



Intel® Storage Expander RES3TV360

Hardware User's Guide

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Document Revision History

Date Published	Revision	Revision Change Description
Jun 2014	1.0	Production version.
Jan 2016	2.0	<ul style="list-style-type: none">• Applied to the new format.• Corrected the SAS connector description• Corrected verbiage about wide ports• Removed reference to activity and fault indicators
Nov 2020	2.1	<ul style="list-style-type: none">• Replaced all RAID Expander references with Storage Expander• System Requirements reviewed• Supported hardware section added• Intel logo updated

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Regulatory Compliance Statements

Federal Communications Commission Radio Frequency Interference Statement

Attention: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.
- Use a shielded and properly grounded I/O cable and power cable to ensure compliance of this unit to the specified limits of the rules.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Intel	Use only with the listed ITE:
	RES3TV360
 Tested to Comply With FCC Standards	
FOR HOME OR OFFICE USE	

UL Compliance Statement

Intel® products are tested and listed by Underwriters Laboratories, Inc. to UL 60950-1 Second Edition and IEC-60950-1 Second Edition standards, file numbers E175975.

 These products are for use only with UL listed ITE.

Intel	Use only with the listed ITE:
	RES3TV360

Special International Committee on Radio Interference Compliance Statement (CISPR 22)

This product has been found to comply with the requirements of the Information Technology Equipment -- Radio Disturbance Characteristics -- Limits and Methods of Measurement (CISPR 22).

European Union Compliance Statement

 This Information Technology Equipment has been tested and found to comply with EMC Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, in accordance with:

- EN55022 (1998+A1:2000+A2:2007) Emissions:
 - Class A ITE radiated and conducted emissions
- EN55024 (1998+A1:2001+A2:2010) Immunity:
 - EN61000-4-2 (2009) Electrostatic discharge: ± 4 kV contact, ± 8 kV air
 - EN61000-4-3 (2010) Radiated immunity: 3V/m
 - EN61000-4-4 (2004) Electrical fast transients/burst: ± 1 kV AC, ± 0.5 kV I/O
 - EN61000-4-5 (2006) Surges: ± 1 kV differential mode, ± 2 kV common mode
 - EN61000-4-6 (2009) Conducted immunity: 3 V
 - EN61000-4-11 (2004) Supply dips and variations: 30% and 100%
- EN50581 (2012) Technical Documentation:
 - For the assessment of electrical and electronic products with respect to the restriction of hazardous substances

In addition, all equipment requiring U.L. listing has been found to comply with EMC Directive 73/23/EEC as amended by 93/68/EEC in accordance with EN60950 with amendments A1, A2, A3, A4, A11.

Australian/New Zealand Compliance Statement



This device has been tested and found to comply with the limits for a Class B digital device, pursuant to the Australian/New Zealand standard AS/NZS 3548 set out by the Spectrum Management Agency.

Canadian Compliance Statement



This Class A digital apparatus meets all requirements of the Canadian Interference - Causing Equipment Regulations (ICES-003).

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada (ICES-003).

Japanese Compliance (Voluntary Control Council Initiative)



This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use but it may cause radio frequency interference

problem if used too near to a television or radio. Please handle it correctly per this documentation.

Korean Compliance (KCC) Statement

Intel® products are tested and certified by KCC: RES3TV360



B급 기기
(가정용 방송통신기자재)
Class B Equipment
(For Home Use Broadcasting & Communication Equipment)
이 기기는 가정용(B급) 전자파적합기기로서 주
로 가정에서 사용하는 것을 목적으로 하며, 모
든 지역에서 사용할 수 있습니다.

This equipment is home use (Class B) electromagnetic wave suitability equipment and to be used mainly at home and it can be used in all areas.

Taiwan Compliance

 This equipment complies to class B Information Technology equipment based on VCCI (Voluntary Control Council for Interface). This equipment is designed for home use, but it may cause radio frequency interference problem if used too near to a television or radio. Please handle it correctly per this documentation.

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1 About This Guide

This Installation and user guide explains how to install and configure your Storage Expander RES3TV360.

1.1 What You Need to Know Before You Begin

You should be familiar with computer hardware, data storage, and Serial Attached SCSI (SAS) and Serial ATA (SATA) technology.

You should also be familiar with RAID controllers, modules, expanders, and related support devices.

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:

- Expander Card (also known as SAS expander, adapter, board, 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 storage enclosure, JBOD enclosure, or expander)

2 Kit Contents and System Requirements

This section lists the contents of your kit and the system requirements for successfully installing and using your expander card.

2.1 Kit Contents

- Storage Expander
- Three installation screws and three rubber bumpers
- Cables for backplane connection

2.2 System Requirements

- An Intel® RAID Controller or Storage Controller with support for SAS drives (see the Supported Hardware section below)
- An Intel approved chassis or compatible with room for the storage expander card installation (the card has a non-standard mid plane form factor, see section 3.5 Board dimensions). See the Supported Hardware section below
- One available RA 4-pin power connector
- SAS or SATA hard drives or SSD allowing bandwidths up to 12 Gb/s

Note: The Intel® SAS Expander RES3TV360 doesn't work with any SATA controllers

2.3 Supported Hardware

The Intel® SAS Expander RES3 TV360 is supported on the following server system families and chassis:

Intel® Server System R2000WT Family
Intel® Server System R2000WF Family
Intel® Server Chassis P4304XXMFEN2
Intel® Server Chassis P4304XXMUXX

Also, it's supported with the following Intel® RAID products:

Intel® RAID Module RMSP3AD160F
Intel® RAID Module RMSP3CD080F
Intel® RAID Module RMSP3HD080E
Intel® Storage Module RMSP3JD160J
Intel® RAID Adapter RSP3TD160F
Intel® RAID Adapter RSP3MD088F
Intel® RAID Adapter RSP3DD080F
Intel® RAID Adapter RSP3WD080E
Intel® Storage Adapter RSP3QD160J
Intel® RAID Controller RS3MC044
Intel® RAID Controller RS3DC040
Intel® RAID Controller RS3DC080

Intel® RAID Controller RS3GC008
Intel® RAID Controller RS3SC008
Intel® RAID Controller RS3WC080
Intel® RAID Controller RS3UC080
Intel® RAID Controller RS3UC080J
Intel® RAID Controller RS3FC044
Intel® Integrated RAID Module RMS3CC040
Intel® Integrated RAID Module RMS3CC080
Intel® Integrated RAID Module RMS3HC080
Intel® Integrated RAID Module RMS3JC080
Intel® Integrated RAID Module RMS3AC160
Intel® Integrated RAID Module RMS3VC160

3 About Your Storage Expander

This section provides an overview of the features of your Storage Expander.

3.1 Standard Storage Expander Features

- Support for both SAS and SATA devices
- 12 Gb/s, 6 Gb/s, 3 Gb/s, or 1.5 Gb/s data transfer rate
- Nine SFF-8643 mini-SAS-HD internal connectors providing 36 SAS/SATA ports
- Supports 8 inputs and 28 outputs configuration
- Output mini-SAS connectors support sideband SGPIO per the SFF-8485 specification
- Power from an RA 4-pin power connector
- Onboard screw holds allow the expander card to be mounted on a chassis wall inside a server system
- Provides a low-latency connection to create and maintain transparent access to each connected SAS/SATA physical drive
- Staggered spin-up
- Native Command Queuing
- Allows multiple initiators to address a single target
- Supports cascaded expander products
- Each port on the expander card supports SAS devices, SATA II devices, or both using SSP, SMP, and STP
 - Serial SCSI Protocol (SSP) to enable communication with other SAS devices
 - Serial Management Protocol (SMP) to share topology management information with expanders
 - Serial Tunneling Protocol (STP) support for SATA II through expander interfaces
 - SAS protocol, described in the Serial Attached SCSI (SAS) Standard, version 2.0
 - SFF-8485 protocol, using the Serial GPIO (SGPIO) interface provided by the expander
- Enclosure Management
 - Onboard temperature sensor
 - SGPIO

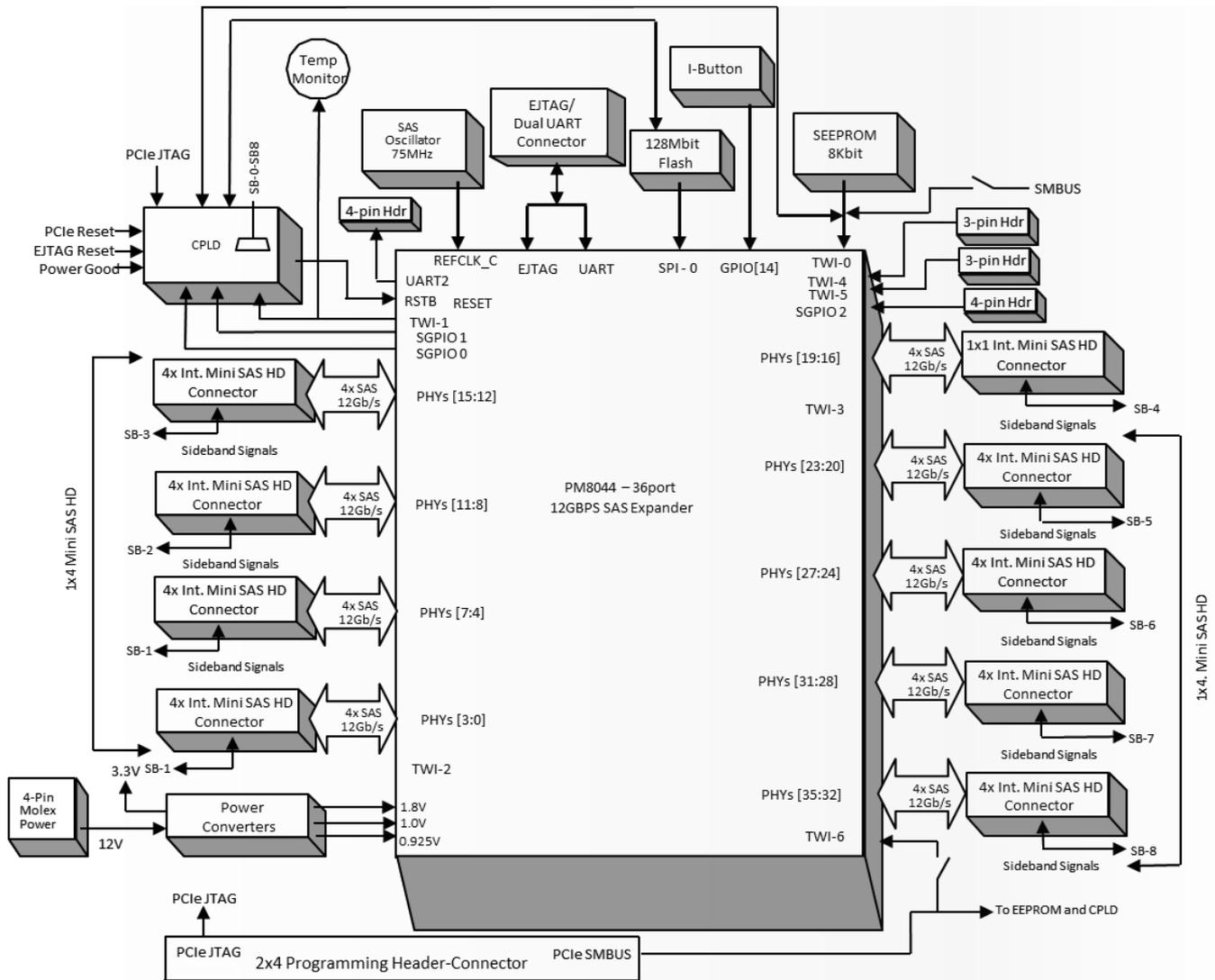
3.2 Major Components

- 36-port 12 Gb/s SAS-3 Expander Chip
 - Provides 36 PHYs
 - Any PHYs may be combined into wide port(s)
 - Any output PHY can be SAS or SATA attached
 - Supports multiple data rates and auto-negotiation between the following:
 - 3.0 Gb/s, 6.0 Gb/s, and 12.0 Gb/s SAS
 - 3.0 Gb/s and 6.0 Gb/s SATA
 - Supports SSP, STP, and SMP
 - Supports the SAS protocol described in the Serial Attached SCSI (SAS) Standard, version 3.0r5
 - Activity and fault indicators per PHY
 - Provides a low-latency connection router to efficiently create and maintain connections
 - Supports T10-Based and Phy-Based Zoning for storage partitioning
 - Allows any number of Phys to be included in a wide port
- Flash ROM – A 128-Mbit Quad SPI flash ROM is used to accommodate expander card firmware.
- Heartbeat LED – A green LED provides a heartbeat with a 1-second blink rate to indicate the expander has booted properly.
- SAS connectors – The RES3TV360 RAID Expander provides internal SAS connectors as shown in [SAS Connectors](#) section.

3.3 Compatible Devices

- 2.5-inch and 3.5-inch SAS-3, SAS-2, and SATA drives
- Non-disk devices including SAS expanders
- Support for drives of mixed capacity.
- SAS-3 and SAS-2 host controllers (RAID and Non-RAID)

3.4 Block Diagram



3.5 Board Dimensions

This table below lists the board dimensions of your RAID Expander RES3TV360.

Dimension	RAID Expander RES3TV360
Height	2.165"
Length	8.405"
PCB Thickness	0.062"
Max Component Height, Top Side	0.570"
Max Component Height, Bottom Side	0.120"

3.6 Mechanical Information

The figure below shows the physical package information for the RAID Expander RES3TV360. All dimensions are in inches.

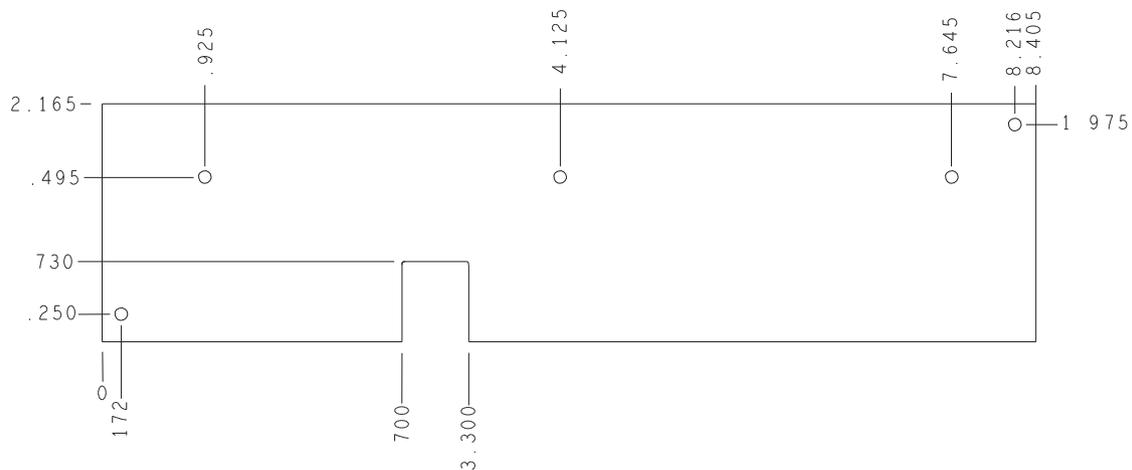
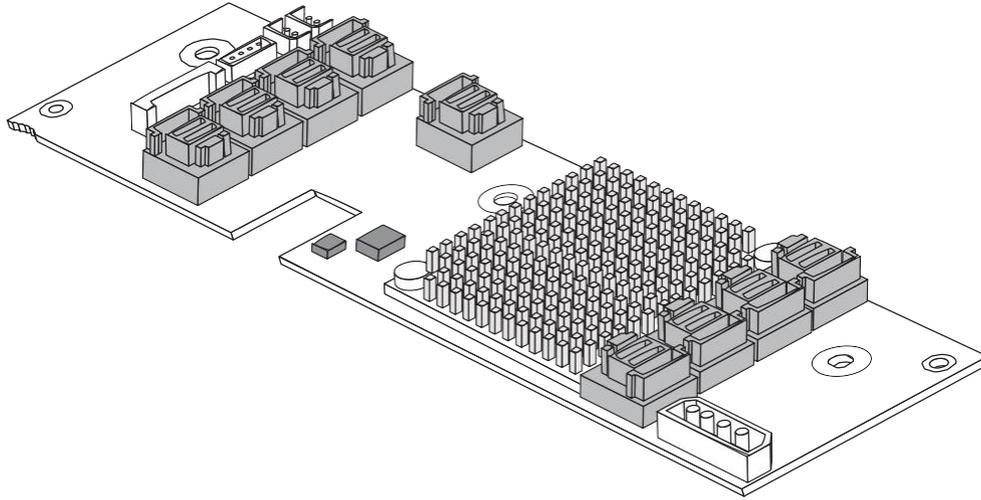


Figure 1. Board dimensions

3.7 About the Intel® Storage Expander Card RES3TV360

The RAID Expander RES3TV360 is a RAID expander with these features:



Form Factor	2.165" x 8.405"
Data transfer rate	12 Gb/s per port
Phys (Unified Serial Ports)	36
Connectors, internal	1 mini-SAS HD x1 2 mini-SAS HD x4 (SFF-8643) 36 ports input or output
Maximum number of disk drives	up to 28 direct attached
Enclosure Support	SES-3
Thermal Sensor	Processor temperature
Encryption	No

4 Installing and Connecting the Storage Expander

This section explains how to install your Storage Expander and connect it to internal and external disk drives.

4.1 Before You Begin

- Read [Appendix A: Safety Information](#).
- Familiarize yourself with your product's physical features (see Section 3.1 Standard Storage Expander Features on Page 3).
- Ensure that you have the right number of drives and cables for your application (see Section 4.2 Selecting Disk Drives and Cables on Page 9).

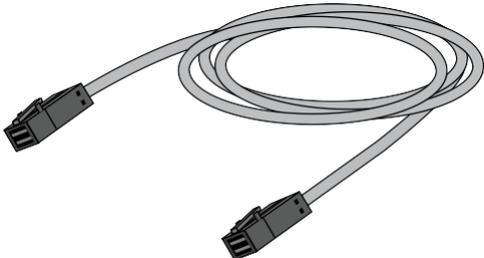
4.2 Selecting Disk Drives and Cables

4.2.1 Disk Drives

Your Storage Expander supports SAS and SATA disk drives, Solid State Drives (SSDs), and SAS tape drives.

4.2.2 Cables

Depending on your application requirements, you can use any of the cables listed below.

Cables	
	Internal mini-SAS HD to mini-SAS HD (SFF-8643 to SFF-8643) – Connects to an internal backplane or enclosure. Also connects the Storage expander to a SAS host controller. The Intel® Storage Expander RES3TV360 kit includes the cables to connect the expander to the backplane.

4.2.3 SAS Connectors

This section shows the internal SAS connectors

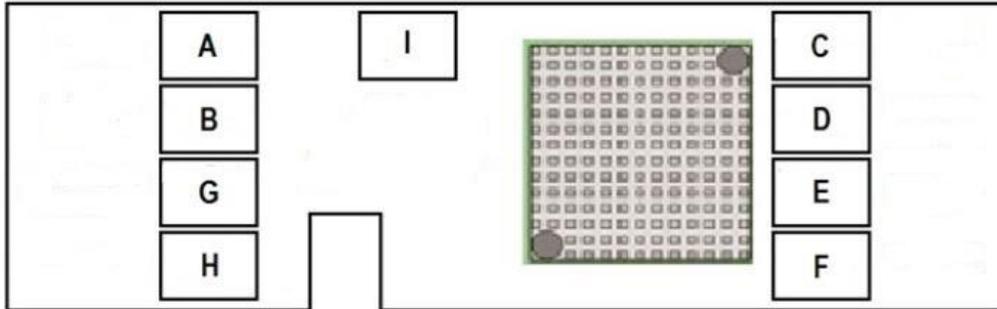


Figure 2. SAS connectors

Connector	Description	Type	Comment
A, B, C, D, E, F, I	Internal output connectors (to backplane or drives)	SFF-8643	A – SAS Output ports (0-3) B – SAS Output ports (4-7) C – SAS Output ports (8-11) D – SAS Output ports (12-15) E – SAS Output ports (16-19) F – SAS Output ports (20-23) I – SAS Output ports (24-27)
G, H	Internal Input connectors (from RAID controller/HBA)	SFF-8643	G – SAS Input ports (0-3) H – SAS Input ports (4-7)

4.3 Installing the Storage Expander

This section describes how to install the Storage Expander into your computer cabinet or server. Follow the steps below to install your Storage Expander card and connect your internal or external storage devices.

Caution: Be sure to handle the expander by its edges only and touch a grounded metal object before handling the expander card.

1. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).
2. Remove the server cover. For instructions, see your server system documentation.
3. Remove the release paper on the card bumpers and adhere them to the designated locations on the bottom of the card.
4. Insert the expander card into the area between the fans and backplane. When installed properly, the expander card bumpers should rest securely on the chassis floor.

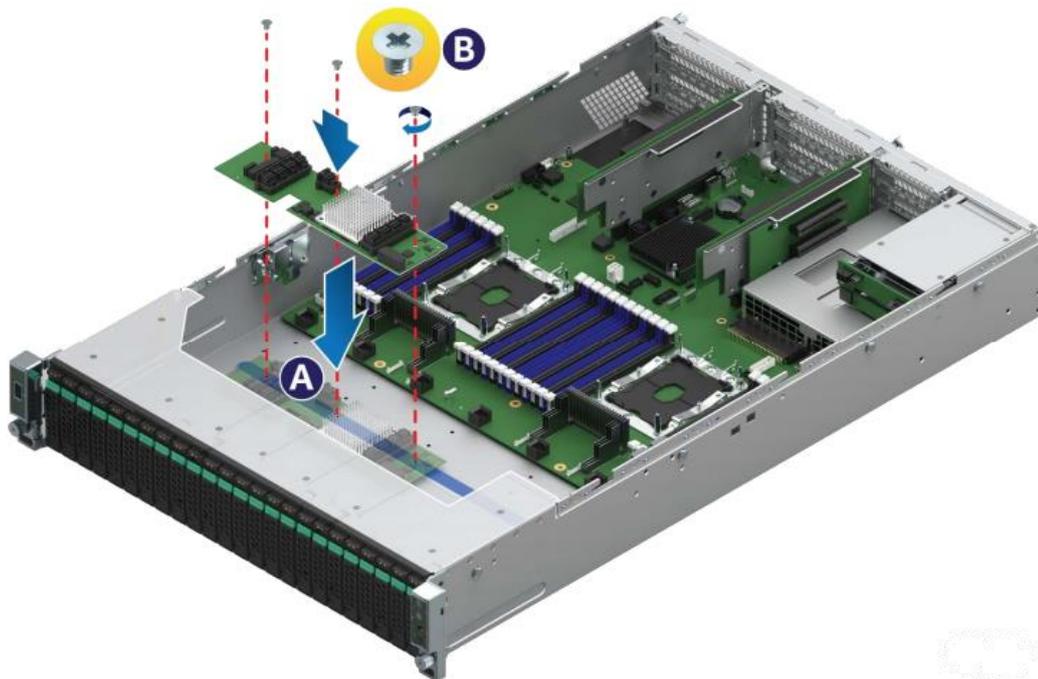


Figure 3. Installing the Expander Card

5. Using a Philips head screwdriver, secure the card to the standoffs on the chassis with the three screws provided in the kit.
6. Connect serial cables between the expander card and internal drives, as required. Connect serial cables between the expander card and the host SAS or RAID controller.

Caution: Follow the instructions carefully when connecting the connectors from the SAS expander to the connectors on the midplane. Each connector is pre-programmed at the factory to provide specific drive identification mapping. Improper connections may provide undesirable drive mapping.

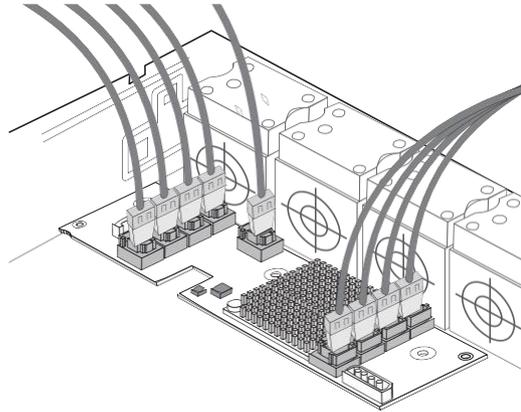


Figure 4. Cable Connection of Expander Card with Internal Ports

7. Close your computer cabinet, reconnect the power cord(s) and network cables, then power up the system.

5 Configuring the Storage Expander

After physically installed into a server system, the RES3TV360 Storage Expander is transparent to users in RAID or non-RAID configurations.

6 Solving Problems

This section provides basic troubleshooting information and solutions for solving problems with your Storage Expander.

6.1 Troubleshooting Checklist

If you encounter difficulties installing or using your Storage Expander, check these items first:

- Ensure that your expander is connected to a RAID controller correctly, check the input and output ports on page 10.
- With your computer powered off, check the connections to each disk drive, power supply, LED connector, and so on.
- Try disconnecting and reconnecting disk drives from the expander.
- Check that your expander is installed in a compatible PCIe expansion slot. To double-check the bus compatibility of your expander, see Chapter 3 About Your Storage Expander on Page 3.
- Ensure that your expander is firmly seated and secured in the PCIe expansion slot.
- If your expander is not detected during system boot, try installing it in a different compatible expansion slot. (See Installing the Storage Expander section on Page 9 for instructions.)
- If you have external disk drives (or other devices), are they powered on and working?

Appendix A: 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(s).

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 expander against your clothing. The wrist strap protects components from ESD on the body only.
- Handle the expander by its bracket or edges only. Avoid touching the printed circuit board or the connectors.
- Put the expander down only on an anti-static surface such as the bag supplied in your kit.

If a wrist strap is not available, ground yourself by touching the metal chassis before handling the expander or any other part of the computer.

Appendix B: Technical Specifications

Environmental Specifications

Note: Your Storage Expander requires adequate airflow to operate reliably. The recommended airflow is 200 LFM (linear feet per minute), minimum to avoid operating above the maximum ambient temperature. Forced airflow is required.

The thermal and atmospheric characteristics are:

Ambient temperature with forced airflow	0°C to 55°C
Relative humidity	20% to 80%, non-condensing
Altitude	Up to 3,000 meters

The storage and transit environment conditions are:

Ambient temperature with forced airflow	-30°C to 80°C (dry bulb)
Relative humidity	5% to 90%, non-condensing

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

DC Power Requirements

Connector	Description	Requirements
4-pin Molex	DC Voltage	12V

Product	Typical Current
Storage Expander RES3TV360	1.34A @ 12 VDC
Storage Expander RES3TV360	All power is supplied through a remote RA 4-pin 12V power connector. The +12 V rail is used to generate the other required voltage rails of 3.3V, 1.8V, 1.005V, and 0.925V and +1.8 V.