LSI® SAS 9212-4i4e PCI Express® to 6Gb/s Serial Attached SCSI (SAS) Host Bus Adapter (HBA)

User Guide

Version 1.1
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For a comprehensive list of changes to this document, see the Revision History.

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LSI SAS 9212-4i4e PCI Express to 6Gb/s SAS HBA User Guide

1 Overview

The LSI SAS 9212-4i4e PCI Express® (PCIe®)-to-Serial Attached SCSI (SAS) host bus adapter (HBA), hereinafter referred to as the LSI SAS 9212-4i4e HBA, provides high-performance internal and external storage connectivity for servers and workstations. The LSI SAS 9212-4i4e HBA provides eight lanes of 6Gb/s SAS connectivity and is matched with eight lanes of PCIe 2.0 5Gb/s performance. The low-profile design of the SAS HBA includes a full-height bracket and low-profile mounting bracket that creates a universal fit for any server. The LSI SAS 9212-4i4e HBA is based on the Fusion-MPT™-architected LSI® SAS 2008 controller that integrates the latest enhancements in PCIe 2.0 technology and 6Gb/s SAS technology.

The LSI SAS 9215-4i4e HBA has onboard Flash memory for the firmware and BIOS, and NVSRAM for RAID support (RAID 0, RAID 1, RAID 10, or RAID 1E).

2 HBA Features

This section lists the LSI SAS 9212-4i4e HBA features.

- Implements one LSI SAS 2008 eight-port 6Gb/s to PCIe 2.0 controller
- Supports eight-lane, full-duplex PCIe 2.0 performance
- Supports four internal 6Gb/s SATA+SAS ports
- Supports four external 6Gb/s SATA+SAS ports
- Supports SATA and SAS link rates of 1.5Gb/s, 3Gb/s, and 6Gb/s
- Provides four x1 internal SATA connectors
- Provides one x4 external mini-SAS connector (SFF-8088)
- Supports passive cable
- Supports RAID 0, RAID 1, RAID 10, or RAID 1E
- Supports up to 256 SATA or SAS end devices
- Offers a full-height bracket and low-profile bracket
- Provides activity LEDs
- Provides a universal asynchronous receiver/transmitter (UART) debug/diagnostic port

3 Functional Descriptions

3.1 PCIe

PCIe is a high-speed standard local bus for point-to-point interfacing of I/O components to the processor and the memory subsystems in a high-end personal computer (PC). The LSI SAS 2008 controller chip contains the PCIe functionality for the LSI SAS 9212-4i4e HBA. The LSI SAS 2008 controller chip connects directly to the PCIe bus and generates timing and protocol in compliance with the PCIe specifications.

The LSI SAS 2008 controller chip JTAG signals are not connected to the corresponding signals in the PCIe connector.

The following table shows the LSI SAS 9212-4i4e HBA 5Gb/s PCIe performance.

Table 1 PCIe Aggregate Bandwidth

Lanes	Single Direction	Dual Direction
Single-Lane (x1)	5Gb/s	10Gb/s
Quad-Lane (x4)	20Gb/s	40Gb/s
Eight-Lane (x8)	40Gb/s	80Gb/s

3.2 SATA and SAS

The LSI SAS 2008 controller chip contains the SATA+SAS functionality for the LSI SAS 9212-4i4e HBA. The following table shows the LSI SAS 9212-4i4e HBA 6Gb/s SAS performance.

Table 2 6Gb/s SAS Bandwidths

Half Duplex	Full Duplex
Narrow Port (one lane), 600MB/s	Narrow Port (one lane), 1200MB/s
Wide Port (four lanes), 2400MB/s	Wide Port (four lanes), 4800MB/s

4 Operating System Support

The LSI SAS 9212-4i4e HBA supports all major operating systems: Windows®, Linux® Red Hat®, Linux SUSE® Enterprise Server (SLES), Solaris™, and VMware®. Refer to http://go.lsi.com/hbas for details on the software versions and device driver support. For Solaris support, contact the LSI Technical Support team.

5 LSI SAS 9212-4i4e HBA Characteristics

5.1 Flash

The LSI SAS 9212-4i4e HBA has onboard Flash ROM for the firmware and BIOS. The LSI SAS 9212-4i4e HBA provides one 4-M x 8-bit Flash ROM for storing the firmware and BIOS.

5.2 Connectors

This section describes the different connectors on the LSI SAS 9212-4i4e HBA. See Figure 1 for connector locations.

PCIe Connector (J1). The LSI SAS 9212-4i4e HBA supports a x8 interface. The PCIe connection is through the edge connector, J1, which provides connections on both the top (J1B) and bottom (J1A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

SATA+SAS Connectors (J5, J6, J7, J8, and J12). The LSI SAS 9212-4i4e HBA supports SATA and SAS connections through connector J12, which is an SFF-8088 mini-SAS, external, right-angle connector, and connectors J5, J6, J7, and J8, which are SATA internal connectors.

Activity LED Header (J11). The LSI SAS 9212-4i4e HBA has a 4-pin, right-angle, 0.1-in. pitch header for driving external activity LEDs.The 4-pin header connects to two LEDs, which indicate SAS activity on Port 0 and Port 1.

Table 3 LSI SAS 9212-4i4e LED Header Pinout

Pin	Function
1	3.3 V
2	Port 0
3	Port 1[a]
4	3.3 V

a. Port 1 consists of the 7-pin SATA connectors.

UART Connector (J4) The UART connector debug port requires a special cable and LSI support to gather detailed input/output controller (IOC) status.

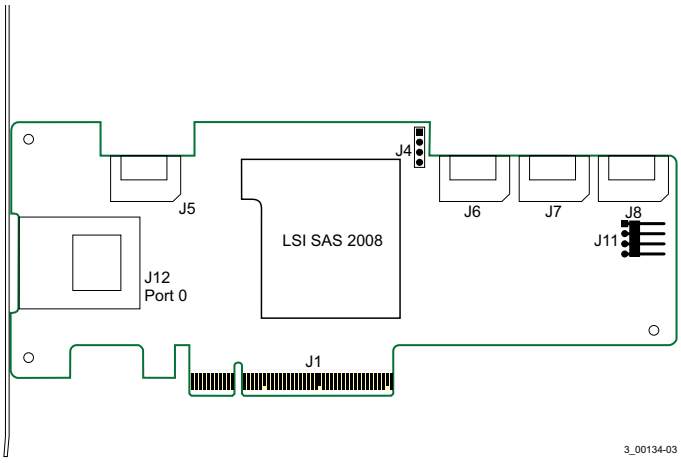
Table 4 LSI SAS 9212-4i4e UART Pinout

Pin	Function
1	UART_TX
2	Gnd
3	UART_RX
4	3.3 V

5.3 Physical Characteristics

The LSI SAS 9212-4i4e HBA is a 6.6-in. x 2.7-in., low-profile board. The component height on the top and bottom of the LSI SAS 9212-4i4e HBA is in accordance with the PCIe specification. The following figure shows the board connectors.

Figure 1 LSI SAS 9212-4i4e Board Layout



- J1: PCIe x8-lane board edge connector
- J4: UART connection
- J5, J6, J7, and J8: SAS internal connectors

- J11: 4-pin, right angle, 0.1-in. pitch, pin header for driving external activity LED
- J12: SFF-8088 mini-SAS, external, right-angle connector

6 Electrical and Environmental Specifications

The design and implementation of the LSI SAS 9212-4i4e HBA minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge. The board carries the CE mark, C-Tick mark, Canadian Compliance Statement, Korean KCC, Taiwan BSMI, Japan VCCI, and FCC Class B, and it is marked with the FCC Self-Certification logo. The board also meets the requirements of CISPR Class B.

6.1 Electrical Characteristics

The maximum power requirements for the LSI SAS 9212-4i4e HBA under normal operation are as follows:

- PCIe 12.0 V = 1.21 A
- Power
  - Nominal = 7.56 W
  - Worst case = 14.63 W
- Operation range = 0 °C to 55 °C

6.2 Thermal and Atmospheric Characteristics

The atmospheric characteristics for the LSI SAS 9212-4i4e HBA are as follows:

- Temperature range: 0 °C to 55 °C (dry bulb)
- Relative humidity range: 5 percent to 90 percent noncondensing
- Maximum dew point temperature: 32 °C

The storage and transit environment parameters for the LSI SAS 9212-4i4e HBA are as follows:

- Temperature range: –45 °C to +105 °C (dry bulb)
- Relative humidity range: 5 percent to 90 percent noncondensing

6.3 Safety Characteristics

All LSI SAS 9212-4i4e HBAs meet or exceed the requirements of UL flammability rating 94V-0. Each bare board is marked with the supplier's name or trademark, type, and UL flammability rating. Because these boards are installed in a PCIe slot, all voltages are below the SELV 42.4-V limit.

7 Hardware Installation

This section provides detailed instructions on how to install your LSI SAS 9212-4i4e HBA.

1. **Unpack the HBA, and inspect it for damage.** Unpack the HBA in a static-free environment. Remove the HBA from the antistatic bag and carefully inspect it for damage. If you notice any damage, or if any component is missing, contact LSI or your reseller support representative.

   ATTENTION Make a backup of your data before changing your system configuration, or you might risk data loss.

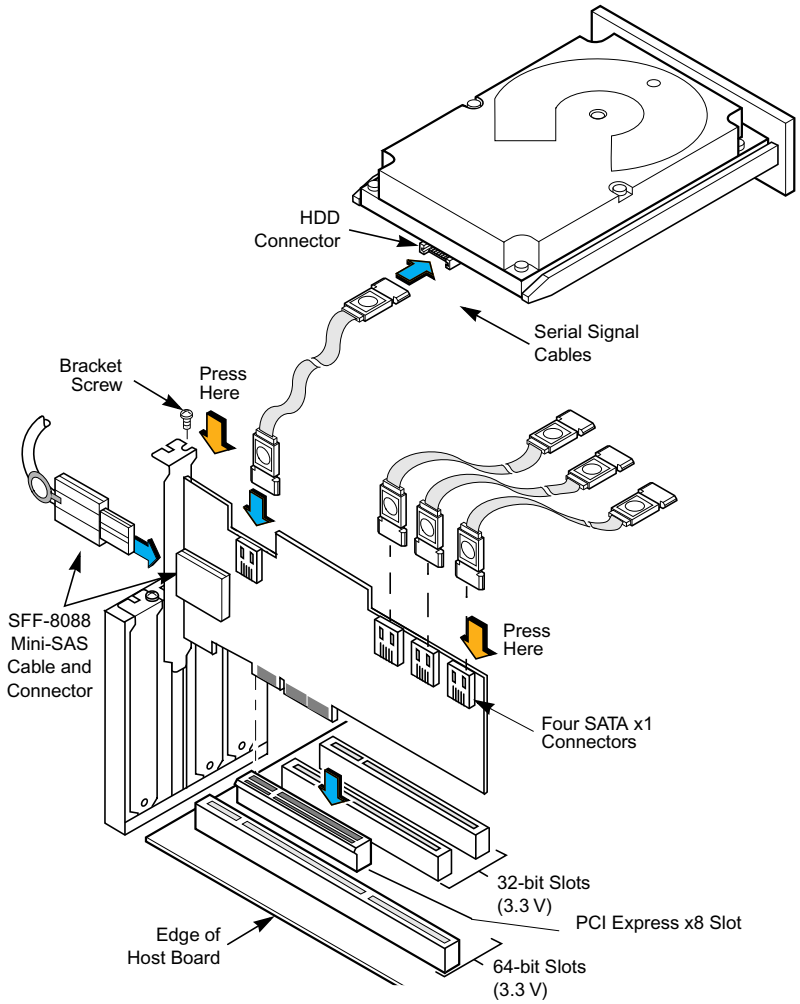
2. **Prepare the system.** Turn off the computer, and disconnect the power cord from the rear of the power supply.
3. **Remove the cover from the chassis.**

CAUTION Disconnect the computer from the power supply and from any networks before you install the HBA, or you risk damaging the system.

4. **Replace the mounting bracket (system dependent).** If required for your system, replace the full-length mounting bracket that ships on the LSI SAS 9212-4i4e HBA with the shorter bracket supplied. Save and reuse the two screws that attach the long bracket to attach the short bracket.
5. **Insert the HBA in an available PCIe slot.** Locate an empty PCIe slot. Remove the blank bracket panel on the back of the computer that aligns with the empty PCIe slot. Save the bracket screw, if applicable.

   Align the HBA to the PCIe slot. Press down gently, but firmly, to properly seat the HBA in the slot. The following figure shows how to insert the HBA in a PCIe slot.

Figure 2 Installing an LSI PCIe to SAS x8 HBA in a PCI Express Slot



NOTE The shape, size, and locations of components on your HBA and its bracket might vary from this illustration. The LSI SAS 9212-4i4e HBA requires a x8 PCIe slot.

6. **Secure the bracket to the system's chassis.** Install the bracket screw, if applicable, or engage the system retention mechanism to secure the HBA to the system's chassis.

7. **Connect serial cables between the HBA and any serial HDDs or external enclosures.** Figure 2 shows the locations of the HBA connectors.
8. **Replace the cover and any power cords, and power up the system.** Replace the system's cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

The hardware installation of your LSI SAS 9212-4i4e HBA is complete.

8 Revision History

8.1 Version 1.1, October 2014

Made the following changes:

- Updated Operating System Support URL.
- Converted the book to the new template.

8.2 Version 1.0, July 2011

Initial release of the document.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