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1. **About This Guide**

This Installation and User's Guide explains how to install and setup your Adaptec® HBA 1100 Series Host Bus Adapter, including driver installation and use of the BIOS-based SAS/SATA Configuration utility. It also provides troubleshooting tips and instructions for flashing the HBA 1100 Series firmware.

These HBA 1100 Series models are described in this guide:

- Adaptec HBA 1100-8i
- Adaptec HBA 1100-4i
- Adaptec HBA 1100-8e
- Adaptec HBA 1100-16i
- Adaptec HBA 1100-24i
- Adaptec HBA 1100-8i8e
- Adaptec HBA 1100-16e

1.1 **What You Need to Know Before You Begin**

This guide is written for data storage and IT professionals who are responsible for installing, configuring, and maintaining HBA 1100 Series Host Bus Adapters in computers or servers in a "cloud" or data center environment. You should be familiar with computer hardware, operating system administration, data storage devices, and SAS and Serial ATA (SATA) technology.

1.2 **Terminology Used in this Guide**

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

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

1.3 **How to Find More Information**

You can find more information about your HBA 1100 Series Host Bus Adapter by referring to these documents, available for download at start.adaptec.com.

- **Adaptec Host Bus Adapter 1100 Series Command Line Utility User's Guide**—Describes how to use the ARCCONF utility to perform configuration and storage management tasks from an interactive command line. (ESC-2161614)
- **Adaptec HBA 1100 Series Host Bus Adapters Installation and User's Guide** (this manual)—Describes how to install drivers and configure the HBA 1100 Series adapter for initial use. (DS-00004281A)
- **Adaptec Host Bus Adapter 1100 Series Release Notes**—Includes updated product information and known issues and limitations. (DS-60001740)
2. **Kit Contents and System Requirements**

This section lists the contents of your HBA 1100 Series kit and the system requirements for successfully installing and using your HBA.

2.1 **Kit Contents**

- HBA 1100 Series adapter
- Low-profile bracket

*Note:* The latest firmware, drivers, utilities software, and documentation can be downloaded at storage.adaptec.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
- One of these operating systems:
  - Microsoft® Windows®
  - 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 OSs and OS versions.

- USB flash drive or CD burner, for creating driver disks and bootable media
3. About Your Host Bus Adapter

This section provides an overview of the features of the HBA 1100 Series adapters.

3.1 Standard Features
- Support for SAS and SATA Hard Disk Drives (HDD), Solid State Drives (SSDs), and SAS tape drives
- UEFI pre-boot BIOS, CTRL-A configuration utility
- Flash ROM for updates to firmware and BIOS
- Up to 8 ports, 12 Gbps SAS I/O and 8 Gbps PCIe I/O with HBA 1100-8i or HBA1100-8e
- Up to 4 ports, 12 Gbps SAS I/O and 8 Gbps PCIe I/O with HBA 1100-4i
- Up to 16 ports, 12 Gbps SAS I/O and 8 Gbps PCIe I/O with HBA 1100-16i
- Up to 24 ports, 12 Gbps SAS I/O and 8 Gbps PCIe I/O with HBA 1100-24i
- 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 sensor, with logging capabilities

3.2 Mechanical Information

3.2.1 Board Dimensions
This table shows the board dimensions of the HBA 1100 Series adapters, in inches.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>HBA 1100-8i/8e/16i/24i</th>
<th>HBA 1100-4i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>2.712&quot;</td>
<td>2.712&quot;</td>
</tr>
<tr>
<td>Length</td>
<td>6.600&quot;</td>
<td>5.200&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>

3.2.2 Heat Sink
HBA 1100 Series adapters include a passive heat sink. For airflow requirements, see 11.1. Environmental Specifications.

3.3 Visual Indicators
LEDs on HBA 1100 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. The LED states are described below in Table 3-2 below.

Front panel brackets have three holes for the Heartbeat LED, Fault LED, and Crypto LED.

Note: The Crypto LED (near the mounting bracket) is not present on HBA 1100-4i adapter boards.
Figure 3-1. HBA 1100 Series LED Locations

![Diagram of HBA 1100 Series LED Locations]

Table 3-2. HBA1100 Status LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEARTBEAT (DS5)</td>
<td>Green</td>
<td>Heartbeat (blinks once per second when firmware is operating normally)</td>
</tr>
<tr>
<td>FAULT (DS7)</td>
<td>Amber</td>
<td>Hardware Lockup/Fault</td>
</tr>
<tr>
<td>CRYPTO (DS1)</td>
<td>Green</td>
<td>Cryptographic State: always off. HBA 1100 Series adapters do not support encryption.</td>
</tr>
<tr>
<td>AVS_ENB (DS2)</td>
<td>Green</td>
<td>The controller is operating normally if this LED is on or off: On=Adaptive Voltage Scaling (AVS) enabled, Off=Adaptive Voltage Scaling (AVS) disabled. <strong>Note</strong>: Not supported on HBA1100-16i and HBA1100-24i adapters.</td>
</tr>
<tr>
<td>PAL_DEBUG (DS10)</td>
<td>Yellow</td>
<td>Reserved: always off. HBA 1100 Series adapters do not support this feature.</td>
</tr>
</tbody>
</table>

3.4 About the Adaptec HBA 1100-8i

The Adaptec HBA 1100-8i is a SAS Host Bus Adapter with these
GUID-6DC50938-3E3C-41D6-8E53-2E604C68108B features:
Figure 3-2. HBA 1100-8i Features

1 Mounting Bracket
2 HDA mode jumper
3 UART
4 Mini SAS HD Connectors
5 PCIe x8 Connector
### About the Adaptec HBA 1100-4i

The Adaptec HBA 1100-4i is a SAS Host Bus Adapter with these features:
Figure 3-3. HBA 1100-4i Features

1. Mounting Bracket
2. HDA mode jumper
3. UART
4. SAS HD Connector
5. PCIe x8 Connector
### About the Adaptec HBA 1100-8e

The Adaptec HBA 1100-8e is a SAS Host Bus Adapter with these features:
Figure 3-4. HBA 1100-8e Features

1. Mounting Bracket
2. HDA mode jumper
3. UART
4. PCIe x8 Connector
5. Mini SAS HD Connectors
### 3.7 About the Adaptec HBA 1100-8i8e

The Adaptec HBA 1100-8i8e is a SAS Host Bus Adapter with these features:
Figure 3-5. HBA 1100-8i8e Features

1. Mounting Bracket
2. HDA mode Connector
3. UART
4. 2 Internal mini-SAS HD connectors (CN4-CN5)
5. PCIe x8 Connector
6. 2 External mini-SAS HD connectors (CN0-CN1)
### About Your 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</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>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 256 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 sensor</td>
<td>Ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>

#### 3.8 About the Adaptec HBA 1100-16e

The Adaptec HBA 1100-16e is a SAS Host Bus Adapter with these features:
Figure 3-6. HBA 1100-16e Features

1. Mounting Bracket
2. HBA mode Connector
3. UART
4. PCIe x8 Connector
5. 4 External mini-SAS HD connectors (CN0-CN3)
### About Your 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</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 MRAM, 128 Kb SEEPROM</td>
</tr>
<tr>
<td>Connectors, internal</td>
<td>4 mini SAS HD x4 (SFF-8644)</td>
</tr>
<tr>
<td>Maximum number of disk drives</td>
<td>16 direct-attached (or up to 256 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 sensor</td>
<td>Ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>

### 3.9 About the Adaptec HBA 1100-16i

The Adaptec HBA 1100-16i is a SAS Host Bus Adapter with these features:
Figure 3-7. HBA 1100-16i Features

1. Mounting Bracket
2. UART
3. 4 internal mini-SAS HD connectors (CN0-CN3)
4. PCIe x8 Connector
5. HBA mode jumper
<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</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</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>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 256 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 sensor</td>
<td>Ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>

### 3.10 About the Adaptec HBA 1100-24i

The Adaptec HBA 1100-24i is a SAS Host Bus Adapter with these features:
Figure 3-8. HBA 1100-24i Features

1. Mounting Bracket
2. UART
3. 2 internal mini-SAS HD connectors (CN4-CN5)
4. 4 internal mini-SAS HD connectors (CN0-CN3)
5. PCIe x8 Connector
6. HDA mode jumper
<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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</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>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 256 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 sensor</td>
<td>Ambient temperature, ASIC die temperature</td>
</tr>
</tbody>
</table>
4. Installing the Controller and Disk Drives
This section explains how to install your HBA 1100 Series adapter in a computer cabinet or server and connect it to internal and external disk drives.

4.1 Before You Begin
- Read Safety Information.
- Familiarize yourself with your HBA's physical features (see Standard Features).
- Ensure that you have the right number of disk drives for your application (see Selecting Disk Drives and Cables).

4.2 Selecting Disk Drives and Cables

4.2.1 Disk Drives
The HBA 1100 Series supports SAS and SATA disk drives, Solid State Drives (SSDs), and SAS tape drives.
For more information about compatible disk drives, refer to adaptec.com/cables.

4.2.2 Cables
Depending on your HBA model and application requirements, you can use any of the cables listed below. For more information about cabling options for your HBA 1100 Series adapter, visit adaptec.com/cables.

Note: We recommend using Microchip 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. |

4.3 Installing the Host Bus Adapter
This section describes how to install the HBA 1100 Series adapter into your computer cabinet or server. HBA 1100 Series adapters have two configurations:
- Adapters with internal connectivity
Follow the steps below to install your HBA and connect internal or external storage devices.

1. Turn off your computer and disconnect the power cord and any network cables. Open the cabinet, following the manufacturer's instructions.

2. Select an available PCIe expansion slot that's compatible with your HBA and remove the slot cover, as shown in the figure below. (To check PCIe bus compatibility of your HBA, see About Your Host Bus Adapter.)

   \[\text{CAUTION}\] Touch a grounded metal object before handling the adapter.

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

   \[\text{CAUTION}\] 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 mini-SAS HD cables between the HBA and internal or external storage devices.
   - For a HBA with internal ports, connect mini-SAS HD cables between the HBA and internal disk drives or enclosures.
• For a HBA with external ports, connect mini-SAS HD cables between the HBA and external disk drives or enclosures.

6. Close your computer cabinet, reconnect the power cord and network cables, then power up the system.
5. Installing the Driver and an Operating System

This chapter explains how to install the SmartPQI controller driver and an operating system on a bootable volume. It assumes that the HBA 1100 is installed in a computer or server.

Note: For information about building the SmartPQI drivers from source, see 9. Installing the SmartPQI Drivers from Source.

5.1 Download the Driver Package

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

1. Open a browser window, then type start.adaptec.com in the address bar.
2. Enter your product or adapter model number, then select HBA 1100.
3. Select your operating system version, for instance, Microsoft Windows Server 2019 or Red Hat Enterprise Linux 7; then select the appropriate driver from the list.
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 (windows2019, rhel7, and so on).

Notes:
- For OSs that provide an inbox smartpqi driver with support for Microchip Smart Storage Controllers, it is not necessary to create a driver disk from the downloaded driver files. Refer to the instructions for each OS for specific driver disk requirements.
- See the Release Notes for a complete list of available driver files.

5.2 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.

5.3 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):

   ```bash
   rpm -ivh kmod-smartpqi-#.##-###.rhel7u9.x86_64.rpm
   ```

RHEL7 Installation with Secure Boot

To install the RHEL driver with a Linux system with secure boot enabled:
Installing the Driver and an Operating System

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:
   
   ```bash
   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):
   ```bash
   rpm -ivh kmod-smartpqi-#.#.#-###.<rhel_version>.x86_64.rpm
   ```
4. Reboot.

5.4 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):
   ```bash
   rpm -ivh smartpqi-ueficert-#.#.#-###.sles12sp5.x86_64.rpm
   rpm -ivh smartpqi-kmp-default-#.#.#-###.sles12sp5.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:
      ```bash
      rpm -ivh smartpqi-ueficert-#.#.#-###.<sles_version>.x86_64.rpm
      ```
   b. Import public key:
      ```bash
      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:
   ```bash
   rpm -ivh smartpqi-kmp-default-#.#.#-###.<sles_version>.x86_64.rpm
   ```
4. Reboot.

5.5 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):

Base Kernel: rpm -ivh kmod-smartpqi-#.#.#-###.ol7u9.x86_64.rpm
UEK Kernel: rpm -ivh kmod-smartpqi-uek-#.#.#-###.ol7u9.x86_64.rpm

5.6 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 that you have a smartpqi driver to support the new kernel.

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

5.7 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 ensures you have a smartpqi driver to support the new kernel.

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

5.8 Installing with FreeBSD

To install the controller SmartPQI driver while installing FreeBSD:

1. Copy the driver module (smartpqi.ko) to a USB drive.
2. Insert the USB driver disk.
3. Insert the FreeBSD Installation disk into the CD/DVD drive and boot from it.

   Disk partition the USB key, using gpart on a unix system.

   For example:

   ```
   # gpart create -s GPT dal
   # gpart add -t freebsd-ufs dal
   # 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.
      
      ```
      # lsmod
      ```
      Expected Output: It will show all the present modules.
   b. Unload the kernel module by executing the following command:
      
      ```
      # unload
      ```
   c. Check whether the kernel is unloaded or not by executing the following command:
      
      ```
      # 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:
      
      ```
      # lsdev
      ```
      Expected Output:
      part 0: …………… (removable)
      part 1: …………… (removable)
      part 2: …………… (removable)
   e. Load the kernel by executing the following command:
      
      ```
      # load /boot/kernel/kernel
      ```
   f. Load the driver module by executing the following command:
      
      ```
      # 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.
      
      ```
      # 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
         ```
      iv. Add the following line:
         
         ```
         smartpqi_load="YES"
         # reboot
         ```
6. 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>
```

---

### 5.9 Installing with Solaris

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

#### 5.9.1 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:

   ```
   # rem_drv 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 **CtrlL+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.

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

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

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

3. Reboot the system using the following command:

```
    # reboot
```

5.9.2 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:

```
    #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:

    ```
    # 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:

    ```
    # chmod +x adddriver.sh
    # ./adddriver.sh text
    ```

24. Reboot the system using the following command:

    ```
    #reboot
    ```

5.10 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.

5.11 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.

You can download the ESXi-Customizer tool, ESXi-Customizer-PS-v2.5.ps1, from https://github.com/VFrontDe/ESXi-Customizer-PS and other locations on the Web.
Note: Be sure to install the prerequisite software first, including Powershell and VMware POWERCLI, before you install ESXi-Customizer.

To install the SmartPQI controller driver while installing VMware:

1. Download and install Microsoft PowerShell and VMware POWERCLI, as needed. You can download PowerShell from the Microsoft Download Center at www.microsoft.com/download, and POWERCLI from my.vmware.com.
   
   Note: PowerShell is pre-installed on many Windows systems, including Windows Server 2012/2016/2019.

2. Download the ESXi-Customizer tool from https://github.com/VFrontDe/ESXi-Customizer-PS or other Web location. Then, unpack the archive to a local directory on your Windows system; C:\ESXi-Customizer, for instance.

3. Copy the VMware driver vib for your OS version to a temp directory, such as C:\temp\pkg. The driver vib files (listed below, where xxxxxxx is the driver version/build number) should be in the driver download directory on your Windows system.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESXi 6.5</td>
<td>smartpqi-1.0.0.xxxx-1OEM.650.0.0.xxxxxxx.x86_64.vib</td>
</tr>
<tr>
<td>ESXi 6.7</td>
<td>smartpqi-1.0.0-xxx-1OEM.670.0.0.xxxxxxx.x86_64.vib</td>
</tr>
</tbody>
</table>

4. Run ESXi-Customizer from the installation directory:

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

5. In PowerShell, enter the following command:

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

   where Vxx is the VMware OS version: V67 for VMware 6.7, V65 for VMware 6.5.

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

6. Burn the custom ISO image to a writable CD or USB drive.
   
   Note: Use whatever tool you prefer to burn the CD or USB drive.

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

7. On the VMware ESXi machine, insert the custom boot CD/USB, then restart your computer.

8. Follow the on-screen instructions to begin the VMware installation.

9. Complete the VMware installation, following the on-screen instructions.

10. Remove the custom boot CD or USB drive, then reboot your computer.
6. 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 HBA 1100 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 9. 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 start.adaptec.com in the address bar.
2. Enter your product or adapter model number, then select HBA 1100.
3. Select your operating system version, for instance, Microsoft Windows Server 2019 or Red Hat Enterprise Linux 7; then select the appropriate driver from the list.
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 2019, rhel7, and so on).

Notes:
• For OSs that provide an inbox smartpqi driver with support for Microchip Smart Storage Controllers, it is not necessary to create a driver disk from the downloaded driver files. Refer to the instructions for each OS for specific driver disk requirements.
• See the Release Notes for a complete list of available driver files.

6.2 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.

6.3 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):
   ```bash
   rpm -ivh kmod-smartpqi-#.#-####.rhel7u9.x86_64.rpm
   ```
2. Reboot the system.
6.4 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):

   ```
   rpm -ivh smartpqi-ueficert-#.#.#-###.sles12sp5.x86_64.rpm
   rpm -ivh smartpqi-kmp-default-#.#.#-###.sles12sp5.x86_64.rpm
   ```
2. Reboot the system.

6.5 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):

   - Base Kernel: `rpm -ivh kmod-smartpqi-#.#.#-###.ol7u9.x86_64.rpm`
   - UEK Kernel: `rpm -ivh kmod-smartpqi-uek-#.#.#-###.ol7u9.x86_64.rpm`
   - UEK6ol7 Kernel: `rpm -ivh kmod-smartpqi-uek6ol7-#.#.#-###.x86_64.rpm`
   - UEK6ol8 Kernel: `rpm -ivh kmod-smartpqi-uek6ol8-#.#.#-###.x86_64.rpm`

6.6 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
   ```

6.7 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.

---

### 6.8 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
   ```

---

### 6.9 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 (i386) 1.0.0-100,REV=2016.06.06.22.10

   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 <MCHPsmartpqi> [y,n,?]
Enter "y".
The following message appears after a successful installation:

```
Installation of <MCHPsmartpqi> 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 smartpqi
```

6. Use the following command to identify the driver package information:
```
# pkginfo -l MCHPsmartpqi
```

Removing the Driver Package

1. Remove the loaded driver package using the following command:
```
# pkgrm MCHPsmartpqi
```

In the terminal, the following messages will appear:

```
The following package is currently installed:
MCHPsmartpqi MICROCHIP Smart PQI RAID Controller driver
(1386) 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 <MCHPsmartpqi> was successful
```

2. Reboot the system using the following command:
```
# reboot
```

6.10 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.

**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 #):

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-#.#.#-###.xen7.6.rpm root@<xen-server-ip>:/tmp/smartpqi
   ```

2. Install the driver module rpm:
   ```
   rpm -ivh /tmp/smartpqi/citrix-smartpqi-#.#.#-###.xen7.6.rpm
   ```

3. Reboot your computer.
6.11 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.
7. **Solving Problems**  
This section provides basic troubleshooting information and solutions for solving problems with your HBA 1100 Series Host Bus Adapter.

7.1 **Troubleshooting Checklist**  
If you encounter difficulties installing or using your HBA 1100 Series Host Bus Adapter, check these items first:

- With your computer powered off, check the connections to each disk drive, power supply, enclosure, and so on.
- Try disconnecting and reconnecting disk drives from the adapter.
- Check that your adapter is installed in a compatible PCIe expansion slot. To verify the bus compatibility of your adapter, see About Your Host Bus Adapter.
- 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; see 5. Installing the Driver and an Operating System.
- If you have external disk drives (or other devices), are they powered on?
- Check the Release Notes for compatibility issues and known problems.

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

7.2 **Resetting the Adapter**  
You may need to reset your HBA 1100 Series adapter if it becomes inoperable or if a firmware upgrade is unsuccessful. HBA 1100 Series adapters support a reset protocol called HDA mode flash. For information about HDA mode, contact your support representative. To locate the HDA mode jumper on your adapter, see the board illustrations in About Your Host Bus Adapter.
8. Using the Microchip Configuration Utility

8.1 Running the Microchip SAS/SATA Configuration Utility: Ctrl-A or UEFI/HII?

Your Adaptec HBA 1100 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 Microchip's legacy Ctrl-A interface. UEFI/HII provides an architecture-independent mechanism for initializing add-in cards, like the HBA 1100, and rendering contents to the screen in a uniform way.

To access the HBA 1100 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 HBA 1100 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.

8.2 Modifying HBA 1100 Settings

For the HBA 1100, no options are available when you select Modify Controller Settings from the Configure Controller Settings menu.

8.3 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 SAS/SATA Configuration Utility in UEFI mode.
2. Select your controller, then press Enter.
3. From the main menu, select Configure Controller 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.</td>
</tr>
<tr>
<td></td>
<td>(For valid range, refer to the Management Component Transport Protocol (MCTP)</td>
</tr>
<tr>
<td></td>
<td>SMBus/I2C Transport Binding Specification document.)</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**.

### 8.4 Viewing Disk Drive Properties

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

To view disk drive properties:

1. Start the Microchip SAS/SATA Configuration Utility in UEFI mode (see 8.1. Running the Microchip SAS/SATA Configuration Utility: Ctrl-A or UEFI/HII?).
2. Select your controller, then press **Enter**.
3. From the main menu, select **Disk Utilities**.
4. Use the arrow keys to select a disk drive.
5. Press **Esc** to return to the previous menu.
8.5 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.

8.6 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.

8.7 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.

8.8 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.

8.9 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).

8.10 Updating the HBA 1100 Firmware
To update the HBA 1100 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.

8.11 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. Installing the SmartPQI Drivers from Source

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

9.1 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 9.2. 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. 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)
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:
   
   # mknitnr -v -m smartpqi
   
   **Note:** SLES provides mknitnr 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.

### 9.2 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

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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:

   ```
   $ 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.

   ```
   # lsscsi
   ```

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

   ```
   # 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:

   ```
   # 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:

   ```
   # 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:

   ```
   # zypper sl
   ```
10. **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.

10.1 **Electrostatic Discharge (ESD)**

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

To prevent ESD damage:

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

11.1 Environmental Specifications

Notes: HBA 1100 Series adapters require adequate airflow to operate reliably. Forced airflow is required. The recommended airflow values are:

- HBA 1100-4i/8i/8e/16i/16e/8i8e—200 LFM (linear feet per minute), minimum.
- HBA 1100-24i—250 LFM (linear feet per minute), minimum.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature with forced airflow</td>
<td>0 °C to 55 °C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>10% to 90%, 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.

11.2 DC Power Requirements

<table>
<thead>
<tr>
<th>Adapter Model</th>
<th>Bus Type</th>
<th>Description</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptec HBA 1100-8i</td>
<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>
<tr>
<td>Adaptec HBA 1100-4i</td>
<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>
<tr>
<td>Adaptec HBA 1100-8e</td>
<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>
<tr>
<td>Adaptec HBA 1100-16i</td>
<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>
<tr>
<td>Adaptec HBA 1100-24i</td>
<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>
<tr>
<td>Adaptec HBA 1100-8i8e</td>
<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>
<tr>
<td>Adaptec HBA 1100-16e</td>
<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>

11.3 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 HBA 1100-8i</td>
<td>8.2 W</td>
<td>0.2A @ 3.3 VDC; 0.63A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec HBA 1100-4i</td>
<td>7.23 W</td>
<td>1.1A @ 3.3 VDC; 0.3A @ 12.0 VDC</td>
</tr>
<tr>
<td>Adaptec HBA 1100-8e</td>
<td>8.2 W</td>
<td>0.2A @ 3.3 VDC; 0.63A @ 12.0 VDC</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 HBA 1100-16i</td>
<td>11.00 W</td>
<td>0.77 A @ 3.3 VDC; 0.70 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 HBA 1100-24i</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 HBA 1100-16e</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 HBA 1100-8i8e</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>
### 12. Revision History

Table 12-1. Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>11/2021</td>
<td>Initial release in Microchip template; Assigned Microchip literature number DS-00004281A, which replaces the previous Microsemi literature number ESC-2161232.</td>
</tr>
<tr>
<td>Previous Releases 1–8</td>
<td>10/2016 – 03/2021</td>
<td>Previous releases. Contact Microchip for release details.</td>
</tr>
</tbody>
</table>
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- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user’s guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
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- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

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