Intel® RAID Expander Card RES3TV360 Hardware User's Guide

Intel Order Number: H40805-002

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Intel warranties that this product will perform to its published specifications. However, all computer systems are inherently subject to unpredictable system behavior under various environmental and other conditions.

This product is not intended to be the sole source for any critical data and the user must maintain a verified backup. Failure to do so or to comply with other user notices in the product user guide and specification documents may result in loss of or access to data.

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 A 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.

UL Compliance Statement

Intel® products are are recognized under the Component Recognition Program of UL to UL 60950-1 Second Edition and IEC-60950-1 Second Edition standards, file numbers E175975.

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

Table of Contents

1   About This Guide

This Installation and User's Guide explains how to install and configure your RAID Expander RES3TV360 in a RAID system.

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.

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 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 RAID Expander kit and the system requirements for successfully installing and using your expander card.

Kit Contents

- RAID Expander
- Three installation screws and three rubber bumpers

System Requirements

- An Intel® Server Board based on the Intel® Xeon® processor E5-2600 v3 product family
- Available RA 4-pin power connector
- SAS and SATA hard drives up to 12 Gb/s speed

3   About Your RAID Expander

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

Standard RAID 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

- On-board 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
    — On-board temperature sensor
    — SGPIO

— SES enclosure services that monitor temperature, system power supplies, and control system fans

Major Components

- 36-port 12 Gb/s SAS-3 Expander Chip
  - Provides 36 PHYs
    - ✧ Any PHYs may be combined into wide port(s)
    - ✧ Any 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 on page 9.

Compatible Devices

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

Block Diagram
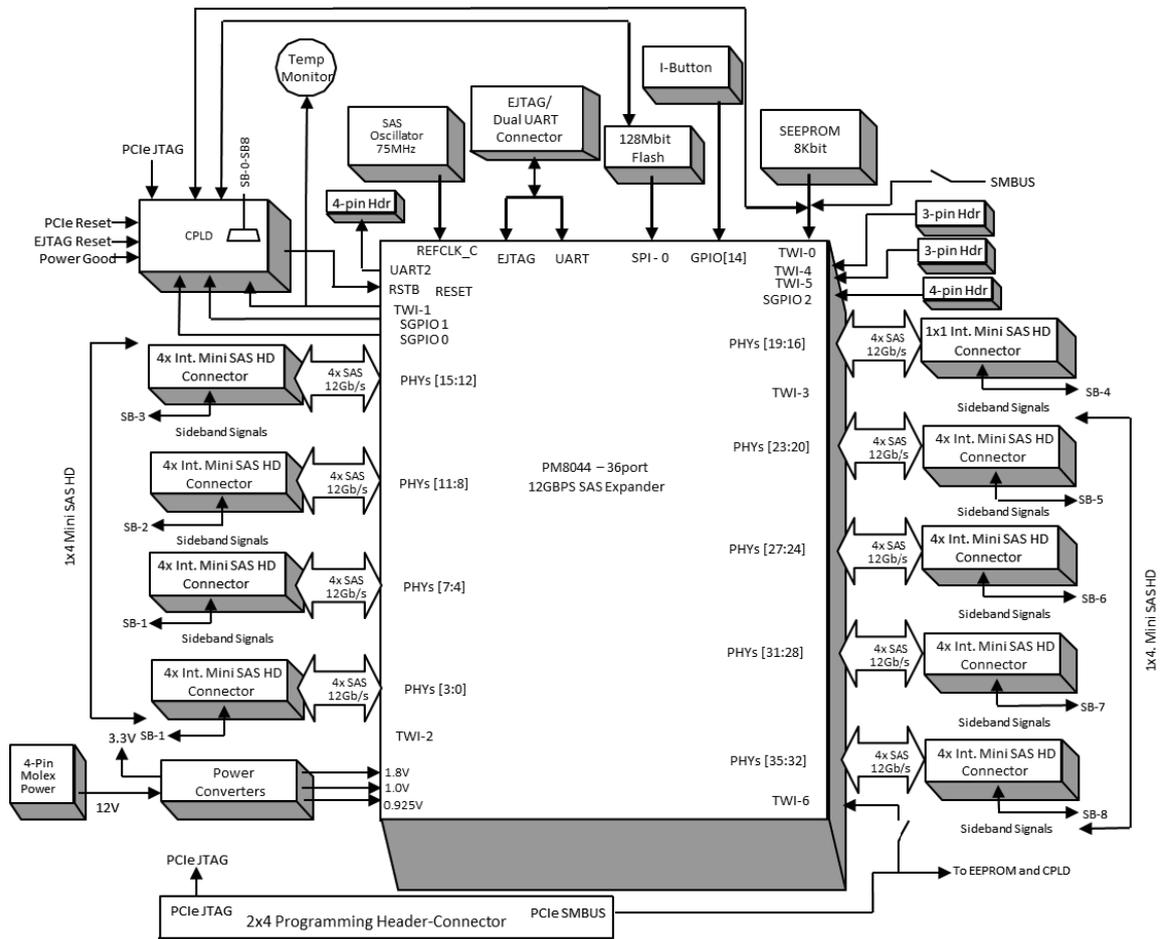
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Board Dimensions

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"

Mechanical Information

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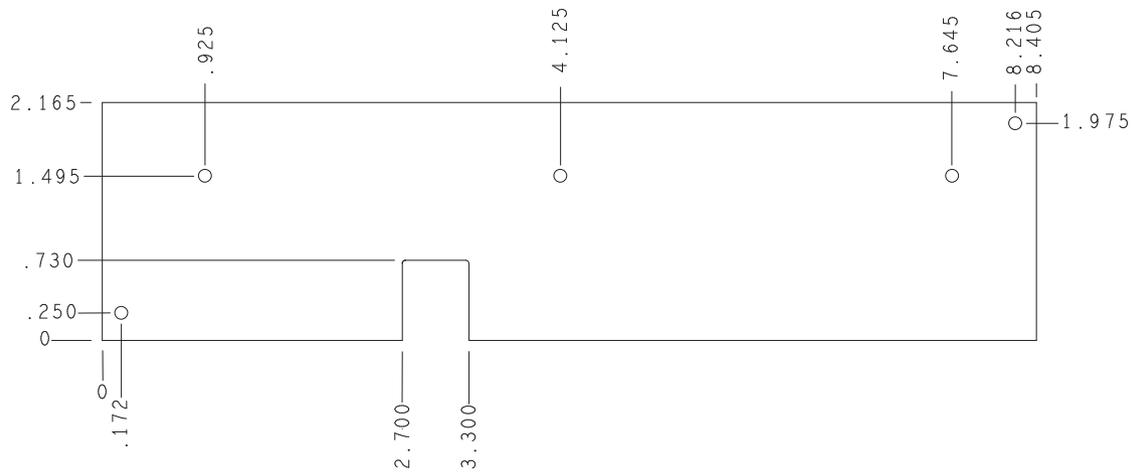
About the Intel® RAID Expander RES3TV360

The RAID Expander RES3TV360 is a RAID expander with these features:
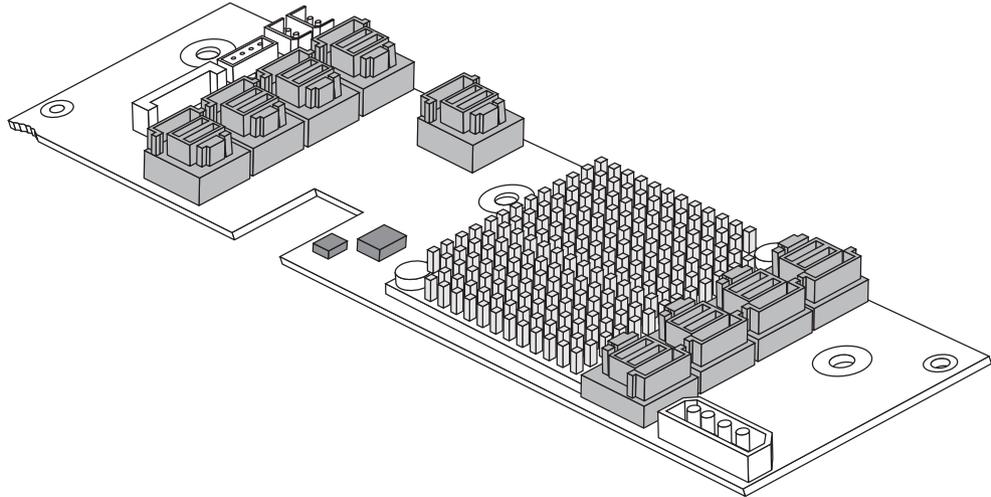
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Form Factor	2.165" x 8.405"
Data transfer rate	12 Gb/s per port
Phys (Unified Serial Ports)	36
Connectors, internal	1 mini-SAS HD x1 2 mini-SAS HD x4 (SFF-8643) 36 ports input or output
Maximum number of disk drives	up to 24 direct-attached
Enclosure Support	SES-3
Thermal Sensor	Processor temperature
Encryption	No

4   Installing and Connecting the RAID Expander

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

Before You Begin

- Read Safety Information on page 14.
- Familiarize yourself with your product's physical features (see Standard RAID Expander Features on page 3).
- Ensure that you have the right number of drives and cables for your application (see Selecting Disk Drives and Cables on page 8).
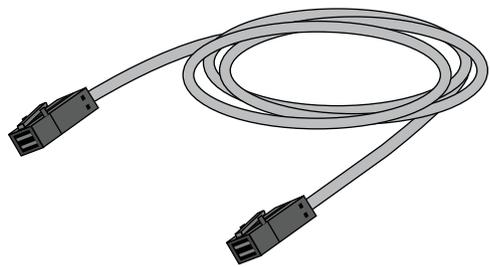
Selecting Disk Drives and Cables

Disk Drives

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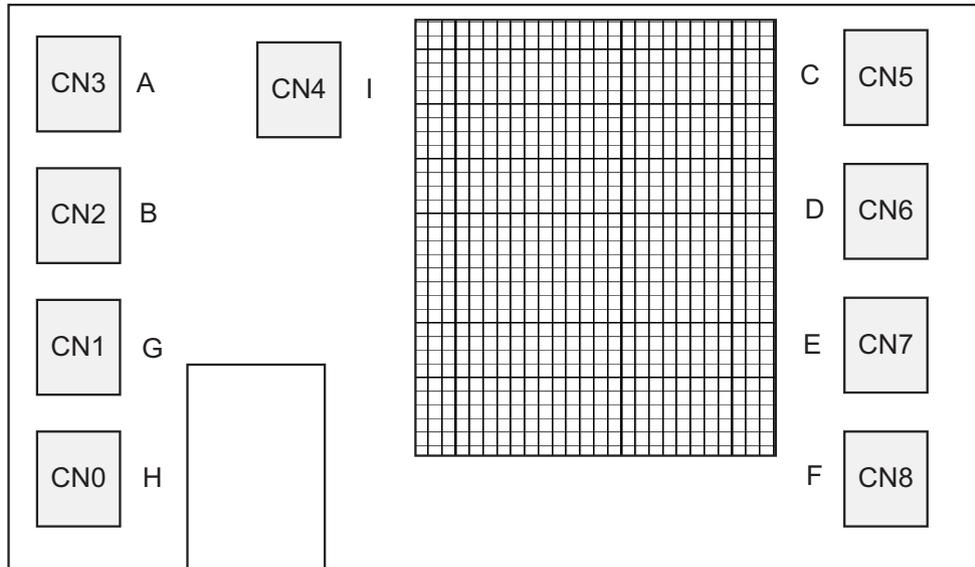
Cables

Use the cables shown below.

Cables	
	Internal HD mini-SAS to HD mini-SAS (SFF-8643 to SFF-8643) – Connects to a backplane or enclosure.

SAS Connectors

This section shows the internal SAS connectors.

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| Connector	Description	Type	Comment
CN0	2x4 HD mini-SAS internal	SFF-8643	CN0 – SAS ports (0-3)
CN1			CN1 – SAS ports (4-7)
CN2			CN2 – SAS ports (8-11)
CN3			CN3 – SAS ports (12-15)
CN4	1x1 HD mini-SAS internal	SFF-8643	CN4 – SAS ports (16-19)
CN5	2x4 HD mini-SAS internal	SFF-8643	CN5 – SAS ports (20-23)
CN6			CN6 – SAS ports (24-27)
CN7			CN7 – SAS ports (28-31)
CN8			CN8 – SAS ports (32-35)

Installing the RAID Expander

This section describes how to install the RAID Expander into your computer cabinet or server.

Follow the steps below to install your RAID Expander card and connect your internal storage device.

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 mappings.*

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 midplane. When installed properly, the expander card bumpers should rest securely on the chassis floor.
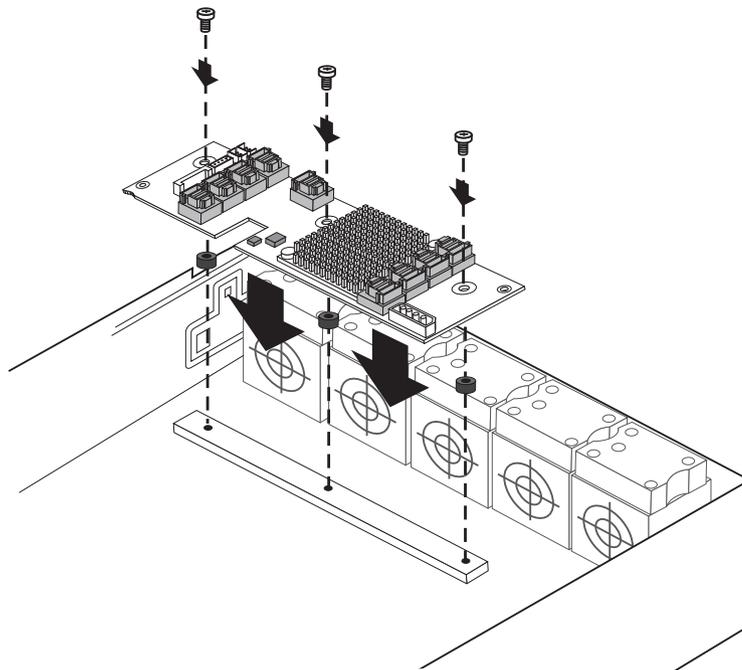
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5. Using a Philips head screwdriver, secure the card to the standoffs on the chassis with the three screws provided in the kit.

6. Connect serial cables between the expander card and internal disk drive, as required.
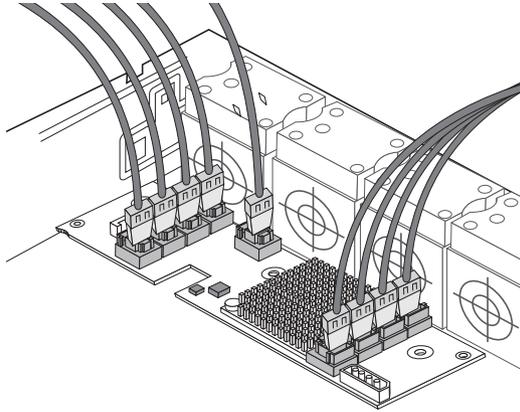
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7. Close your computer cabinet, reconnect the power cord and network cables, then power up the system.

5   Configuring the RAID Expander

After physically installed into a server system, the Intel® RAID Expander RES3TV360 is transparent to users in RAID configurations. Refer to the technical specification or user guide of the RAID controller connected to this expander card to know how to configure a RAID system.

6   Solving Problems

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

Troubleshooting Checklist

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

- 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.
- Did the RAID controller driver install correctly?
- If you have external disk drives (or other devices), are they powered on?

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.

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 you are returning the expander to Intel® Product Support, put it back in its anti-static bag immediately.

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 RAID 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
Mean Operating Time Between Failures number (MTBF): electrical components	2M hours at 40°C

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

DC Power Requirements

Connector	Description	Requirements
4-pin Molex	DC Voltage	12V

Current Requirements

Product	Typical Current
RAID Expander RES3TV360	1.34A @ 12 VDC
RAID Expander RES3TV360	All power is supplied to the RES3TV360 RAID Expander 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. The max operation power is TBD W.