ThinkSystem RAID 545-8i PCIe Gen4 12Gb Internal Adapter Installation and User Guide

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Chapter 1: Overview

The ThinkSystem RAID 545-8i PCIe Gen4 12Gb Internal Adapter, based on the SAS3808 controller, is a high-performance PCIe-to-SATA/SAS storage adapter. The SerDes technology enables operation of SAS and SATA storage devices in a single drive bay. A single controller can operate in two modes concurrently: SAS and SATA. The adapter negotiates between the speeds and the protocols to recognize and concurrently interface with these two storage device types:

- SAS data transfer rates of 12Gb/s, 6Gb/s, and 3Gb/s per phy
- SATA transfer rates at 6Gb/s and 3Gb/s per phy

The following table summarizes key adapter features.

Table 1 *Adapter Features*

Adapter	**545-8i**
Ports	8 internal
I/O Processor	SAS3808
Form Factor	Custom
Storage Interface Connectors	Two SFF-8654 x4
Host Interface	SFF-8654 x8
Storage Interface	SAS and SATA

1.1 Operating System Support

The adapter supports the operating systems in the following list.

- Microsoft Windows
- VMware vSphere/ESXi
- Red Hat Enterprise Linux
- SuSE Linux
- Ubuntu Linux
- Citrix XenServer
- CentOS Linux
- Debian Linux
- Oracle Enterprise Linux
- Fedora
- FreeBSD

Visit http://support.lenovo.com, and download the latest firmware and driver for the adapter.

1.2 PCIe Host Interface

The adapter's PCIe 4.0 host interface provides maximum transmission and reception rates of up to 128 GT/s (16 Gb/s per lane). The controller uses a packet-based communication protocol to communicate over the serial interconnect. Other PCIe host interface features include the following:

- Eight-lane PCIe host interface

- PCIe hot plug
- Power management
  - Supports the *PCI Bus Power Management Interface Specification Revision 1.2*
  - Supports Active State Power Management, including the L0 states, by placing links in a power-saving mode during times of no link activity
- Error handling
- High bandwidth per pin with low overhead and low latency
- Lane reversal and polarity inversion
- Single-phy (one-lane) link transfer rate of 16 GT/s, 8 GT/s, 5 GT/s, and 2.5 GT/s in each direction
- Support of x8, x4, x2, and x1 link widths

1.3 LED Management

The adapter offers LED management support for SAS/SATA backplanes.

1.4 Storage Interface Features

The adapter's storage interface supports concurrent operation with SAS and SATA devices to provide a fully functional solution for any storage environment.

- SAS features:
  - SAS data transfers at 12Gb/s, 6Gb/s, and 3Gb/s
  - DataBolt technology on all SAS phys to improve performance
  - Serial, point-to-point, enterprise-level storage interface
  - Wide ports that contain multiple phys
  - Narrow ports that contain a single phy
  - SAS phy power management
  - Data transfer by using SCSI information units
  - T10 data protection management
  - Support for persistent connection capability
  - Support for SPL-3 initiate close capability
  - Configurable Rx and Tx polarity inversion
  - Configurable phy-to-disk mapping
  - Configurable SSC
- SATA interface features:
  - SATA and STP data transfers at 6Gb/s and 3Gb/s
  - Addressing of multiple SATA targets through an expander

1.5 Adapter Characteristics

The adapter is a 6.02 in. x 2.67 in. (153 mm x 67.7 mm) board. The following figure shows the connectors and LED locations on the adapter.

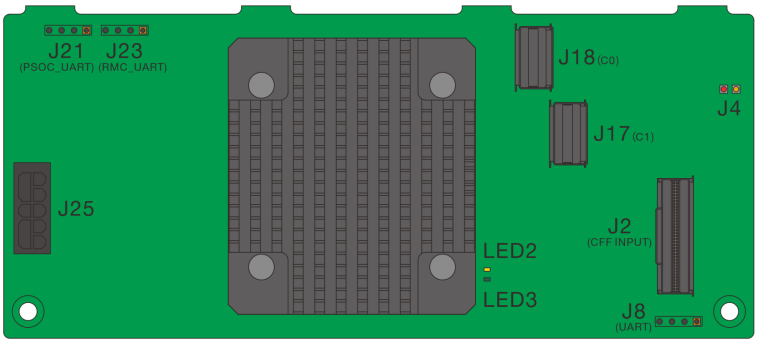

Figure 1 *Card Layout for the Thinksystem RAID 545-8i PCIe Gen4 12Gb Internal Adapter*

The following table describes the headers and connectors on the adapter.

Table 2 *Headers and Connectors*

Connector	Type	Description
J2	CFF input connector	The signal input connector between the adapter and the system board or processor board.
J4	Default serial boot ROM (SBR)	2-pin connector. Reserved.
J8	On-board serial UART connector	4-pin connector. Reserved.
J17, J18	Storage interface connectors	Two SFF-8654 4-port internal connectors. Connect the adapter by cable to the storage devices.
J21	On-board PSOC_UART connector	4-pin connector. Reserved.
J23	On-board RMC_UART connector	4-pin connector. Reserved.
J25	Power	Power connector.

The following table describes the LEDs on the adapter.

Table 3 *LED Designations*

LED	Type	Description
LED2	Yellow controller over temperature	Stays on solid to indicate that the SAS3808 device temperature sensor is over the temperature threshold. When the device is in the proper temperature range, this LED is off.
LED3	Green system heartbeat	Indicates that the SAS3808 IoC ASIC is operating normally. This LED blinks at 0.5 Hz.

Chapter 2: Adapter Installation Instructions

1. Unpack the adapter and inspect the adapter for damage.

   Unpack the adapter in a static-free environment. Remove the adapter from the antistatic bag, and carefully inspect the adapter for damage. If you notice any damage, contact Lenovo or your reseller support representative.

   ATTENTION To avoid the risk of data loss, back up your data before you change your system configuration.
2. Review the adapter connectors.
3. Check whether the adapter is well-fixed on the mounting bracket.

   The adapter ships preinstalled on a mounting bracket. Check that the adapter is fixed in place. If any loose screws exist, tighten the screws using a No.1 Phillips torque screwdriver. The maximum torque is 4.8 ± 0.5 inch-pounds.

   ATTENTION Exceeding this torque specification can damage the board, connectors, or screws, and can void the warranty on the board. Damage caused to the board as a result of changing the bracket can void the warranty on the board. Adapters returned without a bracket mounted on the board will be returned without return merchandise authorization (RMA) processing.
4. Prepare the server.

   Turn off the power to the server and disconnect all power cords.
5. Remove the top cover from the chassis.
6. Remove any components that might impede the adapter installation.

   Refer to ThinkSystem Server Documentation Center, select your product, and review the Hardware replacement procedures section for detailed instructions.
7. Install the adapter.

   Align the notches on the mounting bracket with the four pins or three pins on the chassis, place down the adapter, and slightly slide the adapter to secure it in place, as the following figure shows.

   ATTENTION The shape, size, and locations of the components on your adapter and its bracket might vary from the following illustration.

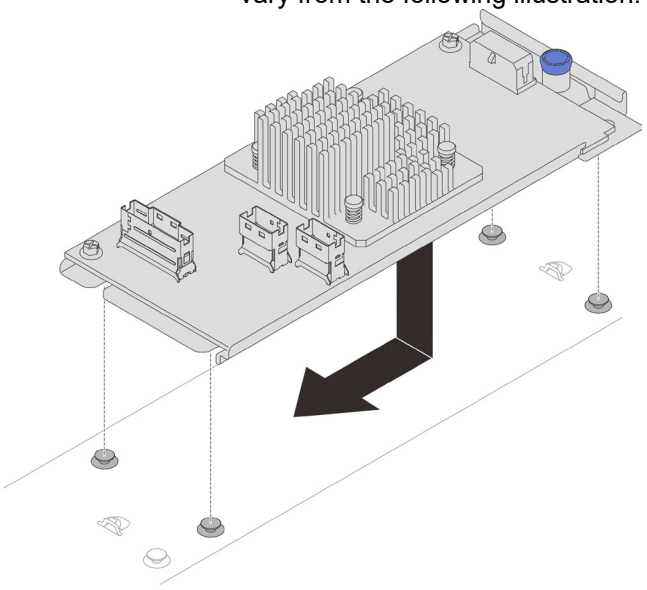

Figure 2 *Installing the Adapter*

8. Connect any cables to the adapter.

   Refer to ThinkSystem Server Documentation Center, select your product, and review the internal cable routing section for detailed instructions.

9. Reinstall any parts that have been previously removed and connect any internal cables.

   Refer to ThinkSystem Server Documentation Center, select your product, and review the Hardware replacement procedures section and the Internal cable routing section for detailed instructions.

10. Reinstall the top cover on the chassis.

    Refer to ThinkSystem Server Documentation Center, select your product, and review the Hardware replacement procedures for detailed instructions.

11. Reconnect any external cables and turn on the power to the system.

    The hardware installation of your adapter is complete.

Chapter 3: Safety Characteristics

The adapter meets or exceeds the requirements of UL flammability rating 94 V0. Each bare board is also marked with the supplier name or trademark, type, and UL flammability rating. For the boards installed in a PCIe bus slot, all voltages are lower than the SELV 42.4 V limit.

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