



# Intel® Server System SR1600UR

## *Technical Product Specification*

*Intel order number E45725-010*



**Revision 1.8**

**April, 2011**

**Enterprise Platforms and Services Division - Marketing**

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## *Revision History*

Date	Revision Number	Modifications
March 2009	1.0	Initial release.
October 2009	1.1	Updated section 7.3 - Control Panel Connectors.
January 2010	1.2	Update section 2.5 - NIC Connectors.
April 2010	1.3	<ul style="list-style-type: none"> <li>▪ Updated section 2.5 - System Board Overview.</li> <li>▪ Removed CCC Certification.</li> </ul>
July 2010	1.4	<ul style="list-style-type: none"> <li>▪ Updated section 2 - Product Overview,</li> <li>▪ Added section 2.1.1 - Processor Support.</li> </ul>
October 2010	1.5	Updated section 2.1.1 - Processor Support.
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	1.7	Updated section 2.1 - Product Overview.
April 2011	1.8	Updated section 2.1 - Product Overview.

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# 1. Introduction

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This Technical Product Specification (TPS) provides system-specific information detailing the features, functionality, and high-level architecture of the Intel® Server System SR1600UR. The *Intel® Server Board S5520UR Technical Product Specification* should also be referenced to obtain greater detail of functionality and architecture specific to the integrated server board, but which are also supported on this server system.

In addition, design-level information for specific subsystems can be obtained by ordering the External Product Specifications (EPS) or External Design Specifications (EDS) for a given subsystem. EPS and EDS documents are not publicly available. They are only made available under NDA with Intel® and must be ordered through your local Intel® representative. See the Reference Documents section at the end of this document for a complete list of available documents.

The Intel® Server System SR1600UR may contain design defects or errors known as errata, which may cause the product to deviate from published specifications. Refer to the *Intel® Server Board S5520UR/Intel® Server System SR1600UR Specification Update* for published errata.

## 1.1 Chapter Outline

This document is divided into the following chapters:

- Chapter 1 – Introduction
- Chapter 2 – Product Overview
- Chapter 3 – Power Subsystem
- Chapter 4 – Cooling Subsystem
- Chapter 5 – Peripheral Support
- Chapter 6 – Hard Disk Drive Support
- Chapter 7 – Standard Control Panel
- Chapter 8 – Intel® Local Control Panel
- Chapter 9 – PCI Riser Cards and Assembly
- Chapter 10 – Environmental Specifications
- Chapter 11 – Regulatory and Certification Information
- Appendix A – Integration and Usage Tips
- Appendix B – POST Code Diagnostic LED Decoder
- Appendix C – Post Code Errors
- Glossary
- Reference Documents

## 1.2 Server Board Use Disclaimer

Intel Corporation server boards support add-in peripherals and contain a number of high-density VLSI and power delivery components that need adequate airflow to cool. Intel® ensures through its own chassis development and testing that when Intel® server building blocks are used together, the fully integrated system will meet the intended thermal requirements of these components. It is the responsibility of the system integrator who chooses not to use Intel®-developed server building blocks to consult vendor datasheets and operating parameters to determine the amount of airflow required for their specific application and environmental conditions. Intel Corporation cannot be held responsible if components fail or the server board does not operate correctly when used outside any of their published operating or non-operating limits.

## 2. Product Overview

The Intel® Server System SR1600UR is a rack mount 1U server system with features that are designed to support the high-density high-performance computing server market. The system is integrated with an Intel® Server Board S5520UR and is offered in two different system configurations:

- Configuration 1: Supports up to three fixed SATA hard drives,
- Configuration 2: Supports hot-swap backplane options capable of supporting up to three hot-swap SAS or SATA hard drives.

This chapter provides a high-level overview of the system features. Greater detail for each major system component or feature is provided in the following chapters.

**Table 1. System Feature Set**

Feature	Description
Peripheral Interfaces	External connections: <ul style="list-style-type: none"> <li>▪ DB-15 video connector (back)</li> <li>▪ Hot-swap hard drive system only: DB-15 video connector (front)</li> <li>▪ RJ-45 serial Port A connector</li> <li>▪ Two RJ-45 10/100/1000 Mb network connections</li> <li>▪ Four USB 2.0 connectors (back)</li> <li>▪ One USB 1.1 connector (front)</li> </ul> Internal connections: <ul style="list-style-type: none"> <li>▪ One USB 2x5 pin header, which supports two USB 2.0 ports</li> <li>▪ One low-profile USB 2x5 pin header to support low-profile USB Solid State drives</li> <li>▪ One DH-10 Serial Port B header</li> <li>▪ Six Serial ATA (SATA) II connectors</li> <li>▪ Two I/O module Mezzanine connectors for optional I/O Module support</li> <li>▪ One RMM3 connector to support an optional Intel® Remote Management Module 3</li> <li>▪ SATA Software RAID 5 Activation Key connector</li> <li>▪ One SSI-EEB compliant front panel header</li> <li>▪ One SSI-EEB compliant 24-pin main power connector</li> <li>▪ One SSI-compliant 8-pin CPU power connector</li> <li>▪ One SSI-compliant power supply SMBus connector</li> </ul>
Video	On-board ServerEngines* LLC Pilot II Controller <ul style="list-style-type: none"> <li>▪ Integrated 2D Video Controller</li> <li>▪ 64 MB DDR2 Memory</li> </ul>
LAN	Two 10/100/1000 Intel® 82575 PHYs with Intel® I/O Acceleration Technology 2 support.

Feature	Description
Expansion Capabilities	One x16 PCI Express* Gen 2 PCI riser slot capable of supporting a full-length full-height PCI Express* add-in card.
Hard Drive Options	<ul style="list-style-type: none"> <li>▪ Fixed mount hard drive system: <ul style="list-style-type: none"> <li>Three SATA drives</li> </ul> </li> <li>▪ Hot-swap hard drive system: <ul style="list-style-type: none"> <li>Three 3.5 inch hot-swap SATA/SAS drives</li> </ul> </li> </ul>
Peripherals	<ul style="list-style-type: none"> <li>▪ Slimline bay for slimline SATA optical drive</li> <li>▪ One PCI Express* X16 add-in card slot (Gen 2)</li> </ul>
Control Panel	<ul style="list-style-type: none"> <li>▪ Standard control panel</li> <li>▪ Hot-swap hard drive system only: Intel® Local Control Panel</li> </ul>
LEDs and displays	<p>With standard control panel:</p> <ul style="list-style-type: none"> <li>▪ NIC1 Activity</li> <li>▪ NIC2 Activity</li> <li>▪ Power/Sleep</li> <li>▪ System Status</li> <li>▪ System Identification</li> <li>▪ Hard Drive Activity</li> </ul> <p>Intel® Light-Guided diagnostics:</p> <ul style="list-style-type: none"> <li>▪ Fan Fault</li> <li>▪ DIMM Fault</li> <li>▪ CPU Fault</li> <li>▪ 5V-STBY</li> <li>▪ System Status</li> <li>▪ System Identification</li> <li>▪ POST Code Diagnostics</li> </ul>
Power Supply	Single 600-W power supply module
Fans	<ul style="list-style-type: none"> <li>▪ Five 40x40x56-mm, non-redundant, variable-speed, dual-rotor system fans</li> <li>▪ Two non-redundant 40-mm power supply fans</li> </ul>
System Management	<p>On-board ServerEngines* LLC Pilot II Controller</p> <ul style="list-style-type: none"> <li>▪ Integrated Baseboard Management Controller (Integrated BMC), IPMI 2.0 compliant</li> <li>▪ Integrated Super I/O on LPC interface</li> </ul> <p>Support for Intel® Server Management Software 3.1</p>

## 2.1.1 Processor Support

The Intel® Server Boards S5520UR supports the following processors:

- One or two Intel® Xeon® Processor 5500 Series with a 4.8 GT/s, 5.86 GT/s, or 6.4 GT/s Intel® QPI link interface and Thermal Design Power (TDP) up to 95 W.
- One or two Intel® Xeon® Processor 5600 Series with a 6.4 GT/s Intel® QPI link interface and Thermal Design Power (TDP) up to 130 W.

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**Note:** When configured with 130W processors, only Single & Dual Rank DIMMs are supported.

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The server boards do not support previous generations of the Intel® Xeon® Processors.

For a complete updated list of supported processors, see:

[http://www.intel.com/p/en\\_US/support/highlights/server/s5520ur](http://www.intel.com/p/en_US/support/highlights/server/s5520ur). On the Support tab, look for **Compatibility** and then **Supported Processor List**.

### 2.1.1.1 Processor Population Rules

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**Note:** Although the server board does support dual-processor configurations consisting of different processors that meet the defined criteria below, Intel® does not perform validation testing of this configuration. For optimal system performance in dual-processor configurations, Intel® recommends that identical processors be installed.

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When using a single processor configuration, the processor must be installed into the processor socket labeled CPU1. A terminator is not required in the second processor socket when using a single processor configuration.

When two processors are installed, the following population rules apply:

- Both processors must be of the same processor family.
- Both processors must have the same front-side bus speed.
- Both processors must have the same cache size.
- Processors with different speeds can be mixed in a system, given the prior rules are met. If this condition is detected, all processor speeds are set to the lowest common denominator (highest common speed) and an error is reported.
- Processor stepping within a common processor family can be mixed as long as it is listed in the processor specification updates published by Intel Corporation.

The following table describes mixed processor conditions and recommended actions for all Intel® server boards and systems that use the Intel® 5520 Chipset. The errors fall into one of the following two categories:

- **Fatal:** If the system can boot, it goes directly to the error manager, regardless of whether the **Post Error Pause** setup option is enabled or disabled.
- **Major:** If the **Post Error Pause** setup option is enabled, system goes directly to the error manager. Otherwise, the system continues to boot and no prompt is given for the error. The error is logged to the error manager.

**Table 2. Mixed Processor Configurations**

Error	Severity	System Action
Processor family not identical	Fatal	<p>The BIOS detects the error condition and responds as follows:</p> <ul style="list-style-type: none"> <li>▪ Logs the error into the system event log (SEL).</li> <li>▪ Alerts the Integrated BMC of the configuration error with an IPMI command.</li> <li>▪ Does not disable the processor.</li> <li>▪ Displays “0194: Processor family mismatch detected” message in the error manager.</li> <li>▪ Halts the system.</li> </ul>
Processor cache not identical	Fatal	<p>The BIOS detects the error condition and responds as follows:</p> <ul style="list-style-type: none"> <li>▪ Logs the error into the SEL.</li> <li>▪ Alerts the Integrated BMC of the configuration error with an IPMI command.</li> <li>▪ Does not disable the processor.</li> <li>▪ Displays “0192: Cache size mismatch detected” message in the error manager.</li> <li>▪ Halts the system.</li> </ul>
Processor frequency (speed) not identical	Major	<p>The BIOS detects the error condition and responds as follows:</p> <ul style="list-style-type: none"> <li>▪ Adjusts all processor frequencies to lowest common denominator.</li> <li>▪ Continues to boot the system successfully.</li> </ul> <p>If the frequencies for all processors cannot be adjusted to be the same, then the BIOS:</p> <ul style="list-style-type: none"> <li>▪ Logs the error into the SEL.</li> <li>▪ Displays “0197: Processor speeds mismatched” message in the error manager.</li> <li>▪ Halts the system.</li> </ul>
Processor microcode missing	Fatal	<p>The BIOS detects the error condition and responds as follows:</p> <ul style="list-style-type: none"> <li>▪ Logs the error into the SEL.</li> <li>▪ Alerts the Integrated BMC of the configuration error with an IPMI command.</li> <li>▪ Does not disable processor.</li> <li>▪ Displays “816x: Processor 0x unable to apply microcode update” message in the error manager.</li> <li>▪ Pauses the system for user intervention.</li> </ul>
Processor Intel® QuickPath Interconnect speeds not identical	Halt	<p>The BIOS detects the error condition and responds as follows:</p> <ul style="list-style-type: none"> <li>▪ Logs the error into the system event log (SEL).</li> <li>▪ Alerts the Integrated BMC of the configuration error with an IPMI command.</li> <li>▪ Does not disable the processor.</li> <li>▪ Displays “0195: Processor Front Side Bus speed mismatch detected” message in the error manager.</li> <li>▪ Halts the system.</li> </ul>



## 2.2 System Overview



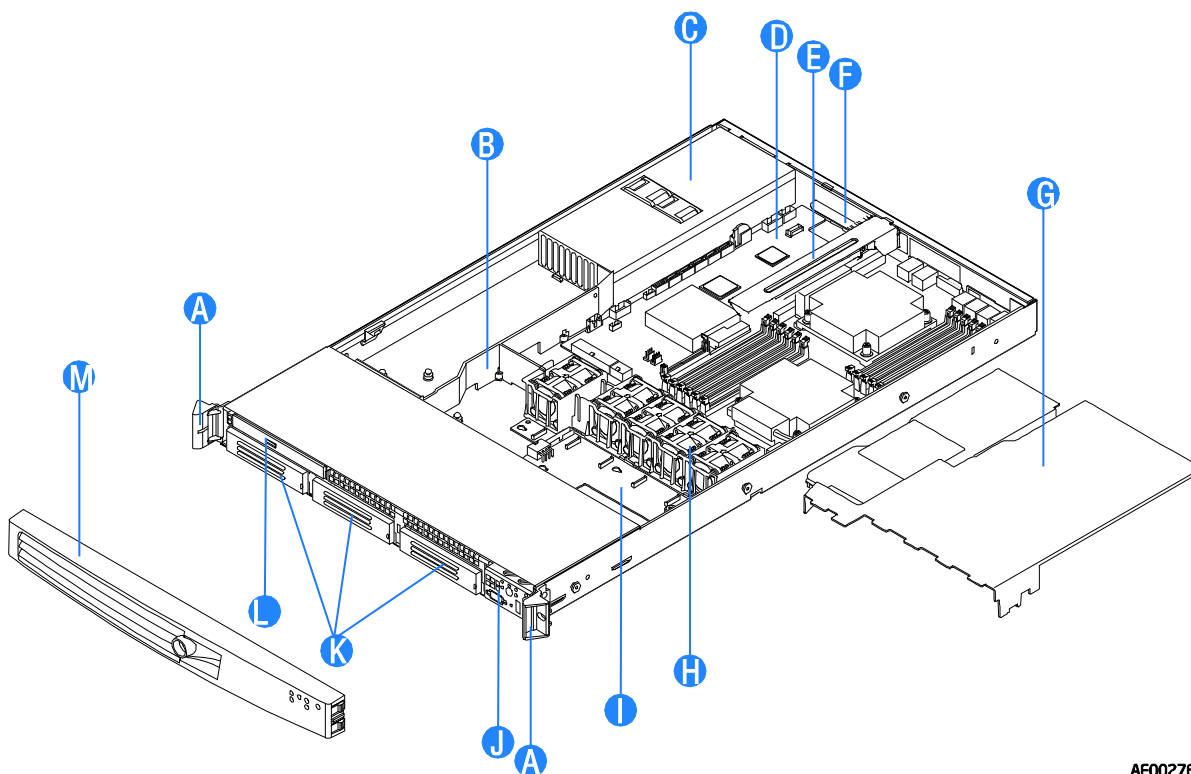
Figure 1. Top Down View – Hot-Swap Drive SKU Shown

## 2.3 System Dimensions

Table 3. Processor Support Matrix

Height	43.3 mm	1.70 in
Width without rails	430 mm	16.9 in
Width with rails	451.6 mm	17.78 in
Depth without CMA	690.6 mm	27.19 in
Depth with CMA	844.5 mm	33.25 in
Maximum Weight	15.4 kg	34 lbs

## 2.4 System Components



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A	Rack handles (optional)	H	System Fan Assembly
B	Air baffle	I	System Fan board used in fixed drive system; Backplane used in hot-swap system
C	Power supply	J	Control panel
D	Server board	K	Hard drive bays: <ul style="list-style-type: none"> <li>• Three hard drives supported for fixed drive system</li> <li>• Three hard drives supported for hot-swap system</li> </ul>
E	PCI add-in riser assembly	L	Slimline drive bay
F	PCI card bracket (full-height)	M	Front bezel (optional)
G	Processor air duct		

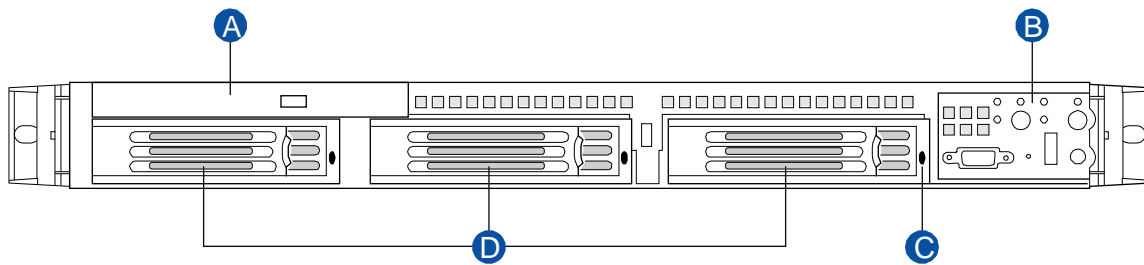
**Not shown:** Bridge board (only in a hot-swap system)

**Figure 2. Major Chassis Components**

## 2.5 Hard Drive and Peripheral Bays

**Table 4. Drive Overview**

	Fixed Drive System Product Code - SR1600UR	Hot-Swap Drive System Product Code - SR1600URHS
Slimline SATA Optical Drive	Supported	Supported
Slimline USB Floppy Drive	No Support	Supported
SATA Drives	Up to three SATA drives	Up to three SATA drives
SAS Drives	No Support	Up to three SAS drives with the active backplane option



AF002191

A	Slimline drive bay
B	Intel® Standard Control Panel
C	Hard Drive Status LEDs (hot-swap drives only)
D	Hard drive bays

**Figure 3. Drive Bay Overview**

## 2.6 System Board Overview



**Figure 4. Intel® Server Board S5520UR**

The following figure shows the board layout of the server board. Each connector and major component is identified by a number or letter, and a description is provided below the figure.



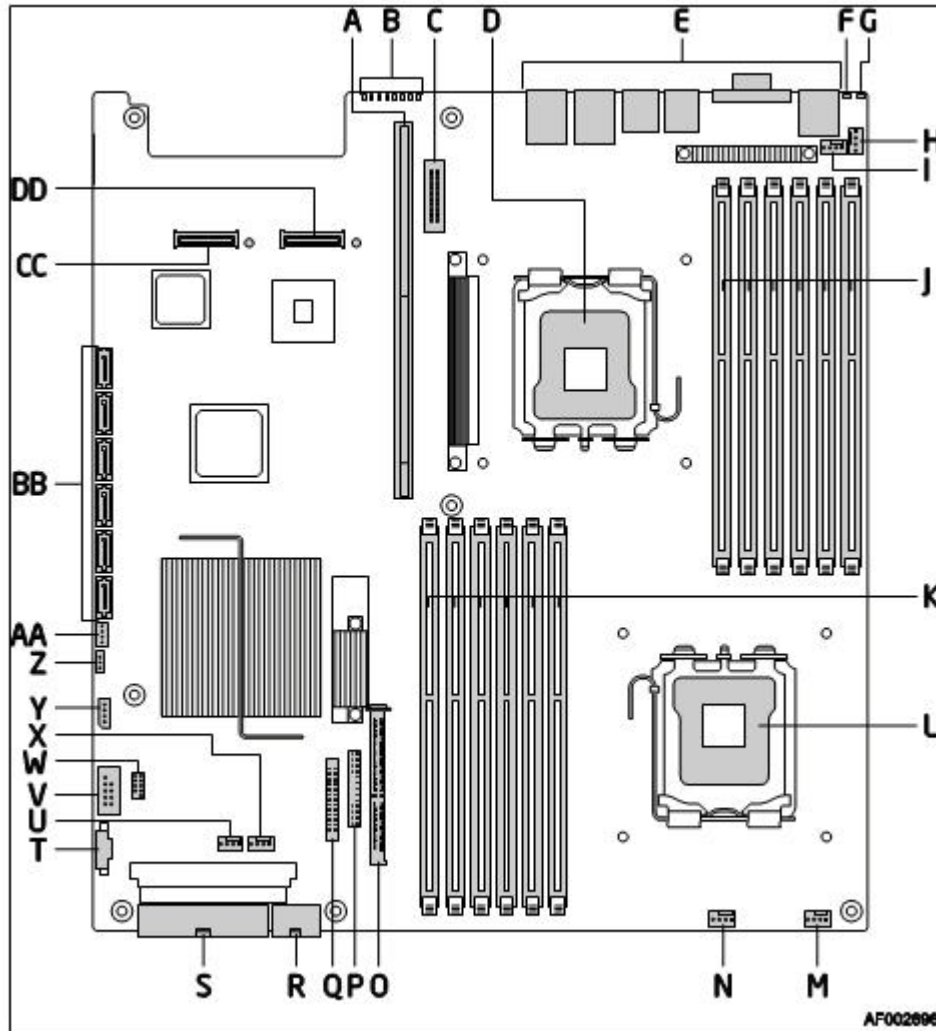
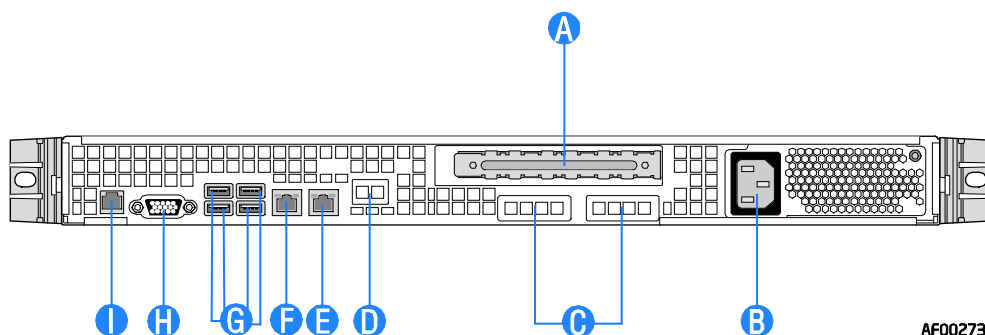


Figure 5. Intel® Server Board S5520UR Components

**Table 5. Major Board Components**

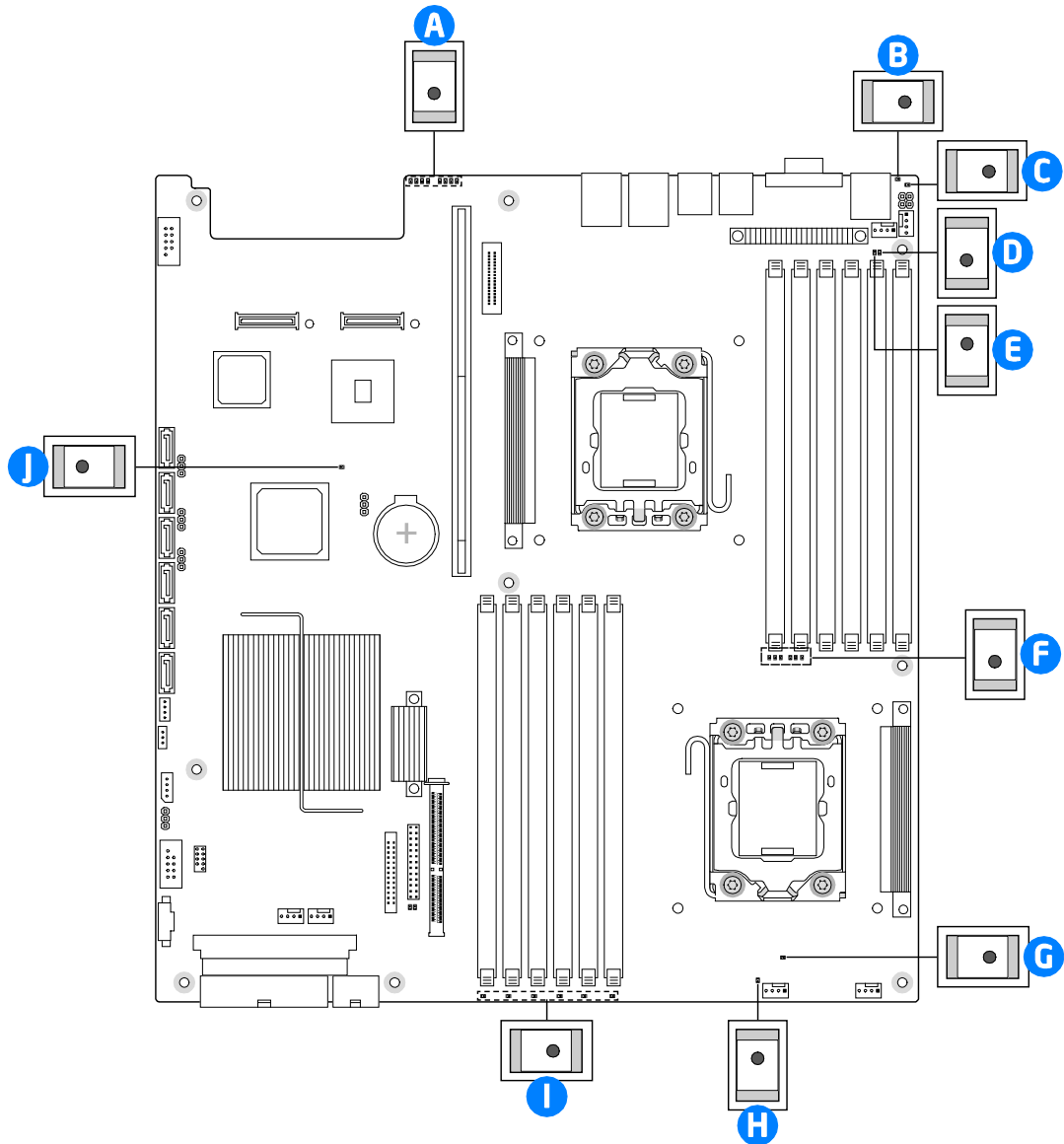
	Description		Description
A	280-pin Intel® Adaptive Riser Card Slot	Q	Fan Board Connector (Intel® Server Chassis)
B	POST Code LEDs	R	2x4 Power Connector
C	Intel® RMM3 Header	S	Main Power Connector
D	Processor 1	T	Power Supply SMBus Connector
E	Back Panel I/O	U	Fan Header
F	ID LED	V	USB Header
G	System Status LED	W	Low-profile USB Solid State Driver Header
H	Fan Header	X	Fan Header
I	Fan Header	Y	LCP IPMB Header
J	Processor 1 DIMM Slots	Z	SATA RAID 5 Key Header
K	Processor 2 DIMM Slots	AA	SGPIO Header
L	Processor 2	BB	SATA Connectors
M	Fan Header	CC	I/O Module Mezzanine Connector 2
N	Fan Header	DD	I/O Module Mezzanine Connector 1
O	Bridge Board Connector (Intel® Server Chassis)		
P	Front Panel Connector		



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A	Add-in card bracket (full-height)	F	NIC 1 connector
B	AC Power Receptacle	G	Four USB 2.0 connectors
C	I/O module external connectors (optional)	H	Video connector
D	Intel® RMM3 Management Network Interface (optional)	I	RJ-45 serial A port
E	NIC 2 connector		

**Figure 6. Back Panel Feature Overview**



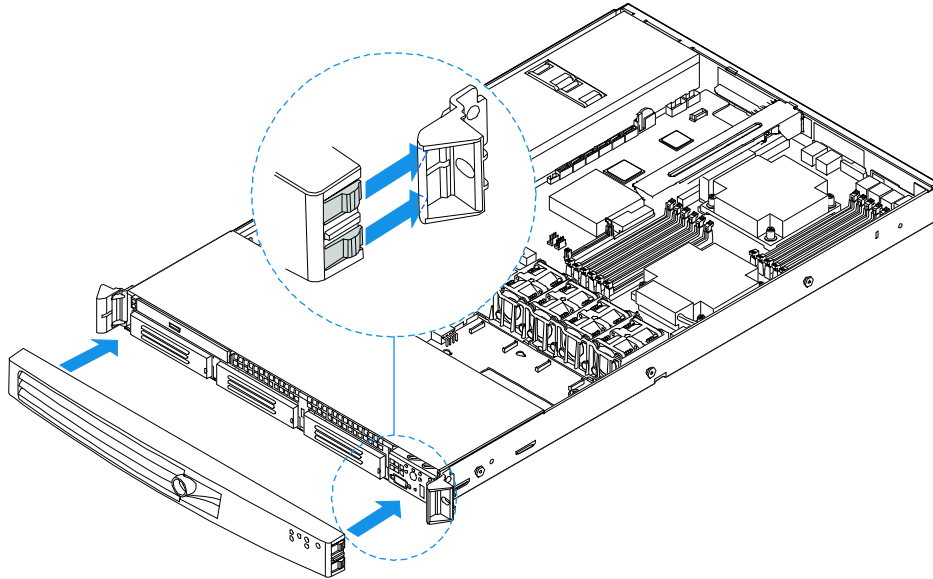
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A	POST Code Diagnostic LEDs	F	CPU 1 DIMM Fault LEDs
B	System Identification LED	G	CPU 2 Fan Fault LED
C	Status LED	H	Memory 2 Fan Fault LED
D	Memory 1 Fan Fault LED	I	CPU 2 DIMM Fault LEDs
E	CPU 1 Fan Fault LED	J	5V Standby LED

**Figure 7. Intel® Light-Guided Diagnostic LEDs - Server Board**

## 2.7 Front Bezel Support

The optional front bezel is made of molded plastic and uses a snap-on design. When installed, its design allows for maximum airflow to maintain system cooling requirements. Separate front bezels are available to support systems that use either a standard control panel (Product Order Code – ADWBEZBLACK) or an Intel® Local Control Panel (Product Order Code – ADWLCDBEZEL).

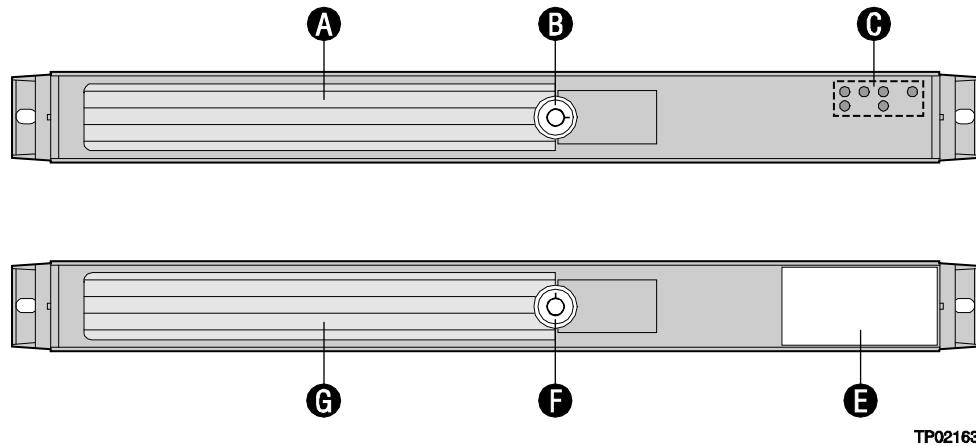


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**Figure 8. Optional Front Bezel**



Light pipes in the front bezel support the standard control panel and allow the system status LEDs to be monitored when the bezel is installed. When the local control panel is used, the control panel module can be adjusted to extend further out from the chassis face to allow the LCD panel to protrude from the front bezel.



A	Ventilation	E	Opening for Intel® Local Control Panel
B	Key Lock	F	Key Lock
C	System Status LEDs	G	Ventilation

**Figure 9. Front Bezel Options**

## 2.8 Rack and Cabinet Mounting Options

The chassis was designed to support 19 inches wide by up to 30 inches deep server cabinets. The chassis supports three rack mount options:

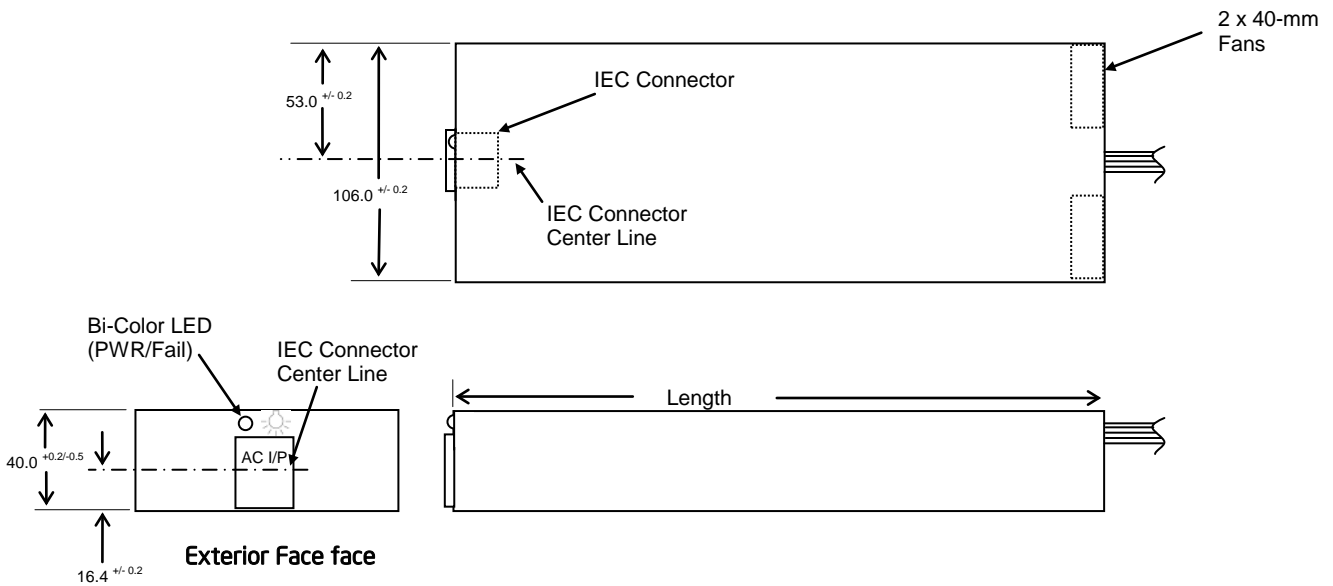
- A fixed mount relay rack/cabinet mount kit (Product Order Code - AXXBRACKETS) which can be configured to mount the system into either a 2-post rack or 4-post cabinet
- A tool-less full extracting slide rail kit (Product Order Code – AXXHERAIL2) designed to support an optional cable management arm (Product Order code – AXXRACKCARM2).
- A basic slide rail kit (Product Order Code – AXXBASRAIL13) designed to mount the chassis into a standard (19 inches by up to 30 inches deep) EIA-310D compatible server cabinet.

## 3. Power Subsystem

The power subsystem consists of a single non-redundant 600-W power supply with eight outputs: 3.3 V, 5 V, 12 V1, 12 V2, 12 V3, 12 V4, -12 V, and 5 VSB. The input is auto-ranging and power factor corrected. The form factor is SSI EPS1U compliant with a 300-mm depth and wire harness output. The power supply provides two non-redundant 40-mm fans for self cooling. These power supply fans also provide additional airflow for the system.

This chapter provides basic technical details on the design and operation of the power supply. For additional information, refer to the *Intel® Server System SR1600UR AC Power Supply Specification*.

### 3.1 Mechanical Overview



1. All dimensions are in mm.
2. The tolerance of the 40 mm height dimension (marked with letter C) pertains to the metal case only.

**Figure 10. Power Supply Mechanical Drawing**

## 3.2 Output Connectors

The power supply has a cable harness with four power connectors that are used to power various platform subsystems. The following table defines each power connector.

**Table 6. Cable Harness Definition**

Label	Length (mm)	Description
P1	230	Main Power Connector
P2	255	Processor Power Connector
P3	265	Backplane Power Connector
P4	265	Power Signal Connector
P5	200*	Slimline SATA Power Connector

\* The Slimline SATA Connector is branched off of the P3 Backplane Power Connector. Length provided is the cable length from the P3 connector.

### 3.2.1 P1 – Main Power Connector

Connector housing: 24-pin Molex\* Mini-Fit Jr. 39-01-2245 or equivalent

Contact: Molex Mini-Fit, HCS, Female, Crimp 44476 or equivalent

**Table 7. P1 – Main Power Connector Pin-out**

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	+3.3 VDC	Orange	13	+3.3 VDC	Orange
2	+3.3 VDC	Orange	14	-12 VDC	Blue
3	COM	Black	15	COM	Black
4	+5 VDC	Red	16	PSON#	Green
5	COM	Black	17	COM	Black
6	+5 VDC	Red	18	COM	Black
7	COM	Black	19	COM	Black
8	PWR OK	Gray	20	Reserved	N.C.
9	5 VSB	Purple	21	+5 VDC	Red
10	+12 V3	Yellow/Blue Stripe	22	+5 VDC	Red
11	+12 V3	Yellow/Blue Stripe	23	+5 VDC	Red
12	+3.3 VDC	Orange	24	COM	Black

**Notes:**

1. 5 V Remote Sense Double Crimped into pin 4.
2. 3.3 V Locate Sense Double Crimped into pin 2.

### 3.2.2 P2 – Processor Power Connector

Connector housing: 8-pin Molex\* 39-01-2085 or equivalent

Contact: Molex 45750-0112 (12A) or equivalent

**Table 8. P2 – Processor Power Connector Pin-out**

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	COM	Black	5	+12 V1	Yellow
2	COM	Black	6	+12 V1	Yellow
3	COM	Black	7	12 V4	Blue/White Stripe
4	COM	Black	8	12 V4	Blue/White Stripe

### 3.2.3 P3 – Backplane Connector

Connector housing: 8-pin Molex\* 39-01-2085 2x4 or Intel® approved equivalent

Contact: Molex 2x4 mini fit Jr, HCS, 44476-1111 or Intel® approved equivalent

**Table 9. P3 – Backplane Power Connector**

Pin	Signal	18AWG Color	Pin	Signal	18 AWG Color
1	GND	Black	5	12 V4	Blue/White Stripe
2	GND	Black	6	12 V4	Blue/White Stripe
3	5 V	Red	7	5 VSB	Purple
4	5 V	Red	8	3.3 V	Orange

### 3.2.4 P4 – Power Signal Connector

Connector housing: 5-pin Molex\* 50-57-9705 or Intel® approved equivalent

Contact: Molex 16-02-0087 or Intel® approved equivalent

**Table 10. P4 – Power Signal Connector**

Pin	Signal	24 AWG Color
1	I <sup>2</sup> C Clock	White/Green Stripe
2	I <sup>2</sup> C Data	White/Yellow Stripe
3	NC	NC
4	COM	Black
5	3.3RS	White/Brown Stripe

### 3.2.5 P5 – Slimline SATA Optical Disk Drive (SSATA ODD) Power Connector

Connector housing: 6-pin Slimline SATA Power

Contact: 15u” plating minimum

**Table 11. P5 – Slimline SATA Optical Disk Drive Power Connector**

Pin	Signal	22 AWG Color
1	Reserved	N.C.
2	+5 VDC	Red
3	+5 VDC	Red
4	Reserved	N.C.
5	COM	Black
6	COM	Black

### 3.2.6 Fixed SATA Hard Drive Power Connectors

In the fixed configuration, no SATA power connectors are provided from the power supply. In order to power the hard drives in the fixed configuration, an adapter cable is provided with the system. This cable fits between the P3 Backplane Connector and the Fan Board and is pre-integrated. A cable branches off with SATA power connections every 165 mm as measured from the fan board connector.

**Table 12. SATA Power Connector**

Pin	Signal	18 AWG Color
1	NC	
2	NC	
3	NC	
4	COM	Black
5	COM	Black
6	COM	Black
7	+5 VDC	Red
8	+5 VDC	Red
9	+5 VDC	Red
10	COM	Black
11	COM	Black
12	COM	Black
13	+12 V4DC	Yellow
14	+12 V4DC	Yellow
15	+12 V4DC	Yellow

### 3.3 Efficiency

The following table provides the required minimum efficiency level at various loading conditions. These are provided at three different load levels: 100%, 50% and 20%. Efficiency is tested over an AC input voltage range of 115 VAC to 220 VAC.

**Table 13. Efficiency**

Loading	100% of maximum	50% of maximum	20% of maximum
Minimum Efficiency	>80%	>80%	>80%

### 3.4 AC Input Voltage Requirement

The power supply must operate within all specified limits over the input voltage range shown in the following table.

**Table 14. AC Input Rating**

Parameter	Minimum	Rated	Maximum	Startup VAC	Power-off VAC	Maximum Input AC Current	Maximum Rated Input AC Current
Voltage (110)	90 V <sub>rms</sub>	100-127 V <sub>rms</sub>	140 V <sub>rms</sub>	85 VAC +/- 4 VAC	75 VAC +/-5 VAC	9.5 A <sub>rms</sub> <sup>1,3</sup>	8.55 A <sub>rms</sub> <sup>4</sup>
Voltage (220)	180 V <sub>rms</sub>	200-240 V <sub>rms</sub>	264 V <sub>rms</sub>			4.75 A <sub>rms</sub> <sup>2,3</sup>	4.3 A <sub>rms</sub> <sup>4</sup>
Frequency	47 Hz	50/60 Hz	63 Hz				

**Notes:**

1. Maximum input current at low input voltage range is measured at 90 VAC, at maximum load.
2. Maximum input current at high input voltage range is measured at 180 VAC, at maximum load.
3. This is not to be used for determining agency input current markings.
4. Maximum rated input current is measured at 100 VAC and 200 VAC.

Harmonic distortion of up to 10% THD must not cause the power supply to go out of specified limits. The power supply powers off if the AC input is less than 75 VAC +/-5 VAC range. The power supply starts up if the AC input is greater than 85 VAC +/- 4 VAC. Application of an input voltage below 85 VAC does not cause damage to the power supply, including a fuse blow.

### 3.5 Protection Circuits

Protection circuits inside the power supply cause only the power supply's main outputs to shut down. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF for 15 seconds and a PSON<sup>#</sup> cycle HIGH for one second reset the power supply.

### 3.5.1 Over-current Protection (OCP)

The power supply has current limits to prevent the +3.3 V, +5 V, and +12 V outputs from exceeding the values shown in the following table. If the current limits are exceeded, the power supply shuts down and latches off. The latch is cleared by toggling the PSON# signal or by an AC power interruption. The power supply is not damaged from repeated power cycling in this condition. -12 V and 5 VSB are protected under over-current or shorted conditions so that no damage can occur to the power supply. Auto-recovery feature is a requirement on 5 VSB rail.

**Table 15. Over-current Protection (OCP)**

Voltage	Minimum OCP Limits ( $I_{out}$ limit)	Maximum OCP Limits
+3.3 V	115%	150%
+5 V	115%	150%
+12 V1	18.5 A	20 A
+12 V2	18.5 A	20 A
+12 V3	25 A	30 A
+12 V4	18.5 A	20 A
-12 V	0.7 A	3.0 A
5 VSB	115%	6 A

### 3.5.2 Over-voltage Protection (OVP)

The power supply over-voltage protection is locally sensed. The power supply shuts down and latches off after an over-voltage condition occurs. This latch is cleared by toggling the PSON# signal or by an AC power interruption. The over-voltage limits are listed in the following table. The values are measured at the output of the power supply's connectors. The voltage never exceeds the maximum levels when measured at the power pins of the power supply connector during any single point of fail. The voltage never trips any lower than the minimum levels when measured at the power pins of the power supply connector.

**Exception:** +5 VSB rail should be able to recover after its over-voltage condition occurs.

**Table 16. Over-voltage Protection (OVP) Limits**

Output Voltage	Minimum (V)	Maximum (V)
+3.3 V	3.9	4.5
+5 V	5.7	6.2
+12 V1,2, 3, 4	13.3	14.5
-12 V	-13.3	-14.5
+5 VSB	5.7	6.5

### 3.5.3 Over-temperature Protection (OTP)

The power supply is protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition, the PSU shuts down. When the power supply temperature drops to within specified limits, the power supply restores power automatically, while the 5 VSB remains constantly on. The OTP circuit must have built-in hysteresis such that the power supply does not oscillate on and off due to the temperature recovery condition. The OTP trip level has a minimum of 4°C of ambient temperature hysteresis.

## 3.6 Power Supply Status LED

There is a single bi-color LED to indicate power supply status. The LED operation is defined in the following table.

**Table 17. LED Indicators**

Power Supply Condition	LED
No AC power to all power supplies	Off
Power supply critical event causing a shutdown: failure, OCP, OVP, OTP	Amber
AC present/Only 5 VSB on (PS off)	1 Hz Blink Green
Output ON and OK	Green

The LEDs are visible on the power supply's exterior face. The LEDs' location meets ESD requirements. The LEDs are securely mounted in such a way that incidental pressure on the LEDs does not cause it to become displaced.

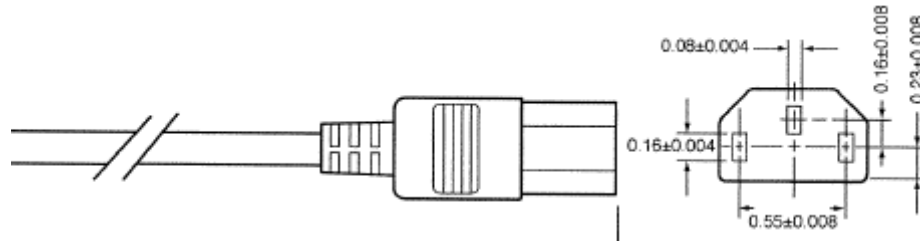
## 3.7 AC Power Cord Specification Requirements

The AC power cord used must meet the specification requirements listed in the following table.

**Table 18. AC Power Cord Specifications**

Cable Type	SJT
Wire Size	16 AWG
Temperature Rating	105°C
Amperage Rating	13 A
Voltage Rating	125 V





**Figure 11. AC Power Cord**

## 4. Cooling Subsystem

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The cooling subsystem is composed of five 40x40x56-mm dual-rotor fans, two 40x40x28-mm power supply fans, a CPU air duct, and a power supply/electronics bay isolation air baffle. These components are used to provide the necessary cooling and airflow to the system. A fan on the processor heatsink is not necessary in this chassis.

In order to maintain the necessary airflow within the system, the air baffle, CPU air duct, PCI riser assembly, and the top cover need to be properly installed.

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**Note:** The Intel® Server System SR1600UR does not support redundant cooling. Should a fan fail, the system should be powered down as soon as possible to replace the failed fan.

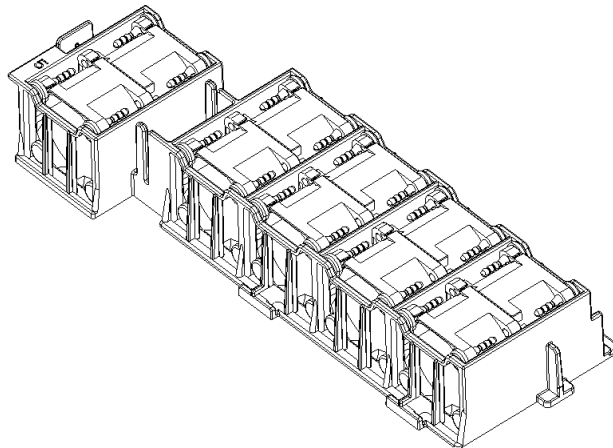
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### 4.1 Five-fan Module

A fan assembly consisting of five 40x40x56-mm dual-rotor multi-speed fans provides the primary airflow for the system. Four of the dual-rotor fans provide the primary cooling for the processors, memory, and second and third hard drive bays. The fifth dual-rotor fan provides the primary cooling for the components in the full-height PCI zone.

Removal and insertion of the fans and the fan module is tool-less and provides for easy installation and serviceability. Fans are individually replaceable through a connection to the hot-swap backplane. Both the fan assembly and the individual fans within it are not hot-swappable. The server must be turned off before any of the fans can be replaced.

Each dual-rotor fan has a 10-pin wire harness, which connects to the hot-swap backplane. Each fan harness provides power and tachometer lines allowing the fans to be monitored independently by the Intel® System Management Software.



**Figure 12. Fan Module Assembly**

**Table 19. Non-redundant Cooling Zones**

Fan	Cooling Zone	Description of greatest cooling influence
System Fan #1 and #2	CPU2	Primary cooling for CPU 2 and memory
System Fan #3 and #4	CPU1	Primary cooling for hard drive2, CPU 1, and memory
System Fan #5	PCI	Primary cooling for hard drive1, full-height PCI cards, and the IOH chipset
Power Supply Fans – 2 fans per module	Power Supply	Primary cooling for hard drive 0, and the power supply module

The system fan module is designed for ease of use and supports several management features that can be utilized by the Integrated Baseboard Management Controller.

- Each fan is designed for tool-less insertion or removal from the fan module housing. For instructions on installing or removing a fan module, see the *Intel® Server System SR1600UR Service Guide*.

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**Note:** The fans are NOT hot-swappable. The system must be turned off in order to replace a failed fan.

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- Each fan within the module is capable of supporting multiple speeds. If the internal ambient temperature of the system exceeds the value programmed into the thermal sensor data record (SDR), the Integrated BMC firmware increases the speed for all the fans within the fan module.
- Each fan connector within the module supplies a tachometer signal that allows the Integrated BMC to monitor the status of each fan. If one of the fans fails, the remaining fans increase their rotation and attempt to maintain the thermal requirements of the system.
- Each fan has an associated fault LED on the fan board or backplane located next to the fan header. If a fan fails, server management illuminates the fault LED for the failing fan.

**Table 20. Individual Fan Assembly Pin-out**

Pin	Signal Name	Description
1	Fan Tach B	Tachometer signal from the first fan rotor
2	PWM	PWM control signal
3	+12 V	Power Supply 12 V
4	+12 V	Power Supply 12 V
5	Fan Tach A	Tachometer signal from the second fan rotor
6	Ground	Power Supply Ground
7	Ground	Power Supply Ground
8	Not used	Not used
9	Loopback wire	Loop back to pin 10 to enable backplane presence LED functionality
10	Loopback wire	Loop back to pin 9 to enable backplane presence LED functionality

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**Note:** There is no fan redundancy. Should a fan fail, the system should be powered down as soon as possible to have the fan replaced. The system fans are not hot-swappable.

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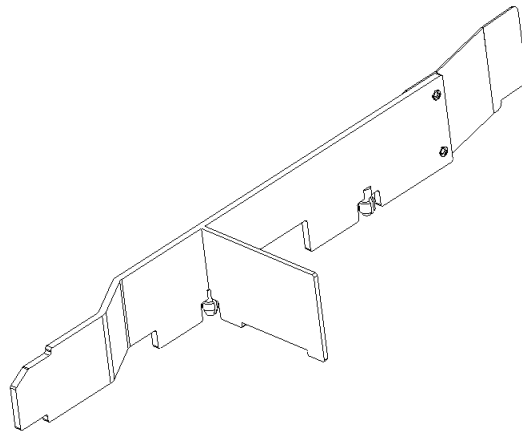
## 4.2 Power Supply Fans

The power supply supports two non-redundant 40-mm fans. They are responsible for the cooling of the power supply, first hard drive bay, and slimline drive bay.

## 4.3 CPU Air Duct and Air Baffle

The chassis requires the use of a CPU air duct and power supply/electronics bay isolation air baffle to direct airflow and sustain appropriate air pressure.

An air baffle is used to isolate airflow of the two power supply fans from that of the system fan module. The baffle is mounted into three stand-offs with one end fitting under the back edge of the hard drive bay.

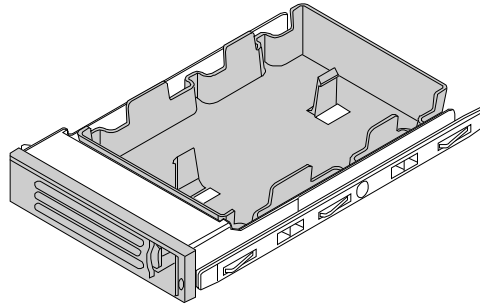


**Figure 13. Air Baffle**

The CPU air duct must be properly installed to direct airflow through the processor heatsink(s) to the low-profile PCI and memory area of the system. The CPU air duct is designed to support either a single or dual processor configuration.

## 4.4 Drive Bay Population

The hard drive bays must be populated in order to maintain system thermal requirements. Hard drive trays used for both hot-swap drives and cabled drives must either have a hard drive or drive blank installed in them. Inserting a drive tray into the system with no hard drive or drive blank installed may prevent the system from meeting its thermal requirements.

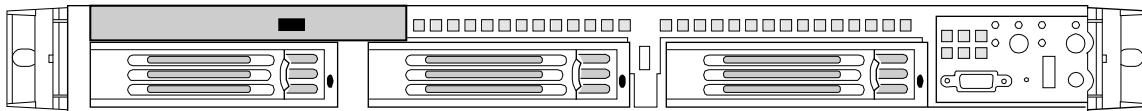


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**Figure 14. Hot-swap Hard Drive Tray with Drive Blank Installed**

## 5. Peripheral Support

The system provides a slimline drive bay that can be populated with a SATA optical drive (CD-ROM, DVD, DVD/CDR) or a USB floppy drive. Drives are mounted on a tool-less tray which allows for easy installation and removal from the system. The slimline devices are not hot-swappable.



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**Figure 15. View of Slimline Drive Bay**

### 5.1 USB Floppy Drive Support

Systems configured with a hot-swap backplane have the option to install a slimline USB floppy drive kit (Product Order Code – AXXUSBFLOPPY). The floppy drive can be inserted into either the slimline bay or the hard drive bay directly below the slimline bay. The option kit includes the necessary cables and trays to support either configuration. Once inserted into the drive bay, the floppy drive is cabled to a 4-pin USB connector on the backplane. The following table provides the pin-out for the USB connector.

**Table 21. 4-pin USB Floppy Connector Pin-out**

Pin #	Pin Definition
1	Power
2	USB_P3n
3	USB P3p
4	Ground

## 5.2 Optical Drive Support

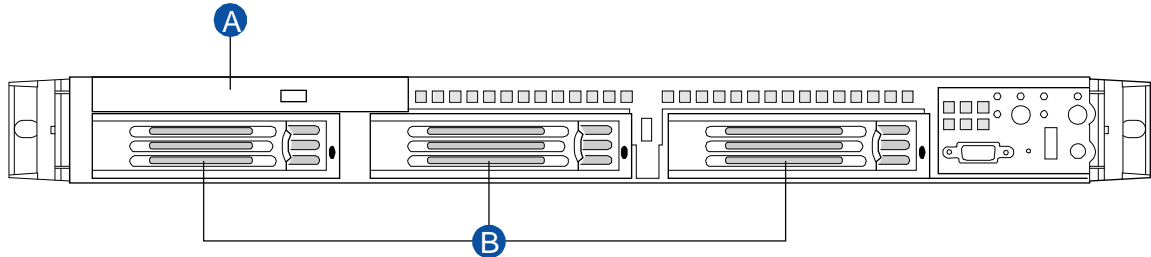
The system has support for a slimline SATA optical drive. The drive is mounted onto a tool-less drive tray. The drive assembly is then inserted into the slimline drive bay. A 7-pin SATA cable is used to connect the drive assembly to a matching SATA connector on the server board.

**Table 22. Internal CD-ROM Connector Pin-out**

Name	Pin	Pin	Name
P 5V	A1	B1	GND
P5V	A2	B2	SATA_TXP
P5V	A3	B3	SATA_TXN
P5V	A4	B4	GND
P5V	A5	B5	GND
P5V	A6	B6	SATA_RXN
P5V	A7	B7	SATA_RXP
P5V	A8	B8	GND
P5V	A9	B9	GND
P5V	A10	B10	GND
P5V	A11	B11	GND
KEY		KEY	
P5V	A12	B12	GND
P5V	A13	B13	GND
P5V	A14	B14	GND
P5V	A15	B15	GND
P5V	A16	B16	GND
P5V	A17	B17	GND
P5V	A18	B18	GND

## 6. Hard Disk Drive Support

The Intel® Server System SR1600UR is available in two hard drive configurations: fixed drive SATA and hot-swap SATA/SAS. The hard drive bays are designed to support tray mounted 3.5 inch x 1 inch hard drives. Depending on the configuration, the system can either support up to three fixed mount SATA drives, or up to three hot-swap SATA or SAS drives.



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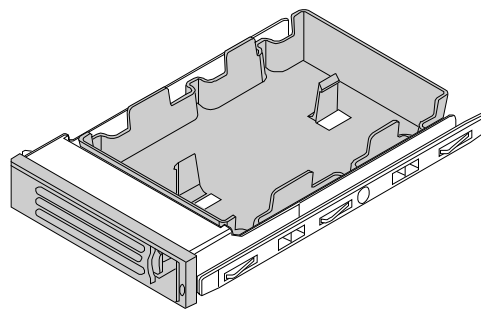
A	Slim Line Optical Drive
B	Hard Drive Bays

**Figure 16. Intel® Server System SR1600UR Peripheral Bay Configuration Options**

### 6.1 Hard Drive Trays

Hard drive trays must be used for both fixed mount and hot-swap drive configurations.

In fixed mount drive configurations, the system ships with a fixed mount drive tray in each of the three drive bays. Each installed hard drive that is mounted to a fixed mount drive tray is designed to slide into the drive bay and lock into place. To remove the drive, the chassis must be opened to disengage the drive tray latch from the bay

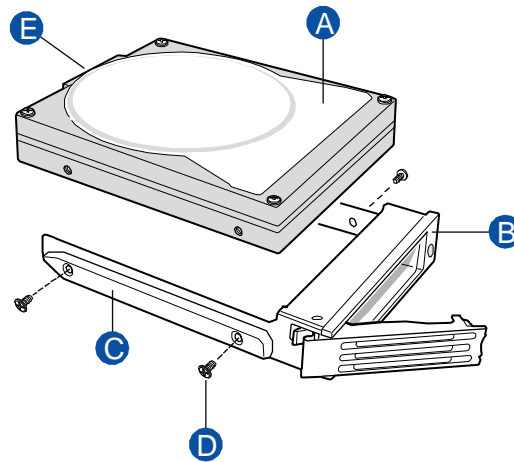


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**Figure 17. Fixed Drive Tray with Drive Blank Installed**



Hot-swap drive trays make insertion and extraction of the drive from the system very simple. Each drive tray has its own dual purpose latching mechanism, which is used to insert and extract drives from the chassis and lock the tray in place. Each drive tray supports a light pipe to direct light from the drive status LED, located on the backplane, to the tray's face plate. This makes it visible from the front of the system.



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**Figure 18. Hot-swap Hard Drive Tray Assembly**

## 6.2 Fixed Mount Hard Drive Support

The Intel® Server System SR1600UR is able to support up to three fixed mount SATA hard drives. In this configuration, the backplane is not installed. Instead, each installed hard drive is cabled to SATA ports on the server board or an add-in card. Power for each installed hard drive is provided from the power supply using the P3 backplane connector adapter.

## 6.3 Hot-swap Hard Drive Support

The Intel® Server System SR1600UR is able to support up to three hot-swap SATA or SAS hard drives, depending on the backplane option installed. Hard drives interface with the backplane through a blind mate connection when drives are installed into a hard drive bay using a hot-swap drive tray.

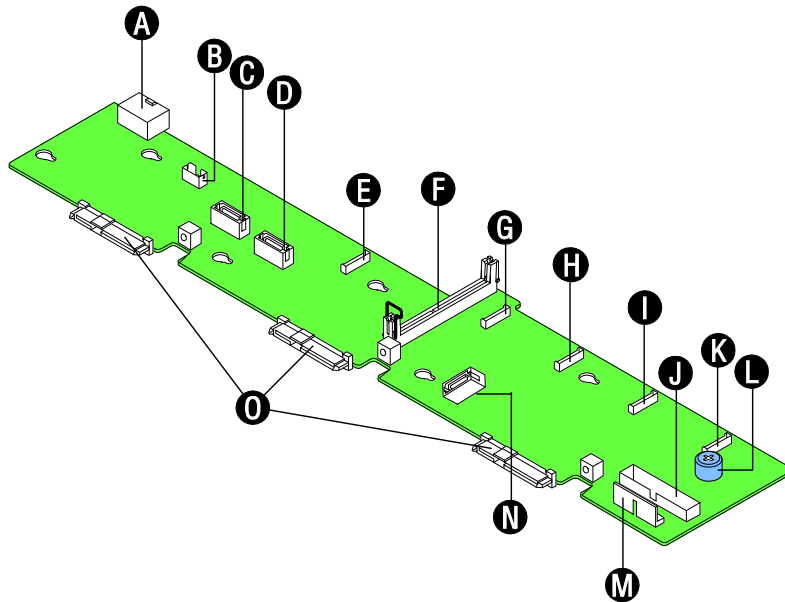
The passive backplane option acts as an intermediate 'pass-through' interface board where SATA ports of the server board or an add-in SAS/SATA controller are cabled to the backplane. The active backplane does not require cables to connect the hard drive to the controller interface. An on-board PCI Express\* LSISAS1064E SAS/SAS RAID controller provides the necessary drive interface.

The following sections describe the features and connections found on both backplane options.

### 6.3.1 Backplane Feature Set

- Vitesse VSC410 enclosure management controller
  - Integrated v3000 32 bit RISC microprocessor core
  - External non-volatile Flash ROM
  - Four I<sup>2</sup>C interfaces
  - 44 GPIO pins
- Three drive control connectors supporting either SATA ports from the server board or SAS/SATA ports from an add-in card (passive backplane only)
- LSI SAS1064E SAS/SATA controller (active backplane only)
  - Four-port, 3.0 Gb/s SAS/SATA controller
  - Integrated Arm966 microprocessor core
  - Compliant with Fusion-MPT\* architecture
  - Supports Integrated RAID\* technology
  - X4 PCI Express\* interfaces
- Support for up to three hot-swap SAS/SATA drives
- Three hard drive activity/fault LEDs
- Temperature sensor
- FRU EEPROM
- 2x4 pin power connector
- Five 1x10 pin mini system fan connectors
- 1x4 pin USB floppy drive connector
- 2x25 pin control panel I/O connector
- 1x10 pin control panel USB connector
- Add-in card I<sup>2</sup>C connector

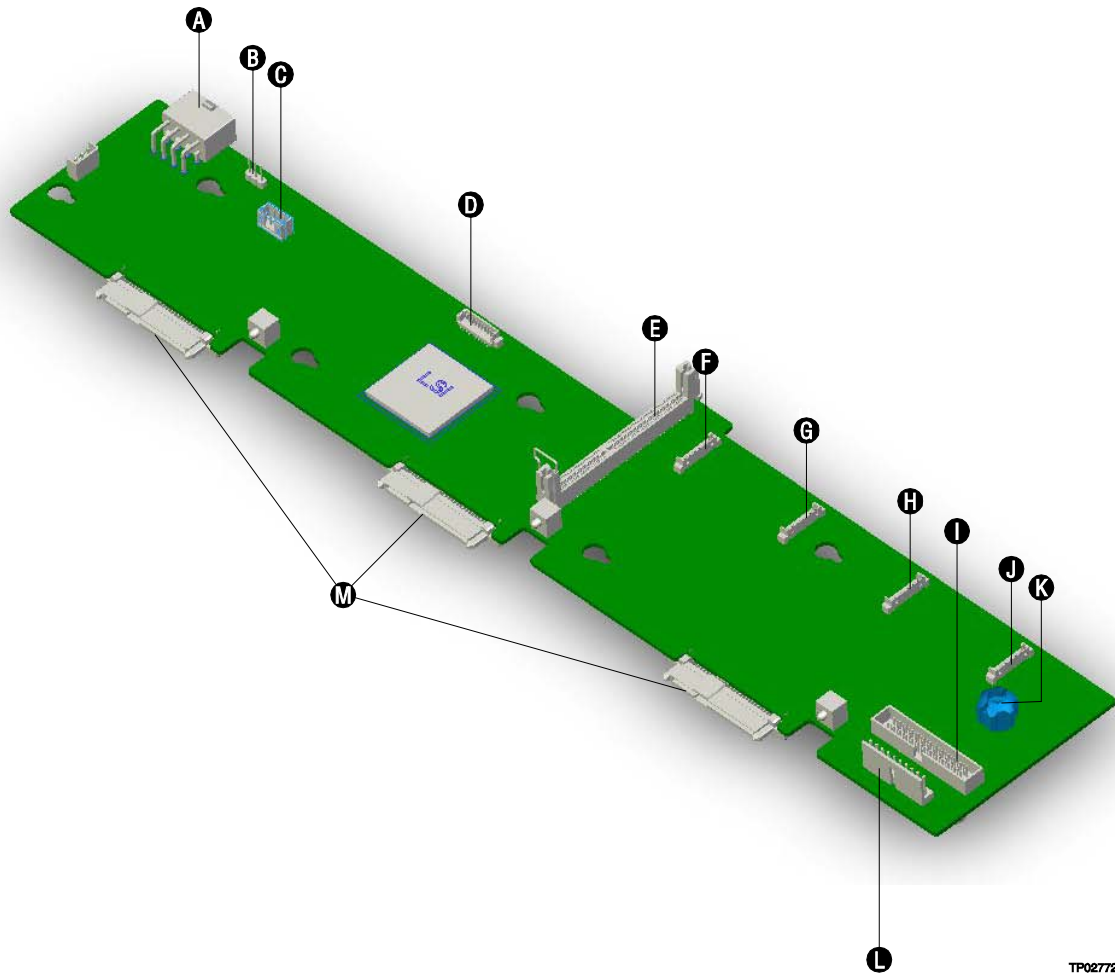
The following figures show the layout of major components and connectors for each backplane.



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A	Backplane Power	I	Fan 2 Power
B	USB Floppy Connector	J	Front Panel Connector
C	SATA 0	K	Fan 1 Power
D	SATA 1	L	Screw
E	Fan 5 Power	M	Front Panel USB
F	Bridge Board Connector	N	SATA 2
G	Fan 4 Power	O	Hot-swap SAS/SATA Connectors
H	Fan 3 Power		

**Figure 19. Hot-swap Passive SAS/SATA Backplane Layout**

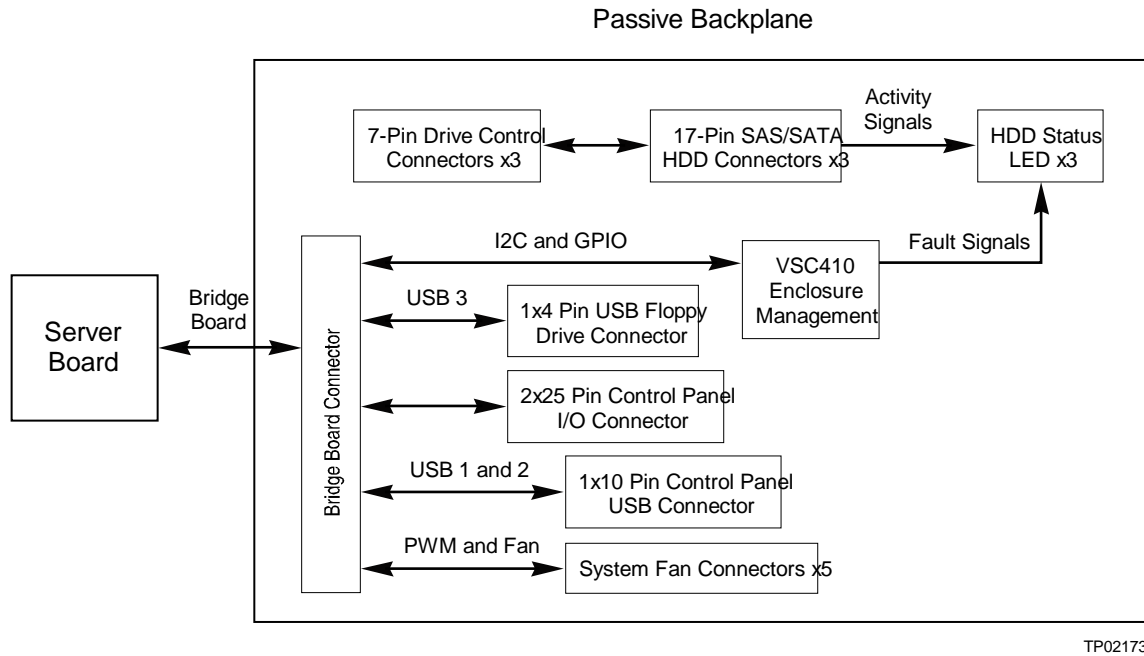


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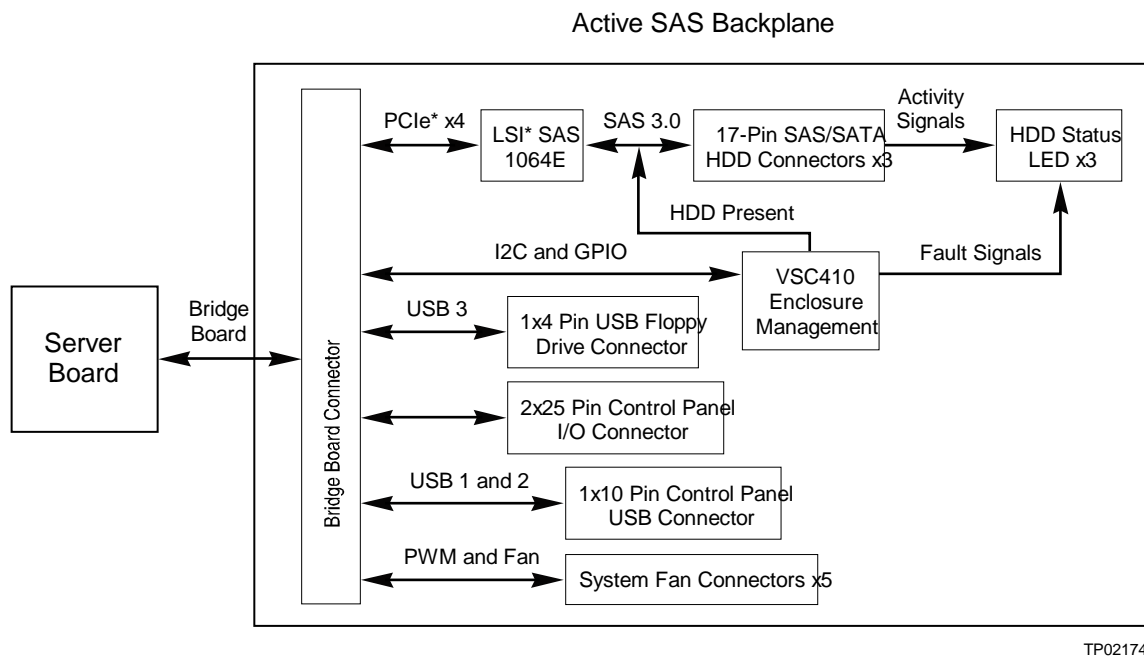
A	Backplane Power	H	Fan 2 Power
B	USB Floppy Connector	I	Front Panel Connector
C	SW RAID Activation Key	J	Fan 1 Power
D	Fan 5 Power	K	Screw
E	Bridge Board Connector	L	Front Panel USB
F	Fan 4 Power	M	Hot-swap SAS/SATA Connectors
G	Fan 3 Power		

**Figure 20. Active SAS Backplane Layout**

The following figures show the functional blocks for each backplane.



**Figure 21. Hot-swap Passive SAS/SATA Backplane Functional Diagram**



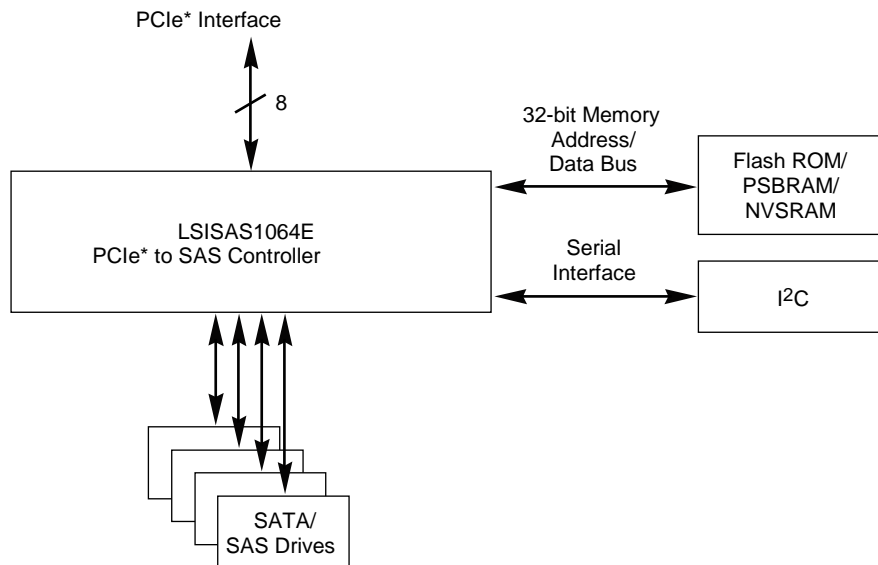
**Figure 22. Hot-swap Active SAS Backplane Functional Diagram**

### 6.3.1.1 Vitesse VSC410 Enclosure Management Controller

Both the active and passive backplanes support enclosure management using a Vitesse VSC410 management controller. The VSC410 drives the hard drive activity/fault LED, hard drive present signal, and controls hard drive power-up during system power-on. In addition, the VSC410 supports the IPMI specification by providing management data to the Integrated Baseboard Management Controller on the server board.

### 6.3.1.2 LSISAS1064E 3.0 Gb/s Serial Attached SCSI Controller

The LSISAS1064E serial attached SCSI (SAS) controller is integrated on to the active SAS backplane. The LSISAS1064E is a four-port, 3.0 Gb/s SAS/SATA controller that is compliant with the Fusion-MPT\* architecture. It provides an eight-lane PCI Express\* interface and supports Intel® Embedded RAID Technology II. The point-to-point interconnect feature of the PCI Express\* bus limits the electrical load on links, allowing increased transmission and reception frequencies. PCI Express\* transmission and reception data rates for each full-duplex interconnect is 2.5 Gb/s.



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**Figure 23. LSISAS1064E SAS Controller Functional Diagram**

PCI Express\* implements a switch-based technology to interconnect a large number of devices. Communication over the serial interconnect is accomplished using a packet-based communication protocol. Quality of Service (QOS) features provide differentiated transmission performance for different applications. Hot-plug/hot-swap support enables “always-on” systems. Enhanced error handling features, such as end-to-end CRC (ECRC) and Advanced Error Reporting, make PCI Express\* suitable for robust, high-end server applications. Hot-plug, power management, error handling, and interrupt signaling are accomplished using packet based messaging rather than sideband signals.

Each of the four SAS PHYs on the LSISAS1064E is capable of SAS/SATA link rates of 3.0 Gb/s and 1.5 Gb/s. The user can configure ports as wide or narrow. Narrow ports have one PHY per port. Wide ports have two, three, or four PHYs per port. Each port supports the SSP, SMP, STP, and SATA protocols.

The SAS interface uses the proven SCSI command set to ensure reliable data transfers, while providing the connectivity and flexibility of point-to-point serial data transfers. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements when compared to parallel SCSI. SAS controllers leverage an electrical and physical connection interface that is compatible with the Serial ATA technology.

The LSISAS1064E supports the Intel® Embedded RAID Technology II solution, which is a highly integrated, low-cost software RAID implementation capable of supporting the following RAID levels: 0, 1, and 10. RAID level 5 is supported with the addition of an optional RAID Activation Key (Product Order Code – AXXRAKSW5). The runtime operation of the integrated RAID solution is transparent to the operating system. A single firmware build supports all integrated RAID capabilities.

For non-RAID SAS configurations, the LSISAS1064E uses the Fusion-MPT\* (Message Passing Technology) architecture, which features a performance based message passing protocol that offloads the host CPU by completely managing all I/Os and minimizes system bus overhead by coalescing interrupts. The proven Fusion-MPT architecture requires only thin, easily developed device drivers that are independent of the I/O bus. LSI Corporation provides these device drivers.

## Features of the LSISAS1064E

### SAS and SSP features:

- Each PHY supports 3.0 Gb/s and 1.5 Gb/s SAS data transfers
- Provides a serial, point-to-point, enterprise-level storage interface
- Supports wide transfers consisting of 2, 3, or 4 PHYs
- Supports narrow ports consisting of a single PHY
- Transfers data using SCSI information units
- Compatible with SATA target devices

### SATA and STP Features:

- Supports 3.0 Gb/s and 1.5 Gb/s SATA data transfers
- Supports 3.0 Gb/s and 1.5 Gb/s STP data transfers

### Usability features:

- Simplifies cabling with point-to-point, serial architecture
- Provides drive spin-up sequencing control
- Provides up to two LED signals for each SAS/SATA PHY to indicate drive activity and faults
- Provides an SGPIO interface

### 6.3.2 LED Support

The backplanes support an activity/fault LED for each of the hard drive connectors. The LED illuminates green for activity or amber for a drive fault. The green activity LED is driven by the SAS/SATA hard disk drive directly. The amber fault LED is driven by the VSC410 management controller whenever a fault condition is detected. When the drive is used in a RAID configuration, the RAID controller has control over the fault LED and it may exhibit different behavior.

**Table 23. LED Function**

Status LED	Definition
Green	HDD Activity
Amber	HDD Fail

The activity LED functionality is controlled directly by the hard drives. This causes the LED to function differently between SAS and SATA drives. The expected operation is outlined in the following table.

**Table 24. Hard Drive Activity LED Functionality**

Condition	Drive Type	Behavior
Power on with no drive activity	SAS	Ready LED stays on
	SATA	Ready LED stays off
Power on with drive activity	SAS	Ready LED blinks off when processing a command
	SATA	Ready LED blinks on when processing a command
Power on and drive spun down	SAS	Ready LED stays off
	SATA	Ready LED stays off
Power on and drive spinning up	SAS	Ready LED blinks
	SATA	Ready LED stays off

### 6.3.3 Backplane Connector Definitions

The backplanes include several different connectors. This section defines the purpose and pin-out associated with each.

#### 6.3.3.1 Power Connector (Backplane to Power Supply Harness)

The backplane provides power to the three hard drive bays and the slimline drive bay. An 8-pin power cable is routed from the power supply and plugs into a 2x4 shrouded plastic PC power connector on the backplane. The following table shows the power connector pin-out:

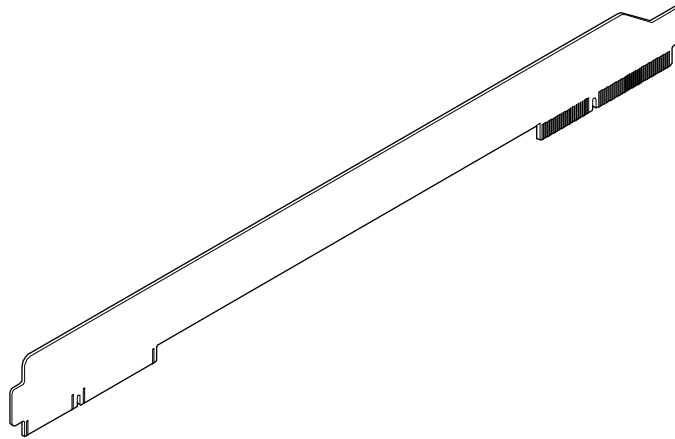


**Table 25. Backplane Power Connector Pin-out (J1B1)**

Pin	Name	Pin	Name
1	Ground	5	+12 V
2	Ground	6	+12 V
3	+5 V	7	5 VSB
4	+5 V	8	+3.3 V

### 6.3.3.2 Bridge Board Interface (Backplane to Server Board)

The backplanes provide a pathway for the control panel, PCI Express\*, USB, and other miscellaneous signals from the server board to connector interfaces on the backplane. The server board and backplane have matching 120-pin connectors which are attached using a PCB called the Bridge Board, as shown in the following figure. To ensure that the bridge board is held in place while the integrated platform is shipped or installed into the rack, the bridge board is secured using metal clips, which latch the bridge board to each of its connectors on the backplane and server board.



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**Figure 24. Bridge Board**

The following table provides the pin-out for the 120-pin connector:

**Table 26. Bridge Board Connector Pin-out (J5A1)**

Pin	Signal Name	Pin	Signal Name
1	GND	61	SMB_SENSOR_3V3SB_CLK_BUF
2	PE1_ESB_TX_DN3	62	SMB_SENSOR_3V3SB_DAT_BUF
3	PE1_ESB_TX_DP3	63	FM_BRIDGE_PRSNT_N
4	GND	64	GND
5	PE_WAKE_N	65	PE1_ESB_RX_DN_C3
6	GND	66	PE1_ESB_RX_DP_C3
7	PE1_ESB_TX_DN2	67	GND
8	PE1_ESB_TX_DP2	68	FAN_PRSNT6_N
9	GND	69	GND
10	FAN_PRSNT5_N	70	PE1_ESB_RX_DN_C2
11	GND	71	PE1_ESB_RX_DP_C2
12	PE1_ESB_TX_DN1	72	GND
13	PE1_ESB_TX_DP1	73	FAN_PRSNT4_N
14	GND	74	GND
15	RST_PS_PWRGD	75	PE1_ESB_RX_DN_C1
16	GND	76	PE1_ESB_RX_DP_C1
17	PE1_ESB_TX_DN0	77	GND
18	PE1_ESB_TX_DP0	78	RAID_KEY_PRES
19	GND	79	GND
20	FM_RAID_MODE	80	PE1_ESB_RX_DN_C0
21	GND	81	PE1_ESB_RX_DP_C0
22	CLK_IOP_DN	82	GND
23	CLK_IOP_DP	83	FAN_PRSNT1_N
24	GND	84	FAN_PRSNT3_N
25	SGPIO_DATAOUT1	85	FAN_PRSNT2_N
26	SGPIO_DATAOUT0	86	GND
27	SGPIO_LOAD	87	USB1_ESB_DP
28	SGPIO_CLOCK	88	USB1_ESB_DN
29	GND	89	GND
30	USB2_ESB_DP	90	USB1_ESB_OC_N
31	USB2_ESB_DN	91	USB0_ESB_OC_N
32	GND	92	GND
33	USB2_ESB_OC_N	93	USB0_ESB_DP
34	NIC1_LINK_LED_N	94	USB0_ESB_DN
35	NIC1_ACT_LED_N	95	GND
36	LED_STATUS_AMBER_R1	96	FP_NMI_BTN_N
37	NIC2_LINK_LED_N	97	BMC_RST_BTN_N
38	NIC2_ACT_LED_N	98	FP_PWR_BTN_N
39	LED_STATUS_GREEN_BUF_R1	99	FP_ID_SW_L
40	GND	100	GND

Pin	Signal Name	Pin	Signal Name
41	SMB_PBI_5VSB_DAT	101	SMB_IPMB_5VSB_DAT
42	SMB_PBI_5VSB_CLK	102	SMB_IPMB_5VSB_CLK
43	GND	103	GND
44	V_IO_HSYNC2_BUF_FP	104	LED_HDD_ACTIVITY_N
45	V_IO_VSYNC2_BUF_FP	105	LED_HDD_5V_A
46	GND	106	FP_PWR_LED_R_N
47	V_IO_BLUE_CONN_FP	107	FP_PWR_LED_3VSB
48	V_IO_GREEN_CONN_FP	108	FP_ID_LED_R1_N
49	V_IO_RED_CONN_FP	109	FM_SIO_TEMP_SENSOR
50	GND	110	LED_FAN3_FAULT
51	LED_FAN6_FAULT	111	LED_FAN2_FAULT
52	LED_FAN5_FAULT	112	LED_FAN1_FAULT
53	LED_FAN4_FAULT	113	FAN_PWM_CPU1
54	FAN_PWM3	114	GND
55	GND	115	FAN_PWM_CPU2
56	PCI_FAN_TACH10	116	PCI_FAN_TACH9
57	FAN_TACH8	117	FAN_TACH7
58	FAN_TACH6	118	FAN_TACH5
59	FAN_TACH4_H7	119	FAN_TACH3_H7
60	FAN_TACH2_H7	120	FAN_TACH1_H7

### 6.3.3.3 Control Panel I/O Interface Connector (Backplane to Control Panel)

The backplanes provide a pathway for control panel I/O signals from the bridge board connector to the control panel interface connector. The following table provides the pin-out for the 50-pin control panel I/O connector.

**Table 27. Backplane Control Panel Connector Pin-out (J9C1)**

Pin #	Description	Pin #	Description
1	V_IO_RED_CONN_FP	2	GND
3	V_IO_GREEN_CONN_FP	4	GND
5	V_IO_BLUE_CONN_FP	6	GND
7	V_IO_HSYNC_BUFF_FP_L	8	GND
9	V_IO_VSYNC_BUFF_FP_L	10	GND
11	VIDEO_IN_USE	12	FP_THERM_SENSOR
13	EMP_DTR2_L	14	EMP_DCD2_L
15	EMP_RTS2_L	16	EMP_CTS2_L
17	EMP_SIN2_L	18	EMP_SOUT2
19	EMP_DSR2_L	20	EMP_IN_USE
21	FP_NMI_BTN_L	22	GND
23	NIC1_ACT_LED_L	24	NIC1_LINK_LED_R_L
25	Reserved	26	FP_CHASSIS_INTRU
27	FP_ID_SW_L	28	SMB_PB1_5VSB_CLK
29	GND	30	SMB_PB1_5VSB_DAT
31	FP_RST_BTN_L	32	NIC2_ACT_LED_L
33	HDD_FAULT_LED_R_L	34	NIC2_LINK_LED_R_L
35	FP_PWR_BTN_L	36	FP_ID_LED_R_L

Pin #	Description	Pin #	Description
37	IPMB_I2C_5VSB_SCL	38	GND
39	IPMB_I2C_5VSB_SDA	40	HDD_LED_5V_A
41	FP_PWR_LED_R_N	42	FAULT_LED_5VSB_P
43	FP_PWR_LED_5VSB	44	LED_STATUS_AMBER_R1
45	RST_P6_PWRGOOD	46	LED_STATUS_GREEN_BUF_R1
47	HDD_LED_ACT_R_L	48	P5V
49	P5V_STBY	50	P5V_STBY

### 6.3.3.4 Control Panel USB Interface Connector (Backplane to Control Panel)

The backplanes provide a pathway for control panel USB signals from the bridge board connector to the control panel USB interface connector. The following table provides the pin-out for the 10-pin control panel USB connector.

**Table 28. 1x10 Pin Control Panel USB Connector Pin-out (J6B1)**

Pin#	Description
1	P5V_USB_P1
2	USB_P1N
3	USB_P1P
4	GROUND
5	GROUND
6	P5V_USB_P2
7	USB_P2N
8	USB_P2P
9	GROUND
10	GROUND

### 6.3.3.5 Hot-swap SATA/SAS Drive Connectors

The backplanes provide three hot-swap SATA/SAS connectors, which provide power and signals using a single docking connector. Each drive attaches to the backplane using one of these connectors.

**Table 29. SAS/SATA Hard Drive Connector Pin-out (J8N1, J6N1, J3N1)**

Pin#	Signal Description
S1	Ground
S2	SAS#_TX_DP (# = 0...2)
S3	SAS#_TX_DN (# = 0...2)
S4	Ground
S5	SAS#_RX_DN (# = 0...2)
S6	SAS#_RX_DP (# = 0...2)
S7	Ground
S8	Not Used
S9	Not Used
S10	Not Used
S11	Not Used
S12	Not Used
S13	Not Used
S14	Not Used
P1	Not Used
P2	Not Used
P3	Not Used

Pin#	Signal Description
P4	Ground
P5	Ground
P6	P3V3
P7	P5V
P8	P5V
P9	P5V
P10	Ground
P11	LED_SAS#_ACT_L (# = 0...2)
P12	Ground
P13	P12V
P14	P12V
P15	P12V
PTH0	Ground
PTY1	Ground

### 6.3.3.6 SATA/SAS Drive Control Connectors (Passive Backplane Only)

The passive backplane includes three drive control connectors. These are used to attach SATA/SAS cables from the backplane to either the SATA ports on the server board, or to SAS/SATA ports from an add-in card. Each drive control connector has the following pin-out.

**Table 30. SATA/SAS Drive Control Connector Pin-out (J3C1, J4B2, J4A1)**

Pin#	Description
1	GROUND
2	SATA # TX_DP (# = 0,1,2)
3	SATA # TX_DN (# = 0,1,2)
4	GROUND
5	SATA # RX_DN (# = 0,1,2)
6	SATA # RX_DP (# = 0,1,2)
7	GROUND

### 6.3.3.7 USB Floppy Drive Connector

With a slimline USB floppy drive installed (using the optional floppy drive kit) into either the slimline drive bay or in one of the hard drive bays, the USB floppy cable is routed from the drive to a 4-pin connector on the backplane. The following table provides the pin-out for the floppy drive connector.

**Table 31. 4-pin Floppy Connector Pin-out (J2B1)**

Pin#	Name
1	P5V_USB_P3
2	USBP3N
3	USBP3P
4	GROUND

### 6.3.3.8 System Fan Connectors

The backplanes provides a pathway for signals from the server board to monitor and control five system fans. A 1x10 mini connector is provided for each of the fans. The following table provides the pin-out for each connector.

**Table 32. System Fan Connector Pin-outs**

J9A5 - FAN_1		J8A1 - FAN_2		J7A1 - FAN_3	
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	FAN_TACH5	1	FAN_TACH6	1	FAN_TACH7
2	FAN_PWM_CPU1	2	FAN_PWM_CPU1	2	FAN_PWM_CPU2
3	P12V	3	P12V	3	P12V
4	P12V	4	P12V	4	P12V
5	FAN_TACH1_H7	5	FAN_TACH2_H7	5	FAN_TACH3_H7
6	GND	6	GND	6	GND
7	GND	7	GND	7	GND
8	FAN_PRSNT1_N	8	FAN_PRSNT2_N	8	FAN_PRSNT3_N
9	LED_FAN1_FAULT	9	LED_FAN2_FAULT	9	LED_FAN3_FAULT
10	LED_FAN1	10	LED_FAN2	10	LED_FAN3

J6A1 - FAN_4		J4B1 - FAN_5		
Pin	Signal Name	Pin	Signal Name	
1	FAN_TACH8	1	PCI_FAN_TACH10	
2	FAN_PWM_CPU2	2	FAN_PWM3	
3	P12V	3	P12V	
4	P12V	4	P12V	
5	FAN_TACH4_H7	5	FAN_TACH9	
6	GND	6	GND	
7	GND	7	GND	
8	FAN_PRSNT4_N	8	FAN_PRSNT5_N	
9	LED_FAN4_FAULT	9	LED_FAN5_FAULT	
10	LED_FAN4	10	LED_FAN5	

### 6.3.3.9 System Management Connectors

The backplanes provide connectors to interface with system management buses. The following tables define the pin-out for each of these connectors.

**Table 33. IPMB Connector Pin-out (J1C1)**

Pin #	Description
1	SMB_IPMB_5VSB_DAT
2	GND
3	SMB_IPMB_5VSB_CLK
4	SMB_PWR_IPMB_CONN

**Table 34. Add-in Card Connector Pin-out (J4B3 – Passive Only)**

Pin #	Description
1	SMB_3V3_SAS_SDA
2	GND
3	SMB_3V3_SAS_SCL

## 6.4 Enclosure Management Cabling for Passive Backplane

When using a rack-optimized system with a passive backplane and an add-in RAID card, you must install an additional 3-pin cable between the RAID card and the backplane to enable fault LED control. The cable is included with your integrated system or the backplane kit.

In Intel® Server System SR1600UR, the 3-pin white HBA connector on the passive backplane should be used.

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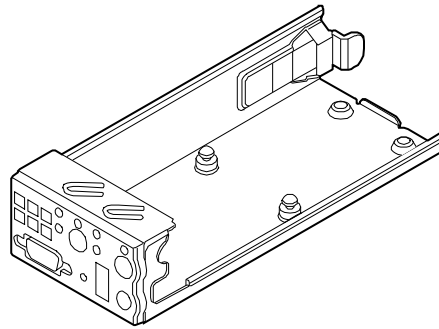
**IMPORTANT:** No cable is required for fault LED control when using the on-board SAS or SATA RAID controller. No cable is required for fault LED control when using an active backplane. In these configurations, connecting a 3-pin I<sup>2</sup>C cable to the backplane may cause unexpected system behavior.

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## 7. Standard Control Panel

The standard control panel supports several push buttons and status LEDs, along with USB and video ports to centralize system control, monitoring, and accessibility within a common compact design.

The control panel assembly comes pre-assembled and is modular in design. The control panel assembly module slides into a predefined slot on the front of the chassis. Once installed, communication to the server board can be achieved by either attaching a 50-pin cable to a hot-swap backplane, or if cabled drives are used, can be connected directly to the server board. In addition, a USB cable is routed to a USB port on the server board.

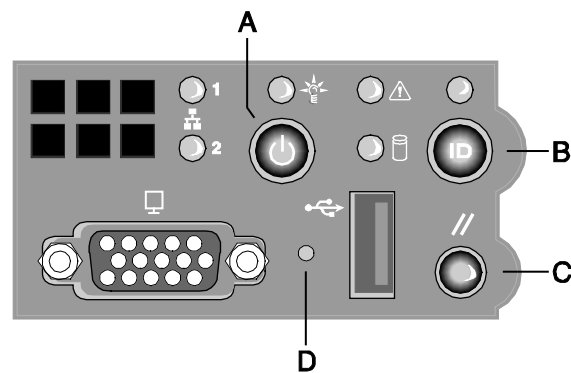


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Figure 25. Standard Control Panel Assembly Module

### 7.1 Control Panel Buttons

The standard control panel assembly houses several system control buttons. The function of each control button is listed in the following table.



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Figure 26. Control Panel Buttons

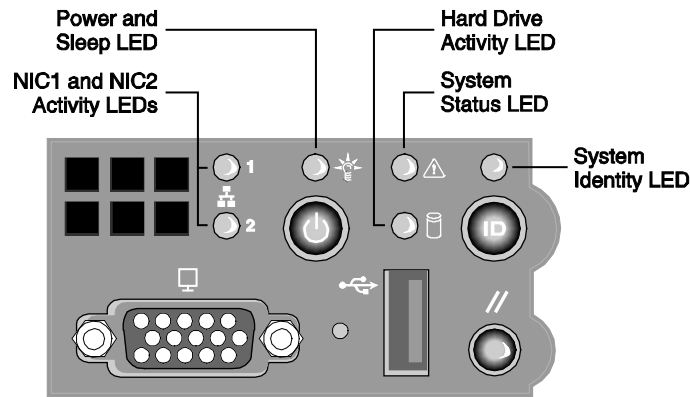


**Table 35. Control Button and Intrusion Switch Functions**

Reference	Feature	Function
A	Power/Sleep Button	Toggles the system power on/off. This button also functions as a Sleep button if enabled by an ACPI-compliant operating system.
B	ID Button	Toggles the front panel ID LED and the server board ID LED on/off. The server board ID LED is visible through the rear of the chassis and allows for server identification and location when working behind a rack of servers.
C	Reset Button	Reboots and initializes the system.
D	NMI Button	When the NMI button is pressed with a paper clip or pin, it puts the server in a halt state for diagnostic purposes and allows the issuance of a non-maskable interrupt. After issuing the interrupt, a memory download can be performed to determine the cause of the problem.

## 7.2 Control Panel LED Indicators

The control panel houses six LEDs to display the system’s operating state. The LEDs are visible with or without the front bezel.



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**Figure 27. Control Panel LED Indicators**

The following table identifies each LED and describes its functionality.

**Table 36. Control Panel LED Functions**

LED	Color	State	Description
NIC1/NIC2 Activity	Green	On	NIC Link
		Blink <sup>1,4</sup>	NIC Activity
Power/Sleep (on standby power)	Green	On	Legacy power-on/ACPI S0 state
	Green	Blink <sup>1,4</sup>	Sleep/ACPI S1 state
	Off	Off	Power-off/ACPI S4 or S5 state
System Status (on standby power)	Green	On	Running/normal operation
		Blink <sup>1,2</sup>	Degraded

LED	Color	State	Description
	Amber	On	Critical or non-recoverable condition.
		Blink <sup>1,2</sup>	Non-critical condition.
	Off	Off	POST/system stop.
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off <sup>3</sup>	No hard disk activity
System Identification	Blue	On	Identify active via command or button.
	Off	Off	No Identification.

**Notes:**

1. Blink rate is ~1 Hz at 50% duty cycle.
2. The amber status takes precedence over the green status. When the amber LED is on or blinking, the green LED is off.
3. Off when the system is powered off (S4/S5) or in a sleep state (S1).
4. The power LED sleep indication is maintained on standby by the chipset. If the system is powered down without going through the BIOS, the LED state in effect at the time of power-off is restored when the system is powered on until the BIOS clears it. If the system is not powered down normally, it is possible that the Power LED is blinking while the system status LED is off. This is due to a failure or configuration change that prevents the BIOS from running.

The current limiting resistors for the power LED, the system fault LED, and the NIC LEDs are located on the Intel® Server Board S5520UR.

## 7.2.1 Power/Sleep LED

**Table 37. SSI Power LED Operation**

State	Power Mode	LED	Description
Power-off	Non-ACPI	Off	System power is off, and the BIOS has not initialized the chipset.
Power-on	Non-ACPI	On	System power is on, but the BIOS has not yet initialized the chipset.
S5	ACPI	Off	Mechanical is off, and the operating system has not saved any context to the hard disk.
S4	ACPI	Off	Mechanical is off. The operating system has saved context to the hard disk.
S3-S1	ACPI	Slow blink <sup>1</sup>	DC power is still on. The operating system has saved context and gone into a level of low-power state.
S0	ACPI	Steady on	System and the operating system are up and running.

**Note:**

1. Blink rate is ~ 1 Hz at 50% duty cycle.

## 7.2.2 System Status LED

**Table 38. Control Panel LED Operation**

Color	State	Criticality	Description
Off	N/A	Not ready	AC power off
Green	Solid on	Ok	System booted and ready
Green	Blink	Degraded	System degraded <ul style="list-style-type: none"> <li>▪ Unable to use all of the installed memory (more than one DIMM installed).</li> <li>▪ Correctable errors over a threshold of 10 and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spare DIMMs indicating a redundancy lost condition. The corresponding DIMM LED should light</li> </ul>

Color	State	Criticality	Description
			<p>up.</p> <ul style="list-style-type: none"> <li>▪ In a mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by the second bullet above.</li> <li>▪ Redundancy loss such as power supply or fan. This does not apply to non-redundant subsystems.</li> <li>▪ PCI Express* link errors.</li> <li>▪ CPU failure/disabled – if there are two processors and one of them fails.</li> <li>▪ Fan alarm – Fan failure. Number of operational fans should be more than the minimum number needed to cool the system.</li> <li>▪ Non-critical threshold crossed – temperature and voltage.</li> </ul>
Amber	Blink	Non-critical	<p>Non-fatal alarm – system is likely to fail.</p> <ul style="list-style-type: none"> <li>▪ Critical voltage threshold crossed.</li> <li>▪ VRD hot asserted.</li> <li>▪ Minimum number of fans to cool the system are not present or have failed.</li> <li>▪ In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window.</li> </ul>
Amber	Solid on	Critical, non-recoverable	<p>Fatal alarm – system has failed or shut down.</p> <ul style="list-style-type: none"> <li>▪ DIMM failure when there is one DIMM present and no good memory is present.</li> <li>▪ Run-time memory uncorrectable error in non-redundant mode.</li> <li>▪ IERR signal asserted.</li> <li>▪ Processor 1 missing.</li> <li>▪ Temperature (e.g., CPU ThermTrip, memory TempHi, critical threshold crossed).</li> <li>▪ No power good – power fault.</li> <li>▪ Processor configuration error (e.g., processor stepping mismatch).</li> </ul>

### 7.2.3 Drive Activity LED

The drive activity LED on the front panel indicates drive activity from the on-board hard disk controllers. The Intel® Server Board S5520UR also provides a header giving access to this LED for add-in controllers.

### 7.2.4 System Identification LED

The blue system identification LED is used to help identify a system for servicing. This is especially useful when the system is installed in a high-density rack or cabinet that is populated with several similar systems.

The blue “System ID” LED can be illuminated using one of the following mechanisms.

- By pressing the System ID Button on the system control panel, the ID LED displays a solid blue color until the button is pressed again.

- By issuing the appropriate hex IPMI “Chassis Identify” value, the ID LED either blinks blue for 15 seconds and turns off or blinks indefinitely until the appropriate hex IPMI chassis identify value is issued to turn it off.

### 7.3 Control Panel Connectors

The control panel has two external I/O connectors:

- One USB port
- One VGA video port

The following tables provide the pin-outs for each connector.

**Table 39. External USB Connectors (J1B1)**

Pin #	Description
1	PWR_FP_USB2
2	USB_DN2_FP_R
3	USB_DP2_FP_R
4	GND
5	GND
6	GND
7	GND

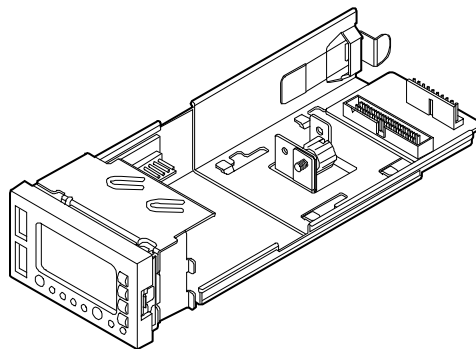
**Table 40. Video Connector (J1A1)**

Description	Pin #	Pin #	Description
VGA_RED	1	9	GND
VGA_GREEN	2	10	GND
VGA_BLUE	3	11	Unused
Unused	4	12	VGA_DDCDAT
GND	5	13	VGA_HSYNC_L
GND	6	14	VGA_VSYNC_L
VGA_INUSE_L	7	15	VGA_DDCCLK
GND	8	16	GND
		17	GND

If a monitor is connected to the front panel video connector, the rear video port on the server board is disabled and the front panel video is enabled. The video source is the same for both connectors and is switched between the two, with the rear video having priority over the control panel. This provides for easy front accessibility to the server.

## 8. Intel® Local Control Panel

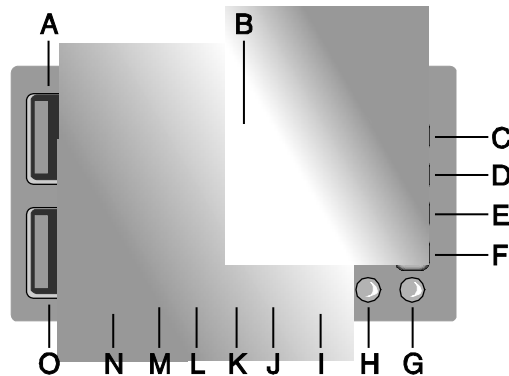
The Intel® Local Control Panel (Product Order Code – ADWLCDBEZEL) utilizes a combination of control buttons, LEDs, and LCD display to provide system accessibility, monitoring, and control functions. The control panel assembly is pre-assembled and is modular in design. The module slides into a slot on the front of the chassis and is designed so that it can be adjusted for use with or without an outer front bezel.



TP02180

**Figure 28. Intel® Local Control Panel Assembly Module**

The following diagram provides an overview of the control panel features.



TP02181

A	USB 1.1 Port	I	Power/Sleep Button
B	LCD Display	J	System Status LED
C	Menu Control Button, Scroll up	K	NIC 2 Activity LED
D	Menu Control Button, Scroll down	L	NIC 1 Activity LED
E	Menu Control Button, Scroll left	M	Hard Drive Activity LED
F	Menu Control Button, Enter	N	System Reset Button
G	System ID LED	O	USB 1.1 Port
H	Power/Sleep LED		

**Figure 29. Intel® Local Control Panel Overview**

## 8.1 LED Functionality

The following table identifies each LED and describes its functionality.

**Table 41. Control Panel LED Functions**

LED	Color	State	Description
NIC1/NIC2 Activity	Green	On	NIC Link
	Green	Blink	NIC Activity
Power/Sleep (on standby power)	Green	On	Legacy power-on/ACPI S0 state
		Blink <sup>1,4</sup>	Sleep/ACPI S1 state
	Off	Off	Power-off/ACPI S4 or S5 state
System Status (on standby power)	Green	On	Running/normal operation
		Blink <sup>1,2</sup>	Degraded
	Amber	On	Critical or non-recoverable condition.
		Blink <sup>1,2</sup>	Non-critical condition.
Off	Off	POST/system stop.	
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off <sup>3</sup>	No hard disk activity
System Identification	Blue	On	Identify active via command or button.
	Off	Off	No Identification.

**Notes:**

1. Blink rate is ~1 Hz at 50% duty cycle.
2. The amber status takes precedence over the green status. When the amber LED is on or blinking, the green LED is off.
3. Off when the system is powered off (S4/S5) or in a sleep state (S1).
4. The power LED sleep indication is maintained on standby by the chipset. If the system is powered down without going through the BIOS, the LED state in effect at the time of power-off is restored when the system is powered on until the BIOS clears it. If the system is not powered down normally, it is possible that the Power LED is blinking while the system status LED is off. This is due to a failure or configuration change that prevents the BIOS from running.

The current limiting resistors for the power LED, the system fault LED, and the NIC LEDs are located on the Intel® Server Board S5520UR.

### 8.1.1 Power/Sleep LED

**Table 42. SSI Power LED Operation**

State	Power Mode	LED	Description
Power-off	Non-ACPI	Off	System power is off, and the BIOS has not initialized the chipset.
Power-on	Non-ACPI	On	System power is on, but the BIOS has not yet initialized the chipset.
S5	ACPI	Off	Mechanical is off, and the operating system has not saved any context to the hard disk.
S4	ACPI	Off	Mechanical is off, and the operating system has saved context to the hard disk.
S3-S1	ACPI	Slow blink <sup>1</sup>	DC power is still on, and the operating system has saved context and gone into a level of low-power state.
S0	ACPI	Steady on	System and the operating system are up and running.

**Note:**

1. Blink rate is ~ 1 Hz at 50% duty cycle.

## 8.1.2 System Status LED

**Table 43. Control Panel LED Operation**

Color	State	Criticality	Description
Off	N/A	Not ready	AC power off
Green	Solid on	Ok	System booted and ready
Green	Blink	Degraded	<p>System degraded</p> <ul style="list-style-type: none"> <li>▪ Unable to use all of the installed memory (more than one DIMM installed).</li> <li>▪ Correctable errors over a threshold of ten and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spare DIMMs indicating a redundancy lost condition. The corresponding DIMM LED should light up.</li> <li>▪ In a mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by the second bullet above.</li> <li>▪ Redundancy loss such as power supply or fan. This does not apply to non-redundant subsystems.</li> <li>▪ PCI Express* link errors.</li> <li>▪ CPU failure/disabled – if there are two processors and one of them fails.</li> <li>▪ Fan alarm – Fan failure. Number of operational fans should be more than the minimum number needed to cool the system.</li> <li>▪ Non-critical threshold crossed – temperature and voltage.</li> </ul>
Amber	Blink	Non-critical	<p>Non-fatal alarm – system is likely to fail.</p> <ul style="list-style-type: none"> <li>▪ Critical voltage threshold crossed.</li> <li>▪ VRD hot asserted.</li> <li>▪ Minimum number of fans to cool the system are not present or have failed.</li> <li>▪ In non-sparing and non-mirroring mode, if the threshold of ten correctable errors is crossed within the window.</li> </ul>
Amber	Solid on	Critical, non-recoverable	<p>Fatal alarm – system has failed or shut down.</p> <ul style="list-style-type: none"> <li>▪ DIMM failure when there is one DIMM present and no good memory is present.</li> <li>▪ Run-time memory uncorrectable error in non-redundant mode.</li> <li>▪ IERR signal asserted.</li> <li>▪ Processor 1 missing.</li> <li>▪ Temperature (e.g., CPU ThermTrip, memory TempHi, critical threshold crossed).</li> <li>▪ No power good – power fault.</li> <li>▪ Processor configuration error (e.g., processor stepping mismatch).</li> </ul>

## 8.1.3 Drive Activity LED

The drive activity LED on the front panel indicates drive activity from the on-board hard disk controllers. The Intel® Server Board S5520UR also provides a header giving access to this LED for add-in controllers.

### 8.1.4 System Identification LED

The blue system identification LED is used to help identify a system for servicing. This is especially useful when the system is installed in a high-density rack or cabinet that is populated with several similar systems.

The blue “System ID” LED can be illuminated using one of the following mechanisms.

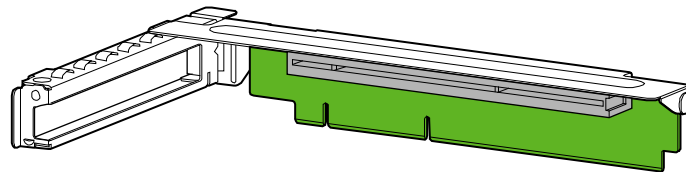
- By pressing the system ID button on the system control panel, the ID LED displays a solid blue color until the button is pressed again.
- By issuing the appropriate hex IPMI “Chassis Identify” value, the ID LED either blinks blue for 15 seconds and turns off or blinks indefinitely until the appropriate hex IPMI chassis identify value is issued to turn it off.



## 9. PCI Riser Cards and Assembly

The Intel® Server System SR1600UR provides one x16 PCI Express\* Gen 2 PCI riser slot capable of supporting one full-length full-height PCI Express\* add-in card.

When re-inserting the riser assembly into the chassis, tabs on the back of the assembly should be aligned with slots on the back edge of the chassis. The tabs fit into the slots securing the riser assembly to the chassis when the top cover is in place. For additional information, see the *Intel® Server System SR1600UR Service Guide*.



AF002207

Figure 30. PCI Riser Card Assembly

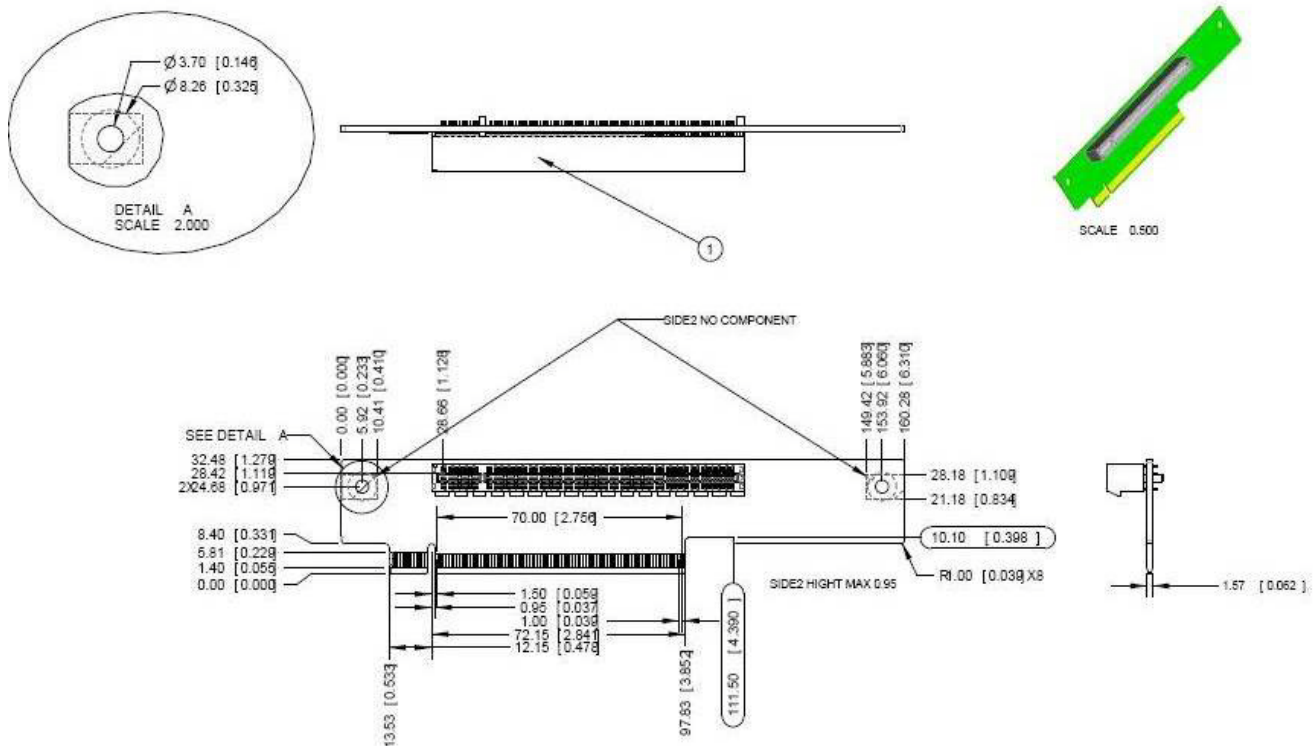


Figure 31. 1U Full-height PCI Express\* Riser Card Mechanical Drawing

## 10. Environmental Specifications

### 10.1 System Level Environmental Limits

The following table defines the system level operating and non-operating environmental limits.

**Table 44. System Environmental Limits Summary**

Parameter	Limits
Operating Temperature	+10°C to +35°C with the maximum rate of change not to exceed 10°C per hour
Non-Operating Temperature	-40°C to +70°C
Non-Operating Humidity	90%, non-condensing at 35°C
Acoustic noise	Sound power: 7.0 BA in an idle state at typical office ambient temperature. (23 +/- 2 degrees C)
Shock, operating	Half sine, 2 g peak, 11 milliseconds
Shock, unpackaged	Trapezoidal, 25 g, velocity change 136 inches/second ( $\geq 40$ lbs to $< 80$ lbs)
Shock, packaged	Non-palletized free fall in height 24 inches ( $\geq 40$ lbs to $< 80$ lbs)
Vibration, unpackaged	5 Hz to 500 Hz, 2.20 g RMS random
Shock, operating	Half sine, 2 g peak, 11 milliseconds
ESD	+/-15 KV except I/O port +/- 8 KV per Intel® Environmental test specification
System Cooling Requirement in BTU/Hr	2550 BTU/hour
Operating Temperature	+10°C to +35°C with the maximum rate of change not to exceed 10°C per hour

### 10.2 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 30 minutes, including diagnosis of the system problem. To meet this goal, the system enclosure and hardware have been designed to minimize the MTTR.

The following table defines the maximum time needed by a trained field service technician to perform the listed system maintenance procedures, after diagnosing the system and identifying the failed component.

**Table 45. Time Estimate for System Maintenance Procedures**

Activity	Time Estimate
Remove cover	1 min
Remove and replace hard disk drive	1 min
Remove and replace power supply module	5 min
Remove and replace system fan	3 min
Remove and replace backplane board	7 min
Remove and replace control panel module	2 min
Remove and replace server board	15 min

## 10.3 Replacing the Backup Battery

The lithium battery on the server board powers the real time clock (RTC) for up to 10 years in the absence of power. When the battery starts to weaken, it loses voltage, and the server settings stored in CMOS RAM in the RTC (e.g., the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.



### WARNING

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**Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.**



### ADVARSEL!

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**Lithiumbatteri - Eksplosjonsfare ved fejløgt håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.**



### ADVARSEL

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**Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.**



### WARNING

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**Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.**



### VAROITUS

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**Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.**

# 11. Regulatory and Certification Information

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## WARNING

To ensure regulatory compliance, you must adhere to the assembly instructions in this document to ensure and maintain compliance with existing product certifications and approvals. Use only the described, regulated components specified in this document. Use of other products/components will void the UL listing and other regulatory approvals of the product and will most likely result in noncompliance with product regulations in the region(s) in which the product is sold.

To help ensure EMC compliance with your local regional rules and regulations, before computer integration, make sure that the chassis, power supply, and other modules have passed EMC testing using a server board with a microprocessor from the same family (or higher) and operating at the same (or higher) speed as the microprocessor used on this server board. The final configuration of your end system product may require additional EMC compliance testing. For more information please contact your local Intel® Representative.

This is an FCC Class A device. Integration of it into a Class B chassis does not result in a Class B device.

## 11.1 Product Regulatory Compliance

The server chassis product, when correctly integrated per this document, complies with the following safety and electromagnetic compatibility (EMC) regulations.

**Intended Application** – This product was evaluated as Information Technology Equipment (ITE), which may be installed in 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.

### 11.1.1 Product Safety Compliance

- UL60950 – CSA 60950(USA/Canada)
- EN60950 (Europe)
- IEC60950 (International)
- CB Certificate & Report, IEC60950 (report to include all country national deviations)
- GS Certification (Germany)
- GOST R 50377-92 - Certification (Russia)
- Belarus Certification (Belarus)
- Ukraine Certification (Ukraine)
- CE - Low Voltage Directive 73/23/EEE (Europe)
- IRAM Certification (Argentina)

### 11.1.2 Product EMC Compliance – Class A Compliance

- FCC/ICES-003 - Emissions (USA/Canada) Verification
- 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 Certification (Belarus)
- Ukraine Certification (Ukraine)
- KCC Certification (EMI) (Korea)

### 11.1.3 Product Ecology Compliance

Intel® has a system in place to restrict the use of banned substances in accordance with world wide regulatory requirements. A Material Declaration Data Sheet is available for Intel® products. For more reference on material restrictions and compliance you can view Intel®'s Environmental Product Content Specification at <http://supplier.intel.com/ehs/environmental.htm>.

- Europe - European Directive 2002/95/EC - Restriction of Hazardous Substances (RoHS) Threshold limits and banned substances are noted below.  
Quantity limit of 0.1% by mass (1000 PPM) for:  
Lead, Mercury, Hexavalent Chromium, Polybrominated Biphenyls Diphenyl Ethers (PBB/PBDE)  
Quantity limit of 0.01% by mass (100 PPM) for:  
Cadmium
- California Code of Regulations, Title 22, Division 4.5, Chapter 33: Best Management Practices for Perchlorate Materials
- China – Restriction of Hazardous Substances (China RoHS)
- WEEE Directive (Europe)
- Packaging Directive (Europe)





### 11.1.4 Certifications/Registrations/Declarations










- NRTL Certification (US/Canada)
- CE Declaration of Conformity (CENELEC Europe)
- FCC/ICES-003 Class A Attestation (USA/Canada)
- VCCI Certification (Japan)
- C-Tick Declaration of Conformity (Australia)


- MED Declaration of Conformity (New Zealand)
- BSMI Certification (Taiwan)
- GOST R Certification/Certification (Russia)
- Belarus Certification/Certification (Belarus)
- KCC Certification (Korea)
- IRAM Certification (Argentina)
- Ecology Declaration (International)
- China RoHS Environmental Friendly Use Period
- Packaging & Product Recycling Marks

## 11.2 Product Regulatory Compliance Markings

This Intel® Server Chassis product is provided with the following regulatory and safety markings. In the event there is no room for a marking(s) on the chassis, the information is provided here in this document.

Regulatory Compliance	Country	Marking
cULus Listing Marks	USA/Canada	
GS Mark	Germany	
CE Mark	Europe	
FCC Marking (Class A)	USA	This device complies with Part 15 of the FCC Rules. Operation of this device 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. Manufactured by Intel Corporation
EMC Marking (Class A)	Canada	CANADA ICES-003 CLASS A CANADA NMB-003 CLASSE A
VCCI Marking (Class A)	Japan	この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。VCCI-A
BSMI Certification Number & Class A Warning	Taiwan	

Regulatory Compliance	Country	Marking	
		<p><b>警告使用者：</b>                      這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策</p>	
GOST R Marking	Russia		
KCC Mark (Korean Communications Commission)	Korea		
Belarus Safety Compliance Mark	Belarus		
Waste of Electronic and Electrical Equipment Recycling Mark	Europe		
China Restriction of Hazardous Substance Environmental Friendly Use Period Mark	China		
China Recycling Mark	China		
Recycling Marks	International		
Battery Perchlorate Warning Information	California	<p>Perchlorate Material – Special handling may apply. See <a href="http://www.dtsc.ca.gov/hazardouswaste/perchlorate">www.dtsc.ca.gov/hazardouswaste/perchlorate</a>                      This notice is required by California Code of Regulations, Title 22, Division 4.5, and Chapter 33: Best Management Practices for Perchlorate Materials. This product may include a battery which contains Perchlorate material.</p>	
Safety	Multiple Power Cord Marking	 <p>This unit has more than one power supply cord. To reduce the risk of electrical shock, disconnect (2) two power supply cords before servicing.                      Simplified Chinese:                      注意：</p>	

Regulatory Compliance	Country	Marking
		<p>本设备包括多条电源系统电缆。为避免遭受电击，在进行维修之前应断开两（2）条电源系统电缆。</p> <p>Traditional Chinese: 注意： 本設備包括多條電源系統電纜。為避免遭受電擊，在進行維修之前應斷開兩（2）條電源系統電纜。</p> <p>German: Dieses Geräte hat mehr als ein Stromkabel. Um eine Gefahr des elektrischen Schlages zu verringern trennen sie beide (2) Stromkabeln bevor Instandhaltung.</p>
Nordic Countries	Connection to Proper Ground Outlet	<p>“WARNING:” “Apparaten skall anslutas till jordat uttag, när den ansluts till ett nätverk.” “Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan.” “Connect only to a properly earth grounded outlet.”</p>
Safety	Stand-by power	

### 11.3 Rack Mount Installation Guidelines

**Anchor the equipment rack:** The equipment rack must be anchored to an unmovable support to prevent it from falling over when one or more servers are extended in front of the rack on slides. You must also consider the weight of any other device installed in the rack. A crush hazard exists should the rack tilt forward which could cause serious injury.

**Temperature:** The temperature, in which the server operates when installed in an equipment rack, must not go below 5 °C (41 °F) or rise above 40 °C (104 °F). Extreme fluctuations in temperature can cause a variety of problems in your server.

**Ventilation:** The equipment rack must provide sufficient airflow to the front of the server to maintain proper cooling. The rack must also include ventilation sufficient to exhaust a maximum of 1023 BTU's (British Thermal Units) per hour for the server. The rack selected and the ventilation provided must be suitable to the environment in which the server will be used.

#### **If AC power supplies are installed:**

**Mains AC power disconnection:** The AC power cord(s) is considered the mains disconnect for the server and must be readily accessible when installed. If the individual server power cord(s) will not be readily accessible for disconnection then you are responsible for installing an AC power disconnect for the entire rack unit. This main disconnect must be readily accessible, and it must be labeled as controlling power to the entire rack, not just to the server(s).

**Grounding the rack installation:** To avoid the potential for an electrical shock hazard, you must include a third wire safety ground conductor with the rack installation. If the server power cord is plugged into an AC outlet that is part of the rack, then you must provide proper grounding for the rack itself. If the server power cord is plugged into a wall AC outlet, the safety ground conductor in the power cord provides proper grounding only for the server. You must provide additional, proper grounding for the rack and other devices installed in it.



Over-current protection: The server is designed for an AC line voltage source with up to 20 amperes of over-current protection per cord feed. If the power system for the equipment rack is installed on a branch circuit with more than 20 amperes of protection, you must provide supplemental protection for the server.

**If DC power supplies are installed:**

Connection with a DC (Direct Current) source should only be performed by trained service personnel. The server with DC input is to be installed in a Restricted Access Location in accordance with articles 110-16, 110-17, and 110-18 of the National Electric Code, ANSI/NFPA 70. The DC source must be electrically isolated by double or reinforced insulation from any hazardous AC source.

Main DC power disconnect: You are responsible for installing a properly rated DC power disconnect for the server system. This mains disconnect must be readily accessible, and it must be labeled as controlling power to the server. The circuit breaker of a centralized DC power system may be used as a disconnect device when easily accessible and should be rated no more than 10 amps.

Grounding the server: To avoid the potential for an electrical shock hazard, you must reliably connect an earth grounding conductor to the server. The earth grounding conductor must be a minimum 18AWG connected to the earth ground stud(s) on the rear of the server. The safety ground conductor should be connected to the chassis stud with a Listed closed two-hole crimp terminal having 5/8 inch pitch. The nuts on the chassis earth ground studs should be installed with a 10 in/lbs torque. The safety ground conductor provides proper grounding only for the server. You must provide additional, proper grounding for the rack and other devices installed in it.

Over-current protection: Over-current protection circuit breakers must be provided as part of each host equipment rack and must be incorporated in the field wiring between the DC source and the server. The branch circuit protection shall be rated minimum 75Vdc, 10 A maximum per feed pair. If the DC power system for the equipment rack is installed with more than 10 amperes of protection, you must provide supplemental protection for the server.

## 11.4 Power Cord Usage Guidelines



### WARNING

Do not attempt to modify or use an AC power cord set that is not the exact type required. You must use a power cord set that meets the following criteria:

- Rating: In the U.S. and Canada, cords must be UL (Underwriters Laboratories, Inc.) Listed/CSA (Canadian Standards Organization) Certified type SJT, 18-3 AWG (American Wire Gauge). Outside of the U.S. and Canada, cords must be flexible harmonized (<HAR>) or VDE (Verband Deutscher Elektrotechniker, German Institute of Electrical Engineers) certified cord with 3 x 0.75 mm conductors rated 250 VAC (Volts Alternating Current).
- Connector, wall outlet end: Cords must be terminated in grounding-type male plug designed for use in your region. The connector must have certification marks showing certification by an agency acceptable in your region and for U.S. must be Listed and rated 125% of overall current rating of the server.
- Connector, server end: The connectors that plug into the AC receptacle on the server must be an approved IEC (International Electro-technical Commission) 320, sheet C13, type female connector.
- Cord length and flexibility: Cords must be less than 4.5 meters (14.76 feet) long.

## 11.5 Electromagnetic Compatibility Notices

### 11.5.1 FCC Verification Statement (USA)

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 Corporation  
5200 N.E. Elam Young Parkway  
Hillsboro, OR 97124-6497  
1-800-628-8686*

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 instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television 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 the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment. The customer is responsible for ensuring compliance of the modified product.

Only peripherals (computer input/output devices, terminals, printers, etc.) that comply with FCC Class A or B limits may be attached to this computer product. Operation with noncompliant peripherals is likely to result in interference to radio and TV reception.

All cables used to connect to peripherals must be shielded and grounded. Operation with cables, connected to peripherals that are not shielded and grounded may result in interference to radio and TV reception.

### 11.5.2 ICES-003 (Canada)

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Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe Aprescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadian des Communications.

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#### English translation of the notice above:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Canadian Department of Communications.

### 11.5.3 Europe (CE Declaration of Conformity)

This product has been tested in accordance too, and complies with the Low Voltage Directive (73/23/EEC) and EMC Directive (89/336/EEC). The product has been marked with the CE Mark to illustrate its compliance.

### 11.5.4 VCCI (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

#### English translation of the notice above:

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) from Information Technology Equipment. If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

### 11.5.5 BSMI (Taiwan)

The BSMI Certification Marking and EMC warning is located on the outside rear area of the product.

警告使用者：  
這是甲類的資訊產品，在居住的環境中使用時，  
可能會造成射頻干擾，在這種情況下，使用者會  
被要求採取某些適當的對策

### 11.5.6 KCC (Korea)

Following is the KCC certification information for Korea.



1. 기기의 명칭(모델명) :
2. 인증번호 :
3. 인증받은 자의 상호 :
4. 제조년월일:
5. 제조자/제조국가 :

#### English translation of the notice above:

1. Type of Equipment (Model Name): On Certification and Product
2. Certification No.: On KCC certificate. Obtain certificate from local Intel® representative
3. Name of Certification Recipient: Intel Corporation
4. Date of Manufacturer: Refer to date code on product
5. Manufacturer/Nation: Intel Corporation/Refer to country of origin marked on product

## 11.6 Regulated Specified Components

To maintain the UL listing and compliance to other regulatory certifications and/or declarations, the following regulated components must be used and conditions adhered to. Interchanging or use of other component will void the UL listing and other product certifications and approvals.

Updated product information for configurations can be found on the Intel® Server Builder Web site at the following URL:

<http://channel.intel.com/go/serverbuilder>

If you do not have access to Intel®'s Web address, please contact your local Intel® representative.

- **Server chassis** (base chassis is provided with power supply and fans) — UL listed.
- **Server board** — you must use an Intel® server board — UL recognized.
- **Add-in boards** — must have a printed wiring board flammability rating of minimum UL94V-1. Add-in boards containing external power connectors and/or lithium batteries must be UL recognized or UL listed. Any add-in board containing modem telecommunication circuitry must be UL listed. In addition, the modem must have the

appropriate telecommunications, safety, and EMC approvals for the region in which it is sold.

- **Peripheral Storage Devices** — must be UL recognized or UL listed accessory and TUV or VDE licensed. Maximum power rating of any one device or combination of devices cannot exceed manufacturer's specifications. Total server configuration is not to exceed the maximum loading conditions of the power supply.

## ***Appendix A: Integration and Usage Tips***

This section provides a list of useful information that is unique to the Intel® Server System SR1600UR and should be kept in mind while integrating and configuring your Intel® Server Board S5520UR.

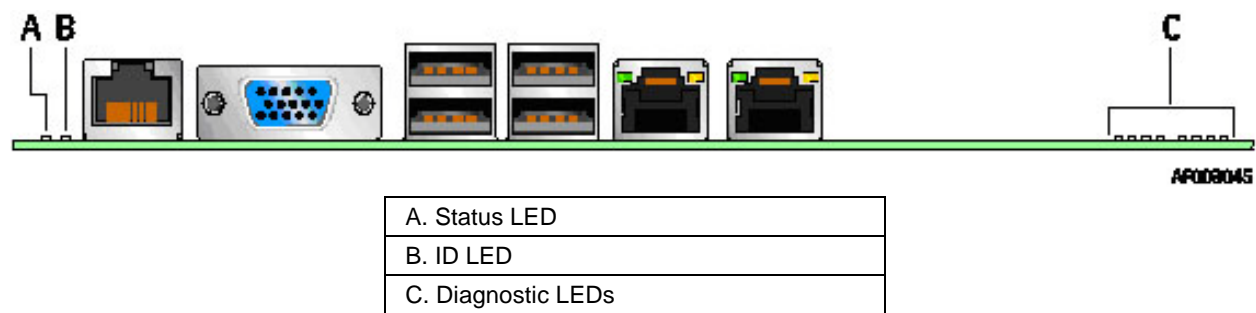
- Only low-profile (1.2 in or 30.48 mm) DIMMs can be used in the server chassis.
- Processor fans are not supported and are not needed in the server chassis. The system fan module and power supply fans provide the necessary cooling needed for the system. Using a processor fan in this chassis may cause Intel® System Management Software to incorrectly monitor the system fans.
- The CPU air duct and air baffle must be used to maintain system thermals.
- To maintain system thermals, all hard drive bays must be populated with either a hard drive or drive blank.
- System fans are not hot-swappable
- Use of the screw found on the front edge of the top cover is required when the unit is installed in a user accessible environment.
- A USB Floppy support kit (Product Order Code – AXXUSBFLOPPY) is available for installing a slimline USB floppy drive in either the slimline bay or in the first 3.5 inch hard drive bay.
- The FRUSDR utility must be run after the hardware integration is complete in order to load the proper Sensor Data Records for the server chassis onto the server board.
- Make sure the latest system software is loaded on the server. This includes system BIOS, FRUSDR, Integrated BMC firmware, and hot-swap controller firmware. The latest system software can be downloaded from [http://www.intel.com/p/en\\_US/support](http://www.intel.com/p/en_US/support).

## Appendix B: POST Code Diagnostic LED Decoder

During the system boot process, the BIOS executes a number of platform configuration processes, each of which is assigned a specific hex POST code number. As each configuration routine is started, the BIOS displays the POST code to the POST Code Diagnostic LEDs on the back edge of the server board. To assist in troubleshooting a system hang during the POST process, the Diagnostic LEDs can be used to identify the last POST process that was executed.

Each POST code is represented by eight amber Diagnostic LEDs. The POST codes are divided into two nibbles, an upper nibble and a lower nibble. The upper nibble bits are represented by Diagnostic LEDs #4, #5, #6, #7. The lower nibble bits are represented by Diagnostics LEDs #0, #1, #2 and #3. If the bit is set in the upper and lower nibbles, the corresponding LED is lit. If the bit is clear, the corresponding LED is off.

The Diagnostic LED #7 is labeled as “MSB”, and the Diagnostic LED #0 is labeled as “LSB”.



**Figure 32. Diagnostic LED Placement Diagram**

In the following example, the BIOS sends a value of ACh to the diagnostic LED decoder. The LEDs are decoded as follows:

**Table 46. POST Progress Code LED Example**

LEDs	Upper Nibble LEDs				Lower Nibble LEDs			
	MSB							LSB
	LED #7	LED #6	LED #5	LED #4	LED #3	LED #2	LED #1	LED #0
	8h	4h	2h	1h	8h	4h	2h	1h
Status	ON	OFF	ON	OFF	ON	ON	OFF	OFF
Results	1	0	1	0	1	1	0	0
	Ah				Ch			

**Note:** Upper nibble bits = 1010b = Ah; Lower nibble bits = 1100b = Ch; the two are concatenated as ACh.

**Table 47. Diagnostic LED POST Code Decoder**

Checkpoint	Diagnostic LED Decoder								Description
	O = On, X=Off								
	Upper Nibble				Lower Nibble				
	MSB							LSB	
LED	#7	#6	#5	#4	#3	#2	#1	#0	
Multi-use code (This POST Code is used in different contexts)									
0xF2h	O	O	O	O	X	X	O	X	Seen at the start of Memory Reference Code (MRC) Start of the very early platform initialization code Very late in POST, it is the signal that the OS has switched to virtual memory mode
Memory Error Codes (Accompanied by a beep code)									
0xE8h	O	O	O	X	O	X	X	X	No Usable Memory Error: No memory in the system, or SPD bad so no memory could be detected
0xEAh	O	O	O	X	O	X	O	X	Channel Training Error: DQ/DQS training failed on a channel during memory channel initialization.
0xEBh	O	O	O	X	O	X	O	O	Memory Test Error: memory failed Hardware BIST.
0xEDh	O	O	O	X	O	O	X	O	Population Error: RDIMMs and UDIMMs cannot be mixed in the system
0xEEh	O	O	O	X	O	O	O	X	Mismatch Error: more than 2 Quad Ranked DIMMS in a channel.
Memory Reference Code Progress Codes (Not accompanied by a beep code)									
0xB0h	O	X	O	O	X	X	X	X	Chipset Initialization Phase
0xB1h	O	X	O	O	X	X	X	O	Reset Phase
0xB2h	O	X	O	O	X	X	O	X	DIMM Detection Phase
0xB3h	O	X	O	O	X	X	O	O	Clock Initialization Phase
0xB4h	O	X	O	O	X	O	X	X	SPD Data Collection Phase
0xB6h	O	X	O	O	X	O	O	X	Rank Formation Phase
0xB8h	O	X	O	O	O	X	X	X	Channel Training Phase
0xB9h	O	X	O	O	O	X	X	O	Memory Test Phase
0xBAh	O	X	O	O	O	X	O	X	Memory Map Creation Phase
0xBBh	O	X	O	O	O	X	O	O	RAS Initialization Phase
0xBFh	O	X	O	O	O	O	O	O	MRC Complete
Host Processor									
0x04h	X	X	X	X	X	O	X	X	Early processor initialization where system BSP is selected
0x10h	X	X	X	O	X	X	X	X	Power-on initialization of the host processor (bootstrap processor)
0x11h	X	X	X	O	X	X	X	O	Host processor cache initialization (including AP)
0x12h	X	X	X	O	X	X	O	X	Starting application processor initialization
0x13h	X	X	X	O	X	X	O	O	SMM initialization
Chipset									
0x21h	X	X	O	X	X	X	X	O	Initializing a chipset component
Memory									
0x22h	X	X	O	X	X	X	O	X	Reading configuration data from memory (SPD on DIMM)
0x23h	X	X	O	X	X	X	O	O	Detecting presence of memory
0x24h	X	X	O	X	X	O	X	X	Programming timing parameters in the memory controller
0x25h	X	X	O	X	X	O	X	O	Configuring memory parameters in the memory controller
0x26h	X	X	O	X	X	O	O	X	Optimizing memory controller settings
0x27h	X	X	O	X	X	O	O	O	Initializing memory, such as ECC init
0x28h	X	X	O	X	O	X	X	X	Testing memory
PCI Bus									
0x50h	X	O	X	O	X	X	X	X	Enumerating PCI busses
0x51h	X	O	X	O	X	X	X	O	Allocating resources to PCI busses
0x52h	X	O	X	O	X	X	O	X	Hot Plug PCI controller initialization
0x53h	X	O	X	O	X	X	O	O	Reserved for PCI bus
0x54h	X	O	X	O	X	O	X	X	Reserved for PCI bus



Checkpoint	Diagnostic LED Decoder								Description
	O = On, X=Off								
	Upper Nibble				Lower Nibble				
	MSB							LSB	
	8h	4h	2h	1h	8h	4h	2h	1h	
LED	#7	#6	#5	#4	#3	#2	#1	#0	
0x55h	X	O	X	O	X	O	X	O	Reserved for PCI bus
0x56h	X	O	X	O	X	O	O	X	Reserved for PCI bus
0x57h	X	O	X	O	X	O	O	O	Reserved for PCI bus
<b>USB</b>									
0x58h	X	O	X	O	O	X	X	X	Resetting USB bus
0x59h	X	O	X	O	O	X	X	O	Reserved for USB devices
<b>ATA/ATAPI/SATA</b>									
0x5Ah	X	O	X	O	O	X	O	X	Resetting SATA bus and all devices
0x5Bh	X	O	X	O	O	X	O	O	Reserved for ATA
<b>SMBUS</b>									
0x5Ch	X	O	X	O	O	O	X	X	Resetting SMBUS
0x5Dh	X	O	X	O	O	O	X	O	Reserved for SMBUS
<b>Local Console</b>									
0x70h	X	O	O	O	X	X	X	X	Resetting the video controller (VGA)
0x71h	X	O	O	O	X	X	X	O	Disabling the video controller (VGA)
0x72h	X	O	O	O	X	X	O	X	Enabling the video controller (VGA)
<b>Remote Console</b>									
0x78h	X	O	O	O	O	X	X	X	Resetting the console controller
0x79h	X	O	O	O	O	X	X	O	Disabling the console controller
0x7Ah	X	O	O	O	O	X	O	X	Enabling the console controller
<b>Keyboard (only USB)</b>									
0x90h	O	X	X	O	X	X	X	X	Resetting the keyboard
0x91h	O	X	X	O	X	X	X	O	Disabling the keyboard
0x92h	O	X	X	O	X	X	O	X	Detecting the presence of the keyboard
0x93h	O	X	X	O	X	X	O	O	Enabling the keyboard
0x94h	O	X	X	O	X	O	X	X	Clearing keyboard input buffer
0x95h	O	X	X	O	X	O	X	O	Instructing keyboard controller to run Self Test (PS2 only)
<b>Mouse (only USB)</b>									
0x98h	O	X	X	O	O	X	X	X	Resetting the mouse
0x99h	O	X	X	O	O	X	X	O	Detecting the mouse
0x9Ah	O	X	X	O	O	X	O	X	Detecting the presence of mouse
0x9Bh	O	X	X	O	O	X	O	O	Enabling the mouse
<b>Fixed Media</b>									
0xB0h	O	X	O	O	X	X	X	X	Resetting fixed media device
0xB1h	O	X	O	O	X	X	X	O	Disabling fixed media device
0xB2h	O	X	O	O	X	X	O	X	Detecting presence of a fixed media device (hard drive detection, etc.)
0xB3h	O	X	O	O	X	X	O	O	Enabling/configuring a fixed media device
<b>Removable Media</b>									
0xB8h	O	X	O	O	O	X	X	X	Resetting removable media device
0xB9h	O	X	O	O	O	X	X	O	Disabling removable media device
0xBAh	O	X	O	O	O	X	O	X	Detecting presence of a removable media device (CDROM detection, etc.)
0xBCh	O	X	O	O	O	O	X	X	Enabling/configuring a removable media device
<b>Boot Device Selection (BDS)</b>									
0xD0	O	O	X	O	X	X	X	X	Trying to boot device selection 0
0xD1	O	O	X	O	X	X	X	O	Trying to boot device selection 1
0xD2	O	O	X	O	X	X	O	X	Trying to boot device selection 2
0xD3	O	O	X	O	X	X	O	O	Trying to boot device selection 3
0xD4	O	O	X	O	X	O	X	X	Trying to boot device selection 4

Checkpoint	Diagnostic LED Decoder								Description
	O = On, X=Off								
	Upper Nibble				Lower Nibble				
	MSB							LSB	
LED	8h	4h	2h	1h	8h	4h	2h	1h	
	#7	#6	#5	#4	#3	#2	#1	#0	
0xD5	O	O	X	O	X	O	X	O	Trying to boot device selection 5
0xD6	O	O	X	O	X	O	O	X	Trying to boot device selection 6
0xD7	O	O	X	O	X	O	O	O	Trying to boot device selection 7
0xD8	O	O	X	O	O	X	X	X	Trying to boot device selection 8
0xD9	O	O	X	O	O	X	X	O	Trying to boot device selection 9
0xDA	O	O	X	O	O	X	O	X	Trying to boot device selection A
0xDB	O	O	X	O	O	X	O	O	Trying to boot device selection B
0xDC	O	O	X	O	O	O	X	X	Trying to boot device selection C
0xDD	O	O	X	O	O	O	X	O	Trying to boot device selection D
0xDE	O	O	X	O	O	O	O	X	Trying to boot device selection E
0xDF	O	O	X	O	O	O	O	O	Trying to boot device selection F
Pre-EFI Initialization (PEI) Core									
0xE0h	O	O	O	X	X	X	X	X	Started dispatching early initialization modules (PEIM)
0xE1h	O	O	O	X	X	X	X	O	Reserved for initialization module use (PEIM)
0xE2h	O	O	O	X	X	X	O	X	Initial memory found, configured, and installed correctly
0xE3h	O	O	O	X	X	X	O	O	Reserved for initialization module use (PEIM)
Driver eXecution Environment (DXE) Core (not accompanied by a beep code)									
0xE4h	O	O	O	X	X	O	X	X	Entered EFI driver execution phase (DXE)
0xE5h	O	O	O	X	X	O	X	O	Started dispatching drivers
0xE6h	O	O	O	X	X	O	O	X	Started connecting drivers
DXE Drivers									
0xE7h	O	O	O	X	O	O	X	O	Waiting for user input
0xE8h	O	O	O	X	O	X	X	X	Checking password
0xE9h	O	O	O	X	O	X	X	O	Entering BIOS setup
0xEAh	O	O	O	X	O	X	O	X	Flash Update
0xEEh	O	O	O	X	O	O	O	X	Calling Int 19. One beep unless silent boot is enabled.
0xEFh	O	O	O	X	O	O	O	O	Unrecoverable boot failure
Runtime Phase/EFI Operating System Boot									
0xF2h	O	O	O	O	X	X	O	X	Signal that the OS has switched to virtual memory mode
0xF4h	O	O	O	O	X	O	X	X	Entering Sleep state
0xF5h	O	O	O	O	X	O	X	O	Exiting Sleep state
0xF8h	O	O	O	O	O	X	X	X	OS has requested EFI to close boot services (ExitBootServices ( ) Has been called)
0xF9h	O	O	O	O	O	X	X	O	OS has switched to virtual address mode (SetVirtualAddressMap ( ) Has been called)
0xFAh	O	O	O	O	O	X	O	X	OS has requested the system to reset (ResetSystem ( ) has been called)
Pre-EFI Initialization Module (PEIM)/Recovery									
0x30h	X	X	O	O	X	X	X	X	Crisis recovery has been initiated because of a user request
0x31h	X	X	O	O	X	X	X	O	Crisis recovery has been initiated by software (corrupt flash)
0x34h	X	X	O	O	X	O	X	X	Loading crisis recovery capsule
0x35h	X	X	O	O	X	O	X	O	Handing off control to the crisis recovery capsule
0x3Fh	X	X	O	O	O	O	O	O	Unable to complete crisis recovery capsule

## Appendix C: POST Code Errors

Whenever possible, the BIOS displays the current boot progress codes on the video screen. Progress codes are 32-bit quantities plus optional data. The 32-bit numbers include class, subclass, and operation information. The class and subclass fields point to the type of hardware that is being initialized. The operation field represents the specific initialization activity. Based on the data bit availability to display progress codes, a progress code can be customized to fit the data width. The higher the data bit, the higher the granularity of information that can be sent on the progress port. The progress codes may be reported by the system BIOS or option ROMs.

The Response section in the following table is divided into three types:

- **No Pause:** The message is displayed on the screen during POST or on the Error Manager screen. The system continues booting with a degraded state. The user may want to replace the erroneous unit. The setup POST error Pause setting does not have any effect with this error.
- **Pause:** The message is displayed on the Error Manager screen, and an error is logged to the SEL. The setup POST error Pause setting determines whether the system pauses to the Error Manager for this type of error, where the user can take immediate corrective action or choose to continue booting.
- **Halt:** The message is displayed on the Error Manager screen, an error is logged to the SEL, and the system cannot boot unless the error is resolved. The user needs to replace the faulty part and restart the system. The setup POST error Pause setting does not have any effect with this error.

**Table 48. POST Error Messages and Handling**

Error Code	Error Message	Response
0012	CMOS date/time not set	Pause
0048	Password check failed	Halt
0108	Keyboard component encountered a locked error.	No Pause
0109	Keyboard component encountered a stuck key error.	No Pause
0113	Fixed Media The SAS RAID firmware cannot run properly. The user should attempt to relish the firmware.	Pause
0140	PCI component encountered a PERR error.	Pause
0141	PCI resource conflict	Pause
0146	PCI out of resources error	Pause
0192	L3 cache size mismatch	Halt
0194	CPUID, processor family are different	Halt
0195	Front side bus mismatch	Pause
0196	Processor Model mismatch	Pause
0197	Processor speeds mismatched	Pause
0198	Processor family is unsupported.	Pause
019F	Processor and chipset stepping configuration is unsupported.	Pause
5220	CMOS/NVRAM Configuration Cleared	Pause
5221	Passwords cleared by jumper	Pause
5224	Password clear Jumper is Set.	Pause
8110	Processor 01 internal error (IERR) on last boot	Pause
8111	Processor 02 internal error (IERR) on last boot	Pause
8120	Processor 01 thermal trip error on last boot	Pause
8121	Processor 02 thermal trip error on last boot	Pause
8130	Processor 01 disabled	Pause
8131	Processor 02 disabled	Pause
8140	Processor 01 Failed FRB-3 Timer.	No Pause
8141	Processor 02 Failed FRB-3 Timer.	No Pause
8160	Processor 01 unable to apply BIOS update	Pause
8161	Processor 02 unable to apply BIOS update	Pause
8170	Processor 01 failed Self Test (BIST).	Pause
8171	Processor 02 failed Self Test (BIST).	Pause
8180	Processor 01 BIOS does not support the current stepping for processor	No Pause
8181	Processor 02 BIOS does not support the current stepping for processor	No Pause
8190	Watchdog timer failed on last boot	Pause
8198	Operating system boot watchdog timer expired on last boot	Pause
8300	Integrated Baseboard Management Controller failed self-test	Pause
84F2	Integrated Baseboard Management Controller failed to respond	Pause

Error Code	Error Message	Response
84F3	Integrated Baseboard Management Controller in update mode	Pause
84F4	Sensor data record empty	Pause
84FF	System event log full	No Pause
8500	Memory component could not be configured in the selected RAS mode.	Pause
8520	DIMM_A1 failed Self Test (BIST).	Pause
8521	DIMM_A2 failed Self Test (BIST).	Pause
8522	DIMM_A3 failed Self Test (BIST).	Pause
8523	DIMM_A4 failed Self Test (BIST).	Pause
8524	DIMM_B1 failed Self Test (BIST).	Pause
8525	DIMM_B2 failed Self Test (BIST).	Pause
8526	DIMM_B3 failed Self Test (BIST).	Pause
8527	DIMM_B4 failed Self Test (BIST).	Pause
8528	DIMM_C1 failed Self Test (BIST).	Pause
8529	DIMM_C2 failed Self Test (BIST).	Pause
852A	DIMM_C3 failed Self Test (BIST).	Pause
852B	DIMM_C4 failed Self Test (BIST).	Pause
852C	DIMM_D1 failed Self Test (BIST).	Pause
852D	DIMM_D2 failed Self Test (BIST).	Pause
852E	DIMM_D3 failed Self Test (BIST).	Pause
852F	DIMM_D4 failed Self Test (BIST).	Pause
8540	DIMM_A1 Disabled.	Pause
8541	DIMM_A2 Disabled.	Pause
8542	DIMM_A3 Disabled.	Pause
8543	DIMM_A4 Disabled.	Pause
8544	DIMM_B1 Disabled.	Pause
8545	DIMM_B2 Disabled.	Pause
8546	DIMM_B3 Disabled.	Pause
8547	DIMM_B4 Disabled.	Pause
8548	DIMM_C1 Disabled.	Pause
8549	DIMM_C2 Disabled.	Pause
854A	DIMM_C3 Disabled.	Pause
854B	DIMM_C4 Disabled.	Pause
854C	DIMM_D1 Disabled.	Pause
854D	DIMM_D2 Disabled.	Pause
854E	DIMM_D3 Disabled.	Pause
854F	DIMM_D4 Disabled.	Pause
8560	DIMM_A1 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8561	DIMM_A2 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8562	DIMM_A3 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8563	DIMM_A4 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8564	DIMM_B1 Component encountered a Serial Presence Detection (SPD) fail error.	Pause

Error Code	Error Message	Response
8565	DIMM_B2 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8566	DIMM_B3 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8567	DIMM_B4 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8568	DIMM_C1 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8569	DIMM_C2 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856A	DIMM_C3 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856B	DIMM_C4 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856C	DIMM_D1 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856D	DIMM_D2 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856E	DIMM_D3 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
856F	DIMM_D4 Component encountered a Serial Presence Detection (SPD) fail error.	Pause
8580	DIMM_A1 Correctable ECC error encountered.	Pause after 10 Occurrence
8581	DIMM_A2 Correctable ECC error encountered.	Pause after 10 Occurrence
8582	DIMM_A3 Correctable ECC error encountered.	Pause after 10 Occurrence
8583	DIMM_A4 Correctable ECC error encountered.	Pause after 10 Occurrence
8584	DIMM_B1 Correctable ECC error encountered.	Pause after 10 Occurrence
8585	DIMM_B2 Correctable ECC error encountered.	Pause after 10 Occurrence
8586	DIMM_B3 Correctable ECC error encountered.	Pause after 10 Occurrence
8587	DIMM_B4 Correctable ECC error encountered.	Pause after 10 Occurrence
8588	DIMM_C1 Correctable ECC error encountered.	Pause after 10 Occurrence
8589	DIMM_C2 Correctable ECC error encountered.	Pause after 10 Occurrence
858A	DIMM_C3 Correctable ECC error encountered.	Pause after 10 Occurrence
858B	DIMM_C4 Correctable ECC error encountered.	Pause after 10 Occurrence
858C	DIMM_D1 Correctable ECC error encountered.	Pause after 10 Occurrence
858D	DIMM_D2 Correctable ECC error encountered.	Pause after 10 Occurrence
858E	DIMM_D3 Correctable ECC error encountered.	Pause after 10 Occurrence
858F	DIMM_D4 Correctable ECC error encountered.	Pause after 10 Occurrence
85A0	DIMM_A1 Uncorrectable ECC error encountered.	Pause
85A1	DIMM_A2 Uncorrectable ECC error encountered.	Pause
85A2	DIMM_A3 Uncorrectable ECC error encountered.	Pause
85A3	DIMM_A4 Uncorrectable ECC error encountered.	Pause
85A4	DIMM_B1 Uncorrectable ECC error encountered.	Pause
85A5	DIMM_B2 Uncorrectable ECC error encountered.	Pause
85A6	DIMM_B3 Uncorrectable ECC error encountered.	Pause
85A7	DIMM_B4 Uncorrectable ECC error encountered.	Pause
85A8	DIMM_C1 Uncorrectable ECC error encountered.	Pause
85A9	DIMM_C2 Uncorrectable ECC error encountered.	Pause
85AA	DIMM_C3 Uncorrectable ECC error encountered.	Pause
85AB	DIMM_C4 Uncorrectable ECC error encountered.	Pause
85AC	DIMM_D1 Uncorrectable ECC error encountered.	Pause
85AD	DIMM_D2 Uncorrectable ECC error encountered.	Pause

Error Code	Error Message	Response
85AE	DIMM_D3 Uncorrectable ECC error encountered.	Pause
85AF	DIMM_D4 Uncorrectable ECC error encountered.	Pause
8601	Override jumper is set to force boot from lower alternate BIOS bank of flash ROM	No Pause
8602	WatchDog timer expired (secondary BIOS may be bad!)	No Pause
8603	Secondary BIOS checksum fail	No Pause
8604	Chipset Reclaim of non critical variables complete.	No Pause
9000	Unspecified processor component has encountered a non specific error.	Pause
9223	Keyboard component was not detected.	No Pause
9226	Keyboard component encountered a controller error.	No Pause
9243	Mouse component was not detected.	No Pause
9246	Mouse component encountered a controller error.	No Pause
9266	Local Console component encountered a controller error.	No Pause
9268	Local Console component encountered an output error.	No Pause
9269	Local Console component encountered a resource conflict error.	No Pause
9286	Remote Console component encountered a controller error.	No Pause
9287	Remote Console component encountered an input error.	No Pause
9288	Remote Console component encountered an output error.	No Pause
92A3	Serial port component was not detected	Pause
92A9	Serial port component encountered a resource conflict error	Pause
92C6	Serial Port controller error	No Pause
92C7	Serial Port component encountered an input error.	No Pause
92C8	Serial Port component encountered an output error.	No Pause
94C6	LPC component encountered a controller error.	No Pause
94C9	LPC component encountered a resource conflict error.	Pause
9506	ATA/ATPI component encountered a controller error.	No Pause
95A6	PCI component encountered a controller error.	No Pause
95A7	PCI component encountered a read error.	No Pause
95A8	PCI component encountered a write error.	No Pause
9609	Unspecified software component encountered a start error.	No Pause
9641	PEI Core component encountered a load error.	No Pause
9667	PEI module component encountered an illegal software state error.	Halt
9687	DXE core component encountered an illegal software state error.	Halt
96A7	DXE boot services driver component encountered an illegal software state error.	Halt
96AB	DXE boot services driver component encountered invalid configuration.	No Pause
96E7	SMM driver component encountered an illegal software state error.	Halt
0xA022	Processor component encountered a mismatch error.	Pause
0xA027	Processor component encountered a low voltage error.	No Pause
0xA028	Processor component encountered a high voltage error.	No Pause
0xA421	PCI component encountered a SERR error.	Halt
0xA500	ATA/ATPI ATA bus SMART not supported.	No Pause
0xA501	ATA/ATPI ATA SMART is disabled.	No Pause

Error Code	Error Message	Response
0xA5A0	PCI Express* component encountered a PERR error.	No Pause
0xA5A1	PCI Express* component encountered a SERR error.	Halt
0xA5A4	PCI Express* IBIST error.	Pause
0xA6A0	DXE boot services driver Not enough memory available to shadow a legacy option ROM.	No Pause



## POST Error Beep Codes

The following table lists the POST error beep codes. Prior to system video initialization, the BIOS uses these beep codes to inform users on error conditions. The beep code is followed by a user-visible code on the POST Progress LEDs. For complete details, refer to the *Intel® S5500/S5520 Server Board Family BIOS External Product Specification*.

**Table 49. POST Error Beep Codes**

Beeps	Error Message	POST Progress Code	Description
3	Memory error	0xE8, 0xEB, 0xED, 0xEE	System halted because a fatal error related to the memory was detected.

The Integrated BMC may generate beep codes upon detection of failure conditions. Beep codes are sounded each time the problem is discovered, such as on each power-up attempt, but are not sounded continuously. Codes that are common across all Intel® server boards and systems that use same generation chipset are listed in the following table. Each digit in the code is represented by a sequence of beeps whose count is equal to the digit. For complete details, refer to the *Intel® Server System Integrated Baseboard Management Controller Core External Product Specification*.

**Table 50. Integrated BMC Beep Codes**

Code	Reason for Beep	Associated Sensors	Supported
1-5-2-1	No CPUs installed or first CPU socket is empty.	CPU Missing Sensor	Yes
1-5-4-2	Power fault: DC power unexpectedly lost (power good dropout).	Power unit – power unit failure offset.	Yes
1-5-4-4	Power control fault (power good assertion timeout).	Power unit – soft power control failure offset.	Yes

## Glossary

Word/Acronym	Definition
ACA	Australian Communication Authority
ANSI	American National Standards Institute
BMC	Baseboard Management Controller
BIOS	Basic Input/Output System
CMOS	Complementary Metal-oxide-semiconductor
D2D	DC-to-DC
EMP	Emergency Management Port
FP	Front Panel
FRB	Fault Resilient Boot
FRU	Field Replaceable Unit
I <sup>2</sup> C	Inter-integrated Circuit bus
LCD	Liquid Crystal Display
LPC	Low-pin Count
LSB	Least Significant Bit
MSB	Most Significant Bit
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
NIC	Network Interface Card
NMI	Non-maskable Interrupt
OTP	Over-temperature Protection
OVP	Over-voltage Protection
PCI	Peripheral Component Interconnect
PCB	Printed Circuit Board
PCIe*	Peripheral Component Interconnect Express*
PCI-X	Peripheral Component Interconnect Extended
PFC	Power Factor Correction
POST	Power-on Self Test
PSU	Power Supply Unit
RAM	Random Access Memory
RI	Ring Indicate
SCA	Single Connector Attachment
SDR	Sensor Data Record
SE	Single-Ended
THD	Total Harmonic Distortion
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
VCCI	Voluntary Control Council for Interference
VSB	Voltage Standby

## ***Reference Documents***

See the following documents for additional information:

- *Intel® Server Board S5520UR Technical Product Specification*
- *Intel® Server System SR1600UR AC Power Supply Module Specification*
- *Intel® Server Board S5520UR/Intel® Server System SR1600UR Spares/Parts List and Configuration Guide*
- *Intel® Server System SR1600UR Service Guide*
- *Intel® S5500/S5520 Server Board Family BIOS External Product Specification*
- *Intel® Server System Integrated Baseboard Management Controller Core External Product Specification*