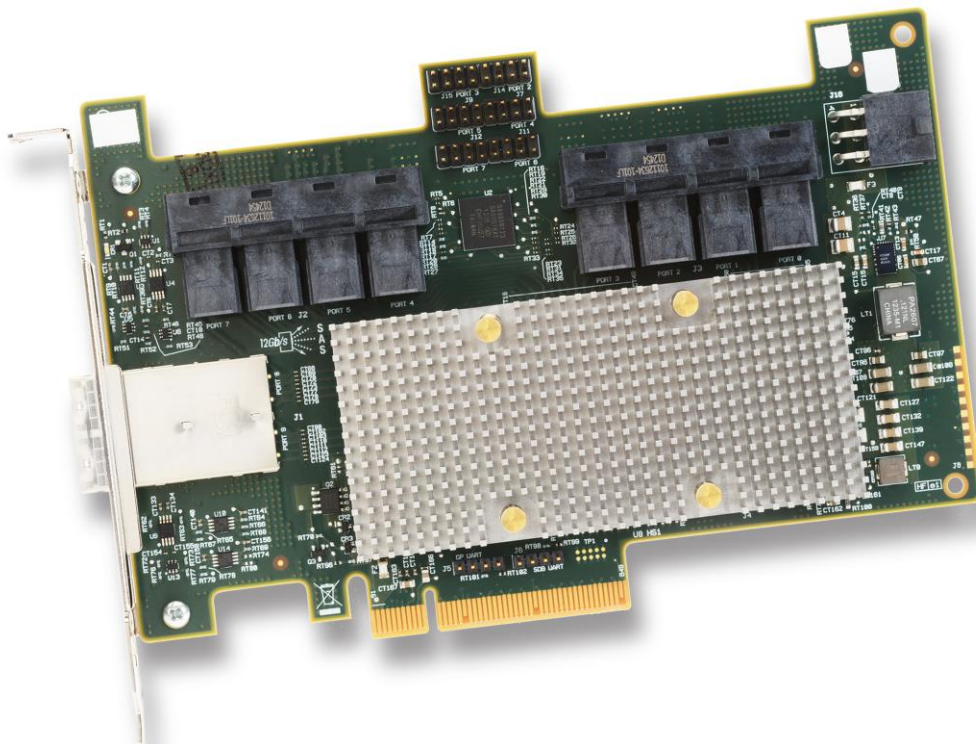




# PCI Express® to 12Gb/s Serial Attached SCSI (SAS) Expander Card

User Guide

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# PCI Express® to 12Gb/s Serial Attached SCSI (SAS) Expander Card User Guide

## 1 Overview

The ASTEK® A34012-PCI expander card, referred to as the ASTEK 12Gb/s SAS expander card, is based on the 12Gb/s SAS, 40 port, ASTEK SAS3x40 expander in a PCI Express® (PCIe®) card form factor. The ASTEK 12Gb/s SAS expander card provides high performance for high port count drives in servers with optional external connectivity expansion. The ASTEK 12Gb/s SAS expander card provides 24 lanes of 12Gb/s SAS for internal drive connectivity, 8 lanes of 12Gb/s SAS for external connectivity, and 8 internal lanes for connectivity to a companion 12Gb/s SAS MegaRAID® adapter or SAS host bus adapter. The 12Gb/s SAS expander card uses the PCIe 3.0 connection for power.

## 2 Features

This section lists the ASTEK 12Gb/s SAS expander card features.

- Implements one ASTEK SAS 3x40 12Gb/s SAS expander
- Supports SATA link rates of 3Gb/s and 6Gb/s
- Supports SAS link rates of 3Gb/s, 6Gb/s, and 12Gb/s
- Provides x4 mini-SAS HD connectors
- Provides six x4 internal mini-SAS HD connectors (SFF-8643) and two x4 external mini-SAS HD connectors (SFF-8644)
- Provides two x4 internal mini-SAS HD connectors (SFF-8643) for RAID card connections
- Supports passive copper cable and active copper cable
- Offered with a full-height bracket
- Provides one heartbeat LED
- Provides a universal asynchronous receiver/transmitter (UART) debug/diagnostic port

### 2.1 SAS-3 Interface

The ASTEK SAS 3x40 expander chip contains the SATA+SAS functionality for the ASTEK 12Gb/s SAS expander card. The following table shows the ASTEK SAS 12Gb/s SAS performance.

Half Duplex	Full Duplex
Narrow port (one lane) 1200 MB/s	Narrow port (one lane) 2400 MB/s
Wide port (four lanes) 4800 MB/s	Wide port (four lanes) 9600 MB/s

## 3 ASTEK A34012-PCI Card Characteristics

### 3.1 Memory

The ASTEK 12Gb/s SAS expander card provides one 4-M × 16-bit Flash ROM to store the firmware and the BIOS.

### 3.2 LED

The ASTEK 12Gb/s SAS expander card Heartbeat LED, CR1, blinks green to indicate the expander card is capable of general activity.

### 3.3 Connectors

**PCIe Connector (EC1).** The PCIe host interface connection is through the edge connector, EC1, which provides connections on both the top (EC1 B) and bottom (EC1 A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

**Auxiliary Power Connector (J16).** The auxiliary power connector provides the required connection used to adequately power the ASTEK 12Gb/s SAS expander card.

**SATA+SAS Connectors (J1, J2, and J3).** The ASTEK 12Gb/s SAS expander card supports SATA and SAS connectors through connectors J2 and J3 which are SFF-8643 mini-SAS HD internal connectors and connector J1 which is an SFF-8644 mini-SAS HD external connector.

**UART Connector (J5).** The UART connector debug port requires a special cable and ASTEK support to gather detailed Input/Output Controller (IOC) status.

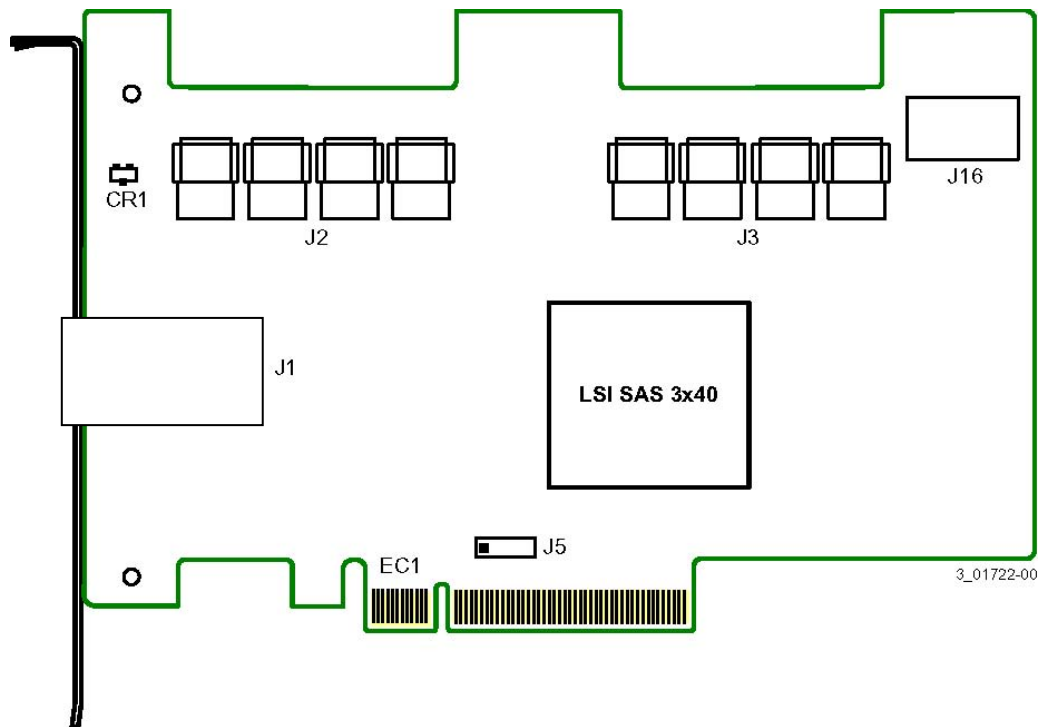
**Table 1 ASTEK A34012-PCI Expander Card UART Pinout**

Pin	Function
1	UART_TX
2	Gnd
3	UART_RX
4	1.8 V

### 3.4 Physical Characteristics

The ASTEK 12Gb/s SAS expander card is a 6.6-in. × 4.4-in., full-height board. The component height on the top and bottom of the ASTEK 12Gb/s SAS expander card is in accordance with the PCIe specification. The following figure shows the board layout.

Figure 1 ASTEK A34012-PCI Card Layout



- **EC1**– PCIe x8 board edge connector
- **CR1**– Heartbeat LED
- **J16**– Auxiliary power connector
- **J2, J3**– SFF-8643 mini-SAS HD, internal, right-angle connectors
- **J1**– SFF-8664 mini-SAS HD, external, right-angle connectors
- **J5**– UART connection

### 3.5 Electrical Characteristics

The maximum power requirements for the ASTEK A34012-PCI card under normal operation are as follows:

- PCIe 12.0 V
- Power Values
  - Nominal = 21.4 watts

### 3.6 Thermal and Atmospheric Limits

The atmospheric limits for the ASTEK 12Gb/s SAS expander card are as follows:

- Temperature range: 0 °C to 55 °C (32 °F to 131 °F) (dry bulb)
- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C (89.6 °F)
- Minimum airflow: 200 linear feet per minute

The following limits define the storage and transit environment for the ASTEK 12Gb/s SAS expander card:

- Temperature range: –45 °C to +105 °C (–49 °F to +221 °F) (dry bulb)
- Relative humidity range: 5% to 90% noncondensing

## 4 ASTEK 12Gb/s SAS Card Certifications and Safety Characteristics

All ASTEK 12Gb/s SAS expander cards 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 bus slot, all voltages are less than the SELV 42.4-V limit.

The design and implementation of the ASTEK 12Gb/s SAS expander card minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge.

The ASTEK 12Gb/s SAS expander card meets the following integrated electromagnetic interference (EMI) compliance labels:

- CE mark
- CISPR Class B
- C-Tick mark
- Canadian Compliance Statement
- FCC Class B, marked with the FCC Self-Certification logo
- Japan VCCI
- Korean KCC
- Taiwan BSMI

The ASTEK 12Gb/s SAS expander card meets the following environmental directives:

- RoHS
- WEEE

## 5 Hardware Detailed Installation Instructions

To install the ASTEK 12Gb/s SAS expander card, follow these steps:

1. **Unpack the expander card, and inspect it for damage.** Unpack the expander card in a static-free environment. Remove the expander card from the antistatic bag, and carefully inspect the device for damage. If you notice any damage, contact ASTEK or your reseller support representative.

**ATTENTION** To avoid the risk of data loss, make a backup of your data before changing your system configuration.

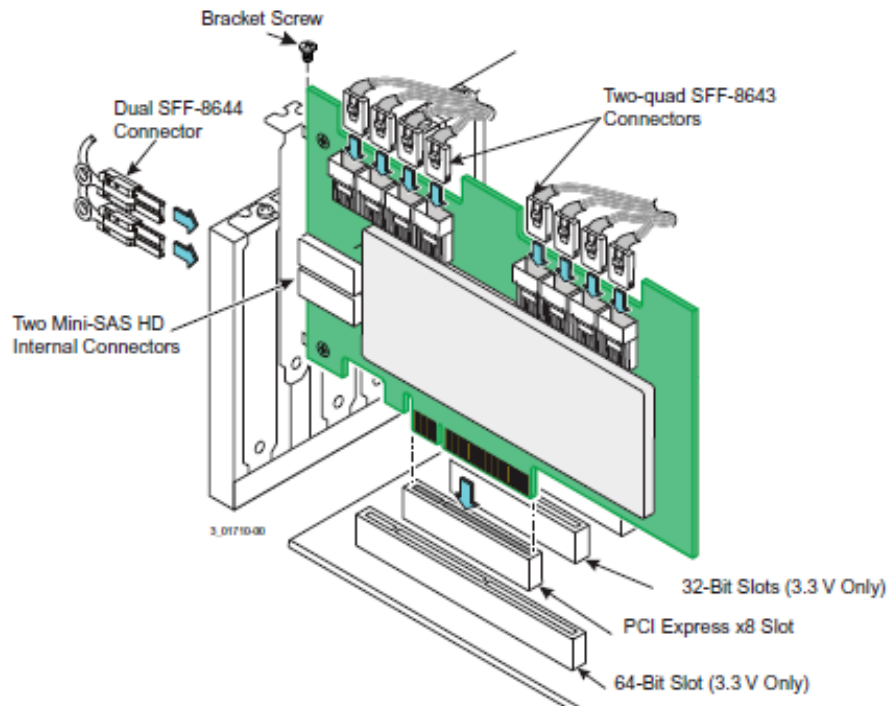
2. **Prepare the computer.** Turn off the computer, and disconnect the power cord from the rear of the power supply.

**CAUTION** Disconnect the computer from the power supply and from any networks to which you will install the expander card, or you risk damaging the system or electrical shock.

3. **Remove the cover from the chassis.**

4. **Insert the expander card into an available PCIe slot.** Locate an empty x8 PCIe slot. Remove the blank bracket panel on the rear of the computer that aligns with the empty PCIe slot. Save this bracket screw, if applicable. Align the expander card to a PCIe slot. Press down gently, but firmly, to seat the expander card correctly in the slot. The following figure shows how to insert the expander card into a PCIe slot.

**Figure 2 Install an ASTEK 12Gb/s x8 Expander Card in a PCIe Slot**



**NOTE** The shape, size, and locations of the components on your expander card and its bracket might vary from this illustration. The expander card requires an x8 PCIe slot.

5. **Secure the expander card bracket to the system's chassis.** Install the bracket screw, if applicable, or engage the system retention mechanism to secure the expander card to the system's chassis.
6. **Connect internal SAS cables between the expander card and the SAS backplane, any other SATA or SAS devices in the system chassis, or both.** The ASTEK 12Gb/s SAS expander card has six, SFF-8643, internal x4, mini-SAS HD connectors. Use a cable with an internal mini-SAS HD connector on one end (to connect to the expander card) and the appropriate connector to attach to the SAS or SATA devices on the other end.
7. **Replace the cover of the chassis.**
8. **Connect SAS cables between the expander card and the SAS enclosure that contains SATA or SAS devices.** The ASTEK 12Gb/s SAS expander card has two, SFF-8644, external x4 mini-SAS HD connectors. Use a cable with an external mini-SAS HD connector (SFF-8644) on one end (to connect to the card) and the appropriate connector to attach to the SAS or SATA devices on the other end.
9. **Replace the cover and any power cords, and power up the system.** Replace the chassis's cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

**The hardware installation of your ASTEK 12Gb/s SAS expander card is complete.**

## Technical Support

For assistance installing, configuring, or running the ASTEK 12Gb/s SAS expander card, contact ASTEK Technical Support:

Website: [www.Astekcorp.com/](http://www.Astekcorp.com/)