



# **Intel<sup>®</sup> Entry Storage System SS4200-E**

## ***Technical Product Specification (Hardware)***

*Intel Order E22057-003*

**Revision 1.1**

**Storage Systems Group Marketing**

---

## *Revision History*

Date	Revision Number	Modifications
17 Sep 2007	0.5	Initial draft for review
28 Sep 2007	0.7	Review comments added and additional information corrected.
12 Oct 2007	0.9	Review comments added and additional information corrected.
24 Oct 2007	1.0	Review comments added and items remaining removed until data available. Ready for publication.
28 Feb 2008	1.1	Updated graphic showing shroud removed, updated spare parts list, corrected MTBF numbers, corrected drive retention bracket locking, updated tables in fan control section.

## *Disclaimers*

Information in this document is provided in connection with Intel® products. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Intel's Terms and Conditions of Sale for such products, Intel assumes no liability whatsoever, and Intel disclaims any express or implied warranty, relating to sale and/or use of Intel products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Intel products are not intended for use in medical, life saving, or life sustaining applications. Intel may make changes to specifications and product descriptions at any time, without notice.

Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them.

This document contains information on products in the design phase of development. Do not finalize a design with this information. Revised information will be published when the product is available. Verify with your local sales office that you have the latest datasheet before finalizing a design.

The Intel® Entry Storage System SS4200-E may contain design defects or errors known as errata that may cause the product to deviate from published specifications. Current characterized errata are available on request.

Intel system boards contain a number of high-density VLSI and power delivery components that need adequate airflow to cool. Intel's own chassis are designed and tested to meet the intended thermal requirements of these components when the fully integrated system is used. It is the responsibility of the system integrator that chooses not to use Intel developed system building blocks to consult vendor datasheets and operating parameters to determine the amount of air flow required for their specific application and environmental conditions. Intel Corporation cannot be held responsible if components fail or the system board does not operate correctly when used outside any of their published operating or non-operating limits.

Intel, Pentium, Itanium, and Xeon are trademarks or registered trademarks of Intel Corporation.  
\*Other brands and names may be claimed as the property of others.

Copyright © Intel Corporation 2007, 2008.

# Table of Contents

<b>1. Feature Summary</b>	<b>1</b>
1.1 System Components	6
1.2 System Board Feature Set	9
1.3 Serial ATA (SATA)	9
1.4 Enclosure Management	9
1.4.1 Fan Connector and Control	10
1.4.2 Voltage Monitoring	11
1.4.3 Hard Disk Drive LEDs	11
1.5 Chassis Dimensions and Weight	12
1.6 Back Panel I/O Ports and Features	13
1.7 Front Panel and Hard Disk Drive Retention Bracket Assembly	13
1.7.1 Front/Rear Panel Controls and Indicators	15
<b>2. Power Sub-System</b>	<b>18</b>
2.1 Power Supply	18
2.1.1 Power Supply Outputs	20
2.1.2 Efficiency, Standby Efficiency and Overshoot	20
2.2 Output Power / Currents	20
2.3 Voltage Regulation	21
2.4 Protection Circuits	21
2.4.1 Over Voltage Protection (OVP)	21
2.4.2 Short Circuit Protection (SCP)	21
<b>3. System Cooling Fans</b>	<b>22</b>
3.1 Fan Control	22
<b>4. Hard Disk Drive Retention Assembly</b>	<b>23</b>
4.1 Hard Disk Drives	24
4.1.1 Hard Disk Drive Retention Bracket Assembly	24
<b>5. System Interconnection</b>	<b>26</b>
5.1 Chassis Internal Connectors	26
5.2 I/O Panel Connectors	26
5.3 SATA Connectors	27
5.3.1 SATA Connector	27
5.3.2 Power Connectors	28

5.3.3 Front Panel Connector ..... 30

**6. Regulatory Information ..... 31**

6.1 Product Regulation Requirements ..... 31

6.1.1 Product Safety Compliance ..... 31

6.1.2 Product EMC Compliance – Class B Compliance ..... 31

6.1.3 Certifications / Registrations / Declarations ..... 32

6.2 Product Regulatory Compliance Markings ..... 33

6.2.1 Component Regulation Requirement Need to Support System Level Certifications 33

6.2.1.1 Product Ecology Requirements ..... 34

**7. Environmental Limits ..... 36**

7.1 System Office Environment ..... 36

7.2 System Environmental Testing ..... 36

7.3 Environmental Limits ..... 37

**8. Serviceability and Availability ..... 38**

**9. Calculated MTBF ..... 39**

**Appendix A: Spares and Accessories ..... 41**

Upgrade and Accessory Parts ..... 41

**Glossary ..... 42**

# List of Figures

Figure 1. Intel® Entry Storage System SS4200-E in optional orientations .....	2
Figure 2. Intel® Entry Storage System SS4200-E Block Diagram .....	6
Figure 3. System Board Connectors .....	7
Figure 4. System Components .....	8
Figure 5. Chassis Rear – showing feet both for vertical and horizontal orientation .....	13
Figure 6. Chassis Front.....	13
Figure 7. Hard Disk Drive Retention Bracket Assembly .....	14
Figure 8. Front Panel .....	16
Figure 9. Rear Panel.....	17
Figure 10. Power Supply Enclosure.....	19
Figure 11. Disk Drive Insertion and Removal .....	23
Figure 12. Drive Ordering .....	24
Figure 13. Hard Drive RVR (Rotational Vibration Reduction) Screw .....	25
Figure 14. Chassis Rear I/O Connectors .....	26
Figure 15. SATA Data and Power Connectors .....	27

# List of Tables

Table 1. Intel® Entry Storage System SS4200-E Hardware Feature Summary .....	3
Table 2. System Board Components .....	7
Table 3. Hardware Monitor Features .....	10
Table 4. Analog Voltage Monitor.....	10
Table 5. Fan Connector Pin-out.....	10
Table 6. Voltage Sensor Locations and Lower and Upper Bounds .....	11
Table 7. HDD and Disk Activity LEDs States.....	11
Table 8. Chassis Dimensions and Weight .....	12
Table 9. Front and Rear Control Button Functions .....	15
Table 10. Front Panel LED Indicators.....	15
Table 11. AC Input Line Voltage Ranges.....	18
Table 12. Power Supply Output Summary (250W 10 second peak ratings).....	20
Table 13. DC Output Load Ratings.....	20
Table 14. DC Output Voltage Regulation Ratings .....	21
Table 15. Over Voltage Protection (OVP) Limits .....	21
Table 16. Thermal Sensor Locations and Temperature Bounds .....	22
Table 17. Fan Speed Lower and Upper Bounds.....	22
Table 18. Thermal Sensor Soft Shutdown Thresholds .....	22
Table 19. SATA Connector Pin-out.....	27
Table 20. 2x12 Main Board Power Connector Pin-out.....	28
Table 21. 2x12 CPU Power Connector Pin-out .....	29
Table 22. Front Panel Power Connector.....	30
Table 23. Intel® Entry Storage System SS4200-E System Office Environment Summary.....	36
Table 24. Intel® Entry Storage System SS4200-E Operating and Non-Operating Environmental Limits.....	37
Table 25. Intel® Entry Storage System SS4200-E Component MTBF Numbers .....	39
Table 26. Intel® Entry Storage System SS4200-E Upgrade and Accessory Parts.....	41

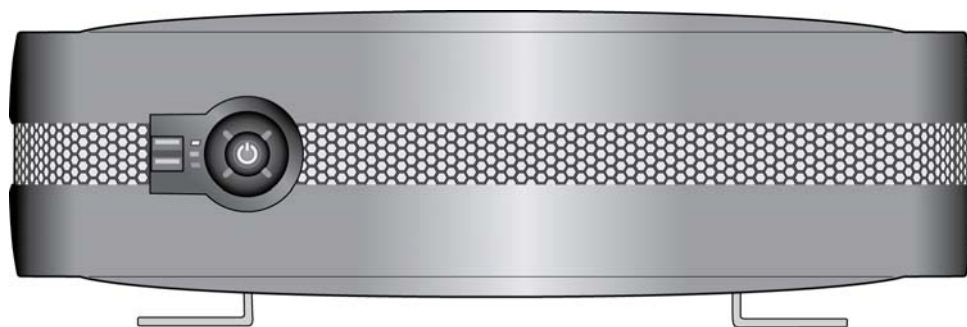
# 1. Feature Summary

---

This Technical Product Specification provides detailed information about the hardware components of the Intel® Entry Storage System SS4200-E.

The Intel® Entry Storage System SS4200-E includes a chassis, Intel® Celeron® M 420 Processor based board, with a single Intel Celeron M 420 processor, four Serial ATA hard disk drive ports, one Intel® 82573 Gigabit Ethernet Network controller, 512MB of DDR2 SDRAM memory and a single 250 W power supply. Intel®-based system boards and chassis have feature sets designed to support the high-density storage market.

The Intel Celeron M 420 Processor based board that is installed in the Storage System SS4200-E chassis is a printed circuit board with features that were designed to support the storage system market. The architecture is based on the Intel Celeron M Processor family.



AF002572

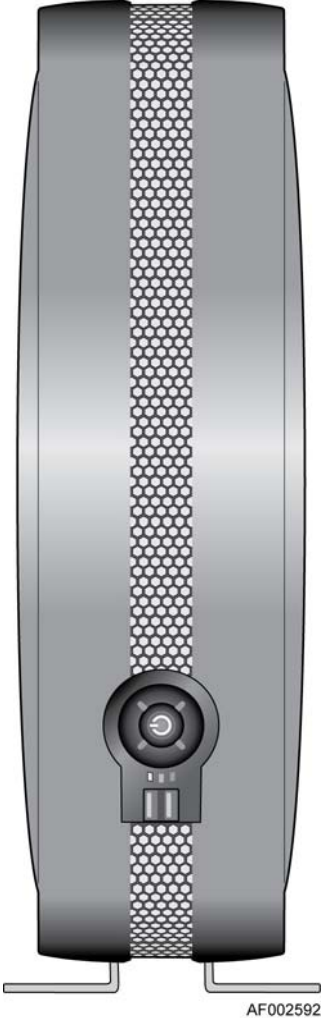


Figure 1. Intel® Entry Storage System SS4200-E in optional orientations



Table 1. Intel® Entry Storage System SS4200-E Hardware Feature Summary

<b>Storage Capacity</b>	Expandable to 4.0 TB – using four 1000 GB drives <b>NOTE: For specific drive family and capacities supported, please refer to the SS4200-E Tested Hardware and OS List (THOL)</b>
<b>Disk Drives</b>	4 Serial ATA (SATA)
<b>Hard Disk Drives Supported</b>	3.5 inch SATA 1.5 Gb/s and SATA 3.0 Gb/s <b>NOTE: For specific drive family and capacities supported, please refer to the SS4200-E Tested Hardware and OS List (THOL)</b>
<b>Processor</b>	A single Low Voltage Intel® Celeron® M 420 processor operating @ 1.6 GHz
<b>Memory Capacity</b>	1 GB maximum, using 32-bit DDR2 SDRAM System ships with 512MB DDR2 SDRAM memory <b>NOTE: Only qualified service personnel should service system memory.</b>
<b>Memory Type</b>	Synchronous Dynamic Random Access Memory (SDRAM), PC4200 – system ships with 512 MB memory <b>NOTE: For specific memory recommendations please refer to the Tested Hardware and OS List (THOL). Only qualified service personnel should service system memory.</b>
<b>DIMM Slots</b>	One 240-pin DIMM socket
<b>SATA Compliance</b>	SATA 3.0Gb/s
<b>Client Connectivity</b>	Client Connectivity via Gigabit Ethernet
<b>Front Panel</b>	
<b>LEDs</b>	Network Port, Disk Status / Fault (per disk drive), System Status, Power, Global Disk Activity
<b>Power</b>	Power button
<b>Connectivity</b>	2 USB 2.0 ports
<b>Back Panel</b>	
<b>Buttons and Switches</b>	Reset / Recovery button
<b>I/O Connectors</b>	1 RJ-45 Ethernet port 2 USB 2.0 ports 2 e-SATA ports
<b>Power Receptacle</b>	1x IEC AC per installed power supply module
<b>Chassis</b>	
<b>Form Factor</b>	Custom chassis
<b>Motherboard</b>	183 mm x 242 mm (7.2" x 9.54")
<b>Height</b>	122 mm (4.8")
<b>Width across body of enclosure</b>	406 mm (16")
<b>Depth from flange to rear of enclosure body</b>	336 mm (13.23")
<b>Weight</b>	As shipped (zero drives): approximately 6.69 kg, 14.57 pounds Fully configured (four drives): approximately 9 kg, 20 pounds
<b>Color</b>	Black
<b>System Cooling</b>	
<b>Fans</b>	Chassis includes two single rotor 70mm x 70mm x 15mm system fans for cooling the hard drives, baseboard and other internal components.

	The power supply enclosure contains a 40mm x 40mm x 20mm fan.
<b>Power</b>	
<b>Configuration</b>	250 W continuous power supply. Intel Entry Storage System SS4200-E ships with one 250 W power supply
<b>Nominal AC input current (PS Enclosure)</b>	1.5 Amperes at 115 Vrms, 0.75 Amperes at 230 Vrms
<b>Max +3.3 V output current (PS Enclosure)</b>	4.0 A (total combined power for the +3.3 V and +5 V outputs should not exceed 60 W steady state).
<b>Max +5 V output current (PS Enclosure)</b>	12.0 A (total combined power for the +3.3 V and +5 V outputs should not exceed 60 W steady state).
<b>Max +12 V output current (PS Enclosure)</b>	17.0 A (total combined power for the +3.3 V, +5 V and +12 V outputs should not exceed 234 W).
<b>Max -12 V output current (PS Enclosure)</b>	0.5 A
<b>Max +5 V Standby output current (PS Enclosure)</b>	2 A
<b>Environment</b>	
<b>Ambient Temperature</b>	Operating: +10 degrees Celsius to +35 degrees Celsius, with maximum change not to exceed 10 degrees Celsius per hour; non-operating (system): -40 degrees Celsius to +70 degrees Celsius.
<b>Relative Humidity</b>	Non-operating: 90%, @ +35 degrees Celsius non-condensing Operating: 0-80% @ 0 degrees Celsius to +40 degrees Celsius non-condensing
<b>Acoustics</b>	
<b>Electrostatic Discharge</b>	±12 Kilovolt (KV) per Intel® Environmental test specification
<b>System Cooling Requirement in British Thermal Units (BTU) per Hour</b>	< 341 BTU/hour @ 100W
<b>Safety Compliance</b>	
<b>Argentina</b>	IRAM
<b>Canada</b>	UL60950 – CSA (60950 (UL and cUL)
<b>China</b>	GB4943- CNCA Certification
<b>Europe, CE Mark</b>	EN60950 (complies with 73/23/EEC)
<b>Germany</b>	GS License
<b>International</b>	IEC60950 (CB Report and Certificate)
<b>Nordic Countries</b>	EMKO-TSE (74-SEC) 207/94
<b>Russia</b>	GOST 50377-92
<b>United States</b>	UL– 60950 – CSA 60950 (UL and cUL)
<b>Electromagnetic Capability (Class B) (EMC)</b>	
<b>Australia/New Zealand</b>	AS/NZS 3548 (based on CISPR 22)
<b>Canada</b>	ICES-003
<b>China</b>	GB 9254 - CNCA Certification GB 17625 - (Harmonics) CNCA Certification
<b>Europe, CE Mark</b>	EN55022; EN55024 & EN61000-3-2;-3-3 (complies with

	89/336/EEC)
<b>International</b>	CISPR 22
<b>Japan</b>	VCCI
<b>Korea</b>	RRL MIC 1997-41 & 1997-42
<b>Russia</b>	GOST 29216-91 & 50628-95
<b>Taiwan</b>	CNS13438
<b>United States</b>	FCC, Part 15

### 1.1 System Components

A block diagram of the storage system’s functional components is shown below.

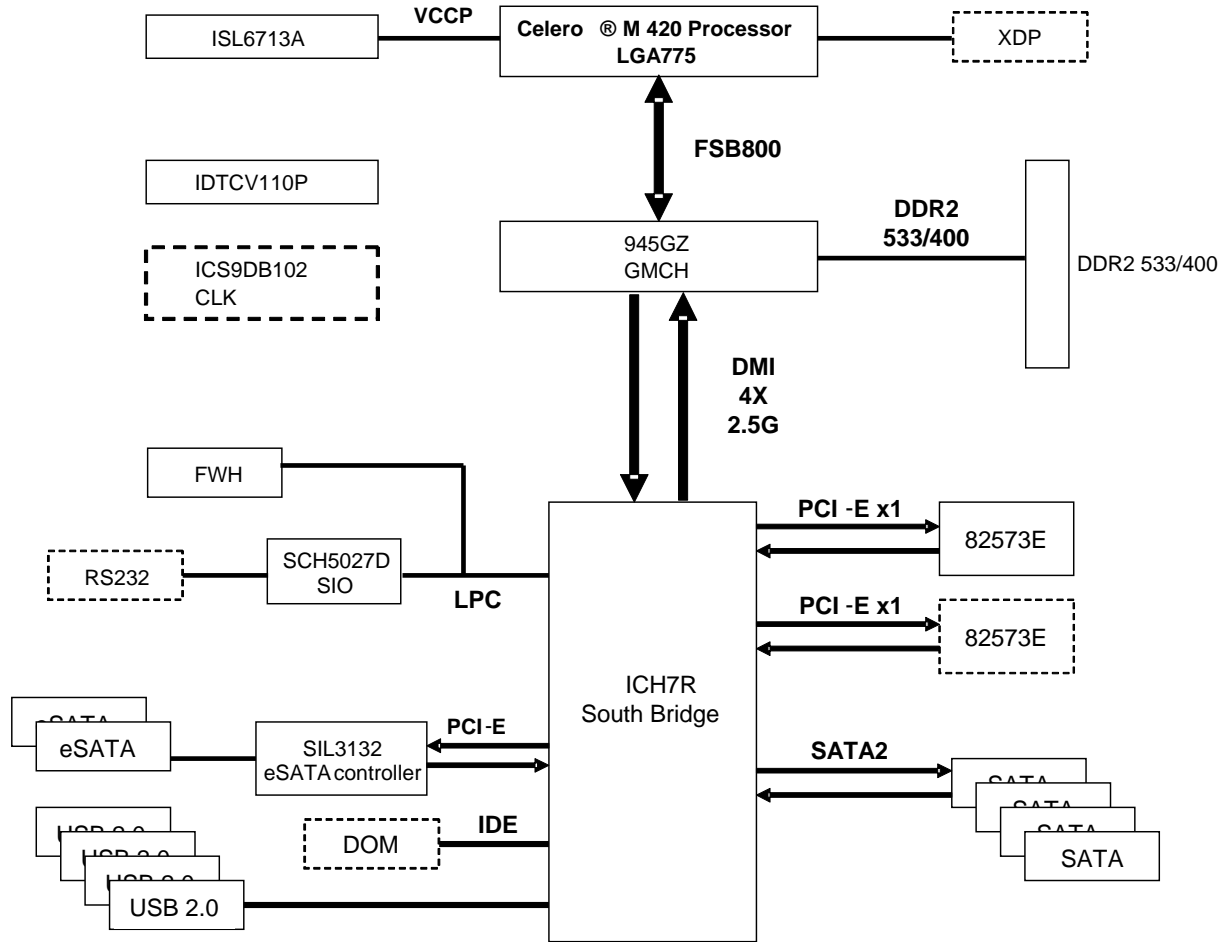
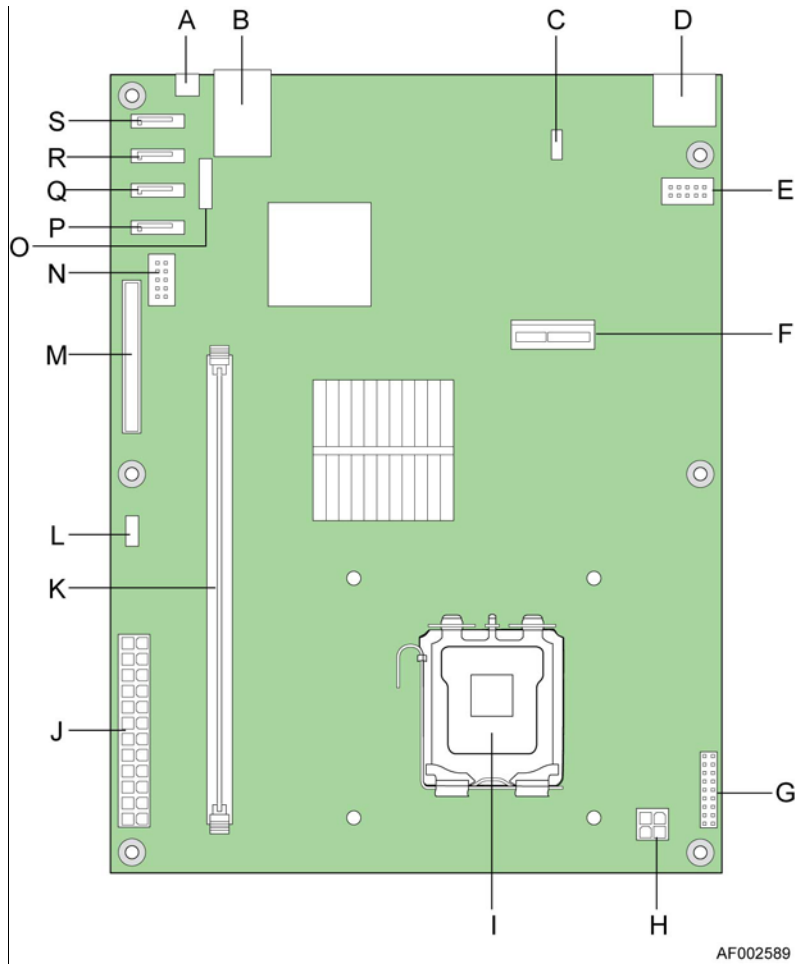


Figure 2. Intel® Entry Storage System SS4200-E Block Diagram

The following diagram shows the system board's connectors.

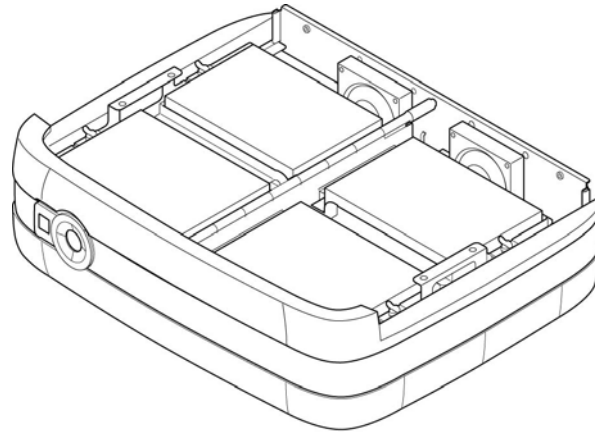


**Figure 3. System Board Connectors**

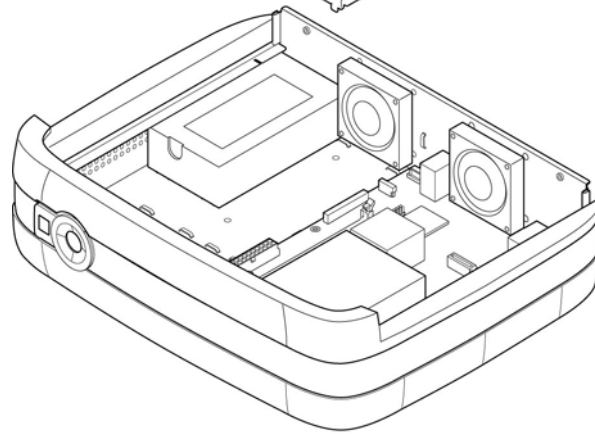
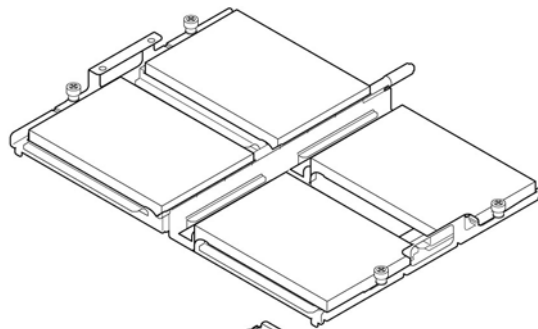
The components included with this storage system are diagrammed below.

**Table 2. System Board Components**

A	Reset / Recovery Button	K	DIMM slot
B	LAN Ethernet Port / USB 2.0 Ports	L	Left Chassis Fan Connector
C	Right Chassis Fan Connector	M	IDE DOM Connector
D	eSATA Ports	N	USB Header
E	RS-232 Debug Port	O	CMOS Battery
F	PCI-e Debug Port	P	SATA4 Connector
G	Front Panel Connector	Q	SATA3 Connector
H	CPU Power Connector	R	SATA2 Connector
I	CPU	S	SATA1 Connector
J	Main Power Connector		



AF002624



AF002625

Figure 4. System Components

## 1.2 System Board Feature Set

The Intel® Entry Storage System SS4200-E Board provides the following feature set, as implemented in the Intel® Entry Storage System SS4200-E.

Feature	Description
Processor	Single 1.6GHz Intel® Celeron M Processor 420
Memory	Unregistered Non-ECC DDR2 533/400 Supports 256MB, 512MB & 1GB <b>NOTE: The Intel Entry Storage System SS4200-E ships with 512MB memory. Only qualified service personnel should service system memory. For specific memory recommendations please refer to the Tested Hardware and OS List (THOL).</b>
Peripheral Interfaces	1 PCI-e x1 bus providing connection for: <ul style="list-style-type: none"> <li>• 2 10/100/1000 Megabits per second (Mb/s) Ethernet LAN ports</li> <li>• 1 Serial ATA 4 port controller operating at 3.0 Gigabits per second</li> </ul> 1 PCI bus providing connection for: <ul style="list-style-type: none"> <li>• 4 USB 2.0 ports</li> </ul> <b>NOTE: The system board contains only a single LAN port connector at this time. The board as designed can support a 2<sup>nd</sup> LAN port connector.</b>
LAN	Intel® 82573E 10/100/1000 Megabits per second (Mb/s) Ethernet Local Area Network (LAN) Controller. <b>NOTE: The system board contains only a single LAN port connector at this time. The board as designed can support a 2<sup>nd</sup> LAN port connector.</b>
Fans	Support for two system fans

## 1.3 Serial ATA (SATA)

The Intel® Entry Storage System SS4200-E ships with an ICH7R part which has an integrated 4 port SATA controller. The SATA controller provides the following feature set:

Feature	Description
Number of ports	4
Serial ATA Bus Speed	3.0 Gb/s
Serial ATA Data Transfer rate	300 MB/s
PCI-e Bus	x1
Hot Swap	Not implemented
RAID Management Tools	Yes, via Intel® Storage Management Software using the user interface

Please refer to <http://www.intel.com/design/chipsets/datashts/307013.htm> for more information.

## 1.4 Enclosure Management

The Intel® Entry Storage System SS4200-E contains thermal sensors, primarily to regulate fan speeds but also to provide an indication of system and enclosure health. Included sensors are an internal CPU thermal sensor and a thermal sensor on the baseboard near the north bridge.

Proper operation of the thermal sensors is critical to system health and availability and protection of user data. The power supply fan cannot be monitored.

Enclosure management is performed by a SMSC SCH5027D part with an integrated hardware monitor controller. The SMSC component monitors various aspects of the storage enclosure. The enclosure management controller supports the following features:

**Table 3. Hardware Monitor Features**

Item	Specification
Voltage	4x Monitoring: V_5P0_STBY\G V_1P5_CORE +12V VCCP
FAN	3x Fan Tachometers 3 PWM Fan Speed Control
Temperature	1x for CPU Temperature 1x for System Temperature

**Table 4. Analog Voltage Monitor**

Item	Item Name	Pin No.	String in BIOS	Remarks
V1	V_1P5_CORE	PIN 1	MON_V_1P5_CORE	1.5V
V2	+12V	PIN 2	MON_12V	12V
V3	VCCP	PIN 127	VCCP	VCCP
V4	V_5P0_STBY\G	PIN 128	V_5P0_STBY\G	5V

**1.4.1 Fan Connector and Control**

The 4-pin fan connector supports a standard fan with integrated fan speed control on the fan itself for better fan life. The first 3 pins of this 4-pin fan connector are backward compatible with a traditional 3-pin fan connector without PWM fan speed control but a 3-pin fan should not be used in the Intel® Entry Storage System SS4200-E. A fan spare kit is available from your supplier which contains the correct fan.

**Table 5. Fan Connector Pin-out**

Pin	Signal Name
1	GND
2	+12V
3	Tachometer
4	Fan PWM (Speed) Control

Fan control is managed through the SMSC SCH5027D Super I/O and enclosure management component. In the event of a fan failure the system will shutdown to prevent an over temperature situation. For additional information refer to Section 3, System Cooling Fans.



### 1.4.2 Voltage Monitoring

The storage system is designed to allow the voltage to be monitored at several points on the system board. This information can be used by the system management software and reported to the user. Any action taken as a result of a possible value being outside of the specification is determined by the software provider. Consult the user manual for the software in use for this information.

The table below shows voltage sensor locations and the lower and upper bounds on values for a system operating within normal range.

**Table 6. Voltage Sensor Locations and Lower and Upper Bounds**

<b>Voltage Sensor</b>	<b>Location</b>	<b>Lower Bound</b>	<b>Upper Bound</b>
V_5P0_STBY/G	U17 Pin128	4.75V	5.25V
MON_V_1.5V CORE	U17 Pin1	1.425V	1.575V
Monitor 12 Volts	U17 Pin2	11.4V	12.6V
VCCp	U17 Pin127	0.980V	1.358V
VCC3	U17 Pin4	3.135V	3.465V
V_3P0_BAT_VREG	U17 Pin32	2.0V	3.6V
V_3P3_STBYG	U17 Pin91	3.135V	3.465V

### 1.4.3 Hard Disk Drive LEDs

The Intel® Entry Storage System SS4200-E contains one LED for each of the four hard disk drives. In addition there is a disk activity LED on the front panel. The states for the LEDs are documented in the following table.

**Table 7. HDD and Disk Activity LEDs States**

<b>HDD LEDs States</b>	
<b>Drive Status LED</b>	<b>State</b>
Drive Unavailable	Solid Off
Drive Available	Solid Blue
Drive is Rebuilding	Blinking Amber
Fault Condition	Solid Amber
<b>Disk Activity</b>	<b>State</b>
Any of HDDs Active	Blinking Blue

## 1.5 Chassis Dimensions and Weight

**Table 8. Chassis Dimensions and Weight**

<b>Height</b>	122 mm	4.8 inches
<b>Width across body of enclosure</b>	406 mm	16 inches
<b>Depth from flange to rear of enclosure body</b>	336 mm	13.23 inches
<b>Weight</b>		
Chassis - as shipped (0 drives)	6.69 kilograms	14.57 pounds
Chassis - fully configured (4 drives)	9 kilograms	20 pounds

## 1.6 Back Panel I/O Ports and Features

At the rear of the chassis is one 10/100/1000 Local Area Network connector, two USB 2.0 ports and two eSATA expansion connectors. The Input/Output (I/O) connectors are integrated into the back panel. The figure below shows the rear of the storage system.

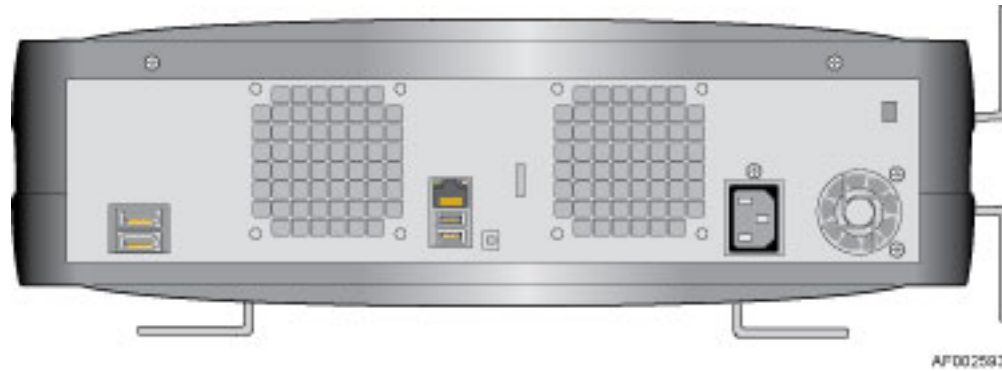


Figure 5. Chassis Rear – showing feet both for vertical and horizontal orientation

## 1.7 Front Panel and Hard Disk Drive Retention Bracket Assembly

The front panel contains 2 2.0 USB ports for additional connectivity and LED indicators for status of disk drives and network connectivity. The power button is also located on the front panel. See figure 8 for the specific LED locations. The hard disk drive retention bracket assembly has been designed to minimize the effects of rotational vibration on disk drive performance.

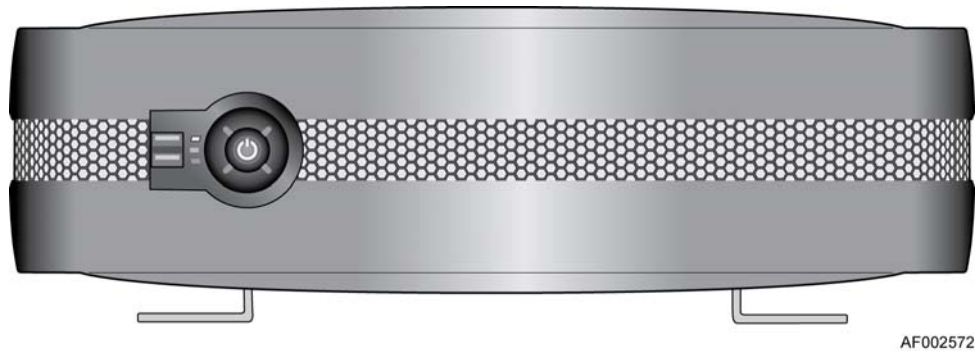
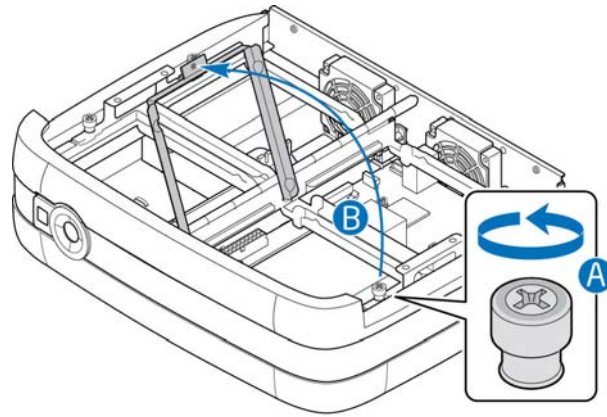


Figure 6. Chassis Front



AF002573

Figure 7. Hard Disk Drive Retention Bracket Assembly

### 1.7.1 Front/Rear Panel Controls and Indicators

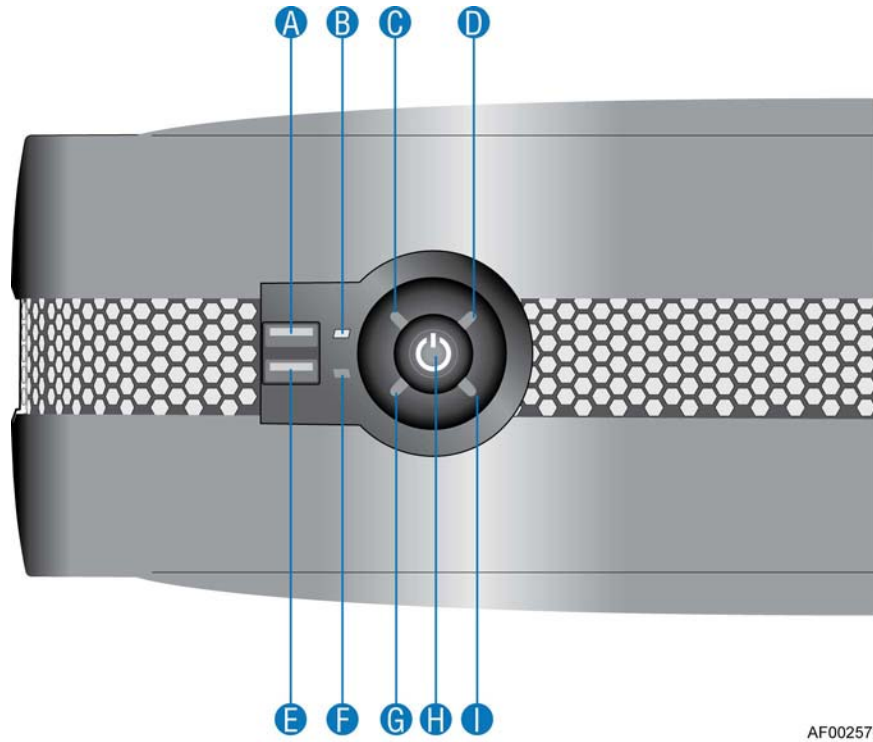
The front/rear panel controls and indicators are defined below:

**Table 9. Front and Rear Control Button Functions**

Power button (front)	Toggles the system power on/off. <b>If system is operating:</b> <ul style="list-style-type: none"> <li>• Depress push-button for &lt;3 seconds to shut down system gracefully.</li> <li>• Depress push-button for &gt;4 seconds to perform a hard shut down of system.</li> </ul>
Reset / Recovery button (rear)	Reboots the system and resets the Ethernet port to default value and the Administrator password to default value. <b>NOTE:</b> If running Microsoft* Windows* Home Server this button will function different from the default. See the Hardware User Guide for appropriate functionality.

**Table 10. Front Panel LED Indicators**

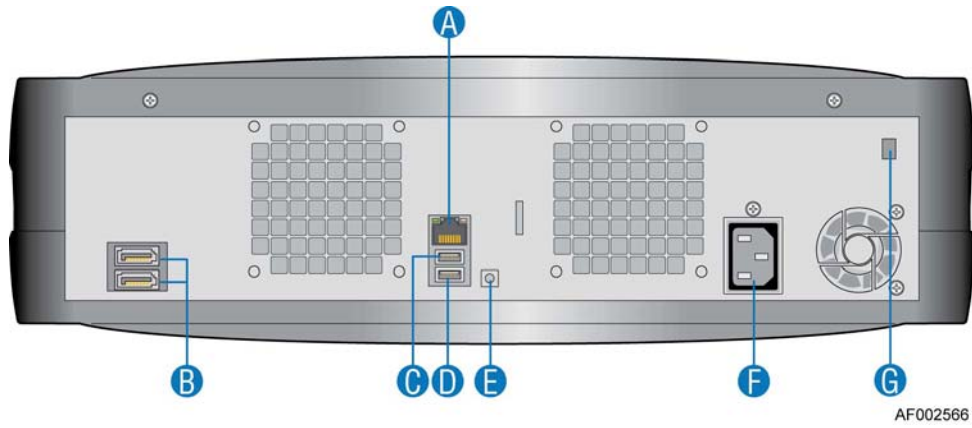
Power/Status Pushbutton	Continuous blue light indicates the system has power applied to it. No light indicates the system does not have power applied to it. Flashing blue light indicates the system is in process of booting. Continuous amber light indicates a critical or non-recoverable condition.
NIC Link	Continuous blue light indicates an active Ethernet connection. Off, no light, indicates no active Ethernet connection.
NIC Activity	Blinking blue indicates Ethernet activity.
Global Disk Activity	Continuous blue light indicates activity on at least one disk drive.
Disk Drive Status	Constant blue light indicates the drive is available Constant amber light indicates a drive fault has occurred. Flashing amber light indicates the drive is rebuilding. No light indicates disk drive is not ready or not present.



AF002570

A	USB Port 0	F	NIC Activity LED
B	Disk Drive Activity LED	G	G. Disk Drive 1 Status LED
C	Disk Drive 2 Status LED	H	Power/Status Push-button
D	Disk Drive 3 Status LED	I	Disk Drive 4 Status LED
E	USB Port 1		

Figure 8. Front Panel



A	NIC Port (1 Gb)	E	Reset Button
B	e-SATA Ports	F	A/C Power
C	USB Port 2	G	Cable Safety Lock
D	USB Port 3		

Figure 9. Rear Panel

## 2. Power Sub-System

---

This section provides an overview of the Intel® Entry Storage System SS4200-E power supply. The power supply is an auto sensing power supply and will detect the input voltage and provide the appropriate output voltage. **NOTE: The Intel® Entry Storage System SS4200-E ships with one 250 Watt power supply.**

### 2.1 Power Supply

The Intel® Entry Storage System SS4200-E accommodates one 250 Watt (W) power supply. The following table shows the AC input line voltage ranges.

**Table 11. AC Input Line Voltage Ranges**

Range	Input	MIN	Nominal	MAX
Low Range	V <sub>in</sub> (V <sub>rms</sub> )	90	100-127	135
	Input Current (A <sub>rms</sub> )	--	3.5	--
High Range	V <sub>in</sub> (V <sub>rms</sub> )	180	200-240	264
	Input Current (A <sub>rms</sub> )	--	2	--
Frequency (Hz)		47 Hz	--	63 Hz

The power supply is designed to minimize EMI.



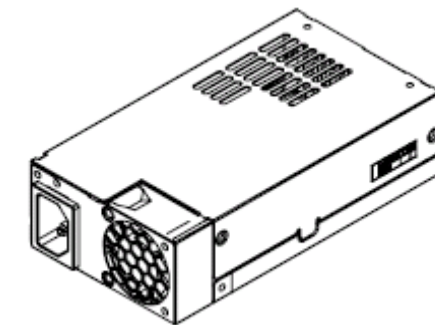
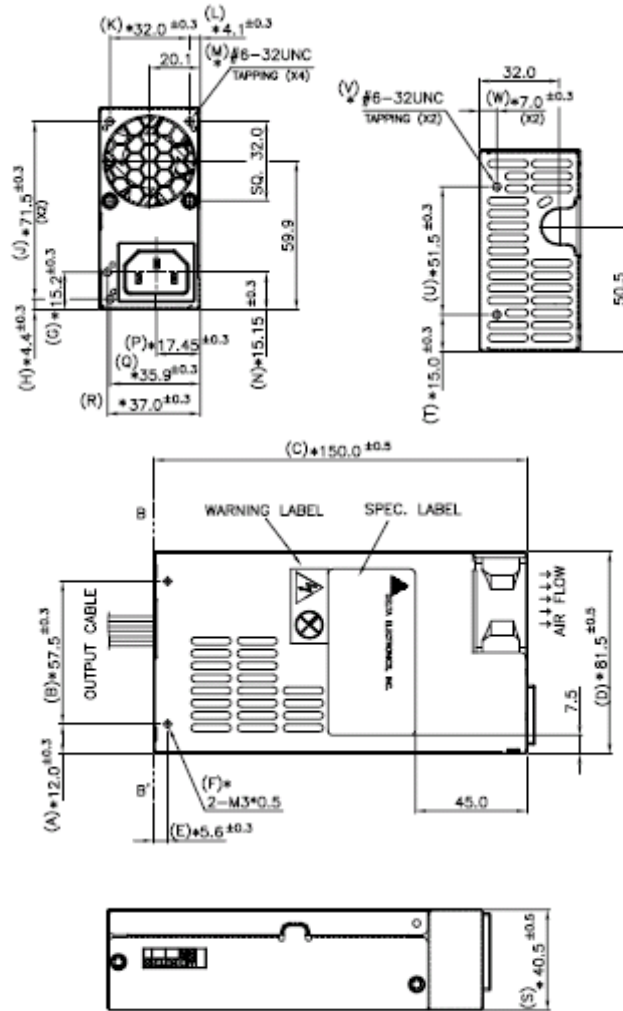


Figure 10. Power Supply Enclosure

### 2.1.1 Power Supply Outputs

The Intel® Entry Storage System SS4200-E power system supports one 250 W power supply. The power supply provides five DC output rails; +3.3V, +5V, +12V, -12V and +5Vsb.

**Table 12. Power Supply Output Summary (250W 10 second peak ratings)**

+3.3V	+5V	+12V	-12V	5Vsb
17A	12A	10A	0.5A	2.0A

**NOTE:** The total combined power for +3.3V and +5V should not exceed 60W. The maximum continuous average DC output power will not exceed 250W. The total combined 3.3V, 5V and 12V power will not exceed 234W. The total peak power shall not exceed 300W.

The power supply may require a #1 screwdriver to remove the chassis cover for insertion and extraction of the power supply.

### 2.1.2 Efficiency, Standby Efficiency and Overshoot

The efficiency of the power supply during normal operation is 70% minimum measured at 115V AC / 230V AC line input voltage and maximum output loading defined in Table 15.

At 115V AC, while in standby mode with a 100mA load on the 5Vsb rail, the power supply draws less than 1W of true input power.

The DC output voltages overshoot at turn on or turn off will be less than 10% of the nominal voltage. All outputs are within the regulation limits prior to the presence of the Power Good signal reaching TTL-High state.

## 2.2 Output Power / Currents

The following table defines power and current ratings for the 250 watt peak power supply. The output power will not exceed the rated output power. The power supply meets both static and dynamic voltage regulation requirements for the minimum loading conditions. The +5Vsb output will remain within the regulation limits during the DC fault condition.

**Table 13. DC Output Load Ratings**

Voltage Rail	Minimum	Nominal	Maximum	Peak
+3.3V	0.0A	2.0A	4.0A	
+5V	1.0A	6.0A	12.0A	
+12V	1.0A	9.0A	17.0A	22.0A
-12V	0.0A	0.25A	0.5A	
+5Vsb	0.0A	1.0A	2.0A	

**NOTE:** The total combined power for +3.3V & +5V does not exceed 60W.

**NOTE:** The maximum continuous DC output power will not exceed 250W at 25 degrees C and de-rating power 2.8W / degree C from 25 degrees C to 50 degrees C to get a maximum continuous power de-rating to 180W at 50 degrees C each output maximum load decrease in proportion.

## 2.3 Voltage Regulation

The power supply output voltages will stay within the following voltage limits when operating at steady state and dynamic loading conditions. All outputs are measured with reference to the COM/GND (black wire)

**Table 14. DC Output Voltage Regulation Ratings**

Parameter	Min	Nom	Max	Units	Tolerance
+3.3V	+3.14	+3.30	+3.47	V <sub>rms</sub>	+/-5%
+5V	+4.75	+5.00	+5.25	V <sub>rms</sub>	+/-5%
+12V	+11.4	+12.00	+12.6	V <sub>rms</sub>	+/-5%
-12V	-10.8	-12.0	-13.20	V <sub>rms</sub>	+/-10%
+5Vsb	+4.75	+5.0	+5.25	V <sub>rms</sub>	+/-5%

## 2.4 Protection Circuits

Protection circuits inside the power supply will cause only the power supply's main outputs to shutdown. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF will be able to reset the power supply.

### 2.4.1 Over Voltage Protection (OVP)

The power supply over voltage protection is locally sensed. If an over voltage fault occurs, the supply will latch all DC outputs into a shutdown state except 5Vsb output. This latch will be cleared by an AC power interruption. Table 16 contains the over voltage limits. If a single point fault occurs (internal to the power supply), the power supply will shutdown before any output exceeds OVP.

**Table 15. Over Voltage Protection (OVP) Limits**

Output Voltage	Max (V)
+5V	7.0
+3.3V	4.8
+12V	15.6

### 2.4.2 Short Circuit Protection (SCP)

A short circuit placed between the return and output (approximately 0.1 ohm) will cause no damage to the power supply and the main output will shutdown and latch off. Only the 5Vsb output will recover automatically.

### 3. System Cooling Fans

The Intel® Entry Storage System SS4200-E includes two cooling fans that are 70mm x 70mm x 15mm single rotor fans, mounted on the rear of the chassis. The Power Supply enclosure contains one 40mm x 40mm x 20mm fan for cooling the power supply module. The current design includes an internal CPU thermal sensor and a thermal sensor on the baseboard near the north bridge. Proper operation of the thermal sensors is critical to system health and availability and protection of user data.

#### 3.1 Fan Control

The fans provide optimal acoustic and thermal performance. The fans are capable of running at multiple speeds, the lowest if conditions allow and will be throttled higher as conditions warrant. This is controlled by temperature sensors. The sensor locations are shown in the following table.

**Table 16. Thermal Sensor Locations and Temperature Bounds**

Thermal Sensor	Location	Lower Bound	Upper Bound
CPU	CPU	10C	68C
SIO	SIO Internal Temp Sensor	10C	75C

The following table shows the lower and upper bounds for the fan speeds.

**Table 17. Fan Speed Lower and Upper Bounds**

Fan	Lower Bound	Upper Bound
1	500 RPM	4200 RPM
2	500 RPM	4200 RPM

In the event the sensors detect temperatures that exceed the upper bounds shown in Table 17, the system software can shutdown the system to avoid potential damage to the system, components or user data. The following table shows the thermal shutdown values for the system. Check with the system management software provider for implementation.

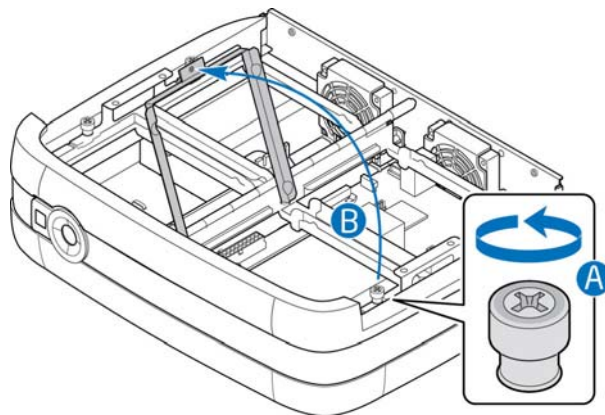
**Table 18. Thermal Sensor Soft Shutdown Thresholds**

Thermal Sensor	Location	Shutdown Threshold
CPU	CPU	70C
Board	Near North Bridge	80C

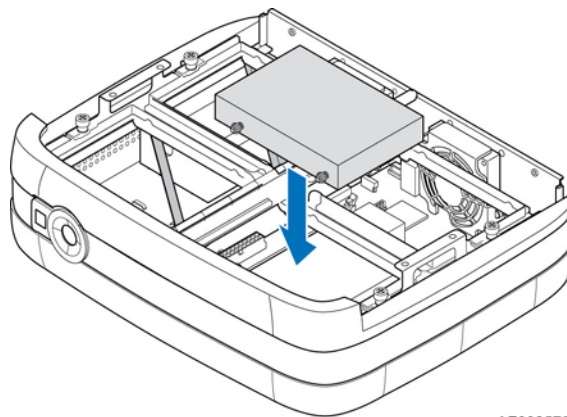
## 4. Hard Disk Drive Retention Assembly

The Intel® Entry Storage System SS4200-E chassis provides a hard drive retention assembly inside the chassis. All retention assembly locations may be populated with a 3.5 inch SATA hard disk drive. To install a hard disk drive requires use of special RVR (rotational vibration reduction) screws. The disk drives are not directly attached to the assembly they rest on the assembly in the specific location recessed to hold the screws. The benefit is to minimize the effects of rotational vibration on the performance of the disk drives and the system.

The upper retention bracket must be open to insert the disk drive into the lower portion of the retention assembly. Once placed the captive screw can be pushed and tightened to ensure the disk drive is properly seated in the retention assembly. **NOTE: For specific drive family and capacities supported, please refer to the SS4200-E Tested Hardware and OS List (THOL)**



AF002573



AF002575

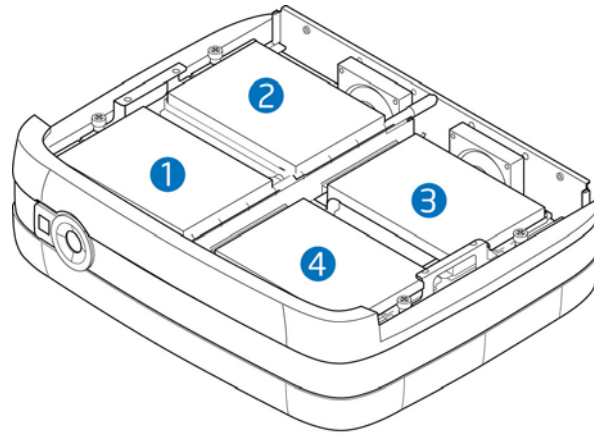
Figure 11. Disk Drive Insertion and Removal

## 4.1 Hard Disk Drives

The Intel® Entry Storage System SS4200-E chassis can support up to four SATA, 3.5 inch x 1 inch, hard disk drives. The SATA drives cannot be “electrically” hot-swapped while the system power is applied, i.e., after POST (Power On Self Test). To replace a hard disk drive the system must be powered off prior to removing / replacing the disk drive.

### NOTE:

- 1) The disk drive numbering and ordering shown relates to the LEDs on the front panel numbered 1-4. This assumes the cables from the SATA1, SATA2, SATA3 and SATA4 connectors are connected to disk drives 1, 2, 3 and 4 as shown. If the disk drives are cabled SATA1 – HDD1, SATA2 – HDD2, SATA3 – HDD3 and SATA4 – HDD4 the LEDs should illuminate accordingly.



AF002618

**Figure 12. Drive Ordering**

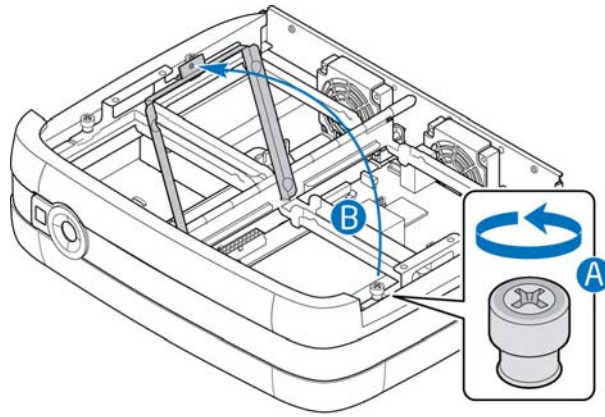
- 2) Once a particular RAID configuration is applied to the present drives, if the drives are removed from the system for any reason, they will need to be re-installed in the same location they were removed from.
- 3) If a failed drive needs replacing, it should be replaced with the exact same manufacturer, model, and size.
- 4) For more information on configuring supported RAID levels, refer to the Intel® Storage System SS4200-E Software User Guide available from Intel Business Link (iBL), [support.intel.com](http://support.intel.com), or your Intel sales representative.

### 4.1.1 Hard Disk Drive Retention Bracket Assembly

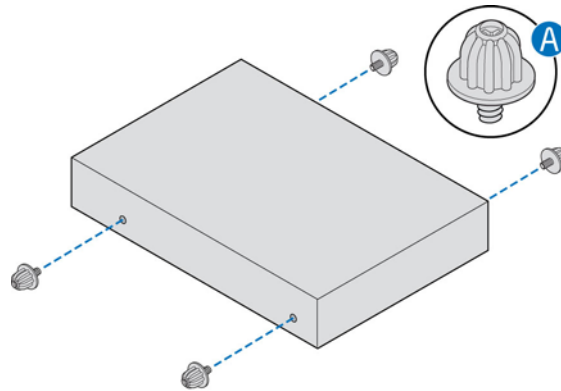
Each hard drive used in the system must be mounted in the hard disk drive retention bracket assembly. This assembly has been engineered and designed with three goals in mind:

- system board, fan and power supply serviceability
- ease of insertion and removal of a disk drive and

- to minimize the effects of rotational vibration that has been observed to occur more frequently in hard disk drives of larger capacities.



AF002573



AF002574

Figure 13. Hard Drive RVR (Rotational Vibration Reduction) Screw

## 5. System Interconnection

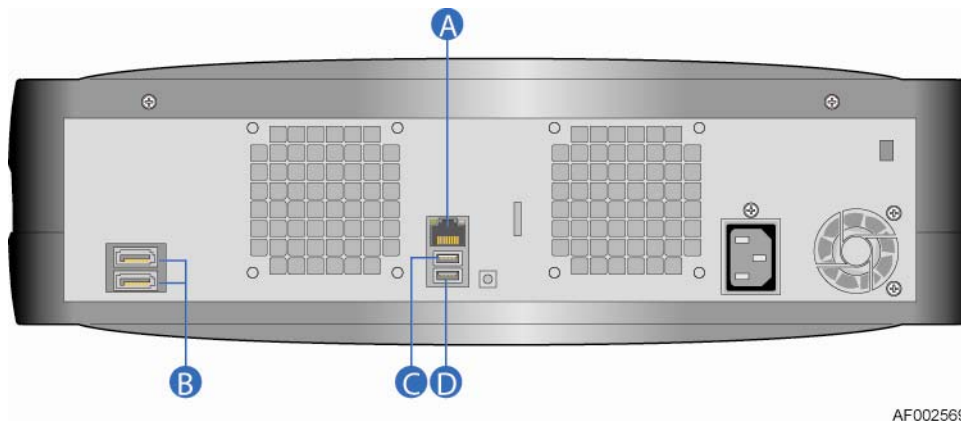
### 5.1 Chassis Internal Connectors

There are four Serial ATA (SATA) connectors on the system board that the hard drives connect to. The USB ports are connected to the system board via a cable to the connectors.

### 5.2 I/O Panel Connectors

The Intel® Entry Storage System SS4200-E provides an aperture for the rear I/O ports. The following are the I/O ports available:

- One RJ-45 LAN connector
- Two USB 2.0 ports
- Two eSATA ports



A	LAN Port
B	eSATA Ports
C	USB 3 Port
D	USB 4 Port

**Figure 14. Chassis Rear I/O Connectors**



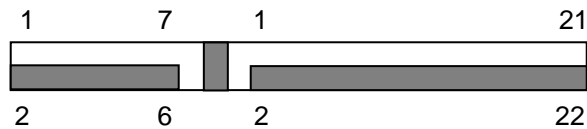
## 5.3 SATA Connectors

### 5.3.1 SATA Connector

The following table defines the pin-outs of the SATA Drive Connector and the SATA power connector. The first connector carries signals from drive 1, the second connector is connected to drive 2, the third connector connects to drive 3 and the fourth connector connects to drive 4.

**Table 19. SATA Connector Pin-out**

Pin	Signal Name	Pin	Signal Name
1	GND	12	GND
2	TX+	13	GND
3	TX-	14	GND
4	GND	15	+5V
5	RX-	16	+5V
6	RX+	17	+5V
7	GND	18	GND
8	+3.3V	19	GND
9	+3.3V	20	GND
10	+3.3V	21	+12V
11	GND	22	+12V



**Figure 15. SATA Data and Power Connectors**

### 5.3.2 Power Connectors

The following tables define the pin-out of the 2x12 power connector for the main power to the board and the 2x2 power connector for the CPU.

**Table 20. 2x12 Main Board Power Connector Pin-out**

Pin	Signal Name	Pin	Signal Name
1	+3.3V	13	+3.3V
2	+3.3V	14	-12V
3	GND	15	GND
4	+5V	16	PS-ON
5	GND	17	GND
6	+5V	18	GND
7	GND	19	GND
8	Power Good	20	-5V
9	Stand-By 5V	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	+3.3V	24	GND

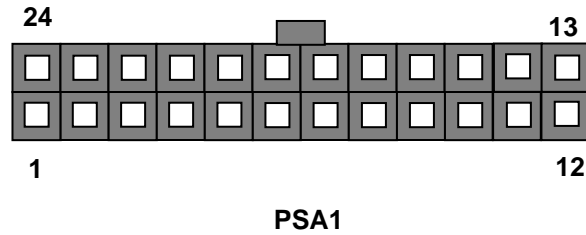
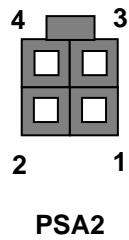


Table 21. 2x12 CPU Power Connector Pin-out

Pin	Signal Name
1	GND
2	GND
3	+12V
4	+12V

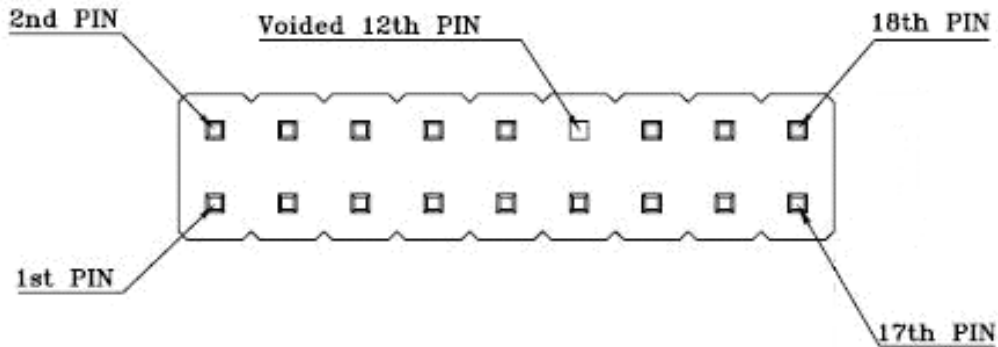


### 5.3.3 Front Panel Connector

The following table defines the pin-outs of the 2x9 Front Panel connector.

**Table 22. Front Panel Power Connector**

Pin	Signal Name	Pin	Signal Name
1	SATA_1_LED_BLU_N	2	LAN_0_LEN_N
3	SATA_1_LED_AMB_N	4	LAN_1_LEN_N
5	SATA_2_LED_BLU_N	6	POWER_ON_LED_GRN_N
7	SATA_2_LED_AMB_N	8	POWER_ON_LED_AMB_N
9	SATA_3_LED_BLU_N	10	GND
11	SATA_3_LED_AMB_N	12	Key (VOID)
13	SATA_4_LED_BLU_N	14	SW_ON_R_N
15	SATA_4_LED_AMB_N	16	SATA_ACTIVE_LED_N
17	PWM_FP_LED_PWR	18	N/C



## 6. Regulatory Information

---

### 6.1 Product Regulation Requirements

**Intended Application** – This product was evaluated as Information Technology Equipment (ITE), which may be installed in homes, offices, schools, computer rooms, and similar commercial type locations. The suitability of this product for other product categories and environments (such as: medical, industrial, telecommunications, NEBS, residential, alarm systems, test equipment, etc.), other than an ITE application, may require further evaluation.

#### 6.1.1 Product Safety Compliance

UL60950 – CSA 60950(USA / Canada)

GB4943 – CNCA (China)

EN60950 (Europe)

IEC60950 (International)

CB Certificate & Report, IEC60950 (report to include all country national deviations)

GS License (Germany)

GOST R 50377-92 - License (Russia)

Belarus License (Belarus)

Ukraine License (Ukraine)

CE - Low Voltage Directive 73/23/EEE (Europe)

IRAM Certification (Argentina)

#### 6.1.2 Product EMC Compliance – Class B Compliance

FCC /ICES-003 - Emissions (USA/Canada)

GB 9254 – CNCA (China)

GB17625 – CNCA (China)

CISPR 22 – Emissions (International)

EN55022 - Emissions (Europe)

EN55024 - Immunity (Europe)

EN61000-3-2 - Harmonics (Europe)

EN61000-3-3 - Voltage Flicker (Europe)

CE – EMC Directive 89/336/EEC (Europe)

VCCI Emissions (Japan)

AS/NZS 3548 Emissions (Australia / New Zealand)

BSMI CNS13438 Emissions (Taiwan)

GOST R 29216-91 Emissions (Russia)

GOST R 50628-95 Immunity (Russia)

Belarus License (Belarus)

Ukraine License (Ukraine)











RRL MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) (Korea)

### **6.1.3 Certifications / Registrations / Declarations**

UL Certification (US/Canada)  
CCC Certification (China)  
CE Declaration of Conformity (CENELEC Europe)  
FCC/ICES-003 (USA/Canada)  
VCCI Certification (Japan)  
C-Tick Declaration of Conformity (Australia)  
MED Declaration of Conformity (New Zealand)  
BSMI Certification (Taiwan)  
GOST R Certification / License (Russia)  
Belarus Certification / License (Belarus)  
RRL Certification (Korea)  
IRAM Certification (Argentina)  
Ecology Declaration (International)

## 6.2 Product Regulatory Compliance Markings

The Intel Server Chassis product bears the following regulatory marks.

Regulatory Compliance	Country	Marking
cULus Listing Marks	USA/Canada	
CCC Mark	China	
GS Mark	Germany	
CE Mark	Europe	
FCC Marking (Class B)	USA	
EMC Marking (Class B)	Canada	<b>CANADA ICES-003 CLASS B</b> <b>CANADA NMB-003 CLASSE B</b>
C-Tick Mark	Australia / New Zealand	
VCCI Marking (Class B)	Japan	
BSMI Certification Number & Class A Warning	Taiwan	
GOST R Marking	Russia	
RRL MIC Mark	Korea	

### 6.2.1 Component Regulation Requirement Need to Support System Level Certifications

Component Power Supplies must have the following certifications:

- UL, cUL
- CNCA China Certification
- Ctick DOC

BSMI RPC  
CE DOC

CB Report (including all national deviations).

All peripheral devices, such as CD ROMS, Disk drives, Tape drives shall have the following certifications: UL or CSA NRTL, CSA or cUL, and TUV or VDE and SEMKO or NEMKO or DEMKO or FIMKO, CE, and FCC.

All Fans shall have the minimum certifications: UL and TUV or VDE

All current limiting devices shall have UL and TUV or VDE certifications and shall be suitable rated for the application where the device in its application complies with IEC60950.

All lithium batteries shall be UL recognized and battery circuits are to have suitable reverse bias current protection for the application it is used in.

All printed wiring boards shall be rated UL94V-0 and be sourced from a UL approved printed wiring board manufacturer.

All connectors shall be UL recognized and have a UL flame rating of UL94V-0.

All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80 V.

All plastics used must be made of a UL recognized material, and have the appropriate flame ratings mandated by IEC60950 per system level requirements. All plastics parts shall be manufactured by an UL approved fabricator and the parts shall be marked with the appropriate UL traceability markings. Markings to include:

Plastic Fabricators name and/or UL Fabricator ID

Material Name (for example GE, C2800)

Date Code

Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.

The product must be marked with the correct regulatory markings to support the certifications that are specified.

Product documentation shall incorporate all safety required information to conform to certifiers and regulators and the certifications issued for the product.

#### **6.2.1.1 Product Ecology Requirements**

All materials, parts and subassemblies must not contain restricted materials as defined in Intel's Environmental Product Content Specification of Suppliers and Outsourced Manufacturers – <http://supplier.intel.com/ehs/environmental.htm>.

All plastic parts shall not use brominated flame retardant or any other halogenated retardants that are not accepted by environmental programs such as Blue Angels, Nordic White Swan, and Swedish TCO.

All plastic parts that weigh >25gm shall be marked with the ISO11469 requirements for recycling. Example >PC/ABS< .

Packaging materials may not contain more than 100 ppm (total) of lead, cadmium, chromium or mercury.

If sold as a retail product, packaging materials must be marked with applicable recycling logos for Europe (green dot) and Japan (Eco-marks).

Product documentation shall incorporate all safety required information to conform to certifiers and regulators and the certifications issued for the product.

All cords and cables shall contain < 100 ppm of cadmium.

European Restriction of Hazardous Substances (RoHS)

Intel has a system in place to restrict the use of banned substances in accordance with the



European Directive 2002/95/EC. Compliance is based on declaration that materials banned in the RoHS Directive are either (1) below all applicable substance threshold limits or (2) an approved/pending RoHS exemption applies.

**Note:** *RoHS implementing details are not fully defined and may change.*

Threshold limits and banned substances are noted below.

Quantity limit of 0.1% by mass (1000 PPM) for:

- o Lead
- o Mercury
- o Hexavalent Chromium
- o Polybrominated Biphenyls Diphenyl Ethers (PBDE)

Quantity limit of 0.01% by mass (100 PPM) for:

- o Cadmium

## 7. Environmental Limits

---

### 7.1 System Office Environment

Table 23. Intel® Entry Storage System SS4200-E System Office Environment Summary

Parameter	Limits
Operating Temperature	10 degrees celcius to +35 degrees celcius with the maximum rate of change not to exceed 10 degrees celcius per hour.
Non-Operating Temperature	-40 degrees celcius to +70 degrees celcius
Non-Operating Humidity	90%, non-condensing at 35 degrees celcius
Acoustic noise	3.8 BA in an idle state at typical office ambient temperature. (23 ± degrees celcius) (2 HDD configuration)
Operating Shock	No errors with a half sine wave shock of 2 G (1.024 x 10 <sup>9</sup> ) (G) (with 11 millisecond duration)
Package Shock	Operational after a 30 inch free fall, although cosmetic damage may be present (chassis weight 30 lbs)
Electrostatic Discharge (ESD)	±12 Kilovolt (KV) per Intel® Environmental test specification
System Cooling Requirement in British Thermal Units (BTU) per Hour	< 341 BTU/hour @ 100W

### 7.2 System Environmental Testing

The system has been tested per the *Intel® Environmental Standards Handbook*, Intel document number 25-GS0009. These tests include:

- Temperature Operating and Non-Operating
- Humidity Non-Operating
- Packaged and Unpackaged Shock
- Packaged and Unpackaged Vibration
- AC Voltage, Frequency and Source Interrupt
- AC Surge
- Acoustics
- ESD
- EMC Radiated Investigation

### 7.3 Environmental Limits

The following table summarizes environmental limits, both operating and non-operating.

**Table 24. Intel® Entry Storage System SS4200-E Operating and Non-Operating Environmental Limits**

<b>Temperature</b>	<b>Specification</b>
Non-operating	-40 degrees celcius to 70 degrees celcius
Operating Temperature	10 degrees celcius to 35 degrees celcius
Thermal Map	Must not exceed maximum Integrated Circuit (IC) junction temperature as specified in the component data sheets (CPDs).
<b>Thermal Shock</b>	<b>Specification</b>
Non-operating	-40 degrees celcius to 70 degrees celcius
<b>Humidity</b>	<b>Specification</b>
Non-operating	90% Relative Humidity (RH) at +35 degrees celcius
<b>Vibration</b>	<b>Specification</b>
Non-Operating:	2.2 Grms 5-500Hz for the unpackaged and 1.09 Grms 5-500Hz for the packaged.
<b>Shock</b>	<b>Specification</b>
Non-operating	25 G, 11 millisecond (msec)
<b>ESD</b>	<b>Specification</b>
Operating	Test (air) to 12 KV and (contact) to 2-8KV with limited errors.
<b>EMI</b>	<b>Specification</b>
Operating	Required to meet EMI emission requirements, tested as part of system.

## 8. Serviceability and Availability

---

The system is designed to be serviced by qualified technical personnel only.

The desired Mean Time To Repair (MTTR) of the system is designed to be less than 60 minutes, including diagnosis of the system problem. To meet this goal, the system enclosure and hardware have been designed to minimize the MTTR.

Below are the maximum times that a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system, and with the system powered down and unplugged.

- |  |                        |
|--|------------------------|
| • Remove top cover                     | 0.5 minutes (estimate) |
| • Remove and replace a hard disk drive | 1 minutes (estimate)   |
| • Remove and replace power supply      | 5 minutes (estimate)   |
| • Remove and replace fan assembly      | 3 minutes (estimate)   |
| • Remove and replace baseboard         | 15 minutes (estimate)  |

## 9. Calculated MTBF

---

The predicted Mean Time Between Failures (MTBF) for the Intel® Entry Storage System SS4200-E is calculated at 177,000 hours operating at 25 degrees C. The following table shows the MTBF numbers for individual components within the chassis, and does not include hard disk drives, operating at 25 degrees C.

**Table 25. Intel® Entry Storage System SS4200-E Component MTBF Numbers**

<b>Subassembly</b>	
<b>(System in 25 °C ambient air)</b>	<b>MTBF (hours)</b>
System Board w/ CPU & memory	380,000
250 W Power Supply	400,000
DC Fan	3,000,000
Front Panel Board & Cables	8,000,000



## Appendix A: Spares and Accessories

### Upgrade and Accessory Parts

Table 26. Intel® Entry Storage System SS4200-E Upgrade and Accessory Parts

Product Code	MM #	Qty.	Description
FXXSS4200EFAN	895029	1	Chassis Fan
FXXSS4200EPSU	895059	1	250 Watt Power Supply

## Glossary

Word / Acronym	Definition
A	Ampere
AC	Alternating Current
ACA	Australian Communication Authority
ACPI	Advanced Configuration and Power Interface
ANSI	American National Standards Institute
ATA	AT Attachment
BA	Decibel Average
BMC	Baseboard Management Controller
BTU	British Thermal Units
C	Celsius
CF	Compact Flash®
CMOS	Complementary Metal Oxide Silicon
CPD	Component Data Sheet
D2D	DC-to-DC
dBA	Decibel Average
DDR	Double Data Rate
DIMM	Dual Inline Memory Module
DMA	Direct Memory Access
DOM	Disk On Module
ECC	Error Correcting Code
EEB	Entry-Level Electronics Bay
EEPROM	Electrical Erasable Programmable Read-Only Memory
EMC	Electro Magnetic Compatibility
EMP	Emergency Management Port
ESD	Electrostatic Discharge
FC	Fibre Channel
FP	Front Panel
FRB	Fault Resilient Boot
FRU	Field Replaceable Unit
FW	Firmware
FWH	Firmware Hub
G	Giga (1.024 x 10 <sup>9</sup> )
GB	Gigabyte
Gb/s	Gigabits per Second
GHz	Gigahertz
HBA	Host Bus Adapter
HDD	Hard Disk Drive
HSBP	Hot Swap Backplane
Hz	Hertz
IBL	Intel Business Link



IC	Integrated Circuit
ICH	I/O Controller Hub
IDC	Internet Database Connector
IDE	Integrated Drive Electronics
IMM	Intel® Management Module
I/O	Input/Output
iSCSI	Internet Protocol Small Computer System Interface
ITE	Information Technology Equipment
K	Kilo (1.024 x 10 <sup>3</sup> )
KB	Kilobyte
KV	Kilovolt
KHz	Kilohertz
LAN	Local Area Network
LED	Light-Emitting Diode
LPC	Low-Pin Count
MB	Megabyte
Mb/s	Megabits per second
MCH	Memory Controller Hub
MHz	Megahertz
mm	Millimeter
msec	Millisecond
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
NIC	Network Interface Card
OTP	Over-Temperature Protection
OVP	Over-Voltage Protection
PCI	Peripheral Component Interconnect
PDB	Power Distribution Board
PFC	Power Factor Correction
PIO	Programmed Input/Output
PLD	Programmable Logic Device
PSON	Power Supply On
PSU	Power Supply Unit
PWT	Processor Wind Tunnel
RAID	Redundant Array of Inexpensive Disks
RH	Relative Humidity
RI	Ring Indicate
SAN	Storage Area Network
SATA	Serial AT Attachment (aka., Serial ATA)
SCA	Single Connector Attachment
SCC	Storage Control Console
SDR	Sensor Data Record
SDRAM	Synchronous Dynamic Random Access Memory
SE	Single-Ended
SMBIOS	System Management Basic Input/Output System

SOIC	Small Outline Integrated Circuit
SRAM	Static Random Access Memory
SSI	Server System Infrastructure
TQFP	Thin Quad Flat Pack
TB	Terabyte
UART	Universal Asynchronous Receiver Transmitter
μF	Micro Farad (1 x 10 <sup>-6</sup> Farads)
μS	Micro Second (1 x 10 <sup>-6</sup> Second)
USB	Universal Serial Bus
V	Volt
VA	Volt-Amp
VCCI	Voluntary Control Council for Interference
VQFP	Very Thin Quad Flat Pack
VRM	Voltage Regulator Module
W	Watt