and caching (utilizing the controller's cache memory).

10. Select Submit Changes.

### 9.4 Creating a maxCache Array

**Note:** This option is available only in the UEFI/HII interface.

Use this option to create a maxCache array. The maxCache array supports read and redundant write caching, using a reserved logical device comprised of SSDs only. You can select drives, specify the RAID level, and configure array settings, such as the logical drive size and cache Write policy.

**Note:** When using maxCache in conjunction with an encrypted primary logical drive, the maxCache volume will also be encrypted automatically.

To create a maxCache array:

1. From the main menu, select Array Configuration, then select Create maxCache Array.

2. Select each drive you want to include in the array: use the arrow keys to select a drive, press Enter, then select Proceed to next Form.

3. Select the RAID level, then select Proceed to next Form.

4. Configure array settings: select the Cache Line size (64KiB or 256KiB), logical drive size (default=all available space), unit of measure (GiB, TiB, MiB), and cache Write Policy (write-back, write-through).

5. Select Submit Changes.

6. Select the data logical drive associated with the maxCache device (16 GB minimum).

### 9.5 Managing Arrays and Logical Drives

Use the Array Configuration option to manage arrays and logical drives. You can view logical drive properties, create and delete logical drives and spares, and delete logical drives and arrays.

#### 9.5.1 Viewing Logical Drive Properties

To view logical drive properties:

1. From the main menu, select Array Configuration, then select Manage Arrays

2. Use the arrow keys the select an array, press Enter, then select List Logical Drives.

3. Use the arrow keys to select a logical drive, press Enter, then select Logical Drive Details.

#### 9.5.2 Creating Logical Drives

Use the Create Logical Drive option to create new logical drives. This option creates a logical drive from the free space on the selected array.

To create a logical drive:
1. From the main menu, select **Array Configuration**, then select **Create Logical Drive**.

2. Select each drive you want to include in the array: use the space bar to select a drive, then press **Enter**.
   - **Note:** Be sure not to mix drive types! Select SATA drives or SAS drives only.

3. Select **Proceed to next Form**, then press **Enter**.

4. Select the RAID level, then select **Proceed to next Form**.

5. Configure array settings: select the stripe size (from 16KiB to 1024KiB, depending on the number of disks and RAID level), logical drive size (default=all available space), the unit of measure (GiB, TiB, MiB), SSD Over Provisioning Optimization (enable or disable over provisioning on solid state drives in the array, if applicable), and caching (utilizing the controller's cache memory).

6. Select **Submit Changes**.

### 9.5.3 Enabling IO Bypass

Use this option to enable IO Bypass acceleration for logical drives comprised of SSDs only.

To adjust the IO Bypass settings:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, press **Enter**, then select **IO Bypass Settings**.
3. From the pop-up menu, select **Enabled** or **Disabled**, then press **Enter**.
4. Select **Submit Changes**.

### 9.5.4 Editing Logical Drive Properties

Use this option to edit logical drive properties, including acceleration method and logical drive label.

To edit logical drive properties:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, press **Enter**, then select **List Logical Drives**.
3. Use the arrow keys to select a logical drive, press **Enter**, then select **Edit Logical Drive**.
4. Select **Acceleration Method**, then select one of these options from the pop-up menu:
   - IO Bypass (for logical drives comprised of SSDs)
   - Controller Cache
   - None (to disable acceleration)
5. Select **Logical Drive Label**, then type the new label.
6. Select **Submit Changes**.

### 9.5.5 Deleting a Logical Drive

**Note:** Use this procedure to delete an individual logical drive. To delete all logical drives on an array, see **9.5.9. Deleting an Array**.

To delete a logical drive:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, press **Enter**, then select **List Logical Drives**.
3. Use the arrow keys to select a logical drive, press **Enter**, then select **Delete LD**.
   - **Note:** Be sure to delete logical drives from the bottom of the list and move up. If you delete a logical drive from the middle of the list, the remaining logical drives move to the Transformation state. During that time, you cannot delete any other logical drives until they all move to the Optimal state.

### 9.5.6 Assigning Spares

A spare is a disk drive that automatically replaces a failed drive in a logical drive. A spare drive must meet the following criteria:

- It must be an unassigned drive or a spare for another array.
- It must be the same type as existing drives in the array (for example, SATA or SAS).
- The drive capacity must be greater than or equal to the smallest drive in the array.
To assign a spare to an array:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, press **Enter**, then select **Manage Spare Drives**.
3. Select the spare activation type:
   - **Assign Dedicated Spare**: activate spare when drive fails
   - **Assign Auto Replace Spare**: activate spare when drive reports a predictive failure (SMART) status
   - **Change Spare type to Dedicated**: change assigned spare type from AutoReplace to Dedicated
   - **Change Spare type to AutoReplace**: change assigned spare type from Dedicated to AutoReplace
4. Use the arrow keys to select the drive to assign as a spare.
   
   **Note**: Only drives that meet the above criteria are displayed.

### 9.5.7 Deleting a Spare Drive

To delete a spare drive:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, then press **Enter**.
3. Select **Manage Spare Drives**, then select **Delete**.
4. If the array has more than one assigned spare, use the arrow keys to select a spare from the list, then press **Enter**.

### 9.5.8 Identifying the Drives in an Array

Use this option to identify and locate the physical drives in an array by turning on their Identification LED.

To identify the physical drives in an array:

1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Use the arrow keys to select an array, then press **Enter**.
3. Select **Identify Device**.
4. Enter a value into **Identification Duration (seconds)**. This value determines how long the LED on the device will remain on.
5. Select **Identify by Drive Configuration type**, then select one of these options from the pop-up menu:
   - Data Drive(s) only
   - Spare Drive(s) only
   - All Physical Drives (default)
6. Select **Start**, then press **Enter**.
7. To turn off the Identification LED(s), press **Esc** to return to the previous menu, then select **Stop**.

### 9.5.9 Deleting an Array

**Note**: Use this procedure to delete all logical drives on an array, and the array itself. To delete an individual logical drive, see 9.5.5, **Deleting a Logical Drive**.

To delete an array:

1. From the main menu, select **Array Configuration**, then select **Manage Array LD**.
2. Use the arrow keys to select an array, press **Enter**, then select **Delete Array**.

### 9.6 Modifying SmartHBA 2100/SmartRAID 3100 Controller Settings

### 9.7 Clearing the Controller Configuration

Clearing the controller configuration destroys the controller meta-data, including partition information.
To clear the controller configuration:

1. From the main menu, select **Configure Controller Settings**, then select **Clear Configuration**.
2. Select **Delete All Array Configurations** or **Delete Configuration Metadata on All Physical Drives**.
3. Select **Submit Changes**.

## 9.8 Backup Power Source

Use the Backup Power Source option to check the status of the cache system's backup power supply, if applicable. From the main menu, select **Configure Controller Settings**, then select **Backup Power Source**.

## 9.9 Managing Power Settings

Use the Manage Power Settings option to configure the controller's power modes. There are three available power modes. You can also enable Survival mode.

- **Maximum Performance** (default): All settings are selected based on maximum performance. Power savings options that affect performance are disabled.
- **Balanced**: You can use this setting to save power with minimal effects on performance. For large queue depths, this setting affects throughput by 10% or less. At lower queue depths or infrequent I/O, impacts on performance may be greater. This command is typically useful in environments using only hard drives, and is not recommended when using SSDs. Settings are based on the user configuration, such as the number or types of drives, the RAID level, storage topology, and so forth. Significant changes to the configuration may require a reboot for optimal setting selection. If a reboot is required to change settings, UEFI HII prompts for a reboot to reflect requested settings.
- **Survival Mode**: Allows the controller to throttle back dynamic power settings to their minimums when the temperature exceeds the threshold. Enabling Survival Mode allows the server to continue running in more situations, but may affect performance.

To change the power settings for a controller:

1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press **Enter**.
3. From the main menu, select **Controller Configuration**.
4. Select **Manage Power Settings**, then select **Power Mode**.
5. Press **Tab** to select the power mode.
6. Select **Survival Mode**, then press **Tab** to select Enabled or Disabled.
7. Select **Submit Changes**.

## 9.10 Out of Band Messaging Settings

Use this option to configure the Out of Band Messaging Interface to PBSI, MCTP, or Disable.

**Note**: This option is supported in the UEFI/HII interface only.

To change the Out of Band Messaging settings for a controller:

1. Start the Microchip Configuration Utility in UEFI mode.
2. Select your controller, then press **Enter**.
3. From the main menu, select **Configure Controller Settings**.
4. Select **Out of Band Messaging Settings**.
5. Select **OOB Interface** and press **Enter**.
6. From the pop-up menu, select **PBSI**, **MCTP**, or **Disable OOB interface**.
7. To configure Out of Band Messaging for PBSI, set these parameters:

<table>
<thead>
<tr>
<th>PBSI Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMBus Slave Address</td>
<td>Sets the SMBus (System Management Bus) slave address of the controller to a</td>
</tr>
<tr>
<td></td>
<td>valid hexadecimal address value.</td>
</tr>
<tr>
<td>SMBus Clock Speed</td>
<td>Sets the SMBus clock speed:</td>
</tr>
<tr>
<td></td>
<td>• Feature Disabled (Default)</td>
</tr>
<tr>
<td></td>
<td>• SMBus clock speed 100 kHz</td>
</tr>
<tr>
<td></td>
<td>• SMBus clock speed 400 kHz</td>
</tr>
<tr>
<td>SMBus Clock Stretching</td>
<td>Sets the SMBus Clock Stretching mode:</td>
</tr>
<tr>
<td></td>
<td>• Enable: Enables SMBus clock stretching</td>
</tr>
<tr>
<td></td>
<td>• Disable: Disables SMBus clock stretching</td>
</tr>
</tbody>
</table>

8. To configure Out of Band Messaging for MCTP, set these parameters:

<table>
<thead>
<tr>
<th>MCTP Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMBus Slave Address</td>
<td>Sets the SMBus (System Management Bus) slave address of the controller to a</td>
</tr>
<tr>
<td></td>
<td>valid hexadecimal address value. (For valid range, refer to the Management</td>
</tr>
<tr>
<td></td>
<td>Component Transport Protocol (MCTP) SMBus/I2C Transport Binding Specification</td>
</tr>
<tr>
<td>SMBus Device Type</td>
<td>Sets the SMBus Device Type:</td>
</tr>
<tr>
<td></td>
<td>• Default</td>
</tr>
<tr>
<td></td>
<td>• Fixed</td>
</tr>
<tr>
<td></td>
<td>• ARP (Address Resolution Protocol)</td>
</tr>
<tr>
<td>SMBus Physical Channel</td>
<td>Sets the SMBus Channel mode:</td>
</tr>
<tr>
<td></td>
<td>• Enable: Enables SMBus channel</td>
</tr>
<tr>
<td></td>
<td>• Disable: Disables SMBus channel</td>
</tr>
<tr>
<td>Use Static EIDs during</td>
<td>Sets the Static End Point Identifier (EID) mode:</td>
</tr>
<tr>
<td>Initialization</td>
<td>• Enable: Enables Static EID</td>
</tr>
<tr>
<td></td>
<td>• Disable: Disables Static EID</td>
</tr>
<tr>
<td>VDM Discovery Notify</td>
<td>Sets the Vendor Defined Message (VDM) discovery notification mode:</td>
</tr>
<tr>
<td></td>
<td>• Enable: Enables VDM discovery notification</td>
</tr>
<tr>
<td></td>
<td>• Disable: Disables VDM discovery notification</td>
</tr>
</tbody>
</table>

9. Select **Submit Changes**.

### 9.11 Using the Encryption Manager

**Notes:**
1. This option is available only in the UEFI/HII interface; UEFI version 2.4A or higher, recommended.
2. This option is available only for controllers that support maxCrypto Controller-Based Encryption.

The Encryption Manager allows you to configure the controller-based encryption options on your Smart Storage controller. The Encryption Manager supports two roles for managing encryption services:

- A Crypto Officer (Admin) role that can perform all encryption operations
- A User role with reduced privileges
Once you configure the Encryption Manager, you can encrypt arrays and logical drives, and create storage spaces with mixed encrypted and plaintext volumes. For more information about creating and managing encrypted volumes, see 9.3. Creating an Array.

9.11.1 Encryption Manager Full Setup

Use the Full Setup option to configure the Encryption Manager for initial use. This option allows you to set the master encryption key, configure the Crypto Officer account, and enable other basic encryption settings. It also allows you to accept the Encryption Manager Terms of Use.

To configure the Encryption Manager:

1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press Enter.
3. From the main menu, select Configure Controller Settings, then select Encryption Manager.
4. Select Manage Encryption Settings, then select Full setup.
5. Using the arrow keys and Enter key, configure basic encryption settings:
   a) In the Encryption Mode field, select one of these options:
      • Enable and Allow future... to enable encryption and allow plaintext logical devices to be created in addition to encrypted logical devices.
      • Enable and Disallow future... to enable encryption and allow only encrypted logical devices to be created.
      • Disable to disable the Encryption Manager. If encryption is disabled, all encrypted logical drives are set to offline and the data becomes inaccessible; newly created logical drives will not be encrypted. (They will be created as plaintext logical drives.)
   b) In the Enter new password field, enter the Crypto Officer password: press Enter, type the password in the pop-up window, then press Enter to submit.
      The password is a 8-16 character string, comprising all printable ASCII characters. It must include at least one uppercase character, one lowercase character, one numeric, and one special character (#,!,@,...).
   c) In the Master Key field, enter the master encryption key: press Enter, type the key in the pop-up window, then press Enter to submit.
      The Master Key is a 10-32 character string, comprising all printable ASCII characters.

   **CAUTION** Be sure to record the master key and store in a safe place. Once set, the Master Key cannot be displayed or recovered, only reset. Failure to provide the Master Key may result in encrypted data being irretrievable.

6. Select Proceed to Next Form.
   The Terms of Use form opens.
7. Select Accept to accept the Terms and Conditions.
8. Select Submit Changes.

9.11.2 Modifying the Encryption Manager Configuration

Use this option to modify the Encryption Manager configuration, including the master encryption key and other basic encryption settings, and the Crypto Officer and User account settings.

**Note:** This option is available only after you complete the Encryption Manager Full setup; see 9.11.1. Encryption Manager Full Setup.

To modify the Encryption Manager configuration:

1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press Enter.
3. From the main menu, select Configure Controller Settings, then select Encryption Manager.
4. Select Manage Encryption Settings, then select Crypto Officer Settings.
5. Using the arrow keys and Enter key, modify basic encryption settings, as needed (encryption enable/disable, master encryption key, allow/disallow future plaintext volumes).

6. In the Firmware Update field, select Unlock to allow controller firmware upgrades. Select Lock to block (prevent) firmware upgrades.

7. Using the arrow keys and Enter key, configure the Crypto Officer and User account settings:
   a) Change the Crypto Officer password, as needed: press Enter, type the password in the pop-up window, then press Enter to submit.
   b) Enter the Password Recovery Question for a forgotten password: press Enter, type the recovery question in the pop-up window, then press Enter to submit.
       The recovery question is 16-255 characters, comprising all printable ASCII characters.
   c) In the Password Recovery Answer field, enter the answer to the recovery question.
       The recovery answer is 16-64 characters and is case sensitive, comprising all printable ASCII characters.
       Note: Password recovery is available only for the Crypto Officer account.
   d) In the User Password field, enter the User account password: press Enter, type the password in the pop-up window, then press Enter to submit.

8. Select Proceed to Next Form. The Terms of Use form opens.

9. Select Accept to accept the Terms and Conditions.

10. Select Submit Changes.

9.11.3 Modifying User Account Settings
Use this option to modify User account settings, including the account password and firmware upgrade options.

Note: This option is available only after you complete the Encryption Manager Full setup; see .
To modify the User Account Settings:

1. From the main menu, select Configure Controller Settings, then select Encryption Manager.
2. Select Manage Encryption Settings, then select User Settings.
3. Modify the User account password, as needed: press Enter; when the pop-up window opens, type the password, then press Enter to submit.
   The password is a 8-16 character string, comprising all printable ASCII characters. It must include at least one uppercase character, one lowercase character, one numeric, and one special character (#,!,@,...).
4. In the Firmware Update field, select Unlock to allow the controller firmware to be upgraded. Select Lock to prevent the controller firmware from being upgraded.
5. Select Proceed to Next Form.
6. Select Submit Changes.

9.11.4 Resetting a Forgotten Password
Use this option to reset the Crypto Officer password by answering the recovery question.

Note: Password recovery is available only for the Crypto Officer account.
To reset a forgotten password:

1. From the main menu, select Configure Controller Settings, then select Encryption Manager.
2. Select Manage Encryption Settings, then selectForgot Crypto Officer Password.
3. Enter the answer to the password recovery question;
4. Enter the Crypto Officer's new password: press Enter; when the pop-up window opens, type the password, then press Enter to submit.
5. Select Submit Changes.

9.11.5 Clearing the Encryption Manager Configuration
Clearing the Encryption Manager configuration resets all keys, passwords, and users, including the Crypto Officer account and User account, and places the Encryption Manager in the factory-new state. If encrypted volumes are still
configured, this option is only available in the Microchip SAS/SATA Configuration Utility or by running the GUI/CLI tools in offline mode.

**Note:** Clearing the configuration does not affect the encrypted logical drives in your storage space. However, to continue accessing or managing encrypted volumes, you must reconfigure the basic encryption settings in the Encryption Manager; see 9.11.1. Encryption Manager Full Setup.

To clear the Encryption Manager configuration:
1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press Enter.
3. From the main menu, select **Configure Controller Settings**, then select **Encryption Manager**.
4. Select **Clear Configuration**.
5. If your storage space includes encrypted volumes, enter the Encryption Master Key.
   The Master Key is a 10-32 character string, comprising all printable ASCII characters.
6. Select **Submit Changes**.

### 9.11.6 Re-Keying a Logical Drive

Use this option to re-key a logical drive for added security. The logical drive key is used with the master key to encrypt the device.

To re-key a logical drive:
1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Select an array, then select **List Logical Drives**.
3. Select an encrypted logical drive, then select **Volume key rekey**.
4. Select your account type: Crypto Officer or User.
5. Select **Submit Changes**.

### 9.11.7 Converting Plaintext Data to Encrypted Data

Use this option to convert plaintext data to encrypted data. You can choose to preserve or discard the existing data during conversion.

To convert plaintext data:
1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Select an array, then select **List Logical Drives**.
3. Select a plaintext logical drive, then select **Convert Plaintext Data to Encrypted Data**.
4. Select your account type: Crypto Officer or User.
5. In the Convert Plaintext Data to Encrypted Data field, select discard existing data or preserve existing data during conversion.
6. Select **Submit Changes**.

### 9.11.8 Erasing an Encrypted Logical Drive

Use this option to securely erase existing data on an encrypted logical drive. Secure erase completely destroys the data on the logical drive; the data is completely and irretrievably eradicated.

To erase an encrypted logical drive:
1. From the main menu, select **Array Configuration**, then select **Manage Arrays**.
2. Select an array, then select **List Logical Drives**.
3. Select an encrypted logical drive, then select **Secure erase**.
4. Select your account type: Crypto Officer or User.
5. Select **Submit Changes**.

### 9.11.9 Importing a Foreign Master Key

When an encrypted logical drive is moved to another controller, the master key used to encrypt the logical drive is needed to decrypt it. Use the Import Foreign Local Key option to import the master key so that the logical drive data can be accessed and managed on the new controller.
Note: This option is available only if an encrypted logical device with a missing key is detected in the configuration.

To import a foreign master key:
1. From the main menu, select Configure Controller Settings, then select Encryption Manager.
2. Select Import Foreign Local Key.
3. Enter the master key used to encrypt the logical drive.
   - The Master Key is a 10-32 character string, comprising all printable ASCII characters.
4. Enter the Crypto Officer password: press Enter; when the pop-up window opens, type the password, then Enter.
5. Select Submit Changes.

9.12 Configuring the Controller Port Mode
This option sets the operating mode for the ports on the controller. (To set the operating mode for individual ports, see 9.6. Modifying SmartHBA 2100/SmartRAID 3100 Controller Settings.) You can set the port mode to:
   - HBA: exposes physical drives to the operating system
   - RAID: exposes only RAID volumes to the operating system and reserves all physical drives for array creation
   - Mixed: exposes RAID volumes and physical drives to the operating system

Notes:
1. Changing the port mode from Mixed or HBA to RAID mode removes access to physical drives from the operating system.
2. HBA mode is not available if a port is already configured with logical drives.

To configure the port mode for a controller:
2. Select your controller, then press Enter.
3. From the main menu, select Configure Controller Settings, then select Configure Controller Port Mode.
4. Select the controller port mode (HBA, RAID, Mixed).
5. Select Submit Changes.

9.13 Device Information
The Device Information menu provides details about the device, such as the Model, Serial Number, and Device Type.
To view the device information, start the Microchip Configuration Utility, select your controller, then press Enter.
From the main menu, select Disk Utilities, select the disk drive, then press Enter.

9.14 Identifying a Disk Drive
You can use the disk utilities to physically locate and identify a disk drive by turning on its Identification LED.

To identify a disk drive:
1. From the main menu, select Disk Utilities.
2. Select the disk drive you want to locate, then press ENTER.
3. Select Identify Device, then enter a value into Identification Duration (seconds). This value determines how long the LED on the device will remain on.
4. Select Start, then press Enter.
5. To turn off the Identification LED, press ESC to return to the previous menu, select Stop and press Enter.
9.15 Erasing a Disk Drive
You can use the disk utilities to erase existing data on any unassigned disk drive. The erase operation destroys the data by writing random patterns across the drive; it does not just write zeros.

To erase a disk drive:
1. From the main menu, select Disk Utilities.
2. Select the disk drive you want to erase, then press Enter.
3. Select Erase Disk, then select Continue.

9.16 Updating Drive Firmware
You can use the disk utilities to flash a hard drive with new firmware.

To update drive firmware:
1. Copy the firmware binary file 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. From the main menu, select Disk Utilities, then select Update Drive Firmware.
3. Select a disk drive, then enter the firmware update mode:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode 5</td>
<td>Download and Activate</td>
</tr>
<tr>
<td>Mode 7</td>
<td>Download in Multiple Transfers</td>
</tr>
<tr>
<td>Mode E</td>
<td>Download in Multiple Transfers but Do Not Activate</td>
</tr>
<tr>
<td>Mode E+F (HBA Mode only)</td>
<td>Download in Multiple Transfers and Activate</td>
</tr>
</tbody>
</table>
4. Enter the Transfer Size, in 512 byte-increments. The default transfer size is 32768 (32K) bytes. The maximum transfer size is 262144 (256K) bytes. **Note:** Transfer Size is not applicable for Mode 5.
5. Select Proceed.
6. 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 hard drive.
7. When the update is complete, reboot the server.

9.17 Clearing Configuration Meta-data
You can use the disk utilities to clear the controller configuration meta-data from any drive that is not part of an array.
**Note:** This option is enabled only if the selected drive contains controller configuration meta-data. A drive may contain configuration meta-data even if it is not part of an array.

To clear the configuration meta-data from a drive:
1. From the main menu, select Disk Utilities.
2. Select a disk drive with configuration meta-data, then press Enter.
3. Select Clear Configuration Metadata, then select Continue.

9.18 Setting the Bootable Device(s) for Legacy Boot Mode
**Note:** This option is applicable only for Legacy Boot Mode.

This option sets the primary and secondary physical boot device(s) for Legacy Boot Mode. The secondary boot device acts as a failover to the primary boot device.
To set the physical boot device(s) for a controller:

1. From the menu, select **Set Bootable Device(s) for Legacy Boot Mode**, then select **Select Bootable Physical Drive**.
2. To set the default bootable device, select a physical drive from the list, then select **Set as Primary Bootable Device**.
3. To set the secondary bootable device, select a physical drive from the list, then select **Set as Secondary Bootable Device**.

**Note:** To clear previously set boot devices, select **Clear Bootable Device(s)**.

### 9.19 Updating the SmartHBA 2100 Firmware

To update the SmartHBA 2100 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. From the main menu, select **Administration**, then select **Flash Controller Firmware**.
3. Select **Continue with flashing Firmware**.
4. 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.
5. When the update is complete, reboot the server.

### 9.20 Creating a Support Archive

Use this option to save configuration and status information to help Customer Support diagnose a problem with your system. Saved information includes device logs, drive logs, event logs, error logs, controller logs, and statistics.

To create a support archive:

1. From the main menu, select **Administration**, then select **Save Support Archive**.
2. Select the device where the support archive information will be gathered and stored, then press **Enter**. The system gathers the logs and statistics for the device and displays the path where the information is saved.
3. Press any key to complete the operation and exit.

### 9.21 Resetting the Controller to Factory Defaults

**CAUTION** Use extreme caution when resetting the controller to factory defaults. This operation clears configured arrays, controller configuration metadata on the drives, license keys, and encryption configuration, causing all existing data and configuration settings to be irretrievably lost.

Use this option to reset the SmartHBA 2100 to factory default settings.

To reset the controller:

1. From the main menu, select **Administration**.
2. Select **Reset controller settings to factory defaults**.
3. Select **Submit Changes**.
10. **Installing the SmartPQI Drivers from Source**

This section explains how to build and install the SmartPQI drivers from source code for the supported Linux OSes, including how to install the packages using the installation DVD as the repository.

### 10.1 Installation Instructions for Supported Linux OSes

This section explains how to install the driver from source for the following Linux OSes:

- RHEL OS images
- SuSE OS images

Use the following command to determine the type of OS installed on a Linux system:

```
# lsb_release -a
```

**Note:** The following instructions assume you are installing the packages from the RHEL or SuSE repositories; if not, refer to 10.2. *Using the Installation DVD as the Repository.*

#### RHEL OS Images

The instructions below apply to the following RHEL OS images:

- Red Hat® Enterprise Linux 7.4, 7.3, 7.2, 7.1, 7.0 (64-bit only)
- Red Hat® Enterprise Linux 6.9, 6.8, 6.7, 6.6 (64-bit only)

To install the SmartPQI driver from source for RHEL-based OS images:

1. **Build the driver from the source using the following command:**
   ```
   $ sudo su
   ```
   **Note:** You must have administrator privileges to perform the installation steps.

2. **Install the following driver dependency packages and reboot the system if necessary:**
   ```
   # yum install kernel kernel-devel kernel-headers gcc
   ```

3. **Extract the driver source code from the source tar.bz2 file by using the following command:**
   ```
   # tar -jxvf smartpqi-1.1.2-125.tar.bz2
   ```

4. **Compile the smartpqi.ko file by using the following command:**
   ```
   # cd smartpqi-1.1.2
   # make -f Makefile.alt
   ```
   **Note:** After the compilation you will get a smartpqi.ko driver file, which is the driver module.

5. **Use the following command to backup the existing inbox driver:**
   ```
   # mv /lib/modules/`uname -r`/kernel/drivers/scsi/smartpqi/smartpqi.ko /lib/modules/`uname -r`/kernel/drivers/scsi/smartpqi/smartpqi.ko.org
   ```

6. **Copy the smartpqi.ko driver file to the destination by using the following command:**
   ```
   # cp ./*smartpqi.ko /lib/modules/`uname -r`/kernel/drivers/scsi/smartpqi/
   ```

7. **Use the following command to rebuild initramfs process with the newly installed smartpqi driver:**
   ```
   # dracut -v -f --add-drivers smartpqi
   ```
   **Note:** RHEL provides dracut command to place the newly installed smartpqi.ko driver modules into the initramfs file to include them in the Linux kernel.

8. **Rebuild initramfs with the newly installed smartpqi driver by using the following command:**
   ```
   # dracut -v -f --add-drivers smartpqi
   ```

9. **Reboot the system to load the new initramfs, which will contain the newly installed smartpqi.ko driver.**

#### SuSE OS Images

The instructions below apply to the following SuSE OS images:

- SuSE Linux Enterprise Server 12, SuSE Linux Enterprise Server 12 SP1, SP2, SP3 (64-bit only)
- SuSE Linux Enterprise Server 11 SP3, SP4 (64-bit only)

To install the SmartPQI driver from source for SuSE OS images:
1. Build the driver from the source using the following command:
   `$ sudo su`
   **Note:** You must have administrator privileges to perform the installation steps.
2. Install the following driver dependency packages and reboot the system if necessary:
   `# zypper install
    kernel-devel gcc make`
3. Extract the driver source code from the source tgz file by using the following command:
   `# tar -jxvf smartpqi-1.1.2-125.tar.bz2`
4. Compile the `smartpqi.ko` file by using the following command:
   
   ```
   # cd smartpqi-1.1.2
   # make -f Makefile.alt
   ```
   **Note:** After the compilation you will get a `smartpqi.ko` driver file, which is the driver module.
5. Backup the already existing inbox driver.
   
   ```
   # mv /lib/modules/`uname -r`/kernel/drivers/scsi/smartpqi/smartpqi.ko
   /lib/modules/`uname -r`/kernel/drivers/scsi/smartpqi/smartpqi.ko.org
   ```
6. Copy the kernel driver file to the destination by using the following command:
   `# cp ./smartpqi.ko /lib/
    modules/`uname -r`/kernel/drivers/scsi/smartpqi`
7. Use the following command to rebuild initramfs process with the newly installed `smartpqi` driver:
   `# mknitrd
    -v -m smartpqi`
   **Note:** SLES provides `mknitrd` command to place the newly installed `smartpqi.ko` driver modules into the initramfs file to include them in the Linux kernel.
8. Reboot the system to load the new initramfs, which will contain the newly installed `smartpqi.ko` driver.

## 10.2 Using the Installation DVD as the Repository

Follow the instructions in this section to install the packages required to compile the driver modules using the OS installation DVD as the repository. In these procedures, the DVD is used as the package repository.

### Installing Packages on a RHEL-based OS

The following steps install the packages required to compile the driver modules from source on a RHEL-based OS.

1. Execute the following command to become a super user to edit and make changes to various system files:
   ```
   $ sudo -i
   ```
   **Note:** Super user rights are required to edit and make changes in various system files.
2. Get the name of the installation DVD entry in `/dev` directory. The DVD is visible as `/dev/srX`. Use the following command to list all the scsi devices on the system.
   ```
   # lsscsi
   ```
3. Once the DVD name is confirmed, create a location to mount the DVD, for example:
   ```
   # mkdir /media/iso
   ```
4. Mount the DVD to the `/media/iso` directory by using the following command:
   ```
   /dev/srX /media/iso udf,iso9660 noauto,user,ro 0 0
   ```
5. Use the following command to mount the DVD, once the entry is placed in `/etc/fstab`:
   ```
   # mount /dev/srX
   ```
6. Create a `dvd.repo` to use the packages from the mounted DVD location:
   ```
   [dvd]
   name=Red Hat Enterprise Linux Installation
   baseurl=file:///media/iso enabled=1
   ```
7. Import the GPG keys for YUM to authenticate the RPM packages in the DVD:
   ```
   # rpm --import /media/iso/RPM-GPG*
   ```
8. Run the following commands to enable the DVD repository:

```
# yum repolist
# yum install
```

**Installing Packages on a SuSE-based OS**
The following steps install the packages required to compile the driver modules from source on a SuSE-based OS.

1. Execute the following command to become a super user:

   ```bash
   $ sudo su
   
   **Note:** Super user rights are required to edit and make changes in various system files.
   
2. Get the name of the installation DVD entry in `/dev` directory. The DVD is visible as `/dev/srX`. Use the following command to list all the scsi devices on the system.

   ```bash
   # lsscsi
   
3. Once the DVD name is confirmed, create a location to save the DVD image, for example:

   ```bash
   # mkdir /var/iso
   
4. Create an ISO image from the installation disk. Once the DVD image is saved, zypper uses the ISO as an installation service and install the packages from it by using the following command:

   ```bash
   # dd if=/dev/srX of=/var/iso/sles.iso
   
5. Once the installation disk is saved as an ISO image, set it as an installation service by using the following command:

   ```bash
   # zypper sa "iso://?iso=/var/iso/sles.iso" "SLES xy spz"
   
   Where, xy z is the SLES distribution ID eg 10 sp1.
   
6. Run the following command after adding the ISO image as an installation service:

   ```bash
   # zypper sl
   ```
## SmartRAID/SmartHBA Physical and Logical Device Support

Table 11-1. SmartRAID/SmartHBA Physical and Logical Device Support

<table>
<thead>
<tr>
<th>Item</th>
<th>SmartRAID Adapters</th>
<th>SmartHBA Adapters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max single/dual devices supported</td>
<td>256</td>
<td>256</td>
<td># of physical SAS/SATA devices supported. Includes SEP devices, expanders. Results into 238 storage devices supported</td>
</tr>
<tr>
<td>Max # of RAID arrays supported</td>
<td>64</td>
<td>64</td>
<td>Maximum number of RAID arrays supported / exposed to host OS</td>
</tr>
<tr>
<td>Max # of logical drives/ single cached volumes (single drive R0)</td>
<td>64</td>
<td>64</td>
<td>Maximum number of logical drives (single or RAID) exposed to host / OS</td>
</tr>
<tr>
<td>Multi-LUN</td>
<td>Y</td>
<td>Y</td>
<td>Support for LUNs per SCSI ID available (for RBODs, tape libraries)</td>
</tr>
<tr>
<td># of LUNs supported per SCSI ID</td>
<td>256</td>
<td>256</td>
<td># of SCSI LUNs supported per SCSI ID (other than RAID LUNs)</td>
</tr>
<tr>
<td>RAID 0: max. devices per volume, RAID 1: 2 devices per volume or 3 devices with no plus hot spare, RAID 10: max. devices per volume</td>
<td>128 drives per volume max.</td>
<td>128 drives max.</td>
<td>Supported drive count in striping and mirroring RAID arrays and the combination of both (RAID10)</td>
</tr>
<tr>
<td>RAID 5: max devices per volume</td>
<td>128</td>
<td>128</td>
<td>Supported drive count in a RAID5</td>
</tr>
<tr>
<td>RAID 50, 6, 60 max. devices per volume</td>
<td>128</td>
<td>N/A</td>
<td>Supported drive count in the named RAID arrays</td>
</tr>
<tr>
<td>maxCache 4.0 logical caching volumes</td>
<td>32</td>
<td>N/A</td>
<td>Max. 32 logical drives can be accelerated by maxCache. 32 LDs used for acceleration.</td>
</tr>
<tr>
<td># of spare drives supported</td>
<td>4 / 32</td>
<td>4/32</td>
<td>Number per Array / number per adapter</td>
</tr>
</tbody>
</table>
12. **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.

12.1 **Electrostatic Discharge (ESD)**

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 Microchip 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.
13. Technical Specifications

13.1 Environmental Specifications

*Note:* SmartRAID 3100 Series adapters and SmartHBA 2100 Series adapters require adequate airflow to operate reliably. Forced airflow is required. The recommended airflow is 200 LFM (linear feet per minute), minimum, for all controllers except:

- SmartRAID 3154-24i—250 LFM, minimum
- SmartRAID 3162-8i [e]—150 LFM, minimum

<table>
<thead>
<tr>
<th>Ambient temperature with forced airflow</th>
<th>0 °C to 55 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity</td>
<td>20% to 80%, non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>Up to 3,000 meters</td>
</tr>
</tbody>
</table>

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

13.2 DC Power Requirements

<table>
<thead>
<tr>
<th>Bus Type</th>
<th>Description</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCIe</td>
<td>DC Voltage</td>
<td>3.3 V ± 9%, 12 V ± 8%, 3.3 V ± 9% (auxiliary power from PCIe slot)</td>
</tr>
</tbody>
</table>

13.3 Current and Power Requirements

<table>
<thead>
<tr>
<th>Adapter Model</th>
<th>Typical Power</th>
<th>Typical Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptec SmartRAID 3101-4i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3101E-4i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3151-4i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3102-8i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3102E-8i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3152-8i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-8i</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-8e</td>
<td>10.86 W</td>
<td>0.2A @ 3.3 VDC ; 0.85A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-16i</td>
<td>13.00 W</td>
<td>0.65A @ 3.3 VDC; 0.9A @ 12.0 VDC (3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-24i</td>
<td>16.80 W</td>
<td>0.74A @ 3.3 VDC; 1.2A @ 12.0 VDC (3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adapter Model</td>
<td>Typical Power</td>
<td>Typical Current</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-8i8e</td>
<td>15.93 W</td>
<td>0.83 A @ 3.3 VDC; 1.1 A @ 12.0 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3154-8i16e</td>
<td>17.6 W</td>
<td>0.97 A @ 3.3 VDC; 1.2 A @ 12.0 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3162-8i</td>
<td>9.15 W</td>
<td>0.52 A @ 3.3 VDC; 0.62 A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartRAID 3162-8i/e</td>
<td>11.72 W</td>
<td>0.65 A @ 3.3 VDC; 0.798 A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartHBA 2100-4i4e</td>
<td>7.23 W</td>
<td>1.1 A @ 3.3 VDC; 0.3 A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartHBA 2100-8i</td>
<td>8.20 W</td>
<td>0.2 A @ 3.3 VDC; 0.63 A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec SmartHBA 2100-16i</td>
<td>11.93 W</td>
<td>0.78 A @ 3.3 VDC; 0.78 A @ 12.0 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adaptec SmartHBA 2100-24i</td>
<td>13.80 W</td>
<td>0.92 A @ 3.3 VDC; 0.90 A @ 12.0 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
<tr>
<td>Adaptec SmartHBA 2100-8i8e</td>
<td>11.93 W</td>
<td>0.78 A @ 3.3 VDC; 0.78 A @ 12.0 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3.3 V auxiliary current consumption approximately 50 mA)</td>
</tr>
</tbody>
</table>
### 14. Revision History

Table 14-1. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>02/2022</td>
<td>Initial release in Microchip template; Assigned Microchip literature number DS-00004439A, which replaces the previous Microsemi literature number ESC-2171547.</td>
</tr>
<tr>
<td>Previous Releases 1–10</td>
<td>10/2017 – 07/2021</td>
<td>Previous releases. Contact Microchip for release details.</td>
</tr>
</tbody>
</table>
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ISBN: 978-1-5224-9765-3
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For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.
<table>
<thead>
<tr>
<th>AMERICAS</th>
<th>ASIA/PACIFIC</th>
<th>ASIA/PACIFIC</th>
<th>EUROPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Office</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2355 West Chandler Blvd.</td>
<td>Australia - Sydney</td>
<td>India - Bangalore</td>
<td>Austria - Wels</td>
</tr>
<tr>
<td>Chandler, AZ 85224-6199</td>
<td>Tel: 61-2-9868-6733</td>
<td>Tel: 91-80-3090-4444</td>
<td>Tel: 43-7242-2244-39</td>
</tr>
<tr>
<td>Tel: 480-792-7200</td>
<td>China - Shanghai</td>
<td>India - New Delhi</td>
<td>Fax: 43-7242-2244-393</td>
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<tr>
<td>Fax: 480-792-7277</td>
<td>Tel: 86-21-3326-8000</td>
<td>India - Pune</td>
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<td>Technical Support:</td>
<td>China - Shenyang</td>
<td>Tel: 91-11-4160-8631</td>
<td>Denmark - Copenhagen</td>
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<td><a href="http://www.microchip.com/support">www.microchip.com/support</a></td>
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<td>India - Pune</td>
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