



Intel[®] Server Chassis SR1500

Intel[®] Server System SR1500AL

Technical Product Specification

Intel order number D31981-004

Revision 1.00

June 2006

Enterprise Platforms and Services Marketing

Revision History

Date	Revision Number	Modifications
June 2006	1.00	Initial external release.

Disclaimers

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

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

The Intel® Server Chassis SR1500 may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

This document and the software described in it is furnished under license and may only be used or copied in accordance with the terms of the license. The information in this manual is furnished for informational use only, is subject to change without notice, and should not be construed as a commitment by Intel Corporation. Intel Corporation assumes no responsibility or liability for any errors or inaccuracies that may appear in this document or any software that may be provided in association with this document.

Except as permitted by such license, no part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without the express written consent of Intel Corporation.

Intel, Pentium and Xeon are trademarks or registered trademarks of Intel Corporation.

*Other brands and names may be claimed as the property of others.

Copyright © Intel Corporation 2006. Portions Copyright ® 2005-2006 by LSI Logic* Corporation.

Table of Contents

1. Product Overview.....	1
1.1 Chassis Views	1
1.2 Chassis Dimensions	2
1.3 System Components	2
1.4 System Boards	3
1.5 Control Panel Options.....	4
1.6 Hard Drive and Peripheral Bays	5
1.7 Power Sub-system.....	6
1.8 System Cooling.....	7
1.9 Chassis Security	7
1.10 Rack and Cabinet Mounting Options	7
1.11 Front Bezels.....	7
2. Power Sub-System.....	9
2.1 Mechanical Overview.....	9
2.2 Output Connectors.....	10
2.3 Efficiency	11
2.4 AC Input Voltage Requirement	12
2.5 Protection Circuits.....	12
2.5.1 Over-Current Protection (OCP).....	12
2.5.2 Over-voltage Protection (OVP)	13
2.5.3 Over-temperature Protection (OTP).....	13
2.6 Power Supply Status LED	13
2.7 AC Power Cord Specification Requirements	14
3. Cooling Sub-System	15
3.1 Five-Fan Module.....	15
3.2 Power Supply Fans.....	17
3.3 CPU Air Duct and Air Baffle.....	17
3.4 Drive Bay Population	18
4. Peripheral and Hard Drive Support.....	19
4.1 Optical and Floppy Drive Support.....	19
4.1.1 USB Floppy Drive Support.....	19
4.1.2 Optical Drive Support.....	20
4.2 Hard Disk Drive Support	21
4.2.1 Hot-Swap Hard Disk Drive Trays	21
4.2.2 Drive Blanks.....	21

4.3	Hot-Swap Backplane Support.....	22
4.3.1	Feature set:.....	22
4.3.2	Vitesse* VSC410 Enclosure Management Controller.....	26
4.3.3	LSI* SAS1064E 3.0 Gbit/s Serial Attached SCSI Controller.....	26
4.3.4	LED Support	28
4.3.5	Backplane Connector Definitions.....	29
5.	Standard Control Panel	36
5.1	Control Panel Buttons	37
5.2	Control Panel LED Indicators	37
5.2.1	Power / Sleep LED	38
5.2.2	System Status LED.....	39
5.2.3	Drive Activity LED	40
5.2.4	System Identification LED.....	40
5.3	Control Panel Connectors.....	40
6.	Intel® Local Control Panel.....	42
6.1	LED Functionality.....	43
6.1.1	Power / Sleep LED	44
6.1.2	System Status LED.....	45
6.1.3	Drive Activity LED	46
6.1.4	System Identification LED.....	46
7.	PCI Riser Cards and Assembly	47
7.1	Riser Card Options	48
8.	Supported Intel® Server Boards.....	52
8.1	Intel® Server Board S5000PAL	52
8.1.1	Processor Support	55
9.	Environmental and Regulatory Specifications	58
9.1	System Level Environmental Limits.....	58
9.2	Product Regulatory Compliance	59
9.2.1	Product Safety Compliance	59
9.2.2	Product EMC Compliance	59
9.2.3	Certifications / Registrations / Declarations	60
9.2.4	Product Regulatory Compliance Markings	60
9.3	Electromagnetic Compatibility Notices	61
9.3.1	USA	61
9.3.2	FCC Verification Statement	62
9.3.3	ICES-003 (Canada)	62
9.3.4	Europe (CE Declaration of Conformity)	62
9.3.5	Japan EMC Compatibility	62

9.3.6	BSMI (Taiwan)	62
9.3.7	RRL (Korea).....	63
9.3.8	CNCA (CCC-China)	63
9.4	Replacing the Back up Battery	64
9.5	Serviceability and Availability.....	65
9.6	Restriction of Hazardous Substances (RoHS) Compliance.....	65
9.7	Regulated Specified Components	66
10.	Platform Control	67
10.1	Overview.....	67
10.2	FBDIMM Open Loop Throughput Throttling	68
10.3	Fan Speed Control.....	68
10.3.1	System Configuration Using the FRUSDR Utility.....	69
10.3.2	Fan Speed Control from BMC and BIOS Inputs	69
Appendix A: Integration and Usage Tips.....		73
Appendix B: POST Code Diagnostic LED Decoder		74
Appendix C: POST Error Beep Codes.....		78
Glossary.....		79
Reference Documents		80

List of Figures

Figure 1. Front View with Bezel – Showing the Intel® Local Control Panel Option	1
Figure 2. Front View without Bezel – Showing the Standard Control Panel Option	1
Figure 3. Rear Chassis View	1
Figure 4. Major Chassis Components.....	2
Figure 5. Back Panel Feature Overview	3
Figure 6. Control Panel Modules	4
Figure 7. Standard Control Panel Overview	5
Figure 8. LCD Control Panel Overview	5
Figure 9. Drive Bay Overview	6
Figure 10. Optional Front Bezel	8
Figure 11. Front Bezel Options	8
Figure 12. Power Supply Mechanical Drawing	9
Figure 13. Fan Module Assembly	15
Figure 14. Air Baffle	17
Figure 15. CPU Air Duct	17
Figure 16. Hard Drive Carrier.....	18
Figure 17. Intel® Server Chassis SR1500 Peripheral Bay Configuration Options.....	19
Figure 18. View of Slim-line Drive Bay.....	20
Figure 19. Hard Drive Tray Assembly	21
Figure 20. Drive Tray with Drive Blank	22
Figure 21. Hot-Swap Passive SAS/SATA Backplane Layout	23
Figure 22. Active SAS Backplane Layout	24
Figure 23. Hot-Swap Passive SAS/SATA Backplane Functional Diagram	25
Figure 24. Hot-Swap Active SAS Backplane Functional Diagram	25
Figure 25. Bridge Board Layout	29
Figure 26. Standard Control Panel Assembly Module	36
Figure 27. Control Panel Buttons	37
Figure 28. Control Panel LED Indicators	37
Figure 29. Intel® Local Control Panel Assembly Module.....	42
Figure 30. Intel® Local Control Panel Overview	42
Figure 31. PCI Riser Card Assembly - FH View	47
Figure 32. PCI Riser Card Assembly – LP View.....	48
Figure 33. 1U Low Profile PCI-X* Riser Card Mechanical Drawing	49
Figure 34. 1U Full Height PCI-X* Riser Card Mechanical Drawing.....	50
Figure 35. 1U Full Height PCI Express* Riser Card Mechanical Drawing	51

Figure 36. Intel® Server Board S5000PAL	53
Figure 37. Intel® Server Board S5000PAL Components.....	55
Figure 38. CEK Processor Mounting	57
Figure 39. Diagnostic LED Placement Diagram	74

List of Tables

Table 1. Chassis Dimensions	2
Table 2. Cable Harness Definition	10
Table 3. P1 – Main Power Connector Pin-out.....	10
Table 4. P2 – Processor Power Connector Pin-out	11
Table 5. P3 – Back Plane Power Connector Pin-out	11
Table 6. P4 – Baseboard Signal Connector Pin-out	11
Table 7. Power Supply Efficiency	11
Table 8. AC Input Rating.....	12
Table 9. Over-current Protection (OCP)	12
Table 10. Over-Voltage Protection (OVP) Limits	13
Table 11. LED Indicators	13
Table 12. Nonredundant Cooling Zones	16
Table 13. Individual Fan Assembly Pin-out.....	16
Table 14. 4-pin USB Floppy Connector Pin-out.....	19
Table 15. 44-pin Internal CD-ROM Connector Pin-out	20
Table 16. LED Function	28
Table 17. Hard Drive Activity LED Functionality	28
Table 18. Backplane Power Connector Pin-out (J1B1)	29
Table 19. Bridge Board Connector Pin-out (J5A1)	30
Table 20. Backplane Control Panel Connector Pin-out (J9C1).....	31
Table 21. 1x10 Pin Control Panel USB Connector Pin-out (J6B1)	32
Table 22. SAS/SATA Hard Drive Connector Pin-outs (J8N1, J6N1, J3N1).....	32
Table 23. SATA/SAS Drive Control Connector Pin-out (J3C1, J4B2, J4A1)	33
Table 24. 4-pin floppy connector Pin-out (J2B1).....	33
Table 25. System Fan Connector Pin-outs	34
Table 26. IPMB Connector Pin-out (J1C1)	35
Table 27. Add-in Card Connector Pin-out (J6B2 – Passive Only)	35
Table 28. Control Button and Intrusion Switch Functions	37
Table 29. Control Panel LED Functions.....	38
Table 30. SSI Power LED Operation	38
Table 31. Control Panel LED Operation	39
Table 32. External USB Connectors (J1B1)	40
Table 33. Video Connector (J1A1).....	40
Table 34. Control Panel LED Functions.....	43
Table 35. SSI Power LED Operation	44

Table 36. Control Panel LED Operation 45

Table 37. Processor Support Matrix 56

Table 38. System Environmental Limits Summary 58

Table 39: POST Progress Code LED Example 74

Table 40. Diagnostic LED POST Code Decoder 75

Table 41. POST Error Beep Codes 78

Table 42. BMC Beep Codes 78

< This page intentionally left blank >

1. Product Overview

The Intel® Server Chassis SR1500 is a 1U server chassis that is designed to support the Intel® Server Board S5000PAL/S5000XAL. The server board and the chassis have features that are designed to support the high-density server market. This chapter provides a high-level overview of the chassis features. Greater detail for each major chassis component or feature is provided in the following chapters.

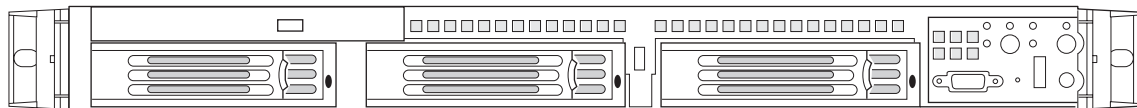
The chassis differs from previous generation products in that the majority of cables have been removed from the system and in their place are a series of board-to-board interconnects. The benefits of using board-to-board interconnects are simplification of platform integration and improved airflow for more reliable cooling.

1.1 Chassis Views



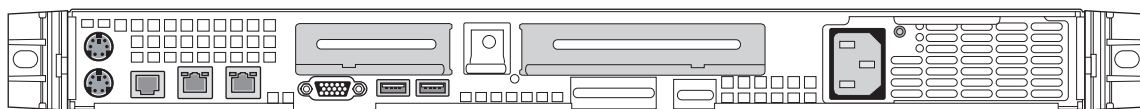
TP02151

Figure 1. Front View with Bezel – Showing the Intel® Local Control Panel Option



TP02152

Figure 2. Front View without Bezel – Showing the Standard Control Panel Option



TP02153

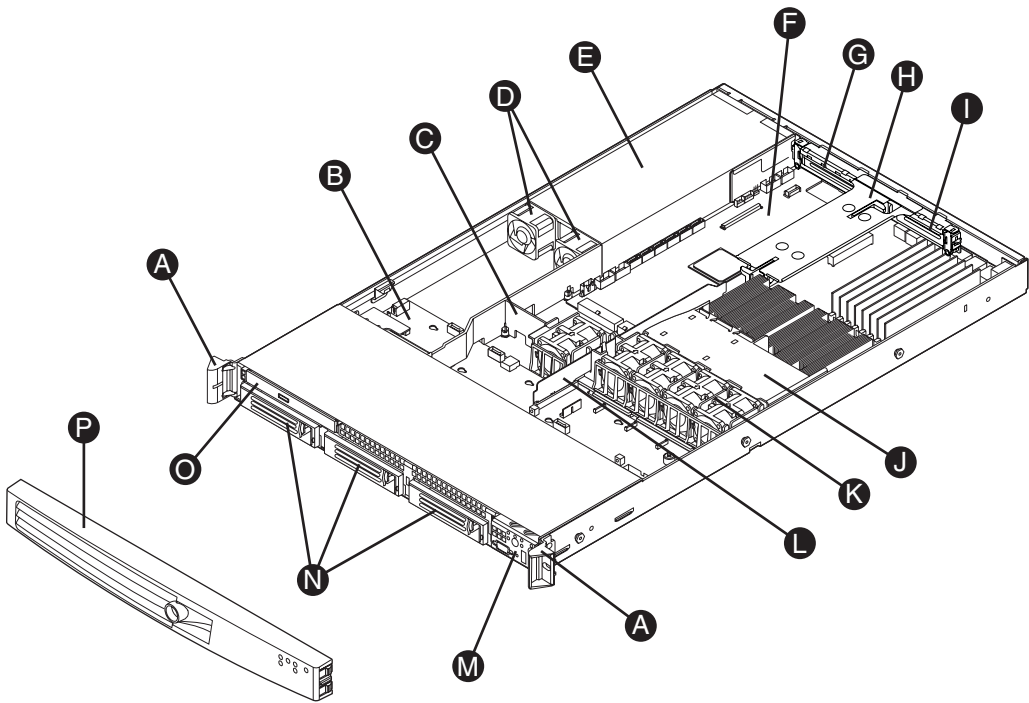
Figure 3. Rear Chassis View

1.2 Chassis Dimensions

Table 1. Chassis Dimensions

Height	43.25 mm	1.703"
Width without rails	430 mm	16.930"
Width with rails	451.3 mm	17.77"
Depth without CMA	692 mm	27.25"
Depth with CMA	838.2 mm	33.0"
Max. Weight	14.1 kg	31 lbs

1.3 System Components

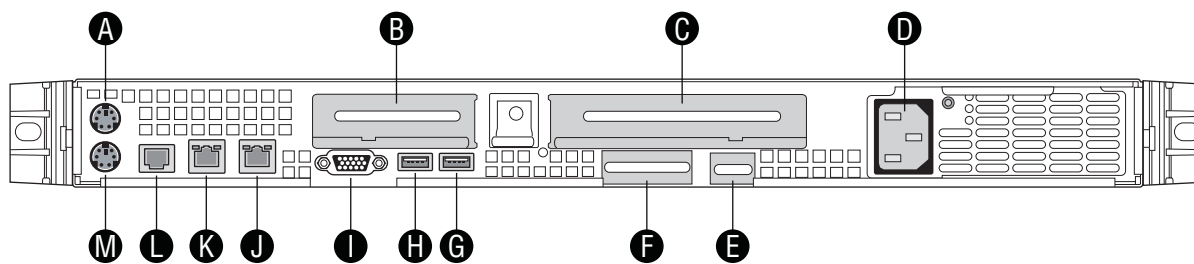


TP02154

A	Rack handles (optional)	I	PCI card bracket (low profile)
B	Backplane	J	Processor air duct
C	Air baffle	K	Fan module
D	Power supply fans	L	Bridge board
E	Power supply	M	Control panel (standard control panel shown)
F	Server board	N	Hard drive bays (drives not included)
G	PCI card bracket (full height)	O	Slimline drive bay (drive not included)
H	PCI add-in riser assembly	P	Front bezel (optional)

Figure 4. Major Chassis Components

The I/O connector locations on the back of the chassis are pre-cut, so the use of an I/O shield is not required. The supplied EMI gasket must be installed to maintain Electromagnetic Interference (EMI) compliance levels.



TP02155

Figure 5. Back Panel Feature Overview

A	PS2 mouse connector	H	USB 2 connector
B	PCI card bracket (low profile)	I	Video connector
C	PCI card bracket (full height)	J	NIC 1 connector
D	AC Power Receptacle	K	NIC 2 connector
E	Management Network Interface (optional)	L	RJ45 serial B port
F	IO module external connector (optional)	M	PS2 keyboard connector
G	USB 1 connector		

1.4 System Boards

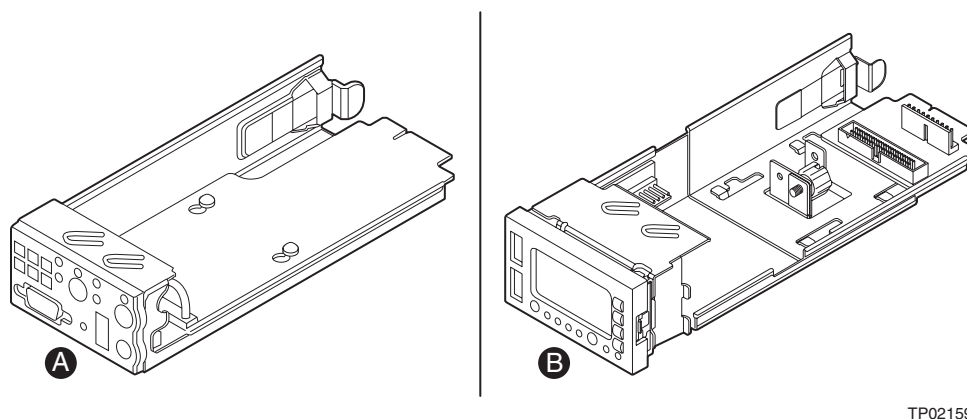
The complete system includes the use of several system boards which are used as internal interconnects and provide feature accessibility. The following provides a brief description for each.

- Bridge Board – PCB used to route signals from the server board to the back-plane and control panel boards.
- Backplane – Hot swap backplane capable of supporting both SATA and SAS hard drives.
 - Active SAS RAID (Product Code – ASR1500SASBP) – cable less solution with onboard SAS controller
 - Passive SATA (Product Code – ASR1500PASBP) – cabled to SATA ports on the server board or from add-in adapter.
- Riser Cards – PCI riser cards used to provide up to two add-in card slots to the system. Available riser card options for this system include:
 - Low Profile, one slot PCI-Express
 - Full Height (Product Code – ADWPCIXR), one slot PCI-X
 - Full Height (Product Code – ADWPCIEXPR), one slot PCI-Express
- Optical Drive Interposer Card – Used to interface optical drive with 44-pin IDE cable as cabled from the server board.
- Control Panel – A PCB providing system status and control functionality features. Two control panel options are available for this system
 - Standard Control Panel (Product Code – AXXRACKFP)

- Intel® Local Control Panel with LCD support (Product Code – AXXLCPRACK)
- RAID Activation Key (Product Code –)
 - Software SATA/SAS RAID 5 Activation Key – This RAID key plugs into a connector on the server board or the Active back-plane. It is used to enable the software SATA RAID 5 functionality of the ESB2 SATA ports of the server board when cabled to the passive backplane or the SAS RAID 5 functionality of the active backplane..

1.5 Control Panel Options

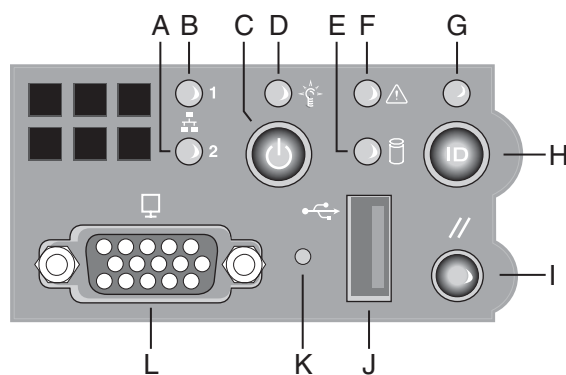
The server chassis can support either of two control panels, the standard control panel and the Intel® Local Control Panel with LCD support. The control panel assemblies are pre-assembled and modular in design. The entire module assembly slides into a predefined slot in the front of the chassis.



TP02159

Figure 6. Control Panel Modules

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



TP02160

Figure 7. Standard Control Panel Overview

A	NIC 2 Activity LED	G	System Identification LED
---	--------------------	---	---------------------------

B	NIC 1 Activity LED	H	System Identification Button
C	Power / Sleep Button	I	System Reset Button
D	Power / Sleep LED	J	USB 2.0 Connector
E	Hard Drive Activity LED	K	Recessed NMI Button (Tool Required)
F	System Status LED	L	Video Connector

The Intel® Local Control Panel utilizes a combination of control buttons, LEDs, and LCD display to provide system accessibility, monitoring, and control functions. The following diagram provides an overview of this control panel.

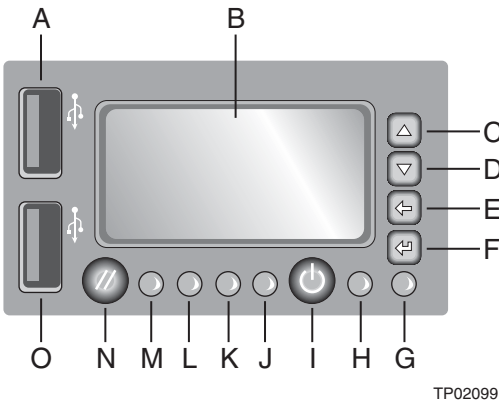


Figure 8. LCD Control Panel Overview

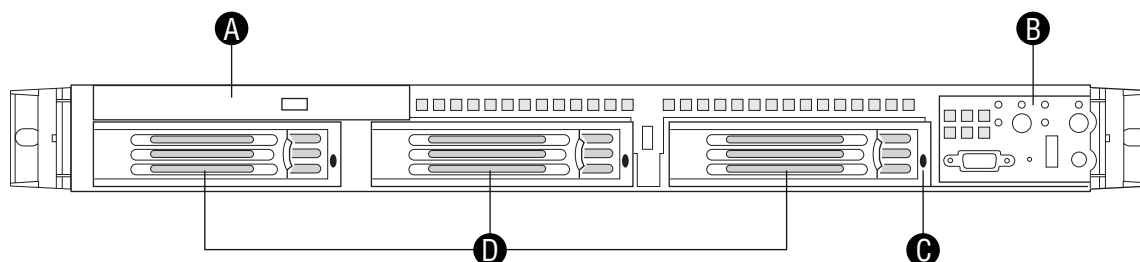
A	USB 2.0 Port	I	Power / Sleep Button
B	LCD Display	J	System Status LED
C	Menu control button, scroll up	K	NIC 2 Activity LED
D	Menu control button, scroll down	L	NIC 1 Activity LED
E	Menu control button, scroll left	M	Hard Drive Activity LED
F	Menu control button, enter	N	System Reset Button
G	System ID LED	O	USB 2.0 Port
H	Power / Sleep LED		

1.6 Hard Drive and Peripheral Bays

The chassis is designed to support up to three hot-swappable SAS (Serial Attach-SCSI) or SATA (Serial ATA) hard drives and one slim-line optical device.

The slim-line peripheral bay is designed to support a single slim-line IDE optical drive or a slim-line USB floppy drive.

If both an optical drive and floppy drive are required, the hard drive bay below the slim-line bay can be used to support an optional USB Floppy drive. The optional floppy drive kit includes the necessary drive tray and cables.



TP02156

Figure 9. Drive Bay Overview

A	Slimline drive bay (drive not included)
B	Control panel (standard control panel shown)
C	Hard Drive Status LEDs
D	Hard drive bays (drives not included)

1.7 Power Sub-system

The power sub-system of the chassis consists of a single non-redundant 600 Watt power supply and provides several integrated management features including:

- Status LED
- Over-temperature protection circuitry
- Over-voltage protection circuitry

With the addition of an Intel® Remote Management Module and Intel® System Management Software, the power subsystem is capable of supporting several system management features including:

- Remote Power On/Off
- Status Alerting
- FRU Information Reporting

The power supply operates within the following voltage ranges and ratings

PARAMETER	MIN	RATED	MAX	Start up VAC	Power Off VAC	Max Input AC Current	Max Rated Input AC Current
Voltage (110)	90 V _{rms}	100-127 V _{rms}	140 V _{rms}	85Vac +/- 4Vac	75Vac +/- 5Vac	9.5A _{rms} ^{1,3}	8.55A _{rms} ⁴
Voltage (220)	180 V _{rms}	200-240 V _{rms}	264 V _{rms}			4.75A _{rms} ^{2,3}	4.3A _{rms} ⁴
Frequency	47 Hz	50/60Hz	63 Hz				

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

1.8 System Cooling

The chassis provides a non-redundant multi-system fan assembly and dual non-redundant power supply fans. When external ambient temperatures remain within specified limits, the cooling system will provide sufficient air flow for all hot-swap drive configurations, processors, supported memory, and add-in cards.

1.9 Chassis Security

The chassis provides support for a lockable front bezel which prevents unauthorized access to the system control buttons and hard drives. In addition, a chassis intrusion switch is integrated into the low profile riser allowing server management software to monitor removal of the top cover from the chassis.

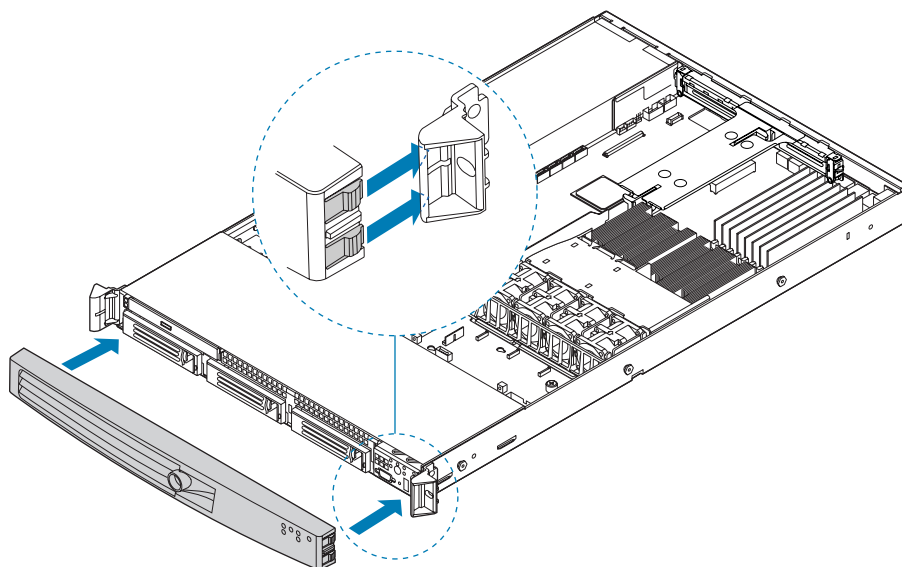
1.10 Rack and Cabinet Mounting Options

The chassis was designed to support 19" wide by up to 30" 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 – AXXHERAIL) designed to support an optional cable management arm (Product order code – AXXRACKCARM).
- A basic slide rail kit (Product order code – AXXBASICRAIL) designed to mount the chassis into a standard (19" by up to 30" deep) EIA-310D compatible server cabinet.

1.11 Front Bezels

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 Code – ADWBEZBLACK) or an Intel® Local Control Panel (Product Code – ADWLCDBEZEL).



TP02162

Figure 10. Optional Front Bezel

Light pipes in the front bezel supporting the standard control panel allow the system status LEDs to be monitored with the bezel 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.

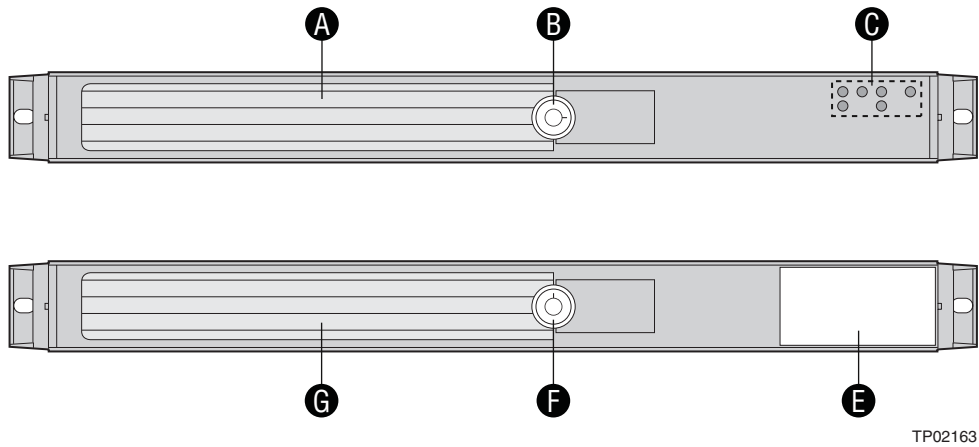


Figure 11. Front Bezel Options

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

2. Power Sub-System

The power sub-system consists of a single non-redundant 550 W power supply with eight outputs; 3.3V, 5V, 12V1, 12V2, 12V3, 12V4, -12V and 5VSB. The input shall be auto ranging and power factor corrected. The form factor is SSI EPS1U at 300mm depth and wire harness output. The power supply provides two non-redundant 40mm fans for self cooling. The power supply fans also contribute to providing additional airflow for parts of the system.

This chapter provides basic technical details to the design and operation of the power supply. For more in-depth information, refer to the Intel® Server Chassis SR1500 AC Power Supply Specification.

2.1 Mechanical Overview

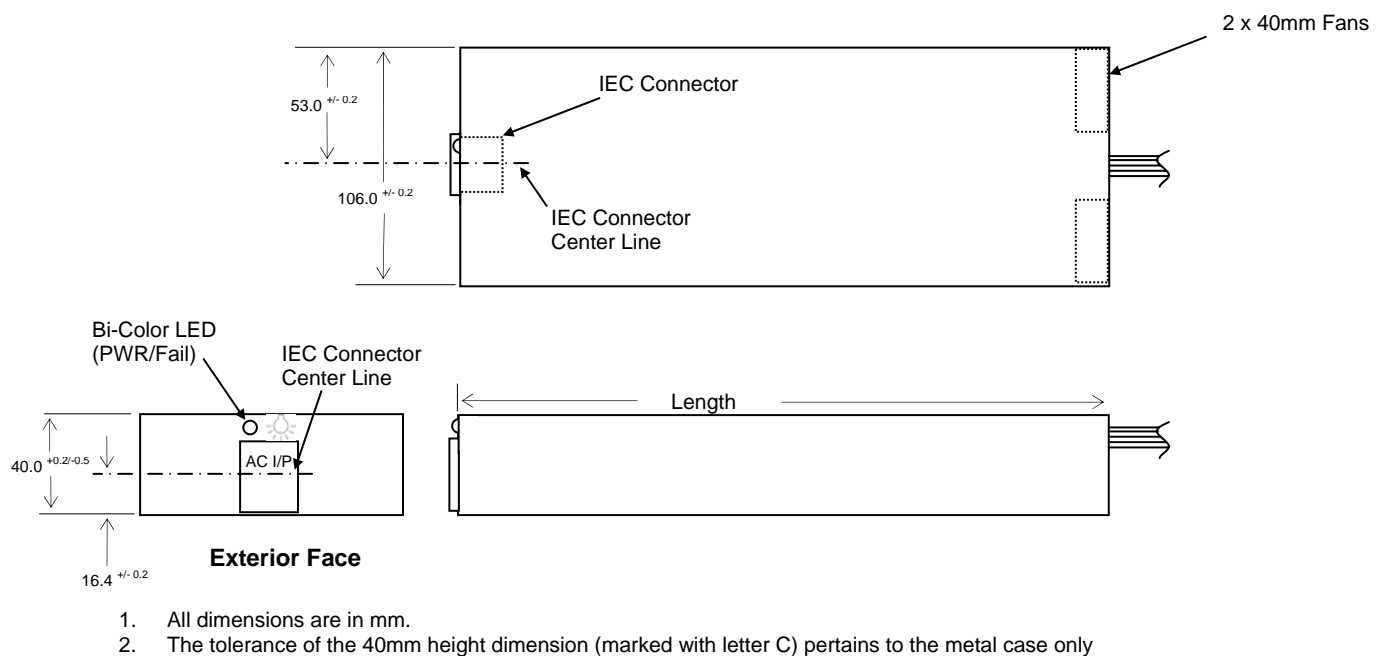


Figure 12. Power Supply Mechanical Drawing

2.2 Output Connectors

The power supply has a cable harness with four power connectors used to power various platform sub-systems. The following table defines each power connector

Table 2. Cable Harness Definition

Label	Length(mm)	Description
P1	210	Main Power Connector
P2	235	Processor Power Connector
P3	190	Backplane Power Connector
P4	230	Signal Connector

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 3. 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	5VSB	Purple	21	+5 VDC	Red
10	+12V3	Yellow/Blue Stripe	22	+5 VDC	Red
11	+12V3	Yellow/Blue Stripe	23	+5 VDC	Red
12	+3.3 VDC	Orange	24	COM	Black

Notes:

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

P2 – Processor Power Connector

Connector housing: 8-Pin Molex 39-01-2085 or equivalent

Contact: Molex, Mini-Fit Jr, HCS, 44476-1111 or equivalent

Table 4. P2 – Processor Power Connector Pin-out

PIN	SIGNAL	18 AWG COLOR	PIN	SIGNAL	18 AWG COLOR
1	COM	Black	5	+12V1	Yellow
2	COM	Black	6	+12V1	Yellow
3	COM	Black	7	+12V2	Yellow/Black Stripe
4	COM	Black	8	+12V2	Yellow/Black Stripe

P3 – Back Plane Power Connector

Connector housing: 8-Pin Molex 39-01-2085 2x4 or equivalent

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

Table 5. P3 – Back Plane Power Connector Pin-out

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

P4 – Baseboard Signal Connector

Connector housing: 5-pin Molex 50-57-9705 or equivalent

Contacts: Molex 16-02-0087 or equivalent

Table 6. P4 – Baseboard Signal Connector Pin-out

Pin	Signal	24 AWG Color
1	I2C Clock	White/Green Stripe
2	I2C Data	White/Yellow Stripe
3	NC	NC
4	COM	Black
5	3.3RS	White/Brown Stripe

2.3 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 shall be tested over an AC input voltage range of 115VAC to 220VAC.

Table 7. Power Supply Efficiency

Loading	100% of maximum	50% of maximum	20% of maximum
Minimum Efficiency	72%	70%	60%

2.4 AC Input Voltage Requirement

The power supply must operate within all specified limits over the following input voltage range, shown in below table. Harmonic distortion of up to 10% THD must not cause the power supply to go out of specified limits. The power supply shall power off if the AC input is less than 75VAC +/-5VAC range. The power supply shall start up if the AC input is greater than 85VAC +/-4VAC. Application of an input voltage below 85VAC shall not cause damage to the power supply, including a fuse blow.

Table 8. AC Input Rating

PARAMETER	MIN	RATED	MAX	Start up VAC	Power Off VAC	Max Input AC Current	Max Rated Input AC Current
Voltage (110)	90 V _{rms}	100-127 V _{rms}	140 V _{rms}	85Vac +/- 4Vac	75VAC +/- 5VAC	9.5A _{rms} ^{1,3}	8.55A _{rms} ⁴
Voltage (220)	180 V _{rms}	200-240 V _{rms}	264 V _{rms}			4.75A _{rms} ^{2,3}	4.3A _{rms} ⁴
Frequency	47 Hz	50/60Hz	63 Hz				

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

2.5 Protection Circuits

Protection circuits inside the power supply shall cause only the power supply's main outputs to shutdown. If the power supply latches off due to a protection circuit tripping, an AC cycle OFF for 15sec and a PSON[#] cycle HIGH for one second shall be able to reset the power supply.

2.5.1 Over-Current Protection (OCP)

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

Table 9. Over-current Protection (OCP)

VOLTAGE	OVER-CURRENT LIMIT (IOUT LIMIT)
+3.3V	110% minimum (= 11A) ; 150% maximum (= 15.0A)
+5V	110% min (= 22A); 150% max (= 30A)
+12V1	18A min; 20A max
+12V2	18A min; 20A max
+12V3	18A min; 20A max
+12V4	18A min; 20A max
-12V	0.625A min; 2.0A max
5VSB	6.0A max

2.5.2 Over-voltage Protection (OVP)

The power supply over-voltage protection shall be locally sensed. The power supply shall shutdown and latch off after an over-voltage condition occurs. This latch shall be cleared by toggling the PSON[#] signal or by an AC power interruption. The following table contains the over-voltage limits. The values are measured at the output of the power supply's connectors. The voltage shall never exceed the maximum levels when measured at the power pins of the power supply connector during any single point of fail. The voltage shall never trip any lower than the minimum levels when measured at the power pins of the power supply connector.

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

Table 10. Over-Voltage Protection (OVP) Limits

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

2.5.3 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 will shutdown. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically, while the 5VSB remains always on. The OTP circuit has built in hysteresis such that the power supply will not oscillate on and off due to a temperature recovering condition. The OTP trip level has a minimum of 4°C of ambient temperature hysteresis.

2.6 Power Supply Status LED

There will be a single bi-color LED to indicate power supply status. The LED operation is defined below.

Table 11. LED Indicators

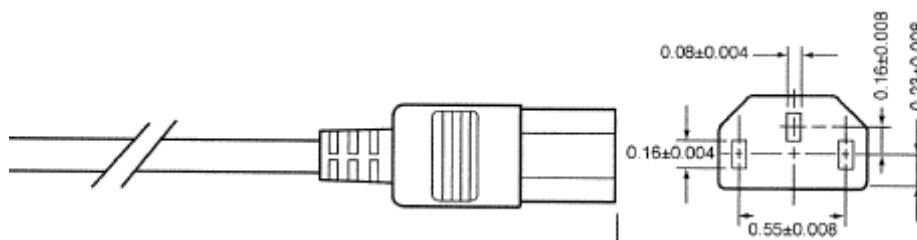
Power Supply Condition	LED
No AC power to all power supplies	OFF
Power supply critical event causing a shutdown; failure, OCP, OVP, Fan Fail	AMBER
AC present / Only 5VSB on (PS off)	1Hz Blink GREEN
Output ON and OK	GREEN

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

2.7 AC Power Cord Specification Requirements

The AC power cord used must meet the following specification requirements:

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



3. Cooling Sub-System

The cooling sub-system is compromised of five 40x40x56mm dual rotor fans, two 40x40x28mm power supply fans, a CPU air duct, and a PS / Electronics Bay Isolation Air Baffle. These components are used to provide the necessary cooling and airflow to the system. A fan on the processor heat sink is not necessary in this chassis.

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

Note: The Intel® Server Chassis SR1500 does not support redundant cooling. Should a fan fail, the system should be powered down as soon as possible to replace the failed fan.

3.1 Five-Fan Module

A fan assembly consisting of five 40x40x56mm 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, second and third hard drive bays, and components in the low profile PCI zone. 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 fan module is tool-less and provides for ease of installation and serviceability. Fans are individually replaceable through a connection to the hot-swap backplane. Neither the fan assembly nor the individual fans within it are 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 Intel® System Management Software.

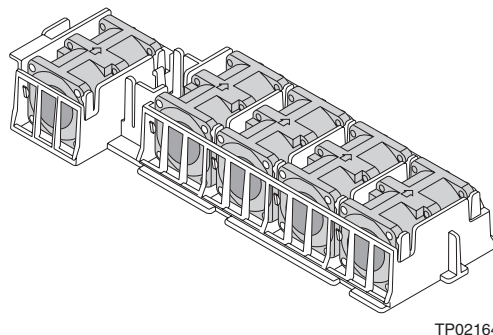


Figure 13. Fan Module Assembly

Table 12 Nonredundant Cooling Zones

Fan	Cooling Zone	Description of greatest cooling influence
System Fan #1/2	CPU1	Primary cooling for CPU1 and memory
System Fan #3/4	CPU2	Primary cooling for hard drive2, CPU2, the MCH, and the low profile PCI cards
System Fan #5	PCI	Primary cooling for hard drive1, Full Height PCI cards, PXH and IOP80333 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 has been designed for ease of use and has support for several management features that can be utilized by the server board management system.

- Each fan is designed for tool-less insertion to or removal from the fan module housing. Note: The fans are NOT hot-swappable. The system must be turned off in order to replace a failed fan.
- 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 BMC firmware will increase the speed for all the fans within the fan module.
- Each fan connector within the module supplies a tachometer signal that allows the BMC to monitor the status of each fan. If one of the fans should fail, the remaining fans will increase their rotation and attempt to maintain the thermal requirements of the system.
- Each fan has an associated fault LED on the mid-plane located next to the fan header. In the event of a fan failure, the fault LED for the failing fan can be illuminated by server management.

Table 13. Individual Fan Assembly Pin-out

Pin	Signal Name	Description
1	Fan Tach b	Tachometer signal from 1 st fan rotor
2	PWM	PWM control signal
3	+12V	Power Supply 12V
4	+12V	Power Supply 12V
5	Fan Tach a	Tachometer signal from 2 nd fan rotor
6	Ground	Power Supply Ground
7	Ground	Power Supply Ground
8	Not used	Not used
9	Loopback wire	Loopback to pin 10 to enable backplane presence LED functionality
10	Loopback wire	Loopback to pin 9 to enable backplane presence LED functionality

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.

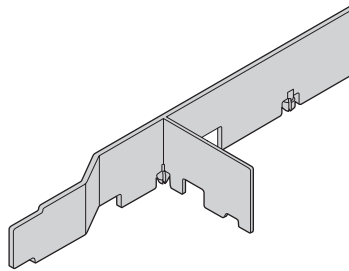
3.2 Power Supply Fans

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

3.3 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.

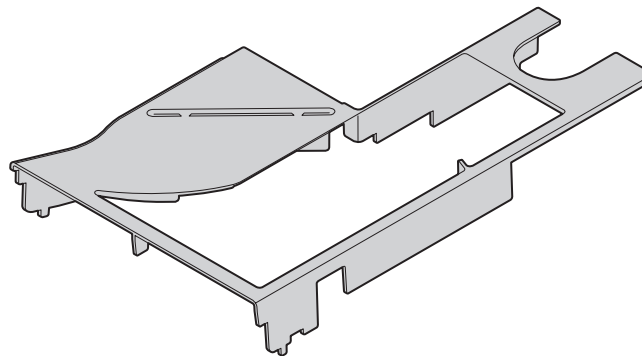
An air baffle is used to isolate airflow of the two power supply fans from that of the system fan module. The baffle is mounted into three stand-offs with one end fitting under the back edge of the hard drive bay.



TP02165

Figure 14. 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. For single processor configurations the pre-installed air dam must be left in place in order to maintain necessary air pressure and air flow through the processor heat sink. For dual processor configurations, the air dam must be snapped off of the CPU air duct. The CPU air duct cannot be installed if the air dam is in place and two processors are installed.



TP02166

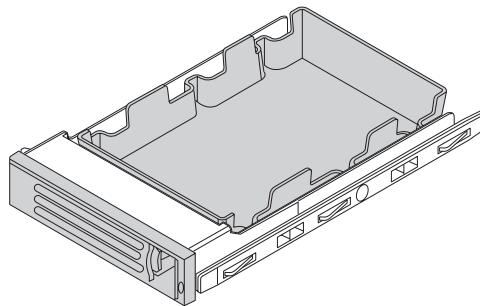
Figure 15. CPU Air Duct

Notes: IMPORTANT: Do not remove the air dam if only one processor is installed in the system. For single processor configurations, if the air dam is removed, the system will not meet the thermal cooling requirements of the processor, which will most likely result in a thermal shutdown of the system.

Once the air dam is removed from the CPU air duct, it cannot be reinstalled.

3.4 Drive Bay Population

Hard drive bays must be populated in order to maintain system thermals. Hard drive trays, both hot-swap and cabled drives, must either have a hard drive or drive blank installed in them.

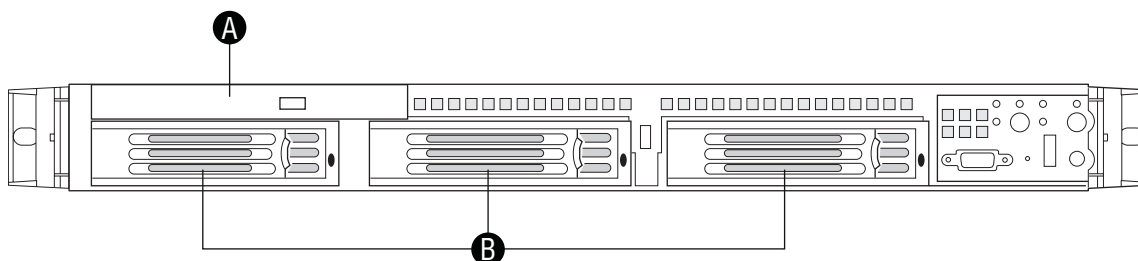


TP02104

Figure 16. Hard Drive Carrier

4. Peripheral and Hard Drive Support

The server chassis provides three hard drive bays and one slim-line peripheral drive bay at the front of the chassis. The hard drive bays are designed to support both SAS and SATA hot-swap drives depending on the backplane and controller configuration. The chassis is also capable of being configured to support an IDE optical drive and a USB floppy drive.



TP02168

Figure 17. Intel® Server Chassis SR1500 Peripheral Bay Configuration Options

A	Slim Line Optical Drive
B	Hot Swap Drive Bays

4.1 Optical and Floppy Drive Support

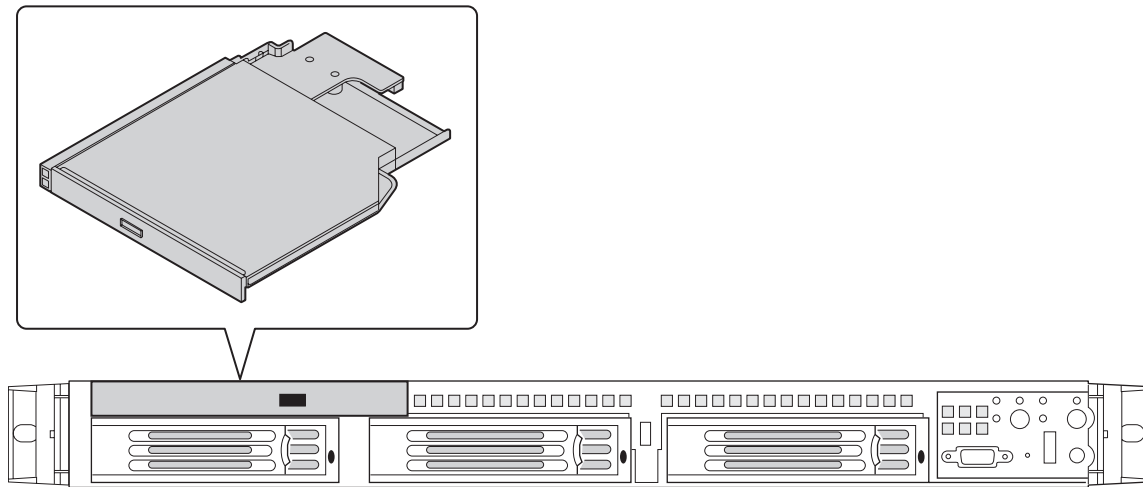
The chassis provides a slim-line drive bay that can be configured for an IDE optical CD-ROM, DVD/CDR, or USB floppy drive. Drives are mounted on a tool-less tray which allows for easy installation into and removal from the chassis. The slim-line devices are not hot-swappable.

4.1.1 USB Floppy Drive Support

With an optional floppy drive installation kit, the chassis can support a slim-line USB floppy drive. The floppy drive can be inserted into either the slim-line bay or the hard drive bay directly below the slim-line 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 four pin USB connector on the backplane. The following table provides the pin-out for the USB connector.

Table 14. 4-pin USB Floppy Connector Pin-out

Pin	Name
1	Power
2	USB_P3n
3	USB P3p
4	Ground



TP02169

Figure 18. View of Slim-line Drive Bay

4.1.2 Optical Drive Support

The chassis has support for a slim-line IDE optical drive. The drive is mounted onto a tool-less drive tray and is connected to an interposer card attached to the tray. The drive assembly is then inserted in to the slim-line drive bay. A 44-pin ribbon cable is used to connect the drive assembly to a matching IDE connector on the server board.

Table 15. 44-pin Internal CD-ROM Connector Pin-out

Name	Pin	Pin	Name
RST_IDE_S_L	1	2	GND
IDE_SDD<7>	3	4	IDE_SDD<8>
IDE_SDD<6>	5	6	IDE_SDD<9>
IDE_SDD<5>	7	8	IDE_SDD<10>
IDE_SDD<4>	9	10	IDE_SDD<11>
IDE_SDD<3>	11	12	IDE_SDD<12>
IDE_SDD<2>	13	14	IDE_SDD<13>
IDE_SDD<1>	15	16	IDE_SDD<14>
IDE_SDD<0>	17	18	IDE_SDD<15>
GND	19	20	Unused
IDE_SDDREQ	21	22	GND
IDE_SDIOW_L	23	24	GND
IDE_SDIOR_L	25	26	GND
IDE_SIORDY	27	28	IDEP_ALE_H
IDE_SDDACK_L	29	30	GND
IRQ_IDE_S	31	32	TP_IDEIO16_L
IDE_SDA<1>	33	34	IDE_CBL_DET_S
IDE_SDA<0>	35	36	IDE_SDA<2>
IDE_SDCS0_L	37	38	IDE_SDCS1_L
IDE_SEC_HD_ACT_L	39	40	GND
P5V	41	42	P5V
GND	43	44	GND

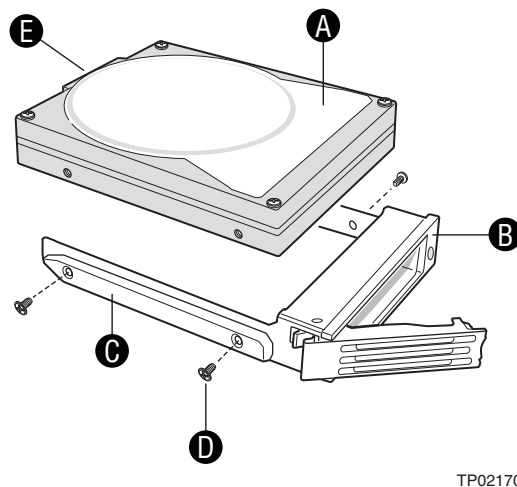
4.2 Hard Disk Drive Support

The chassis can support up to three 3.5" x 1" hot-swap SAS or SATA hard disk drives. The drives are mounted to hot-swap drive trays for easy insertion to or extraction from the drive bay.

Note: All hard drive bays must be populated to maintain system thermals. Drive trays should either have a hard drive or drive blank installed.

4.2.1 Hot-Swap Hard Disk Drive Trays

Each hard drive must be mounted to a hot-swap drive tray, making insertion and extraction of the drive from the chassis very simple. Each drive tray has its own dual purpose latching mechanism which is used to both insert and extract drives from the chassis and lock the tray in place. Each drive tray supports a light pipe providing a drive status indicator, located on the backplane, to be viewable from the front of the chassis.



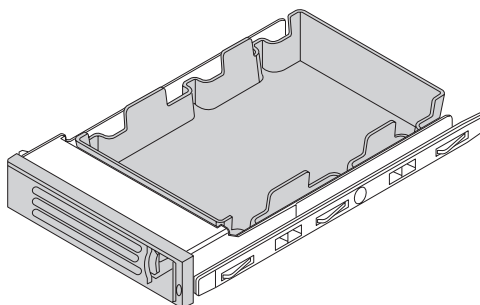
TP02170

Figure 19. Hard Drive Tray Assembly

- A. Hard Drive
- B. Drive Carrier
- C. Side Rail
- D. Mounting Screw
- E. Hard Drive Connector

4.2.2 Drive Blanks

Drive blanks must be used when no drive is used in a hard drive bay. Drive blanks simulate the spatial volume of a hard disk which is required to maintain proper air pressure limits necessary to cool the system.



TP02104

Figure 20. Drive Tray with Drive Blank

4.3 Hot-Swap Backplane Support

The chassis can support either an active SAS (Product Code – ASR1500SASBP) or a passive SAS/SATA backplane (Product Code – ASR1500PASBP). The backplanes provide the platform support for peripheral drives and hot-swap SAS or SATA hard drives. To eliminate several cables, the backplanes are also used as a pathway for signals from the server board to various platform interconnects, including those for the control panel and peripheral drives.

The passive backplane acts as a 'pass-through' for the SAS/SATA data from the drives to the SATA controller on the server board or a SAS/SATA controller add-in card. It provides the physical requirements for the hot-swap capabilities. The active backplane has a built-in SAS controller that does not need communication with the baseboard controller or an add-in card.

4.3.1 Feature set:

The backplanes support the following features and functions.

Vitesse* VSC410 enclosure management controller

- Integrated v3000 32 bit RISC microprocessor core
- External non-volatile Flash ROM
- Four I²C 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* LSISAS1064E SAS/SATA controller (Active Backplane Only)

- Four-port, 3.0 Gbit/s SAS/SATA controller
- Integrated Arm966 microprocessor core
- Compliant with Fusion-MPT* architecture
- Supports Integrated RAID* technology
- X4 PCIe* 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 I2C connector

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

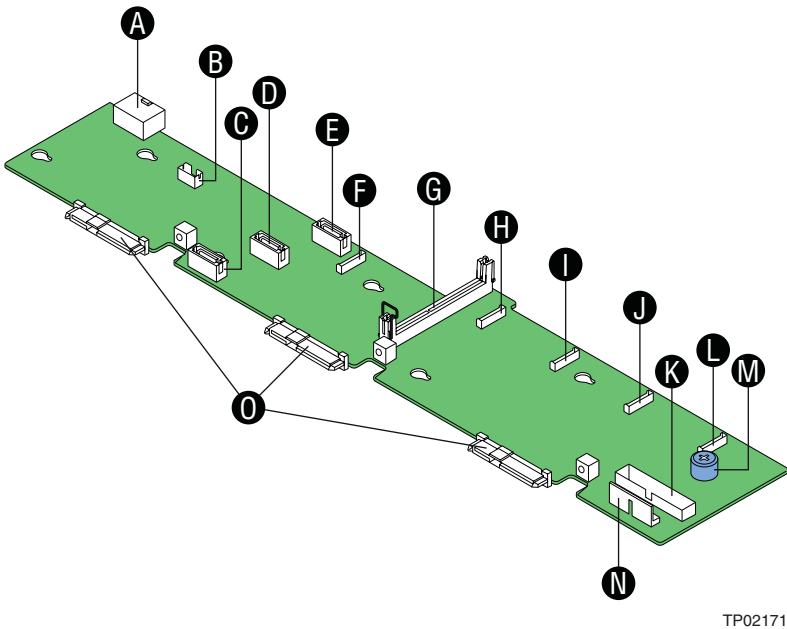


Figure 21. Hot-Swap Passive SAS/SATA Backplane Layout

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

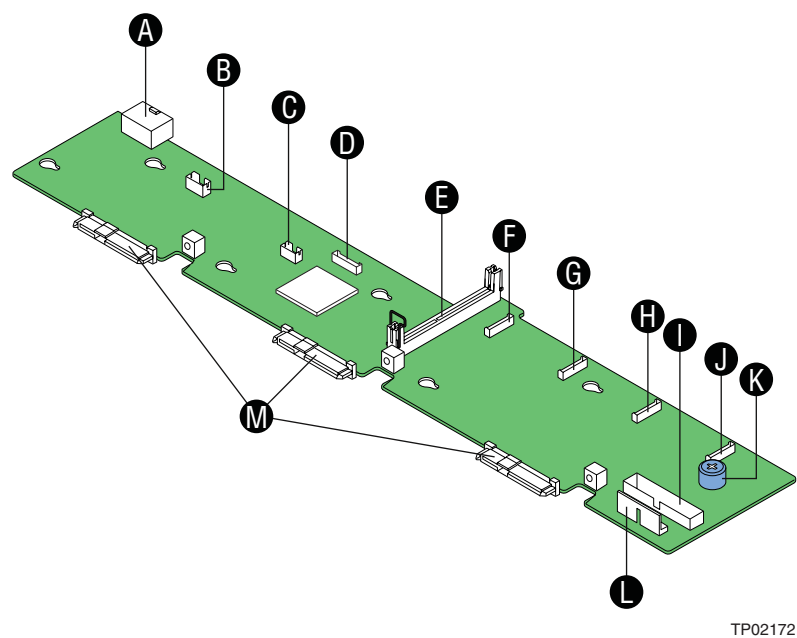


Figure 22. Active SAS Backplane Layout

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	Backplane Connectors
G	Fan 3 Power		

The following figures show the functional blocks for each backplane.

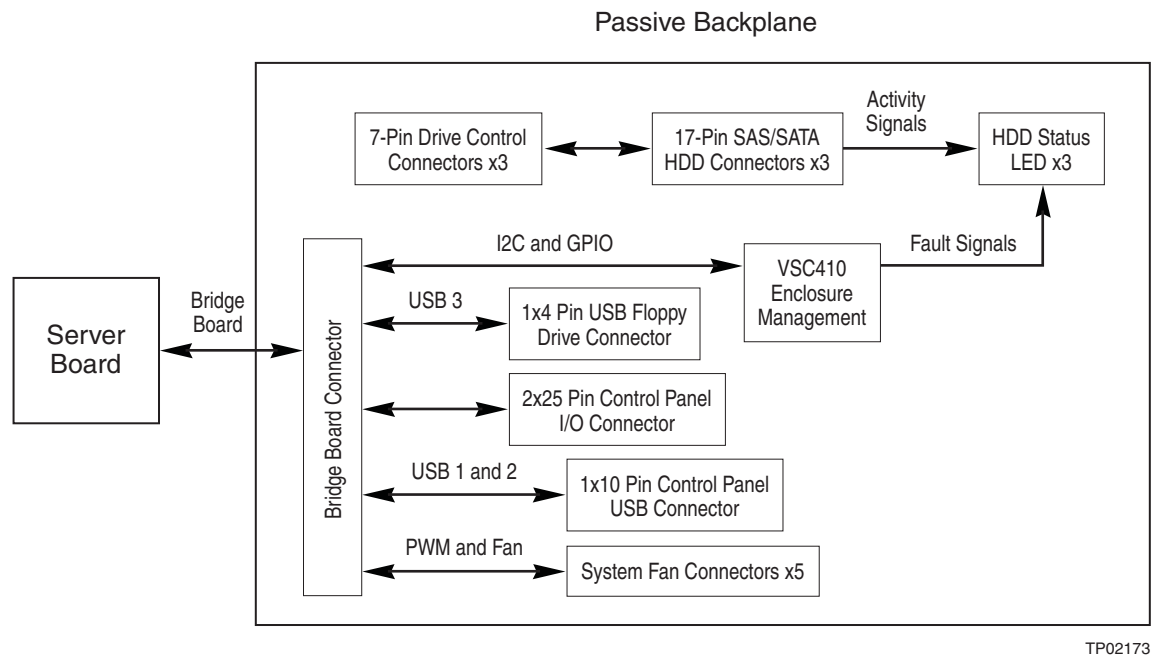


Figure 23. Hot-Swap Passive SAS/SATA Backplane Functional Diagram

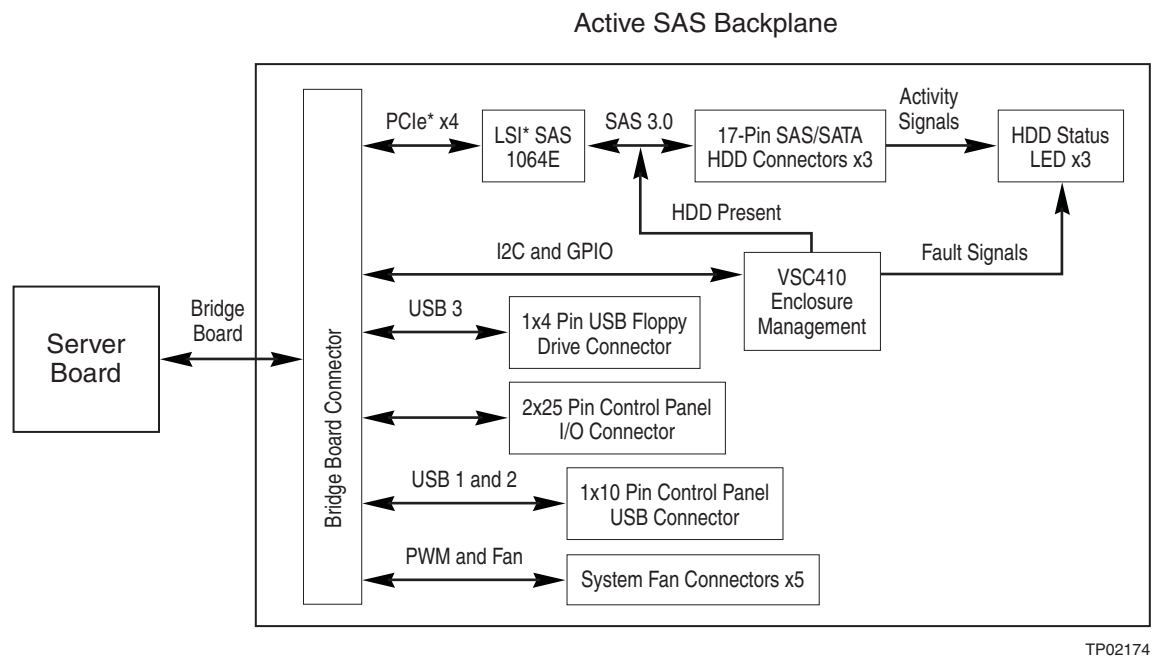


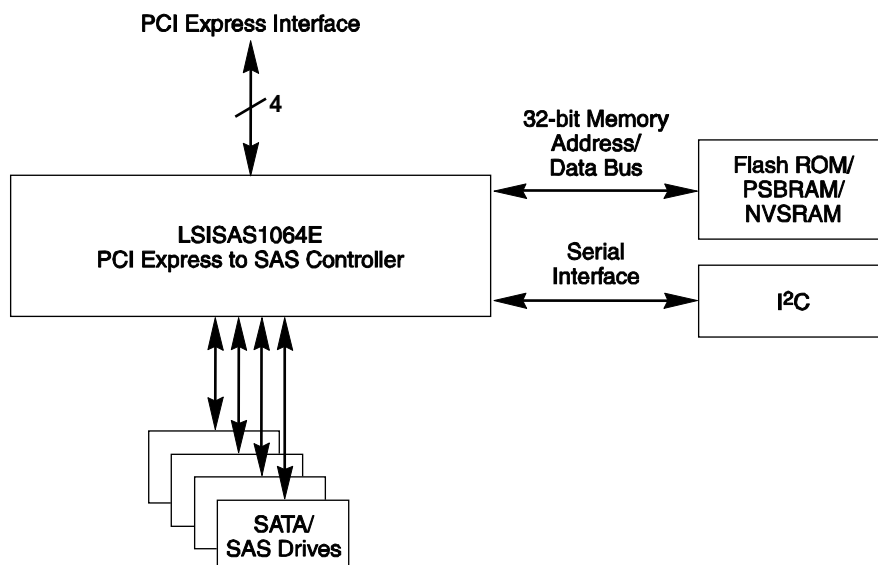
Figure 24. Hot-Swap Active SAS Backplane Functional Diagram

4.3.2 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 baseboard management controller on the server board.

4.3.3 LSI* SAS1064E 3.0 Gbit/s Serial Attached SCSI Controller

Integrated on to the Active SAS Backplane is an LSI SAS1064E Serial Attached SCSI (SAS) controller. The LSISAS1064E is a four-port, 3.0 Gbit/s SAS/SATA controller that is compliant with the Fusion-MPT* architecture, 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 Gbit/s.



TP02175

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 Gbit/s and 1.5 Gbit/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 Serial ATA technology.

The LSISAS1064E supports the Intel® Embedded RAID Technology II solution, which is a highly integrated, low-cost RAID implementation. 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 Logic* provides these device drivers.

4.3.3.1 Features of the LSI SAS1064E

SAS and SSP features:

- Each phy supports 3.0 Gbit/s and 1.5 Gbit/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 Gbits/s and 1.5 Gbits/s SATA data transfers
- Supports 3.0 Gbits/s and 1.5 Gbits/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

4.3.4 LED Support

The backplanes support an activity/fault LED for each of the hard drive connectors. The LED will illuminate 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 will have control over the fault LED and it may exhibit different behavior.

Table 16. 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 below.

Table 17. 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

4.3.5 Backplane Connector Definitions

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

4.3.5.1 Power Connector (Backplane to Power Supply Harness)

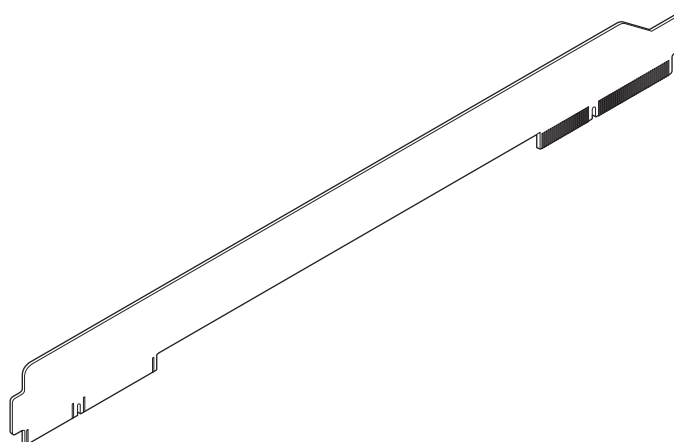
The backplane provides power to the three hard drive bays and the slim-line drive bay. An 8-pin power cable is routed from the power supply and plugs into a 2x4 shrouded plastic PC power connector on the backplane. The following table shows the power connector pin-out.

Table 18. Backplane Power Connector Pin-out (J1B1)

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

4.3.5.2 Bridge Board Interface (Backplane to Server Board)

The backplanes provide a pathway for the control panel, PCIe*, 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 assure the bridge board is held in place while the integrated platform is shipped or installed into the rack, the bridge board is held in place using metal clips which latch the bridge board to each of its connectors on the backplane and server board.



TP02176

Figure 25. Bridge Board Layout

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

Table 19. 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_PRSENT_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_PRSENT6_N
9	GND	69	GND
10	FAN_PRSENT5_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_PRSENT4_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_PRSENT1_N
24	GND	84	FAN_PRSENT3_N
25	SGPIO_DATAOUT1	85	FAN_PRSENT2_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
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

PIN	SIGNAL NAME	PIN	SIGNAL NAME
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

4.3.5.3 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 pin-out for the 50-pin control panel I/O connector is shown in the following table.

Table 20. Backplane Control Panel Connector Pin-out (J9C1)

Description	Pin #	Pin #	Description
V_IO_RED_CONN_FP	1	2	GND
V_IO_GREEN_CONN_FP	3	4	GND
V_IO_BLUE_CONN_FP	5	6	GND
V_IO_HSYNC_BUFF_FP_L	7	8	GND
V_IO_VSYNC_BUFF_FP_L	9	10	GND
VIDEO_IN_USE	11	12	FP_THERM_SENSOR
EMP_DTR2_L	13	14	EMP_DCD2_L
EMP_RTS2_L	15	16	EMP_CTS2_L
EMP_SIN2_L	17	18	EMP_SOUT2
EMP_DSR2_L	19	20	EMP_IN_USE
FP_NMI_BTN_L	21	22	GND
NIC1_ACT_LED_L	23	24	NIC1_LINK_LED_R_L
	25	26	FP_CHASSIS_INTRU
FP_ID_SW_L	27	28	SMB_PB1_5VSB_CLK
GND	29	30	SMB_PB1_5VSB_DAT
FP_RST_BTN_L	31	32	NIC2_ACT_LED_L
HDD_FAULT_LED_R_L	33	34	NIC2_LINK_LED_R_L
FP_PWR_BTN_L	35	36	FP_ID_LED_R_L
IPMB_I2C_5VSB_SCL	37	38	GND
IPMB_I2C_5VSB_SDA	39	40	HDD_LED_5V_A
FP_POWER_LED_R_N	41	42	FAULT_LED_5VSB_P
FP_PWR_LED_5VSB	43	44	LED_STATUS_AMBER_R1
RST_P6_PWRGOOD	45	46	LED_STATUS_GREEN_BUF_R1
HDD_LED_ACT_R_L	47	48	P5V
P5V_STBY	49	50	P5V_STBY

4.3.5.4 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 pin-out for the 10-pin control panel USB connector is shown in the following table.

Table 21. 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

4.3.5.5 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 22. SAS/SATA Hard Drive Connector Pin-outs (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
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

Pin#	Signal Description
PTY1	Ground

4.3.5.6 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 23. 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

4.3.5.7 USB Floppy Drive Connector

With a slim-line USB floppy drive installed (using the optional floppy drive kit) into either the slim-line 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 24. 4-pin floppy connector Pin-out (J2B1)

Pin	Name
1	P5V_USB_P3
2	USBP3N
3	USBP3P
4	GROUND

4.3.5.8 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 pin-out for each connector is provided in the following table.

Table 25. 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	

4.3.5.9 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 26. IPMB Connector Pin-out (J1C1)

Pin #	Description
1	SMB_IPMB_5VSB_DAT
2	GND
3	SMB_IPMB_5VSB_CLK
4	SMB_PWR_IPMB_CONN

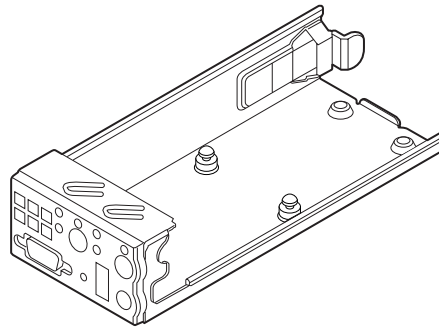
Table 27. Add-in Card Connector Pin-out (J6B2 – Passive Only)

Pin #	Description
1	SMB_3V3_SAS_SDA
2	GND
3	SMB_3V3_SAS_SCL

5. Standard Control Panel

The standard control panel (Product Code – AXXRACKFP) supports several push buttons and status LEDs, along with USB and video ports to centralize system control, monitoring, and accessibility to 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.



TP02177

Figure 26. Standard Control Panel Assembly Module

5.1 Control Panel Buttons

The standard control panel assembly houses several system control buttons. Each of their functions is listed in the table below.

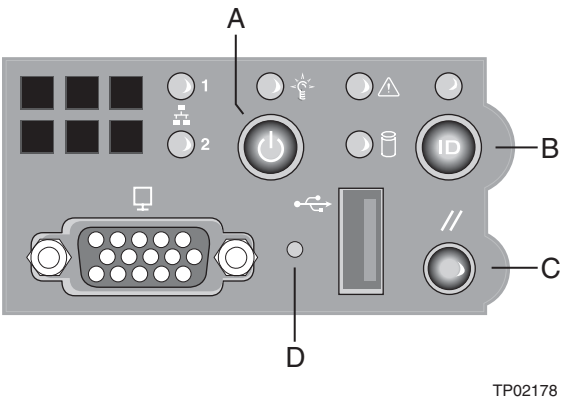


Figure 27. Control Panel Buttons

Table 28. 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 baseboard ID LED on/off. The baseboard ID LED is visible through the rear of the chassis and allows you to locate the server you're working on from behind a rack of servers.
C	Reset Button	Reboots and initializes the system.
D	NMI Button	Pressing the recessed button with a paper clip or pin puts the server in a halt state for diagnostic purposes and allows you to issue a non-maskable interrupt. After issuing the interrupt, a memory download can be performed to determine the cause of the problem.

5.2 Control Panel LED Indicators

The control panel houses six LEDs, which are viewable with or without the front bezel to display the system's operating state.

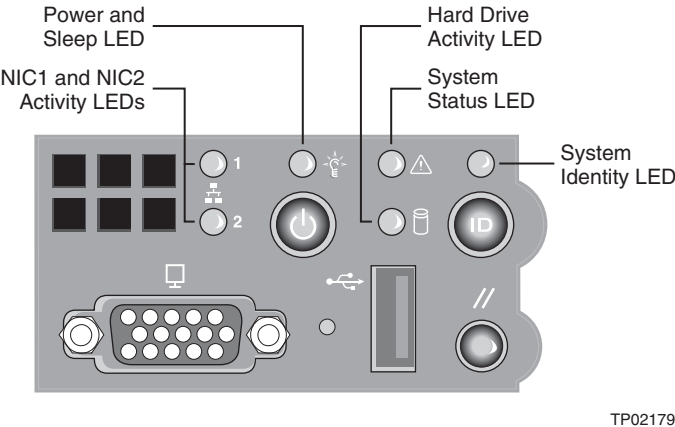


Figure 28. Control Panel LED Indicators

The following table identifies each LED and describes their functionality.

Table 29. 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 ^{1,4}	Sleep / ACPI S1 state
	Off	Off	Power Off / ACPI S4 or S5 state
System Status (on standby power)	Green/Amber	Alternating Blink	Pre DC Power On – 15-20 second BMC Initialization
	Green	On	Running / normal operation
		Blink ^{1,2}	Degraded
	Amber	On	Critical or non-recoverable condition.
		Blink ^{1,2}	Non-critical condition.
	Off	Off	POST / system stop.
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off ³	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 with 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. Also 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 BIOS, the LED state in effect at the time of power off will be 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 will be blinking at the same time that the system status LED is off 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 S5000PAL.

5.2.1 Power / Sleep LED

Table 30. 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 1	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 ~ 1Hz with at 50% duty cycle.

5.2.2 System Status LED

Table 31. Control Panel LED Operation

Color	State	Criticality	Description
Off	N/A	Not ready	AC power off
Green/ Amber	Alternating Blink	Not ready	Pre DC Power On – 15-20 second BMC Initialization when AC is applied to the server. Control Panel buttons are disabled until BMC initialization is complete.
Green	Solid on	Ok	System booted and ready
Green	Blink	Degraded	<p>System degraded</p> <p>Unable to use all of the installed memory (more than one DIMM installed).</p> <p>Correctable errors over a threshold of 10 and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spared DIMMs indicating a redundancy lost condition. Corresponding DIMM LED should light up.</p> <p>In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2).</p> <p>Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems.</p> <p>PCI-e link errors</p> <p>CPU failure / disabled – if there are two processors and one of them fails</p> <p>Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system</p> <p>Non-critical threshold crossed – Temperature and voltage</p>
Amber	Blink	Non-critical	<p>Non-fatal alarm – system is likely to fail</p> <p>Critical voltage threshold crossed</p> <p>VRD hot asserted</p> <p>Minimum number of fans to cool the system not present or failed</p> <p>In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window</p>
Amber	Solid on	Critical, non-recoverable	<p>Fatal alarm – system has failed or shutdown</p> <p>DIMM failure when there is one DIMM present, no good memory present</p> <p>Run-time memory uncorrectable error in non-redundant mode</p> <p>IERR signal asserted</p> <p>Processor 1 missing</p> <p>Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed)</p> <p>No power good – power fault</p> <p>Processor configuration error (for instance, processor stepping mismatch)</p>

5.2.2.1 System Status LED – BMC Initialization

When AC power is first applied to the system and 5V-STBY is present, the BMC controller on the server board requires 15-20 seconds to initialize. During this time, the System Status LED will Blink, alternating between Amber and Green, and the Power Button functionality of the Control Panel is disabled, preventing the server from powering up. Once BMC initialization has completed, the Status LED will stop blinking and the Power Button functionality is restored and can be used to turn on the Server.

5.2.3 Drive Activity LED

The drive activity LED on the front panel indicates drive activity from the onboard hard disk controllers. The Intel® Server Board S5000PAL also provides a header giving access to this LED for add-in controllers.

5.2.4 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 either of two mechanisms.

- By pressing the System ID Button on the system control panel the ID LED will display a solid blue color, until the button is pressed again.
- By issuing the appropriate hex IPMI “Chassis Identify” value, the ID LED will either Blink Blue for 15 seconds and turn off or will blink indefinitely until the appropriate hex IPMI Chassis Identify value is issued to turn it off.

5.3 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 32. 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

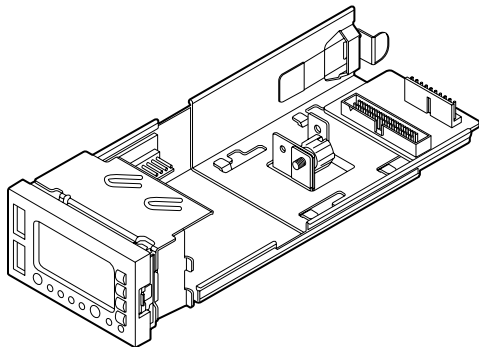
Table 33. Video Connector (J1A1)

Description	Pin #	Pin #	Description
VGA_RED	1	9	GND
VGA_GREEN	2	10	GND
VGA_BLUE	3	11	Unused
Unused	4	12	VGA_DDCCDAT
GND	5	13	VGA_HSYNC_L
GND	6	14	VGA_VSYNC_L
VGA_INUSE_L	7	15	VGA_DDCCCLK
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 will be disabled and the front panel video will be enabled. The video source is the same for both connectors and is switched between the two, with the control panel having priority over the rear video. This provides for easy front accessibility to the server.

6. Intel® Local Control Panel

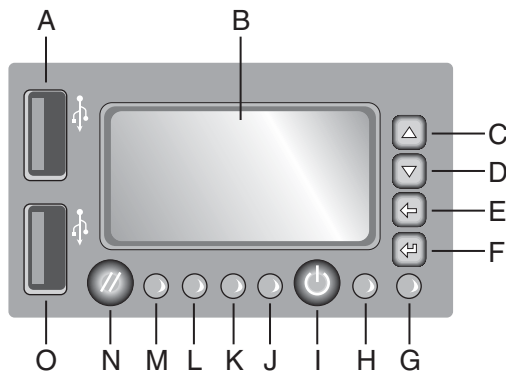
The Intel® Local Control Panel (Product Code – AXXLCPRACK) utilizes a combination of control buttons, LEDs, and LCD display to provide system accessibility, monitoring, and control functions. The control panel assembly is pre-assembled and is modular in design. The module slides into a slot on the front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



TP02180

Figure 29. Intel® Local Control Panel Assembly Module

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



TP02181

Figure 30. Intel® Local Control Panel Overview

A	USB 2.0 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 2.0 Port
H	Power / Sleep LED		

6.1 LED Functionality

The following table identifies each LED and describes their functionality.

Table 34. 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 ^{1,4}	Sleep / ACPI S1 state
	Off	Off	Power Off / ACPI S4 or S5 state
System Status (on standby power)	Green/Amber	Alternating Blink	Pre DC Power On – 15-20 second BMC Initialization
	Green	On	Running / normal operation
		Blink ^{1,2}	Degraded
	Amber	On	Critical or non-recoverable condition.
		Blink ^{1,2}	Non-critical condition.
	Off	Off	POST / system stop.
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off ³	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 with 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. Also 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 BIOS, the LED state in effect at the time of power off will be 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 will be blinking at the same time that the system status LED is off due to a failure or configuration change that prevents the BIOS from running.

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 ^{1,4}	Sleep / ACPI S1 state
	Off	Off	Power Off / ACPI S4 or S5 state
System Status (on standby power)	Green/Amber	Alternating Blink	Pre DC Power On – 15-20 second BMC Initialization
		On	Running / normal operation
	Amber	Blink ^{1,2}	Degraded
		On	Critical or non-recoverable condition.
	Off	Off	POST / system stop.
Disk Activity	Green	Random blink	Provides an indicator for disk activity.
	Off	Off ³	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 with 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. Also 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 BIOS, the LED state in effect at the time of power off will be 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 will be blinking at the same time that the system status LED is off 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 S5000PAL.

6.1.1 Power / Sleep LED

Table 35. 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 1	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 ~ 1Hz with at 50% duty cycle.

6.1.2 System Status LED

Table 36. Control Panel LED Operation

Color	State	Criticality	Description
Off	N/A	Not ready	AC power off
Green/ Amber	Alternating Blink	Not ready	Pre DC Power On – 15-20 second BMC Initialization when AC is applied to the server. Control Panel buttons are disabled until BMC initialization is complete.
Green	Solid on	Ok	System booted and ready
Green	Blink	Degraded	<p>System degraded</p> <p>Unable to use all of the installed memory (more than one DIMM installed).</p> <p>Correctable errors over a threshold of 10 and migrating to a spare DIMM (memory sparing). This indicates that the user no longer has spared DIMMs indicating a redundancy lost condition. Corresponding DIMM LED should light up.</p> <p>In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2).</p> <p>Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems.</p> <p>PCI-e link errors</p> <p>CPU failure / disabled – if there are two processors and one of them fails</p> <p>Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system</p> <p>Non-critical threshold crossed – Temperature and voltage</p>
Amber	Blink	Non-critical	<p>Non-fatal alarm – system is likely to fail</p> <p>Critical voltage threshold crossed</p> <p>VRD hot asserted</p> <p>Minimum number of fans to cool the system not present or failed</p> <p>In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window</p>
Amber	Solid on	Critical, non-recoverable	<p>Fatal alarm – system has failed or shutdown</p> <p>DIMM failure when there is one DIMM present, no good memory present</p> <p>Run-time memory uncorrectable error in non-redundant mode</p> <p>IERR signal asserted</p> <p>Processor 1 missing</p> <p>Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed)</p> <p>No power good – power fault</p> <p>Processor configuration error (for instance, processor stepping mismatch)</p>

6.1.2.1 System Status LED – BMC Initialization

When AC power is first applied to the system and 5V-STBY is present, the BMC controller on the server board requires 15-20 seconds to initialize. During this time, the System Status LED will Blink, alternating between Amber and Green, and the Power Button functionality of the Control Panel is disabled, preventing the server from powering up. Once BMC initialization has completed, the Status LED will stop blinking and the Power Button functionality is restored and can be used to turn on the Server.

6.1.3 Drive Activity LED

The drive activity LED on the front panel indicates drive activity from the onboard hard disk controllers. The Intel® Server Board S5000PAL also provides a header giving access to this LED for add-in controllers.

6.1.4 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 either of two mechanisms.

- By pressing the System ID Button on the system control panel the ID LED will display a solid blue color, until the button is pressed again.
- By issuing the appropriate hex IPMI “Chassis Identify” value, the ID LED will either Blink Blue for 15 seconds and turn off or will blink indefinitely until the appropriate hex IPMI Chassis Identify value is issued to turn it off.

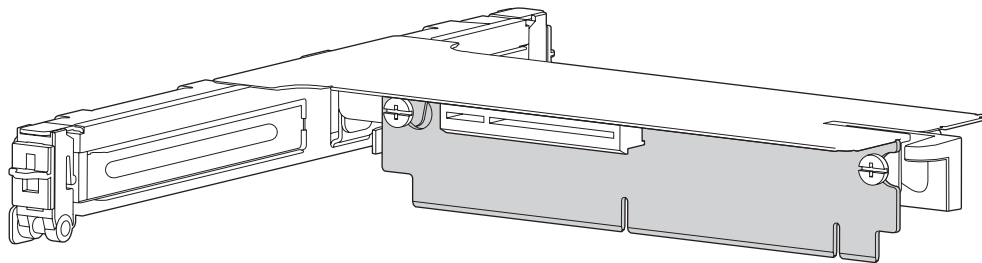
7. PCI Riser Cards and Assembly

The Intel® Server Board S5000PAL provides two PCI riser slots, one supporting a low profile add-in card riser, and the other used for full height add-in card risers. The riser cards for these slots are not interchangeable due to their orientation on the board and connector differences. The low profile riser slot is only capable of supporting a riser using PCI Express* cards. The full height riser slot is capable of supporting risers that follow either the PCI-X* or PCI Express* specifications.

The riser assembly for the server chassis is tool-less. Stand-offs allow the riser cards to slide onto the assembly where a latching mechanism holds each riser in place. Holding down the latch releases the risers for easy removal.

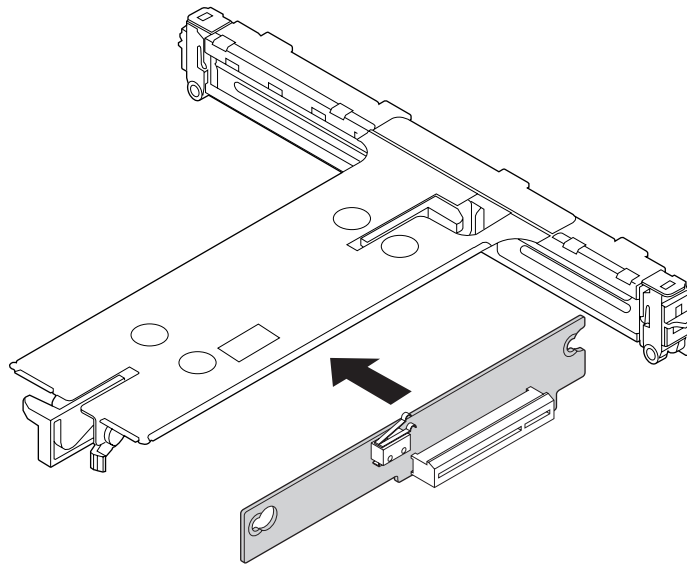
When re-inserting the riser assembly into the chassis, tabs on the back of the assembly should be aligned with slots on the back edge of the chassis. The tabs fit into the slots securing the riser assembly to the chassis when the top cover is in place.

The riser assembly provides two extraction levers to assist with riser assembly removal from the riser slots.



TP02188

Figure 31. PCI Riser Card Assembly - FH View



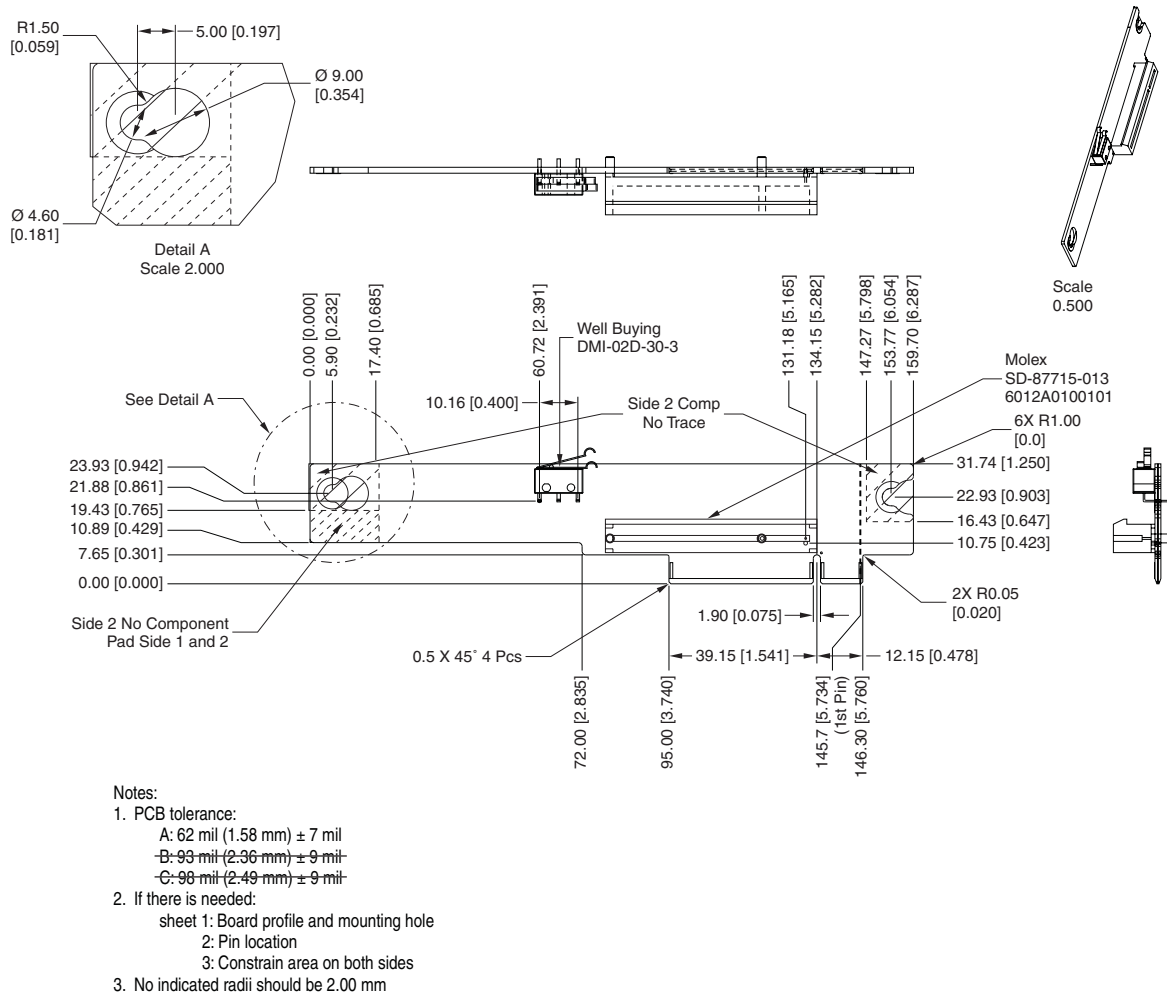
TP02187

Figure 32. PCI Riser Card Assembly – LP View

7.1 Riser Card Options

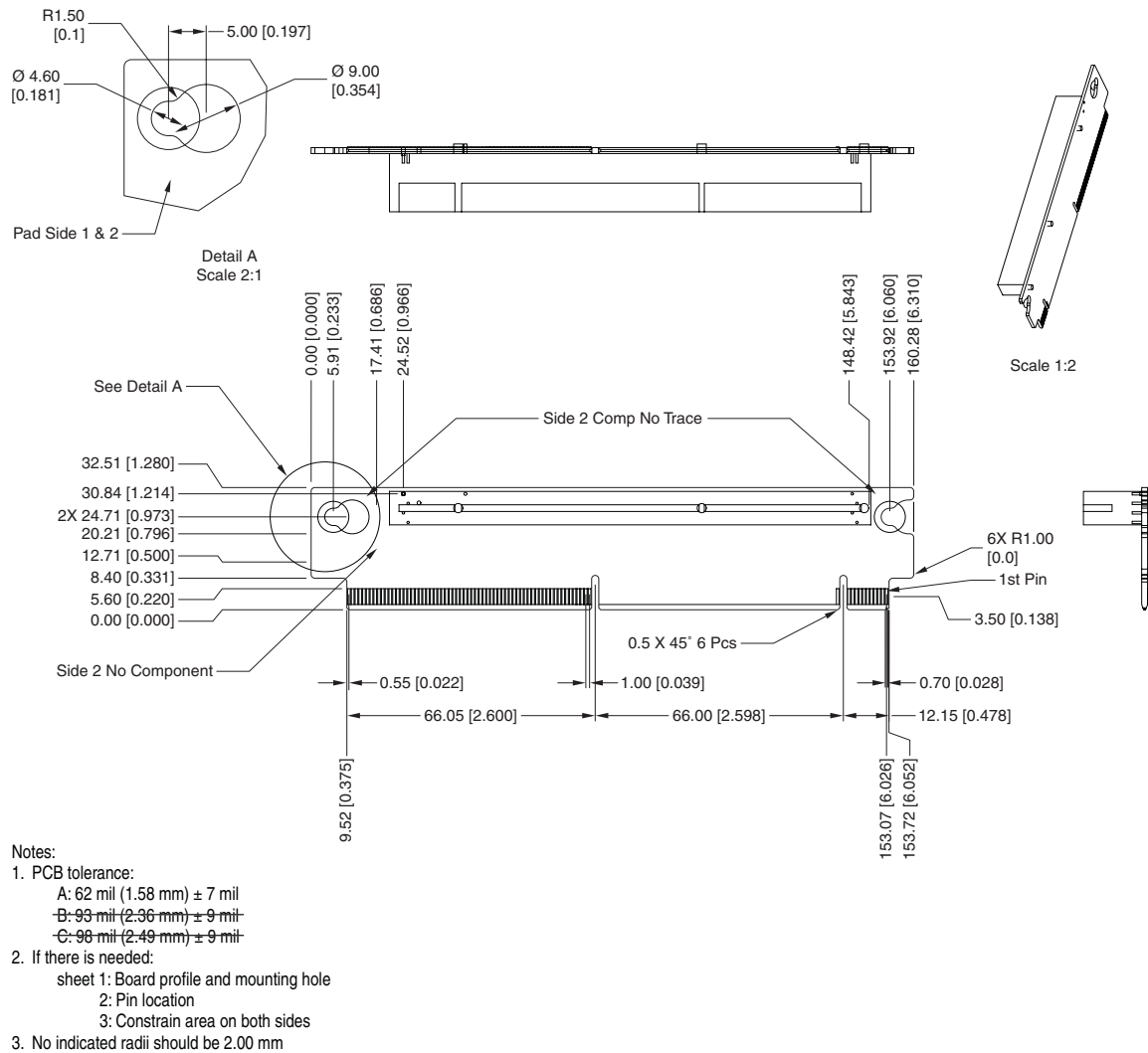
There are three different riser card options offered for use in the server chassis.

- Low profile PCI Express* (Product Code – ASR15XXLPRIS)– capable of supporting a single x8 PCI Express add-in card
- Full length PCI-X* (Product Code – ADWPCIXR)– capable of supporting a single PCI-X 66/100/133 MHz card;
- Full length PCI Express* (Product Code – ADWPCIEXPR) – capable of supporting a single x8 PCI Express add-in card.



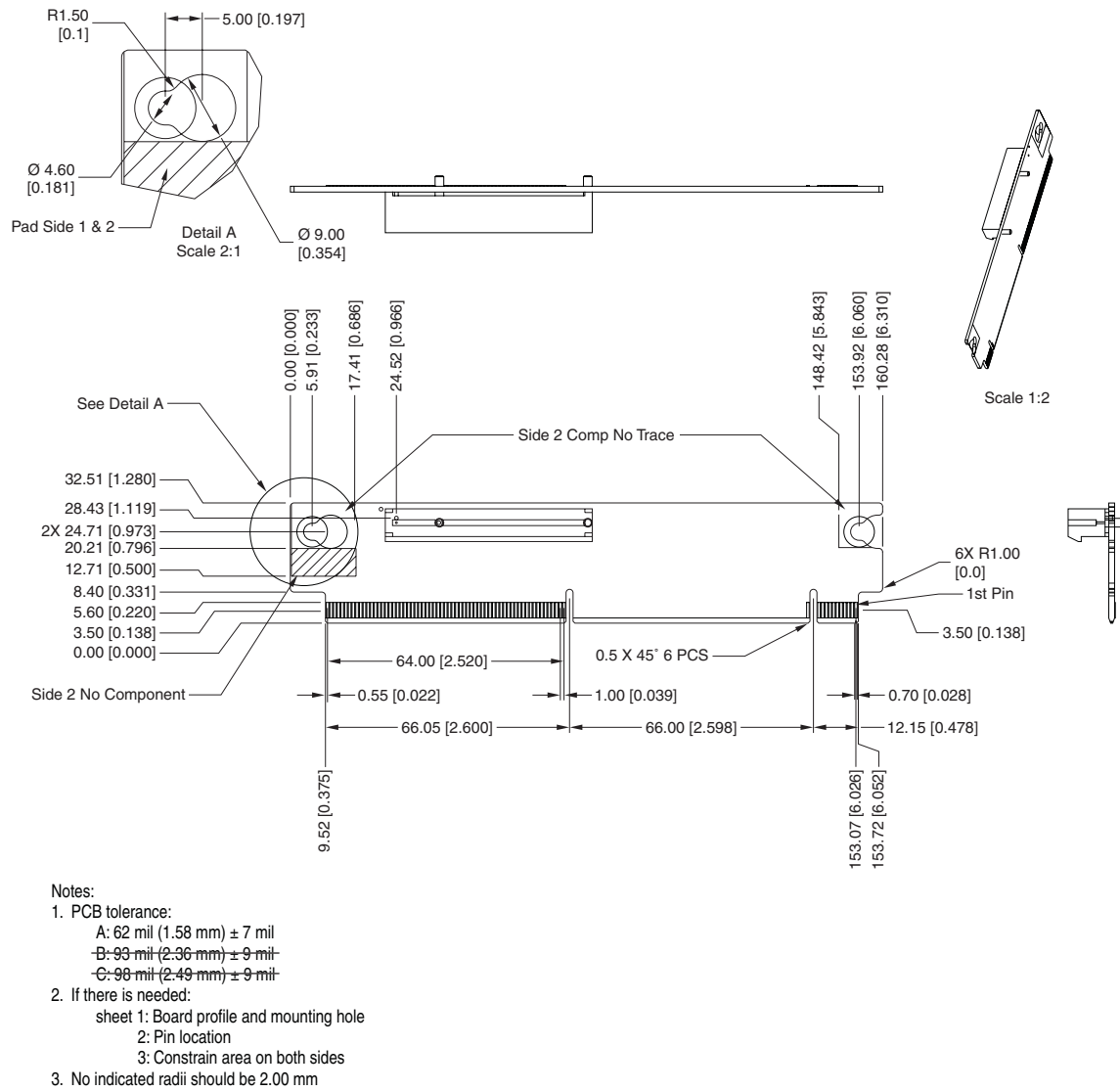
TP02182

Figure 33. 1U Low Profile PCI-X* Riser Card Mechanical Drawing



TP02183

Figure 34. 1U Full Height PCI-X* Riser Card Mechanical Drawing



TP02184

Figure 35. 1U Full Height PCI Express* Riser Card Mechanical Drawing

8. Supported Intel® Server Boards

The chassis is mechanically and functionally designed to support the Intel® Server Board S5000PAL. The following sections provide an overview of the server board feature sets. The Technical Product Specification for the server board should be referenced for more detailed information.

8.1 Intel® Server Board S5000PAL

The Intel® Server Board S5000PAL is a monolithic printed circuit board with features that were designed to support the high-density 1U and 2U server markets.

Feature	Description
Processors	771-pin LGA sockets supporting 1 or 2 Dual-Core Intel® Xeon® processors 5000 sequence, with system bus speeds of 667 MHz, 1066 MHz, or 1333 MHz
Memory	8 Keyed DIMM slots supporting fully buffered DIMM technology (FBDIMM) memory. 240-pin DDR2-533 and DDR2-677 FBDIMMs must be used.
Chipset	Intel® 5000 Chipset Family which includes the following components: Intel® 5000P / 5000X Memory Controller Hub Intel® ESB2-E I/O Controller
On-board Connectors/Headers	External connections: <ul style="list-style-type: none"> Stacked PS/2* ports for keyboard and mouse RJ45 Serial B port Two RJ45 NIC connectors for 10/100/1000 Mb connections Two USB 2.0 ports Video Connector Internal connectors/headers: <ul style="list-style-type: none"> One USB port header, capable of providing two USB 2.0 ports One DH10 Serial A header Six SATA ports via ESB2 supporting 3Gb/s and integrated SW RAID 0/1 support One 44pin (power + I/O) ATA/100 connector for optical drive support One Intel® Remote Management Module (RMM) connector (RMM use is optional) One I/O Module Connector supporting: <ul style="list-style-type: none"> Dual GB NIC I/O Module (Optional) External SAS Module (Optional) SSI-compliant 24-pin control panel header SSI-compliant 24-pin main power connector, supporting the ATX-12V standard on the first 20 pins 8-Pin +12V Processor Power Connector
Add-in PCI, PCI-X*, PCI Express* Cards	<ul style="list-style-type: none"> One low profile riser slot supporting 1U or 2U PCIe* riser cards One Full-height riser slot supporting 1U or 2U PCI-X* and PCIe riser cards
On-board Video	ATI* ES1000 video controller with 16MB DDR SDRAM
On-board Hard Drive Controller	<ul style="list-style-type: none"> Six ESB2 3Gb/s SATA ports. Intel® Embedded Server RAID Technology II with SW RAID levels 0/1/10. Optional support for SW RAID 5 with enablement key.¹
LAN	Two 10/100/1000 Intel 82563EB PHYs supporting Intel® I/O Acceleration Technology
System Fans	Six 4-pin Fan Headers supporting two processor fans, and four system fans
System Management	Support for Intel® System Management Software

¹ Onboard SATA SW RAID 5 support provided as a post product launch feature.

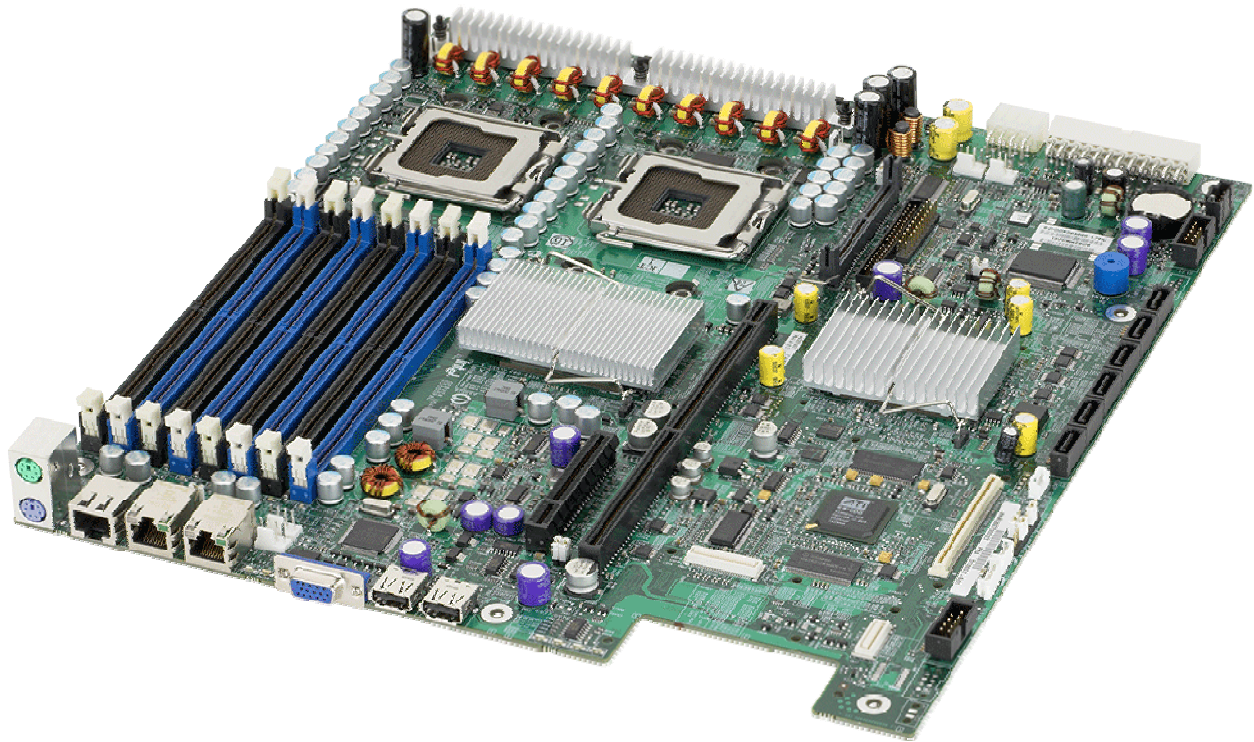
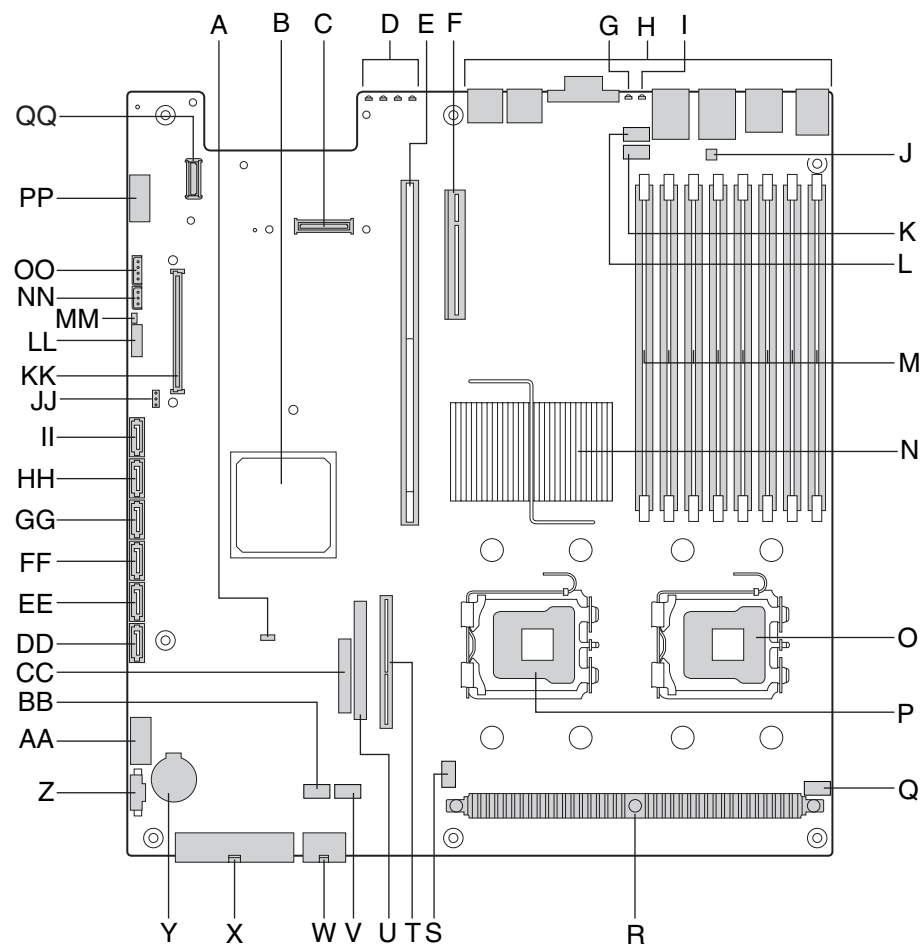


Figure 36. Intel® Server Board S5000PAL



TP02071

	Description		Description
A	BIOS Bank Select Jumper	V	System Fan #2 Header
B	Intel® 6321ESB I/O Controller Hub	W	CPU Power Connector
C	IO Module Option Connector	X	Main Power Connector
D	POST Code Diagnostic LEDs	Y	Battery
E	Intel® Adaptive Slot – Full Height	Z	Power Supply Management Connector
F	PCI Express* Riser Slot – Low Profile	AA	Dual Port USB 2.0 Header
G	System Identification LED - Blue	BB	System Fan #1 Header
H	External IO Connectors	CC	SSI 24-pin Control Panel Header
I	Status LED – Green / Amber	DD	SATA 0
J	Serial 'B' Port Configuration Jumper	EE	SATA 1
K	System Fan #4 Header	FF	SATA 2
L	System Fan #3 Header	GG	SATA 3
M	FBDIMM Slots	HH	SATA 4
N	Intel® 5000P Memory Controller Hub (MCH) or Intel® 5000X Memory Controller Hub (MCH)	II	SATA 5
O	CPU #1 Connector	JJ	SATA SW RAID 5 Activation Key Connector
P	CPU #2 Connector	KK	Intel® Remote Management Module (RMM) Connector
Q	CPU #1 Fan Header	LL	System Recovery Jumper Block
R	Voltage Regulator Heat Sink	MM	Chassis Intrusion Switch Header
S	CPU #2 Fan Header	NN	3-pin IPMB Header
T	Bridge Board Connector	OO	Intel® Local Control Panel Header
U	ATA-100 Optical Drive Connector (Power+IO)	PP	Serial 'A' Header
		QQ	Intel® RMM NIC Connector

Figure 37. Intel® Server Board S5000PAL Components

8.1.1 Processor Support

The server system supports one or two Dual-Core Intel® Xeon® processors 5000 sequence, with system bus speeds of 667 MHz, 1066 MHz, and 1333 MHz, and core frequencies starting at 2.67 GHz. Previous generations of the Intel® Xeon® processor are not supported on this server board.

Note: Only Dual-Core Intel® Xeon® processors 5000 sequence, that support system bus speeds of 667 MHz, 1066 MHz, and 1333 MHz are supported on this server board. See the following table for a list of supported processors.

Dual-Core Intel® Xeon® processor 5000 sequence processors will encompass the following:

Table 37. Processor Support Matrix

Processor Family	System Bus Speed	Core Frequency	Cache	Watts	Support
Intel® Xeon® Processor	533 MHz	All			No
Intel® Xeon® Processor	800 MHz	All			No
Dual-Core Intel® Xeon® Processor 5030	667 MHz	2.67 GHz	2x 2 MB	95	Yes
Dual-Core Intel® Xeon® Processor 5050	667 MHz	3.0 GHz	2x 2 MB	95	Yes
Dual-Core Intel® Xeon® Processor 5060	1066 MHz	3.2 GHz	2x 2 MB	130	Yes
Dual-Core Intel® Xeon® Processor 5063	1066 MHz	3.2 GHz	2x 2 MB	95	Yes
Dual-Core Intel® Xeon® Processor 5080	1066 MHz	3.73 GHz	2x 2 MB	130	Yes
Dual-Core Intel® Xeon® Processor 51xx	1333/1066 MHz	TBD	TBD	TBD	Yes

8.1.1.1 Processor Population Rules

When two processors are installed, both must be of identical revision, core voltage, and bus/core speed. When only one processor is installed, it must be in the socket labeled CPU1. The other socket must be empty.

The system is designed to provide up to 130A of current per processor. Processors with higher current requirements are not supported.

No terminator is required in the second processor socket when using a single processor configuration.

8.1.1.2 Common Enabling Kit (CEK) Design Support

The server system complies with Intel's Common Enabling Kit (CEK) processor mounting and heat sink retention solution. The server board ships with a CEK spring snapped onto the underside of the server board, beneath each processor socket. The heat sink attaches to the CEK, over the top of the processor and the thermal interface material (TIM). See the figure below for the stacking order of the chassis, CEK spring, server board, TIM, and heat sink.

The CEK spring is removable, allowing for the use of non-Intel heat sink retention solutions.

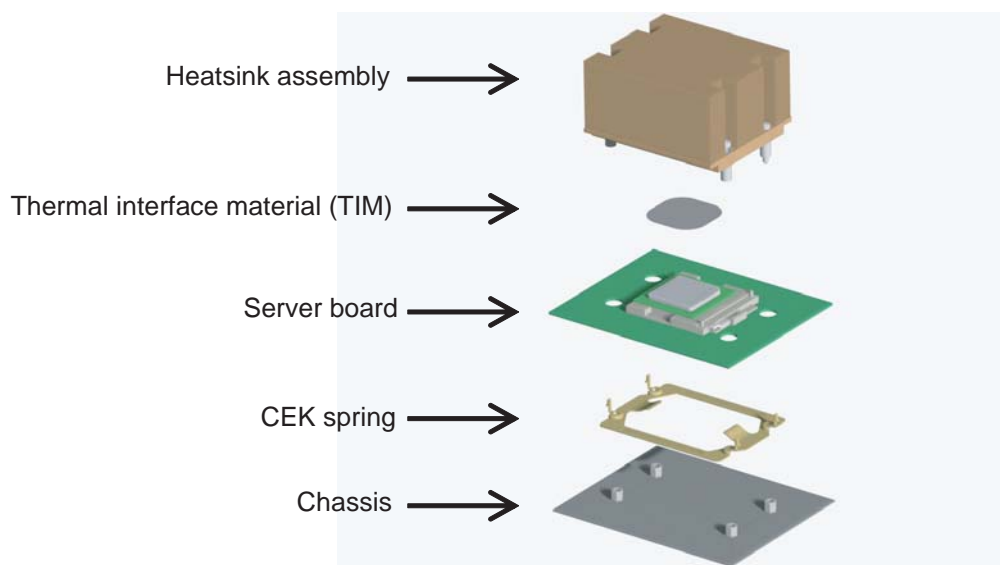


Figure 38. CEK Processor Mounting

9. Environmental and Regulatory Specifications

9.1 System Level Environmental Limits

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

Table 38. System Environmental Limits Summary

Parameter	Limits
Operating Temperature	10° C to 35° C (50° F to 90° F) 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 @ 28°C
Acoustic noise	Sound Pressure: 55 dBA (Rack mount) in an idle state at typical office ambient temperature. (23 +/- degrees C) 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 mSec
Shock, unpackaged	Trapezoidal, 25 g, velocity change 136 inches/sec (≥ 40 lbs to > 80 lbs)
Shock, packaged	Non-palletized free fall in height 24 inches (≥ 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 mSec
ESD	+/-15kV except I/O port +/-8KV per Intel Environmental test specification
System Cooling Requirement in BTU/Hr	2550 BTU/hour

9.2 Product Regulatory Compliance

9.2.1 Product Safety Compliance

The platform complies with the following safety requirements:

- UL60950 – CSA 60950(USA / Canada)
- EN60950 (Europe)
- IEC60950 (International)
- CB Certificate & Report, IEC60950 (report to include all country national deviations)
- GS License (Germany)
- GOST R 50377-92 - License (Russia)
- Belarus License (Belarus)
- Ukraine License (Ukraine)
- CE - Low Voltage Directive 73/23/EEE (Europe)
- IRAM Certification (Argentina)
- GB4943- CNCA Certification (China)

9.2.2 Product EMC Compliance

The platform has been tested and verified to comply with the following electromagnetic compatibility (EMC) regulations when installed a compatible Intel host system. For information on compatible host system(s) refer to Intel's Server Builder website or contact your local Intel representative.






- FCC (Class A Verification) – Radiated & Conducted Emissions (USA)
- CISPR 22 – Emissions (International)
- EN55022 - Emissions (Europe)
- EN55024 - Immunity (Europe)
- EN61000-3-2 - Harmonics (Europe)
- EN61000-3-3 - Voltage Flicker (Europe)
- CE – EMC Directive 89/336/EEC (Europe)
- VCCI Emissions (Japan)
- AS/NZS 3548 Emissions (Australia / New Zealand)
- BSMI CNS13438 Emissions (Taiwan)
- GOST R 29216-91 Emissions (Russia)
- GOST R 50628-95 Immunity (Russia)
- Belarus License (Belarus)
- Ukraine License (Ukraine)
- RRL MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) (Korea)
- GB 9254 - CNCA Certification (China)
- GB 17625 - (Harmonics) CNCA Certification (China)

9.2.3 Certifications / Registrations / Declarations

- UL 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 / License (Russia)
- Belarus Certification / License (Belarus)
- RRL Certification (Korea)
- IRAM Certification (Argentina)
- CNCA Certification (China)
- Ecology Declaration (International)

9.2.4 Product Regulatory Compliance Markings

The Intel® Server Chassis SR1500 is provided with the following regulatory marks.

Regulatory Compliance	Region	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
C-Tick Mark	Australia / New Zealand	
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	

		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
GOST R Marking	Russia	
RRL MIC Mark	Korea	
China Compulsory Certification Mark	China	

9.3 Electromagnetic Compatibility Notices

9.3.1 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.

For questions related to the EMC performance of this product, contact:

Intel Corporation
 5200 N.E. Elam Young Parkway
 Hillsboro, OR 97124
 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 to an outlet on a circuit other than the one 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 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.

9.3.2 FCC Verification Statement

Product Type: SR1500; S5000PAL

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.

For questions related to the EMC performance of this product, contact:

Intel Corporation

5200 N.E. Elam Young Parkway

Hillsboro, OR 97124-6497

Phone: 1 (800)-INTEL4U or 1 (800) 628-8686

9.3.3 ICES-003 (Canada)

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

(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.

9.3.4 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.

9.3.5 Japan EMC Compatibility

Electromagnetic Compatibility Notices (International)

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.

9.3.6 BSMI (Taiwan)

The BSMI Certification number and the following warning is located on the product safety label which is located on the bottom side (pedestal orientation) or side (rack mount configuration).

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。

9.3.7 RRL (Korea)

Following is the RRL certification information for Korea.



English translation of the notice above:

1. Type of Equipment (Model Name): On License and Product
2. Certification No.: On RRL 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

9.3.8 CNCA (CCC-China)

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

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取可行的措施。

9.4 Replacing the Back up 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 (for example, the date and time) may be wrong. Contact your customer service representative or dealer for a list of approved devices.



WARNING

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!

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



ADVARSEL

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



VARNING

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



VAROITUS

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

9.5 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.

Following are the maximum times that a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system and having identified the failed component.

Activity	Time Estimate
Remove cover	1 min
Remove and replace hard disk drive	5 min
Remove and replace power supply module	1 min
Remove and replace system fan	7 min
Remove and replace backplane board	12 min
Remove and replace control panel module	2 min
Remove and replace baseboard	15 min

9.6 Restriction of Hazardous Substances (RoHS) Compliance

Intel has a system in place to restrict the use of banned substances in accordance with the European Directive 2002/95/EC. Compliance is based on declaration that materials banned in the RoHS Directive are either (1) below all applicable substance threshold limits or (2) an approved/pending RoHS exemption applies.

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

Threshold limits and banned substances are noted below.

- Quantity limit of 0.1% by mass (1000 PPM) for:
 - Lead
 - Mercury
 - Hexavalent Chromium
 - Polybrominated Biphenyls Diphenyl Ethers (PBDE)
- Quantity limit of 0.01% by mass (100 PPM) for:
 - Cadmium

9.7 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.

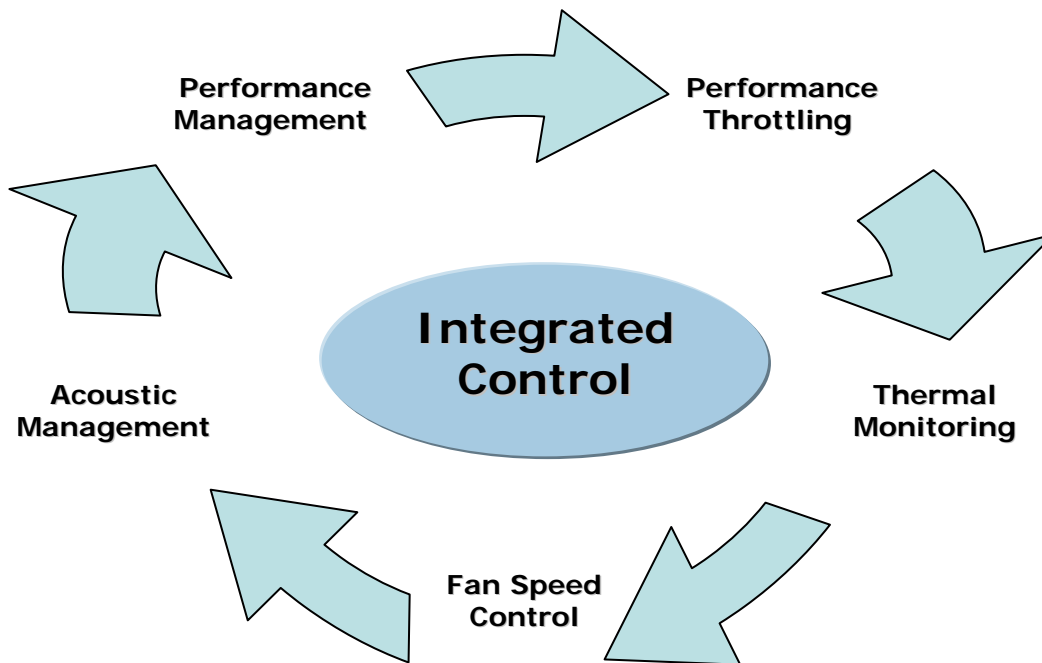
Server board—you must use an Intel server board—UL recognized.

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 is 19 watts. Total server configuration is not to exceed the maximum loading conditions of the power supply

10. Platform Control

This server platform has embedded platform control which is capable of automatically adjusting system performance and acoustic levels.



10.1 Overview

Platform control optimizes system performance and acoustics levels through:

- Performance Management
- Performance Throttling
- Thermal Monitoring
- Fan Speed Control
- Acoustics Management

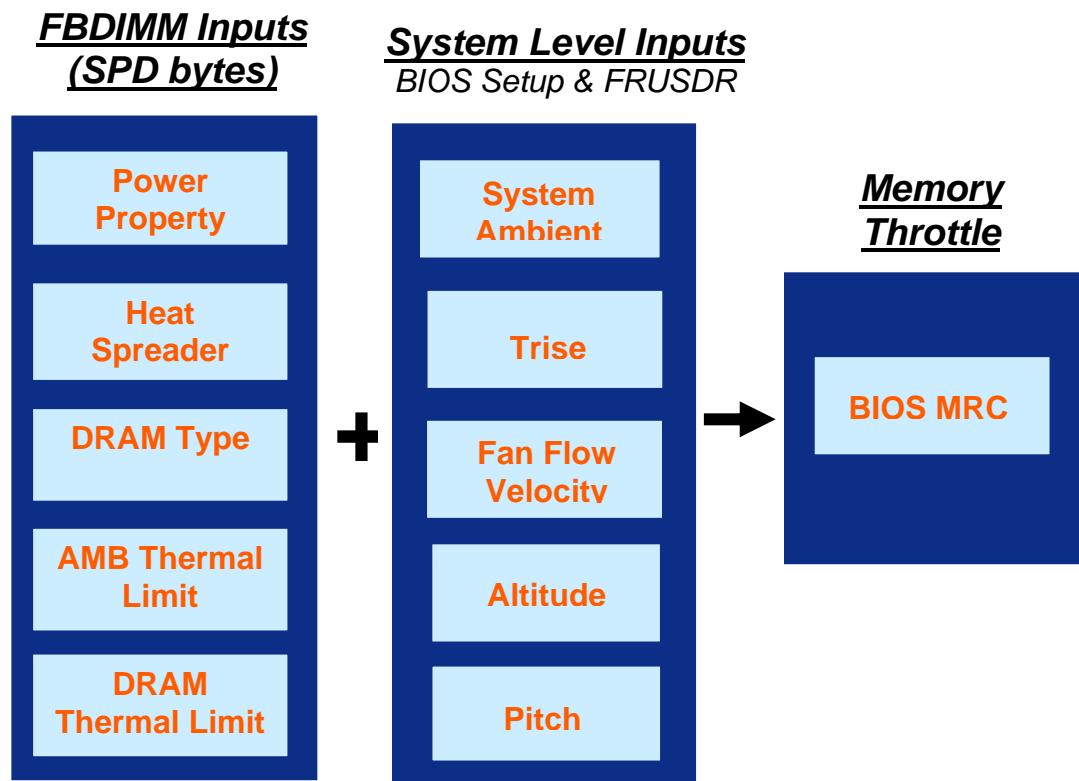
The platform components used to implement platform control include:

- Baseboard Management Controller functions of the ESB-2
- LM94 Sensor Monitoring Chip
- Platform Sensors
- Variable Speed System Fans
- System BIOS
- BMC Firmware
- Sensor Data Records as loaded by the FRUSDR Utility
- FBDIMM type
- Processor type

10.2 FBDIMM Open Loop Throughput Throttling

Memory throttling is a feature of the Intel 5000 sequence chipsets to prevent FBDIMM memory from overheating. If the performance of the installed FB-DIMMs approaches their supported thermal limit for a given platform, system BIOS will initiate memory throttling which manages memory performance by limiting bandwidth to the DIMMs, therefore capping the power consumption and preventing the DIMMs from overheating. Memory throttling can be minimized by operating your platform in “Performance Mode” (default) which changes the system Fan Control profile to run the system fans at higher speeds. Running the platform in “Acoustics Mode” will cause the system fans to run slower to meet the acoustic limits for the given platform.

System BIOS utilizes a Memory Reference Code (MRC) throttling algorithm to maximize memory bandwidth for a given configuration when memory throttling is initialized. The MRC code relies on Serial Presence Detect (SPD) data read from the installed DIMMs as well as system level data as set through BIOS Setup Options and the FRUSDR Utility.



10.3 Fan Speed Control

System fan speed is controlled by the Baseboard Management Controller (BMC) functions of the ESB-2 chip. During normal system operation, the BMC will retrieve information from BIOS and monitor several platform thermal sensors to determine the required fan speeds.

In order to provide the proper fan speed control for a given system configuration, the BMC must have the appropriate platform data programmed. Platform configuration data is programmed using the FRUSDR Utility during the system integration process, and by System BIOS during run time.

10.3.1 System Configuration Using the FRUSDR Utility

The Field Replaceable Unit and Sensor Data Record Update Utility (FRUSDR utility) is a program used to write platform specific configuration data to NVRAM on the server board. It allows the User to select which supported chassis (Intel or Non-Intel) and platform chassis configuration is being used. Based on the input provided, the FRUSDR writes sensor data specific to the configuration to NVRAM for the BMC controller to read each time the system is powered on.

10.3.2 Fan Speed Control from BMC and BIOS Inputs

Using the data programmed to NVRAM by the FRUSDR utility, the BMC is configured to monitor and control the appropriate platform sensors and system fans each time the system is powered on. After power-on, the BMC uses additional data provided to it by System BIOS to determine how the system fans should be controlled.

The BIOS provides data to the BMC telling it which fan profile the platform is setup for, Acoustics Mode or Performance Mode. The BIOS uses the parameters retrieved from the thermal sensor data records (SDR), the fan profile setting from BIOS Setup, and the altitude setting from BIOS Setup to configure the system for memory throttling and fan speed control. If the BIOS fails to get the Thermal SDRs, then it will use the Memory Reference Code (MRC) default settings for the memory throttling settings.

The <F2> BIOS Setup Utility provides options to set the fan profile or operating mode the platform will operate under. Each operating mode has a predefined profile for which specific platform targets are configured, which in turn determines how the system fans operate to meet those targets. Platform profile targets are determined by which type of platform is selected when running the FRUSDR utility and by BIOS settings configured using the <F2> BIOS Setup Utility.

10.3.2.1 Configuring the Fan Profile Using the BIOS Setup Utility

The BIOS uses options set in the <F2> BIOS Setup Utility to determine what fan profile the system should operate under. These options include “SET FAN PROFILE” and “ALTITUDE”.

The “SET FAN PROFILE” option can be set to either the “Performance” mode (Default), or “Acoustics” mode. See the following sections for detail describing the difference between each mode. Changing the fan profile to Acoustics mode may affect system performance.

The “ALTITUDE” option is used to determine appropriate memory performance settings based on the different cooling capability at different altitudes. At high altitude, memory performance must be reduced to compensate for thinner air. Be advised, selecting an Altitude option to a setting that does not meet the operating altitude of the server may limit the system fans ability to provide adequate cooling to the memory. If the air flow is not sufficient to meet the needs of the server even after throttling has occurred, the system may shut down due to excessive platform thermals.

By default, the Altitude option is set to 301Meters – 900 Meters which is believed to cover the majority of the operating altitudes for these server platforms.

The following Diagrams show which BIOS Setup Utility menu is used to configure the desired Fan Profile.

Advanced

System Acoustic and Performance Configuration

Set Fan Profile

Performance / Acoustics

Altitude

300 M or less / **301 M - 900 M** / Higher than 900 M

Setup Item	Option	Help Text	Comments
Set Fan Profile	Performance Acoustic	Select the fan control profile that will be used to cool the system.	Performance mode favors using fans over throttling memory bandwidth to cool the system.
Altitude	300 M or less 301 M - 900 M Higher than 900 M	300 M or less (<= 980ft): Provides the best performance option for servers operating at or near sea level. 301 M – 900 M (980ft - 2950ft): Provides the best performance option for servers operating at moderate altitudes above sea level. Higher than 900 M (>2950ft): Provides the best performance option for servers operating at high elevations above sea level.	

Note: Fan speed control for non-Intel chassis, as configured after running the FRUSDR utility and selecting the Non-Intel Chassis option, is limited to only the CPU fans. The BMC only requires the processor thermal sensor data to determine how fast to operate these fans. The remaining system fans will operate at 100% operating limits due to unknown variables associated with the given chassis and its fans. Therefore, regardless of whether the system is configured for Performance Mode or Acoustics Mode, the System fans will always run at 100% operating levels providing for maximum airflow. In this scenario the Performance and Acoustic mode settings only affects the allowable performance of the memory (higher BW for the Performance mode).

10.3.2.2 Performance Mode (Default)

With the platform running in Performance mode (Default), several platform control algorithm variables are set to enhance the platform's capability of operating at maximum performance targets for the given system. In doing so, the platform is programmed with higher fan speeds at lower external temperatures. This will result in a louder acoustic level than is targeted for the given platform, but the increased airflow of this operating mode will greatly reduce possible memory throttling from occurring and will reduce dynamic fan speed changes based on processor utilization.

10.3.2.3 Acoustics Mode

With the platform running in Acoustics mode, several platform control algorithm variables are set to ensure acoustic targets are not exceeded for specified Intel platforms. In this mode, the platform is programmed to set the fans at lower speeds when the processor does not require

additional cooling due to high utilization / power consumption. Memory throttling will be utilized to ensure that the memory thermal limits are not exceeded.

< This page intentionally left blank >

Appendix A: Integration and Usage Tips

This section provides a list of useful information that is unique to the Intel® Server Chassis SR1500 and should be kept in mind while integrating and configuring your Intel® Server Board S5000PAL.

- 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.
- The air dam on the CPU air duct must be in place for single processor configurations. Once the air dam is removed, it cannot be re-installed.
- 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 is available for installing a slimline USB floppy drive in either the slim-line bay or in the first 3.5" hard drive bay. This kit has the following product order code:
- The FRUSDR utility must be run 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, BMC firmware, and hot swap controller firmware. The latest system software can be downloaded from

<http://support.intel.com/support/motherboards/server/S5000PAL/>

Appendix B: POST Code Diagnostic LED Decoder

During the system boot process, 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, BIOS will display the given POST code to the POST Code Diagnostic LEDs found 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 to be executed.

Each POST code will be represented by a combination of colors from the four LEDs. The LEDs are capable of displaying three colors: green, red, and amber. The POST codes are divided into two nibbles, an upper nibble and a lower nibble. Each bit in the upper nibble is represented by a red LED and each bit in the lower nibble is represented by a green LED. If both bits are set in the upper and lower nibbles then both red and green LEDs are lit, resulting in an amber color. If both bits are clear, then the LED is off.

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

- red bits = 1010b = Ah
- green bits = 1100b = Ch

Since the red bits correspond to the upper nibble and the green bits correspond to the lower nibble, the two are concatenated to be ACh.

Table 39: POST Progress Code LED Example

LEDs	8h		4h		2h		1h	
	Red	Green	Red	Green	Red	Green	Red	Green
ACh	1	1	0	1	1	0	0	0
Result	Amber		Green		Red		Off	
	MSB						LSB	

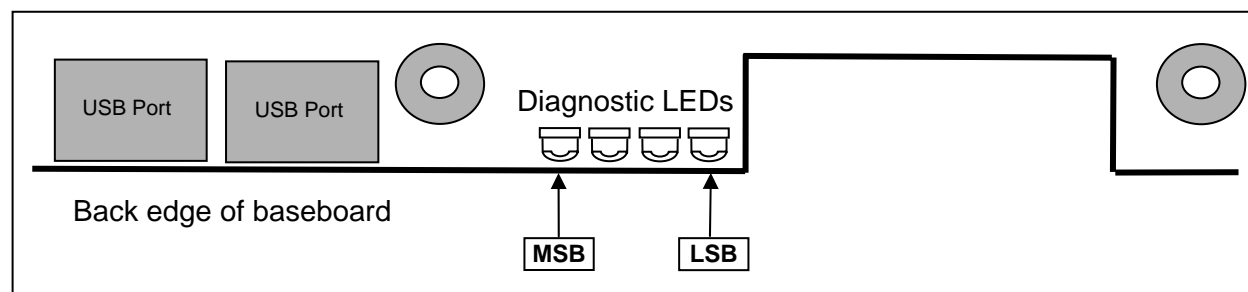


Figure 39. Diagnostic LED Placement Diagram

Table 40. Diagnostic LED POST Code Decoder

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
Host Processor					
0x10h	OFF	OFF	OFF	R	Power-on initialization of the host processor (bootstrap processor)
0x11h	OFF	OFF	OFF	A	Host processor cache initialization (including AP)
0x12h	OFF	OFF	G	R	Starting application processor initialization
0x13h	OFF	OFF	G	A	SMM initialization
Chipset					
0x21h	OFF	OFF	R	G	Initializing a chipset component
Memory					
0x22h	OFF	OFF	A	OFF	Reading configuration data from memory (SPD on DIMM)
0x23h	OFF	OFF	A	G	Detecting presence of memory
0x24h	OFF	G	R	OFF	Programming timing parameters in the memory controller
0x25h	OFF	G	R	G	Configuring memory parameters in the memory controller
0x26h	OFF	G	A	OFF	Optimizing memory controller settings
0x27h	OFF	G	A	G	Initializing memory, such as ECC init
0x28h	G	OFF	R	OFF	Testing memory
PCI Bus					
0x50h	OFF	R	OFF	R	Enumerating PCI busses
0x51h	OFF	R	OFF	A	Allocating resources to PCI busses
0x52h	OFF	R	G	R	Hot Plug PCI controller initialization
0x53h	OFF	R	G	A	Reserved for PCI bus
0x54h	OFF	A	OFF	R	Reserved for PCI bus
0x55h	OFF	A	OFF	A	Reserved for PCI bus
0x56h	OFF	A	G	R	Reserved for PCI bus
0x57h	OFF	A	G	A	Reserved for PCI bus
USB					
0x58h	G	R	OFF	R	Resetting USB bus
0x59h	G	R	OFF	A	Reserved for USB devices
ATA / ATAPI / SATA					
0x5Ah	G	R	G	R	Resetting PATA / SATA bus and all devices
0x5Bh	G	R	G	A	Reserved for ATA
SMBUS					
0x5Ch	G	A	OFF	R	Resetting SMBUS
0x5Dh	G	A	OFF	A	Reserved for SMBUS
Local Console					
0x70h	OFF	R	R	R	Resetting the video controller (VGA)
0x71h	OFF	R	R	A	Disabling the video controller (VGA)
0x72h	OFF	R	A	R	Enabling the video controller (VGA)
Remote Console					
0x78h	G	R	R	R	Resetting the console controller
0x79h	G	R	R	A	Disabling the console controller
0x7Ah	G	R	A	R	Enabling the console controller
Keyboard (PS2 or USB)					
0x90h	R	OFF	OFF	R	Resetting the keyboard
0x91h	R	OFF	OFF	A	Disabling the keyboard

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
0x92h	R	OFF	G	R	Detecting the presence of the keyboard
0x93h	R	OFF	G	A	Enabling the keyboard
0x94h	R	G	OFF	R	Clearing keyboard input buffer
0x95h	R	G	OFF	A	Instructing keyboard controller to run Self Test (PS2 only)
Mouse (PS2 or USB)					
0x98h	A	OFF	OFF	R	Resetting the mouse
0x99h	A	OFF	OFF	A	Detecting the mouse
0x9Ah	A	OFF	G	R	Detecting the presence of mouse
0x9Bh	A	OFF	G	A	Enabling the mouse
Fixed Media					
0xB0h	R	OFF	R	R	Resetting fixed media device
0xB1h	R	OFF	R	A	Disabling fixed media device
0xB2h	R	OFF	A	R	Detecting presence of a fixed media device (IDE hard drive detection, etc.)
0xB3h	R	OFF	A	A	Enabling / configuring a fixed media device
Removable Media					
0xB8h	A	OFF	R	R	Resetting removable media device
0xB9h	A	OFF	R	A	Disabling removable media device
0xBAh	A	OFF	A	R	Detecting presence of a removable media device (IDE CDROM detection, etc.)
0xBCh	A	G	R	R	Enabling / configuring a removable media device
Boot Device Selection					
0xD0	R	R	OFF	R	Trying boot device selection
0xD1	R	R	OFF	A	Trying boot device selection
0xD2	R	R	G	R	Trying boot device selection
0xD3	R	R	G	A	Trying boot device selection
0xD4	R	A	OFF	R	Trying boot device selection
0xD5	R	A	OFF	A	Trying boot device selection
0xD6	R	A	G	R	Trying boot device selection
0xD7	R	A	G	A	Trying boot device selection
0xD8	A	R	OFF	R	Trying boot device selection
0xD9	A	R	OFF	A	Trying boot device selection
0XDA	A	R	G	R	Trying boot device selection
0xDB	A	R	G	A	Trying boot device selection
0xDC	A	A	OFF	R	Trying boot device selection
0xDE	A	A	G	R	Trying boot device selection
0xDF	A	A	G	A	Trying boot device selection
Pre-EFI Initialization (PEI) Core					
0xE0h	R	R	R	OFF	Started dispatching early initialization modules (PEIM)
0xE2h	R	R	A	OFF	Initial memory found, configured, and installed correctly
0xE1h	R	R	R	G	Reserved for initialization module use (PEIM)
0xE3h	R	R	A	G	Reserved for initialization module use (PEIM)
Driver Execution Environment (DXE) Core					
0xE4h	R	A	R	OFF	Entered EFI driver execution phase (DXE)
0xE5h	R	A	R	G	Started dispatching drivers
0xE6h	R	A	A	OFF	Started connecting drivers
DXE Drivers					
0xE7h	R	A	A	G	Waiting for user input

Checkpoint	Diagnostic LED Decoder				Description
	G=Green, R=Red, A=Amber				
	MSB			LSB	
0xE8h	A	R	R	OFF	Checking password
0xE9h	A	R	R	G	Entering BIOS setup
0xEAh	A	R	A	OFF	Flash Update
0xEEh	A	A	A	OFF	Calling Int 19. One beep unless silent boot is enabled.
0xEFh	A	A	A	G	Unrecoverable boot failure / S3 resume failure
Runtime Phase / EFI Operating System Boot					
0xF4h	R	A	R	R	Entering Sleep state
0xF5h	R	A	R	A	Exiting Sleep state
0xF8h	A	R	R	R	Operating system has requested EFI to close boot services (ExitBootServices () has been called)
0xF9h	A	R	R	A	Operating system has switched to virtual address mode (SetVirtualAddressMap () has been called)
0xFAh	A	R	A	R	Operating system has requested the system to reset (ResetSystem () has been called)
Pre-EFI Initialization Module (PEIM) / Recovery					
0x30h	OFF	OFF	R	R	Crisis recovery has been initiated because of a user request
0x31h	OFF	OFF	R	A	Crisis recovery has been initiated by software (corrupt flash)
0x34h	OFF	G	R	R	Loading crisis recovery capsule
0x35h	OFF	G	R	A	Handing off control to the crisis recovery capsule
0x3Fh	G	G	A	A	Unable to complete crisis recovery.

Appendix C: POST Error Beep Codes

The following table lists POST error beep codes. Prior to system Video initialization, BIOS uses these beep codes to inform users on error conditions. The beep code is followed by a user visible code on POST Progress LEDs.

Table 41. POST Error Beep Codes

Beeps	Error Message	POST Progress Code	Description
3	Memory error		System halted because a fatal error related to the memory was detected.
6	BIOS rolling back error		The system has detected a corrupted BIOS in the flash part, and is rolling back to the last good BIOS.

The 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 the Intel® 5000 Series Chipsets are listed in Table 42. Each digit in the code is represented by a sequence of beeps whose count is equal to the digit.

Table 42. BMC Beep Codes

Code	Reason for Beep	Associated Sensors	Supported?
1-5-2-1	CPU: Empty slot / population error – Processor slot 1 is not populated.	CPU Population Error	Yes
1-5-2-2	CPU: No processors (terminators only)	N/A	No
1-5-2-3	CPU: Configuration error (e.g., VID mismatch)	N/A	No
1-5-2-4	CPU: Configuration error (e.g, BSEL mismatch)	N/A	No
1-5-4-2	Power fault: DC power unexpectedly lost (power good dropout)	Power Unit – power unit failure offset	Yes
1-5-4-3	Chipset control failure	N/A	No
1-5-4-4	Power control fault	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
CMOS	Complementary Metal Oxide Silicon
D2D	DC-to-DC
EMP	Emergency Management Port
FP	Front Panel
FRB	Fault Resilient Boot
FRU	Field Replaceable Unit
LCD	Liquid Crystal Display
LPC	Low-Pin Count
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
OTP	Over-temperature Protection
OVP	Over-voltage Protection
PFC	Power Factor Correction
PSU	Power Supply Unit
RI	Ring Indicate
SCA	Single Connector Attachment
SDR	Sensor Data Record
SE	Single-Ended
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
VCCI	Voluntary Control Council for Interference

Reference Documents

See the following documents for additional information:

- Intel® Server Board S5000PAL Technical Product Specification
- Intel® 5000 Series Chipsets Server Board Family Datasheet
- Intel® Server Chassis SR1500 AC Power Supply Module Specification
- Intel® Server Board S5000PAL/S5000XAL Tested Hardware and OS List
- Intel® Server Board S5000PAL / Intel® Server Chassis SR1500 Spares/Parts List and Configuration Guide