Intel® Server System SR2520SA

Technical Product Specification

Intel order number D78005-004

Revision 1.2

May 2010

Enterprise Platforms and Services Division – Marketing

Revision History

Date	Revision Number	Modifications
November 2006	1.0	Initial Release.
August 2007	1.1	Updated processor and product code information.
May 2010	1.2	Deleted CCC and CNCA.

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1. System Overview

Note: In this document, the name Intel® Server System SR2520SA refers to six product SKUS:

Intel® Server System SR2520SAF/ SR2520SAFR: non-redundant power with cabled (fixed) hard drives

Intel® Server System SR2520SAX/ SR2520SAXR: redundant power with a passive backplane

Intel® Server System SR2520SAXS/ SR2520SAXSR: redundant power with an active backplane

The Intel® Server System SR2520SA is a 2U rack system capable of supporting up to six fixed or hot-plug 3.5-inch hard drives. The system is powered by either:

A fixed 2U 600-watt power supply that is cabled to the server board, hard drives, and CD-ROM drive.

A redundant 2U 600-watt power supply that powers the system through a power distribution board.

The server system supports either SATA or SAS technology using onboard Intel® Server Board S5000VSA controllers.

The Intel® Server System SR2520SA is a low-cost system. The design does not include expensive features that are available in other high-density systems, such as tool-less fans and support for the Intel® Local Control Panel.

The base product SKU provides fixed drives and a fixed power supply that is hard-mounted to the chassis. The backplane is present in Intel® 5000 Series chipsets-based products, and the system is fully cabled. The SATA backplane is modified to exclude system management features and hardware, such as SAF-TE.

1.1 System Views

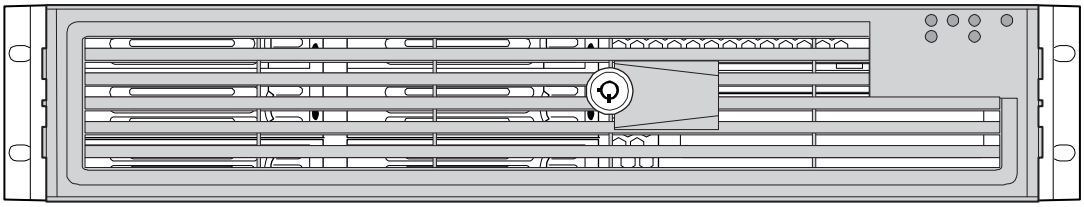

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Figure 1. Front View with Optional Bezel

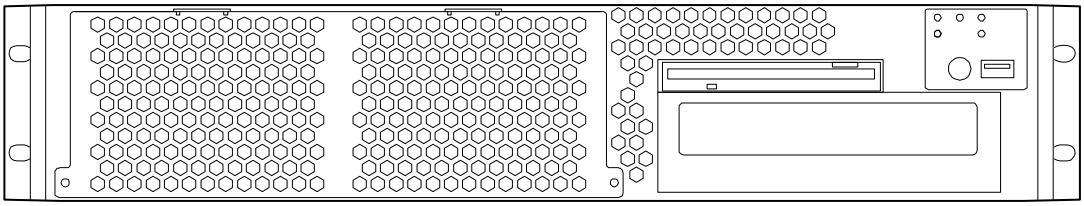

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Figure 2. Front View without Bezel (Fixed Drives)

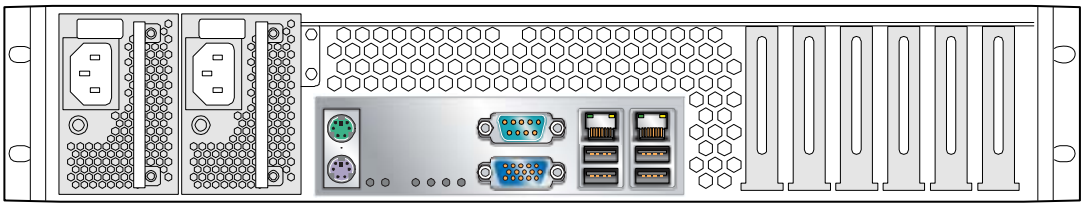

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Figure 3. Back View (Redundant Power Supplies)

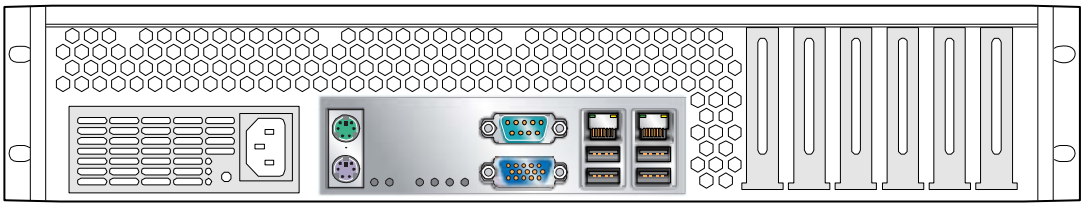

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Figure 4. Back View (Fixed Power Supply)

1.2 System Dimensions

Table 1. System Dimensions

Height	87.30 mm	3.44 inches
Width without rails	430 mm	16.93 inches
Width with rails	451.3 mm	17.77 inches
Depth without CMA	704.8 mm	27.75 inches
Depth with CMA	838.2 mm	33.0 inches
Maximum weight	29.5 kg	65 pounds

1.3 System Components

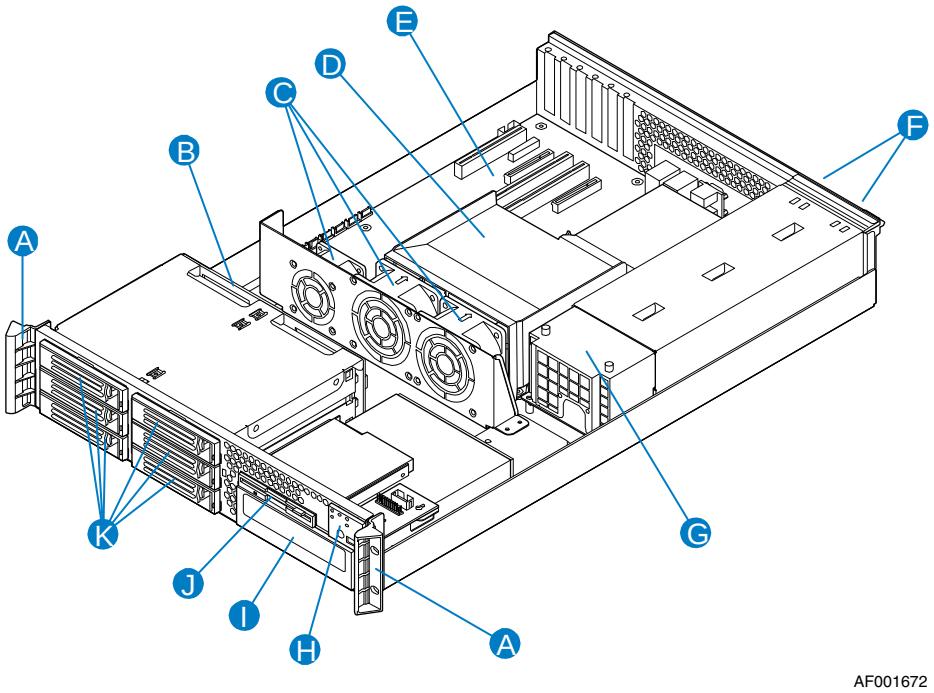
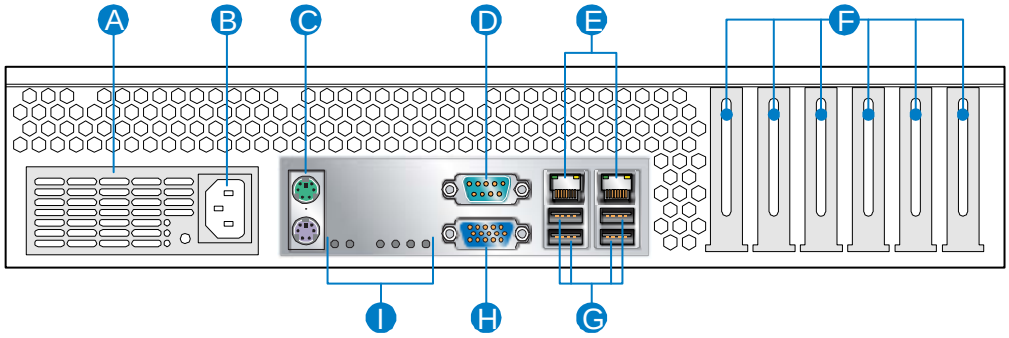


Figure 5. Major System Components – Hot-swap Drive System

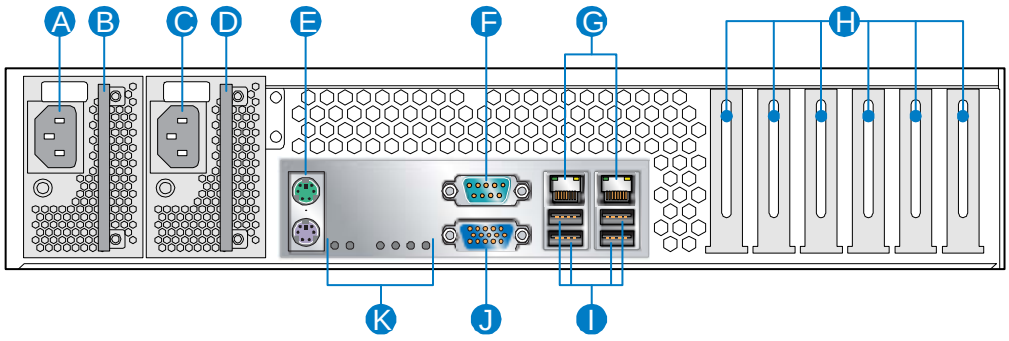
A.	Rack Handles	F.	Hot-swap Power Supply Modules (second module is an optional accessory)
B.	SAS or SATA Backplane	G.	Power Distribution Module
C.	System Fans/Fan Assembly	I.	Front Panel Sub-bezel and Circuit Board
D.	Processor Air Duct	J.	Slimline Floppy Drive
E.	Server Board	K.	Hot-swap SAS/SATA Drive Carriers (drives not included)

The I/O connector locations on the back of the system 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.



A. Power Supply Module
B. Power Receptacle
C. PS2* Keyboard/Mouse Connectors
D. DB-9 Serial A Connector
E. NIC1/NIC2
F. PCI Add-in Card Slots
G. USB Ports
H. Video
I. System LEDs

Figure 6. Non-Redundant Power Supply Back Panel



A. Left Power Receptacle
B. Left Power Supply Module
C. Right Power Receptacle
D. Right Power Supply Module
E. PS2* Keyboard/Mouse Connectors
F. DB-9 Serial A Connector
G. NIC1/NIC2
H. PCI Add-in Card Slots
I. USB Ports
J. Video
K. System LEDs

Figure 7. Redundant Power Supply Back Panel

1.4 System Boards

System boards are used as internal interconnects and provide feature accessibility.

Control Panel: PCB providing system status and control functionality features. The standard control panel is available for this system.

Backplane: Active and passive backplane support.

The system supports only the standard control panel. The standard control panel supports one push button, status LEDs, and includes USB and video ports to centralize system control, monitoring, and accessibility.

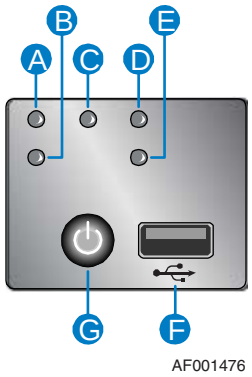
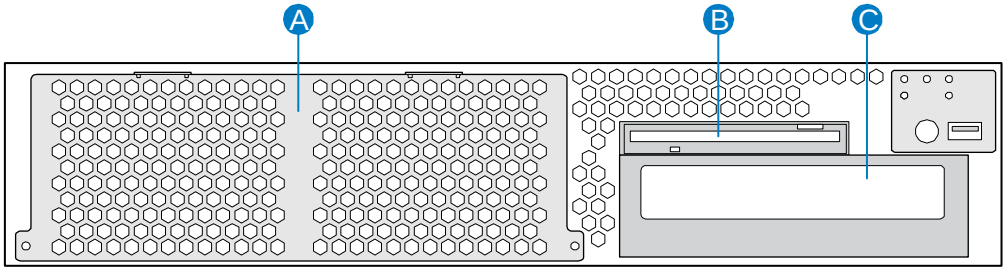


Figure 8. Standard Control Panel Overview

A. NIC1 Activity LED
B. NIC2 Activity LED
C. Power State Indicator LED
D. System Status Bi-color LED
E. Hard Drive Activity LED
F. USB 2.0 Port
G. Power/Sleep Button

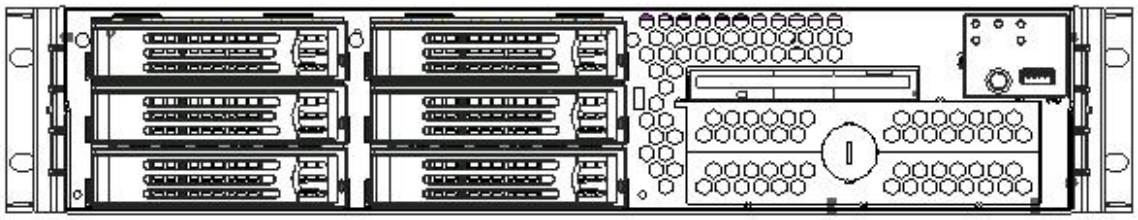
1.5 Hard Drive and Peripheral Bays

The system supports multiple hard drive and peripheral configurations. The hot-swap version of the system includes a hot-swap backplane for either SAS or SATA drives. The fixed power supply version of the system supports cabled SATA drives.



A. 3.5-inch Hard Drive Bay
B. Slimline Floppy Drive Bay
C. 5.25-inch Flex Bay – Optical Drive

Figure 9. Fixed Hard Drive Configuration



A. 3.5-inch Hard Drive Bay
B. Slimline Floppy Drive Bay
C. 5.25-inch Flex Bay – Optical Drive

Figure 10. Hot-swap Hard Drive Configuration

1.6 Power Sub-system

Two 600-watt power supply configurations are available, one with a fixed power supply and one with a hot-swap power supply. The fixed power supply is a SSI-compliant power supply.

The power sub-system has several integrated management features including:

- Status LED on each power module
- Over-temperature protection circuitry
- Over-voltage protection circuitry

With the addition of server management software, the power subsystem is capable of supporting several system management features including:

- Remote power on/off
- Status alerting
- FRU information reporting

See Section 2.

1.7 System Cooling

The system has three cooling fans that together provide enough airflow to maintain internal system thermal requirements when the external ambient temperature remains within specified limits.

Air is pushed through a processor air duct. This air duct has a knock-out that must be removed if a second processor is installed.

Note: If the processor 2 knock-out is removed, do not operate the system without a processor and heat sink installed in the processor 2 location. Operating the server in this condition may overheat the DIMMs.

1.8 System Security

The system provides support for a lockable front bezel that prevents unauthorized access to the system control buttons and hard drives.

1.9 Rack and Cabinet Mounting Options

The chassis can be installed in 19-inch wide by up to 30-inch deep server cabinets. The chassis supports two rack-mount options:

A fixed-mount relay rack/cabinet-mount kit (Product order code - AXXBRACKETS) that can be configured to mount the system into either a 2-post rack or 4-post cabinet

A basic slide rail kit (Product order code – AXXBASICRAIL) to mount the system into a standard (19-inch by up to 30-inch deep) EIA-310D compatible server cabinet.

A tool-less full extracting slide rail kit (Product order code – AXXHERAIL) is available to support an optional cable management arm (Product order code – AXXRACKCARM).

1.10 Front Bezel Features

The optional front bezel is made of molded plastic and uses a snap-on design. When installed, it allows for maximum airflow to maintain system cooling requirements.

Light pipes on the back of the bezel allow the system status LEDs to be monitored with the bezel installed. The front bezel lock prevents unauthorized access to hard drives, peripheral devices, and the control panel.

Note: The chassis ID light pipe on the front bezel is not intended to be functional on this system.

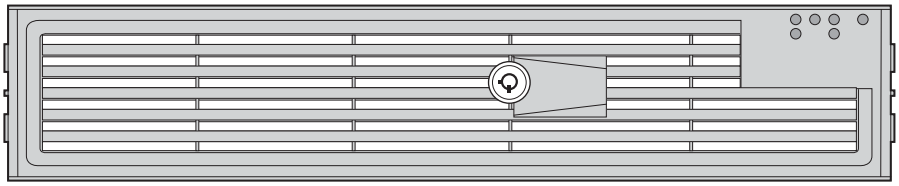


Figure 11. Optional Front Bezel

2. Power Sub-System

Two 600-watt power supply configurations are available, one with a fixed power supply and one with a hot-swap power supply.

For additional information refer to the *Intel® Server Chassis SR2520 AC Power Supply Specification* and the *Intel® Server Chassis SR2520 Power Distribution Module Specification*.

2.1 600-watt Fixed Power Supply

The fixed power supply provides does not provide power redundancy.

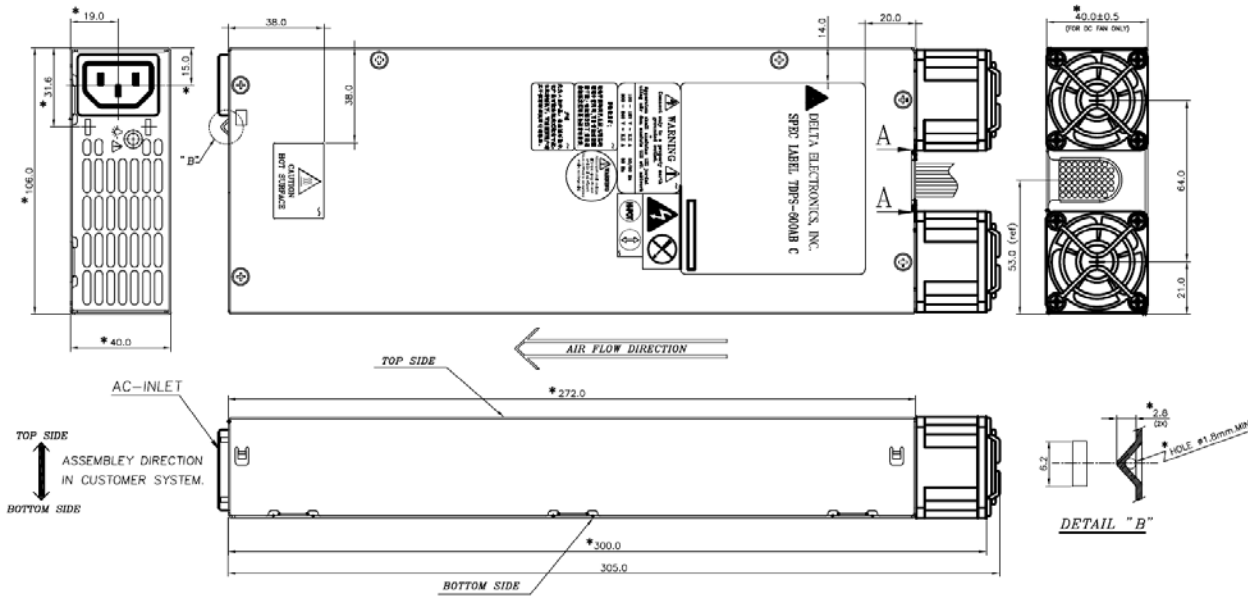


Figure 12. Fixed 600-watt Power Supply

2.1.1 AC Input Voltage

Harmonic distortion of up to 10% of the rated AC input voltage must not cause the power supply to go out of specified limits. The power supply powers off at or below 75 Vac ± 5 Vac. The power supply starts up at or above 85 VAC ±4 Vac. Application of an input voltage below 85 VAC does not cause damage to the power supply or blow a fuse.

Table 2. AC Input Rating

Parameter	Minimum	Rated	Maximum	Start-up Vac	Power Off Vac	Max Input AC Current	Max Rated Input AC Current
Voltage (110)	$90V_{rms}$	100-127 V_{rms}	$140V_{rms}$	85 Vac +/- 4 Vac	75Vac +/- 5Vac	$9.5A_{rms}$ [1,3]	$8.55A_{rms}$ [4]
Voltage (220)	$180V_{rms}$	200-240 V_{rms}	$264V_{rms}$			$4.75A_{rms}$ [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.

2.1.2 Air Flow

Each power supply module incorporates two non-redundant 40 mm fans for self-cooling and partial system cooling. The fans provide at least 10 CFM of airflow through the power supply when operating at maximum fan speed. The cooling air enters the power module from the PDB side (pre-heated air from the system).

2.1.3 Efficiency

Efficiency is tested over an AC input voltage range of 115 VAC to 220 VAC.

Table 3. Efficiency

Loading	100% of maximum	50% of maximum	20% of maximum
Recommended Efficiency	~72%	~70%	~60%

2.1.4 AC Line Dropout/Holdup

An AC line dropout is when the AC input drops to 0 VAC at any phase of the AC line. During an AC dropout of one cycle or less, the power supply must meet dynamic voltage regulation requirements over the rated load. If the AC dropout lasts longer than one cycle, then the power supply should recover and meet all turn-on requirements. The power supply must meet the AC dropout requirement over rated AC voltages, frequencies, and output loading conditions. A dropout of the AC line does not damage the power supply.

20 ms with a 78% load

12 ms with a 100% load

2.1.5 Protection Circuits

Protection circuits inside the PDB and the power supply cause the power supply's main +12 V and the remaining three outputs to shut down. If the power supply latches off due to a protection circuit tripping, an AC cycle off for 15 seconds can reset the power supply and the PDB.

Each DC/DC converter output on the PDB has individual OCP protection circuits. The power supply and power distribution board (PS and PDB) shut down and latch off after an over-current condition occurs. This latch is cleared by an AC power interruption. Over-current limits are measured at the PDB harness connectors.

The DC/DC converters are not damaged from repeated power cycling. The +12 V output from the power supply is divided on the PDB into four channels and each is limited to 240 VA of power. Current sensors and limit circuits shut down the PS and PDB if the limit is exceeded.

Table 4. Over-Current Protection Limits/240VA Protection

Output Voltage	Min OCP Trip Limits	Max OCP Trip Limits
+3.3V	27A	35A
+5V	30A	40A
+12V1	18A	20A
+12V2	18A	20A
+12V3	18A	20A
+12V4	18A	20A

Each DC/DC converter output on the PDB has individual OVP circuits built in. They are locally sensed. The PS and PDB shut down and latch off after an over-voltage condition occurs. This latch is cleared by an AC power interruption. Over-voltage limits are measured at the PDB harness connectors. The voltage never exceeds the maximum levels when measured at the power pins of the output harness connector during a single point of fail. The voltage never trips lower than the minimum levels when measured at the power pins of the PDB connector.

Table 5. Over-Voltage Protection (OVP) Limits

Output Voltage	OVP Minimum	OVP Maximum
+3.3V	3.9V	4.5V
+5V	5.7V	6.2V
+12V1/2/3/4	13.3V	14.5V

The power supply is protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the power supply shuts down. If the power supply temperature drops to within specified limits, the power supply restores power. The 5 Vsb remains on. The OTP trip level has a minimum of 4 C of ambient temperature hysteresis, so the power supply does not oscillate on and off. The power supply alert the system of the OTP condition via the power supply FAIL signal and the PWR LED.

2.1.6 Single Power Supply Module Population

If only one power supply is installed, server management firmware requires that it be in the bottom power module slot as shown by the figure below. The non-operating slot must have the power supply blank installed.

Installing a single power supply module in the top location causes the server management firmware and the BIOS to generate a system error during POST. The error is written to the system event log (SEL).

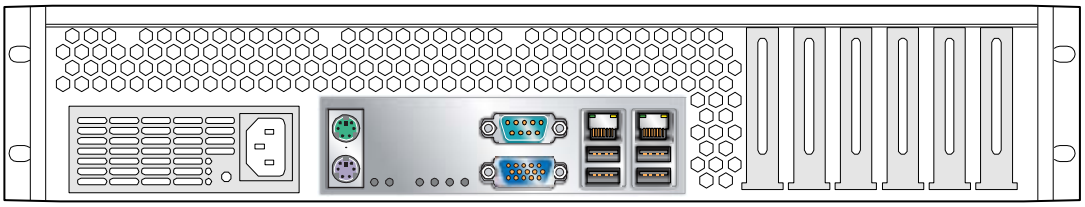


Figure 13. Correct Power Supply Installation

2.2 600-watt Hot-swap Power Supply

Hot-swapping a power supply module is the process of extracting and re-inserting a power supply module from a server system that is powered on. During this process the output voltages remain within specified limits. Up to two power supply modules can be on one AC line. If two hot-swap power supplies are installed, a power supply module can be hot-swapped using the following process.

Extraction: To remove a power supply, unplug the power cord and then remove the power module. This can be done while the system is in standby mode or power-on mode.

Insertion: Insert the power supply module, and then plug in the power cord. If the system is powered off, the system and the power supply will power on into standby mode or power-on mode.

The hot-swap power supply provides the minimum power delivery support with AC power module redundancy. The power sub-system consists of an integrated power distribution module (PDM), a power module enclosure, and support for up to two 600-watt power supply modules. The power sub-system can be configured to support a single module in a 1+0 non-redundant configuration, or dual modules in a 1+1 redundant power configuration. In a 1+1 configuration, a single failed power module can be hot-swapped with the system running. Either configuration will support up to 600 watts of power.

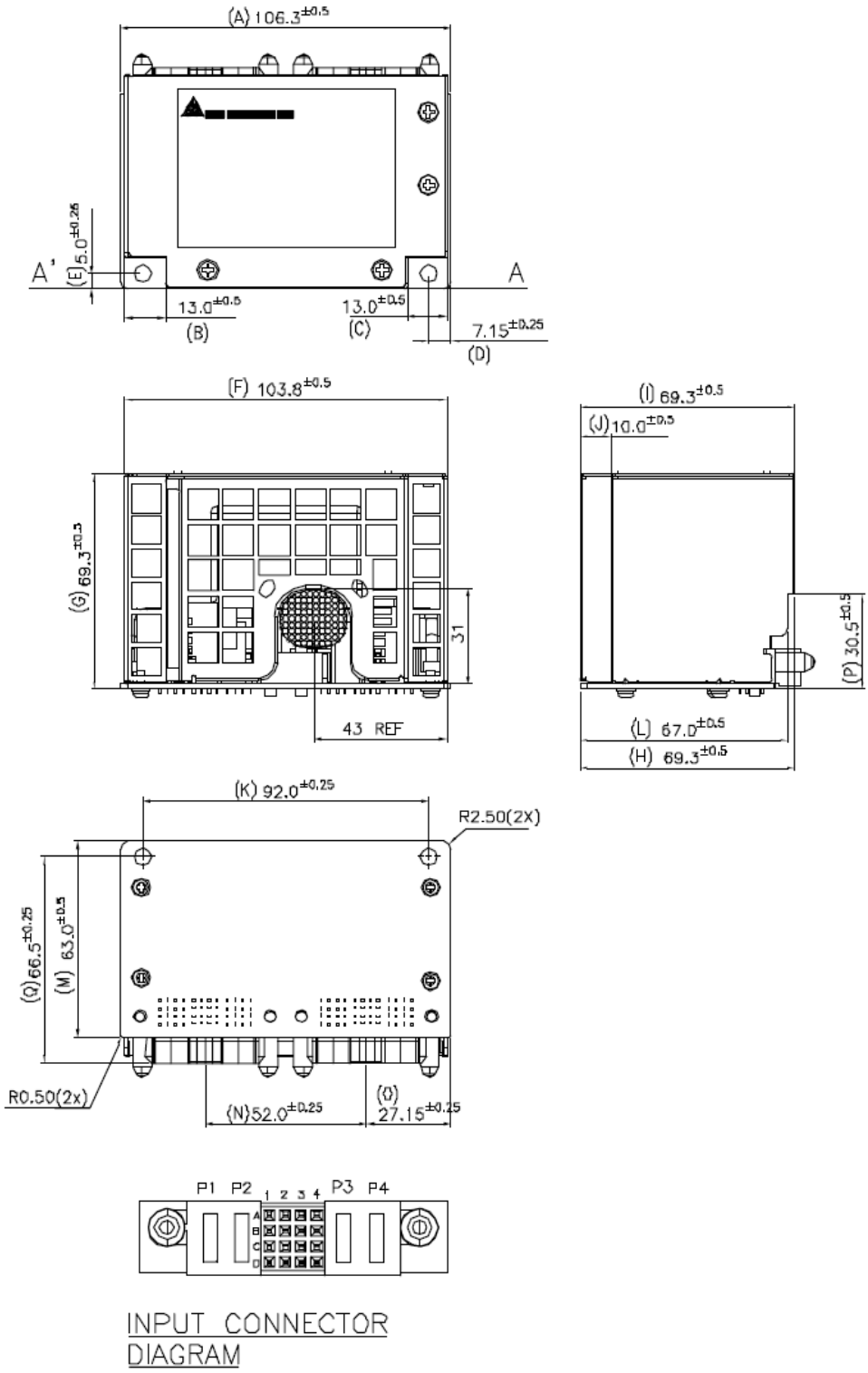


Figure 14. Hot-swap 600-watt Power Supply

2.2.1 AC Input Voltage

Harmonic distortion of up to 10% of the rated AC input voltage does not cause the power supply to go out of the specified limits. The power supply powers off at or below 75 Vac ± 5 Vac. The power supply starts up at or above 85 VAC ±4 Vac. Application of an input voltage below 85 VAC does not damage the power supply.

Table 6. AC Input Rating

Parameter	Minimum	Rated	Maximum	Start–up Vac	Power Off Vac	Max Input AC Current	Max Rated Input AC Current
Voltage (110)	$90V_{rms}$	100-127 V_{rms}	$140V_{rms}$	85 Vac +/- 4 Vac	75 Vac +/- 5 Vac	10.0 A_{rms} [1,3]	8.9 A_{rms} [4]
Voltage (220)	$180V_{rms}$	200-240 V_{rms}	$264V_{rms}$			5.0 A_{rms} [2,3]	4.5 A_{rms} [4]
Frequency	47 Hz	50/60 Hz	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.

2.2.2 Air Flow

Each power supply module incorporates two non-redundant 40 mm fans for self-cooling and partial system cooling. The fans provide at least 10 CFM of airflow through the power supply when operating at maximum fan speed. The cooling air enters the power module from the PDB side (pre-heated air from the system).

2.2.3 Output Cable Harness

The power distribution board provides a cable harness that provides connectors to the system boards. Listed or recognized component appliance wiring material (AVLV2), CN, rated 105 C min, 300 Vdc min is used for all output wiring.

Table 7. Power Harness Cable Definitions

From	Length mm	To connector #	No of pins	Description
Backplane cover exit hole	420, 90° turn	P1	2x12	Baseboard Power Connector
Backplane cover exit hole	400	P2	2x4	Processor Power Connector
Backplane cover exit hole	370	P3	1x5	Power Signal Connector
Backplane cover exit hole	310	P4	2x4	HSBP Power Connector
Extension from P4	185	P5	1x4	IDE Power Connector

2.2.4 Output Power/Currents

The following table defines power and current ratings 1+0 or 1+1 redundant configuration. The combined output power of both outputs does not exceed the rated output power. The power supply meets both static and dynamic voltage regulation requirements for the minimum loading conditions. The power supply supplies the peak currents and power for a minimum of 10 seconds. Outputs are not required to be peak loaded simultaneously.

Table 8. Power and Current Ratings

	+12 V	+5 Vsb	-12 V
Maximum Load	62.0 A	3.0 A	0.5 A
Minimum Dynamic Load	3.0 A	0.1 A	0 A
Minimum Static Load	0.0 A	0.1 A	0 A
Peak Load	56.0 A (12 seconds minimum)	5.0 A (0.4 seconds minimum minimum)	N/A

2.2.5 Efficiency

The DC/DC converter has a minimum efficiency of 85% at 50% to 100% loads and over +12 V line voltage range and over-temperature and humidity range. The cooling airflow is at least 10 CFM.

2.2.6 AC Line Dropout/Holdup

An AC line dropout is when the AC input drops to 0 VAC at any phase of the AC line. During an AC dropout of one cycle or less the power supply meets dynamic voltage regulation requirements over the rated load. If the AC dropout lasts longer than one cycle the power supply recovers and meets turn-on requirements. The power supply meets the AC dropout requirement over rated AC voltages, frequencies, and output loading conditions. A dropout of the AC line does damage the power supply.

20 ms with a maximum combined load of 360 watts

12 ms with a maximum combined load of 600 watts

2.2.7 Protection Circuits

Protection circuits inside the PDB and the power supply cause the power supply's main +12 V output to shut down, or cause a shutdown of any of the three outputs on the PDB. Either of these shutdowns result in shutting down the entire power supply/PDB combination. If the power supply latches off due to a protection circuit tripping, an AC cycle off for 15 seconds resets the power supply and the PDB.

Each DC/DC converter output on the PDB has individual OCP protection circuits. The power supply and power distribution board (PS and PDB) shut down and latch off after an over-current condition occurs. This latch is cleared by an AC power interruption. Over-current limits are measured at the PDB harness connectors. The DC/DC converters are not damaged from

repeated power cycling. The +12 V output from the power supply is divided on the PDB into four channels and each is limited to 240 VA of power. Current sensors and limit circuits shut down the PS and PDB if the limit is exceeded.

Table 9. Over-Current Protection Limits/240 VA Protection

Output Voltage	OCP Limits
+12 V	120% min (= 58.8A min) 140% max (= 68.6A max)
+5 Vsb	110% min (= 3.3A min) 200% max (= 4.0A max)
-12 V	Short circuit protection only

Each DC/DC converter output on the PDB has individual OVP circuits built in. They are locally sensed. The PS and PDB shut down and latch off after an over-voltage condition. This latch is cleared by an AC power interruption. Over-voltage limits are measured at the PDB harness connectors. The voltage never exceeds the maximum levels when measured at the power pins of the output harness connector during a single point of fail. The voltage never trips lower than the minimum levels when measured at the power pins of the PDB connector.

Table 10. Over-Voltage Protection (OVP) Limits

Output Voltage	OVP Minimum	OVP Maximum
+12 V	13.3 V	14.5 V
+5 Vsb	5.7 V	6.5 V

The power supply is protected against over-temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the power supply shuts down. If the power supply temperature drops to within specified limits, the power supply restores power. The 5 Vsb remains on. The OTP trip level has a minimum of 4 C of ambient temperature hysteresis, so the power supply does not oscillate on and off. The power supply alert the system of the OTP condition via the power supply FAIL signal and the PWR LED.

2.2.8 Handle and Retention Mechanism

Each power supply module includes a handle for module insertion or removal. Each module has a simple retention mechanism to hold the power module in place. This mechanism withstands the platform mechanical shock and vibration requirements.

The tab on the retention mechanism is green to indicate it is a hot-swap touch point. The latch mechanism prevents insertion or removal when the power cord is plugged in.

2.3 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	105º C
Amperage Rating	13A
Voltage Rating	125V

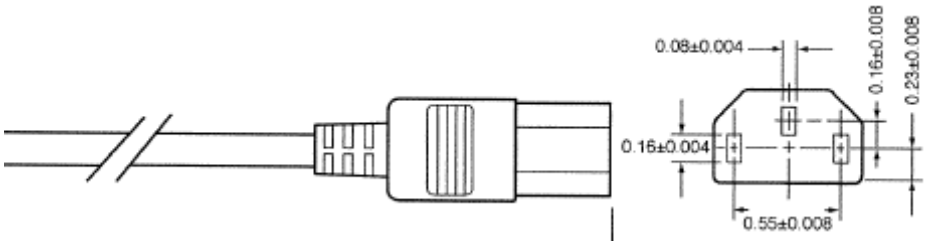


Figure 15. AC Power Cord Specifications

2.4 Power Connectors

2.4.1 P1 – Server Board 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 11. P1 Main Power Connector

Pin	Signals	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 (GND)	Black	15	COM	Black
4	5 VDC	Red	16	PS_ON#	Green
	5V RS	Red (24 AWG)	17	COM	Black
5	COM	Black	18	COM	Black
6	+5 VDC	Red	19	COM	Black
7	COM	Black	20	Reserved (-5V in ATX)	N.C.
8	PWR OK	Gray	21	+5 VDC	Red
9	5Vsb	Purple	22	+5 VDC	Red
10	+12 V3	Yellow/Blue	23	+5 VDC	Red
11	+12 V3	Yellow/Blue	24	COM	Black
12	+3.3 VDC	Orange			

2.4.2 P2 – Processor Power Connector

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

Contact: Molex 44476-1111 or equivalent

Table 12. P2 Processor Power Connector

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	COM	Black	5	+12 V1	Yellow
2	COM	Black	6	+12 V1	Yellow
3	COM	Black	7	+12 V2	Yellow/Black
4	COM	Black	8	+12 V2	Yellow/Black

2.4.3 P3 – Power Signal Connector

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

Contacts: Molex 16-02-0087 or equivalent

Table 13. P3 Power Signal Connector

Pin	Signal	24 AWG Color
1	I2C Clock (SCL)	White/Green
2	I2C Data (SDL)	White/Yellow
3	SMBAlert#	White
4	ReturnS	Black
5	3.3RS	White/Brown

2.4.4 P4 – Backplane Power Connector

Connector housing: 8 Pin Molex Mini-Fit Jr. PN# 39-01-2245 or equivalent

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

Table 14. P4 Hot Swap Backplane Power Connector

Pin	Signal	18 AWG Color	Pin	Signal	18 AWG Color
1	COM	Black	5	+12 V4	Yellow/Green
2	COM	Black	6	+12 V4	Yellow/Green
3	+5V	Red	7	+5Vsb	Purple
4	+5V	Red	8	+3.3V	Orange

2.4.5 P5 Mid-plane Power Connector

Connector housing: 10 Pin Molex Mini-Fit Jr. 43025-1000 or equivalent

Contact: Molex Mini-Fit, HCS, Female, Crimp 43030-0007 or equivalent

Table 15. P5 Mid-plane Power Connector

Pin	Signal	20 AWG Color	Pin	Signal	20 AWG Color
1	COM	Black	6	+12 V4	Yellow/Green
2	COM	Black	7	+12 V4	Yellow/Green
3	+5V	Red	8	+12 V4	Yellow/Green
4	+3.3V	Orange	9	+12 V4	Yellow/Green
5	COM	Black	10	+5Vsb	Purple

2.5 AC Input Requirements

The power supply module incorporates universal power input with active power factor correction, which reduces line harmonics in accordance with the EN61000-3-2 and JEIDA MITI standards.

2.5.1 AC Line 5 VSB Holdup

The 5 VSB output voltage stays in regulation under its full load (static or dynamic) during an AC dropout of 70 ms minimum (=5 VSB holdup time) whether the power supply is in on or off state (PSON asserted or de-asserted).

2.5.2 AC Inrush

AC line inrush current does not exceed 40 amp peak for up to one-quarter of the AC cycle, after which, the input current is no more than the specified maximum input current. The peak inrush current is less than the ratings of its critical components (including input fuse, bulk rectifiers, and surge limiting device).

The power supply meets the inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during a single cycle AC dropout condition as well as upon recovery after AC dropout of any duration, and over the specified temperature range (T_{op}). It is acceptable that AC line inrush current may reach up to 60 amp peak for up to 1 msec.

2.6 Standby Output/Standby Mode

The 5 Vsb output is present when an AC input greater than the power supply turn-on AC voltage is applied. Applying an external 5.25 V to 5 Vsb does not cause the power supply to shut down or exceed operating limits. When the external voltage is removed the voltage returns to the operating voltage without exceeding the dynamic voltage limits.

2.7 Power Supply Status LED

Each power supply module has one bi-color LED to indicate power supply status. The LED is visible on the rear panel of each power supply module.

Table 16. LED Indicators

Power Supply Condition	Bi-color LED
No AC power to all power supplies	Off
No AC power to this PSU only (for 1+1 configuration) or power supply critical event causing a shutdown: failure, fuse blown (1+1 only), OCP, OVP, fan failed	Amber
Power supply warning events where the power supply continues to operate: high temp, high power, high current, slow fan.	1 Hz blink amber
AC present/Only 5VSB on (PS Off)	1 Hz blink green
Output ON and OK	Green

3. Cooling Sub-system

Several components and configuration requirements make up the cooling sub-system of the server system. These include the system fan module, the power supply fans, air baffles, CPU air duct, and drive bay population. All are necessary to provide and regulate the air flow and air pressure needed to maintain the system's thermals when operating at or below maximum specified thermal limits. See Table 29. System Environmental Limits.

The system fan assembly is a non-redundant three fan solution providing sufficient airflow to maintain internal system thermal requirements when the external ambient temperature remains within specified limits. The fan module utilizes two fan types: a 60 mm variable speed fan and an 80 mm variable speed fan.

The system uses a variable fan speed control engine to provide adequate cooling for the system at various ambient temperature conditions, under various server workloads, and with the least amount of acoustic noise possible. To minimize acoustics, the fans operate at the lowest speed for any given condition.

The baseboard management controller (BMC) is used for the variable fan speed control function. The BMC monitors selective component temperatures, the ambient temperature, and each fan's RPM to determine the necessary airflow. The BMC sets the fan speeds to the appropriate RPM to maintain proper cooling. The BMC logs errors into the SEL when temperature sensors exceed safe operating ranges, or if any of the fans fail to operate at safe airflow speeds.

If a fan fails, the BMC will boost the remaining fans to compensate for the lost air flow. Only a chassis with redundant fans can continue to operate in this degraded condition. If the cooling is not sufficient, the system will eventually shutdown to protect itself from thermal damage.

3.1 Fan Module

The fan module provides the primary airflow. The fans can be installed and removed without the use of tools.

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

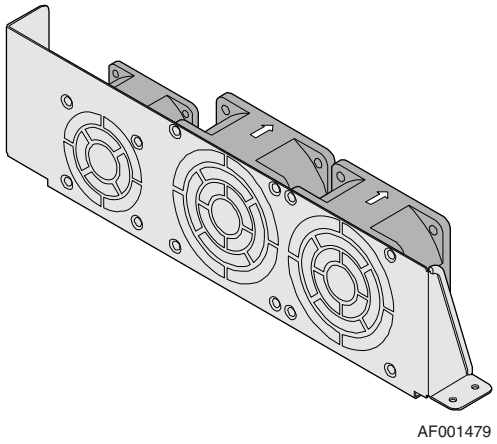


Figure 16. Fan Module

Table 17. Cooling Zones

Fan	Cooling Zone	Greatest Cooling Influence
System Fan 1	CPU1	Primary cooling for CPU1 and memory
System Fan 2	CPU2	Primary cooling for hard drives 4 and 5, CPU2, the MCH, and low-profile PCI cards
System Fan 3	PCI	Primary cooling for hard drives 2 and 3, full-height PCI cards, PXH and the Intel® I/O processor IOP80333 chipset
Power Supply Fans 1 fans per module	Power Supply	Primary cooling for hard drives 0 and 1, and the power supply module(s)

The system fan module supports several management features that can be utilized by the management system.

The fan module houses two fan sizes. System fans 1 and 2 use an 80 mm fan; system fan 3 uses a 60 mm fan.

Each fan supports multiple speeds. If the internal ambient temperature exceeds the value programmed into the thermal sensor data record (SDR), the BMC firmware increases the speed for all fans in the module.

Each fan connector supplies a tachometer signal that allows the BMC to monitor the fan status. If a fan fails, the remaining fans increase their rotation.

Each fan has an associated fault LED on the mid-plane located. If a fan fails, system management can light the LED.

Table 18. Fan Connector Pin Assignment

Pin	Signal Name	Description
1	Tachometer B	Reserved, unused by the non-redundant fan
2	PWM	Fan speed control signal
3	12V	Power for fan
4	12V	Power for fan

The system fans plug into headers on the mid-plane board:

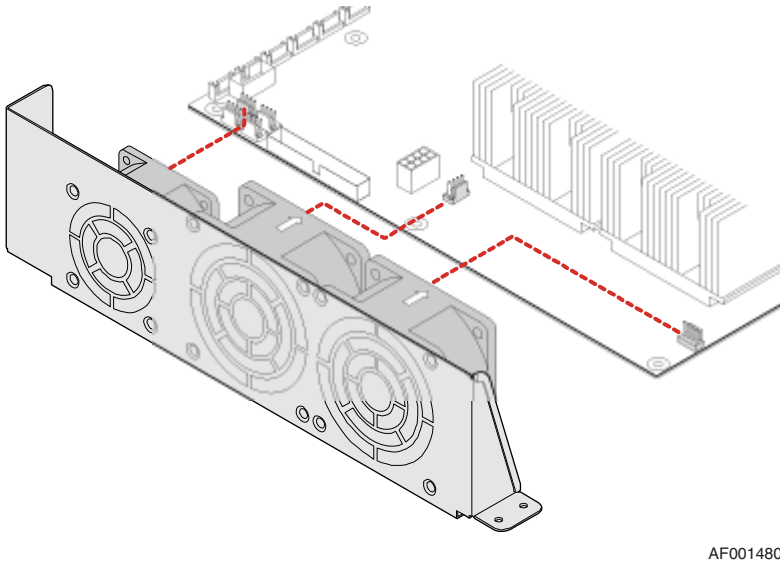


Figure 17. Fan Header Assignments on Server Board

Table 19. Fan Header Assignment

Fan ID	Server Board Fan Header Name
Fan 1 - CPU1 cooling	FAN_2
Fan 2 - CPU2 cooling	FAN_4
Fan 3 - PCI cooling	FAN_6

3.2 Air Flow Support

To control airflow within the system, the system uses an air baffle and a CPU air duct to isolate and direct airflow to three critical zones: the power supply zone, the full-height PCI riser zone, and the CPU/memory/low-profile PCI riser zone.

The SR2520SA chassis does not have hot-swappable or redundant fans.

3.2.1 Power Supply Zone

The power supply provides its own cooling. The power supplies contain fans that are controlled by the thermal management controller within the power supply.

3.2.2 Half-height PCI Zone

The half-height PCI zone to the right of the memory. The airflow through this area is generated by a 60 mm system fan. Air is drawn from the drive bay area through the fan and pushed through ventilation holes at the back of the system.

3.2.3 Processor, Memory, and Low-profile PCI Zone

The processor, memory, low-profile PCI zone is between the low-profile riser card and the right system wall. The air flow for this zone is generated by the two 80 mm system fans. Air is drawn from the drive bay area through the fans, directed through the processor air duct, and out through ventilation holes on both the back and rear side walls.

The processor air duct directs air through the processor heat sinks. For single processor configurations, a flexible air baffle is attached to the air duct as shown in the following diagram.

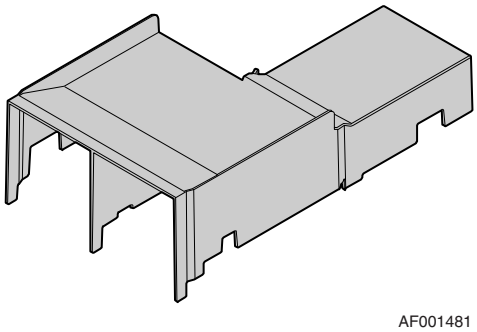


Figure 18. CPU Air Duct with Air Baffle

Note: Operating a single processor configuration without the air baffle installed will result in the processor over heating and may cause the system to shutdown.

3.3 Drive Bay Population

To maintain the proper air pressure within the system, all hard drive bays must be populated with either a hard drive or a drive blank.

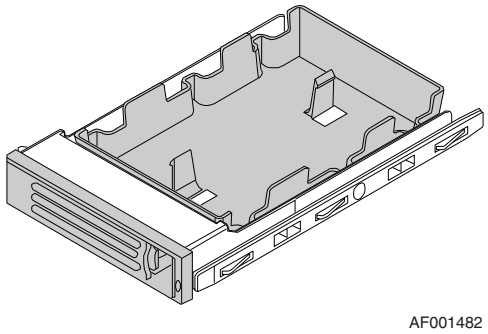


Figure 19. Drive Blank

4. System Board Interconnects

The system has improved cable routing over prior generation systems. Server boards in this system include the hot-swap backplane and the control panel. This chapter describes the interconnect features of each and defines the pin-outs for their connectors.

Two types of 2U backplanes are supported: an active SAS backplane and a passive SATA backplane. Both include activity and fault LEDs for each of the six hard drives.

4.1 Passive SATA Backplane

The passive backplane provides support for up to six SATA drives. RAID modes 0, 1, and 10 are supported. The backplane has one 8-pin power connector and provides a power connection for the system CD-ROM drive.

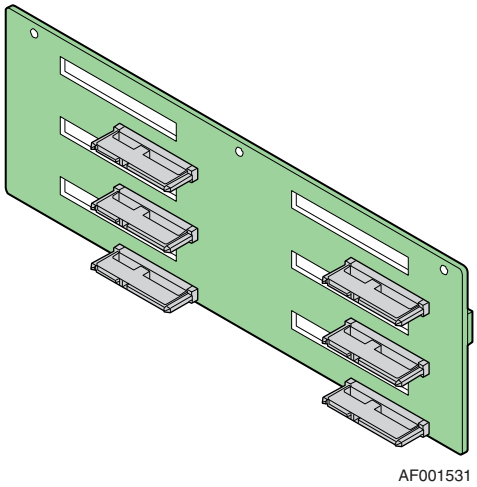


Figure 20. Passive SATA Backplane (Front Side)

Table 20. Passive SATA Backplane Power Connector Pin-out (J1B1)

Pin	Signal Name
1	Ground
2	Ground
3	P5V
4	P5V
5	P12V
6	P12V
7	No Connection
8	P3V3

Table 12. SATA I/O Connector to Baseboard Pin-out (J5B1, J5B2, J5B4, J5B5, J5C1, J5C2)

Pin #	Signal Name
1	Ground
2	SATA_RX_P
3	SATA_RX_N
4	Ground
5	SATA_TX_N
6	SATA_TX_P
7	Ground

Table 13. SATA Connector to Hard Drive Pin-out (J7L1, J7M1, J7N1, J3L1, J3M1, J3N1)

Pin #	Signal Name
S1	Ground
S2	SATA_DRVxA_RX_P
S3	SATA_DRVxA_RX_N
S4	Ground
S5	SATA_DRVxA_TX_N
S6	SATA_DRVxA_TX_P
S7	Ground
P1	TP
P2	TP
P3	TP
P4	Ground
P5	Ground
P6	Ground
P7	P5V_DRVx_PRECHG
P8	P5V
P9	P5V
P10	Ground
P11	LED_DRVx_READY_N
P12	Ground
P13	P12V_DRVx_PRECHG
P14	P12V
P15	P12V

Table 14. SGPIO Connector from Baseboard (J9A1)

Pin #	Signal Name
1	SGPIO_CLK
2	SGPIO_LOAD
3	SGPIO_DATAOUT0
4	SGPIO_DATAOUT1

4.2 Active SAS Backplane

The active backplane support up to six SAS drives. RAID modes 0, 1, and 10 are supported. The backplane has one 8-pin power connector and provides a power connection for a CD-ROM drive. There are two SAS connectors because the backplane routes all data to each individual drive automatically.

Table 15. Active SAS Backplane Power Connector Pin-out (J1B1)

Pin #	Signal Name
1	Ground
2	Ground
3	P5V
4	P5V
5	P12V
6	P12V
7	No Connection
8	P3V3

Table 16. SAS I/O Connector to Baseboard Pin-out (J9C1, J9C2)

Pin #	Signal Name
1	Ground
2	SASx_EP_RX_P
3	SASX_EP_RX_N
4	Ground
5	SASx_EP_TX_N
6	SASx_EP_TX_P
7	Ground

Table 17. SAS Connector to Hard Drive Pin-out (J7L1, J7M1, J7N1, J3L1, J3M1, J3N1)

Pin #	Signal Name
S1	Ground
S2	SAS_DRVxA_RX_P
S3	SAS_DRVxA_RX_N
S4	Ground
S5	SAS_DRVxA_TX_N
S6	SAS_DRVxA_TX_P
S7	Ground
P1	TP
P2	TP
P3	TP
P4	Ground
P5	Ground
P6	Ground
P7	P5V_DRVx_PRECHG
P8	P5V
P9	P5V
P10	Ground
P11	LED_DRVx_READY_N
P12	Ground
P13	P12V_DRVx_PRECHG
P14	P12V
P15	P12V

5. Peripheral and Hard Drive Sub-System

The system supports several hard drive and peripheral options. The peripheral/hard drive sub-system consists of either a hot-swap drive bay or a fixed drive bay. 3.5-inch SATA and SAS hard drives are supported. The system supports one 5.25-inch optical drive bay and one slimline floppy drive bay. The hot swap system includes one of two types of hot-swap backplanes.

5.1 Optical/Floppy Drive Combo

The system provides two drive bays that support a single slimline USB floppy drive and a standard 5.25-inch optical device. Supported drives are listed the *Intel® Server Board S5000VSA Tested Hardware and OS List*.

A knockout in the outer panel needs to be removed before installing one of these devices. A screwdriver slot is included in the center of the knockout area to make it easier to remove the sheet metal. The devices are not hot-swappable.

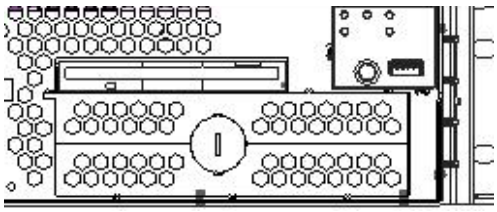


Figure 21. Knockout Area

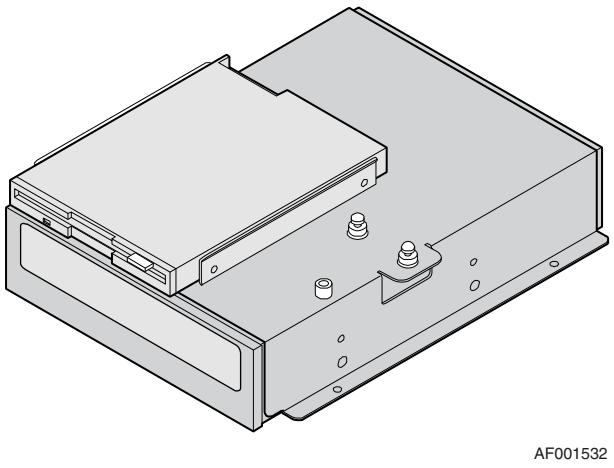


Figure 22. 5.2-inch Optical Drive/USB FDD Combo Assembly

The IDE optical drive assembly (customer supplied component) connects to the server board with an IDE cable. The USB floppy drive assembly (included with the chassis) connects to the server board with a 4-pin USB cable. Both the IDE cable and USB cable are provided with the chassis. Both the IDE optical drive and the USB drive are powered directly from the power supply.

5.2 Hard Drive Bays

5.2.1 Cabled Drives

The fixed drive system has two internal bays for securing the hard drives. The drives are installed with the hard drive electronics on the upper surface to provide easier cable access.

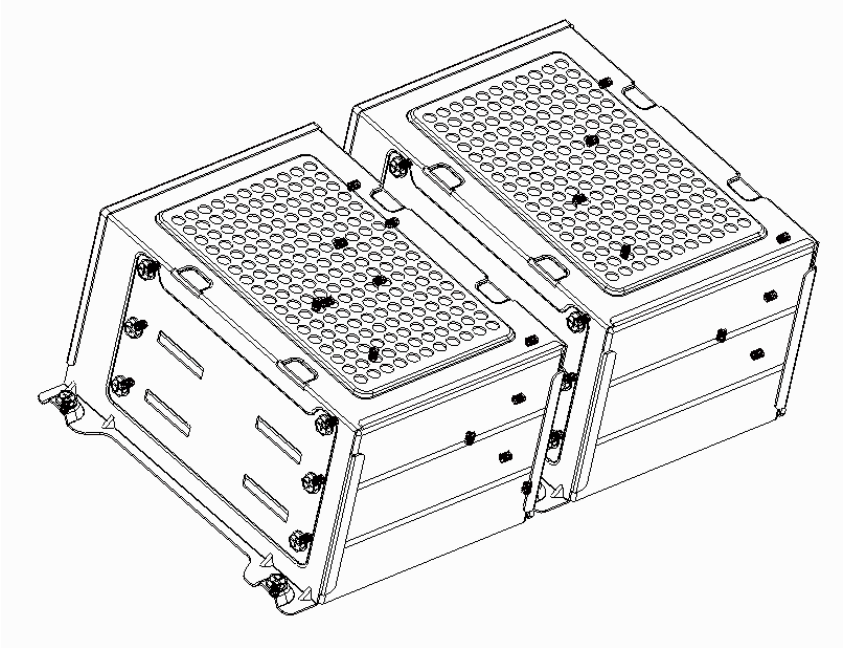
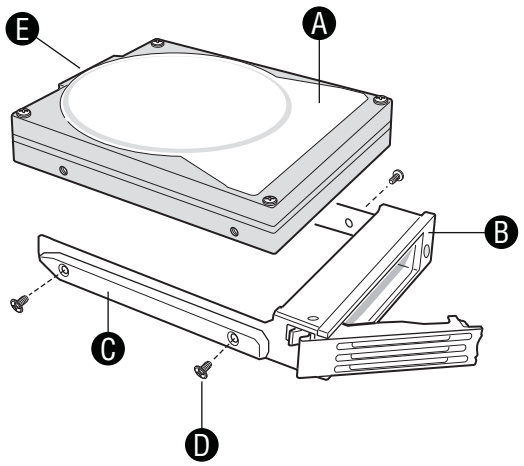


Figure 23 Fixed Hard Drive Bay

5.2.2 Hot-swap Drives

The system support up to six hot-swap 3.5-inch by 1-inch SAS or SATA hard drives. Hard drives are mounted to hot-swap drive trays for easy insertion to or extraction from the drive bay.

Each hard drive is mounted to a hot-swap drive tray. Each drive tray has its own dual-purpose latching mechanism that is used to both insert/extract drives from the system and lock the tray in place. Each drive tray supports a light pipe that provides a drive status indicator. The light pipe is located on the backplane and can be viewed from the front of the system.



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

Figure 24. Hard Drive Assembly

5.3 Active SAS and Passive SAS/SATA Backplanes

The active backplane work with the SAS Intel Server Board S5000VSA. The passive backplane works with the SATA Intel(R) Server Board S5000VSA.

The SAS backplane has the following features:

Six SAS-compatible hot-swap hard drive connectors

Two SAS connectors to the server board that expand to fill all six drive connectors

Hard drive activity and fault LEDs for each hard drive connector

FRU EEPROM

One 2x4-pin power connector

The SATA backplane has the following features:

Six SATA-compatible hard drive connectors

Six SATA connectors to the server board

Hard drive activity and fault LEDs for each hard drive connector

One 2x4-pin power connector

5.3.1 SAS/SATA Backplane Layout

The backplane installs on the back of the hot-swap drive bay. The following diagram shows the layout of components and connectors found on the board.

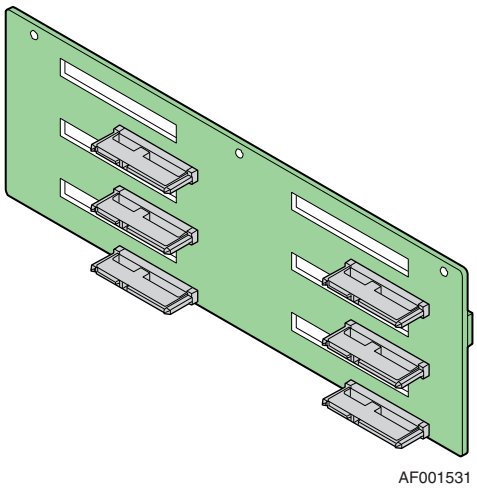


Figure 25. SAS/SATA Backplane (Front View)

5.3.2 SAS/SATA Backplane Functional Architecture

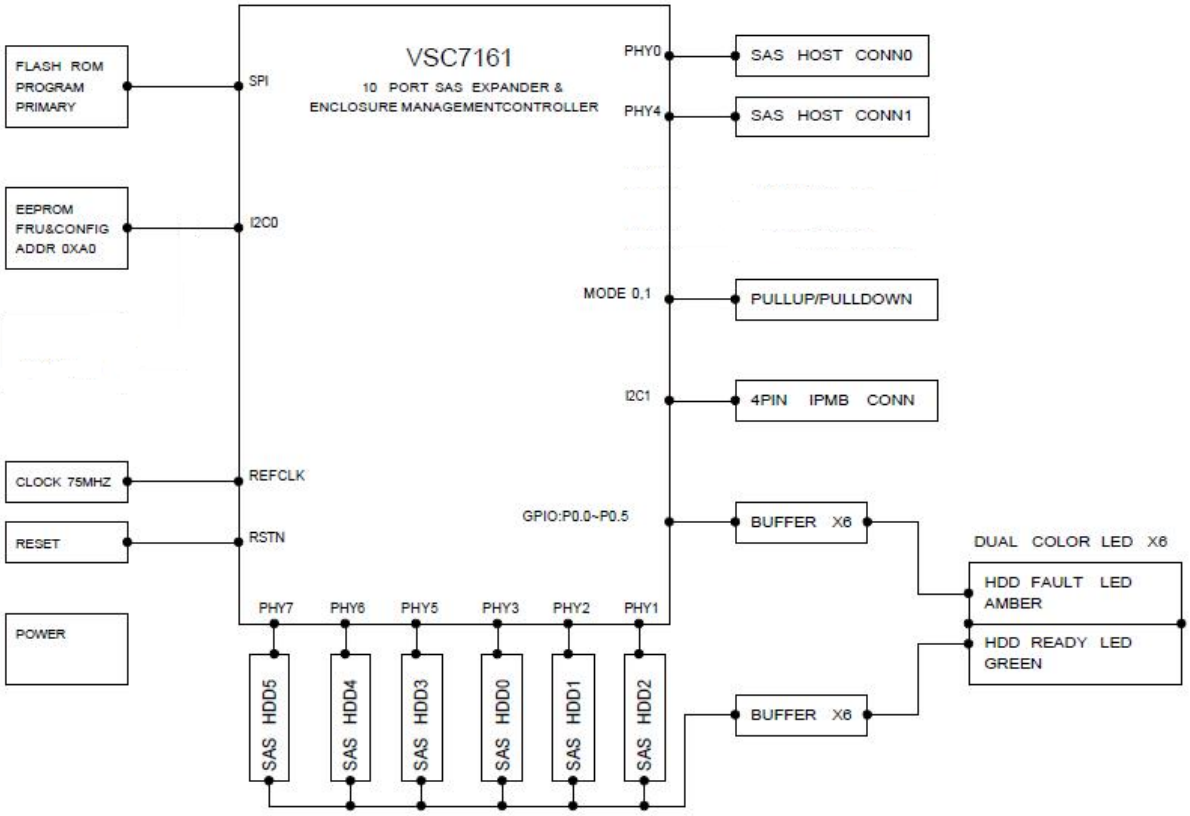


Figure 26. Active SAS Backplane Functional Block Diagram

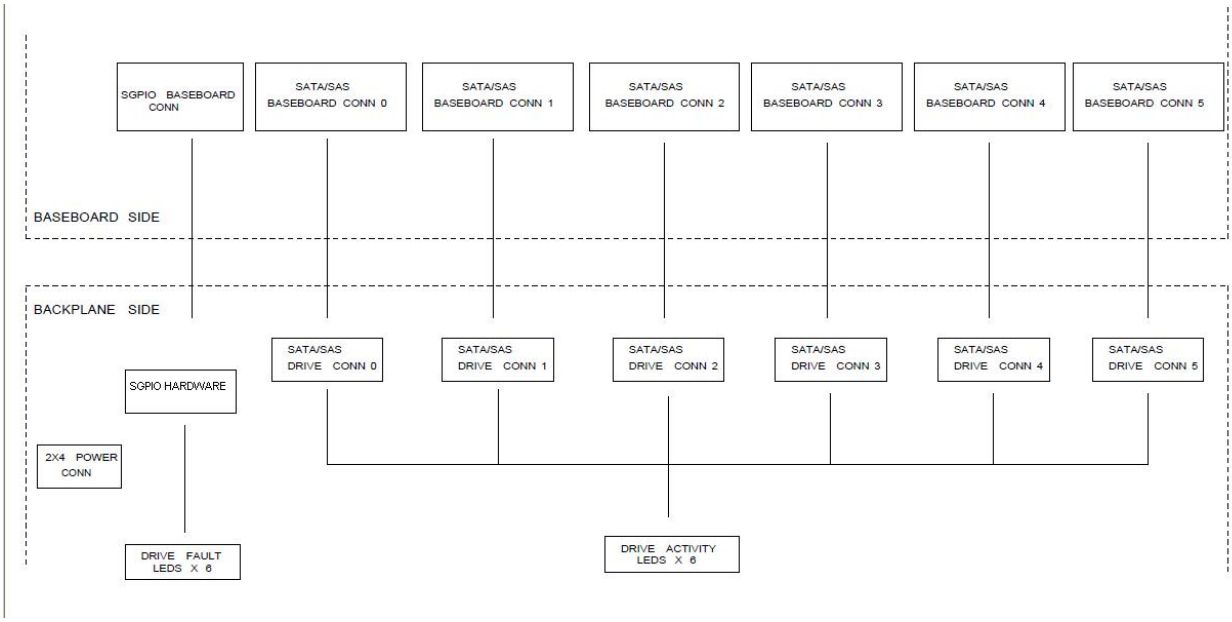


Figure 33. Passive SATA Backplane Functional Block Diagram

5.3.2.1 Hard Drive Activity and Fault LEDs

The backplanes support an activity/fault LED for each of the hard drive connectors. The LED lights green for activity or amber for a drive fault. The green activity LED is driven by the SAS/SATA hard disk drive. The amber fault LED is driven by the VSC7161 on the SAS backplane or by the SGPIO hardware on the SATA backplane.

Table 21. Hard Drive LED Function Definitions

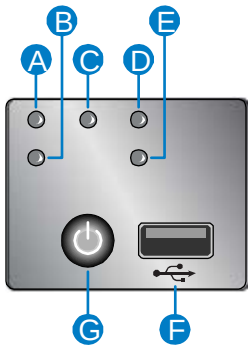
Status LED	Definition
Green	HDD activity
Amber	HDD fail

The activity LED functionality is controlled by the hard drives so the LED functions differently between SAS and SATA drives.

Table 22. Hard Drive Activity LED Functionality

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

6. Standard Control Panel



AF001476

Callout	LED/Button/Port	Color	State	Description
A/B	NIC1/NIC2 Activity LEDs	Green	On	NIC Link
		Green	Blink	NIC Activity
C	Power State Indicator LED)	Green	On	Legacy power on/ACPI S0 state
			Blink [1,4]	Sleep/ACPI S1 state
		Off	Off	Power Off/ACPI S4 or S5 state
D	System Status Bi-color LED	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.
D	Hard Drive Activity	Green	Random blink	Provides an indicator for disk activity.
		Off	Off [3]	No hard disk activity
F	USB Port	N/A	N/A	USB 2.0 port
G	Power/Sleep button	N/A	N/A	Toggles the system power on/off. This button also functions as a sleep button if enabled by an ACPI-compliant operating system.

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

Figure 27. Standard Control Panel

The current-limiting resistors for the power LED, the system fault LED, and the NIC LEDs are located on the server board.

6.1.1 Power/Sleep LED

Table 23. 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.

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

6.1.2 System Status LED

Table 24. 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	System degraded ▪ Unable to use all of the installed memory (more than one DIMM installed). ▪ 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. ▪ In mirrored configuration, when memory mirroring takes place and system loses memory redundancy. This is not covered by (2). ▪ Redundancy loss such as power-supply or fan. This does not apply to non-redundant sub-systems. ▪ PCIe* link errors ▪ CPU failure/disabled – if there are two processors and one of them fails ▪ Fan alarm – Fan failure. Number of operational fans should be more than minimum number needed to cool the system ▪ Non-critical threshold crossed – Temperature and voltage
Amber	Blink	Non-critical	Non-fatal alarm – system is likely to fail ▪ Critical voltage threshold crossed ▪ VRD hot asserted

Color	State	Criticality	Description
			▪ Minimum number of fans to cool the system not present or failed ▪ In non-sparing and non-mirroring mode if the threshold of ten correctable errors is crossed within the window
Amber	Solid on	Critical, non-recoverable	Fatal alarm – system has failed or shutdown ▪ DIMM failure when there is one DIMM present, no good memory present ▪ Run-time memory uncorrectable error in non-redundant mode ▪ IERR signal asserted ▪ Processor 1 missing ▪ Temperature (CPU ThermTrip, memory TempHi, critical threshold crossed) ▪ No power good – power fault ▪ Processor configuration error (for instance, processor stepping mismatch)

6.1.3 Drive Activity LED

The drive activity LED on the front panel indicates drive activity from the onboard hard disk controllers. The server board provides a header giving access to this LED for add-in controllers.

6.2 Control Panel Connectors

The control panel has one external USB port. The following table provides the pin-out for the USB port.

Table 25. External USB Port (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

6.3 Internal Control Panel Interconnect

All control panel signals are directed through a single 64-pin card edge connector, eliminating the need for cables. The control panel card edge connector is blind-mated with a slot connector on the backplane.

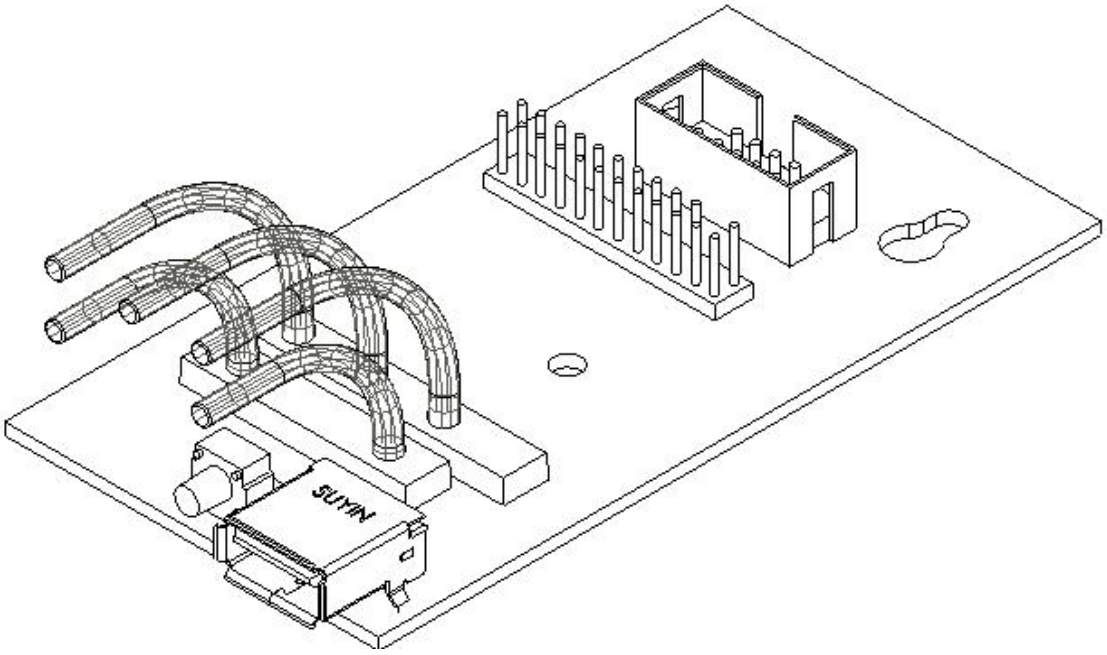


Figure 28. Control Panel Interconnect

Table 26. 24-pin Control Panel Connector

Pin	Signal Name	Pin	Signal Name
1	P3V3_AUX	13	GND
2	P3V3_AUX	14	NIC1_LINK_LED_BUF_N
3	KEY	15	FM_BMC_RST_BTN_N
4	P5V_STBY	16	SMB_SENSOR_3V3SB_DAT_BUF
5	FP_PWR_LED_N_R	17	GND
6	FP_ID_LED_N_R_R	18	SMB_SENSOR_3V3SB_CLK_BUF
7	P3V3	19	FP_ID_BTN_N
8	FP_LED_STATUS_GREEN_BUF_R	20	FP_CHASSIS_INTRU
9	LED_HDD_ACTIVITY_R_N	21	FM_SIO_TEMP_SENSOR_R
10	FP_LED_STATUS_AMBER_BUF_R	22	NIC2_ACT_LED_BUF_R_N
11	FP_PWR_BTN_N_R	23	FP_NMI_BTN_N
12	NIC1_ACT_LED_BUF_R_N	24	NIC2_LINK_LED_BUF_N

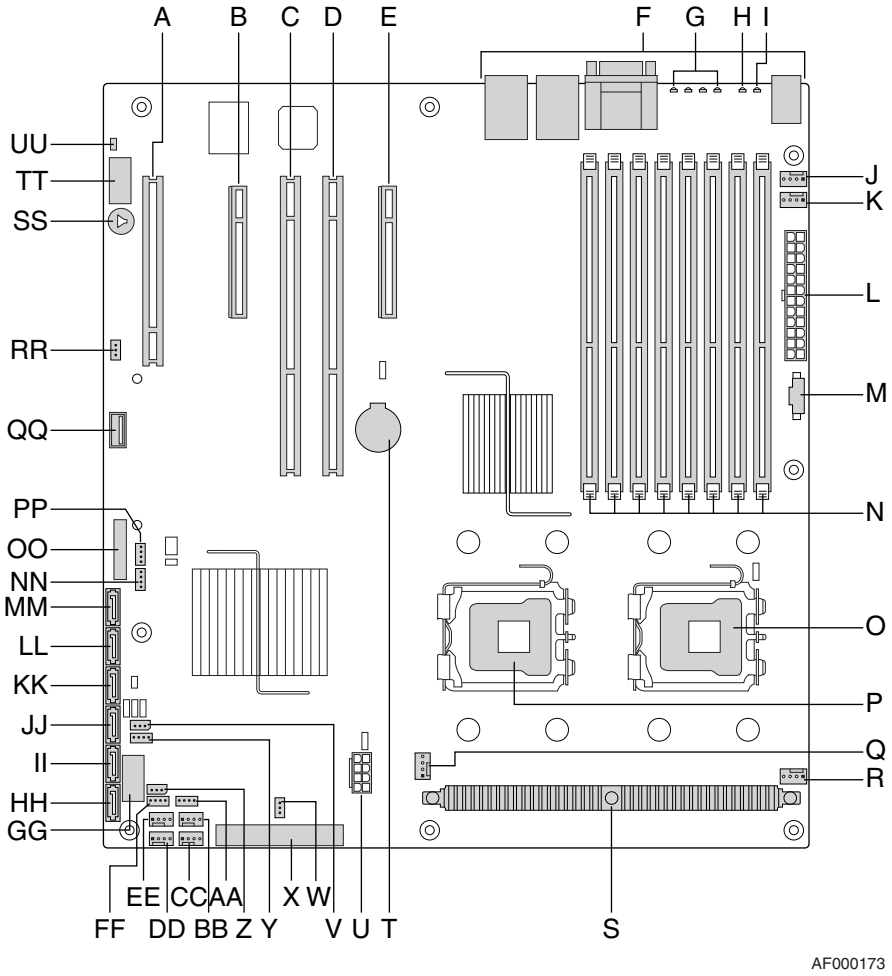
7. Supported Intel® Server Board

The chassis is mechanically and functionally designed to support the Intel® Server Board S5000VSA. See also the technical product specification for the server board.

7.1 Intel® Server Board S5000VSA Feature Set

The Intel® Server Board S5000VSA 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 the following processors: ▪ One or two Dual-Core Intel® Xeon® processors 5000 or 5100 sequence with a 677-, 1066-, or 1333-MHz front side bus with frequencies starting at 2.67 GHz. ▪ Up to two Quad-Core Intel® Xeon® processors 5300 sequence with a 1066- or 1333-MHz front side bus. ▪ Up to two 45nm 2P Dual-Core Intel® Xeon® processors. Product codes SR2520SAFR, SR2520SAXR, and SR2520SAXSR only. ▪ Up to two 45nm next generation Quad-Core Intel® Xeon® processors. Product codes SR2520SAFR, SR2520SAXR, and SR2520SAXSR only.
Memory	Maximum support for 16 GB. Four or eight (based on board SKU type) DIMM slots supporting fully buffered DIMM technology (FBDIMM) memory. 240-pin DDR2-533 and DDR2-667 FBDIMMs may be used. Note: Full DIMM heat spreaders are required.
Chipset	Intel® 5000V Chipset, including: Intel® 5000V MCH Intel® ESB2-E
I/O Control	External connections: ▪ Stacked PS/2* ports for keyboard and mouse ▪ DB9 Serial port ▪ Two RJ45 NIC connectors for 10/100/1000 Mb connections ▪ Seven USB 2.0 ports (4 rear, 2 front, 1 floppy) ▪ Internal Connections: ▪ One RS-232 Serial ▪ One P-ATA133 ▪ Six SATA (300MB) connectors with integrated RAID 0/1/5/10 support ▪ SSI-compliant front panel header ▪ SSI-compliant 24-pin main power connector, supporting the ATX-12V standard on the first 20 pins.
Video	On-board ATI* ES1000 video controller with 16MB DDR SDRAM external video memory
Hard Drives	SKU dependant: ▪ SATA Server board supports six SATA-300 hard drives ▪ SAS Server board supports four SAS-300 and two SATA-300 hard drives
LAN	Intel® 82563EB dual port controller for 10/100/1000 Mbit/sec Ethernet LAN connectivity
Fans	Support for two processor fans, five system fans, and one memory fan
System Management	Support for Intel® System Management Software



A. PCI 32/33 Slot 1	B. PCI Express* x4 Slot 3	C. PCI-X* 64/133 Slot 4
D. PCI-X* 64/100 Slot 5	E. PCI Express* x4 Slot 6	F. Back Panel I/O Ports
G. Diagnostic LEDs	H. System ID LED	I. System Status LED
J. System Fan 6	K. System Fan 5	L. Main Power Connector
M. Auxiliary Signal Connector	N. DIMM Sockets	O. Processor 1 Socket
P. Processor 2 Socket	Q. Processor Fan 2 Header	R. Processor Fan 1 Header
S. Processor Voltage Regulator	T. CMOS Battery	U. Processor Power Connector
V. IPMB Header	W. SAS RAID5 Key	X. IDE Connector
Y. LCP Header	Z. SAS_SES2	AA. SAS SGPIO
BB. System Fan 3	CC. System Fan 4	DD. System Fan 2
EE. System Fan 1	FF. SATA SGPIO	GG. USB 4-5
HH. SATA 0 Connector	II. SATA 1 Connector	JJ. SATA 2/SAS 0 Connector
KK. SATA 3/SAS 1 Connector	LL. SATA 4/SAS 2 Connector	MM. SATA 5/SAS 3 Connector
NN. I2C Backplane Connector B	OO. Front Panel Header	PP. I2C Backplane Connector A
QQ. USB 6	RR. SATA RAID5 Key	SS. Speaker
TT. Serial B EMP Connector	UU. Chassis Intrusion	

Figure 29. Intel® Server Board S5000VSA Components

7.2 Functional Architecture

The Intel® Server Board S5000VSA is based on the Intel® 5000V Chipset. This chipset is for systems that are based on the Dual-Core Intel® Xeon® processor 5000 sequence and supports FSB frequencies of 1066 MTS/1333 MTS.

The chipset contains two main components: the Memory Controller Hub (MCH) for the host bridge, and the I/O controller hub for the I/O subsystem. The chipset uses the Enterprise South Bridge (ESB2-E) for the I/O controller hub.

See also the *Intel® 5000 Series Chipset Server Board Family Datasheet.*

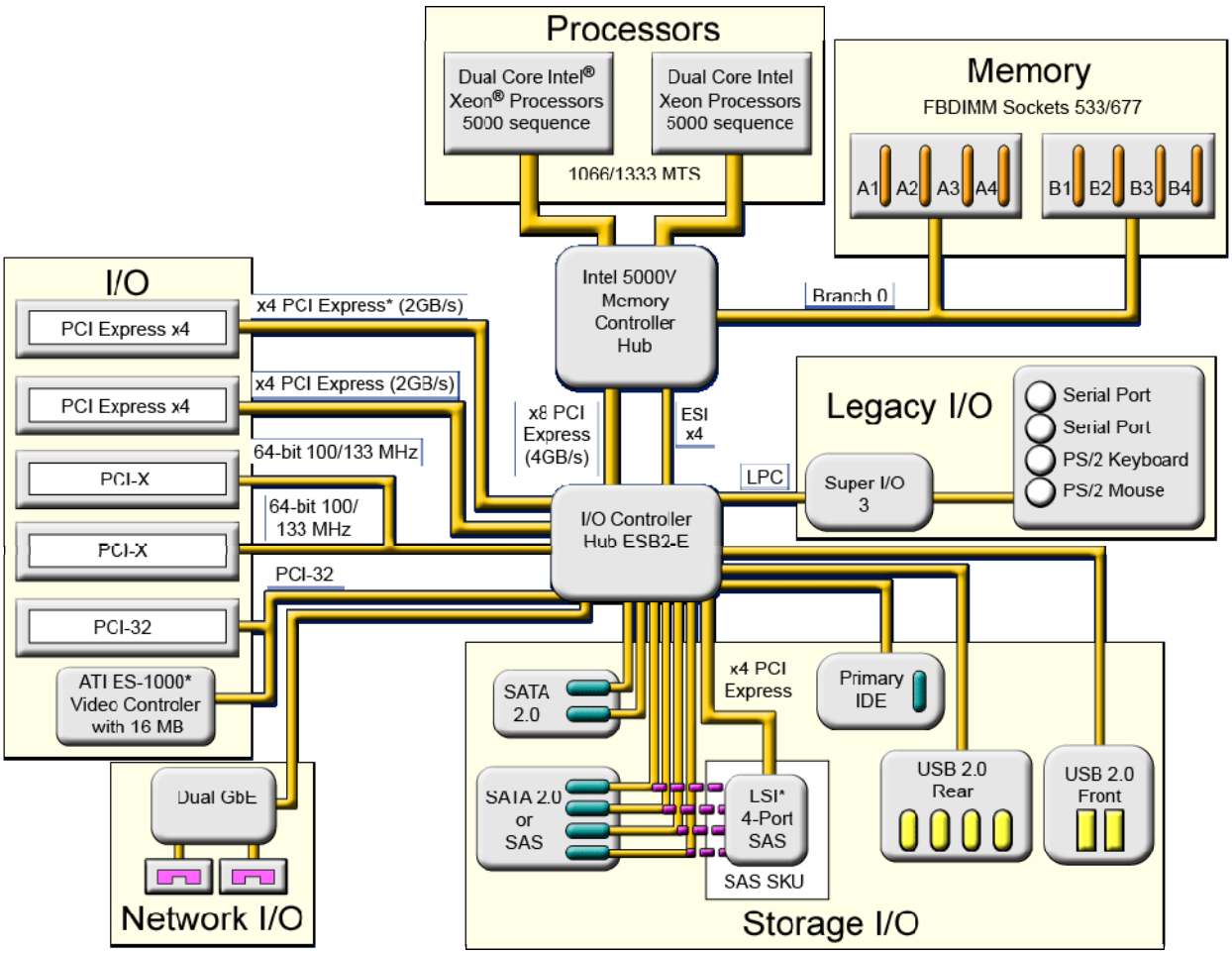


Figure 30. Intel® Server Board S5000VSA Functional Block Diagram

7.3 5000V Memory Controller Hub (MCH)

The 5000V Memory Controller Hub (MCH) is packaged in a 1432 pin FCBGA package. It supports the Dual-Core Intel® Xeon® processor 5000 sequence (1067 MTS/1333 MTS) package. This package uses the matching LGA771 socket.

7.4 Processor Sub-system

The MCH supports a FSB frequency of 267 MHz/333 MHz (1067 MTS/1333 MTS) using a point-to-point dual inline bus (DIB) processor system bus interface. Each processor FSB supports peak address generation rates of 133 million addresses per second. Both FSB data buses are quad pumped 64-bits, which allows peak bandwidths of 8.5 GB/s (1067 MT/s) or 10.7 GB/s (1333 MT/s) depending on the processor. The support circuitry for the processor sub-system consists of:

- Dual LGA771 zero insertion force (ZIF) processor sockets
- Processor host bus AGTL+ support circuitry
- Reset configuration logic
- Processor module presence detection logic
- BSEL detection capabilities
- CPU signal level translation
- Common Enabling Kit Direct Chassis Attach (CEK DCA) CPU retention support

For details about the chipset functional architecture, see the *Intel® 5000 Series Chipset Server Board Family Datasheet.*

7.4.1 Processor Support

The server system supports the following processors:

- One or two Dual-Core Intel® Xeon® processors 5000 or 5100 sequence with a 677-, 1066-, or 1333-MHz front side bus with frequencies starting at 2.67 GHz.
- Up to two Quad-Core Intel® Xeon® processors 5300 sequence with a 1066- or 1333-MHz front side bus.
- Up to two 45nm 2P Dual-Core Intel® Xeon® processors. Product codes SR2520SAFR, SR2520SAXR, and SR2520SAXSR only.
- Up to two 45nm next generation Quad-Core Intel® Xeon® processors. Product codes SR2520SAFR, SR2520SAXR, and SR2520SAXSR only.

Previous generations of the Intel® Xeon® processor are not supported in the server system. See the following table for a detailed list of supported Multi-Core Intel® Xeon® processors 5000 sequence. See http://support.intel.com/support/motherboards/server/s5000vsa/ for a complete updated list of supported processors.

Table 27. Processor Support Matrix

CPU Number	sSpec Number	Core Speed	Bus Speed	L2 Cache Size	Core Stepping	Notes (See Below)
Quad-Core Intel® Xeon® processor 5300 series						
X5355	SLAC4	2.66 GHz	1333 MHz	8 MB	B3	4,5
X5355	SL9YM	2.66 GHz	1333 MHz	8 MB	B3	4,5
E5345	SLAC5	2.33 GHz	1333 MHz	8 MB	B3	4,5
E5345	SL9YL	2.33 GHz	1333 MHz	8 MB	B3	4,5
E5335	SLAC7	2.00 GHz	1333 MHz	8 MB	B3	4,5
E5335	SL9YK	2.00 GHz	1333 MHz	8 MB	B3	4,5
E5320	SLAC8	1.86 GHz	1066 MHz	8 MB	B3	4,5
E5320	SL9MV	1.86 GHz	1066 MHz	8 MB	B3	4,5
L5320	SLAC9	1.86 GHz	1066 MHz	8 MB	B3	4,5,6
L5320	SLA4Q	1.86 GHz	1066 MHz	8 MB	B3	4,5,6
E5310	SLACB	1.60 GHz	1066 MHz	8 MB	B3	4,5
E5310	SL9XR	1.60 GHz	1066 MHz	8 MB	B3	4,5
L5310	SLACA	1.60 GHz	1066 MHz	8 MB	B3	4,5,6
L5310	SLAEQ	1.60 GHz	1066 MHz	8 MB	B3	4,5,6
L5310	SL9MT	1.60 GHz	1066 MHz	8 MB	B3	4,5,6
Dual-Core Intel® Xeon® processor 5100 series						
5160	SLABS	3.00 GHz	1333 MHz	4 MB	B2	2
5160	SL9RT	3.00 GHz	1333 MHz	4 MB	B2	2
5150	SLABM	2.66 GHz	1333 MHz	4 MB	B2	2
5150	SL9RU	2.66 GHz	1333 MHz	4 MB	B2	2
5148	SLABH	2.33 GHz	1333 MHz	4 MB	B2	2,3, 7
5148	SL9RR	2.33 GHz	1333 MHz	4 MB	B2	2,7
5140	SLABN	2.33 GHz	1333 MHz	4 MB	B2	2
5140	SL9RW	2.33 GHz	1333 MHz	4 MB	B2	2
5138	SL9RN	2.13 GHz	1066 MHz	4 MB	B2	8
5130	SLABP	2.00 GHz	1333 MHz	4 MB	B2	2
5130	SL9RX	2.00 GHz	1333 MHz	4 MB	B2	2
5120	SLABQ	1.86 GHz	1066 MHz	4 MB	B2	2
5120	SL9RY	1.86 GHz	1066 MHz	4 MB	B2	2
5110	SLABR	1.60 GHz	1066 MHz	4 MB	B2	2
5110	SL9RZ	1.60 GHz	1066 MHz	4 MB	B2	2
Dual-Core Intel® Xeon® processor 5000 series						
5030	SL96E	2.67 GHz	667 MHz	2x2MB	C1	
5050	SL96C	3.00 GHz	667 MHz	2x2MB	C1	
5060	SL96A	3.20 GHz	1066 MHz	2x2MB	C1	
5063	SL96B	3.20 GHz	1066 MHz	2x2MB	C1	1
5080	SL968	3.73 GHz	1066 MHz	2x2MB	C1	

Notes:
1. Dual-Core Intel® Xeon® processor 5063 is a medium voltage sku with lower wattage consumption, ideal for rack servers.
2. Your Intel® Server Board requires BIOS version 54, or later to support this processor.
3. Dual-Core Intel® Xeon® processor LV 5148 is a low voltage sku with lower wattage consumption, ideal for rack servers.

4. Quad-Core Intel® Xeon® processor 5300 series employ Intel® Advanced Smart Cache (Shared Cache). Features 4MB Smart Cache per core pair.
5. Important Information on http://www.intel.com/support/motherboards/server/sb/CS-023585.htm of Quad-Core Intel® Xeon® processor 5300 series.
6. These processors have a Thermal Design Power of 50 watts.
7. These processors have a Thermal Design Power of 40 watts.

7.4.1.1 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 provides 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.

7.4.1.2 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.

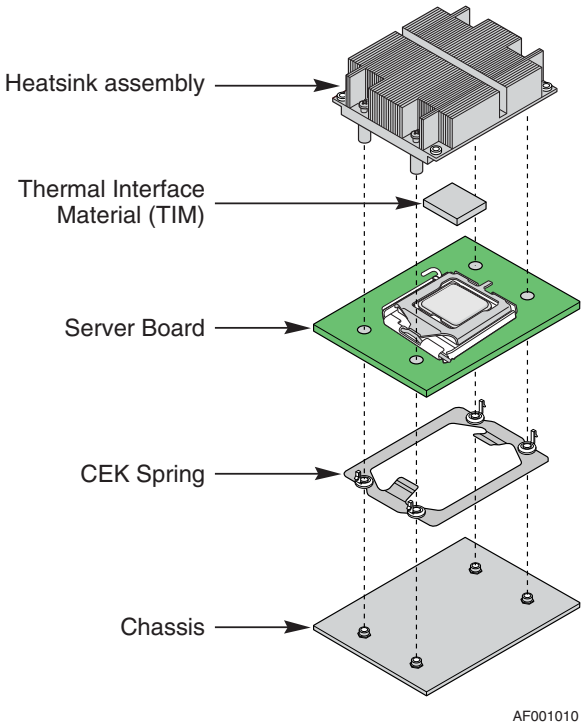


Figure 31. CEK Processor Mounting

8. Platform Control

The embedded platform control adjusts system performance and acoustic levels. Platform control optimizes system performance and acoustics levels through:

Performance management
Performance throttling
Thermal monitoring
Fan speed control
Acoustics management

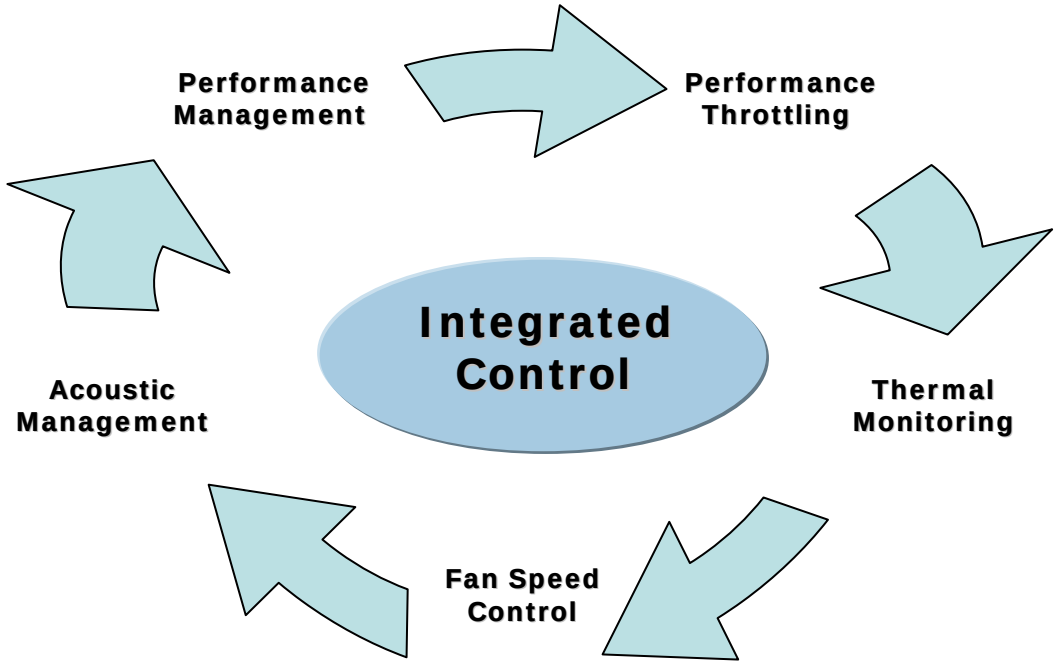


Figure 32. Platform Control

The system 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

8.1 FBDIMM Open Loop Throughput Throttling

The memory throttling chipset feature prevents FBDIMM memory from overheating. If the performance of the FBDIMMs approaches their supported thermal limit, the system BIOS initiates memory throttling, which limits bandwidth to the DIMMs, capping power consumption and preventing the FBDIMMs from overheating. Memory throttling can be minimized by using the Performance Mode, which changes the system fan control profile to run the system fans at higher speeds. Acoustics Mode causes the system fans to run slower to meet the acoustic limits.

The BIOS uses a memory reference code (MRC) throttling algorithm to maximize memory bandwidth when memory throttling is initialized. The MRC code relies on serial presence detect (SPD) data read from the installed DIMMs and from system level data set in the BIOS Setup utility and the FRUSDR Utility.

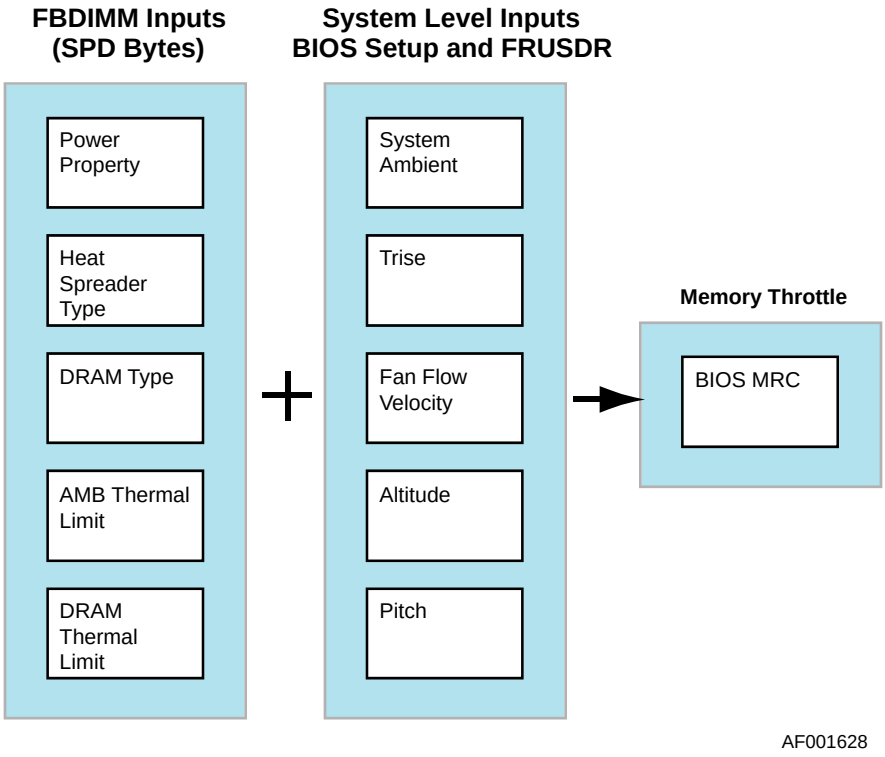


Figure 33. FBDIMM Open Loop Throughput Throttling

8.2 Fan Speed Control

System fan speed is controlled by the baseboard management controller (BMC) functions of the ESB-2 chip. During normal operation, the BMC retrieves information from the BIOS and monitors platform thermal sensors to determine the required fan speeds.

To provide the proper fan speed control, 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 the BIOS during run time.

8.2.1 System Configuration Using the FRUSDR Utility

The Field Replaceable Unit and Sensor Data Record Update Utility (FRUSDR utility) writes platform-specific configuration data to NVRAM. It allows the user to select which supported chassis (Intel or third-party) and platform chassis configuration is being used. Based on the input, the FRUSDR writes configuration-specific sensor data to NVRAM for the BMC to read each time the system is powered on.

8.2.2 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 platform sensors and system fans each time the system is powered on. After power-on, the BMC uses additional data provided from the BIOS to determine how the system fans should be controlled.

The BIOS tells the BMC if the platform is set up for the Acoustics Mode or Performance Mode fan profile. The BIOS uses the parameters retrieved from the thermal sensor data records (SDR), and the fan profile and the altitude settings from BIOS Setup utility 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 BIOS Setup utility provides options to set the fan profile or operating mode. Each operating mode has a predefined profile for platform targets. These determine how the system fans operate to meet those targets. Platform profile targets are determined the type of platform selected from the FRUSDR utility and the BIOS settings configured through the BIOS Setup utility.

8.2.2.1 Configuring the Fan Profile Using the BIOS Setup Utility

The Set Fan Profile and Altitude options in the BIOS Setup utility determine the fan profile the system that should be used.

Set Fan Profile can be set to Performance mode (Default) or Acoustics mode. Changing the fan profile to Acoustics mode may affect system performance.

Altitude determines appropriate memory performance settings based on the cooling capability at different altitudes. At a high altitude, memory performance must be reduced to compensate for thinner air. Selecting an Altitude 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, Altitude is set to 301 meters to 900 meters, which covers the majority of the operating altitudes.

The following diagram shows the BIOS Setup utility menu that is used to configure the fan profile.

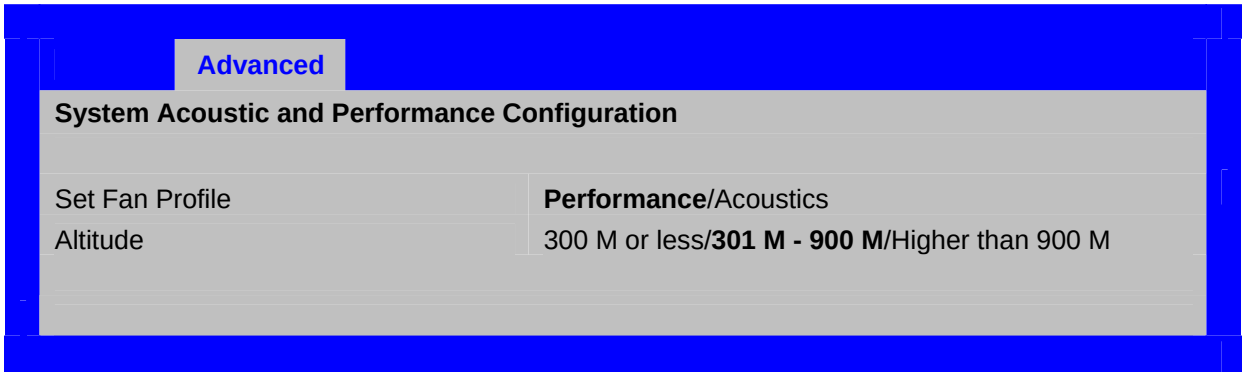


Figure 34. BIOS Setup utility menu

Table 28. BIOS Setup utility configuration table

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 third-party chassis, configured by selecting Non-Intel Chassis in the FRUSDR utility, is limited to only the processor 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 because of unknown variables for 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. In this scenario the Performance and Acoustic mode settings only affect the performance of the memory (higher BW for the Performance mode).

8.2.2.2 Performance Mode (Default)

In Performance mode, platform control algorithm variables are set to enhance the platform's capability of operating at maximum performance targets. The platform is programmed with higher fan speeds at lower external temperatures. This results in a louder acoustic level than is

targeted, but the increased airflow reduces the possibility of memory throttling reduces dynamic fan speed changes based on processor utilization.

8.2.2.3 Acoustics Mode

In Acoustics mode, platform control algorithm variables are set to ensure acoustic targets are not exceeded. 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 is used to ensure memory thermal limits are not exceeded.

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 29. System Environmental Limits Summary

Parameter	Limits
Operating Temperature	+10 C to +35 C with the maximum rate of change not to exceed 10 C per hour
Non-Operating Temperature	-40 C to +70 C
Non-Operating Humidity	90%, non-condensing at 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
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	1826 BTU/hour

9.2 Product Regulatory Compliance

9.2.1 Product Safety Compliance

The Intel® Server System SR2520SA 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)
Belarus License (Belarus)
Ukraine License (Ukraine)
CE - Low Voltage Directive 73/23/EEE (Europe)
IRAM Certification (Argentina)

9.2.2 Product EMC Compliance

The Intel® Server System SR2520SA 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)
Belarus License (Belarus)
Ukraine License (Ukraine)
RRL MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) (Korea)

9.2.3 Product Regulatory Compliance Markings

This product is provided with the following product certification markings.

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
RRL MIC Mark	Korea	

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: Intel® Server Chassis SR2520; Intel® Server Board S5000VSA

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 Canadian 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 Korean RRL Compliance

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

English translation of the notice above:

1. Type of Equipment (Model Name): On 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

9.4 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:

Table 30. Serviceability and Availability

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 (non-hot swappable)	7 min
Remove and replace backplane board	12 min
Remove and replace control panel module	2 min
Remove and replace server board	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 implementation 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.

5. **Server Chassis** (base chassis is provided with power supply and fans) UL listed.
6. **Server board** you must use an Intel server board—UL recognized.
7. **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.

Appendix A: Chassis Integration and Usage Tips

This appendix provides a list of useful information that is unique to the Intel® Server System SR2520SA and should be kept in mind while integrating and configuring your system.

In a single power supply configuration, the power supply must be placed in the lower slot. A power supply blank must be installed in the upper slot in order to maintain proper airflow in the system.

Do not mix DIMMs of different heights. For tall DIMMS the DIMM baffle must be removed from the Processor Air Duct for proper fitment. The baffle must be installed for shorter DIMMS to ensure proper airflow and DIMM cooling.

You must run the FRUSDR utility to load the proper Sensor Data Records for this chassis on to the server board. Failure to do so may result in possible false errors being reported to the System Event Log. It is best to download the latest FRUSDR Utility for your particular server board using the Intel® Server Deployment Toolkit 2.0 CD or from the following web site: http://support.intel.com/support/motherboards/server

To ensure proper cooling of your server, all air baffles and air ducts must be in place. In addition, all drive bays must be populated with either a drive or a drive blank and both power supply slots must be populated by either a power supply or a power supply blank.

Processor fans are not supported and are not needed in the Intel® Server System SR2520SA.

There are three indentations in the top of the chassis. These are for the Intel Safety Label, the Windows Certification Label, and a Customer Defined Label.

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 31. POST Progress Code LED Example

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

Table 32. Diagnostic LED POST Code Decoder

Checkpoint	Diagnostic LED Decoder G=Green, R=Red, A=Amber				Description
	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)

Checkpoint	Diagnostic LED Decoder G=Green, R=Red, A=Amber				Description
	MSB			LSB	
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
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

Checkpoint	Diagnostic LED Decoder G=Green, R=Red, A=Amber				Description
	MSB			LSB	
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
0xE8h	A	R	R	OFF	Checking password
0xE9h	A	R	R	G	Entering BIOS setup

Checkpoint	Diagnostic LED Decoder G=Green, R=Red, A=Amber				Description
	MSB			LSB	
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 33. 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 34. Each digit in the code is represented by a sequence of beeps whose count is equal to the digit.

Table 34. 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

Appendix D: Product Contents

Items	Quantity		
Pre-installed in the Server System	SR2520SAF/SR2520SAFR	SR2520SAX/SR2520SAXR	SR2520SAXS/SR2520SAXSR
Intel S5000VSA 4DIMM Server Board	1	0	0
Intel S5000VSA SATA Server Board	0	1	0
Intel S5000VSA SAS Server Board	0	0	1
Quick Reference Label (inside top cover)	1	1	1
600 Watts Fixed Power Supply	1	0	0
600 Watts Hot-Swap Power Supply	0	1	1
Dummy Hot-Swap Power Cage	0	1	1
80mm System Fan	2	2	2
60mm System Fan	1	1	1
USB Y cable for Floppy and Front Panel Cable	1	1	1
Front Panel Cable	1	1	1
I2C Cable (Serverboard to HSBP)	0	1	0
SGPIO Cable (Server board to HSBP)	0	0	1
SATA Cable (Server board to HSBP)	0	6	0
SAS Cable (Server board to HSBP)	0	0	2
CPU Duct	1	1	1
I/O Shield	1	1	1
Drive Filler Panel	0	2	2
Hot-Swap Drive Carrier	0	4	4
Hot-Swap Backplane (Active or Passive)	0	1	1
Standard Control Panel	1	1	1
Slimline USB Floppy	1	1	1
In the Server System Product Box			
Collateral			
▪ Attention document	1	1	1
▪ Quick Start User's Guide	1	1	1
▪ Intel® software kit	1	1	1
▪ Third-party software kit	1	1	1
SATA cable	6	0	0
CD-ROM cable	1	1	1
Bag of screws	1	0	0
Rock handles	1	1	1
Rails	1	1	1
Front panel sub-bezel assembly	0	1	1
Product Codes for Optional Accessories and Spares			
AXXBASICRAIL	Supported	Supported	Supported
AXXUSBFLOPPY	Supported	Supported	Supported

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 S5000VSA Technical Product Specification

Intel® 5000 Series Chipsets Server Board Family Datasheet

Intel® Server Chassis SR2520 Power Distribution Board for 600 Watt Power Supply Specification

Intel® Server Chassis SR2520 600 Watt AC Power Supply Module Specification

Intel® Server Board S5000VSA Tested Hardware and OS List